VOLUMEN / *VOLUME* 50 eISSN: 2340-4078 ISSN: 0300-5267
NÚMERO / *NUMBER* 200 LCCN: sn 93026779 CODEN: SRLPEF
(Fecha de publicación 30 de diciembre de 2022 / *Issued 30 December 2022*

SHILAP

REVISTA DE LEPIDOPTEROLOGIA

SOCIEDAD HISPANO-LUSO-AMERICANA DE LEPIDOPTEROLOGIA -1973-

50 ANIVERSARIO
50 ANNIVERSARY

Madrid
2022

2022 CALIDAD REVISTAS CIENTÍFICAS ESPAÑOLAS
FECYT
FECYT-072/2022
Fecha de certificación: 2ª Convocatoria (2011)
Válido hasta: 22 de julio de 2023

Organismo Rector de *SHILAP* / *Officers and Board* of SHILAP

La *Sociedad Hispano-Luso-Americana de Lepidopterología (SHILAP)*, es una Sociedad científica, fundada en 1972 y formalmente registrada en 1973, de acuerdo al Régimen Jurídico de la Ley de Asociaciones de 24 de diciembre de 1964. Con el propósito de agrupar a los interesados en una Asociación con fines científicos y sin ánimo de lucro, se crea en Madrid la *Sociedad Hispano-Luso-Americana de Lepidopterología (SHILAP)*. Podrán pertenecer a ella todas las personas interesadas en el estudio de los Lepidoptera. La Sociedad es independiente de los demás Organismos, Asociaciones, Instituciones y Entidades nacionales o extranjeras que puedan tener objetivos similares, con las que mantendrá relaciones y colaborará eficazmente. Son fines de la Sociedad promover y perfeccionar el estudio de los Lepidoptera en general y en particular de los ibéricos, su ciclo biológico y conservación de su hábitat, poniendo en contacto a los entomólogos españoles y extranjeros que lo deseen, y haciendo llegar a los mismos y a los Organismos oficiales la mayor cantidad de información disponible sobre la especialidad, en pos de un intercambio mayor de experiencias científicas de índole biológico. / *The Sociedad Hispano-Luso-Americana de Lepidopterologia (SHILAP), is a scientific Society founded in 1972 and formally registered in 1973 according to the Spanish Law of Association of December 24th, 1964. The* Sociedad Hispano-Luso-Americana de Lepidopterologia (SHILAP) *was formed in Madrid to bring together in a Scientific Society all persons interested in the study of Lepidoptera. The Society is a non-profit organization. The Society shall be independent from any other national or foreign Organization, Society, Institution or group with similar aims. Nevertheless, it is open to and shall encourage effective cooperation with such Organizations. The objectives of the Society are to improve and support studies on Lepidoptera in general, paying special attention to those from the Iberian Peninsula. It shall promote the study of the biology of Lepidoptera and conservation of their habitat and encourage cooperation between its members. The Society shall facilitate the exchange of information between Spanish and foreign specialists and shall provide entomologists and Official Institutes with research results and scientific experience derived from its particular field of study.*

Sede Social
Cátedra de Entomología Agraria
E.T.S. de Ingeniería Agronómica
Alimentación y Biosistemas
Universidad Politécnica de Madrid
Avenida Puerta de Hierro, 2
E - 28040 Madrid
ESPAÑA / *SPAIN*

© SHILAP
Apartado de correos, 331
E - 28080 Madrid
ESPAÑA / *SPAIN*
E-mail: avives1954@outlook.es / avives1954@outlook.com
E-mail: avives1954@gmail.com
https://shilap.org

ISSN: 0300-5267 (edición impresa / *print edition*) / eISSN: 2340-4078 (edición electrónica / *online edition*)
CODEN: SRLPEF / LCCN: sn 93026779 / NLM ID: 101611953 / CDU: 595.78(05) / GND: 3004332-3
TIRADA / *EDITION*: 500 ejemplares / *500 copies*
EDITADO por / *EDITED by*: © Sociedad Hispano-Luso-Americana de Lepidopterología
IMPRESO por / *PRINTED by*: Ágata Comunicación Gráfica. Tomelloso, 27. E-28026 Madrid, ESPAÑA / *SPAIN*
Depósito Legal: M. 23.796-1973

VOLUMEN / *VOLUME* 50 eISSN: 2340-4078 ISSN: 0300-5267
NÚMERO / *NUMBER* 200 LCCN: sn 93026779 CODEN: SRLPEF
(Fecha de publicación 30 de diciembre de 2022 / *Issued 30 December 2022*

SHILAP REVISTA DE LEPIDOPTEROLOGIA

SUMARIO / *CONTENTS*

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 580 eISSN: 2340-4078 ISSN: 0300-5267

NOTAS DE REDACCIÓN – *EDITOR’S NOTES*

1. Las opiniones que los autores de las colaboraciones contenidas en esta revista exponen, representa exclusivamente su criterio personal, salvo que firmen en su carácter de Directivos de *SHILAP*.

2. Las referencias bibliográficas sobre trabajos contenidos en esta publicación deben hacerse como sigue: *SHILAP Revista de lepidopterología.*

3. Los trabajos publicados en esta revista son citados o resumidos en: *Academic Journals Database, Biological Abstracts, BIOSIS Previews*, *CABI-CAB Abstracts, CWTS Journal Indicators, Google Scholar*, *Entomology Abstracts*, *FAO-Agris*, *Fuente Académica Plus*, *Índice Español de Ciencia y Tecnología* (*ICYT*), *DIALNET*, e-revist@s - Revistas Electrónicas, *Índice Latinoamericano de Revistas Científicas* (*LATINDEX*), *Matriz de Información para el Análisis de Revistas (MIAR), Información y Documentación de la Ciencia en España* (*ÍnDICEs-CSIC*), *International Bibliography of Periodical Literature* (*IBZ*), *PUBLINDEX, Qualis* (*CAPES*)*, Red de Revistas Científicas de América Latina y el Caribe, España y Portugal* (*REDALYC*), *Referativnyi Zhurnal (VINITI), Repositorio Español de Ciencia y Tecnología* (*RECYT*), *Science Citation Index Expanded* (*SCIE*), *SCImago, SCOPUS, Ulrich's International Periodical Directory*, *Veterinary Science Database*, *Web of Science y Zoological Record.*

4. Todo el contenido es de Acceso Abierto y se distribuye bajo los términos de la Licencia de Reconocimiento 4.0 Internacional de Creative Commons (CC BY 4.0), que permite el uso, la distribución y la reproducción sin restricciones en cualquier medio, siempre que se cite al autor original y la fuente.

5. Según el artículo 8 del CINZ a partir de 1999, los autores de “SHILAP Revista de lepidopterología” indican en todos los actos nomenclaturales que están pensados para su exposición permanente, pública y científica. “SHILAP Revista de lepidopterología” está producida por técnicas de impresión, las cuales garantizan una edición conteniendo simultáneamente la obtención de copias.

6. Factor de Impacto JCR (2021): 0.313 / SJR (2021): 0.263.

1. *The opinions expressed by the collaborators of this journal represent only their personal opinion, except when they sing in the capacity Officers of* SHILAP.

2. *Bibliographic references about works included in this publication must be written as follows:* SHILAP Revista de lepidopterología.

3. *Papers published in this journal are cited or abstracted in:* Academic Journals Database, Biological Abstracts, BIOSIS Previews, CABI-CAB Abstracts, CWTS Journal Indicators, Google Scholar, Entomology Abstracts, FAO-Agris, Fuente Académica Plus, Índice Español de Ciencia y Tecnología (ICYT), DIALNET, e-revist@s - Revistas Electrónicas, Índice Latinoamericano de Revistas Científicas (LATINDEX), Information Matrix for the Analysis of Journals (MIAR), Information and Documentation of Science in Spain (ÍnDICEs-CSIC), International Bibliography of Periodical Literature (IBZ), PUBLINDEX, Qualis (CAPES), Red de Revistas Científicas de América Latina y el Caribe, España y Portugal (REDALYC), Referativnyi Zhurnal (VINITI), Repositorio Español de Ciencia y Tecnología (RECYT), Science Citation Index Expanded (SCIE), SCImago, SCOPUS, Ulrich's International Periodical Directory, Veterinary Science Database, Web of Science *and* Zoological Record.

4. *All content is Open Access distributed under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0) License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*

5. *According to article 8 ICNZ, from 1999 the authors of “SHILAP Revista de lepidopterología” state that all taxonomic and nomenclatural acts are intended for permanent, public, scientific record. “SHILAP Revista de lepidopterología” is produced by printing techniques which guarantee an edition containing simultaneously obtainable copies.*

6. *JCR Impact Factor (2021): 0.313 / SJR (2021): 0.263.*

Cómo ser socio de la Sociedad Hispano-Luso-Americana de Lepidopterología
How to be membership of the Sociedad Hispano-Luso-Americana de Lepidopterologia

Esta Sociedad está abierta a todas las personas e Instituciones con interés en el estudio de los Lepidoptera en el mundo. La subscripción anual se paga al comienzo del año. Es de 75 € para los socios y 240 € para las Instituciones. Se puede pagar por Giro Postal, por Transferencia Bancaria, sin cargo para SHILAP, o con Tarjeta de Crédito. La transferencia bancaria puede hacerse a la cuenta de SHILAP en el Banco de Bilbao Vizcaya Argentaria, Madrid (IBAN: ES06 0182 1216 2802 0151 5543). Los socios recibirán *SHILAP Revista de lepidopterología* trimestralmente y otras publicaciones de la Sociedad, así como descuentos en libros y publicaciones sobre Entomología.

Las solicitudes, por carta o por correo electrónico, se enviarán a:

This Society is open to all persons and Institutions interested in the study of world-wide Lepidoptera. The annual subscription is paid at the beginning of the year. It is 75 € for members and 240 € for Institutions. Payment can be made by Postal Money Order, by Bank Transfer free of charge to SHILAP, or by Credit Card. Bank transfer should be made to SHILAP account Banco Bilbao Vizcaya Argentaria [Madrid] (IBAN: ES06 0182 1216 2802 0151 5543). Members will receive quarterly a copy of SHILAP Revista de lepidopterología *and other Society’s publications as well as deductions on books and Entomological publications.*

The applications, by letter or by e-mail, should be sent to:

ANIVERSARIO
ANNIVERSARY

SHILAP
Apartado de Correos, 331
E - 28080 Madrid
ESPAÑA / *SPAIN*
E-mail: avives1954@outlook.es / avives1954@gmail.com / avives1954@outlook.com

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 581-588 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.249

A new species of *Gladiovalva* Sattler, 1960 from Central Asia (Lepidoptera: Gelechiidae)

Oleksiy Bidzilya & Jan Šumpich

Abstract

Re-examination of museum's vouchers of *Gladiovalva igorella* Falkovitsh & Bidzilya, 2003 resulted in the discovery of new, hitherto undescribed species, which is in this paper described as *Gladiovalva arevika* Bidzilya & Šumpich, sp. n. Photographs of its adults and genitalia of both sexes are presented as well as the comparison with those of *G. igorella*.

Keywords: Lepidoptera, Gelechiidae, *Gladiovalva igorella*, Armenia, Iran, Turkmenistan.

Una nueva especie de *Gladiovalva* Sattler, 1960 de Asia Central (Lepidoptera: Gelechiidae)

Resumen

El reexamen del estudio de los ejemplares de museo de *Gladiovalva igorella* Falkovitsh & Bidzilya, 2003, dio como resultado el descubrimiento de una nueva especie, hasta ahora no descrita, que en este trabajo se describe como *Gladiovalva arevika* Bidzilya & Šumpich, sp. n. Se presentan fotografías de los adultos y de la genitalia de ambos sexos, así como la comparación con los de *G. igorella*.

Palabras clave: Lepidoptera, Gelechiidae, *Gladiovalva igorella*, Armenia, Irán, Turkmenistán.

Introduction

The genus *Gladiovalva* Sattler, 1960 initially comprised three species - *G. rumicivorella* (Millière, 1881) (type species), *G. pseudodorsella* Sattler, 1960 and *G. badidorsella* (Rebel, 1935) (Sattler, 1960), and two additional species have been described: *G. aizpuruai* Vives, 1990 (Spain) and *G. igorella* Falkovitsh & Bidzilya, 2003 (SE Kazakhstan and Uzbekistan).

Acetosa scutata (L.) Mill. and *Acetosa pratensis* Mill. are host plants for *G. rumicivorella,* and *G. aizpuruai* respectively, whereas larvae of *G. igorella* are known feeding on *Atraphaxis spinosa* L. (Polygonaceae).

The genus can be identifiable from weakly sclerotised uncus, reduced gnathos, very short sacculus and bulbus ejaculatorius with long, coiled, strongly sclerotised lamina in the male genitalia. The female genitalia of *Gladiovalva* are rather variable, but a combination of shape of signum and antrum can be considered as characteristic. Externally species of *Gladiovalva* are recognizable by dark forewing with light dorsal 1/3-1/4. In this respect *Gladiovalva* resembles some species of *Ornativalva* Gozmány, 1955, but latter are usually less contrasting and has longer brush of modified scales on underside of segment 2 of labial palps. Within Gelechiidae the genus was placed in the subfamily Anomologinae near to *Ornativalva* (Elsner et al. 1999; Huemer & Karsholt, 2020). Bidzilya & Karsholt (2008) indicated some affinity of *Gladiovalva* to *Spiniductellus* Bidzilya & Karsholt, 2008.

In this present contribution we describe additional new species from Central Asia that is extremely similar to *G. igorella* in wing pattern but well distinguishable in genitalia of both sexes. A particularly significant difference is evident in the structure of the male genitalia where *G. arevika* Bidzilya & Šumpich, sp. n. has phallus with distinct medial process on dorsal side, which is unique within the genus.

Material and methods

The present study based on material from the following collections:

MNCN	Museo Nacional de Ciencias Naturales, Madrid, Spain
NHMW	Naturhistorisches Museum, Wien, Austria
NMPC	National Museum, Prague, Czech Republic
SMNK	Staatliches Museum für Naturkunde Karlsruhe, Karlsruhe, Germany
ZIN	Zoological Institute, Russian Academy of Sciences, Sankt-Petersburg, Russia
ZMKU	Zoological Museum, Kyiv Taras Shevchenko National University, Kyiv, Ukraine

Study material collected by the second author was attracted at ultraviolet light (8W/12V tubes) installed in portable light traps.

Preparations of genitalia slides followed standard techniques (Robinson, 1976). Pinned specimen were photographed with a camera Canon 750D in the combination of a Canon MP-E-65 mm lens (Jan Šumpich) or Canon EOS Rebel T5 equipped with a Canon EFS 60 mm f/2.8 Macro USN lens (Oleksiy Bidzilya). Slide-mounted genitalia were photographed with a Canon EOS 200D DSLR camera mounted on an Olympus CX-31 stereomicroscope (Jan Šumpich) or with a Canon EOS 600D DSLR camera mounted on an Olympus U-CTR30-2 trinocular head mounted on a Carl Zeiss compound microscope. For each photographs sets of 10-20 images were taken at different focal planes and focused-stacked using Helicon Focus 6 with the final image edited in Adobe Photoshop CS5.

Results

Gladiovalva arevika Bidzilya & Šumpich, sp. n.

Material examined: Holotype ♂, Armenia mer., Arevik National Park, 3,2 km NE of Meghri, Artsvakar gorge, 750 m, rocky steppe, 38º55’15”N, 46º16’17”E, 6-7-VI-2017, J. Šumpich leg. (NMPC).

Paratypes: Armenia: 42 ♂♂, 31 ♀♀, same data as for holotype (gen. slides 22022 and 22013, J. Šumpich); Arevik National Park, 2.3 km NW of Aygedzor, Lichtkvaz, 1355 m, mountain steppe, rocks, 38º59’25”N, 46º11’9”E, 1 ♀, 4-VI-2017, J. Šumpich leg.; Arevik National Park, 3 km NW of Meghri, Lehvaz env., 844 m, rocky steppe, 38º54’59”N, 46º13’12”E, 2 ♂♂, 5 ♀♀, 5-VI-2017, J. Šumpich leg.; Arevik National Park, Shvanidzor env., 780 m, rocky steppe, 38º56’34”N, 46º22’57”E, 7 ♂♂, 2 ♀♀, 8-VI-2017, J. Šumpich leg.; Areni env., Noravank monastery, 1330 m, rocky steppe, 39º41’44”N, 45º12’52”E, 3 ♂♂, 10-VI-2017, J. Šumpich leg.; Khosrov, 130 m, 8-9-VII-2009, D. Vacula leg., 1 ♀ (gen. slide 295/17, O. Bidzilya) (all NMPC, 1 ♂, 1 ♀, MNCN, 1 ♂, 1 ♀ ZMKU); Migry on Araks, 6-VII-1931, M. Rjabov leg., 1 ♂ (gen. slide 73/22, O. Bidzilya); 1 ♂, same data as for preceding but 8-VII-1931 (gen. slide 12/18, O. Bidzilya) (all ZIN). Iran, Prov. Semnãn, 30 km NW Dãmghãn, Cheschme Ali, 36º15’07”N, 54º04’20”E, 1560 m NN, 1 ♂, 24-V-[20]05, R. Trusch, G. Petschenka, B. Müller leg. (SMNK E-Lep. 215) (gen. slide 88/18, O. Bidzilya) (SMNK). Iran: mountains N of Semnan, 1 ♂, 18-VI-1963, Kasy & Vartian leg. (gen. slide Hendriksen 6388) (NHMW).

TURKMENISTAN: Kara-Kala, Chandyrskaya doroga, 1 ♂, 8-VI-1953, V. Kuznetzov leg. (gen. slide 72/22, O. Bidzilya); Central Kopetdagh, Germab, 780 m, 1 ♂, 22-VI-1982, M. Falkovitsh leg. (gen. slide 9/18, O. Bidzilya) (all ZIN).

Diagnosis: The new species is similar in wing pattern to *G. igorella* (Figures 4-5, 9-11) but differs in lighter, white with few brown scale's labial palps, head (predominantly black in *G. igorella*), and lighter and shiny hindwing (but see also under Remarks). The male genitalia are unique in *Gladiovalva* having medial process on dorsal side in the distal portion of the phallus. The female genitalia resemble those of *G. igorella* (Figure 17) having the serrate signum but differ in absent of long well sclerotised antrum that is characteristic for the latter species.

Description: Adult (Figures 2-3, 6-8). Wingspan 13.5-15.0 mm. Head covered with white grey to brown tipped scales. Labial palpus recurved, segment 3 white mixed with brown, diffuse brown belt before apex, underside with brush of long modified scales, segment 3 with few brown scales basally on upper side and near middle, 3/4 length and 1/2 width of segment 2; scape black with white apex, flagellomeres black with distinct wide white rings in basal 1/4-1/3, and unicolour brownish black in the rest part of antennae; thorax black with white caudal spot, tegulae black; forewing black with pale yellow undulated pattern from base of costa to dorsal margin and then extending along dorsal margin to 2/3 length and about 1/3 width of forewing, two white nearly connected spots at 3/4, cilia blackish brown; hindwing grey at basal 1/3, then light brown, darker along margins, with brown cilia.

Male genitalia (Figures 12-13): Uncus trapezoidal slightly longer than broad, weakly sclerotised; gnathos reduced; tegumen triangular to 3/4 length with distinct transition to distal 1/4 that is narrow, about as broad as uncus, subrectangular to ovate with distinctly sclerotised sides and sclerotised posterior margin, lateral lobes of tegumen two times longer than broad, subrectangular, anteromedial emargination triangular; valva of even width, weakly bent, apex rounded, densely covered with hairs in distal 1/3, far extending over posterior margin of uncus; sacculus very short, about 1/7 length of valva, weakly narrowed towards rounded apex; vinculum broadly emarginated in middle, membranous, covered with short dense setae, fused dorsally with membranous transtilla forming weakly sclerotised ring around phallus; saccus subtriangular, broad at base, apex pointed or rounded, far extending beyond top of pedunculus; phallus separated into weakly sclerotised subovate caecum and strongly sclerotised distal portion, the latter has gradually bent ventral margin with short extension before middle, and deeply excavated dorsal margin with elongated narrow subapical process, apex weakly broadened, bulbus ejaculatorius about five times as long as phallus, lamina in anterior 1/3 of bulbus ejaculatorius, distinct, strongly coiled.

Variation: Specimen from Turkmenistan differs in shorter and broader saccus and narrower distal process of phallus (Figure 13). These differences are considered as individual variations until molecular analysis data will not indicate otherwise.

Female genitalia (Figures 15-16). Papillae anales elongated, covered with setae; apophyses posteriores slender, rod-like, two times as long as segment VIII; segment VIII about as long as broad, tergum VIII with shallow anterior emargination, sternum VIII parallel-sided, subgenital plates weakly sclerotised laterally, with more distinct sclerotised medial patches in posterior 2/3 edged laterally and anteriorly with narrow distinct folds, medial membranous zone very slender, just weakly broadened before straight, strongly sclerotised anterior margin; apophyses anteriores slender, as long as segment VIII; very slender saber-shaped processes extending medially from base of apophyses anteriores to 1/3 of sternum VIII and nearly connected above ostium opening; ostium opening large, subovate, near anterior margin of sternum VIII, surrounded laterally with elongated sclerite; posterior part of ductus bursae funnel-shaped, membranous, without sclerotised antrum, ductus bursae short, slender, broadened towards large, rounded corpus bursae, signum plate large, subhexagonal, covered with short triangular thorns, margins distinctly serrate, medial ridge about 1/4 width of signum.

Biology: Host plant unknown. Adults have been collected from late May to mid-July up to 1550 m in rocky steppes (Figure 1).

Distribution: Armenia, Iran, Turkmenistan.

Figure 1. Artsvakar gorge near Meghri in Armenia, habitat of holotype *Gladiovalva arevika* Bidzilya & Šumpich, sp. n.

Etymology: The species name is derived from territory in south of Armenia protected in Arevik National Park, from where the larger part of type series was collected.

Remark: *Gladiovalva igorella* that is most similar to *G. arevika* sp. n. by the wing pattern has been described from male holotype from Karatau Mts in SE Kazakhstan (Figures 4, 14), three females from Aksu-Dzubagly Nature Reserve (SE Kazakhstan) and two males and four females bred from *Atraphaxis spinosa* L. in Kyzylkum desert of Uzbekistan (Falkovitsh & Bidzilya, 2003). Our study of the type series of this species indicated small differences in the shape of phallus between holotype and paratypes. Revisionary studies are necessary to confirm if two species are involved.

Acknowledgements

The authors thank Robert Trusch, Michael Falkenberg (SMNK) and Sergei Sinev (ZIN) for assistance during the work with collections under their care. Ole Karsholt kindly shared record of *G. arevika* sp. n. from Iran (coll. NHMW) and, together with another anonymous reviewer provided helpful comments on the manuscript. Jan Šumpich expresses his gratitude to Gayane Karagyan (Scientific Centre of Zoology and Hydroecology, Yerevan, Armenia) for the company during the trip to Armenia and for the direction to the prominent Armenian sites. The work was supported by the Ukrainian State Budget Program “Support for the Development of Priority Areas of Scientific Research” (Code: 6541230) (O. Bidzilya). J. Šumpich carried out his part of the work on this article with support from the Ministry of Culture Czech Republic (DKRVO 2019-2023 / 5.I.d, National Museum, 00023272).

References

Bidzilya, O., & Karsholt, O. (2008). New data on Anomologini from Palaearctic Asia (Gelechiidae). *Nota lepidopterologica, 31*(2), 199-213.

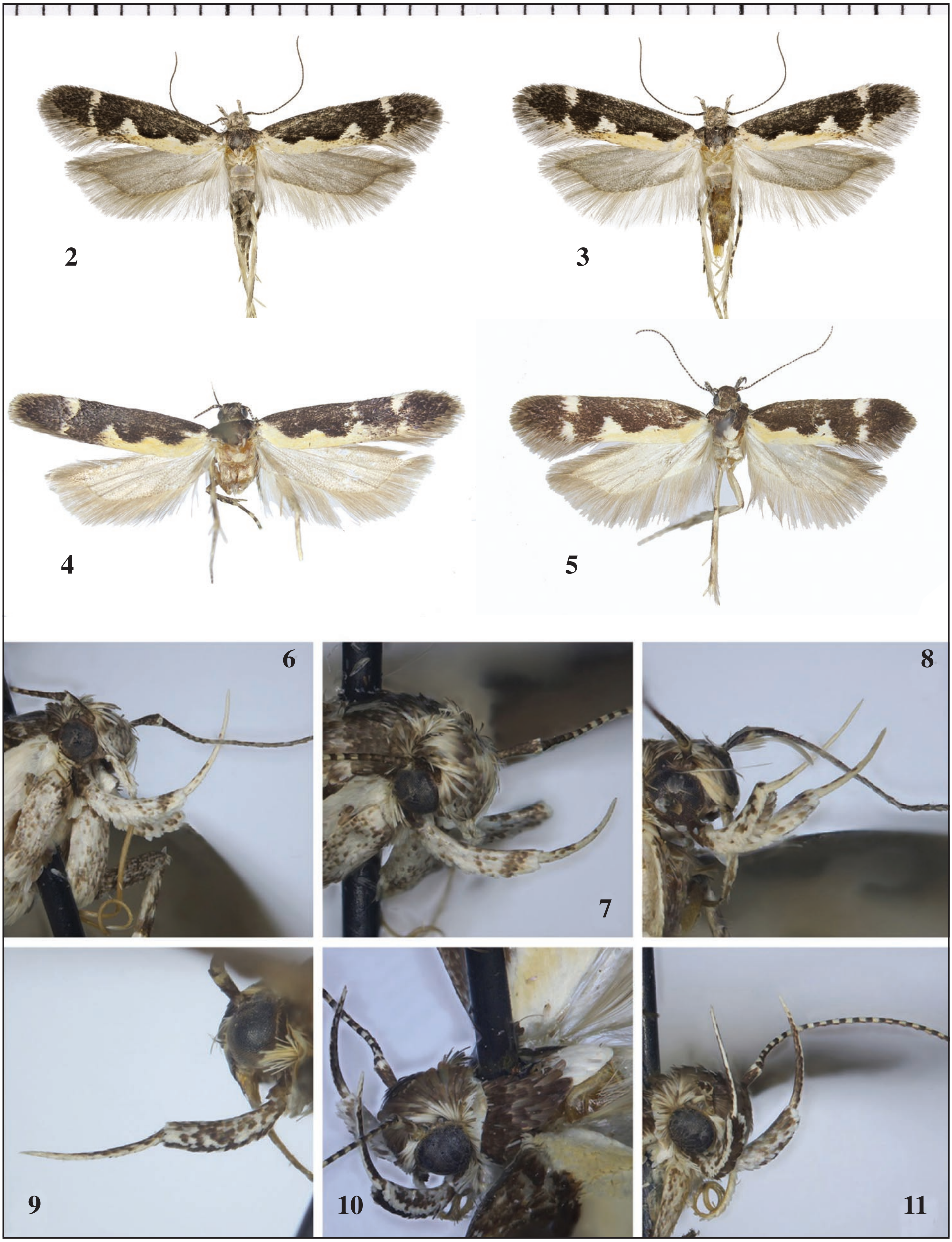
Elsner, G., Huemer, P., & Tokar, Z. (1999). *Die Palpenmotten (Lepidoptera, Gelechiidae) Mitteleuropas. Bestimmung - Verbreitung - Flugstandort - Lebensweise der Raupen*. Bratislava.
Falkovitsh, M. I., & Bidzilya, O. V. (2003). Gelechiidae (Lepidoptera) reared from the larvae collected in Kyzylkum desert, with descriptions of new species. *Proceedings of Zoological Museum of Kyiv Taras Shevchenko National University, 1*, 113-147. [in Russian].
Huemer, P., & Karsholt, O. (2020). Commented checklist of European Gelechiidae (Lepidoptera). *ZooKeys, 921*, 65-140. https://doi.org/10.3897/zookeys.921.49197
Milliére, P., 1881. *Lépidoptérologie, 7*, 1-19, pl. VIII-IX.
Rebel, H. (1935). Neue Pterophoriden und Tineen aus der Sierra de Gredos (Kastilien). *Zeitschrift des Österreichischen Entomologen-Vereins, 20*(2), 9-15, 26-28.
Robinson, G. S. (1976). The Preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. *Entomologist's Gazette, 27*, 127-132.
Sattler, K. (1960). Generische Gruppierung der europäischen Arten der Sammelgattung *Gelechia* (Lepidoptera, Gelechiidae). *Deutsche entomologische Zeitschrift*, *7*(1-2): 10-118.
Vives Moreno, A. (1990). Contribución al conocimiento del género *Gladiovalva* Sattler, 1960, en la Península Ibérica (Lepidoptera: Gelechiidae). *SHILAP Revista de la lepidopterología, 18*(71), 229-237.

*Oleksiy Bidzilya
Institute for Evolutionary Ecology
National Academy of Sciences of Ukraine
37, Academician Lebediev str.
UA-03143 Kyiv
UCRANIA / *UKRAINE*
E-mail: olexbid@gmail.com
https://orcid.org/0000-0001-9243-2481

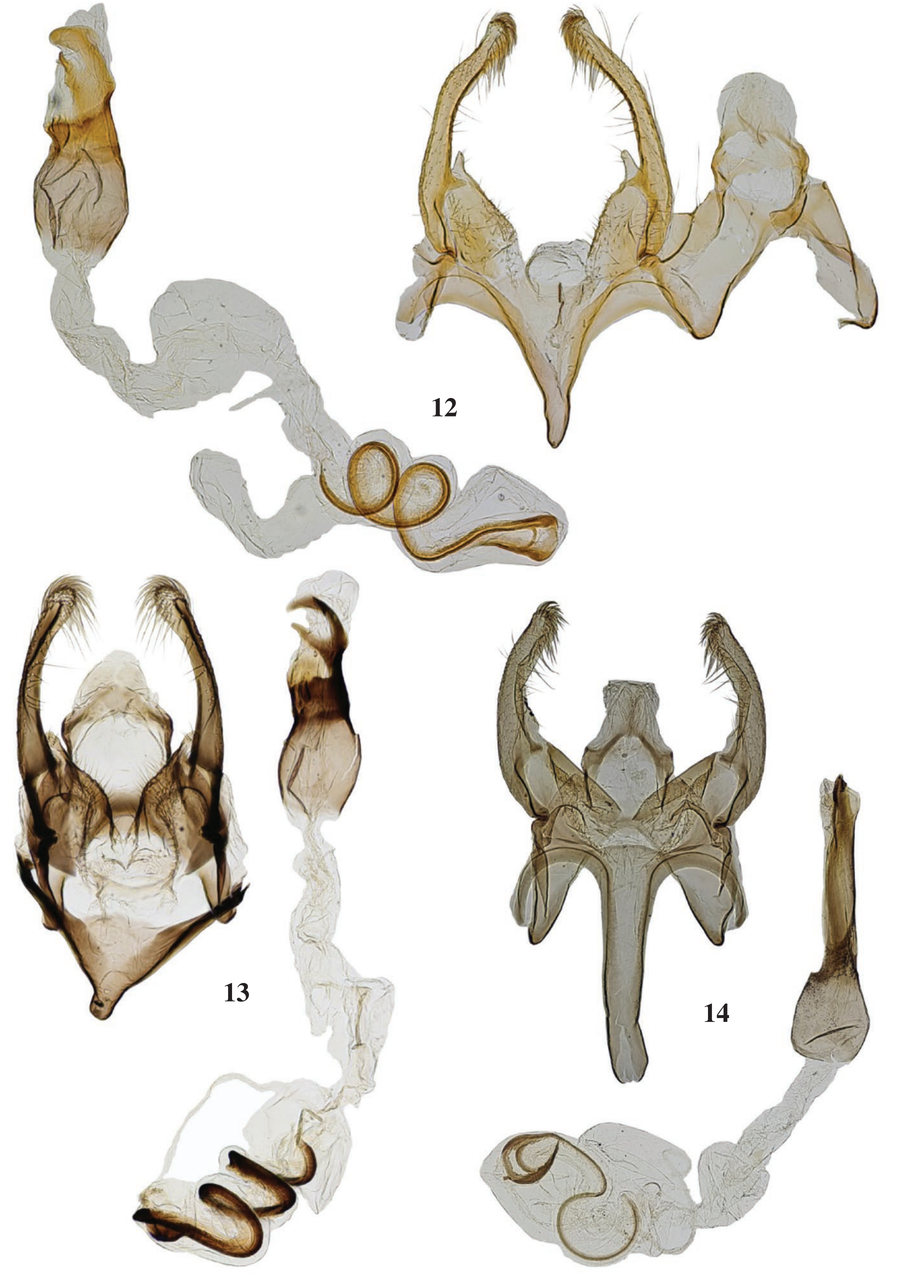
Jan Šumpich
National Museum
Department of Entomology
Cirkusová, 1740
CZ-193 00 Praha 9 - Horní Počernice
REPÚBLICA CHECA / *CZECH REPUBLIC*
E-mail: jansumpich@seznam.cz
https://orcid.org/0000-0002-0262-2941

*Autor para la correspondencia / *Corresponding author*

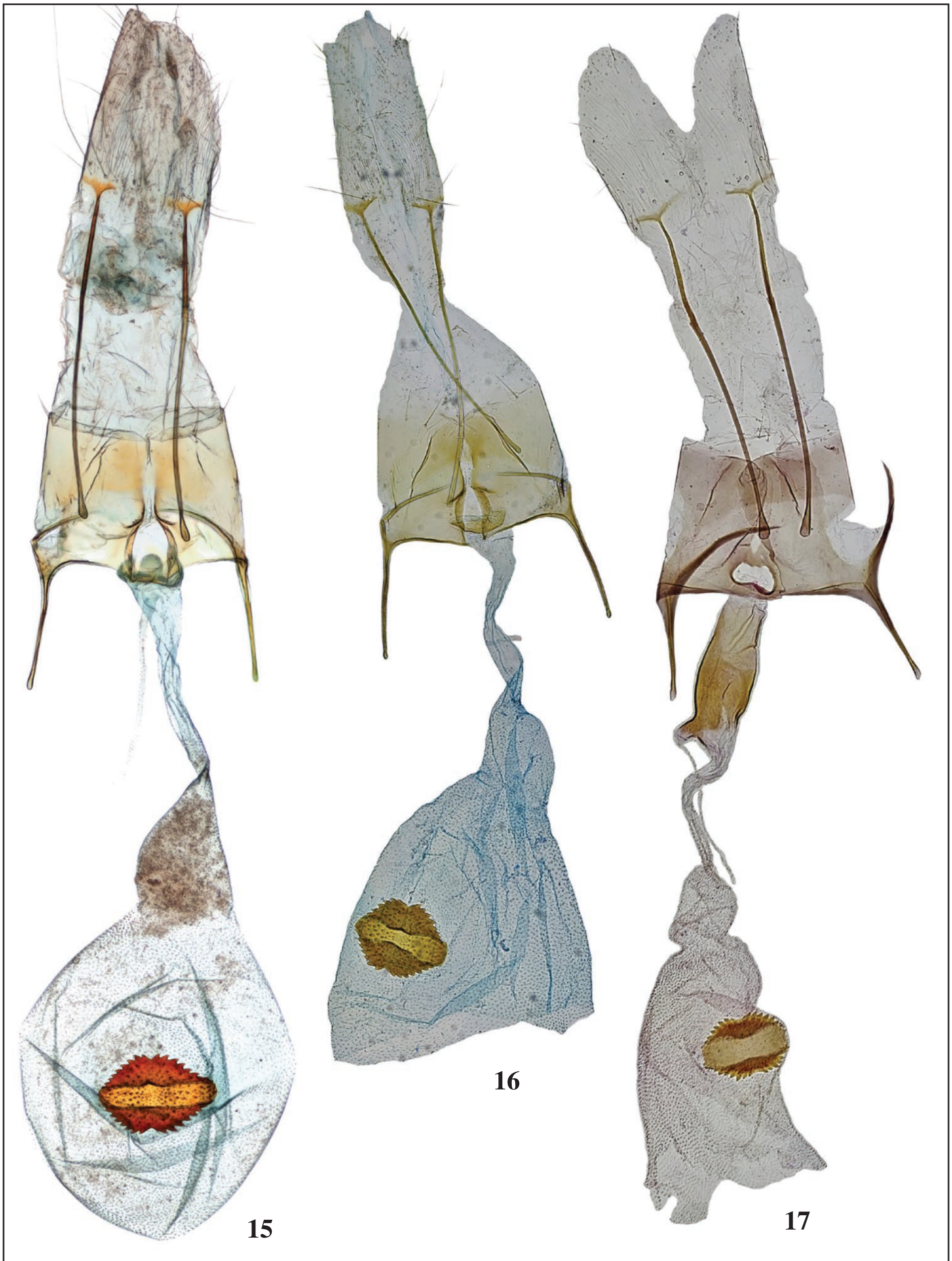
(Recibido para publicación / *Received for publication* 9-IV-2022)
(Revisado y aceptado / *Revised and accepted* 24-V-2022)
(Publicado / *Published* 30-XII-2022)



Figures 2-11. *Gladiovalva* spp. **2-5.** Dorsal view. **2-3.** *G. arevika* Bidzilya & Šumpich sp. n. **2.** Holotype, male. **3.** Paratype, female. **4-5.** *G. igorella* Falkovitsh & Bidzilya. **4.** Holotype, male. **5.** Paratype, female (gen. slide 53/07, OB). **6-11.** Head. **6-8.** *G. arevika* Bidzilya & Šumpich, sp. n. **6-7.** Female, Armenia. **8.** Male, Iran. **9-11.** *G. igorella* Falkovitsh & Bidzilya. **9.** Holotype, male, Kazakhstan. **10-11.** Paratype, female, Uzbekistan.



Figures 12-14. *Gladiovalva* spp., male genitalia. **12-13.** *Gladiovalva arevika* Bidzilya & Šumpich, sp. n. **12.** Paratype, Armenia (gen. slide 73/22, OB). **13.** Paratype, Turkmenistan (gen. slide 72/22, OB). **14.** *G. igorella* Falkovitsh & Bidzilya, holotype, Kazakhstan.



Figures 15-17. *Gladiovalva* spp., female genitalia. **15-16.** *G. arevika* Bidzilya & Šumpich, sp. n. **15.** Paratype, Armenia (gen. slide JŠ 22023). **16.** Paratype, Armenia (gen. slide 295/17, OB). **17.** *G. igorella* Falkovitsh & Bidzilya, paratype, Uzbekistan (gen. slide 53/07, OB).

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 589-592 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.250

Una nueva especie del género *Dindica* Moore, 1887 del Monte Mutis, Oeste de la Isla de Timor (Indonesia) (Lepidoptera: Geometridae, Geometrinae, Archaeobalbini)

Andrés Expósito-Hermosa

Resumen

Se describe *Dindica soriai* Expósito, sp. n., del oeste de Timor, Monte Mutis (Indonesia). Se proporcionan imágenes tanto del adulto como de la genitalia del macho.

Palabras clave: Lepidoptera, Geometridae, Geometrinae, Archaeobalbini, *Dindica,* especie nueva, Timor, Indonesia.

A new species of the genus *Dindica* Moore, 1887 from the Mount Mutis, West Timor Island (Indonesia) (Lepidoptera: Geometridae, Geometrinae, Archaeobalbini)

Abstract

Dindica soriai Expósito, sp. n., is described from west Timor, Mount Mutis (Indonesia). Images of both the adult and the genitalia of the male are provided.

Keywords: Lepidoptera, Geometridae, Geometrinae, Archaeobalbini, *Dindica,* new species, Timor, Indonesia.

Introducción

El compacto género *Dindica* Moore, 1887 se encuentra ubicado en la subfamilia Geometrinae Stephens, 1829 (Holloway, 1996) y de la tribu Archaeobalbini Viidalepp, 1981.

En el mismo, se hallan registradas veintiuna especies agrupadas en cinco grupos (Inoue, 1990). El grupo *sundae* es el que goza de un mayor número de especies; el cual presenta, en general, unos modelos - tanto por su morfología externa como interna - muy crípticos.

Se ha tenido la ocasión de poder estudiar material de *Dindica* del Monte Mutis, el cual, pertenece, sin ninguna duda, al grupo *sundae.* Ahora bien, el citado material muestra suficientes diferencias, con respecto al resto de especies allí censadas, como para no poder asignarle a ninguna de las ya conocidas. Asi pues, se procede seguidamente a su estudio y descripción como una especie nueva.

Abreviaturas usadas

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

Descripción y resultados

Dindica soriai Expósito, sp. n.

Holotipo ♂: INDONESIA; Mt. Mutis, W. de Timor, I-2021, colector local (preparación de genitalia AEH3460). El ejemplar tipo y preparación de genitalia quedan depositados en la colección del autor AEH, Móstoles (Madrid), España.

Descripción (Figuras 1-3): La expansión alar es de 35 mm en el macho. El anverso de la cabeza, tórax y abdomen muestran idéntica tonalidad al del fondo de las alas anteriores, esto es, verde oliva salpicado de manchas marrones (Ségury, 1936), el reverso del cuerpo, en su totalidad, es blanco amarillento. El vertex es ocre claro. Antenas bipectinadas dos-tercios de su longitud desde la base y filiforme en su tercio distal. Alas anteriores con mancha cuadrangular en su área apical, más clara y grisácea; la mancha discal de contorno elíptico es marrón oscuro. La alas posteriores poseen un tono amarillo anaranjado brillante con una ancha banda submarginal de color negro y una significativa línea, discontinua y delgada, paralela a la citada banda que converge con ella a la altura de $4=M_3$ y diverge cerca del tornus. El reverso de las alas es blanquecino, como el resto del cuerpo; el área basal es anaranjado hasta la zona disco-celular; en donde se encuentra la mancha elíptica de tono oscuro, como se aprecia en el anverso y que, como se puede comprobar, en el reverso está mucho más contrastada. En ambas alas existe una oscura banda submarginal que desaparece en sus áreas apicales y del tornus.

Genitalia del macho (Figura 3): Semejante al resto de especies del grupo *sundae* (Inoue, 1990). El uncus es profundamente bífido, con los brazos paralelos y curvados, la zona distal es arqueada. El gnathos con una pequeña proyección central hacia el interior. La transtilla es triangular y juxta circular. La costa está guarnecida por una única y pequeña púa. La cresta de la costa es membranosa y vellosa. En el harpe los procesos están casi integrados en uno solo; el interno es muy robusto y coronado de una púa, y el externo con una espina alargada que se proyecta hacia el interior. El saccus es redondeado. Coremata presente, pero no figurada en la imagen. Aedeagus delgado y tubular, más grueso en su zona central por la zona del ductus.

Hembra desconocida.

Distribución: Sólo se conoce del oeste de la Isla de Timor, Monte Mutis, INDONESIA. De todas las especies asignadas al género *Dindica,* es *D. soriai* la más meridional que se conoce hasta ahora.

Diagnosis: Las diferencias más significativas, entre otras especies, para separar a la nueva del resto, son por su morfología externa: La existencia de una fina línea paralela a la banda submarginal en las alas posteriores y en su morfología interna: En la forma del harpe y costa de la cápsula de la genitalia.

Etimología: Se dedica esta especie nueva al Dr. Ing. Santiago Soria Carreras y se la denomina *soriai*.

Agradecimientos

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

Referencias

Holloway, J. D. (1996). The Moths of Borneo, part 9: Geometridae, Geometridae (Incl. Orthostixini) Oenochrominae, Desmobathrinae, Geometrinae, Ennominae addenda. *Malayan Nature Journal, 49*, 147-326, 12 pls.

Inoue, H. (1990). A revision of the genus *Dindica* Moore (Lepidoptera: Geometridae). *Bulletin of the Faculty of Domestic Science, Otsuma Women's University, 26,* 121-161.

Moore, F. (1887). Heterocera (Spingidae Hepialidae). In W. C. Hewitson & F. Moore. *Descriptions of new Indian Lepidopterous Insects: from the collection of the late Mr. W. S. Atkinson, M. A., F. L. S. & c. Director of Public Instruction, Bengal,* (1), XII + 88 pp., pl. 1-3 (1879); (2), 89-198, pl. 4-5 (1881); (3), 199-299, pl. 6-8 (1887). Taylor & Francis.

Ségury, E. (1936). Code Universel des Couleurs. *Encyclopédie Pratique du Naturaliste*, *30*, I-LXVIII, plates I-XLIX. Paul Lechevelier Editeur.

Andrés Expósito-Hermosa
Gardenia, 25
E-28933 Móstoles (Madrid)
ESPAÑA / *SPAIN*
E-mail: aexposih@telefonica.net
https://orcid.org/0000-0003-4475-4974

(Recibido para publicación / *Received for publication* 15-III-2022)
(Revisado y aceptado / *Revised and accepted* 26-III-2022)
(Publicado / *Published* 30-XII-2022)

Figuras 1-3.– *Dindica soriai* Expósito, sp. n. Mt. Mutis. **1.** Holotipo ♂ Anverso. **2.** Reverso. **3.** Holotipo ♂ Preparación de Genitalia AEH3460. (Trazo de 1 cm).

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 593-597 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.251

A new specie of the genus *Phthorarcha* Meyrick, 1892 from Gansu, China (Lepidoptera: Geometridae)

Chunlan Xian, Rui Cheng, Hongxiang Han & Nan Jiang

Abstract

A new species of the genus *Phthorarcha* Meyrick, 1892 is described from Gansu of China: *Phthorarcha pallidia* Xian & Jiang, sp. nov. Diagnosis of the new species is provided; illustrations of external features and male genitalia of the new species are also presented.

Keywords: Lepidoptera, Geometridae, *Phthorarcha*, diagnoses, morphology, taxonomy, China

Una nueva especie del género *Phthorarcha* Meyrick, 1892 de Gansú, China (Lepidoptera: Geometridae)

Resumen

Se describe una nueva especie del género *Phthorarcha* Meyrick, 1892, procedente de Gansú, China: *Phthorarcha pallidia* Xian & Jiang, sp. nov. Se proporciona el diagnóstico de la nueva especie; también se presentan ilustraciones de las características externas y de la genitalia del macho de la nueva especie.

Palabras clave: Lepidoptera, Geometridae, *Phthorarcha*, diagnóstico, morfología, taxonomía, China

Introduction

The genus *Phthorarcha* Meyrick, 1892 is a member of the subfamily Alsophilinae. The species of *Phthorarcha* are active in cold season, and the females are apterous (Kostjuk et al. 2020). Meyrick (1892) established *Phthorarcha* and mentioned *primigena* Staudinger as the type species. Later, Staudinger (1895) described *Anisopteryx primigena* Staudinger, 1895 for the first time. Fletcher (1979) mentioned: “*Phthorarcha* was nomenclatural available from 1892, but the sole species included by Meyrick was a nomen nudum until described by Staudinger in 1895”.

Recently, Kostjuk et al. (2020) reviewed the Central Asian species of *Phthorarcha*, described a new species, *Phthorarcha haberhaueri* Kostjuk, Mironov & Viidalepp, 2020, and gave some diagnoses of the genera *Phthorarcha*, *Alsophiloides* Inoue, 1961 and *Chimaphila* Nakajima & Wang, 2013. Until now, four species have been recognized including one species recorded from China (Prout, 1912-1916; Parsons et al. 1999; Viidalepp, 1986, 1987; Nakajima & Wang, 2013; Kostjuk et al. 2020).

During recent studies in the collection in IZCAS, we have discovered one new species of *Phthorarcha*. The purpose of this paper is to describe a new species of *Phthorarcha* from Gansu of China: *Phthorarcha pallidia* Xian & Jiang sp. n. and provide diagnostic characters of the new taxa.

Material and methods

Specimens used in this study are deposited in IZCAS-Institute of Zoology, Chinese Academy of Sciences, Beijing, China. Terminology for wing venation follows the Comstock-Needham System (Comstock, 1918) as adopted for Geometridae by Scoble (1992) and Hausmann (2001); that for genitalia follows Pierce (1914, reprint 1976), Klots (1970), and Nichols (1989). Photographs of moths were taken with a digital camera. Composite images were generated using Auto-Montage software version 5.03.0061 (Synoptics Ltd). The plates were compiled using Adobe Photoshop software 7.0. Ink (Adobe Systems Software Ireland Ltd).

Taxonomy

Phthorarcha pallidia **Xian & Jiang sp. n.** (Figures 1-3)

Material examined (IZCAS). Holotype ♂, China: Gansu, Lanzhou, yuzhongxian, xinglongshan, 2200 m, 13-IV-2005, coll. Wang Xuejian. Paratypes: Gansu, 16 ♂♂, same data as holotype.

Description: Male adult (Figure 1). Antennae dentate with very long fascicles of cilia, length of bristles more than three times of diameter of shaft. Frons grey. Labial palpus very small, not extending beyond frons. Tongue obsolete. Vertex, dorsal side of thorax and abdomen dark grey. Hind tibia without medial spurs. Forewing length: male 16-18 mm. Forewing slender, slightly pointed at apex, outer margin smooth; hindwing slender with apex rounded. Wings ground colour pale grey, forewing densely covered with dark greyish brown, hindwing translucent. Forewing with medial and postmedial lines blackish brown, serrate, distinct near costa and anal margin, and often dentate on each vein; blackish brown streak near Sc connected medial line and postmedial line; postmedial line edged with pale grey line outside; a blackish brow streak raising from apex and contacted with postmedial line at M_1; a pale patch present inside of apex, extending to inner side of postmedial line and breaking postmedial line in most specimens; marginal line blackish brown, often dot-like at end of each vein; discal spot dark grey; fringes pale grey. Hindwing with discal spot dark grey; marginal line indistinct; fringes pale grey. Underside grey, discal spot of both wings blackish grey; postmedial line forming a blackish grey patch on costa.

Venation. Forewing: R_1 shortly anastomosed with Sc and two accessory cells between radial veins or sometimes R_1 free and one accessory cell between radial veins; R_2 anastomosed with R_1 and $R_{3\text{-}4}$; R_5 rising after R_3, near apex. Hindwing: Sc+R long anastomosed with upper margin of discal cell to near middle of cell; length of discal cell more than two third of maximum length in middle of hindwing; Rs and M_1 rising from apical of discal cell or shortly stalked; M_2 weak, almost absent.

Male genitalia (Figures 2-3). Uncus triangular with apex slender. Gnathos absent. Valva short with apex almost triangular, rounded at tip; dorsal margin with two processes, basal one narrow and straight, medial one curved outward and slightly longer than basal one; juxta almost Y shaped, semicircle concaved on posterior margin. Saccus almost quadrate terminally with a tongue-like lobe. Aedeagus curved; manica bifurcate with apex tapering.

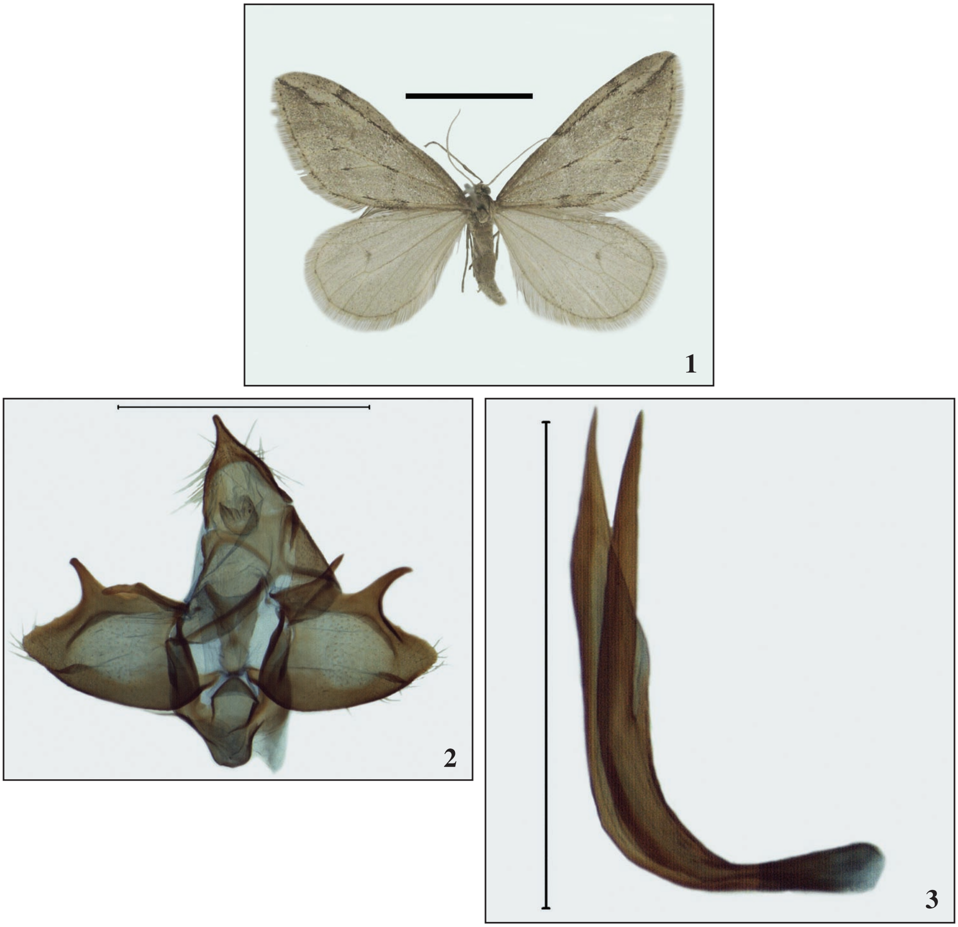
Diagnosis: The species is similar to *Phthorarcha ishkovi* Viidalepp, 1986, However, it can be distinguished from *P. ishkovi* by the following characters: the streak between the apex and the postmedial line of the forewing is straighter; the distance from the medial line to the postmedial line on the costa of the forewing is less than twice the distance from the medial line to the postmedial line on the hind margin, while it is twice as broad on the costa than on the hind margin in *P. ishkovi*; the radian of the anal angle of the forewing is larger; the outer margin of the forewing is more inclined; the streak between the medial line and postmedial line is continuous, while it is broken and indistinct in *P. ishkovi*; the pale patch inside the apex usually extends to inner side of the postmedial line and breaks the postmedial line, while it rarely extends to inner side of the postmedial line and breaks the postmedial line in *P. ishkovi*; the marginal dots of the forewing are more indistinct. In the male genitalia, the apex of the uncus is slenderer; the apex of the valva is much narrower; the medial process on the dorsal margin of the valva is much slenderer and longer; the apex of the saccus is almost quadrate, while it is rounded in *P. ishkovi*.

Distribution: China (Gansu).

Etymology: The specific name is based on the Latin word *pallidius*, referring to the pale apex of the forewing.

Acknowledgements

We sincerely appreciate for Dr Jaan Viidalepp (Estonian University) and Prof. Min Wang (South China Agricultural University) for providing references for this study and to Prof. Dayong Xue (IZCAS) for his kind assistance. This project was supported by the National Science Foundation of China (31872966, 32170464, 31872967), National Science & Technology Fundamental Resources Investigation Program of China (Grant No. 2019FY101800), Biological Resources Programme of Chinese Academy of Sciences (Grant No. KFJ-BRP-017-45), the Ministry of Science and Technology of China (2015FY210300), and by a grant (Y229YX5105) from the Key Laboratory of the Zoological Systematics and Evolution of the Chinese Academy of Sciences.



Figures 1-3. *Phthorarcha pallidia* Xian & Jiang, sp. n., holotype. **1.** Adult. **2-3.** Male genitalia. Scale bars =1.0 cm (figure1); 1 mm (figures 2-3).

References

Comstock, J. H. (1918). *The Wings of Insects*. Comstock Publishing.

Fletcher, D. S. (1979). Geometridae. In W. R. Nye (Ed.). *The Generic Names of Moths of the World*. Trustees of the British Museum (Natural History).

Hausmann, A. (2004). Sterrhinae. *The Geometrid Moths of Europe* (Vol. 2). Apollo Books.

Inoue H. (1961). *Lepidoptera: Geometridae (1)*. *Insecta Japonica, 1*(4). Hokuryukan Publishing.

Klots, A. B. (1970). Lepidoptera. In S. L. Tuxen (Ed.). *Taxonomist's Glossary of Genitalia in Insect.* Munksgaard.

Kostjuk, I., Mironov, V. G., & Viidalepp, J. (2020). Review of the Central Asian species of *Phthorarcha* Meyrick (Geometridae: Alsophilinae) with description of a new species. *Zootaxa, 4861*(2): 232-240.

Meyrick, E. (1892). On the classification of the Geometrina of the European fauna. *Transactions of the Royal Entomological Society of London*, *40,* 53-124.

Nakajima, H., & Wang, M. (2013). Winter geometrid moths of the Guangdong Nanling National Nature Reserve, South China (Lepidoptera, Geometridae). *Tinea, 22*(3), 217-225.

Nichols, S. W. (1989). *The Torre-Bueno Glossary of Entomology*. New York Entomological Society in cooperation with the American Museum of Natural History.

Parsons, M. S., Scoble, M. J., Honey, M. R., Pitkin, L. M., & Pitkin, B. R. (1999). The catalogue. In M. J. SCOBLE (Ed.). *Geometrid Moths of the World: a Catalogue (Lepidoptera, Geometridae)*. CSIRO.

Pierce, F. N. (1914 [reprinted 1967]). *The Genitalia of the Group Geometridae of the British Islands*. E.W. Classey Ltd.

Prout, L. B. (1912-1916). The Palaearctic Geometrae. In A. Seitz (Ed.). *The Macrolepidoptera of the World* (Vol. 4). Verlag A. Kernen.

Scoble, M. J. (1992). *Lepidoptera: Form Function and Diversity*. Oxford University Press.

Staudinger, O. (1895). Neue Lepidopteren-Arten und Varietäten aus dem paläarktischen Faunengebiet. *Deutsche Entomologische Zeitschrift Iris, 7*, 241-296, taf. IX.

Viidalepp, J. (1986). The subfamily Alsophinae (Lepidoptera, Geometridae) of the fauna of USSR I Review of the species. In P. Ler (Ed.). *Systematics and ecology of Lepidoptera of the Russian Far East*, 57-69.

Viidalepp, J. (1987). The subfamily Alsophinae (Lepidoptera, Geometridae) of the fauna of USSR II Systematics and ecology. In P. Ler (Ed.). *Lepidoptera of the Far East of the USSR*.

Rui Cheng, Hongxiang Han, *Nan Jiang
Key Laboratory of Zoological Systematics and Evolution
Institute of Zoology Chinese Academy of Sciences
Beijing 100101
CHINA / *CHINA*
E-mail: chengrui@ioz.ac.cn
https://orcid.org/0000-0002-3044-4724

E-mail: hanhx@ioz.ac.cn
https://orcid.org/0000-0001-7538-2902

*E-mail: jiangn@ioz.ac.cn
https://orcid.org/0000-0003-4211-1385

Chunlan Xian
Key Laboratory of Zoological Systematics and Evolution
Institute of Zoology Chinese Academy of Sciences
Beijing 100101
CHINA / *CHINA*
E-mail: 2358315226@qq.com
https://orcid.org/0000-0003-4053-7307

y / *and*

College of Resources & Environment
Tibet Agricultural & Animal Husbandry University
Linzhi 860000
CHINA / *CHINA*

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 14-IV-2022)
(Revisado y aceptado / *Revised and accepted* 16-V-2022)
(Publicado / *Published* 30-XII-2022)

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

Solicitud de autorización para recoger Lepidoptera con fines científicos en España

Las solicitudes cumplirán las siguientes condiciones:

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

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

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

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

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

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

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

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

Application for permits to collect Lepidoptera in Spain for scientific purposes

Applications must abide by the following conditions:

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

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

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

4.– All members of SHILAP who apply for these permits to collect Lepidoptera in Spain with scientific purposes, will be included in the Scientific Research 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.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 599-605 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.252

Coleophora gecidiella Baldizzone, sp. n., a new species from Turkey. The female of *Coleophora turca* Baldizzone, 1994. Contribution to the knowledge of the Coleophoridae CLI (Lepidoptera: Coleophoridae)

Giorgio Baldizzone

Abstract

Coleophora gecidiella Baldizzone, sp. n., new species from Turkey belonging to the group of *C. onobrychiella* Zeller, 1849 is described based on specimens collected by Günther Baisch. The female of *C. turca* Baldizzone, 1994, a species of which only the male is known, is described for the first time.

Keywords: Lepidoptera, Coleophoridae, *Coleophora*, new species, Turkey.

Coleophora gecidiella Baldizzone, sp. n., una nueva especie de Turquía. La hembra de *Coleophora turca* Baldizzone, 1994. Contribución al conocimiento de los Coleophoridae CLI (Lepidoptera: Coleophoridae)

Resumen

Se describe *Coleophora gecidiella* Baldizzone, sp. n., nueva especie de Turquía perteneciente al grupo de *C. onobrychiella* Zeller, 1849, a partir de ejemplares recogidos por Günther Baisch. Se describe la hembra, por primera vez, de *C. turca* Baldizzone, 1994, una especie de la que sólo se conoce el macho.

Palabras clave: Lepidoptera, Coleophoridae, *Coleophora*, nueva especie, Turquía.

Introduction

On the occasion of the description of *Coleophora donata* Baldizzone, 2021, I highlighted how the fauna of the Coleophoridae of Turkey is very rich and that certainly many other species will be added to the 200 already known. In the present work, a further new species is described, *C. gecidiella* Baldizzone, sp. n. collected in Eastern Anatolia by Günther Baisch. The female of *C. turca* Baldizzone, 1994, a species described only on the male, is also described and illustrated.

Material and methods

The Euparal slide mounts of dissected genitalia were photographed with a Bresser 5.0 camera attached to a Bresser BioScienze 40-1000x trinocular microscope, using a Leitz PL Fluotar 6.3 / 0.20 objective. The images were edited in Corel PaintShop Pro. The habitus was photographed with a Canon EOS 5D Mark II digital camera equipped with a Canon MP-E 65 mm objective, with lighting provided by two circular neon lamps OSRAM L 32W / 8400 C (cool white). The CombineZP program was used for stacking layers into deep-focus images.

Morphological terms follow Baldizzone (2019).

Abbreviations

Bldz	= Giorgio Baldizzone
PG	= genital preparation
ZMUC	= Zoological Museum, University of Copenhagen, Copenhagen, Denmark.

Coleophora gecidiella **Baldizzone, sp. n.** (Figures 1, 3-6)

Holotype ♂ (PG Bldz 13776) “TÜRKEY, Erzincan | ca. 16 km nördl.[isch] | Kolcekmezdagi Gec.[idi] 2100 m | 13.-14.7.1992 Li.[chtfang] | G. Baisch”, in coll. Baldizzone. Paratype ♂ (PG Bldz 13777) same label, in coll. Baldizzone.

Diagnosis: Medium-sized species, with light ochre forewing and white costal stripe. Based on male genitalia belongs to the group of *C. onobrychiella* Zeller. It is a complicated group with some species not yet described, especially from Anatolia, the Caucasus, Iran and neighbouring regions. The main distinguishing feature consists in the shape of the sacculus, wide, not notched on the lower edge and straight on the external edge, perpendicular to the ventral angle. No other known species has a similar structure to the sacculus.

Description (Figure 1): Wingspan 13 mm. Head white, creamy suffused on the dorsum. Antenna: scape light yellowish ochre, with a tuft of erect scales yellowish ochre on the outer side, ferruginous ochre on the inner side; flagellum white and dark brown ringed. Labial palpus white, creamy tinged dorsally, the second segment is about 0.5 times longer than the third. Proboscis of normal shape. Thorax white, creamy suffused medially. Tegula white, creamy on the inner side. Forewing light ochre with a white stripe along the costa, ending just before the apex; a thin stripe along the anal fold, from the base to one-half; very short stripe along the dorsum, broad at the base, becoming very thin, ending before the cilia; costal cilia white, apical cilia brown, dorsal cilia light brownish grey. Hindwing and cilia light brownish grey. Abdomen dirty white.

Abdominal structures (Figure 6): Anterior lateral strut about 5 times longer than the posterior, transverse strut with proximal edge straight, sclerotized only in middle, distal edge arched, not medially sclerotized. Tergal disks (3rd tergite) long, about twice their width, covered with about 45 conical spines.

Male genitalia (Figures 3-5): Gnathos knob oval. Tegumen slightly medially constricted; pedunculus short. Transtilla short and curved. Valvula large, dorsal edge curved, with a long and sturdy curve seta at the apex, ventral edge weakly delimited, external edge curved, prominent between the cucullus base and the dorsal edge of sacculus. Cucullus long, slightly more expanded in the ventral part. Sacculus large inclined on ventral edge, ventral angle curved, lateral edge straight, dorsal angle small and curved. Phallotheca conical, more sclerotized dorsally. Cornuti numerous, of different length, gathered in a long braid, progressively longer towards the apex where two protrude long and sinuous.

Female genitalia: Unknown.

Distribution: Turkey, Oriental Anatolia, prov. Erzincan.

Etymology: From the Turkish word geçidi = pass.

Coleophora turca Baldizzone, 1994 (Figures 2, 7-12)

The species was described from a single male specimen collected in Turkey. In the following years I had the opportunity to study other specimens of the two sexes, and therefore I can describe the female genitalia.

Material: Holotypus ♂ (PG 9871) “Asia min. | Turcia | Nevsehir | Göreme | 10-11-VI-1985, leg. Hahn”, in coll. Baldizzone; 1 ♀ (PG Bldz 11137) Turkey, Kayseri, 20 km S, Erciyas Dagi, 2000 m, Bldz 13089) Kayseri, 25 km S, Erciyas Dagi, 1900 m, 31-VII-1997, leg. T. Nupponen, in coll. Baldizzone; 1 ♂ (PG Bldz 14205), 1 ♀ (PG Bldz 14206) Anatolia, Cappadocia, dint. Uçhisar, Mustafapaşa, 1400 m, 25-VI-2005, leg. G. Bassi, in coll. Bassi.

Female genitalia (Figures 11-12): Papillae anales narrow and long. Apophyses posteriores about 3.5 times as long as the anteriores. Sterigma trapezoidal, excavated by the sinus vaginalis up to the middle, ostium bursae large, oval. Colliculum large, about as long as the sterigma, more sclerotized on the outer edges, asymmetrical in the proximal part at the insertion of the ductus bursae. Ductus with distal part divided into two sections, of which the posterior is covered with small spines with two very sclerified bands, while the anterior is without spines, very sclerified, curved and narrows in the direction of the insertion of the proximal part of the ductus, which is much thinner, transparent, finely dotted. Corpus bursae in the shape of an oval sac, with a small leaf-shaped signum.

Note: In the specimens studied there are variations in the length of the spinulate part of the ductus and in the length and thickness of the very sclerified curved part.

Distribution: The species is known only from Turkey, where it appears to be widespread.

Acknowledgements

I warmly thank Günther Baisch (Biberach an der Riss, Germany) for the kind gift of specimens. Thanks also to Ole Karsholt (Copenhagen, Denmark) and Dr. Graziano Bassi (Avigliana, Italy) for the specimens entrusted to me for the determination. I also thank also Pier Giuseppe Varalda (Morano sul Po, Italy) for the photograph of the adult. Thanks to Martin Corley (Faringdon, UK) for correcting the English text and Jukka Tabell (Hartola, Finland) who gave me his opinion on the identity of the new species. Finally, I thank Dr. Antonio Vives (Madrid, Spain) for the Spanish translation of the abstract.

References

Baldizzone, G. (1994). Contribuzioni alla conoscenza dei Coleophoridae. LXXV. Coleophoridae dell'Area Irano-Anatolica e regioni limitrofe (Lepidoptera). *Associazione Naturalistica Piemontese, Memorie, 3*: 424 pp.

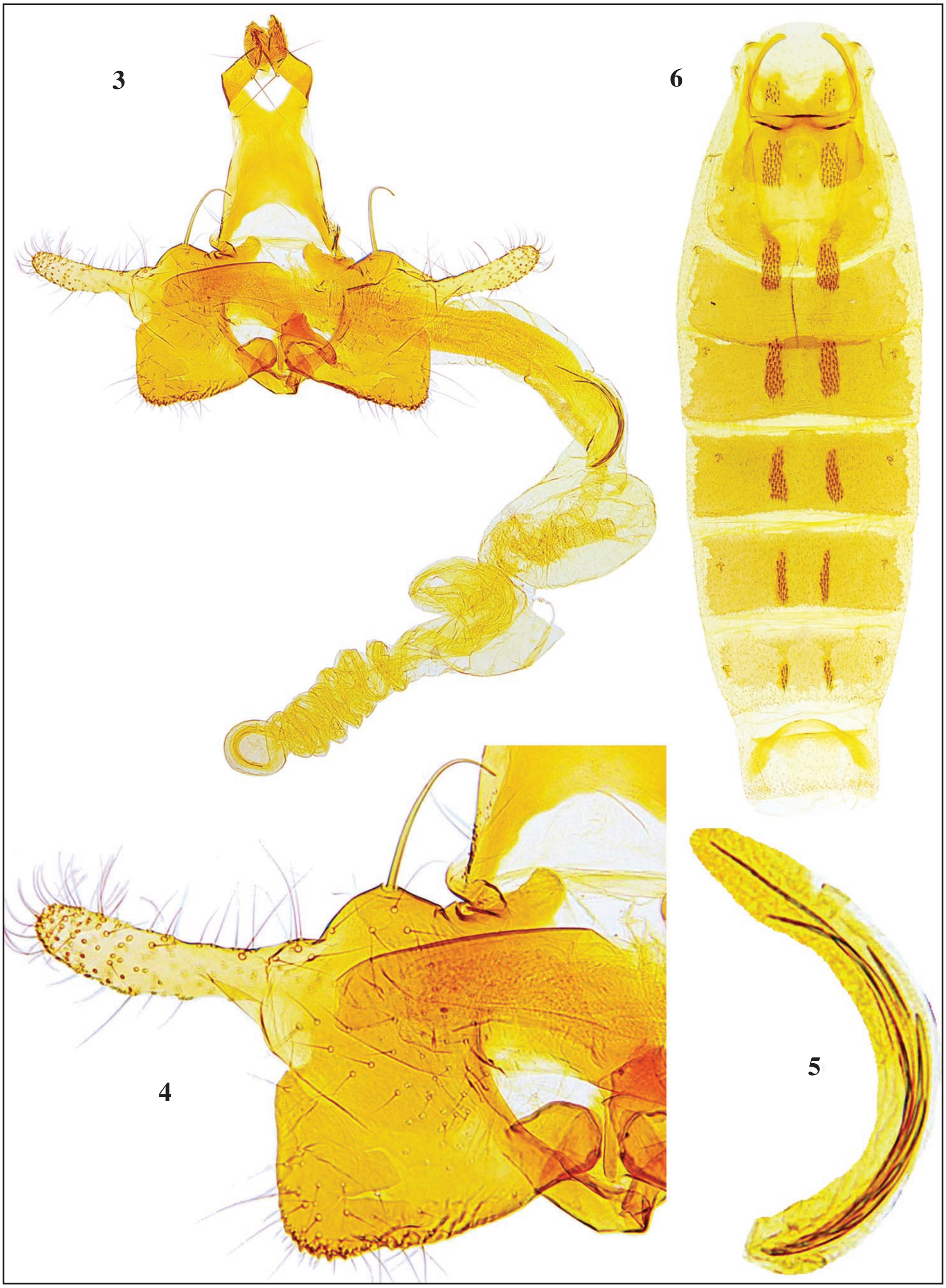
Baldizzone, G. (2019). Lepidoptera Coleophoridae. *Fauna d'Italia* (Vol. 53). Calderini.

Baldizzone, G. (2021). *Coleophora donata* Baldizzone, sp. n., a new species from Turkey. Contribution to the knowledge of the Coleophoridae CXLVII (Lepidoptera: Coleophoridae). *SHILAP Revista de lepidopterología, 49*(195), 479-484.

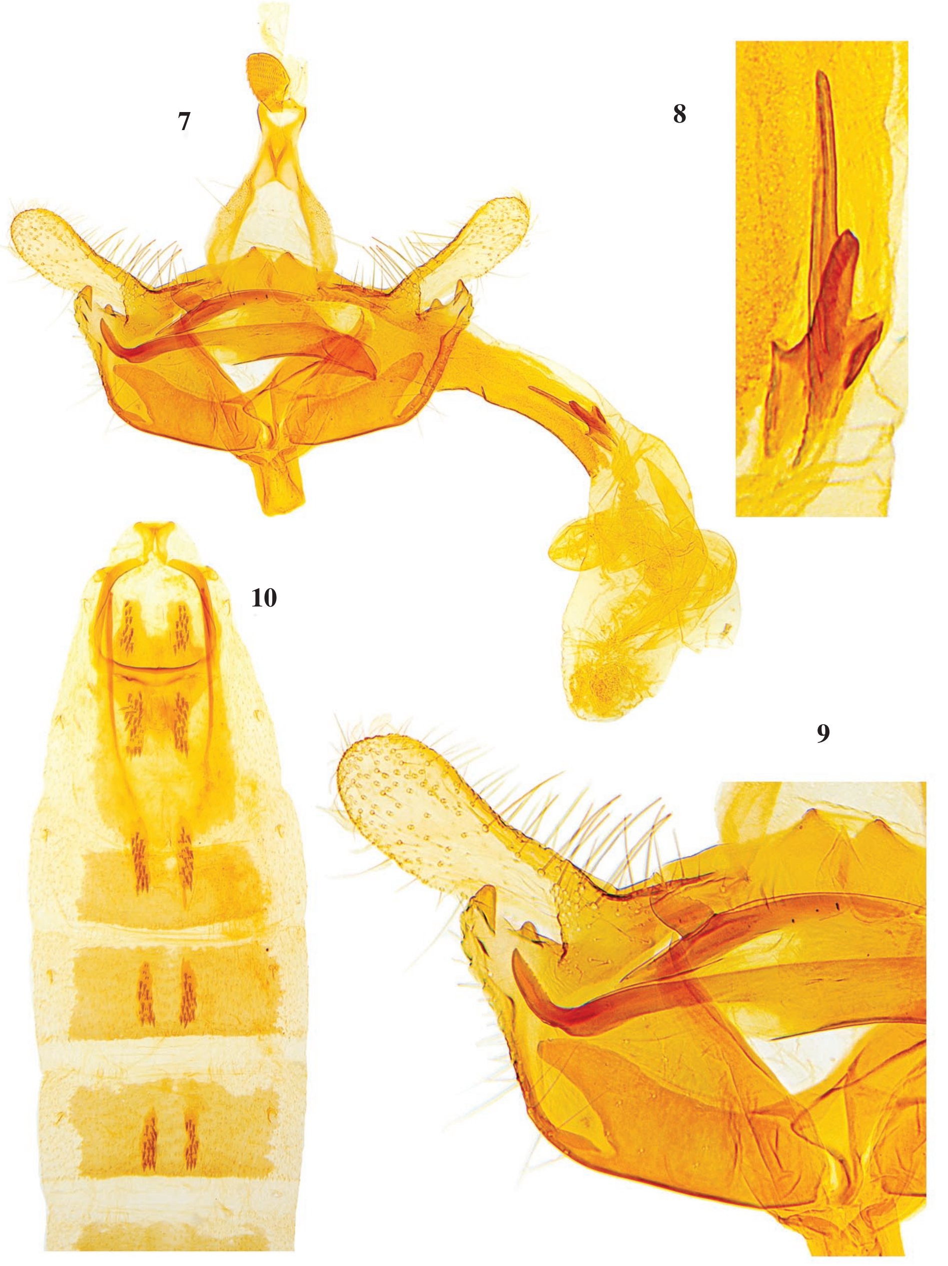
Giorgio Baldizzone
via Manzoni, 24
I-14100 Asti
ITALIA / *ITALY*
E-mail: baldizzonegiorgio@gmail.com
https://orcid.org/0000-0001-8127-0843

(Recibido para publicación / *Received for publication* 19-II-2022)
(Revisado y aceptado / *Revised and accepted* 20-III-2022)
(Publicado / *Published* 30-XII-2022)

Figures 1-2. 1. *Coleophora gecidiella* Baldizzone, sp. n. - male, paratype (wingspan 13 mm). **2.** *C. turca* Baldizzone, 1994 - female, Turkey, Sivas, 12 km nördl. Yidizeli, Çamlibel geçidi, 1600-1800 m, 8-11-VII-1992, leg. G. Baisch, in coll. Baldizzone (wingspan 12 mm).



Figures 3-6. 3. *C. gecidiella* Baldizzone, sp. n. - male genitalia (PG Bldz 13776), holotype. **4.** Enlargement of valva and phallotheca. **5.** Enlargement of cornuti. **6.** Abdomen.



Figures 7-10. 7. *C. turca* Baldizzone, 1994 - male genitalia (PG Bldz 14205), Turkey, Anatolia, Cappadocia, dint. Uçhisar, Mustafapaşa, 1400 m, 25-VI-2005, leg. G. Bassi, in coll. Bassi. **8.** Enlargement of cornuti. **9.** Enlargement of valva and phallotheca. **10.** Abdominal segments 1-5.

Figures 11-12. *C. turca* Baldizzone, 1994 - female genitalia. **11.** (PG Bldz 14206), Turkey, Anatolia, Cappadocia, dint. Uçhisar, Mustafapaşa, 1400 m, 25-VI-2005, leg. G. Bassi, in coll. Bassi. **12.** (PG Bldz 13089) Turkey, Kayseri, 25 km S, Erciyas Dagi, 1900 m, 31-VII-1997, leg. T. Nupponen, in coll. Baldizzone.

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:

Dr. Sabine Gaal-Haszler (Austria / *Austria*)
D. Francisco Javier Moreno Tubio (España / *Spain*)
Dr. Mika Laitinen (Finlandia / *Finland*)
Mr. Helder Rodrigues Cardoso (Portugal / *Portugal*)
Dr. Hans Christof Zeller-Lukashort (Austria / *Austria*) (Reingreso */ Rejoing*)
Dr. Peter Huemer (Austria / *Austria*) (Reingreso */ Rejoing*)
Mr. Gerhard Forster (Austria / *Austria*) (Reingreso */ Rejoing*)
Dr. Frank Rosenbauer (Alemania / *Germany*) (Reingreso */ Rejoing*)
Mr. Petr Krejčik (República Checa / *Czech Republic*) *(*Reingreso */ Rejoing)*

La Sociedad ha recibido comunicación formal, de darse de baja como socio de:

The Society has received formal notice of the resignation from the membership of the following:

Dr. Jens Tonboe (Dinamarca / *Denmark*)
Dr. Ana Beatriz Barros de Morais (Brasil / *Brazil*)
D. Juan Ortiz Salmerón (España / *Spain*)
Mr. Jean-Louis Simounet (Francia / *France*)
D. Francisco Javier Pérez Vías (España / *Spain*)
D. José Manuel Novoa Pérez (España / *Spain*)
Dña. Teresa Fariño (España / *Spain*)
Mr. Robert J. Heckford (Reino Unido / *United Kingdom*)
D. Jesús García Horrillo (España / *Spain*)
Mr. John Tennent (Reino Unido / *United Kingdom*)

La Sociedad lamenta tener que dar la noticia de la baja por fallecimiento de los siguientes socios:

The Society regrets to have to give the new of the drop for the following member's death:

Mr. Jan E. F. Asselbergs (Países Bajos / *The Netherlands*)
Mr. Barry Goater (Reino Unido / *United Kingdom*)
Prof. Dr. Andrés Angulo Ormeño (Chile / *Chile*)

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 607-616 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.253

First discovery of the natural egg parasitoid of *Cydalima perspectalis* (Walker, 1859) in Turkey with molecular methods (Lepidoptera: Crambidae)

Feza Can, Fahriye Ercan & Başak Ulaşlı

Abstract

The genus *Trichogramma* Westwood, 1833 are important biological control agents of especially Lepidoptera pests in all around the world. These tiny wasps can't be reliably identified owing to their small size and lack of definable morphological characters. ITS2 (Internal transcribed spacer 2) sequence-based identification has been performed successfully for years for parasitoids of the genus *Trichogramma*. The use of indigenous *Trichogramma* species against pests is very important for the success of biological control. Therefore, accurate and precise species identification of *Trichogramma* plays a key role in biological control programs. In the study, egg parasitoids were obtainedfrom parasitized egg masses of *Cydalima perspectalis* (Walker, 1859) collected in Hatay province of Turkey in May 2021. *Trichogramma* wasps were collected and only one species was determined by using both ribosomal and mitochondrial sequences. According to ribosomal and mitochondrial sequence results, all of the collected samples were determined to be *Trichogramma evanescens* Westwood, 1833. This is the first report of *T. evanescens* as egg parasitoid of *C. perspectalis* in the worldwide.

Keywords: Lepidoptera, Crambidae, *Cydalima perspectalis*, *Trichogramma evanescens*, phylogeny, Internal transcribed spacer 2, Cytochrome oxidase subunit I, Turkey.

Primer descubrimiento del parasitoide natural de los huevos de *Cydalima perspectalis* (Walker, 1859) en Turquía con métodos moleculares (Lepidoptera: Crambidae)

Resumen

El género *Trichogramma* Westwood, 1833 es un importante agente de control biológico, especialmente de plagas de Lepidoptera, en todo el mundo. Estas diminutas avispas no pueden ser identificadas de forma fiable debido a su pequeño tamaño y a la falta de caracteres morfológicos definibles. La identificación basada en la secuencia ITS2 (Internal transcribed spacer 2) se ha realizado con éxito durante años para los parasitoides del género *Trichogramma*. El uso de especies autóctonas de *Trichogramma* contra las plagas es muy importante para el éxito del control biológico. Por lo tanto, la identificación exacta y precisa de las especies de *Trichogramma* desempeña un papel fundamental en los programas de control biológico. En el estudio, los parasitoides de huevos se obtuvieron de masas de huevos parasitados de *Cydalima perspectalis* (Walker, 1859) recogidos en la provincia de Hatay de Turquía en mayo de 2021. Se recogieron avispas *Trichogramma* y se determinó una sola especie mediante el uso de secuencias ribosómicas y mitocondriales. Según los resultados de las secuencias ribosómicas y mitocondriales, se determinó que todas las muestras recogidas eran *Trichogramma evanescens* Westwood, 1833. Este es el primer informe de *T. evanescens* como parasitoide de huevos de *C. perspectalis* en el mundo.

Palabras clave: Lepidoptera, Crambidae, *Cydalima perspectalis*, *Trichogramma evanescens*, filogenia, espaciador transcrito interno 2, subunidad I de la citocromo oxidasa, Turquía.

Introduction

Intensive human communications in 21st century caused introduction of a few pest species from eastern Asia to Europe and western Asia. As examples *Artona martini* Efetov, 1997 (a pest of bamboo spp.) (Marianelli et al. 2020) and *Cydalima perspectalis* (Walker, 1859) (a pest of *Buxus* spp.) could be mentioned.

Buxus species (Buxaceae), is one of the most cultivated wood species in parks, gardens and also it grows naturally forests in Turkey. In addition, it contributes economically to our country due to the use of its wood, shoots and evergreen leaves in floriculture. One hundred five box tree species exist in the world, but Turkey has only, Anatolian box tree*, Buxus sempervirens* L. and Balearic box tree, *B. balerica* Lam species. Both are located in the southernmost province of Turkey, Hatay, on the Mediterranean coast (Symmes, 1984; Sari & Celikel, 2019; Ak et al. 2021).

Lepidoptera have wide range of host plants and can lead to destructive damages on many cultural and ornamental plants also indoor planting areas all over the world. The invasive pest *Cydalima perspectalis* (Walker), the box tree moth, is the most cosmopolitan pest of box trees in Asia, Europe recently America and Africa. It is natural distribution include China, Japan, Korea, and India (Hampson, 1896; Inoue, 1982a, b; Park, 2008; Khaddad et al. 2020). Some insects have been spreading very fast in recent decades due to of the increase in trade of plant species (Caliskan et al. 2020). Because of this transportation *C. perspectalis* was recorded in Russian Far East in 2005 and then Europe for the first time in 2007 in Germany and in the Netherlands (Kirpichnikova, 2005; Eppo, 2019). It was reported for the first time in parks of İstanbul province in the Marmara Region of Turkey in 2011 (Hizal, 2012). Then it spread from the western to the East Black Sea Region and then to the Middle Anatolia Region, finally Hatay province of eastern Mediterranean Region (Kaygin & Tasdeler, 2019; Ak et al. 2021). The box tree larvae feed on primarily on leaves of the *Buxus* species as primarily, then when it is left without food, it moves to the bark on the branches of the plant and then dried out the box trees. It often causes serious defoliation and considerable injuries to young plants, natural living environment and botanical gardens (Van Der Straten & Muus, 2010; Wan et al. 2014; Mitchell et al. 2018).

There are many contact or systemic insecticides which have been used in the box wood areas for the control of *C. perspectalis*. However, the use of insecticides for pest management may harm natural enemies and other species using the box trees for hiding places, such as birds, arachnids, and other insects. Also, can be cause undesirable indirect outcomes such as resistance improvement, secondary pest outbreaks, environmental pollution, and risk to operators in the long term. Therefore, it may be preferable to use biological control agents or biopesticides in the management of cosmopolitan pests. In control programs, on the other hand, it should be aimed to investigate different biological stages such as eggs of invasive species (Cancengı et al. 2016; CABI, 2021). A number of natural enemies of box tree moth in *Buxus* trees have been recorded around the globe. Some common natural enemies of *C. perspectalis* were listed belong to Diptera, Hymenoptera and Thysanoptera order in Europe, China, Japan, and Britain (Wan et al. 2014; Bird et al. 2020). In the last decade, *Chelonus tabonus* Sonan (Hymenoptera: Braconidae) was record in China, as an egg-larval parasitoid (Wan et al. 2014) however initially two larval parasitoids *Bracon brevicornis* Wesmael, 1838 and *Bracon hebetor* Say, 1836 (Braconidae) used in trade and these two parasitoids could not complete their development in this new host Zimmermann & Wuhrer (2010). Besides pottential biocontrol agents eight *Trichogramma* Westwood, 1833 species were applied in laboratory conditions for *C. perspectalis* eggs (Gotting & Herz, 2016). In the last year, two larval parasitoids, a chalcidoid wasp *Stenomalina cf. communis* (Nees) (Hymenoptera: Pteromalidae) and a Tachinidae *Pseudoperichaeta nigrolineata* (Walker, 1853), which is the only reported in the worldwide, determined as native parasitoids of *C. perspectalis* in Britain (Bird et al. 2020).

Trichogramma wasps are very important natural enemies, especially against lepidopterous pests on different crops (Ercan et al. 2011). These tiny wasps are members of Trichogrammatidae family, and they have long been used in various biological control programs. The success of a biological control program is directly related to the correct identification of the biological control agent species. The micro size and lack of morphologically distinctiveness characters or in most cases uniform morphological characters, identification of these wasps is problematic. In addition, environmental conditions such as warmth and host size can affect the morphological characteristics of these wasps (Ponto et al. 1989). In the release studies, the determination of the most successful biological control agent was done by trial and error (Van Lenteren & Woets, 1988). Detection of the ingenuous species in the field to be released and the use of this species in release studies will undoubtedly increase success of the biological control.

Since morphological diagnostic methods are not always adaquately clear and reliable to distinguish micro-hymenopteran species at the species level, molecular methods have been advanced for the routine determination of *Trichogramma* species. The utility of the internally transcribed spacer 2 regions of the ribosomal DNA (rDNA-ITS2) sequence in the identification of *Trichogramma* was evidenced by Stouthamer et al. (1999). Sumer et al. (2009) developed a general molecular key for the detection of *Trichogramma* species known to occur in the Mediterranean by using ITS2 sequences. In another study, ITS2 sequence has aided the description of two *Trichogramma* species (*T. euproctidis* (Girault, 1911) and *T. brassicae* Bezdenko, 1968) from Turkey using molecular methods (Ercan et al. 2011).

The sequences of the mitochondrial cytochrome oxidase subunit I (COI) are generally used in DNA barcoding. Besides the ITS2 sequence, the COI gene sequence is a powerful tool for characterizing intraspecies molecular diversity (Correae et al. 2016). Molecular systematics is used as a very powerful tool for the determination of cryptic species. In the study, both ribosomal and mitochondrial genes were used to determine *Trichogramma* species that collected from Hatay province, in the Mediterranean Region of Turkey. This is the first record from Turkey by using DNA-based identification method.

Materials and methods

Egg masses and larvae of *C. perspectalis* were collected from infested box trees in Batıayaz-Samandağ-Hatay province in May 2021 (Figure 1).

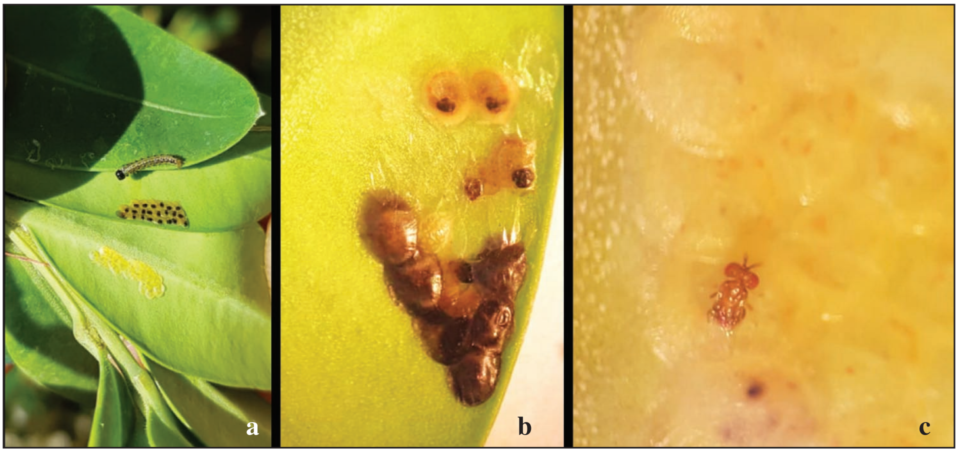


Figure 1.– A. B. Larvae of *C. perspectalis*, parasitized and non-parasitized egg masses. **C.** Adult of *T. evanescens* (Photos: F. Can).

Trichogramma SAMPLES

The branches with the egg masseswere cut and put into glass storage containers. The materials were incubated at room condition (25-28ºC, 60% RH, 16L:8D h), to allow the emergence of adults of both *C. perspectalis* and eventual parasitoids. The newly hatched egg parasitoids were stored in 96% ethanol for molecular analysis. Larvae of *C. perspectalis* were observed in plastic culture cage to get adults. Emerged adults of *C. perspectalis* were identified based on male genitalia and wing pattern by the third author. The specimens of both species are conserved in the Entomology Museum of Hatay Mustafa Kemal University, Hatay, Turkey as a museum material.

DNA extraction was performed from a single individual *Trichogramma* samples, regardless of whether it is male or female. They were ground in 60 µl 5% Chelex-100 and 2 µl Proteinase K (20 mg/ml) and incubated at 1h at 55º C, followed by 10 min at 96º C (Stouthamer et al. 1999).

ITS2 AMPLIFICATION

The following primers were used for ITS2 amplification: ITS2 forward, 5'-TGTGAACTGCAGGACACATG-3', and ITS2 reverse, 5'- GTCTTGCCTGCTCTGAG-3' (Stouthamer et al. 1999). Amplification of ITS2 sequences, purification of PCR products and electrophoresis were performed as previously described (Ercan et al. 2013). PCR products were then sent for automatic sequencing (MedSanTek, Turkey).

COI AMPLIFICATION

The following primers were used for COI amplification: COI forward, 5'-GGTCAACAAATCATAAAGATATTGG-3' and COI reverse, 5'-TAAACTTCAGGGTGAC CAAAAAATCA-3' (RUGMAN-JONES et al. 2009). Amplification of COI sequences and electrophoresis were performed as previously described (ERCAN et al. 2013). Then the PCR products were sent for automatic sequencing (MedSanTek, Turkey).

Results

A natural egg parasitoid of *Cydalima perspectalis*, *Trichogramma evanescens,* was found in the parasitized egg masses from *Buxus sempervirens* plants from Batıayaz-Hatay province of Turkey. The best method thought to be putting under pressure the population levels and therefore spread of invasive species is by use of natural enemies (Bonhof, 2000; Midega et al. 2004). First step for a successful use of natural enemy is the correct identification of the agent. In the current study, identification of parasitoid has been accomplished by means of molecular work which is considerably easier and faster than morphological identification.

The ITS2 sequences of *Trichogramma* samples varied in length between 520 and 531 bp (Figure 2). The ITS2 sequences of *Trichogramma* samples searched in GenBank database of National Center for Biotechnology Information. We compared them to all of the obtained homologous sequences of other *Trichogramma* species in GenBank. BLASTN searches of GenBank proved that available sequences of GenBank showed similarities with ITS2 sequences of collected *Trichogramma* samples with maximum identity scores ranging between 93,5 and 100%. Similarly, the COI sequences of samples were also compared with the sequences available in GenBank.

The phylogenetic tree created through the ITS2 sequences from our six samples and their laboratory and GeneBank codes, respectively, T1-T6 and OM869958-63. Besides it included other *Trichogramma* species sequences that obtained from GenBank showed in Figure 3. Also, our samples were most similar to *T. evanescens*, and were found to be quite different from other *Trichogramma* species. T2 coded sample was determined as the most different among these six samples.

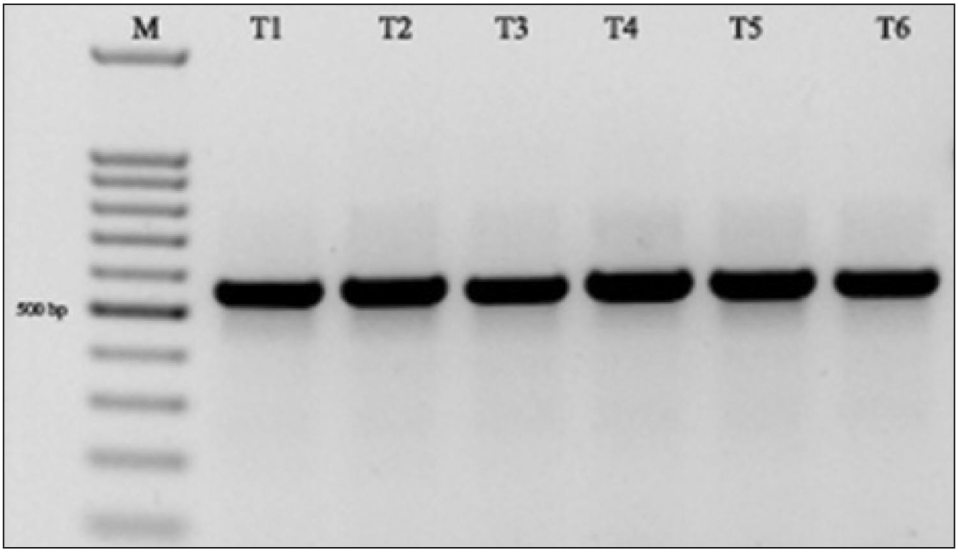


Figure 2. PCR products of the ITS2 for the species of *T. evanescens* from different samples (M: Molcular marker, T1-T6: Different *Trichogramma* samples).

Phylogenetic analysis was carried out with Neighbor Joining in the MEGAX program for COI sequences of six *Trichogramma* samples (Figure 4). The lengths of the COI sequences of the samples ranged from 675 to 680 bp. Based on the results of both ITS2 and COI sequences, all of the collected samples were determined to be *T. evanescens*. Samples only differed non-significantly in sequence size and identity scores.

Discussion

It is essential to correctly determine species before choosing suitable bio-control agent for successful control program of many pests (Hassan, 1995). The reason for the difficulties in diagnosing the morphological species in Trichogrammatidae family is due to their very tiny bodies. However, this problem can be overcome by using molecular diagnostic methods (Borba et al. 2005; Thiruvengadam et al. 2016). For this purpose, two different gene regions both ITS2 and COI which is known to distinguish *Trichogramma* species were preferred in the study.

ITS2 is a molecular marker that fastly evolving and also located within a highly conserved gene region, so can be used successfully to distinguish closely related taxa. Since ITS2 is a multi-copy gene, it can be easily amplified by PCR. Cytochrome oxidase unit I (COI) is the standard marker for DNA barcodingfor identification varied animal groups which is also evolves too slowly to facilitate species-level discrimination among insects (Hebert et al. 2003; Ratnasingham & Hebert, 2007). Simultaneous examination of COI and ITS regions has been reported to be useful for species identification. For instance; *T. minutum* and *T. platneri*, are known that morphologically identical (Pinto et al. 2003). They also do not differ in their ITS2 sequence (Stouthamer et al. 2000). These species can only be differentiated by the sequence of their mitochondrial gene (Borghuis et al. 2004). It was found to be effective to phylogenically distinguish and separate these species with these two gene regions.

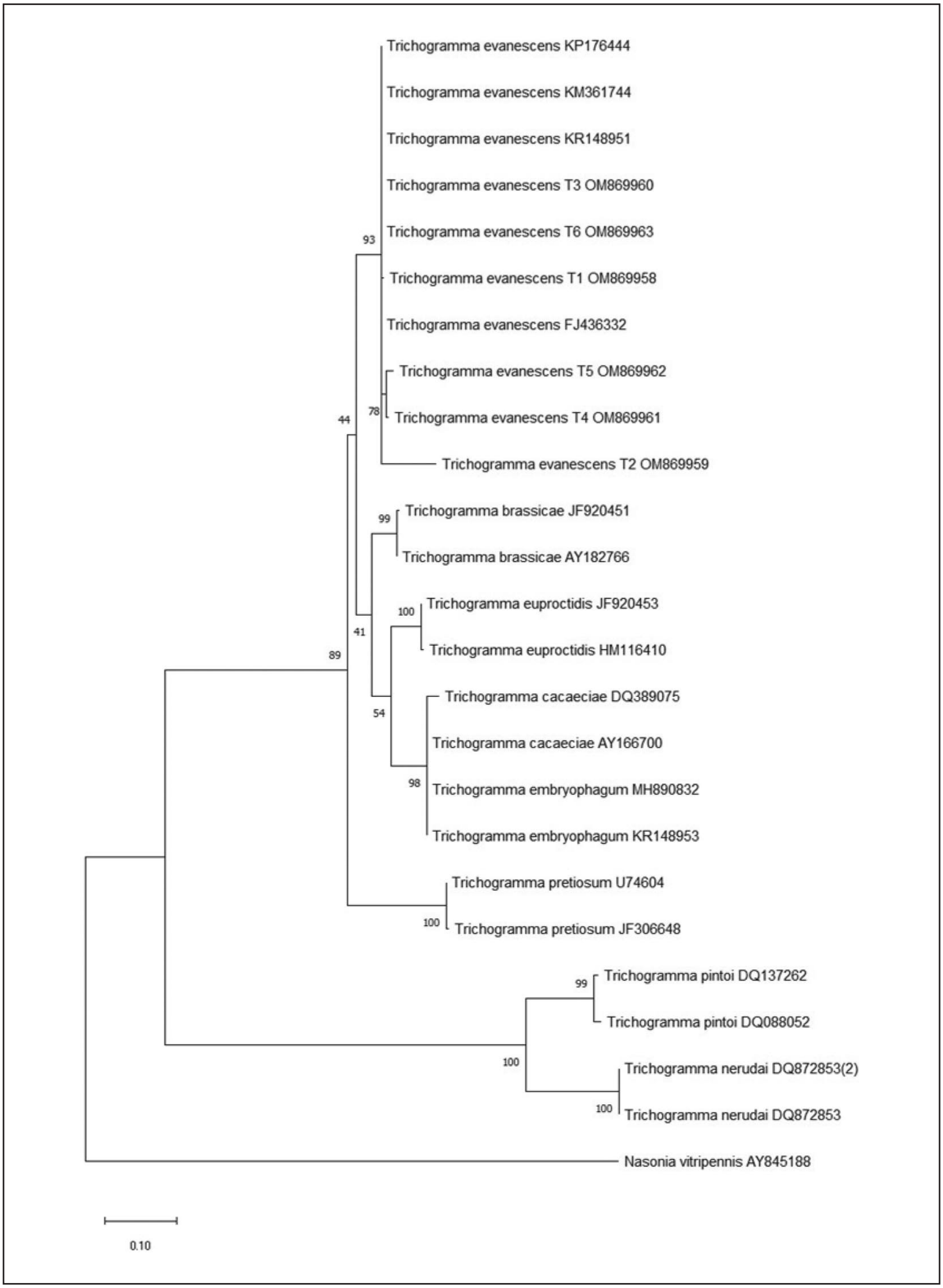


Figure 3. Phylogenetic tree based on ITS2 gene region of six *Trichogramma evanescens* populations and *Nasonia vitripennis* (Walker, 1836) is used as an outgroup.

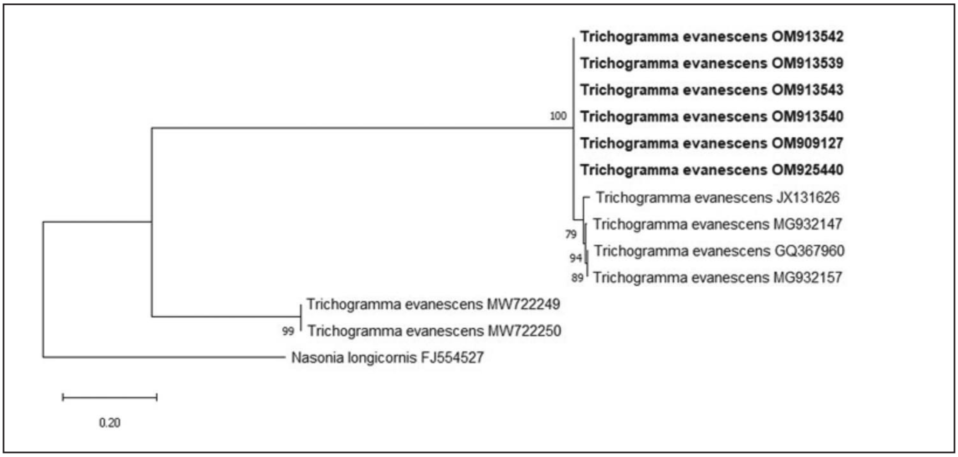


Figure 4. Phylogenetic tree (Neighbor Joining) based on COI gene region of six *Trichogramma evanescens* populations sub-tree separately and *Nasonia longicornis* Darling, 1990 used as an outgroup.

Consequently, choosing the best molecular marker is very important for molecular identification of cryptic species like *Trichogramma*. In this sense, ITS2 acts as a very powerful molecular marker. It is very similar within species but differs between species. The results confirm that our tested species can be identified in their respective clades using ITS2 and COI. We have also evaluated intra and interspecific evolutionary distances of both loci (ITS2 & COI), based on the mean pairwise distance using the Kimura 2+Gama (K2+G) distance model and sequences were aligned by Clustal W program. Variability and resolving power were observed in the case of both loci; whereas, the ITS2 locus has high discriminative capability based on intra- and interspecies distances for determination of *Trichogramma* species as compared to COI gene region (Venkatesan et al. 2015).

Since, *T. evanescens* is known to be a very important parasitoid on the eggs of lepidopteran pest son different crops, it could be considered is the most appropriate candidate for biological control of the box tree moth. In order to control this pest, it is thought that it is inevitable to produce its natural enemies, especially native ones, and to make their controlled mass releases. Thus, the data obtained as a result of the study will contribute to biological control studies of this invasive pest.

Acknowledges

The authors are grateful to Dr. Ahmet Ilç. Im (Hatay Mustafa Kemal University, Faculty of Science and Literature, Department of Biology, Hatay-Turkey) for the host plant identification.

References

Ak, K., Sari, Ö., Altaş, K., & Yaşar, H. (2021). Hatay ili şimşir alanlarında yeni bir zararlı, *Cydalima perspectalis* (Walker, 1859) (Lepidoptera: Crambidae). *Artvin Çoruh Üniversitesi Orman Fakültesi Dergisi*, *22*(1),109-116.

Akinci, H. A., & Kurdoglu, O. (2019). Damage level of *Cydalima perspectalis* (Lepidoptera: Crambidae) on naturally growing and ornamental box populations in artvin, Turkey. *Kastamonu Üniversitesi Orman Fakültesi Dergisi, 19*(2),144-151.

Bonhof, M. J. (2000). *The impact of predators on maize stem borers in coastal Kenya* [Tesis]. Wageningen University.

Bird, S., Raper, C., Dale-Skey, N., & Salisbury, A. (2020). First records of two natural enemies of box tree moth, *Cydalima perspectalis* (Lepidoptera: Crambidae), in Britain. *The British Journal of Entomology and Natural History, 33*, 67-70.

Borba, R. S., Garcia, M. S., Kovaleski, A., Oliveira, A. C., Zimmer, P. D., Branco, J. S. C., & Malonen. G. (2005). Genetic dissimilarity of lines of *Trichogramma* Westwood (Hymenoptera: Trichogrammatidae) through ISSR markers. *Neotropical Entomology, 34*, 565-569.

Borghuis, A, Pinto, J. D., Platner, G. R., & Stouthamer, R. (2004). Partial cytochrome oxidase II sequences distinguish the sibling species *Trichogramma minutum* Riley and *Trichogramma platneri* Nagarkatti. *Biological Control, 30*, 90-94.

CABI (2021). *Invasive Species Compendium*. https://www.cabi.org/isc/datasheet/118433

Can Cengiz, F., Ulaşlı, B., Kaya, K., & Moriniere, J. (2016). First of the egg parasitoids of *Chilo partellus* (Swinhoe) (Lepidoptera: Crambidae) in Turkey using DNA barcoding. *Turkish Journal of Entomology, 40*(2), 125-131.

Correa, M. C. G., Palero, F., Dubreuil, N., Etienne, L., Hulak, M., Tison, G., Warot, S., Crochard, D., Ris, N., & Kreiter, P. (2016). Molecular characterization of parasitoids from armoredscales infesting citrus orchards in Corsica, France. *Biological Control, 61*(6), 639-647.

Çalışkan-Keçe, A. F., Ulaşlı, B. T., & Ulusoy, M. R. (2020). Mealybugs (Hemiptera: Pseudococcidae) on ornamental plants in Eastern Mediterranean Region, Turkey. Acta Horticulture. *XXX. IHC - Proceedings II International Symposium on Innovative Plant Protection in Horticulture*, 221-230.

EPPO (2019). Global Database: Reporting Service no. 06-2019. Num. Article: 2019/118, Update on the Situation of *Cydalima perspectalis* in the EPPO Region. https://gd.eppo.int/reporting/article-65482019

Ercan, F. S., Oztemiz, S., Tuncbilek, A. S., & Stouthamer, R. (2011). Sequence analysis of the ribosomal DNA ITS2 region in two *Trichogramma* species (Hymenoptera: Trichogrammatidae). *Archives of Biological Sciences, 63*(4), 949-954.

Ercan, F. S., Oztemiz, S., & Tuncbilek, A. (2013). Mitochondrial and ribosomal DNA sequence analysis for discrimination of *Trichogramma euproctidis* Girault and *Trichogramma brassicae* Bezdenko (Hymenoptera: Trichogrammatidae). *Turkish Journal of Entomology, 37*(2), 195-201.

Hadded, K., Kalaentzis, K., & Demetriou, J. (2020). On track to becoming a cosmopolitan invasive species: First record of the box tree moth *Cydalima perspectalis* (Lepidoptera: Crambidae) in the African continent. *Entomologia Hellenica, 29*(2), 27-32.

Hampson, G. F. (1896). *The Fauna of British India, including Ceylon and Burma* (Vol. 4). Taylor & Francis.

Hassan, S. A. (1995). Introduction to the “Effectiviness and Assessment” session. *Les Colloq del’INRA, 73*, 107-111.

Hebert,P. D. N, Cywinska, A., Ball, S. L., & Dewaard, J. R. (2003). Biological identifications through DNA barcodes. *Proceedings of the Royal Society of London: Biological Sciences, 270*(1512), 313-321.

Hizal, E., Kose, M., Yesil, C., & Kaynar, D. (2012). The new pest *Cydalima perspectalis* (Walker, 1859) (Lepidoptera: Crambidae) in Turkey. *Journal of Animal and Veterinary Advances, 11*(3), 400- 403.

Inoue, H. (1982a). Pyralidae. In H. Inoue, S. Sugi, H. Kuroko, S. Moriuti, A. Kawabe & M. Owada. *Moths of Japan* (Vol. 1). Kodansha.

Inoue, H. (1982b). Pyralidae. In H. Inoue, S. Sugi, H. Kuroko, S. Moriuti, A. Kawabe & M. Owada. *Moths of Japan* (Vol. 2). Kodansha.

Kaygin, A. T. & Taşdeler, C. (2019). *Cydalima perspectalis* (Walker) (Lepidoptera: Crambidae, Spilomelinae)’ in Türkiye’de Coğrafi Yayılışı, Yaşam Döngüsü Ve Zararı. *Bartın Orman Fakültesi Dergisi, 21*(3), 833-847.

Kirpichnikova, V. A. (2005). Pyralidae. In P. A. Lehr. *Key to the insects of Russian Far East. Trichoptera and Lepidoptera* (Vol. 5, pp. 526-539). Dalnauka.

Marianelli, L., Iovinella, I., Strangi, A., Madonni, L., Efetov, K. A., Tarmann, G. M., Raiola, V., Baruzzo, F., Sabbatini, G. P., & Roversi, P. F. (2020). First record of the pest *Artona* (*Fuscartona*) *martini* Efetov, 1997 (Lepidoptera, Zygaenidae, Procridinae, Artonini) in European territory. *Redia, 103*, 3-7. https://doi.org/10.19263/REDIA-103.20.01

Midega, C. A. O., Ogol, C. K. P. O., & Overholt, W. A. (2004). Effect of agroecosystem diversity on natural enemies of maize stemborers in coastal Kenya. *International Journal of Tropical Insect Science, 4*(4), 280-286.

Mitchell, R., Chitanava, S., Dbar, R., Kramarets, V., Lehtijrvi, A., Matchutadze, I., Mamadashvili, G., Matsiakh, I., Nacambo, S., Papazova-Anakieva, I., Sathyapala, S., Tuniyev, B., Vétek, G., Zukhbaia, M., & Kenis, M. (2018). Identifying the ecological and societal consequences of a decline in *Buxus* forests in Europe and the Caucasus. *Biological Invasions, 20*, 3605-3620.

Nagarkatti, S., & Nagaraja, H. (2009). Redescriptions of some known species of *Trichogramma* showing the importance of the male genitalia as a diagnostic character. *Bulletin of Entomological Research, 61*, 13-31.

Park, I. K. (2008). Ecological characteristic of *Glyphodes perspectalis*. *Korean Journal of Applied Entomology, 47*, 299-301.

Pinto, J. D., Velten, R. K., Platner, G. R., & Oatman, E. R. (1989). Phenotypic plasticity and taxonomic characters in *Trichogramma* (Hymenoptera: Trichogrammatidae). *Annals of the Entomological Society of America, 82*, 414-425.

Pinto, J. D., Platner,G. R., & Stouthamer, R. (2003). The systematics of the *Trichogramma minutum* complex (Hymenoptera: Trichogrammatidae), a group of important North American biological control agents: the evidence from reproductive compatibility and allozymes. *Biological Control, 27*, 167-180.

Ratnasingham, S., & Hebert, P. D. (2007). BOLD: The barcode of life data systems. *Molecular Ecology Notes, 7*, 355-364.

Rugman-Jones, P. F., Wharton, R., Noort, T., & Stouthamer, R. (2009). Molecular differentiation of the *Psyttalia concolor* (Szépligeti) species complex (Hymenoptera: Braconidae) associated with olive fly, *Bactrocera oleae* (Rossi) (Diptera: Tephritidae), in Africa. *Biological Control, 49*, 17-26.

Sari, T., & Çelikel, F. G. (2019). Türkiye'nin Şimşirleri (*Buxus sempervirens* ve *Buxus balearica*) ve Mevcut Tehditler. *I. International Ornamental Plants Congress - VII. Süs Bitkileri Kongresi, 9-11 Ekim 2019, Bursa*.

Stouthamer, R., Hu, J., Van Kan, F. J. P. M., Platner, G. R., & Pinto, J. D. (1999). The utility of internally transcribed spacer 2 DNA sequences of the nuclear ribosomal gene for distinguishing sibling species of *Trichogramma*. *Biological Control, 43*, 421-440.

Stouthamer, R., Gai, Y., Koopmanschap, A. B., Platnerm, G. R., & Pinto, J. D. (2000). ITS-2 sequences do not differ for the closely related species *Trichogramma minutum* and *T. platneri*. *Entomologia Experimentalis et Applicata, 95*, 105-111.

Sumer, F., Tuncbilek, A. S., Oztemiz, S., Pintureau, B., Rugman-Jones, P. F., & Stouthamer, R. (2009). A molecular key to the common species of *Trichogramma* of the Mediterranean region. *Biological Control, 54*, 617-624.

Symmes, H. (1984). Native stands of boxwood in modern Turkey. *The Boxwood Bulletin. Boyce, 23*(4), 76-79.

Thiruvengadam, V., More, R. P., Baskar, R., Jalali, S. K., Lalitha, Y., & Ballal, C. R. (2016). Differentiation of some indigenous and exotic trichogrammatids (Hymenoptera: Trichogrammatidae) from India based on Internal transcribed spacer-2 and cytochrome oxidase-I markers and their phylogenetic relationship. *Biological Control, 101*, 130-137.

Van Lenteren, J. C., & Woets, J. (1988). Biological and integrated pest control in greenhouses. *Annual Review of Entomology, 33*(1), 239-269.

Van Der Straten, M. J., & Muus, T. S. (2010). The box tree pyralid (*Glyphodes perspectalis* (Walker 1859), Lepidoptera: Crambidae); an invasive alien moth ruining box trees. *Proceedings of the Netherlands Entomological Society Meeting, 21*, 107-111.

Venkatesan, T., Reetha, B., Jalali, S. K., Lalitha, Y., Ballal, C. R., Ravi, P. M., & Verghese, A. (2015). Molecular identification of egg parasitoid, *Trichogramma* species of India using COI and ITS-II regions and their phylogenetic relationships. *Genome, 56*(5), 291-29.

Wan, H., Haye, T., Kenis, M., Nacambo, S., Xu, H., Zhang, F., & Li, H. (2014). Biology and natural enemies of C*ydalima perspectalis* in Asia: Is there biological control potential in Europe? *The Journal of Applied Entomology, 138*, 715-722.

Zimmermann, O., & Wuhrer, B. (2010). Initial investigations on the ability of the indigenous larval parasitoid *Bracon brevicornis* to control the Box tree pyralid *Diaphania perspectalis* in Germany. *DGaaE Nachrichten, 24*, 25-26.

*Feza Can
Hatay Mustafa Kemal University
Faculty of Agriculture
Plant Protection Department
Hatay
TURQUÍA / *TURKEY*
E-mail: cezafan_onurcan@hotmail.com
https://orcid.org/0000-0002-0737-6145

Fahriye Ercan
Kırşehir Ahi Evran University
Faculty of Agriculture
Plant Protection Department
Kırşehir
TURQUÍA / *TURKEY*
E-mail: fahriye.ercan@ahievran.edu.tr
https://orcid.org/0000-0002-0111-8460

Başak Ulaşıh
Hatay Mustafa Kemal University
Faculty of Agriculture
Plant Protection Department
Hatay
TURQUÍA / *TURKEY*
E-mail: basaktok@yandex.com
https://orcid.org/0000-0002-0989-2020

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 26-IV-2022)
(Revisado y aceptado / *Revised and accepted* 31-VII-2022)
(Publicado / *Published* 30-XII-2022)

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 617-631 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.270

New and interesting Portuguese Lepidoptera records from 2021 (Insecta: Lepidoptera)

Martin F. V. Corley, Helder Cardoso, João Nunes, Jorge Rosete, Ana Valadares & Thijs Valkenburg

Abstract

13 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 2021. In addition, second and third records for the country, new province records and new host-plant data for a number of species are included. A summary of recent papers affecting the Portuguese fauna is included.

Keywords: Insecta, Lepidoptera, distribution, Portugal.

Novos e interessantes registos portugueses de Lepidoptera em 2021 (Insecta: Lepidoptera)

Resumo

Como resultado do trabalho de campo desenvolvido pelos autores e outros, principalmente no ano de 2021, são adicionadas 13 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 2021 (Insecta: Lepidoptera)

Resumen

Con el trabajo de campo efectuado por los autores y otros, principalmente durante el año de 2021, se añaden 13 especies de Lepidoptera a la fauna de Portugal, tres de las cuales 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 sixteenth 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 2021 and some unpublished earlier records, together with new province records not included in the checklist (Corley, 2015). Additional data include new data on larval host-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 2021 and part of 2022 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.

13 species new for Portugal are listed below, of which three are new for the Iberian Peninsula. Two species are removed from the Portuguese list. One of the new species listed here (*Conistra alicia*) was previously listed for Portugal, but the record was rejected in Corley (2015), as being erroneous, see below.

In Corley et al. (2020) the number of Lepidoptera species recognised from Portugal was 2743. With the current paper this total has risen to 2754.

Material and Methods

Most species were captured at light. 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. Original photos of all species new for Portugal but without a voucher specimen are provided in this paper (Figures 1, 2, 5, 7, 8).

The order and nomenclature of families and species follows the Portuguese list (Corley, 2015). The nomenclature of plant names follows the EURO+MED PLANT-BASE.

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

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

Abiúl (Pombal)	NE3913	180 m
Aguas do Marão, Ansiães (Amarante)	NF9070	880 m
Alcaria, Rocha da Pena (Loulé)	NB8222	230 m
Aldeia Nova, Avintes (Vila Nova de Gaia)	NF3749	70 m
Alfambras (Aljezur)	NB1724	75 m
Amoreira, Rego Travesso (Óbidos)	MD8255	50 m
Ansião, 2 km E. of,	NE5019	250 m
Aveção do Cabo, Campeã (Vila Real)	NF9372	800 m
Castelo dos Mouros (Sintra)	MC6694	350 m
Corredoura, São Pedro, Serra da Pevide (Porto de Mós)	ND1383	200 m
Corticeiro de Cima (Cantanhede)	NE2875	55 m
Cruzinha, Mexilhoeira Grande (Portimão)	NB3411	20 m
Furadouro (Condeixa-a-Nova)	NE4335	250 m
Glória (Estremoz)	PC2595	350 m
Grada, Barcouço (Mealhada)	NE4481	60 m
Lama Grande, Serra de Montesinho (Bragança)	PG8346	1390 m
Louredo (Póvoa de Lanhoso)	NG5900	260 m
Louriçal (Pombal)	NE2228	40 m
Manteigas, S.W. of,	PE2270	1000 m
Meia Praia (Lagos)	NB3108	3 m
Montesinho (Bragança)	PG8545	1005 m
Palácio de Sintra (Sintra)	MC6694	240 m

Pampilhosa de Botão (Mealhada)	NE4964	90 m
Parque Biológico de Gaia (Vila Nova de Gaia)	NF3650	110 m
Pinhel	PE6316	540 m
Pó (Bombarral)	MD8151	50 m
Poço (Condeixa-a-Nova)	NE4406	220 m
Ponte do Rio Maceira, Serra do Gerês (Terras de Bouro)	NG7127	650 m
Portela de Famalicão (Guarda)	PE3879	890 m
Praia das Bicas (Sesimbra)	MC8357	60 m
Praia do Osso da Baleia, Carriço (Pombal)	NE0728	10 m
Praia do Samouco (Marinha Grande)	NE0007	6 m
Quinta das Flores, Estoi (Faro)	NB9807	160 m
Quinta de Marim (Olhão)	PA0599	13 m
Quintarrei (Valongo)	NF5900	166 m
Ribeiro de Guilharde, 2 km S.E. of Meixedo (Bragança)	PG8634	605 m
Sagres, road to Cabo de São Vicente (Vila do Bispo)	NA0298	50 m
Senande, Aguiar da Sousa (Paredes)	NF4751	100 m
Torre, zone adjacent to, (Seia)	PE1666	1800 m
Vairão (Vila do Conde)	NF2775	95 m
Valarinho, Louriçal (Pombal)	NE2230	35 m
Vale de Figueiredo (Bombarral)	MD8051	80 m
Vendas Novas da Tôr (Loulé)	NB8618	260 m
Vila Velha de Ródão	PD1289	100 m

Recorders and determiners:

Carlos Almeida
Giorgio Baldizzone
Paula Banza
Miguel Berkemeier
Rudolf Bryner
Helder Cardoso
Martin Corley
Michael Dale
Ben van Dort
Agostinho Fernandes
Isaías Ferreira
Sónia Ferreira
Nelson Fonseca
Christopher Fraser-Jenkins
Jorge Pereira Gomes
Ana Rita Gonçalves
Martin Honey
Edmundo Jesus
Ole Karsholt
João Nunes
Patrícia Garcia Pereira
Carla Rosete
Jorge Rosete
Carlos Silva
Luís Silva
Isabel Soares
Andreas Stübner
Joaquim Teixeira
João Tomás
Ana Valadares
Thijs Valkenburg
Christof Zeller-Lukashort
Alberto Zilli

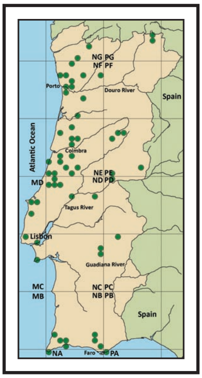
Abbreviations and symbols

coll.	collection
comm	communicated by
conf.	confirmed by
det.	determined by
gen. det.	confirmed by genitalia dissection
pers. comm.	personal communication
ZMUC	University of Copenhagen Zoological Museum, Copenhagen, Denmark

*	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
BB	Beira Baixa
BAL	Baixo Alentejo
BL	Beira Litoral
DL	Douro Litoral
E	Estremadura
M	Minho
R	Ribatejo
TM	Trás-os-Montes



List of families and species

MICROPTERIGIDAE

Micropterix granatensis Heath, 1981

Third Portuguese record. ALG: Alcaria, Rocha da Pena, by day, 8-IV-2013, Bryner, det. Zeller-Lukashort.

NEPTICULIDAE

Stigmella basiguttella (Heinemann, 1862)

BL: Ansião, 5-VII-2016, Rosete, det. Corley.

Stigmella samiatella (Zeller, 1839)

BL: Ansião, 9-VII-2021, Rosete.

Stigmella eberhardi (Johansson, 1971)

BL: Furadouro, 7-IX-2015, Rosete, Jesus, I. Ferreira and Gonçalves, conf. Corley.

Zimmermannia liguricella (Klimesch, 1953)

E: Praia do Samouco, 16-VII-2021, Rosete, conf. Corley.

PSYCHIDAE

Delete *Ptilocephala melanura* (Bourgogne, 1954). Considered to be at best a subspecies of *P. colossa* (Bang-Haas, 1907) but almost certainly just infraspecific variation (Arnscheid & Weidlich, 2017).

TINEIDAE

Infurcitinea karadaghica Zagulajev, 1979

E: Praia do Samouco, 16-VII-2021, Rosete, conf. Corley.

Reisserita flavofimbriella (Chrétien, 1925)

BL: Ansião, 9-VII-2021, Rosete; BA: Portela de Famalicão, 1-VIII-2021, Rosete.

** *Teichobia filicivora* (Meyrick, 1937)

E: Palácio de Sintra, larvae on *Polypodium cambricum* L., 2020, Fraser-Jenkins; larvae were subsequently found at Sintra by Fraser-Jenkins on *Polystichum setiferum* (Forssk.) Woyn, *Asplenium hemionitis* L. and *Polypodium interjectum* Shivas; adult on ferns, Castelo dos Mouros, Sintra, 1-XI-2021, van Dort, conf. Corley (Figure 1). Britain, Ireland and Madeira.

BUCCULATRICIDAE

** *Bucculatrix cristatella* (Zeller, 1839)

BL: Abiúl, 15-VII-2020, Rosete, det. Dale. Most of Europe from France, northern Italy and Romania northwards. [*Achillea millefolium* L.].

GRACILLARIIDAE

Phyllonorycter barbarella (Rebel, 1901)

BL: Ansião, 3-V-2013, Rosete.

Phyllonorycter cerasicolella (Herrich-Schäffer, 1855)

BA: Portela de Famalicão, 1-VIII-2021, Rosete, conf. Corley.

Phyllonorycter ulicicolella (Stainton, 1851)

BL: Ansião, 5-VII-2016, Rosete, conf. Corley.

YPONOMEUTIDAE

* *Pseudoswammerdamia combinella* (Hübner, 1786)

BL: Pampilhosa de Botão, 3-III-2021, Jesus, det. Nunes (Figure 2). Nearly all Europe, absent from most Baltic countries and southern Balkan peninsula. [*Prunus spinosa* L.].

YPSOLOPHIDAE

Ypsolopha ustella (Clerck, 1759)

E: Praia do Samouco, 16-VII-2021, Rosete.

AUTOSTICHIDAE

Symmocoides ferreirae Gozmány, 2008

BL: Ansião, 10-VI-2017, Rosete, conf. Corley.

OECOPHORIDAE

Metalampra italica Baldizzone, 1977

Second Portuguese record. DL: Aldeia Nova, Avintes, 27-VII-2021, Teixeira, det. Nunes.

Dasycera oliviella (Fabricius, 1794)

ALG: Alfambras, 20-V-2018, Valadares.

DEPRESSARIIDAE

Agonopterix rutana (Fabricius, 1794)

E: Vale de Figueiredo, 11-VI-2021, H. Cardoso.

COSMOPTERIGIDAE

* *Cosmopterix coryphaea* Walsingham, 1907
ALG: Quinta de Marim, 10-V-2021, Valkenburg, gen. det. Nunes (Figure 3). Southernmost parts of Europe from Spain to Greece, Croatia, Canary Islands. [*Phragmites australis* (Cav.) Steud.].

GELECHIIDAE

Mesophleps trinotella Herrich-Schäffer, 1856
E: Pó, 3-IV-2021, H. Cardoso.

Anarsia spartiella (Schrank, 1802)
E: Pó, 5-VII-2021, H. Cardoso, conf. Corley.

Chrysoesthia sexguttella (Thunberg, 1794)
E: Amoreira, 11-III-2021, H. Cardoso.

* *Aroga temporariella* Sattler, 1960
BL: Poço, 7-IV-2017, Rosete, det. Corley. France, Spain. Host-plant unknown.

ELACHISTIDAE

** *Elachista pullicomella* Zeller, 1839
BA: Above Manteigas, by day, 12-VI-1986, Karsholt (ZMUC). Most of Europe, absent from British Isles, Mediterranean Islands, Spain, Greece. [Various Poaceae].

COLEOPHORIDAE

Coleophora albella (Thunberg, 1788)
BL: Ansião, 26-V-2017, Rosete, det. Corley.

* *Coleophora zernyi* Toll, 1944
ALG: Vendas Novas da Tôr, 6–14-IV-2013, Bryner, det. Stübner. Spain, Sardinia, Corsica. Host-plant unknown.

Coleophora discordella Zeller, 1849
DL: Quintarrei, case on *Lotus corniculatus* L., 25-I-2021, Nunes.

Coleophora helichrysiella Krone, 1909
E: Praia do Samouco, 16-VII-2021, Rosete, det. Corley.

Coleophora albilineella Toll, 1960
Third (and earliest) Portuguese record. BA: Torre, 1600-1950 m, 10-11-VII-1986, Karsholt, det. Baldizzone (ZMUC).

Coleophora ribasella Baldizzone, 1982
E: Praia do Samouco, empty cases on *Artemisia campestris maritima* (DC) Arcang., 9-VII-2021, Rosete.

SCYTHRIDIDAE

Scythris cistorum (Millière, 1876)
E: Corredoura, São Pedro, 29-IX-2014, Rosete, det. Corley.

Scythris sinensis (Felder & Rogenhofer, 1875)
Second Portuguese record. M: Adults on *Chenopodium* L. by day, Louredo, 20-IX-2021, Nunes.

* *Scythris pulicella* (Staudinger, 1859)
ALG: Sagres, road to Cabo de São Vicente, by day, 12-IV-2013, Bryner. Spain. Host-plant unknown.

PTEROPHORIDAE

Pterophorus pentadactyla (Linnaeus, 1758)
BL: Corticeiro de Cima, 26-VIII-2021, C. Rosete, in coll. J. Rosete.

Gypsochares bigoti Gibbeaux & Nel, 1989
E: Praia do Samouco, 16-VII-2021, Rosete.

TORTRICIDAE

Clepsis consimilana (Hübner, 1817)
Since the description of *Clepsis razowskii* Gastón, Vives & Revilla, 2017 (synonym of *C. eatoniana* (Ragonot, 1881) we have examined genitalia of a substantial number of specimens of the *C. consimilana* aggregate, although not from every province. From this it is evident that nearly all records of *C. consimilana* from Portugal belong to *C. eatoniana*, with confirmed records from ALG, AAL, R, E, BL, DL and TM. *C. consimilana* sensu stricto appears to be restricted to north-west Portugal. We only have the following records: DL: Vairão, 29-V-2004, Corley; Senande, 7-V-2021, Nunes and S. Ferreira; M: Ponte Rio Maceira, 15-VI-2010, Corley.

Cochylidia rupicola (Curtis, 1834)
BL: Grada, Barcouço, 5-X-2021, L. Silva, conf. Corley.

* *Ancylis unculana* (Haworth, 1811)
TM: Ribeiro de Guilharde, Meixedo, 30-VII-2021, C. Silva, Jesus and Teixeira (Figure 5). Almost all Europe except southern Balkan countries. [*Rhamnus* L., *Frangula* Mill.].

Rhyacionia pinivorana (Lienig & Zeller, 1846)
DL: Águas do Marão, Ansiães, 9-VI-2021, Jesus and C. Silva.

Selania leplastriana (Curtis, 1831)
BL: Praia do Osso da Baleia, Carriço, on *Brassica tournefortii* Gouan by day, 23-XII-2021, Rosete.

COSSIDAE

Cossus cossus (Linnaeus, 1758)
BL: Ansião, 9-VII-2021, Rosete.

Stygia australis Latreille, 1803
ALG: Pair *in copula* found by day, Meia Praia, 12-VI-2021, I. Soares, det. H. Cardoso.

NYMPHALIDAE

Charaxes jasius (Linnaeus, 1767)

ALG: Female ovipositing on *Osyris lanceolata* Hochst. & Steud., Quinta das Flores, 6-XI-2013, egg eclosion 25-XI-2013, larva until 24-II-2014, Fonseca.

PYRALIDAE

Aglossa caprealis (Hübner, 1809)
BL: Louriçal, 30-VI-2020, Rosete.

Hypotia corticalis (Denis & Schiffermüller, 1775)
E: Praia das Bicas, 24-VIII-2021, Almeida, det. Valadares.

* *Merulempista turturella* (Zeller, 1848)
ALG: Quinta de Marim, 10-VIII-2021, Valkenburg and Tomás, gen. det. Nunes (Figure 6). Spain, France, Italy, Mallorca. [*Tamarix*].

Acrobasis marmorea (Haworth, 1811)
BL: Abiúl, 2-VII-2021, Rosete, gen. det.

Phycitodes albatella (Ragonot, 1887)
E: Praia do Samouco, 16-VII-2021, Rosete, gen. det.

CRAMBIDAE

Anania hortulata (Linnaeus, 1758)
Third Portuguese record. TM: Aveção do Cabo, 2-VII-2021, Fernandes.

Arnia nervosalis Guenée, 1849
E: Praia das Bicas, 24-VIII-2021, Almeida, det. Valadares.

Catoptria lythargyrella (Hübner, 1796)
Second Portuguese record. TM: Lama Grande, 16-VIII-2021, Nunes and Jesus.

GEOMETRIDAE

* *Idaea alicantaria* (Reisser, 1963)
ALG: Quinta de Marim, 25-VI-2021, Valkenburg and Tomás, conf. Nunes (Figure 7). Spain, Ibiza. Host-plant unknown.

Larentia clavaria (Haworth, 1809)
BA: Pinhel, 14-XI-2021, Valadares.

Chesias legatella (Denis & Schiffermüller, 1775)
E: Praia do Samouco, 28-XI-2014, Rosete.

Neognopharmia stevenaria (Boisduval, 1840)
AAL: Glória, 12-V-2021, H. Cardoso.

Agriopis bajaria (Denis & Schiffermüller, 1775)
ALG: Cruzinha, 13-I-2011, Banza.

NOTODONTIDAE

Pheosia tremula (Clerck, 1759)
DL: Parque Biológico de Gaia, 6-V-2021, Gomes.

EREBIDAE

Orgyia trigotephras Boisduval, 1829
BA: Pinhel, 29-VI-2020, Valadares.

Setina cantabrica (de Freina & Witt, 1985)
First record of 21st century. TM: Lama Grande, 29-VII-2021, Jesus, C. Silva and Teixeira.

Autophila dilucida (Hübner, 1803)
BB: Vila Velha de Ródão, 26-VI-2019, Berkemeier, comm. Garcia Pereira, conf. Corley. Not recorded since 1967.

NOCTUIDAE

Acronicta leporina (Linnaeus, 1758)
BL: Valarinho, Louriçal, 18-VIII-2018, Rosete.

* *Apamea furva* (Denis & Schiffermüller, 1775)
TM: Montesinho, 1-VII-2021, Valadares, conf. Corley (Figure 8). Nearly all European countries; Sardinia, absent from other Mediterranean islands. [Poaceae].

Oligia latruncula (Denis & Schiffermüller, 1775)
DL: Senande, 7-V-2021, Nunes and S. Ferreira (gen. det.).

* *Conistra alicia* Lajonquière, 1939
Reinstate this as a Portuguese species, see below under *C. haleae*. *C. alicia* is known from BAL, AAL, BL, DL and TM (Corley, 2015; Marabuto, 2018; Corley et al. 2020). To these a recent record from Algarve can be added: ALG: Alfambras, 6-I-2022, Valadares, det. H. Cardoso and Corley. Spain, France.

Delete *Conistra haleae* Fibiger & Top-Jensen, 2010
We have re-examined nearly all Portuguese specimens previously identified as *C. haleae* and additional specimens collected recently and conclude that they do not have all the characters given for *C. haleae* in the original description of that species. It is our view that they lie within the variation of *C. alicia*, which should therefore be reinstated as a Portuguese species.

Xestia sexstrigata (Haworth, 1809)
Second Portuguese record. TM: Lama Grande, 16-VIII-2021, Nunes and Jesus.

Recent literature

Aarvik et al. (2021) make a number of taxonomic changes which are relevant to the Portuguese list. They point out that Brown et al. (2020) had overlooked *Longicornutia* Razowski, 1960 as the available genus for *Cochylis epilinana*, which they considered not to be congeneric with other *Cochylis* sensu stricto species.

They consider that the transfer of *Tuta absoluta* to genus *Phthorimaea* was premature based on the evidence provided by Corro Cheng & Metz (2021) and that it should remain in genus *Tuta* until a really thorough taxonomic revision of Gnorimoschemini on a global scale renders change necessary.

They give *Colias croceus* (Geoffroy, 1785) as the correct citation for this species.

The correct year of publication of *Fissipunctia* Beck is 1992.

Corley et al. (2021) add 13 species to the Portuguese list and delete three.

Gastón & Huemer (2022) describe a new species, *Metzneria leae* from Spain. Portuguese records are not considered, but Algarve records of *M. subflavella* Englert, 1974 (Corley, 2005) belong to the new species, which feeds in seed-heads of *Klasea baetica* (DC.) Holub in Portugal. There is one more Portuguese record: Vale Santo, Vila do Bispo, Algarve, 15-V-2019, Nunes, C. Silva and Jesus (Figure 4). *M. subflavella* should be deleted from the Portuguese list.

Huemer (2021) describes *Metzneria neli* sp. n. from France and Spain, closely related to *M. tristella* Rebel, 1901. He did not examine Portuguese specimens. We can confirm that material named *tristella* from Algarve and Baixo Alentejo belongs to *M. neli*. Probably all Portuguese specimens belong to the new species, but although this has not been confirmed, it is appropriate to delete *M. tristella* from the Portuguese list. In France *M. neli* feeds on the seeds of *Cheirolophus intybacea* (Lam.) Dostál. In Algarve it feeds on seeds of *Cheirolophus sempervirens* Pomel. Records of *M. tristella* from Estremadura, Beira Litoral and Beira Baixa remain unconfirmed.

Huemer (2022) has revised the *Caryocolum tricolorella* complex, describing new species from Italy and the Balkans. He suggests that there are uncertainties regarding the Portuguese records of *C. tricolorella* and *C. fibigerium*. His doubts arise from not including Portuguese material in his study. We have re-examined our Portuguese material and there is no reason to doubt the identifications.

Nunes (2021) listed Lepidoptera recorded from Valongo municipality in Douro Litoral but did not indicate those species that were new for that province. These are *Parectopa ononidis* (Zeller, 1839), *Euspilapteryx auroguttella* Stephens, 1835, *Ocnerostoma friesei* Svensson 1966, *Odites kollarella* (Costa, 1832), *Monochroa hornigi* (Staudinger, 1883), *Acleris hyemana* (Haworth, 1811), *Pyralis lienigialis* (Zeller, 1843), *Apomyelois ceratoniae* (Zeller, 1839), *Eupithecia nanata* (Hübner, 1813), *Eublemma purpurina* (Denis & Schiffermüller, 1775), *Minucia lunaris* (Denis & Schiffermüller, 1775) and *Lithophane semibrunnea* (Haworth, 1809).

Nunes (2022) listed Lepidoptera recorded from Mata de Vilar in Lousada municipality in Douro Litoral. He indicates 19 new species for Douro Litoral: *Monopis obviella* (Denis & Schiffermüller, 1775), *Coleophora albella* (Thunberg, 1788), *Paramesia alhamana* (Schmidt, 1933), *Aleimma loeflingiana* (Linnaeus, 1758), *Epinotia festivana* (Hübner, 1799), *Eucosma conterminana* (Guenée, 1845), *Pseudococcyx tessulatana* (Staudinger, 1871), *Pammene splendidulana* (Guenée, 1845), *Brachodes gaditana* (Rambur, 1866), *Elegia atrifasciella* Ragonot, 1887, *Elegia similella* (Zincken, 1818), *Acrobasis fallouella* (Ragonot, 1871), *Eupithecia laquaearia* Herrich-Schäffer, 1848, *Eilema uniola* (Rambur, 1866), *Conistra erythrocephala* (Denis & Schiffermüller, 1775), *Cosmia trapezina* (Linnaeus, 1758), *Trigonophora jodea* (Herrich-Schäffer, 1850), *Egira conspicillaris* (Linnaeus, 1758) and *Noctua tirrenica* Biebinger, Speidel & Hanigk, 1983, the third record of *Metalampra italica* Baldizzone, 1977 for Portugal and a new record for *Eotaleporia lusitaniella* (Amsel, 1955). Two more new species for DL province were recorded but not highlighted in this work. These are *Helcystogramma lutatella* (Herrich-Schäffer, 1854) and *Eudemis profundana* (Denis & Schiffermüller, 1775).

Nunes et al. (2022) include 45 new province records for 40 species, but they are not highlighted in the database, so we list them here: AAL: *Coscinia chrysocephala* (Hübner, 1804) and *Clytie illunaris* (Hübner, 1813); ALG: *Idaea fuscovenosa* (Goeze, 1781), *Idaea rhodogrammaria* (Püngeler, 1913), *Perizoma flavofasciata* (Thunberg, 1792), *Lenisa geminipuncta* (Haworth, 1809), *Lithophane ornitopus* (Hufnagel, 1766) and *Griposia aprilina* (Linnaeus, 1758); BB: *Idaea sardoniata* (Homberg, 1912), *Coscinia chrysocephala* (Hübner, 1804) and *Tathorhynchus exsiccata* (Lederer, 1855); BL: *Triodia sylvina* (Linnaeus, 1761), *Nebula ibericata* (Staudinger, 1871), *Chesias rufata* (Fabricius, 1775), *Coscinia chrysocephala* (Hübner, 1804), *Eilema marcida* (Mann, 1859), *Cucullia calendulae* Treitschke, 1835, *Luperina dumerilii* (Duponchel, 1826), *Hadena bicruris* (Hufnagel, 1766) and *Agrotis lata* Treitschke, 1835; DL: *Acasis viretata* (Hübner, 1799), *Raphia hybris* (Hübner, 1813), *Coenobia rufa* (Haworth, 1809) and *Agrochola haematidea* (Duponchel, 1827); E: *Ennomos alniaria* (Linnaeus, 1758), *Thalera fimbrialis* (Scopoli, 1763), *Phalera bucephala* (Linnaeus, 1758), *Caradrina proxima* Rambur, 1837, *Agrochola blidaensis* (Stertz, 1915), *Agrochola haematidea* (Duponchel, 1827) and *Mythimna languida* (Walker, 1858); M: *Scopula minorata* (Boisduval, 1833), *Cucullia calendulae* Treitschke, 1835, *Lithophane semibrunnea* (Haworth, 1809) and *Nola confusalis* (Herrich-Schäffer, 1847); R: *Phyllodesma suberifolia* (Duponchel, 1842), *Idaea mustelata* (Gumppenberg, 1892), *Idaea infirmaria* (Rambur, 1833), *Cyclophora porata* (Linnaeus, 1767), *Catarhoe basochesiata* (Duponchel, 1831), *Epirrhoe alternata* (Müller, 1764), *Eupithecia pantellata* Millière, 1875, *Abraxas pantaria* (Linnaeus, 1767), *Orthosia gothica* (Linnaeus, 1758) and *Mythimna languida* (Walker, 1858). This publication consists of a dataset including the 2021 results from the moth recording scheme (Rede de Estações de Borboletas Nocturnas) that started in Portugal in the same year.

Ronkay et al. (2017) have revised *Agrochola*, splitting it into a number of genera, as follows:

Agrochola Hübner, 1821
  lychnidis (Denis & Schiffermüller, 1775)
  orejoni Agenjo, 1951
Anchoscelis Guenée, 1839 (*Omphaloscelis* Hampson, 1906)
  lunosa (Haworth, 1809)
  meridionalis (Staudinger, 1971)
  helvola (Linnaeus, 1758)
Leptologia L. B. Prout, 1901
  lota (Clerck, 1759)
  blidaensis (Stertz, 1915)
  macilenta (Hübner, 1809)
Haemachola Beck, 1991
  haematidea (Duponchel, 1827)
Sunira Franclemont, 1950
  circellaris (Hufnagel, 1766)

In our view some of these genera are not homogeneous, and in the long-term further genera are likely to be proposed to accommodate species such as *helvola* and *lota* which do not rest comfortably with their proposed congeners. There seems to be no good reason why the newly recognised genera should not be treated as subgenera. At this time, we shall retain all the species in *Agrochola*. If, at some time in the future, a wide consensus emerges demanding the adoption of these genera, then we will reconsider the problem. Retaining all the species in *Agrochola* has the considerable advantage of maintaining stability of the nomenclature, to the benefit of the great majority of lepidopterists. An added argument for this conservative approach is that changes at generic level are frequently reversed by another author a few years later. There are two such examples below (*Protodeltote pygarga* and *Callistege mi*).

Schmidt et al. (2018) return *Deltote pygarga* (Hufnagel, 1766) to genus *Protodeltote* Ueda, 1984

Sinev et al. (2017) synonymise *Holcopogon bubulcellus* (Staudinger, 1859) with *H. adseclella* (Eversmann, 1844).

Vargas-Rodríguez et al. (2020) place *Nyctobrya muralis* in genus *Bryopsis* Boursin, 1970.

Wang & Li (2020) raise Peleopodinae to family status (Peleopodidae), with *Carcina* the only Portuguese genus included. They also raise Ethmiinae to family status (Ethmiidae).

Zahiri et al. (2012) return *Euclidia mi* (Clerck, 1759) to genus *Callistege* Hübner, 1823.

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, *Metzneria neli* Huemer, 2021 replaces *Metzneria tristella* Rebel, 1901, which was previously misidentified, but the species retains the number 0608 in the checklist.

0133 *Ptilocephala colossa* (Bang-Haas, 1907) (*P. melanura* (Bourgogne, 1954)
Tineidae subfamily **Teichobiinae**
Teichobia Herrich-Schäffer, 1853
0205.1 *Teichobia filicivora* (Meyrick, 1937)
0215.1 *Bucculatrix cristatella* (Zeller, 1839)
Pseudoswammerdamia Friese, 1960
0313.1 *Pseudoswammerdamia combinella* (Hübner, 1786)
0373 *Holcopogon adseclella* (Eversmann, 1844) (*Holcopogon bubulcellus* (Staudinger, 1859))
[0480] ETHMIIDAE
[0488] PELEOPODIDAE (CARCINIDAE)
0497.1 *Cosmopterix coryphaea* Walsingham, 1907
0606 *Metzneria leae* Gastón & Huemer, 2022 (*M. subflavella auct. nec* Englert, 1974)
0608 *Metzneria neli* Huemer, 2021 (*M. tristella auct. nec* Rebel, 1901)
0643.1 *Aroga temporariella* Sattler, 1960
0674 *Tuta absoluta* (Meyrick, 1917) *(Phthorimaea absoluta* (Meyrick, 1917))
0722.2 *Elachista pullicomella* Zeller, 1839
0751.1 *Coleophora zernyi* Toll, 1944
0887.1 *Scythris pulicella* (Staudinger, 1859)
Longicornutia Razowski, 1960
1086 *Longicornutia epilinana* (Duponchel, 1842)
1125.1 *Ancylis unculana* (Haworth, 1811)
1302 *Colias croceus* (Geoffroy, 1785)
1469.1 *Merulempista turturella* (Zeller, 1848)
1751.1 *Idaea alicantaria* (Reisser, 1963)
Callistege Hübner, 1823
2202 *Callistege mi* (Clerck, 1759) (*Euclidia mi* (Clerck, 1759))
Protodeltote Ueda, 1984
2225 *Protodeltote pygarga* (Hufnagel, 1766) (*Deltote pygarga* (Hufnagel, 1766))
Bryopsis Boursin, 1970
2302 *Bryopsis muralis* (Forster, 1771) (*Nyctobrya muralis* (Forster, 1771))
2356.1 *Apamea furva* (Denis & Schiffermüller, 1775)
2396 *Conistra alicia* Lajonquière, 1939 (*C. haleae auct*. *nec* Fibiger & Top-Jensen, 2010)
[2419] *Fissipunctia* Beck, 1992.

Acknowledgements

We are most grateful to all those others who have contributed records and to Giorgio Baldizzone, Martin Honey and Alberto Zilli who identified or confirmed specimens and photos, to Mike Dale for dissections and identifications, and to Ernestino Maravalhas who kindly produced the map.

References

Aarvik, L., Bengtsson, B. Å., Elven, H., Ivinskis, P., Jürivete, U., Karsholt, O., Mutanen, M., & Savenkov, N. (2021). Additions and corrections to the Nordic-Baltic Checklist of Lepidoptera. *Norwegian Journal of Entomology*, *68*, 1-14.

Arscheid, W. R., & Weidlich, M. (2017). *Psychidae*. In O. Karsholt, M. Mutanen & M. Corley. (Eds.). *Microlepidoptera of Europe* (Vol. 8). Brill.

Brown, J. W., Aarvik, L., Heikkilä, M., Brown, R., & Mutanen, M. (2020). A molecular phylogeny of Cochylina, with confirmation of its relationship to Euliina (Lepidoptera: Tortricidae). *Systematic Entomology*, *45*, 160-174.

Corley, M. F. V. (2015). *Lepidoptera of Continental Portugal. A fully revised list*. pp. Martin Corley.

Corley, M. F. V., Nunes, J., Rosete, J., Terry, R., & Ferreira, S. (2020). New and interesting Portuguese Lepidoptera records from 2019 (Insecta: Lepidoptera). *SHILAP Revista de lepidopterología*, *48*(192), 609-641.

Corley, M. F. V., Nunes, J., & Rosete, J. (2021). New and interesting Portuguese Lepidoptera records from 2020. *SHILAP Revista de lepidopterología*, *49*(196), 609-625.

Corro Chang, P., & Metz, M. (2021). Classification of *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae: Gelechiinae: Gnorimoschemini) based on cladistic analysis of morphology. *Proceedings of the Entomological Society of Washington*, *123*(1), 41-54.

Gastón, J., & Huemer, P. (2022). *Metzneria leae* Gastón & Huemer sp. n., a new species from Spain (Lepidoptera: Gelechiidae). *SHILAP Revista de lepidopterología*, *50*(198), 321-329.

Huemer, P. (2021). *Metzneria neli* Huemer, sp. n., a new species hitherto mixed with *M. tristella* Rebel, 1901 (Lepidoptera: Gelechiidae). *SHILAP Revista de lepidopterología*, *49*(196), 647-655.

Huemer, P. (2022). Underestimated cryptic diversity in the *Caryocolum tricolorella* species complex (Lepidoptera, Gelechiidae). *Zookeys*, *1103*, 189-209.

Marabuto, E. (2018). Butterfly and moth diversity in Serpa (Baixo Alentejo, Portugal): an advance in a yet poorly surveyed region (Insecta: Lepidoptera). *SHILAP Revista de lepidopterología*, *46*(183), 371-410.

Nunes, J. (2021). New records of Lepidoptera for Valongo (Porto, Portugal). *Boletín de la Asociación española de Entomología*, *45*(3-4), 329-330; Supplementary Material to: New records of Lepidoptera for Valongo (Porto, Portugal), 1-22.

Nunes, J. (2022). Moth diversity of Mata de Vilar, Lousada, Portugal (Lepidoptera). *Boletín de la Sociedad Entomológica Aragonesa*, *70*, 367-372.

Nunes, J., Cardoso, H., Valadares, A., Banza, P., Tomás, J., & Valkenburg, T. (2022). *Portuguese Moth Recording Scheme*. GBIF Portugal. https://doi.org/10.15468/mbpxnd accessed via GBIF.org on 2022-12-01.

Ronkay, L., Ronkay, G., Gyulai, P., & Varga, Z. (2017). Xyleninae I. *The Witt Catalogue. A Taxonomic Atlas of the Eurasian and North African Noctuoidea, 9*, 1-342. Heterocera Press.

Schmidt, B. C., Lafontaine J. D., & Troubridge, J. T. (2018). Additions and corrections to the check list of the Noctuoidea (Insecta, Lepidoptera) of North America north of Mexico IV. *ZooKeys*, *788*, 241-252.

Sinev, S. Yu., Baryshnikova, S. V., Lvovsky, A. L., Anikin, V. V., & Zolotuhin, V. V. (2017). Volgo-Ural Microlepidoptera described by E. Eversmann. In V. V. Anikin, S. A. Sachkov, & V. V. Zolotuhin (Eds.) Fauna Lepidopterologica Volgo-Uralensis: from P. Pallas to present days. *Proceedings of the Museum Witt Munich*, *7*, 374-379.

Vargas-Rodríguez, S. M., Fibiger, M., Honey, M. R., Ronkay, G., Yela, J. L., Zilli, A., & Ronkay, L. (2020). *Bryophila perloides* Guenée, 1852 (Lepidoptera: Noctuidae: Bryophilinae), an overlooked member of the European Noctuidae fauna, with upgrading of *Bryopsis* Boursin, 1970 to generic level (Taxonomic studies on the western Palaearctic Bryophilinae, No. 1). *Zootaxa*, *4845*(1), 53-70.

Wang, Q.-Y., & Li, H.-H. (2020). Phylogeny of the superfamily Gelechioidea (Lepidoptera: Obtectomera), with an exploratory application on geometric morphometrics. *Zoologica Scripta*, *49*(3), 307-328.

Zahiri, R., Holloway, J. D., Kitching, I. J., Lafontaine, J. D., Mutanen, M., & Wahlberg, N. (2012). Molecular phylogenetics of Erebidae (Lepidoptera, Noctuoidea). *Systematic Entomology*, *37*, 102-124.

*Martin F. V. Corley
Pucketty Farm Cottage
Faringdon
GB-Oxfordshire SN7 8JP
GRAN BRETAÑA/ *GREAT BRITAIN*
E-mail: martin.corley@btinternet.com
https://orcid.org/0000-0003-4240-8007

y / *and*

CIBIO-InBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos
Universidade do Porto
Campus Agrário de Vairão
P-4485-661 Vairão
PORTUGAL / *PORTUGAL*

Helder Cardoso
Largo dos Camarnais Nº 3
P-2540-479 Pó
PORTUGAL / *PORTUGAL*
E-mail: cardosohrc@gmail.com
https://orcid.org/0000-0002-7013-6216

João Nunes
Rua Padre Miguel Paupério do Vale, 401
P-4440-687 Valongo
PORTUGAL / *PORTUGAL*
E-mail: joaomiguelfn@sapo.pt
https://orcid.org/0000-0002-9146-6089

Jorge Rosete
Urbanização Lourisol
Rua Manuel Cerqueira Nobrega, Lote 16, 2º frente
P-3105-165 Louriçal, Pombal
PORTUGAL / *PORTUGAL*
E-mail: roseteprof@gmail.com
https://orcid.org/0000-0002-5460-9255

Ana Valadares
Casa da Amendoeira
Sargaçal
P-8600-316 Lagos
PORTUGAL / *PORTUGAL*
E-mail: ana.valadares@gmail.com
https://orcid.org/0000-0001-6970-7301

Thijs Valkenburg
Sítio Pinheiros de Marim 247A
P-8700-225 Olhão
PORTUGAL / *PORTUGAL*
E-mail: thysvalkenburg@gmail.com
https://orcid.org/0000-0003-2525-6443

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 18-XI-2022)
(Revisado y aceptado / *Revised and accepted* 3-XII-2022)
(Publicado / *Published* 30-XII-2022)

Figures 1-8. 1. *Teichobia filicivora* (Meyrick, 1937), Sintra (B. van Dort). **2.** *Pseudoswammerdamia combinella* (Hübner, 1786), Pampilhosa de Botão (E. Jesus). **3.** *Cosmopterix coryphaea* Walsingham, 1907, Quinta de Marim, Olhão (T. Valkenburg). **4.** *Metzneria leae* Gastón & Huemer, Vale Santo, Vila do Bispo (J. Nunes). **5.** *Ancylis unculana* (Haworth, 1811), Meixedo (E. Jesus). **6.** *Merulempista turturella* (Zeller, 1848), Quinta de Marim, Olhão (T. Valkenburg). **7.** *Idaea alicantaria* (Reisser, 1963), Quinta de Marim, Olhão (T. Valkenburg). **8.** *Apamea furva* (Denis & Schiffermüller, 1775), Montesinho (A. Valadares).

CÓDIGO ÉTICO PARA LA REVISTA CIENTÍFICA ©*SHILAP Revista de lepidopterología*

SHILAP Revista de lepidopterología como revista de excelencia internacional se inspira en el código ético del Comité de Ética de Publicaciones (COPE), dirigido tanto a editores, como a revisores y autores.

Compromisos de los Autores

Originalidad y plagio: Los autores de los manuscritos enviados a *SHILAP Revista de lepidopterología* aseguran que el trabajo sometido es original y que los manuscritos mismos no contienen partes de otros autores, no contiene fragmentos ni otros trabajos escritos que fueron previamente publicados por los mismos autores. Además, los autores confirman la veracidad de los datos, esto es, que no se han alterado los datos empíricos para verificar hipótesis.

Publicaciones múltiples y/o repetitivas: El autor no debería publicar artículos en los que se repitan los mismos resultados en más de una revista científica. La propuesta simultánea de la misma contribución a múltiples revistas científicas es considerada éticamente incorrecta y reprobable.

Lista de fuentes: El autor debe proporcionar siempre la correcta indicación de las fuentes y los aportes mencionados en el artículo.

Autoría: En cuanto a la autoría del manuscrito, los autores garantizan que ésta es la inclusion de aquellas personas que han hecho una contribución científica e intelectual significativa en la conceptualización y la planificación del trabajo y también ha contribuido en la interpretación de los resultados y en la redacción actual del mismo. Al mismo tiempo, los autores se han jerarquizado de acuerdo a su nivel de responsabilidad e implicación.

Acceso y retención: Si el editor lo considera apropiado, los autores de los artículos deben poner a disposición también los datos en que se basa la investigación, que puede conservarse durante un período razonable de tiempo después de la publicación y posiblemente hacerse accesible.

Conflicto de intereses y financiación: Todos los autores están obligados a declarar explícitamente que no hay conflictos de intereses que puedan haber influido en los resultados obtenidos o las interpretaciones propuestas. Los autores también deben indicar cualquier financiación de agencias y/o de proyectos del artículo.

Errores en los artículos publicados: Cuando un autor identifica en su artículo un significante error o una inexactitud, deberá inmediatamente informar al editor de la revista y proporcionarle toda la información necesaria para listar las correcciones del artículo.

Responsabilidad: Todos los autores aceptan la responsabilidad de lo que se ha escrito. Los autores se comprometen también a que se ha realizado una revisión de la literatura científica más actual y relevante del tema analizado, teniendo presente de forma plural las diferentes corrientes del conocimiento.

Compromisos de los Revisores

Contribución a la decisión editorial: La revisión por pares es un procedimiento que ayuda al editor para tomar decisiones sobre los artículos propuestos y también permite al autor mejorar la contribución sometida para su publicación. Los revisores asumen el compromiso de llavar a cabo una revisión crítica, honesta, constructiva e imparcial, tanto de la calidad científica como literaria del trabajo basado en sus conocimientos y destreza individual.

Respeto del tiempo: El revisor que no se sienta competente en la temática a revisar o que no pueda terminar la evaluación en el tiempo programado notificará de inmediato al editor. Los revisores se comprometen a evaluar los trabajos en el menor tiempo posible para respetar los plazos de entrega, dado que la política de SHILAP Revista de lepidopterología es mantener los límites de custodia de los manuscritos y restringirlos por respeto a los autores y sus trabajos.

Confidencialidad: Cada manuscrito asignado debe ser considerado como confidencial. Por lo tanto, estos textos no se deben discutir con otras personas sin el consentimiento expreso del editor.

Objetividad: La revisión por pares se realizará de una manera objetiva. No se considera adecuado ningún juicio personal sobre los autores de las contribuciones. Los revisores están obligados a dar razones suficientes para sus valoraciones. Los revisores entregarán un completo y crítico informe con referencias adecuadas según el protocolo de revisiones de *SHILAP Revista de lepidopterología* y las normas públicas para los revisores; especialmente si se propone que el trabajo sea rechazado. Estarán obligados a advertir al editor, si partes sustanciales del trabajo ya han sido previamente publicadas o si están en revisión para otra publicación.

Visualización de texto: Los revisores se comprometen a indicar con precisión las referencias bibliográficas de obras fundamentales posiblemente olvidadas por el autor. El revisor también debe informar al editor de cualquier similitud o solapamientos del manuscrito con otros trabajos publicados conocidos por él.

Conflicto de intereses y divulgación: Información confidencial o información obtenida durante el proceso de revisión por pares debe considerarse confidencial y no puede utilizarse para propósitos personales. Los revisores no aceptarán leer un manuscrito, si existen conflictos de interés de una previa colaboración con el autor y/o su institución.

Compromisos del Editor

Decisión de publicación: El editor garantizará la selección de los revisores más cualificados y especialistas científicamente para emitir una apreciación crítica y experta del trabajo, con los menores sesgos posibles. *SHILAP Revista de lepidopterología* opta por seleccionar entre 2 y 3 revisores por cada trabajo de forma que se garantice una mayor objetividad en el proceso de revisión.

Honestidad: El editor evalúa los artículos enviados para su publicación sólo basándose en el mérito científico del contenido, sin discriminación de raza, género, orientación sexual, religión, origen étnico, nacionalidad u opinión política de los autores.

Confidencialidad: El editor y los miembros del grupo de trabajo se comprometen a no divulgar la información relativa a los artículos sometidos para su publicación a otras personas que no sean el autor, los revisores y el editor. El editor y el Consejo de Redacción Internacional se comprometen a mantener la confidencialidad de los manuscritos, sus autores y revisores, de forma que el anonimato preserve la integridad intelectual de todo el proceso.

Conflicto de intereses y divulgación: El editor se compromete a no usar en su investigación contenidos de los artículos enviados para su publicación sin el consentimiento por escrito del autor.

Respeto de los tiempos: El editor es responsable del cumplimiento de los límites de tiempo para las revisiones y la publicación de los trabajos aceptados, para asegurar una rápida difusión de sus resultados. Se compromete fehacientemente a cumplir los plazos divulgados (máximo de 30 días en la estimación/desestimación desde la recepción del manuscrito en la plataforma de revisión) y máximo 150 días desde el inicio del proceso de revisión científica por expertos. Asimismo, los manuscritos no permanecerán aceptados en listas de espera interminables sin publicar en el siguiente número posible. Se evitará en *SHILAP Revista de lepidopterología* tener una bolsa de trabajos en lista de espera.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 633-635 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.272

Metamicroptera christophi Przybyłowicz, 2005, a hitherto rarely recorded species new for Malawi (Lepidoptera: Erebidae, Arctiinae, Syntomini)

Łukasz Przybyłowicz

Abstract

The genus *Metamicroptera* Hulstaert, 1923 and *Metamicroptera christophi* Przybyłowicz, 2005 (Erebidae: Arctiinae) is recorded for the first time from Malawi. This new record provides a link between Tanzanian and Zimbabwean localities of the taxon suggesting that the species may be continuously distributed along the subequatorial grass savannah biome of Eastern Africa.

Keywords: Lepidoptera, Erebidae, Arctiinae, Syntomini, *Metamicroptera christophi*, new record, Malawi.

Metamicroptera christophi Przybyłowicz, 2005 una especie raramente registrada, nueva para Malawi (Lepidoptera: Erebidae, Arctiinae, Syntomini)

Resumen

El género *Metamicroptera* Hulstaert, 1923 y *Metamicroptera christophi* Przybyłowicz, 2005 se cita por la primera vez para Malawi. Este nuevo registro, proporciona un vínculo entre las localidades del taxón de Tanzania y Zimbabwe, lo que sugiere que la especie puede estar distribuida continuamente a lo largo del bioma de la sabana de pastos subecuatoriales de África oriental.

Palabras clave: Lepidoptera, Erebidae, Arctiinae, Syntomini, *Metamicroptera christophi*, nueva cita, Malawi.

Introduction

Metamicroptera christophi Przybyłowicz, 2005 (Erebidae: Arctiinae) is recorded for the first time from Malawi based on a single specimen housed in the Lepidoptera collection of the African Natural History Research Trust in Leominster (ANHRT, the UK).

The species was described by Przybyłowicz (2005) based on a short series of two males from Tanzania and Zambia. The type specimens are housed in the Natural History Museum, London (UK) and Transvaal Museum, Pretoria (RSA) respectively.

Since its description, this species had not been detected, neither in any Lepidoptera collection I visited nor among newly collected, fully scrutinized material. Only recently, a single specimen representing *M. christophi* was discovered in the collection of ANHRT among a long series of similar and much commoner specimens of *Metamicroptera rotundata* Hulstaert, 1923.

Details

The detailed data of the voucher specimen are as follows:

Metamicroptera christophi Przybyłowicz, 2005
Metamicroptera christophi Przybyłowicz, 2005. *Acta zool. cracov*., *48B*(1-2): 14

MALAWI, Nkhata Bay, Kolwe Forest reserve, 11º36’39”S, 34º14’60”E, 540 m, 1 ♂, 19-IV-2011, R. Yakovlev, leg./ex. coll. R. Yakovlev, ANHRT:2018.32/ANHRTUK 00147953.

The specimen perfectly matches the original description, providing no additional information on possible intraspecific variation in pattern and coloration.

The new locality is not only a new country record for this extremely rare species of arctiine but provides a distributional link between Tanzanian record located much further north and the Zambian one to the south-west (Figure 1). These new data favours the hypothesis that the range of *M. christophi* may be continuous along the subequatorial grass savannah biome of Eastern Africa.

The collecting month (April) indicates that the imago is on the wing at the end of the main rainy season, which in Malawi lasts from December until April (Mungai et al. 2016). However, the length of the entire flying season remains unknown.

Metamicroptera christophi (Figure 2A) may be confused with the similar *M. rotundata* (Figure 2B). It is, however, much smaller and shows a markedly reduced white pattern on the forewing (as far as can be judged only by external comparison between the species). The clearest and most discrete diagnostic character is a white colored frons which in *M. rotundata* is entirely black.

With now still only three known specimens, the life history details and ecological and habitat preferences of *M. christophi* remain completely unknown. The females of either *Metamicroptera* species are not described yet, although they are expected to be markedly larger and sexually dimorphic from the known males as it is common in other *“Balacra*-like” African Syntomini (Przybyłowicz, 2009).

Acknowledgments

I thank to Gyula M. László (ANHRT) who kindly took the photographs of depicted specimens and to David Lees (NHMUK) who corrected the text linguistically.

References

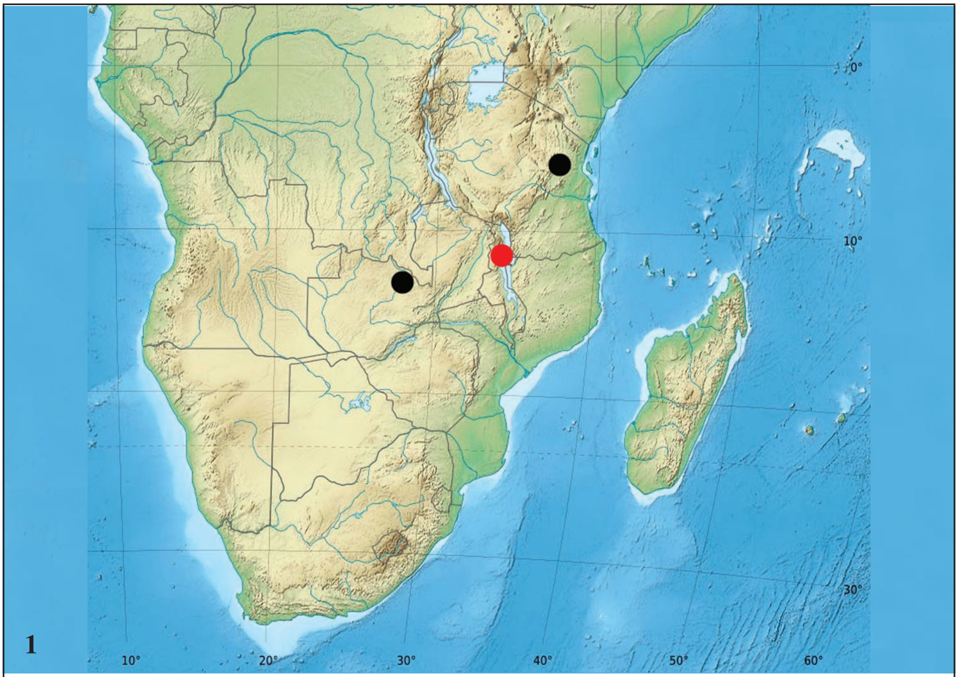
Mungai, L. M., Snapp, S., Messina, J. P., Chikowo, R., Smith, A., Anders, E., Richardson R. B., & Li, G. (2016). Smallholder Farms and the Potential for Sustainable Intensification. *Frontiers in Plant Science, 16*(7), https://doi.org/10.3389/fpls.2016.01720.

Przybyłowicz, Ł. (2005). A new Afrotropical species of *Metamicroptera* Hulstaert, 1923 with the first record of *M. rotundata* Hulst. from Zambia (Lepidoptera: Arctiidae). *Acta zoologica Cracoviensia, 48B*(1-2), 139-144.

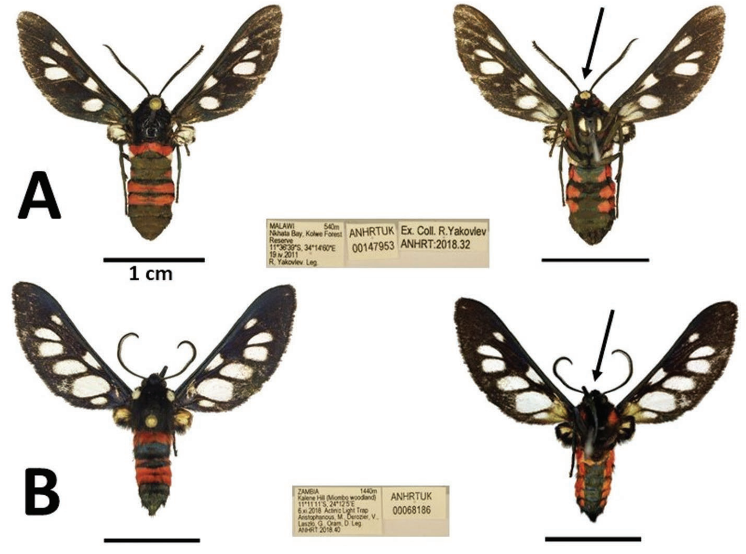
Przybyłowicz, Ł. (2009). Thyretini of Africa. An illustrated catalogue of the Thyretini (Lepidoptera: Arctiidae: Synthominae) of the Afrotropical Region. *Entomonograph, 16*, 1-170.

Łukasz Przybyłowicz
Institute of Systematics and Evolution of Animals
Polish Academy of Sciences
Sławkowska, 17
PL-31-016 Kraków
POLONIA / *POLAND*
E-mail: lukasz@isez.pan.krakow.pl
https://orcid.org/0000-0001-5456-9479

(Recibido para publicación / *Received for publication* 22-XII-2021)
(Revisado y aceptado / *Revised and accepted* 1-III-2022)
(Publicado / *Published* 30-XII-2022)



1



2

Figures 1-2. 1. Known localities of *Metamicroptera christophi* in East Africa. Red dot - new locality in Malawi, black dots - known localities in Zambia and Tanzania. **2.** *Metamicroptera* male habitus with respective labels, to the same scale. **A)** *M. christophi*; **B)** *M. rotundata.* Black arrows indicate the diagnostic and easily visible character - the coloration of frons, which is white in *M. christophi* and black in *M. rotundata*.

CODE OF ETHICS FOR THE SCIENTIFIC JOURNAL ©*SHILAP Revista de lepidopterología*

SHILAP Revista de lepidopterología as an international journal of excellence is inspired by the ethical code of publications prepared by the Committee on Publication Ethics (COPE) and aimed to editors, referees and authors.

DUTIES OF AUTHORS

Originality and plagiarism: The authors of the manuscripts sent to *SHILAP Revista de lepidopterología* guarantee that the submitted work is original and that the manuscripts themselves neither contain extracts from other authors, nor contain other fragments from written works that were previously published by the same authors. Furthermore, the authors confirm the veracity of the data, namely that the empirical data have not been altered to verify hypotheses.

Publications multiple and/or repetitive: The author should not publish articles that repeat the same search results in more than a scientific journal. The simultaneous proposal of the same contribution to multiple scientific journals is to be considered ethically improper and reprehensible.

List of sources: The author should always provide the correct indication of the sources and contributions mentioned in the article.

Authorship: In terms of the authorship of the work, the authors guarantee that there is the inclusion of those individuals who have made a scientifically significant and intellectual contribution to the conceptualization and planning of the work, and have also made a contribution to the interpretation of the results and the actual writing of the article. At the same time, the authors have been hierarchically organized in accordance to their level of responsibility and their respective roles.

Access and retention: If the editor deem it appropriate, the authors of the articles should make available also the data on which research is based, so that they can be kept for a reasonable period of time after the publication and possibly be made accessible.

Conflict of interest and funding: All the authors are required to declare explicitly that there are no conflicts of interest that may have influenced the results obtained or the interpretations proposed. The authors must also indicate any research funding agencies and/or the project from which arise the article.

Errors in published articles: When an author in his article identifies a significant error or inaccuracy, it shall promptly inform the journal editor and provide them with all the information required to list the relevant corrections of the article.

Responsibility: All the authors accept responsibility for what they have written. The authors pledge that they have revised the most up-to-date and relevant materials about the subject matter, thereby considering the dual nature of different currents of thought.

DUTIES OF REFEREES

Contribution to the editorial decision: The revision peer review is a procedure that help the editor to make decisions on the proposed articles and allows the author to improve the contribution submitted for publication. The referees are committed to performing a critical, honest, constructive, and unbiased review of both the scientific and the literary quality of the written work, based on their individual skills and knowledge.

Respect of time: The referee who does not feel adequate to the task proposed or who are not able to finish the evaluation of the proposed contribution in the scheduled time is required to promptly notify the editor. The referees are committed to evaluating the works in the minimum possible time to respect the stated deadlines, given that *SHILAP Revista de lepidopterología'*s policy for holding pending documents is limited and restricted for the purpose of respecting authors and their works.

Confidentiality: Each manuscrit assigned reading should be considered as confidential. Therefore, these texts should not be discussed with other people without the explicit permission of the editor.

Objectivity: The revision peer-review must be conducted in an objective manner. Any personal judgment about the authors of contributions is considered inappropriate. The referees are required to give adequate reasons for their judgments. The reviewers will submit a complete and critical report with adequate references according to *SHILAP Revista de lepidopterología'*s review protocol and the established public norms for referees, especially if it should be recommended that the work be rejected. They are obliged, to advise the editor whether substantial sections of the work have been previously published, or if they are being revised by another publication.

Text display: The referees undertake to accurately indicate the bibliographical references of fundamental works possibly neglected by the author. The referee must also report to the editor any similarities or overlaps between the text received and other works known to him.

Conflict of interest and disclosure: Confidential information or information obtained during the process of peer-review must be considered confidential and may not be used for personal purposes. The referee shall not accept in reading manuscrit for which there is a conflict of interest due to previous collaboration or competition with the author and/or his institution.

DUTIES OF THE EDITOR

Decisions on publication: The editor ensure the selection of the most qualified reviewers and scientifically specialists to issue an expert and critical appreciation of the manuscript, with the least possible level of bias. *SHILAP Revista de lepidopterología* opts to select between 2 and 3 referees for each manuscript to ensure a greater objectivity in the revision process.

Honesty: The editor evaluate the articles submitted for publication only based on the scientific merit of the content, without discrimination of race, gender, sexual orientation, religion, ethnicity, nationality or political opinion of the authors.

Confidentiality: The editor and members of the working group undertake not to disclose information relating to the articles submitted for publication to other persons other than the author, the referees and the editor. The editor and the International Editorial Boards are committed to maintaining the confidentiality of the manuscripts, their authors and their referees, in such a way that anonymity preserves the intellectual integrity of the whole process.

Conflict of interest and disclosure: The editor undertake not to use in their research content of articles submitted for publication without the written consent of the author.

Respect of time: The editor is responsible for compliance with the time limits for reviews and publication of accepted papers, to ensure rapid dissemination of its results. They reliably undertake to comply with the published deadlines (up to 30 days in accepting/rejecting from the receipt of the manuscript in the review platform) and maximum of 150 days from the beginning of the process of scientific review by experts. Also, manuscripts will not remain accepted in endless waiting lists without being published in possible following issue. This will prevent *SHILAP Revista de lepidopterología* from having a bank of manuscripts on a waiting list.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 637-641 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.273

A new species of the genus *Epischnia* Hübner, 1825 from Kazakhstan (Lepidoptera: Pyraloidea, Pyralidae, Phycitinae)

Eugene V. Tsvetkov

Abstract

Epischnia porphyrea Tsvetkov, sp. n. is described from Kyzylorda and Turkestan Provinces of Kazakhstan. The new species is related to *Epischnia albella* Amsel, 1954 and it is distinguished by the forewing pattern and by the male genitalia. The description is based on material collected by the author in Kazakhstan in 2019.

Keywords: Lepidoptera, Pyralidae, Phycitinae, *Epischnia*, new species, Kazakhstan.

Una nueva especie del género *Epischnia* Hübner, 1825 de Kazajistán (Lepidoptera: Pyraloidea, Pyralidae, Phycitinae)

Resumen

Se describe de las provincias de Kyzylorda y Turkestán de Kazajistán *Epischnia porphyrea* Tsvetkov, sp. n. La nueva especie está relacionada con *Epischnia albella* Amsel, 1954 y se distingue por el dibujo de las alas y por la genitalia del macho. La descripción está basada sobre el material colectado por el autor en Kazajistán en 2019.

Palabras clave: Lepidoptera, Pyralidae, Phycitinae, *Epischnia*, nueva especie, Kazajistán.

Introduction

The genus *Epischnia* Hübner, 1825 includes about 35 species distributed in the Palaearctic. The species occur mostly in the southern regions and their habitats are often dry steppes and semi-deserts. The fauna of the genus is richly represented in Western and Central Asia.

An unknown species of the subfamily Phycitinae was collected by the author in June 2019 in Kazakhstan. During the collecting and moving along the Syrdarya river from the Aral Sea to Turkestan Province, the species was regularly attracted to light in a number of localities. So, it seemed rather common and widely distributed in Kazakhstan semi-deserts. The species was preliminary determined as *Ancylosis* sp. due to its peculiar pattern of the forewing much resembling the typical pattern in the latter genus. But after examination of the genitalia it was referred to *Epischnia* and was compared with a few related *Epischnia* ssp. based on literature sources (Amsel, 1949, 1954, 1958, 1961; Caradja, 1916; Leraut, 2014; Ragonot, 1893; Ragonot & Hampson, 1901; Vives Moreno & Gastón, 2017). Also, two paratypes (a male and a female) of *Epischnia albella* Amsel, 1954 were examined in the collection of Zoological Institute in St Petersburg. Finally, the reviewing of some little known species of the genera *Ancylodes* Ragonot, 1887, *Ancylosis* Zeller, 1839 and *Myelois* Hübner, 1825 made possible the description of new *Epischnia* species.

Epischnia porphyrea Tsvetkov, sp. n. (Figures 1-7)

Type material: Holotype ♂, KAZAKHSTAN, Kyzylorda Province, 13 km NW vill. Shieli, 44º16'12"', 66º34'54"', 20-VI-2019, leg. E.V. Tsvetkov (ZIN). Paratypes (1 ♂, 8 ♀♀): the same data as for holotype, 1 ♂, 3 ♀♀; KAZAKHSTAN, Kyzylorda Province, 5 km W vill. Akbai, bank of the lake, 1 ♀, 19-VI-2019, leg. E. V. Tsvetkov (ZIN). Turkestan Province, bank of Lake Kyzylkol, 43º 45' 44", E 69º 27' 35", 2 ♀♀, 28-VI-2019, leg. E. Tsvetkov; Turkestan Province, 33 km NE vill. Sozak, sands, 44º 25' 14", E 68º 38' 58", 2 ♀♀, 26-VI-2019, leg. E. Tsvetkov; Type material is deposited in the collection of Zoological Institute, St Petersburg (ZISP).

Imago: Head (Figure 3). Frons convex. Chaetosemata present behind ocelli (whitish scales). Proboscis well developed. Labial palps about 1.5 diameters of eye. First segment short and narrow; second segment pointed up and ahead, 2.5 times as long as the first and 1.5-1.6 times broader; third segment pointed ahead, small, elongate ovoid, 2.1-2.2 times narrower and 3.1-3.2 times shorter than the second segment. Maxillary palps very small, reaching the edge of clypeus, segments drop-like. Antennae nearly 2/3 of the forewing. Scape about 1.5 times as long as wide, flattened. Flagellum flattened, narrowing; male flagellum broader than in females; base of male flagellum (1-7) slightly bent with tiny hitinous spine-like protrusions on flagellomeres 5-7; cilia very short in both sexes. Head and body light brown, covered with light brown, dark grey and whitish scales, sometimes with admixture of reddish scales.

Wings (Figures 1-2): Venation within the genus *Epischnia* Hulst, 1888; M_2 and M_3 veins of the hindwing rather short on a long common stalk. Forewing 7.5-8.5 mm, relatively broad, costal margin in distal 1/3 and termen bent. Sexual dimorphism is not expressed in appearance. Forewing pale brown, covered with mixture of white and reddish-brown scales or sometimes white, dark brown, and light reddish-brown scales; intensity of reddish tinge varies. Antemedial and postmedial dark brown or reddish-brown lines bold, as stripes with blurred edges; antemedial line slightly bent, postmedial oblique line straight. Discal spots absent. White costal streak reaches postmedial line, divided by antemedial line, partly dusted by reddish-brown scales. Area along termen dark brown. Space between Cu stalk and hind margin dusted with reddish scales in some specimens (Figure 1). Fringe brown (white tipped brown scales). Forewing underside partly dark brown, partly whitish in area between Cu stalk and hind margin; white costal streak of the same length as on the upperside. Hindwing whitish brown with darker marginal area, fringe whitish or whitish brown with brown basal stripe. Hindwing underside unicolourous brown.

Male genitalia (Figures 4-5): Uncus elongate triangular with sharply rounded apex. Anal tube well sclerotised, cylindrical. Gnathos flattened dorsoventrally, oblanceolate, heavily sclerotised; branches less sclerotised, very short and broad, abruptly broadening to their ends. Tegumen bears tiny side lobes. Transtilla components as weakly sclerotised semicircular plates. Valva elongate with rounded apex; costal arm with broad (1/4-1/3 of valva width) well sclerotised part reaching nearly 3/8 of costal edge of valva; clasper as small well sclerotised process broadened at its base; sacculus occupies nearly 1/2 of ventral edge of valva; cucullus covered by fine setae; very long hair-like setae on costal arm basally. Aedeagus conical, broadest proximally, flattened dorsoventrally; ductus ejaculatorius arises from proximal end (Figure 5). Vesica with three clusters of cornuti and finely granulated membranous wrapping in proximal part. Two clusters of cornuti small, each consisting of several tiny spine-like cornuti joined together. Another cluster larger, narrowing ribbon-like, occupies up to 4/9 of aedeagus length and consists of spine-like cornuti of different size. Anterior margin of eighth sternum arched and well sclerotised, posterior margin with large apically rounded median process; culcita present (Figure 6).

Female genitalia (Figure 7): Papillae anales elongate, weakly sclerotised, densely covered by setae. Posterior apophyses thin, not much longer than papillae anales and slightly shorter than anterior apophyses. Anterior apophyses broadened basally, more strong than posterior apophyses. Eighth tergum broad, posterior margin straight, anterior margin strongly convex. Antrum membranous; weakly sclerotised elongate plate is present on the dorsal wall. Ductus bursae membranous. Corpus bursae elongate membranous with a cluster of very small thorn-like signa of different size located anteriorly on the right side; two (sometimes merged) sclerotised plates in posterior part on ventral surface; irregularly curved plate with partly spiny surface inside corpus bursae at junction with ductus bursae. Ductus seminalis arises from protrusion of corpus bursae on the right side.

Diagnosis: The new species is well distinguished from the other congeners by its peculiar forewing pattern: the presence of two transverse lines is characteristic for *E. porphyrea*. *Epischnia albella* is similar in the genitalia with no visible differences in females. In males of *E. albella*, the vinculum is relatively narrower and longer, it is much narrower distally with almost straight side edges; the clusters of cornuti are larger in the vesica. In males of *E. porphyrea,* the vinculum is relatively broader and shorter, it is much broader distally and is significantly narrowed in the middle; side edges of the vinculum are sinuate and the clusters of cornuti are smaller in the vesica. Two species from Central Asia, *Epischnia nervosella* Ragonot, 1887 and *Epischnia maracandella* Ragonot, 1887, are quite different in habitus from the described species.

Several *Epischnia* species, *E. albella*, *Epischnia arabica* Amsel, 1949, *Epischnia parvella* Amsel, 1954, *Epischnia hofufella* Amsel, 1958 and *Epischnia unicornutella* Amsel, 1961 show the morphology of the male genitalia similar to morphology in *E. porphyrea*. Males of these species and males of the new species also have the same structure of the culcita with very small differences from each other. They, as a rule, differ in the shape of the vinculum, the clasper (also in its location), the juxta and the sclerite structure in the vesica. The mentioned species are known, except for *E. albella*, only from the southern areas of Western Asia.

Etymology: The name of the species is derived from the Ancient Greek adjective *πορφύριος* (=*porphýreos*). It is associated with the forewing colouration.

Biology: In Kazakhstan *E. pophyrea* inhabits various sand steppes and semi-deserts at low altitudes. No material was collected in mountain areas.

References

Amsel, H. G. (1949). On the Microlepidoptera collected by E. P. Wiltshire in Irak and Iran in the years 1935 to 1938. *Bulletin de la Société Fouad Ier d'Entomologie, 33*, 271-351, pls 1-12.

Amsel, H. G. (1954). Die Microlepidopteren der Brandt'schen Iran-Ausbeute. 4. Teil. *Arkiv för Zoologi, 6*(16), 255-326, pls 1-33.

Amsel, H. G. (1958). Kleinschmetterlinge aus Nordost-Arabien der Ausbeute A. S. Talhouk. *Beiträge zur Naturkundlichen Forschung in Südwestdeutschland, 17*(1), 61-82, pl. 5.

Amsel, H. G. (1961). Die Microlepidopteren der Brandt'schen Iran-Ausbeute. 5. Teil. *Arkiv för Zoologi, 13*(17), 323-445, pls. 1-9.

Caradja, A. (1916). Beitrag zur Kenntnis der geographischen Verbreitung der Pyraliden und Tortriciden des europäischen Faunengebietes, nebst Beschreibung neuer Formen. *Deutsche entomologische Zeitschrift Iris, 30*(1), 1-88.

Leraut, P. (2014). *Moths of Europe. Pyralids 2* (Vol. 4). N. A. P. Editions.

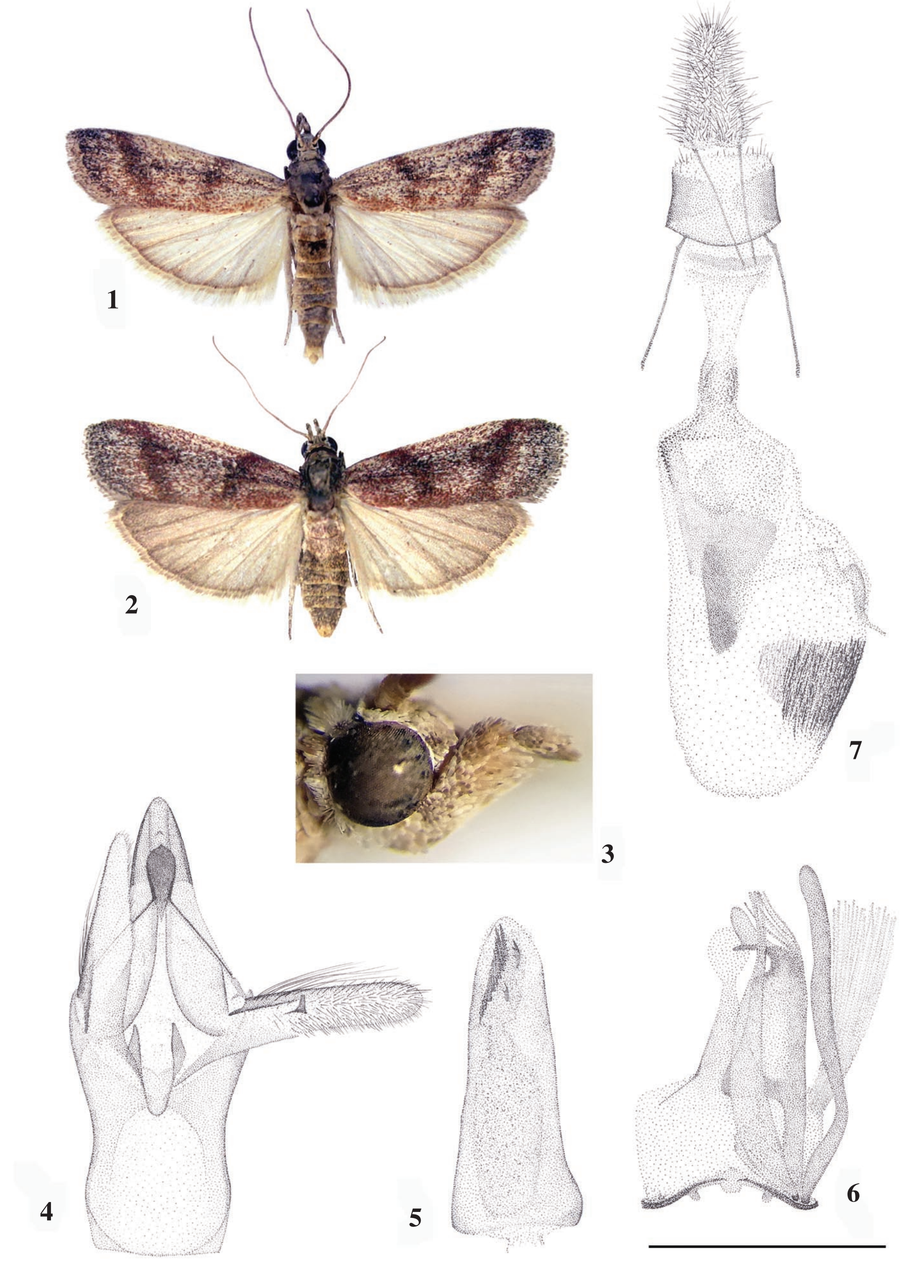
Ragonot, E. L. (1893). Monographie des Phycitinae et des Galleriinae. In N. M. Romanoff. *Mémoires sur les lépidoptères* (Vol. 7). St. Pétersbourg.

Ragonot, E. L., & Hampson, G. F. (1901). Monographie des Phycitinae et des Galleriinae. In N. M. Romanoff. *Mémoires sur les lépidoptères* (Vol. 8). St. Pétersbourg.

Vives Moreno, A., & Gastón, F. J. (2017). Contribución al conocimiento de los Microlepidoptera de España, con la descripción de una especie nueva (Insecta: Lepidoptera). *SHILAP Revista de lepidopterología, 45*(178), 317-342.

Eugene V. Tsvetkov
Mechnikova, 3-1-30
RUS-195271 St. Petersburg
RUSIA / *RUSSIA*
E-mail: tsvcountcal@rambler.ru
https://orcid.org/0000-0003-0614-9810

(Recibido para publicación / *Received for publication* 25-XII-2021)
(Revisado y aceptado / *Revised and accepted* 7-III-2022)
(Publicado / *Published* 30-XII-2022)



Figures 1-7. 1. *Epischnia porphyrea* Tsvetkov, sp. n., holotype. **2.** Idem, paratype (female). **3.** Idem, head laterally (male). **4-7.** Idem, genitalia (scale 1 mm). **4.** male genitalia (aedeagus extracted). **5.** aedeagus. **6.** eighth sternum (male, left part of culcita removed). **7.** female genitalia.

Normas para los autores que deseen publicar en ©*SHILAP Revista de lepidopterología*

1. *SHILAP Revista de lepidopterología* es una revista internacional publicada desde 1973 por la Sociedad Hispano-Luso-Americana de Lepidopterología y utiliza el identificador digital persistente de ORCID® como una manera de asegurar la normalización de la autoría correcta. Incluye artículos de investigación empírica y teórica en todas las áreas de la Lepidopterología (sistemática, taxonomía, filogenia, morfología, bionomía, ecología, faunística y zoogeografía, también trabajos bibliográficos o sobre la historia de la Lepidopterología, así como revisiones de libros sobre estos temas) procedentes de todas las regiones del mundo, con especial interés en los estudios que de una u otra manera tengan relevancia en la biología de la conservación. Cada volumen consta de cuatro fascículos anuales (un volumen por año) en marzo, junio, septiembre y diciembre.
2. Se permite emplear como idiomas el español, inglés, francés, alemán, italiano y portugués, lenguas oficiales de la revista.
3. El manuscrito versa sobre **investigaciones originales** no publicadas anteriormente y que se somete en exclusiva a *SHILAP Revista de lepidopterología*, de no ser así deberá comunicarlo urgentemente. El manuscrito se enviará preferentemente en formato electrónico y se prefiere el archivo en Word, WordPerfect o Formato de Texto Enriquecido (RTF).
4. El Director representa la opinión del Consejo de Redacción y hará saber a los autores su fallo sobre la aceptación o no de sus trabajos. Todos los manuscritos serán revisados por el Director y al menos dos revisores independientes en orden de garantizar la calidad de los trabajos. El proceso de revisión es rápido. Basándose en su informe, el Director decide si un manuscrito será aceptado para su publicación. La publicación de los trabajos aceptados se realiza con la mayor rapidez posible, normalmente dentro de los 12 meses siguientes a la recepción de éstos. Una vez aceptado, el trabajo pasará a ser propiedad de la revista, ésta se reserva los derechos de autor y ninguna parte del trabajo podrá ser reproducida sin citar su procedencia.
5. Todos los artículos deberán llevar un resumen de su contenido en español e inglés (Abstract) y, de ser necesario, otro en cualquiera de los idiomas oficiales de la revista. Para autores que no conocen el español, la traducción del Abstract del inglés al español se realizará por el Director, si el trabajo es aceptado. El resumen será conciso (250 palabras máximo) y condensará las conclusiones del trabajo, no incluirá puntos y aparte. Cada uno de los resúmenes deberá ir seguido de un máximo de 10 palabras clave (Keywords) en el mismo idioma, separadas por comas. El resumen en idioma diferente al del texto, deberá ir precedido de una traducción del título en inglés.
6. El orden de presentación de los trabajos será: título, autor, resúmenes, texto y referencias bibliográficas. En caso de duda, por favor consulten números anteriores de la revista. **Los trabajos que no se ajusten a estas normas o que tengan más de un 20% de plagio, serán devueltos a los autores.**
7. **DE LOS AUTORES:** Presentarán su nombre completo, dirección de contacto, correo electrónico e incluirán en su firma sus identificadores ID ORCID®. Se aconseja a los autores de expresión española que usen los dos apellidos, que los unan mediante un guion.
8. **DEL TEXTO:** Se recomienda no utilizar las llamadas infrapaginales. Las fechas se escribirán como sigue: 15-VII-1985 (o sea, días y años en números arábigos y meses en romanos). Las citas de los autores de la bibliografía en el texto se darán con la fecha: Linnaeus (1758), (Linnaeus, 1758) o si se quieren indicar las páginas, éstas se pospondrán al año separándolas con una coma y la palabra "p." (Linnaeus, 1758, p. 65); si hubiese tres a más autores se indicará el primero y, a continuación, et al. Si son autores distintos, se ordenan alfabéticamente separados por punto y coma (Herrich-Schäffer, 1857; Linnaeus, 1758). Las citas del material capturado deberán hacerse del siguiente modo: País (cuando necesario), provincia, localidad, altitud, sexo de los especímenes, fecha y colector. El símbolo de macho y hembra tiene que ser codificado como (&&) y (&) respectivamente con paréntesis. Los caracteres diacríticos normalmente no incluidos en las fuentes europeas del oeste (por ejemplo: lenguas eslavas, rumano, polaco, turco, etc.) deberán también codificarse; los códigos usados se presentarán en hoja aparte, con una versión impresa del manuscrito.
9. **DE LAS ESPECIES Y OTRAS CATEGORÍAS TAXONÓMICAS:** Todos los nombres de taxones mencionados en el texto, tanto de los ya establecidos como de los nuevos que se describan, deberán ajustarse a las recientes normas del *Código Internacional de Nomenclatura Zoológica*. Los nombres latinos de géneros y especies deben de ir en cursiva. Las abreviaturas **gen. nov.**, **sp. nov.**, **syn. nov.**, **comb. nov.**, o similar, deberán de usarse explícitamente para todas las innovaciones taxonómicas. En la descripción de un nuevo género, la especie tipo nominal, debe de ser designada en la combinación original y con referencia a la descripción original e inmediatamente después del nuevo nombre. Si en el artículo se describen nuevos taxones, es imprescindible que los **tipos estén depositados en alguna institución científica**. Todos los taxones se mencionarán seguidos de su descriptor (con el nombre completo) y la fecha de descripción por lo menos una vez. Las abreviaturas de los autores que son reconocidas internacionalmente pueden utilizarse: L. (Linnaeus); H.-S. (Herrich-Schäffer); Stgr. (Staudinger), etc.
10. **DE LAS ILUSTRACIONES:** Los dibujos serán realizados en tinta china o impresión digital DIN A4. Podrán presentarse fotografías que tengan un alto contraste, compatibles con Adobe Photoshop y en cualquier formato de imágenes como TIFF o JPEG. El coste de las publicaciones en color podría ser cargado a los autores, si así lo considera el Director.
11. **DE LAS REFERENCIAS Y CITAS:** Todos los trabajos irán acompañados de una referencia bibliografía que incluirá únicamente las publicaciones citadas en el texto. Las referencias se adaptarán a las **Normas APA 7ma Edición**, con el siguiente formato:

    Artículos en revista:

    Apellido, A., Apellido, B., & Apellido, C. (2019). Título del artículo específico. *Título de la Revista, Volumen*(número de la revista), número de página inicio-número de página fin.

    Si un artículo de revista tiene DOI o URL, se incluirá al final de la referencia:

    Efetov, K. A., Knyazev, S. A., & Kucherenko, E. E. (2022). The first record of *Jordanita* (*Solaniterna*) *subsolana* (Staudinger, 1862) from Kazakhstan (Lepidoptera: Zygaenidae, Procridinae). *SHILAP Revista de lepidopterología, 50*(198), 233-239. https://shilap.org/revista/article/view/68

    Artículo en volumen colectivo:

    Rebel, H. (1901). Famil. Pyralidae-Micropterygidae. 2 Theil.- In O. Staudinger & H. Rebel. *Catalog der Lepidopteren des palaeartischen Faunengebietes* (pp. 1-265). R. Friedlander & Sohn.

    Libro:

    Vives Moreno, A. (2014). *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)*. Improitalia.

    Internet:

    De Prins, J., & De Prins, W. (2011). *Global taxonomic database of Gracillariidae (Lepidoptera).* http://www.gracillariidae.net

    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.

    Las citas se harán con los nombres de los autores la primera en mayúsculas y el resto en minúsculas, de la siguiente forma: (Linnaeus, 1758), Linnaeus (1758) o Linnaeus (1758, p. 65), utilizando esta última para citar una página concreta. Cuando los autores sean dos, sus nombres se separarán por & (De Prins & De Prins, 2008). Se utilizará el nombre del primero seguido de et al., cuando los autores sean tres o más (Efetov et al. 2022). Cuando se hagan referencias a más de una obra de un mismo autor, publicadas en el mismo año, se diferenciarán en el texto y en la lista bibliográfica mediante una letra minúscula, según se indica: Efetov (1997a, b).
12. **DE LAS TABLAS:** Llevarán su propia numeración correlativa, en hojas independientes sin paginar y de ser necesario podrán llevar una nota explicativa.
13. **DE LAS NOTAS Y RESEÑAS BIBLIOGRÁFICAS:** De extensión no superior a dos páginas y deben seguir las mismas normas que los artículos.
14. **DE LAS PRUEBAS DE IMPRENTA:** Los autores recibirán pruebas en un PDF para corregir cuidadosamente los errores de imprenta. Las pruebas deberán ser devueltas dentro del plazo de 15 días a partir de la fecha de recepción. Transcurrido este tiempo, el Director decidirá entre retrasar su publicación o realizar las correcciones, declinando toda responsabilidad sobre la persistencia de posibles errores. El Director se reserva el derecho a realizar las modificaciones oportunas para mantener la uniformidad de la revista.
15. **DE LAS SEPARATAS:** Los autores recibirán un **PDF gratis de su trabajo**. Si necesita separatas adicionales de su trabajo en soporte papel, debería de comunicárselo con antelación al Secretario General y el gasto correrá a cargo del autor/s. Se permite el autoarchivo de los artículos en el momento de su publicación en la versión impresa.
16. **DE LA CORRESPONDENCIA:** Sólo se mantendrá correspondencia con el primer autor firmante, si el autor corresponsal no fuese éste, deberá indicarse por escrito al Secretario General.
17. **DE LOS TRABAJOS:** Se remitirán a:

SHILAP
Apartado de Correos, 331
E-28080 Madrid
ESPAÑA
E-mail: avives1954@outlook.es / avives1954@gmail.com / avives1954@outlook.com

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 643-652 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.274

New distributional record of Heterocera from Andaman and Nicobar Islands with six new additions to Indian Lepidoptera Fauna (Insecta: Lepidoptera)

B. Sumit Kumar Rao & Chandrakasan Sivaperuman

Abstract

This paper reports six species of Heterocera belonging to family Geometridae, Notodontidae, Euteliidae, and Noctuidae viz. *Probithia imprimata* (Walker, 1861), *Ruttellerona pseudocessaria* Holloway, 1994, *Amraica solivagaria* (Walker, 1866), *Phalera sundana* Holloway, 1982, *Paectes psaliphora* Hampson, 1912 and *Iambia lyricalis* Holloway, 1989. The species stated above have been collected from different islands of Andaman and Nicobar archipelago. Furthermore, the study reveals new contributions to India's Lepidoptera fauna. Microphotographs of Adult genitalia along with species diagnosis, habitat, and the new distributional data from these islands are provided.

Keywords: Insecta, Lepidoptera, biodiversity, distribution, new record, rare records, Andaman and Nicobar Islands, India.

Nuevo registro de distribución de Heterocera en las islas Andamán y Nicobar, con seis nuevas incorporaciones a la fauna de Lepidoptera de la India (Insecta: Lepidoptera)

Resumen

En este artículo se describen seis especies de Heterocera pertenecientes a la familia Geometridae, Notodontidae, Euteliidae y Noctuidae, a saber: *Probithia imprimata* (Walker, 1861), *Ruttellerona pseudocessaria* Holloway, 1994, *Amraica solivagaria* (Walker, 1866), *Phalera sundana* Holloway, 1982, *Paectes psaliphora* Hampson, 1912 e *Iambia lyricalis* Holloway, 1989. Las especies mencionadas, han sido recolectadas en diferentes islas del archipiélago de Andaman y Nicobar. Además, el estudio revela nuevas contribuciones a la fauna de Lepidoptera de la India. Se proporcionan microfotografías de la genitalia de los adultos junto con el diagnóstico de la especie, el hábitat y los nuevos datos de distribución de estas islas.

Palabras clave: Insecta, Lepidoptera, biodiversidad, distribución, nuevo registro, registros raros, Islas Andamán y Nicobar, India.

Introduction

The Andaman and Nicobar Archipelago consist of around 572 Oceanic Islands extending from 6º to 14º North latitudes and from 92º to 94º East longitudes and is situated in the Bay of Bengal. The northernmost Island (North Andaman) lies 285 km southwest from the mainland of Myanmar and the southernmost point, Great Nicobar lies 189 km northwest of the Sumatra coast (Ganeshaiah et al.

2019). The Andaman and Nicobar Islands are among the major biodiversity eco-regions (Indo-Burma and Sundaland hotspot) in the world (Wikramanayake et al. 2002; Krupnick & Kress,, 2003). The insular nature, unique geographical setup, and physical isolation between Islands have contributed to the evolution of rich biological diversity in the region (Nayar, 1996). Like other archipelago, these tropical islands are characterized by high endemicity and species diversity (Prasad et al. 2007). These islands are home to a diverse insect species. The islands' long isolation from the mainland India, as well as their pristine environment, create ideal conditions for the evolution of many locally evolved species. The Andaman and Nicobar Islands' proximity to different subregions of the oriental region has resulted in biota with Indo-Burmese and Indo-Malayan affinities, respectively (Mohanraj & Veenakumari, 2011).

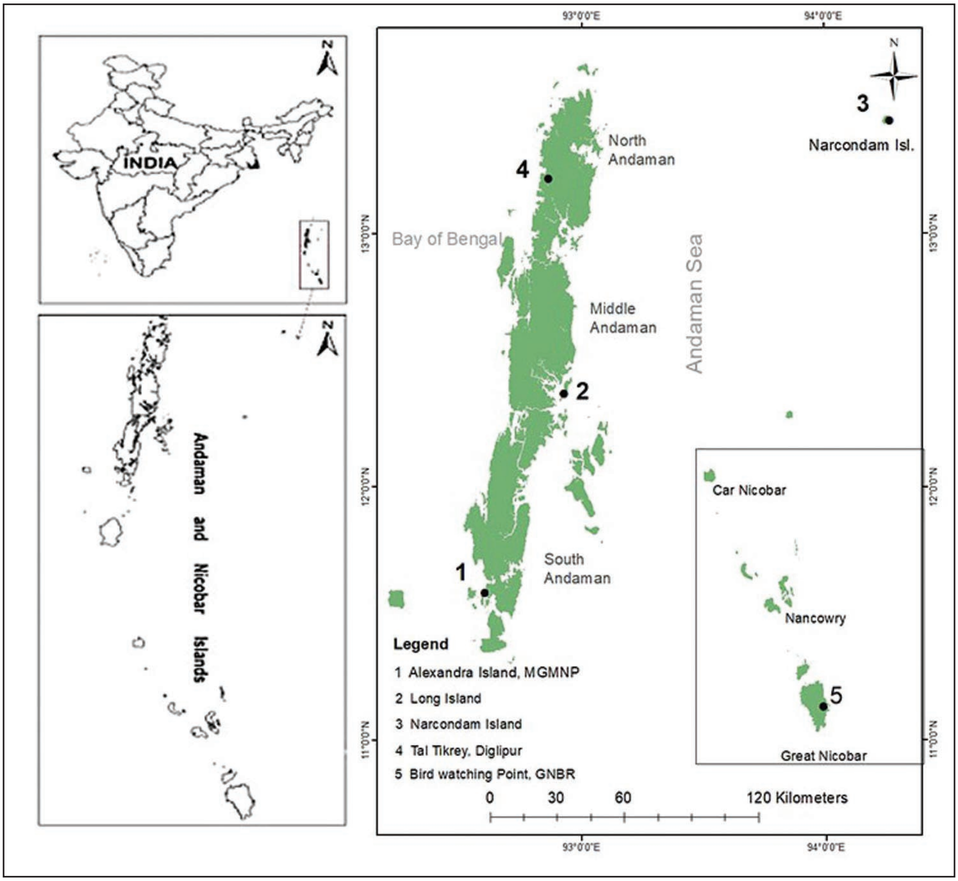


Figure 1. Map showing the Surveyed points in Andaman and Nicobar Islands.

Material and Method

The specimens included in the present study were collected from different Islands of Andaman and Nicobar archipelago (Figure 1) using traditional mercury vapor light traps. Adults were killed using

Ethyl acetate vapours and preserved further by standardized methods of Robinson et al. (1994). Dissections of the respective specimens (abdomen) were carried out to study Male and female genitalia, following the methodology of hashank & Benedek (2020) with little modification. After dissection and cleaning, genitalia were stained with Basic fuchsin for ten seconds. Photographs were acquired, using Leica M205FA Stereo zoom microscope and further processed in grey scale mode of Adobe Photoshop version CS6. All the materials examined in this study are deposited in the National Zoological Collection of Zoological Survey of India - Andaman and Nicobar Regional Centre.

Taxonomic Account

Family Geometridae Leach, 1815

Probithia Warren, 1894. *Novit. Zool.*, *1*, 440
Type species: Type Species. *Hemerophila exclusa* Walker, 1860.
Type Locality: Hindostan (INDIA).

Probithia imprimata (Walker, 1861) (Figures 2, 8)
Acidalia imprimata Walker, 1861. *List Spec. Lepid. Insects Colln Br. Mus.*, *23*, 771
Type Locality: SARAWAK.

Material examined: INDIA, Andaman and Nicobar Islands, Alexandra Island, Mahatma Gandhi Marine National Park, 11.584N, 92.601E, 8 m, 1 ♂, 19-VII-2019, Coll. B. Sumit Kumar Rao, Reg. No. ZSI/ANRC/T/13481; Andaman and Nicobar Islands, Long Island, 11.584N, 92.601E, 50 m, 1 ♂, 5-VIII-2019, Coll. B. Sumit Kumar Rao, Reg. No. ZSI/ANRC/T/13737.

Diagnosis: *Probithia imprimata* (Walker, 1861) appears similar to *P. exclusa* (Walker, 1860), but differs externally without a strong dark brown irregular band distal to the postmedial over the dorsal half of the hindwings as in *P. exclusa* and ventrally by more prominent medial and terminal markings in Fore and hindwings. Male genitalia of both species show few similarities, but *P. imprimata* differ by less setation on the lobe of the dorsal arm and comparatively long and narrow saccus. Whereas, in *P. exclusa* have dense setae on the dorsal lobe and short and stout Saccus.

Distribution: Borneo, Peninsular Malaysia, Sumatra (Holloway, 1993), India - Andaman and Nicobar Islands (Present study).

Remarks: The genus *Probithia* Warren, 1894 is represented by only six species throughout world (Parsons et al. 1999). Out of which only *P. exclusa* (Walker, 1860) is reported from India from North Himalayas and from Andaman and Nicobar. *P. imprimata* was found considerably rare in insular habitat. Both individuals were collected from under story foliage of lowland primary forest during Monsoon season. New record for India.

Ruttellerona Warren, 1894
Ruttellerona Warren, 1894. *Trans. R. Ent. Soc. Lond.*, *1894,* 220
Type Species: *Boarmia cessaria* Walker, 1860 by subsequent designation by Prout, 1928.
Type Locality: CEYLON (Sri Lanka).

Ruttellerona pseudocessaria Holloway, 1994. (Figures 3, 9)
Ruttellerona pseudocessaria Holloway, 1994. *Malay. Nat. J., 47*, 224
Type Locality: SARAWAK.

Material examined: INDIA, Andaman and Nicobar Islands, Narcondam Island, 13.454N, 94.271E, 25 m, 3 ♂♂, 14-V-2020, Coll. G. Gokulakrishnan, Reg. No. ZSI/ANRC/T/13739, 13740,13741; Andaman and Nicobar Islands, Narcondam Island, 13.454N, 94.271E, 25 m, 5 ♂♂, 16-XI-2020, Coll. Dr. Naveen Kumar Nigam and Apurba Kumar Das, Reg. No. ZSI/ANRC/T/13907, 13908, 13909; 13910, 13911.

Diagnosis: *Ruttellerona pseudocessaria* Holloway, 1994 is closely similar to *R. pallicostaria* externally but, the males differ by latter by comparatively more fasciated appearance and less irrorated fore wings and hindwing postmedial. *R. pseudocessaria* shows a significant difference in the male genitalia from its Indian Congeners in uncus with lateral horns; costal end projection of the transverse sclerotized band on the valve and a broadly and obliquely spined lobe at the saccular end (Holloway, 1994).

Distribution: Oriental tropics east to Seram (Holloway, 1993), Sri Lanka, Taiwan (India - Andaman and Nicobar Islands (Present study).

Remarks: The genus *Ruttellerona* Swinhoe, 1894 is presently known by only eleven species and two subspecies in this globe (Parsons et al. 1999). Kirti et al. (2019) listed only two species of this genus from India, namely *Ruttellerona cessaria* (Walker, 1890) and *R. pallicostaria* (Moore, 1868) in their consolidated checklist of Indian Geometridae. This species is fairly common in the lowland Semi-evergreen forest of Narcondam Island and adults were observed from May-November, with higher abundance in post monsoon. **New Record to India**.

Amraica Moore, 1888
Amraica Moore, 1888, In Hewitson & Moore. *Descr. New Ind. Lep. Coll. Atkinson,* (3), 245
Type Species: *Amraica fortissima* Moore, 1888.
Type Locality: Darjeeling, INDIA.

Amraica solivagaria (Walker, 1866) (Figures 4, 10)
Boarmia solivagaria Walker, 1866. *List Specimens Lepid. Insects Colln. Br. Mus.*, *35*, 1586
Type Locality: JAVA.

Material examined: INDIA, Andaman and Nicobar Islands, Narcondam Island, 13.454N, 94.271E, 25 m, 1 ♂, 22-XI-2020, Coll. Dr. Naveen Kumar Nigam and Apurba Kumar Das, Reg. No. ZSI/ANRC/T/13918.

Diagnosis: *Amraica solivagaria* (Walker, 1866) is different from its other two Indian congeners in the male genitalia by having asymmetrical saccular processes.

Distribution: China (Yunnan), Thailand, Philippines, Malaysia, Brunei, Indonesia (Jiang et al. 2012), India - Andaman and Nicobar Islands (Present study)

Remarks: Only two species of the genus *Amraica* were previously reported from India, namely *Amraica ferrolavata* (Walker, 1863) and *Amraica recursaria* (Walker, 1860) (Kirti et al. 2019). *Amraica solivagaria* (Walker, 1866) is a **new record for India**.

Family Notodontidae Stephens, 1829

Phalera Hübner, [1819]
Phalera Hübner, [1819] 1816. *Verz. bek. Schmett.* (10), 147
Type Species: *Phalaena Noctua bucephala* Linnaeus, 1758
Phalera sundana Holloway, 1982 (Figures 5, 13)
Phalera sundana Holloway, 1982. In Barlow. 1982. *An Introduction to the Moths of South East Asia*: 201
Type Locality: MALAYSIA.

Material examined: INDIA, Andaman and Nicobar Islands, Tal Tikrey, Diglipur, 13.219N, 94.860E, 59 m, 10-III-2019, Coll. B. Sumit Kumar Rao, 1 ♀, Reg. No. ZSI/ANRC/T/7838.

Diagnosis: *Phalera sundana* Holloway, 1982 appears similar to *P. grotei* Moore, 1859 but can be distinguished externally by broader forewings which are less apically produced, the paler grey patch at the tornus with two black dots each.

Distribution: Malaya, Sumatra, Java, Bali, Borneo, Mindanao (Holloway, 1982), India - Andaman and Nicobar Islands (Present study).

Remarks: Chandra et al. (2018) listed a total of ten species under the genus *Phalera* in their catalogue of Indian Notodontidae. A single specimen of *P. sundana* was collected during the summer season from secondary forest edge. **New Record to India**.

Family Euteliidae Grote, 1882

Paectes Hübner, 1818
Paectes Hübner, 1818. *Zutr. Samml. Exot. Schmett.*, *1*, 21
Type Species. *Paectes pygmaea* Hübner, 1818.
Type Locality: aus Georgien in Florida, USA.

Paectes psaliphora Hampson, 1912 (Figures 6, 11, 14)
Paectes psaliphora Hampson, 1912. *Cat. Lepid. Phalaenae Br. Mus.*, *11*, 110
Type Locality: PAPUA NEW GUINEA.

Material examined: INDIA, Andaman and Nicobar Islands, Narcondam Island, 13.454 N, 94.271E, 25 m, 1 ♀, 16-XI-2020, Coll. Dr. Naveen Kumar Nigam and Apurba Kumar Das, Reg. No. ZSI/ANRC/T/13730; Andaman and Nicobar Islands, Narcondam Island, 13.454N, 94.271E, 25 m, 1 ♂, 16-XI-2020, Coll. Dr. Naveen Kumar Nigam and Apurba Kumar Das, Reg. No. ZSI/ANRC/T/13731; Andaman and Nicobar Islands, Narcondam Island, 13.454N, 94.271E, 25 m, 1 ♂, 9-XI-2020, Coll. Dr. Naveen Kumar Nigam and Apurba Kumar Das, Reg. No. ZSI/ANRC/T/13732.

Diagnosis: *P. psaliphora is* similar to P. *cristatrix* (Guenée, 1852) and *P. kebeae* (Bethune-Baker, 1906) in external morphology but differs with former by having more darker dorsum and slightly convex basal pale mark, rather than concave, directed at the dorsum as in *P. cicatrix*. *P. psaliphora* differs with latter by sub-basal streak, which is not broadly connected to the median curved line, as in P. *kebeae*.

Distribution: Sundaland, Sulawesi, New Guinea to Solomons (Holloway, 1985), India - Andaman and Nicobar Islands (Present study).

Remarks: Only three species of the genus *Paectes* are represented from India, viz. *Paectes subapicalis* (Walker, [1858] 1857) from North India, *Paectes taminata* (Warren, 1914) from Assam, *Paectes cristatrix* (Guenée, 1852) from Western Ghats. Holloway (1985) provided detailed geography of the *Paectes* complex and provided a possible explanation with reference to the evolution of this group. Four Representatives of *Paectes psaliphora* Hampson, 1912 were observed from low land semi-evergreen Forest of Narcondam islands. **New Record to India.**

Family Noctuidae Latreille, 1809

Iambia Walker, 1863
Iambia Walker, 1863. *List Spec. Lepid. Insects Colln. Br. Mus.*, *27,* 109
Type Species. *Iambia inferalis* Walker, 1863.
Type Locality: SOUTH AFRICA, Port Natal.

Iambia lyricalis Holloway, 1989 (Figures 7, 12, 15)
Iambia lyricalis Holloway, 1989. *Malay. Nat. J.*, *42*(2-3), 110
Type Locality: SARAWAK.

Material examined: INDIA, Andaman and Nicobar Islands, Bird watching Point, Great Nicobar Biosphere Reserve, 06.999N, 93.879E, 136 m, 3 ♂♂, 15-XI-2018, Coll. K. C. Gopi and Party, Reg. No. ZSI/ANRC/T/13487, 13490, 13491; Andaman and Nicobar Islands, Bird watching Point, Great Nicobar Biosphere Reserve, 06.999N, 93.879E, 136 m, 3 ♀♀, 15-XI-2018 Coll. K. C. Gopi and Party, Reg. No. ZSI/ANRC/T/13488;13489;13492.

Diagnosis: *Iambia lyricalis* Holloway, 1989 is mostly similar to *I. harmonica* Hampson from the Northeast Himalaya in the reticulated Pattern of forewings but differs by the darker submarginal band. The male genitalia of both species show a significant difference. The valve in *I. harmonica* is less strongly produced apically, marginally excavate, and with the harpe slenderer and with stronger curvature at the apex. The aedeagus vesica is larger, more massively and extensively spined than in the Bornean species (Holloway, 1989).

Distribution: Malaysia, Sumatra, Borneo (Holloway, 1989), India - Andaman and Nicobar Islands (Present study).

Remarks: Poole (1989) listed, 22 species in the genus *Iambaia*, out of which five species were observed from the Indian mainland, viz. *Iambia anormalis* (Hampson, 1907) from Andhra Pradesh, *Iambia harmonica* (Hampson, 1902) from Mizoram, Sikkim and Meghalaya, *Iambia nocturna* (Hampson, 1902) from Madras, *Iambia rufescens* (Hampson, 1894) from Ganjam, *Iambia transversa* (Moore, 1882) from Darjeeling. *I. lyricalis* is observed only in the month of November at an Elevation of 136 m from the Primary Evergreen Forest of Great Nicobar Biosphere Reserve. *Iambia lyricalis* Holloway, 1989, adds up to the Indian fauna as a **New Record**.

Acknowledgement

The authors are thankful to the Director, Zoological Survey of India, for providing the facilities and constant support. Authors are also thankful to the officials of the Department of Environment and Forests, Andaman and Nicobar Islands for the necessary permission; to the Coast Guard and Police Department for logistic support during survey and sampling in Narcondam Islands. First Author is also thankful for his colleagues (Dr. Naveen Kumar Nigam, Apurba Kumar Das and G. Gokulakrishnan) for their dedicated hard work in the collection of samples from challenging terrain of Narcondam Island, and to Sant Kumar and Minakshi Dash for the preparation of maps and for their support.

References

Barlow, H. S. (1982). *An Introduction to the Moths of South East Asia*. Malayan Nature Society.

Chandra, K., Mazumder, A., Sanyal, A. K., Ash, A., Bandyopadhyay, U., Mallick, K., & Raha, A. (2018). Catalogue of Indian Notodontidae Stephens, 1829 (Lepidoptera: Noctuoidea). *Zootaxa, 4505*(1), 1-84.

De Prins, J., & De Prins, W. (2011). *Global taxonomic database of Gracillariidae (Lepidoptera)*. http://www.gracillariidae.net

Ganeshaiah, K. N., Sanjappa, M., Rao, R., Murugan, C., & Shivaprakash, K. N. (2019). Spatial distribution pattern of taxonomic and phylogenetic diversity of woody flora in Andaman and Nicobar Islands, India. *Forest Ecosystems, 6*(38), 1-14.

Holloway, J. D. (1989). The moths of Borneo: Family Noctuidae, trifine subfamilies: Noctuinae, Heliothinae, Hadeninae, Acronictinae, Amphipyrinae, Agaristinae. *Malayan Nature Journal, 42*(2-3), 57-228, 171 pls.

Holloway, J. D. (1994). The moths of Borneo: Family Geometridae, subfamily Ennominae [The Moths of Borneo, Part 11]. *Malayan Nature Journal*, *47*, 1-19.

Holloway, J. D. (1982). Taxonomic Appendix. In H. S. Barlow (ed.). *An Introduction to the Moths of South East Asia*. Malayan Nature Society.

Holloway, J. D. (1985). Moths of Borneo: Family Noctuidae: Subfamilies Euteliinae, Stictopterinae, Plusiinae, Pantheinae, part 14. *Malayan Nature Journal, 38*, 157-317.

Holloway, J. D. (1993). The moths of Borneo: Family Geometridae, subfamily Ennominae; Part 11. *Malayan Nature Journal, 47,* 1-309, 19 plates.

Jiang, N., Sato, R., & Han, H. (2012). One new and one newly recorded species of the genus *Amraica* Moore, 1888 (Lepidoptera: Geometridae: Ennominae) from China, with diagnoses of the Chinese species. *Entomological Science, 15*(2), 219-231.

Kirti, J. S., Chandra, K., Saxena, A., & Singh, N. (2019). *Geometrid Moths of India*. Nature Books India.

Krupnick, G. A., & Kress, W. J. (2003). Hotspots and ecoregions: A test of conservation priorities using taxonomic data. *Biodiversity & Conservation, 12*(11), 2237-2253.

Mohanraj, P., & Veenakumari, K. (2011). Butterflies of the Andaman and Nicobar Islands: history of collection and checklist. *Zootaxa, 3050*, 1-36.

Nayar, M. P. (1996). *Hot Spot of Endemic Plants of India, Nepal and Bhutan*. Tropical Botanic Garden and Research Institute.

Parsons, M. S., Scoble, M. J., Honey, H. R., Pitkin, L. M., & Pitkin, R. B. (1999). The catalogue. In M. J. Scoble (ed.). *Geometrid Moths of the World: A Catalogue* (*Lepidoptera, Geometridae*). CSIRO Publishing.

Poole, R. W. (1989). *Lepidopterorum Catalogus. Noctuidae* (Vol. 118). E. J. Brill/Flora Fauna Publications.

Prasad, P. R., Sringeswara, A. N., Reddy, C. S., Nagabhatla, N., Rajan, K. S., Giriraj, A., Murthy, M. S. R., Raza, S. H., & Dutt, C. B. H. (2009). Assessment of forest fragmentation and species diversity in North Andaman Islands (India): A geospatial approach. *International Journal of Ecology and Development, 14*(F09), 33-46.

Robinson, G. S., Tuck, K. R., & Shaffer, M. (1994). *Field guide to the smaller moths of South-East Asia*. The Natural History Museum.

Shashank, P., & Benedek, B. (2020). New records of Noctuid moths (Lepidoptera, Noctuidae) from India, Bhutan, and China. *Journal of Insect Biodiversity, 20*(1), 26-34.

Stojanoviæ, D., Æurèiæ, S., Stanisavljeviæ, L., & Orloviæ, S. (2014). New and rare moth species (Insecta: Lepidoptera) from Serbia. *North-Western Journal of Zoology, 10*(2), 318-324.

Wikramanayake, E. D., Dinerstein, E., & Loucks, C. J. (2002). *Terrestrial Ecoregions of the Indo-Pacific: A Conservation Assessment* (Vol. 3). Island Press.

*B. Sumit Kumar Rao, Chandrakasan Sivaperuman
Zoological Survey of India
Andaman and Nicobar Regional Centre Port Blair
744102 Andaman and Nicobar Islands
INDIA / *INDIA*
*E-mail: sumitkumarb3850@gmail.com
https://orcid.org/0000-0002-1110-2083

E-mail: c_sivaperuman1@rediffmail.com
https://orcid.org/0000-0002-3582-7767

Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 12-IV-2022)
(Revisado y aceptado / *Revised and accepted* 20-VI-2022)
(Publicado / *Published* 30-XII-2022)

2

3

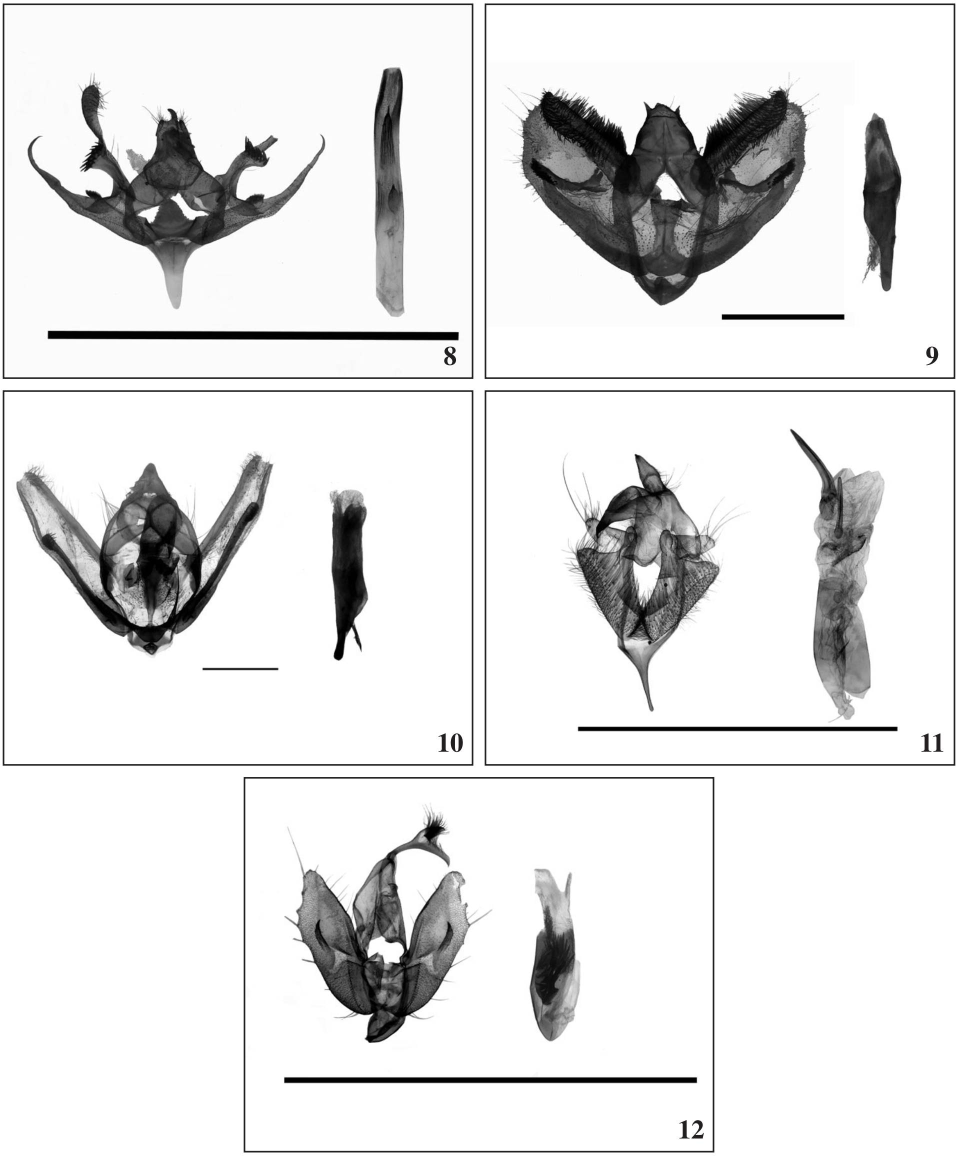
4

5

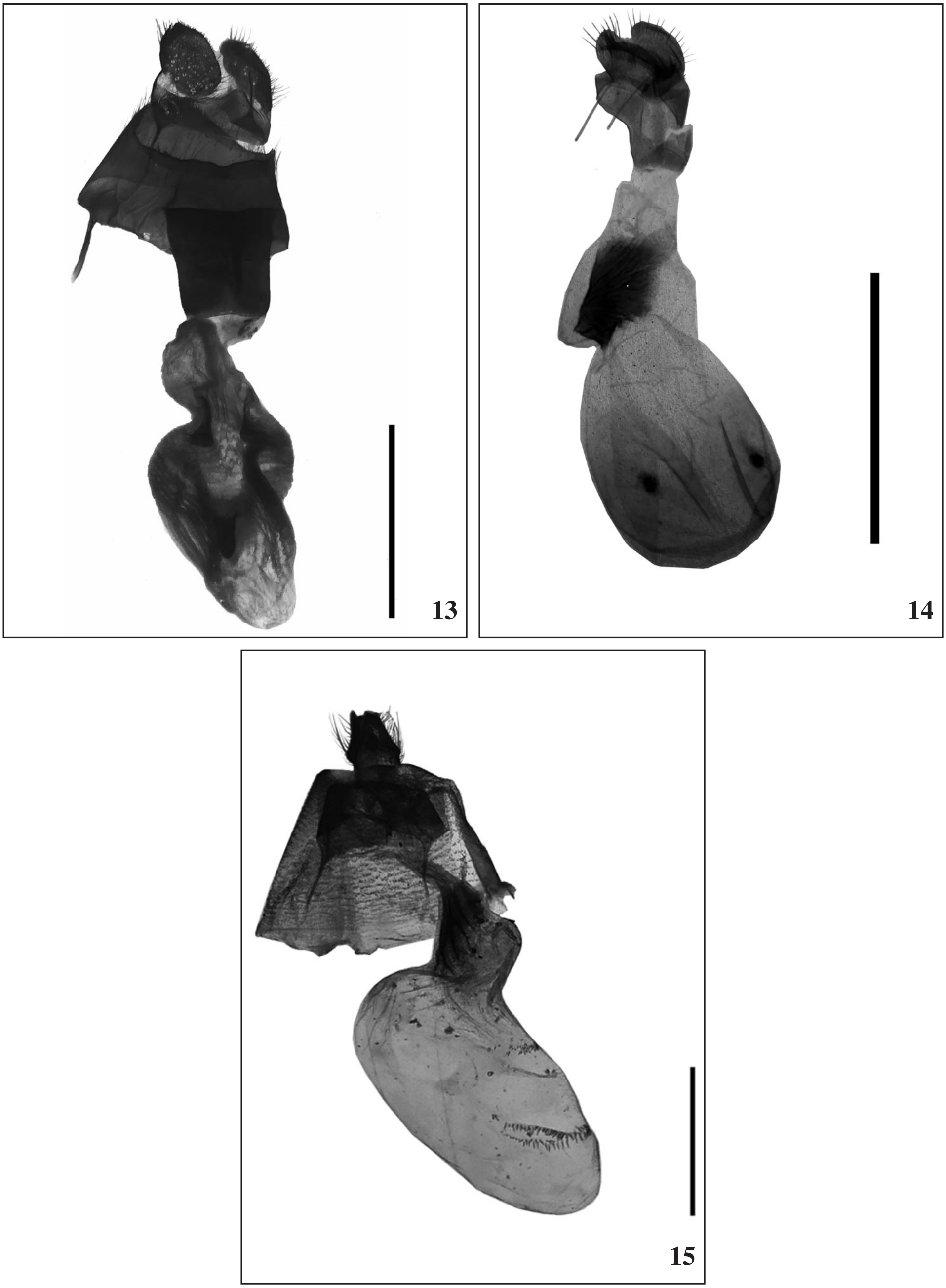
6

7

Figures 2-7. Adults. **2.** *Probithia imprimata* (Walker, 1861). **3.** *Ruttellerona pseudocessaria* Holloway, 1994. **4.** *Amraica solivagaria* (Walker, 1866). **5.** *Phalera sundana* Holloway, 1982. **6.** *Paectes psaliphora* Hampson, 1912. **7.** *Iambia lyricalis* Holloway, 1989.



Figures 8-12. Male Genitalia. **8.** *Probithia imprimata* (Walker, 1861). **9.** *Ruttellerona pseudocessaria* Holloway, 1994. **10.** *Amraica solivagaria* (Walker, 1866). **11.** *Paectes psaliphora* Hampson, 1912. **12.** *Iambia lyricalis* Holloway, 1989. Scale bar : 1 cm.



Figures 13-15. Female Genitalia. **13.** *Phalera sundana* Holloway, 1982. **14.** *Paectes psaliphora* Hampson, 1912. **15.** *Iambia lyricalis* Holloway, 1989. Scale bar :1 cm.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 653-658 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.275

Range extension of the *Macroglossum pyrrhosticta* Butler, 1875, in Northwestern India (Lepidoptera: Sphingidae)

Shahabab A. Farooqui, Ian J. Kitching, Hina Parwez & Rahul Joshi

During a faunistic survey of Lepidoptera in Sasni (27.7063º N, 78.0823º E; 181 m), Uttar Pradesh, a specimen of *Macroglossum pyrrhosticta* Butler, 1875, was collected and thus the species reported for the first time from the Gangetic Plains Biogeographic Zone of India, as well as North-West India as a whole. Details of the known larval host plants of *M. pyrrhosticta* are also provided, together with a checklist of the Indian species of genus *Macroglossum* Scopoli, 1777.

Keywords: Lepidoptera, Sphingidae, female genitalia, *Macroglossum pyrrhosticta*, new record, India.

Extensión del área de distribución de *Macroglossum pyrrhosticta* Butler, 1875, en el noroeste de la India (Lepidoptera: Sphingidae)

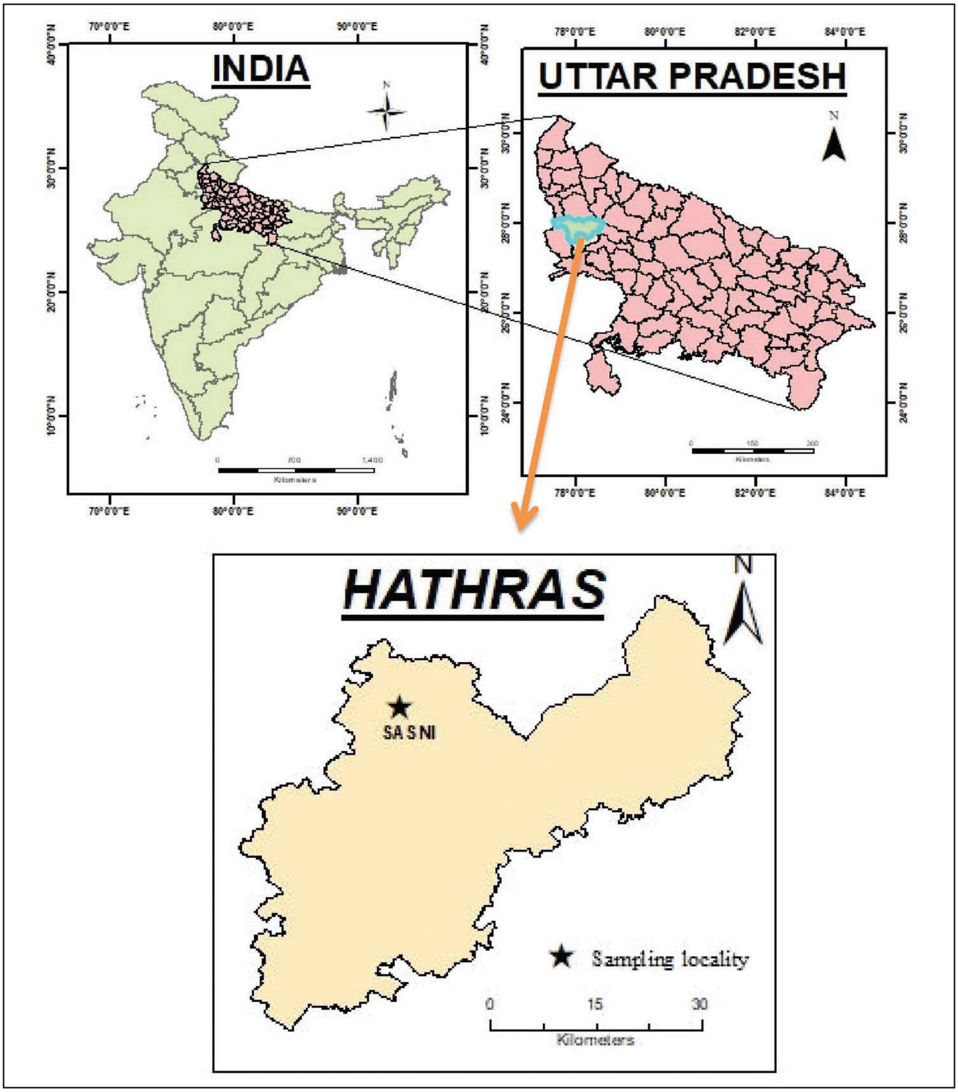
Resumen

Durante un estudio faunístico de Lepidoptera en Sasni (27,7063º N, 78,0823º E; 181 m), Uttar Pradesh, se recogió un espécimen de *Macroglossum pyrrhosticta* Butler, 1875, con lo que se registró la especie por primera vez en la zona biogeográfica de las llanuras del Ganges de la India, así como en el noroeste de la India en su conjunto. También se proporcionan detalles de las plantas nutricias conocidas de larvas de *M. pyrrhosticta*, junto con una lista de control de las especies indias del género *Macroglossum* Scopoli, 1777.

Palabras clave: Lepidoptera, Sphingidae, genitalia hembra, *Macroglossum pyrrhosticta*, nuevo registro, India.

Introduction

Adults of many species of the moth family Sphingidae, are nectarivorous (Boggs, 1987) and important pollinators in both natural and anthropogenic environments, being highly specialized flower visitors equipped with a long, thin and very flexible proboscis (Meeuse & Morris, 1984). Many species hover at flowers like hummingbirds to imbibe nectar. They can be quite abundant in forests and in Costa Rica, pollinate 5-10% of all trees and shrubs (Janzen, 1983; Bawa et al. 1985; Haber & Frankie, 1989). Most adult hawkmoths are nocturnal, although some species fly by day, or predominantly in the crepuscular period (Opler, 1983). Among the diurnal and crepuscular species are members of the genus *Macroglossum*, although many are also nocturnal. The genus was erected by Giovanni Antonio Scopoli in 1777. The genus name was derived from the Latin prefix "macro" meaning big or large, and the Greek *γλοσσα* [glossa] meaning tongue. Only five species of *Macroglossum* have so far reported from Gangetic Plains Biogeographic Zone of India (encompassing Uttar Pradesh, Uttarakhand, Bihar and West Bengal states), viz., *M. assimilis* Swainson, 1821, *M. belis* (Linnaeus, 1758), *M. corythus* Walker, 1856, *M. gyrans* Walker, 1856 and *M. nycteris* Kollar, 1844 (Joshi et al. 2021). The present paper provides information on the occurrence of a sixth species, *Macroglossum pyrrhosticta* Butler, 1875, based on morphotaxonomic and genital study.



Map 1. Site of observation of *M. pyrrhosticta* Butler, 1875.

Materials and Methods

Our study was carried out at Sasni (27.7063º N, 78.0823º E; 181 m; Map 1), nearby Shri Balaji Garden in Hathras District, Uttar Pradesh, in the late afternoon (5:10 p.m.) of 12th October 2018. A specimen of the genus *Macroglossum* was collected on the wing using an insect net. After killing with ethyl acetate, the specimen was transferred to an insect envelope and labelled with the name of locality, date, latitude, longitude, and altitude. Later, in the laboratory, the specimen was relaxed and spread on a setting board. The exemplar was initially identified simply as *Macroglossum* sp. but the identification as *Macroglossum pyrrhosticta* was later confirmed by the second author. The specimen has been preserved in a fumigated insect storage box in the collection of the Zoology Department, Aligarh Muslim University (ZDAMU), Aligarh, Uttar Pradesh.

Results

Taxonomic

Class: Insecta Linnaeus, 1758
  Order: Lepidoptera Linnaeus, 1758
    Clade: Ditrysia Borner, 1925
      Superfamily: Bombycoidea Latreille, [1802]
        Family: Sphingidae Latreille, [1802]
          Subfamily: Macroglossinae Harris, 1839
            Tribe: Macroglossini Harris, 1839
              Subtribe: Macroglossina Harris, 1839
                Genus: *Macroglossum* Scopoli, 1777

Distribution: Europe, Africa, Asia, and Australian region (Hampson, [1893]).

Note: The species of this genus are numerous, closely allied and can be difficult to discriminate.

Macroglossum pyrrhosticta Butler, 1875
Macroglossa pyrrhosticta Butler, 1875; *Proc. zool. Soc. Lond., 1875*, 242
TL: CHINA, Shanghai.
Holotype: ♀, China, Shanghai [NHMUK].
= *Macroglossa catapyrrha* Butler, 1875
= *Macroglossum pyrrhosticta* form *albifascia* Mell, 1922
= *Macroglossum pyrrhosticta* form *ferrea* Mell, 1922
= *Macroglossum fukienensis* Chu & Wang, 1980

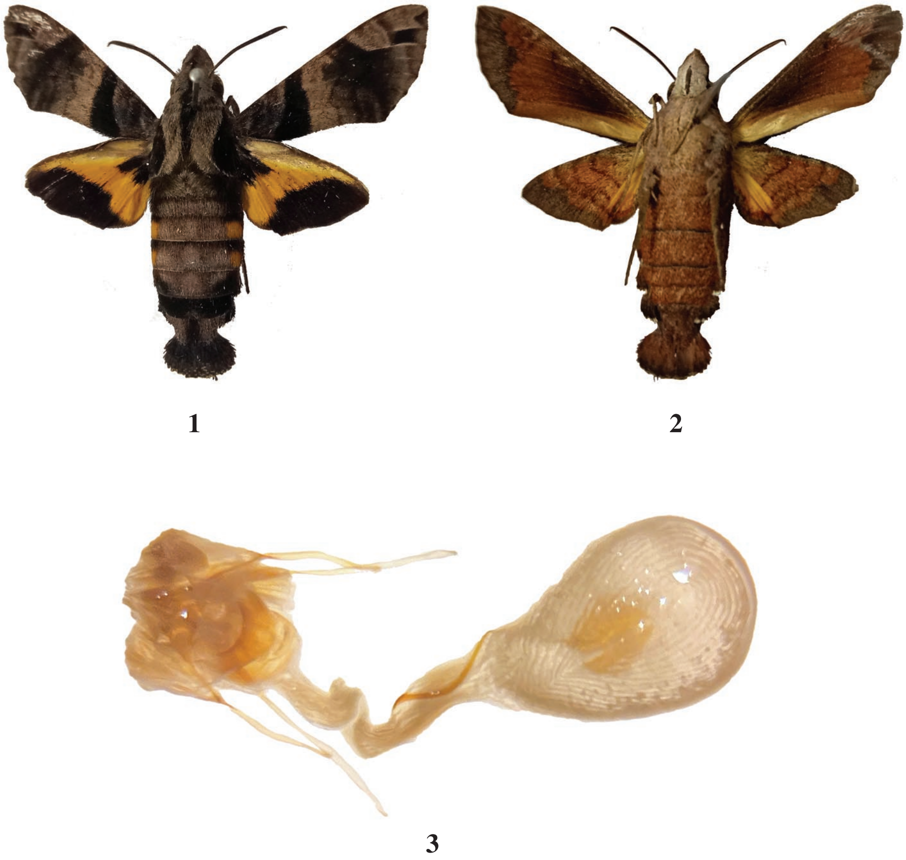
Description Adult (Figures 1-2): Very similar to *Macroglossum variegatum* Rothschild & Jordan, 1903, but most easily distinguished by the chestnut brown underside of the abdomen (greyish brown in *M. variegatum*). Head, thorax, abdomen, and forewings greyish without a rufous tinge. The upperside of the forewing is brown flushed with whitish grey, the dark brown antemedial band is wider at the inner margin than the costa, with slightly curved margins.

Female genitalia (Figure 3): Papillae anales broad, strong. Apophyses anteriores and posteriores large and weak, blunt apically. Ductus bursae thin, curved and spiralled, long, anterior end gradually widening into the corpus bursae. Corpus bursae ovoid. Signum with a circular anterior section and a very long and narrow posterior band that runs along the anterior half of the ductus bursae.

Distribution in India: Uttar Pradesh (Hathras District) (this study); Arunachal Pradesh (Changlang District); Assam (East Karbi Anglong District); West Bengal (Bankura District, South 24 Parganas District) (Sondhi et al. 2021).

Elsewhere: Sri Lanka, Nepal, Bhutan, Myanmar, central, eastern and southern China, South Korea, North Korea, Japan, the southern Russian Far East, Taiwan, Philippines (Luzon), Laos, Cambodia, Thailand, Vietnam, Malaysia (Peninsula and Sarawak) and Indonesia (Sumatra, Java, Bali, Lombok) (Pittaway & Kitching, 2021); established in Hawaii, USA.

Larval Host Plants: Larvae have been recorded feeding on *Paederia scandens*, *Psychotria rubra*, *Paederia foetida* and *Paederia tomentosa*; *Paederia foetida* and *Psychotria rubra* (Rubiaceae) in Hong Kong, *Paederia foetida* in India (Bell & Scott, 1937, 1937), and *Paederia foetida* in mainland China and Taiwan. On the latter island, it has also been recorded from *Paederia cavaleriei*, *Serissa japonica* [syn.: *Serissa serissoides*] and *Sida rhombifolia* (Pittaway & Kitching, 2021); also, *Paederia foetida* (Rubiaceae) and *Impatiens* sp. (Balsaminaceae) (Robinson et al. 2010).



Figures 1-3. *M. pyrrhosticta* Butler, 1875. **1.** Adult female, dorsal view, **2.** Adult female, ventral view, **3.** Female genitalia.

Discussion

In the first comprehensive treatment of the Sphingidae fauna of the Indian subcontinent, Hampson ([1893]) reported 23 species under the genus name *"Macroglossa*", representing 18 currently accepted species of *Macroglossum*. *Macroglossum pyrrhosticta* was not mentioned as such, but was included under the current junior subjective synonym, *Macroglossa catapyrrha*. In their updated and expanded treatment of the Sphingidae of India and adjacent countries, Bell & Scott (1937) reported 27 species representing 24 currently valid species, including *M. pyrrhosticta* (from the Eastern Himalaya). Kendrick (2010) mentioned only 15 species of *Macroglossum* in India (those that were in common with Hong Kong, China), while the *Moths of India* website (Sondhi et al. 2021) currently lists only 13 species that have been photographed in the different parts of the country (which may reflect the difficulties of photographing these fast-flying insects).

Prior to the present study, *M. pyrrhosticta* was only known in India from several eastern states, namely Arunachal Pradesh, Assam and West Bengal. However, the two districts in West Bengal (Bankura district and South 24 Parganas district) do not include land of the Gangetic Plains. Thus, the present study is the first to report the occurrence (and associated range extension) of *M. pyrrhosticta* in the state of Uttar Pradesh, the Gangetic Plains and North-West India in general.

Checklist of Indian species of the genus *Macroglossum* Scopoli, 1777.

1. *Macroglossum affictitia* Butler, 1875
2. *Macroglossum aquila* Boisduval, 1875
3. *Macroglossum assimilis* Swainson, 1821
4. *Macroglossum belis* (Linnaeus, 1758)
5. *Macroglossum bifasciata* Butler, (1875)
6. *Macroglossum bombylans* Boisduval, 1875
7. *Macroglossum corythus* Walker, 1856
8. *Macroglossum divergens divergens* Walker, 1856
9. *Macroglossum divergens heliophila* Boisduval, 1875
10. *Macroglossum gyrans* Walker, 1856
11. *Macroglossum mitchellii imperator* Butler, 1875
12. *Macroglossum neotroglodytus* Kitching & Cadiou, 2000
13. *Macroglossum nycteris* Kollar, 1844
14. *Macroglossum obscura* Butler, 1875
15. *Macroglossum particolor* Rothschild & Jordan, 1903
16. *Macroglossum passalus* (Drury, 1773)
17. *Macroglossum prometheus* Boisduval, 1875
18. *Macroglossum pyrrhosticta* Butler, 1875
19. *Macroglossum regulus* Boisduval, 1875
20. *Macroglossum saga* Butler, 1878
21. *Macroglossum semifasciata* Hampson, 1893
22. *Macroglossum sitiene* Walker, 1856
23. *Macroglossum stellatarum* (Linnaeus, 1758)
24. *Macroglossum troglodytus* Boisduval, 1875
25. *Macroglossum variegatum* Rothschild & Jordan, 1903
26. *Macroglossum vicinum* Jordan, 1923

Acknowledgements

The authors are very grateful to the Chairperson, Department of Zoology, Aligarh Muslim University and the Director, Zoological Survey of India, for their continuous support and encouragement throughout.

References

Bawa, K. S., Bullock, S. H., Perry, D. R., Coville, R. E., & Grayum, M. H. (1985). Reproductive biology of tropical low land rain forest trees II. Pollination Systems. *American Journal of Botany, 72*(3), 346-356.

Bell, T. R. D., & Scott, F. B. (1937). *The fauna of British India, including Ceylon and Burma. Moths* (Vol. 5). Taylor and Francis.

Boggs, C. L. (1987). Ecology of nectar and pollen feeding in Lepidoptera. In F. Slansky Jr. & D. Rodriguez (Eds.). *Nutritional ecology of insects, mites and spiders, and related invertebrates* (pp. 369-391). John Wiley and Sons.

Butler, A. G. (1875). Descriptions of new species of Sphingidae. *Proceedings of the Zoological Society of London, 1875*, 238-261.

Haber, W. A., & Frankie, G. W. (1989). A tropical hawkmoth community: Costa Rican dry forest Sphingidae. *Biotropica, 21,* 155-172.

Hampson, G. F. ([1893] 1892). *The fauna of British India, including Ceylon and Burma. Moths* (Vol. 1). Taylor & Francis.

Janzen, D. H. (1983). *Costa Rican natural history.* University of Chicago Press.

Joshi, R., Ghosh, J., Farooqui, S. A., & Singh, N. (2021). Insecta: Lepidoptera (Moth). In K. Chandra, D. Banerjee, C. Raghunattan, D. Gupta, P. Rai & G. Sharma. *Faunal Diversity of Biogeographic Zones of India: Gangetic Plains.* Zoological Survey of India.

Kendrick, R. C. (2010). The genus *Macroglossum* Scopoli 1777 (Lepidoptera: Sphingidae, Macroglossinae) in Hong Kong. *Hong Kong Entomological Society, 2*(1), 13-21.

Kitching, I. J. (2021). *Macroglossum pyrrhosticta* Butler, 1875. *Sphingidae Taxonomic Inventory*. https://sphingidae.myspecies.info/taxonomy/term/1604 & https://sphingidae.myspecies.info/taxonomy/term/1604/media.

Meeuse, B., & Morris, S. (1984). *The Sex Life of Flowers*. Facts on File.

Opler, P. A. (1983). Nectar production in a tropical ecosystem. In B. Bentle & T. Elias (Eds.). *The biology of nectaries* (pp. 30-79). Columbia University Press.

Pittaway, A. R., & Kitching, I. J. (2021). *Sphingidae of the Eastern Palaearctic (including Siberia, the Russian Far East, Mongolia, China, Taiwan, the Korean Peninsula and Japan)*. https://tpittaway.tripod.com/china/china.htm

Scopoli, G. A. (1777). *Introductio ad historiam naturalem, sistens genera lapidum, plantarum et animalium hactenus detecta, caracteribus essentialibus in tribus divisa, subinde ad leges naturae*. Wolfgang Gerle.

Sondhi, S., Sondhi, Y., Roy, P., & Kunte, K. (2021). *Moths of India*, *v. 2.21*. Indian Foundation for Butterflies. https://www.mothsofindia.org

*Shahabab A. Farooqui
Department of Zoology
Aligarh Muslim University
Aligarh- 202002, Uttar Pradesh
INDIA / *INDIA*
E-mail: shahababfarooqui@gmail.com
https://orcid.org/0000-0001-7289-5331

Ian J. Kitching
Natural History Museum
Cromwell Road
GB-London SW7 5BD
REINO UNIDO / *UNITED KINGDOM*
E-mail: i.kitching@nhm.ac.uk
https://orcid.org/0000-0003-4738-5967

Hina Parwez
Department of Zoology
Aligarh Muslim University
Aligarh- 202002, Uttar Pradesh
INDIA / *INDIA*
E-mail: hinap301@gmail.com
https://orcid.org/0000-0002-9325-7627

Rahul Joshi
Lepidoptera Section
Zoological Survey of India
M-Block, New Alipore
Kolkata-700053, West Bengal
INDIA / *INDIA*
E-mail: joshiarctiidae@gmail.com
https://orcid.org/0000-0001-8514-1272

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 25-I-2022)
(Revisado y aceptado */ Revised and accepted* 17-III-2022)
(Publicado / *Published* 30-XII-2022)

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 659-663 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.254

Dispersal of Heterocera species from North Africa to the Maltese Islands (Insecta: Lepidoptera)

Jonathan Agius

Abstract

Located right in the middle of the Mediterranean, the Maltese Islands are some of the richest in the region. When the winds are right, several North African Heterocera species can be observed during the same night, depending on the season. The purpose of this paper is to document the North African Heterocera recorded from Malta during the last 13 months ending December 2021.

Keywords: Insecta, Lepidoptera, migration, dispersal, North Africa, Malta.

Dispersión de especies de Heterocera desde el norte de África hasta Malta (Insecta: Lepidoptera)

Resumen

Situadas en pleno Mediterráneo, las islas maltesas son unas de las más ricas de la región. Cuando los vientos son adecuados, se pueden observar varias especies de Heterocera norteafricanas durante la misma noche, dependiendo de la temporada. El objetivo de este trabajo es documentar los Heterocera norteafricanos registrados en Malta durante los últimos 13 meses hasta diciembre de 2021.

Palabras clave: Insecta, Lepidoptera, migración, dispersión, África del Norte, Malta.

Introduction

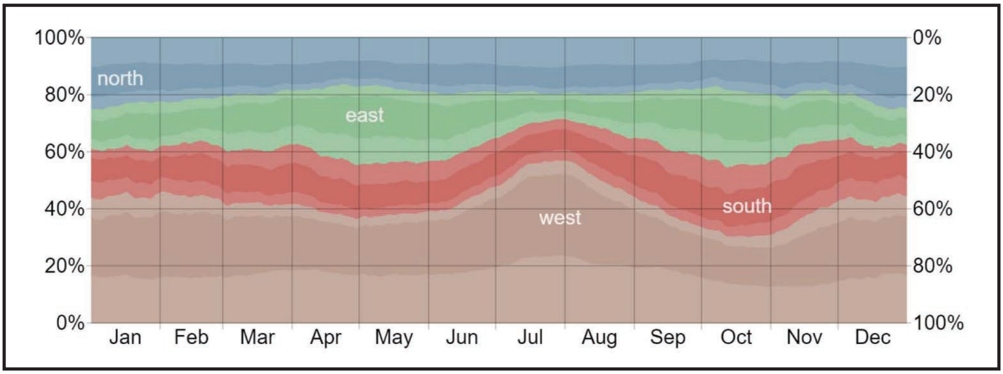
With an area of just 316 sq km, the Maltese Archipelago is one of the smallest in the world. Yet it is also one of the densest, with over 514,000 residents as of 2019. Only the three largest islands - Malta, Gozo and Comino are inhabited whilst the other small islands such as Filfla, St. Paul’s islands, Kemmunett and the Fungus Rock are unoccupied. The Islands are enviably located in the passageway between Africa and Europe, 93 km south of Sicily and 288 km north of Libya.

Malta is the largest and most developed of the three islands, and remains the cultural, commercial and administrative centre. Gozo is the second largest island and more rural; it is known for its more abundant countryside and open spaces. Comino, while largely uninhabited, is a popular destination for day-trippers and hikers. The highest point above sea level is 250 metres at Dingli Cliffs.

Malta has a Mediterranean climate according to the Köppen climate classification with very mild winters and warm to hot summers. Rain occurs mainly in autumn and winter, with summer being generally dry. According to the Troll-Paffen and the Siegmund / Frankenberg climate classifications, Malta lies within the subtropical zone, being at 35ºN latitude.

The average yearly temperature is around 23 ºC (73 ºF) during the day and 16 ºC (61 ºF) at night (one of the warmest temperature averages in Europe). January is normally the coldest month with the typical maximum temperature ranging from 12 to 20 ºC (54 to 68 ºF) during the day and a minimum from 6 to 12 ºC (43 to 54 ºF) at night. In the warmest month - August - the typical maximum temperature ranges from 28 to 34 ºC (82 to 93 ºF) during the day and the minimum from 20 to 24 ºC (68 to 75 ºF) at night. Malta has an average of 90 precipitation days a year, and experiences from a few to a dozen rainy days per month (≥ 1 mm), ranging from half a day in July to around 15 days between November and December. The average annual precipitation is around 600 mm, ranging from ≈ 0.3 mm in July to ≈ 110 mm in December. The annual average relative humidity is high, averaging 75% per annum but ranging from 65% in July to 80% in December. As one might expect from an archipelago situated next to North Africa, Malta enjoys around 3,000 hours of sunshine per year (also one of the highest in Europe), from an average of about 5 hours of sunshine per day in December to an average of more than 12 hours of sunshine per day in July. Thus, Malta enjoys about twice the amount of sunshine as cities in the northern half of Europe. For comparison, London has 1,461 sunshine hours per year.

Malta can be windy. During an analysis carried out on surface wind speeds measured using cup anemometers and wind vanes which are situated at a standard height at the Malta Airport MetOffice between 1951 and 2010, the yearly average wind speed can range between of 10.3 knots (or 19.1 km/hr) to 7.1 knots (13.2 km/hr). (Galdes, 2011). Retrieving data from Malta Weather Station for the year 2021, there were 6 days where the wind speed exceeded the 80 km/hr mark with the average windspeed being 11.5 km/hr whilst the average gust speed reading 17.9 km/hr. The most prevailing winds in Malta are Northwest and North-northwest with southern winds normally experienced during winter to mid-spring and then again during mid-autumn as depicted in the chart below.



Discussion

Wind is a major contributor in the migration and dispersal of insects. The definition of the term migration that best suits the purposes of this research, and that is most consistent with insect behaviour has been provided by Kennedy (1985) by stating that *“Migratory behaviour is persistent and straightened-out movement effected by the animal’s own locomotory exertions on or by its active embarkation on a vehicle. It depends on some temporary inhibition of station-keeping responses but promotes their eventual disinhibition and recurrence.*” An important term in this definition is the word persistent where the activity of the insect is tenacious so that it carries the migrant beyond its original habitat to a new one where it gathers previously unavailable resources. Dispersal is more simply defined as movement that results in an increase in the mean distance between individuals (Southwood, 1981) and which in the author’s opinion is not normally initiated by the insect but normally the result of external factors such as weather conditions. Apparently, insects using kinetic energy of atmospheric circulation through downward movement has enormous survival rate and they are also able to locate and exploit ephemeral vegetation. A case in point is *Helicoverpa armigera* (Hübner, [1808]) which has been documented travelling from North to Northeast of China and flew about 8.5 hours per night (Sujayanand et al. 2016).

In Malta, most species are not recorded on an annual basis but only when perfect atmospheric conditions coincide precisely with the peak emergence of the species in North Africa. It is important to highlight that the species recorded from North Africa have all been recorded either during or following southern winds. Furthermore, no larvae of these dispersed moths have been recorded so far in Malta. This could be the result of lack of proper foodplants, improper micro-environmental conditions or just an oversight from local naturalists. However, based on the above, it is logically to conclude that North African moths which are recorded in Malta are not the result of migration but simply dispersal due to southern winds.

Methods

The present paper will compile all records made by the author. None of these species are new to the Maltese islands but all species have been flagged as rare migrants in Maltese literature (Sammut, 2000). The cited material has been recorded using a 250 W mercury vapour light and / or an 18W UV Black light tube, with most specimens found in the author's private collection.

Results

NOCTUIDAE

Cucullia biskrana Oberthür, 1918

Material: MALTA, Salina Nature Reserve, 1 ♂, 03-XII-2020 leg. J. Agius; Dingli Cliffs, 1 ♂, 15-XII-2020 leg. J. Agius

Cucullia syrtana Mabille, 1888

Material: MALTA, Zurrieq, 1 ♂, 05-II-2021 leg. J. Agius

Agrotis haifae Staudinger, 1897

Material: Several specimens from both gender MALTA, Zurrieq, 07-I-2021, 04-XI-2021, 05-XI-2021, 06-XI-2021, 07-XI-2021, and 08-XI-2021 leg. J. Agius.

Agrotis herzogi Rebel, 1911

Material: Several specimens from both gender MALTA, Zurrieq, 23-XII-2020, 07-I-2021, 09-I-2021, 23-X-2021, 04-XI-2021, 05-XI-2021, 07-XI-2021, 08-XI-2021, 09-XI-2021, 10-XI-2021, 12-XI-2021, 16-XI-2021; Dingli Cliffs 07-XI-2021 leg. J. Agius.

Agrotis lasserrei (Oberthür, 1881)

Material: MALTA, Zurrieq, 1 ♂, 17-XI-2021 leg. J. Agius

EREBIDAE

Cerocala algiriae Oberthür, 1876

Material: MALTA, Zurrieq, 6 ♂♂, 8-XI-2021 leg. J. Agius

Tathorhynchus exsiccata (Lederer, 1855)

Material: Several specimens from both gender MALTA, Zurrieq, 06-I-2021, 22-I-2021, 03-II-2021, 05-II-2021, 08-II-2021, 19-02-2021, 09-III-2021, 03-IV-2021, 14-IV-2021, 28-IV-2021, 29-IV-2021, 13-V-2021, 11-XI-2021; Salina Nature Reserve 05-V-2021; Simar Nature Reserve 21-II-2021; Qormi - Wied il-Kbir 03-IV-2021; Mellieha (next to Red tower) 04-VI-2021 leg. J. Agius

Autophila maura (Staudinger, 1888)
Material: Malta, Qormi - Wied il-Kbir, 1 ♂, 03-IV-2021 leg. J. Agius

CRAMBIDAE

Evergestis desertalis (Hübner, [1813])
Material: Malta, Zurrieq, 1 ♂, 19-II-2021 leg. J. Agius

TORTRICIDAE

Cydia blackmoreana (Walsingham, 1903)
Material: Several specimens from both gender Malta, Zurrieq 08-I-2021, 09-I-2021, 04-II-2021, 06-II-2021, 07-II-2021, 08-II-2021, 10-II-2021 leg. J. Agius

Acknowledgments

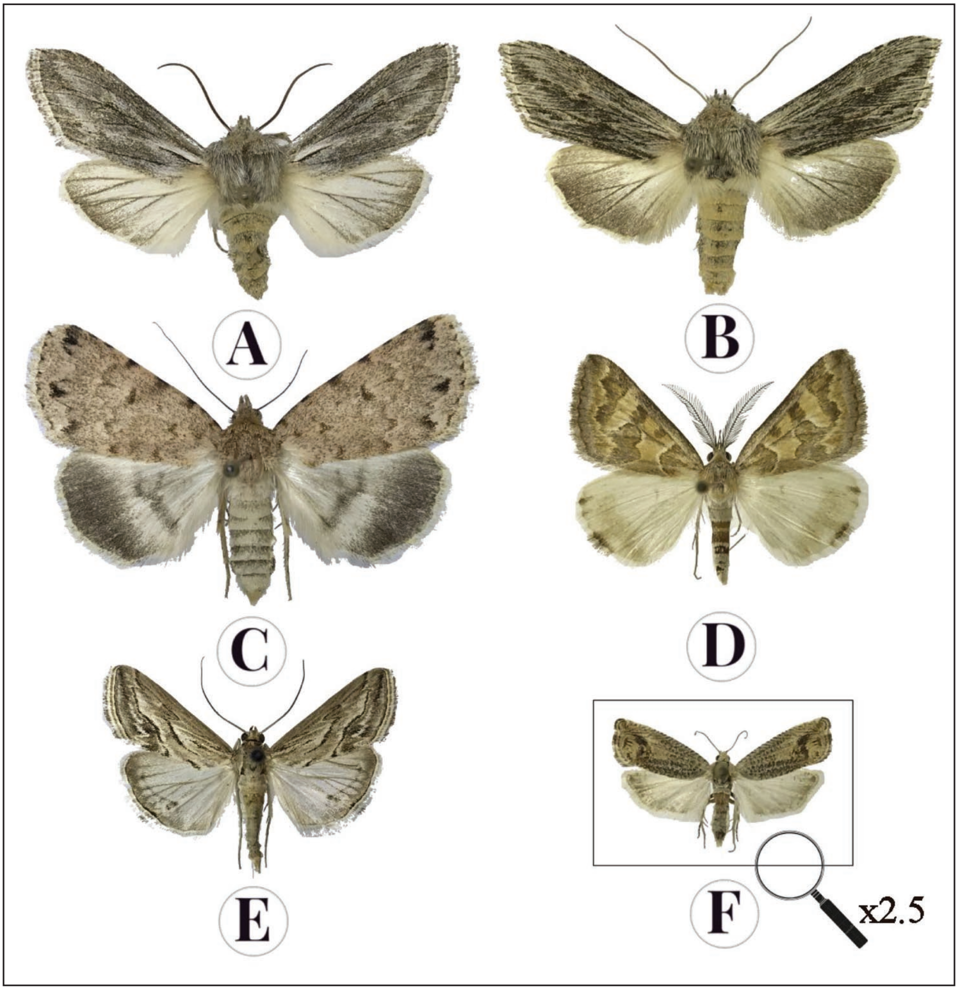
The author is grateful to Dr. Antonio Vives for the Spanish abstract.

References

Galdes, C. (2011). *The Climate of Malta: statistics, trends and analysis 1951-2010*. National Statistics Office.
Kennedy, J. S. (1985). Migration, behavioural and ecological. In M. A. Rankin (Ed.). *Migration: Mechanisms and Adaptive Significance, Contributions in Marine Science, 27 (Supplement)* (pp. 5-26). University of Texas Marine Science Institute.
MALTA WEATHER STATION (2022). http://www.maltaws.com/
Sammut, P. (2000). *Kullana Kulturali. 12 - Il-Lepidoptera*. Pubblikazzjonijiet Indipendenza.
Southwood, T. R. E. (1981). *Ecological Methods*. Chapman and Hall.
Sujayanandm, G. K., & Karuppaiah, V. (2016). Aftermath of climate change on insect migration: A review. *Agricultural Reviews, 37*(3), 221-227.

Jonathan Agius
166 ‘Infinity’
Vjal ix-Xarolla
MT-Zurrieq, ZRQ1617
MALTA / *MALTA*
E-mail: jonagius@msn.com
https://orcid.org/0000-0003-4875-0524

(Recibido para publicación / *Received for publication* 3-I-2022)
(Revisado y aceptado / *Revised and accepted* 25-II-2022)
(Publicado / *Published* 30-XII-2022)



Figures A-F. A. *Cucullia biskrana* **B.** *Cucullia syrtana* **C.** *Autophila maura* **D.** *Cerocala algiriae* **E.** *Evergestis desertalis* **F.** *Cydia blackmoreana.*

Guidelines to authors wishing to publish in ©*SHILAP Revista de lepidopterología*

1. *SHILAP Revista de lepidopterología* is an international journal published since 1973 by the Sociedad Hispano-Luso-Americana de Lepidopterología and uses the ORCID® persistent digital identifier as a way to ensure standardization of correct authorship. It includes empirical and theoretical research articles in all areas of Lepidopterology (systematics, taxonomy, phylogeny, morphology, bionomics, ecology, faunistic and zoogeography, also works on bibliographical or on the history of Lepidopterology, as well as book reviews on these topics) from all regions of the world, with special interest in studies that in one way or another have relevance to conservation biology. Each volume consists of four annual issues (one volume per year) in March, June, September, and December.
2. The official languages of the journal are Spanish, English, French, German, Italian and Portuguese.
3. The manuscript must be about **original research** not previously published and submitted exclusively to *SHILAP Revista de lepidopterología*, otherwise it must be communicated urgently. The manuscript should preferably be submitted in electronic format and a Word, WordPerfect, or Rich Text Format (RTF) file is preferred.
4. The Editor represents the opinion of the Editorial Board and will inform the authors of his decision on the acceptance or rejection of their papers. All manuscripts will be reviewed by the Editor and at least two independent reviewers in order to ensure the quality of the papers. The review process is fast. Based on their report, the Editor decides whether a manuscript will be accepted for publication. Accepted papers are published as quickly as possible, normally within 12 months of receipt. Once accepted, the paper becomes the property of the journal, the journal retains the copyright, and no part of the paper may be reproduced without citing its source.
5. All articles must include a summary of their content in Spanish and English (Abstract) and, if necessary, another in any of the official languages of the journal. For authors who do not know Spanish, the translation of the Abstract from English to Spanish will be done by the Editor, if the paper is accepted. The abstract should be concise (250 words max) and condense the conclusions of the paper and should not include full stops. Each abstract must be followed by a maximum of 10 keywords in the same language, separated by commas. The abstract in a language other than that of the text must be preceded by a translation of the title in English.
6. The order of presentation of papers will be: title, author, abstracts, text, and bibliographical references. In case of doubt, please consult previous issues of the journal. **Papers that do not conform to these rules or that have more than 20% plagiarism, will be returned to the authors**.
7. **AUTHORS:** Authors must submit their full name, contact address, e-mail address, and include their ID identifiers ORCID® in their signature. Spanish-speaking authors who use both surnames are advised to join them with a hyphen.
8. **OF THE TEXT:** It is recommended not to use footnotes. Dates should be written as follows: 15-VII-1985 (i.e., days and years in Arabic numerals and months in Roman numerals). Citations of the authors of the bibliography in the text should be given with the date: Linnaeus (1758), (Linnaeus, 1758) or, if pages are to be indicated, these should be placed after the year by separating them with a comma and the word “p. “(Linnaeus, 1758, p. 65); if there are three or more authors, the first one should be indicated, followed by et al. If they are different authors, they should be arranged alphabetically separated by a semicolon (Herrich-Schäffer, 1857; Linnaeus, 1758). Citations of captured material should be made as follows: Country (when necessary), province, locality, altitude, sex of specimens, date, and collector. The symbol for male and female has to be coded as (&&) and (&) respectively with brackets. Diacritical characters not normally included in Western European sources (e.g., Slavic languages, Romanian, Polish, Turkish, etc.) should also be coded; the codes used should be submitted on a separate sheet with a printed version of the manuscript.
9. **SPECIES AND OTHER TAXONOMIC CATEGORIES:** All names of taxa mentioned in the text, both established and new taxa to be described, should conform to recent standards of the *International Code of Zoological Nomenclature*. Latin names of genera and species should be in italics. The abbreviations **gen. nov**., **sp. nov**., **syn. nov**., **comb. nov**., or similar, should be used explicitly for all taxonomic innovations. In the description of a new genus, the nominal type species should be designated in the original combination and with reference to the original description and immediately after the new name. If new taxa are described in the article, it is essential that the types are deposited in a scientific institution. All taxa should be mentioned followed by their descriptor (with the full name) and the date of description at least once. Internationally recognized abbreviations of authors may be used: L. (Linnaeus); H.-S. (Herrich-Schäffer); Stgr. (Staudinger), etc.
10. **ILLUSTRATIONS:** Drawings shall be made in India ink or digital print DIN A4. Photographs with high contrast, compatible with Adobe Photoshop and in any image format such as TIFF or JPEG may be submitted. The cost of colour publications may be charged to the authors, if deemed necessary by the Director.
11. **REFERENCES AND CITATIONS:** All papers will be accompanied by a bibliographical reference which will include only the publications cited in the text. The references will be adapted to the **APA 7th Edition**, with the following format:

    Journal articles:

    Surname, A., Surname, B., & Surname, C. (2019). Title of the specific article. *Journal Title, Volume*(journal number), start page number-end page number.

    If a journal article has a DOI or URL, it will be included at the end of the reference:

    Efetov, K. A., Knyazev, S. A., & Kucherenko, E. E. (2022). The first record of *Jordanita (Solaniterna) subsolana* (Staudinger, 1862) from Kazakhstan (Lepidoptera: Zygaenidae, Procridinae). *SHILAP Revista de lepidopterología, 50*(198), 233-239. https://shilap.org/revista/article/view/68

    Article in collective volume:

    Rebel, H. (1901). Famil. Pyralidae-Micropterygidae. 2 Theil.- In O. Staudinger & H. Rebel. *Catalog der Lepidopteren des palaeartischen Faunengebietes* (pp. 1-265). R. Friedlander & Sohn.

    Book:

    Vives Moreno, A. (2014). *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)*. Improitalia.

    Internet:

    De Prins, J., & De Prins, W. (2011). *Global taxonomic database of Gracillariidae (Lepidoptera)*. http://www.gracillariidae.net

    Bibliographic citations should be listed in alphabetical order of authors. When reference is made to more than one paper by the same author, the corresponding bibliographic citations will be listed in order of seniority of the papers.

    Citations will be made with the names of the authors, the first in capital letters and the rest in lower case, as follows: (Linnaeus, 1758), Linnaeus (1758) or Linnaeus (1758, p. 65), using the latter to cite a specific page. When there are two authors, their names should be separated by & (De Prins & De Prins, 2008). The name of the first author followed by et al. should be used when there are three or more authors (Efetov et al. 2022). When references are made to more than one work by the same author, published in the same year, they should be differentiated in the text and in the bibliographic list by a lower-case letter, as indicated: Efetov (1997a, b).
12. **TABLES:** They will have their own correlative numbering, on independent, unpaginated sheets and, if necessary, may include an explanatory note.
13. **BIBLIOGRAPHICAL NOTES AND REVIEWS:** They should not exceed two pages in length and should follow the same rules as the articles.
14. **PROOFS:** Authors will receive proofs in PDF format in order to carefully correct printing errors. Proofs must be returned within 15 days from the date of receipt. After this time, the Editor will decide whether to delay publication or to make the corrections, declining all responsibility for the persistence of possible errors. The Editor reserves the right to make necessary modifications to maintain the uniformity of the journal.
15. **REPRINS:** Authors will receive a **free PDF of their work**. If you need additional offprints of your paper in hard copy, you should inform the Secretary General in advance and the cost will be borne by the author(s). Self-archiving of articles is permitted at the time of publication in the printed version.
16. **CORRESPONDENCE:** Correspondence will only be maintained with the first corresponding author. If the corresponding author is not the first author, this must be indicated in writing to the Secretary General.
17. **SUBMISSIONS:** Papers should be sent to:

SHILAP
Apartado de Correos, 331
E-28080 Madrid
ESPAÑA / ***SPAIN***
E-mail: avives1954@outlook.es / avives1954@gmail.com / avives1954@outlook.com

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 665-672 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.255

On recently described Procridinae taxa from the Volga Region (Lepidoptera: Zygaenidae)

Konstantin A. Efetov & Gerhard M. Tarmann

Abstract

The systematic position of the recently described taxa: *Jordanita* (*Roccia*) *scintillosa* Zolotuhin, 2020, *J.* (*R.*) *smaragdonna* Zolotuhin, 2020, and *Adscita* (*Adscita*) *albanica accola* Zolotuhin & Nedoshivina, 2020, are discussed. *J. scintillosa* and *J. smaragdonna* are considered to be synonyms of *Jordanita* (*Roccia*) *paupera* (Christoph, 1887) and *A. albanica accola* is synonymised with the nominotypical *Adscita albanica* (Naufock, 1926). Moreover, some notes on the book *"Zygaenoid moths (Lepidoptera, Zygaenoidea) of the Middle and Lower Volga Region*" are presented.

Keywords: Lepidoptera, Zygaenidae, Procridinae, new synonymies, Volga Region, Russia.

Sobre los taxones de Procridinae recientemente descritos de la región del Volga (Lepidoptera: Zygaenidae)

Resumen

Se discute la posición sistemática de los taxones recientemente descritos: *Jordanita (Roccia) scintillosa* Zolotuhin, 2020, *J. (R.) smaragdonna* Zolotuhin, 2020 y *Adscita (Adscita) albanica accola* Zolotuhin & Nedoshivina, 2020. *J. scintillosa* y *J. smaragdonna* se consideran sinónimos de *Jordanita (Roccia) paupera* (Christoph, 1887) y *A. albanica accola* se sinonimiza con la nominotípica *Adscita albanica* (Naufock, 1926). Además, se presentan algunas notas sobre el libro *"Zygaenoid moths (Lepidoptera, Zygaenoidea) of the Middle and Lower Volga Region*".

Palabras clave: Lepidoptera, Zygaenidae, Procridinae, nuevas sinonimias, Región del Volga, Rusia.

Introduction

It is well known that Zygaenidae show an exceptional variability in characters that exceeds most of that of others Lepidoptera (Efetov, 1999, 2018; Efetov et al. 2011; Efetov & Savchuk, 2013; Efetov & Tarmann, 2017a; Hofmann & Tremewan, 2017). We find famous examples in the subfamily Chalcosiinae with striking habitus forms in many species and in Zygaeninae with the variability in habitus of the adults and larvae. However, the Procridinae are an example of almost unbelievable character variability (Can et al. 2019; Can Cengiz et al. 2018; Efetov, 2001b, 2004; Efetov et al. 2004, 2006, 2014a, 2014c, 2015a, 2015b, 2016, 2018, 2019a, 2019b; Efetov & Hayashi, 2008; Razov et al. 2012; Subchev et al. 2016; Vrenozi et al. 2019). In habitus, the size, the wing shape, the colour, the sheen and brilliance of the external surface are often variable characters, but anatomical characters are also not at all constant, such as the wing venation and genitalia structures. The tricky situation in this subfamily is that one group can have very constant characters throughout a whole genus but in a related genus these characters are completely variable. Good examples are the genera *Harrisina* Packard, 1864 and *Pampa* Walker, 1854 in America, both with externally uniform and similar looking species, where the first genus shows only little difference in genitalia structures but the second shows constant and therefore good differences between species. Moreover, Zygaenidae are also exceptional in genetic character analyses and there are several groups where DNA barcoding does not give satisfactory resolutions (e. g. genera *Jordanita* Verity, 1946 in the Palaearctic and *Pollanisus* Walker, 1854 in Australia) (Efetov et al. 2019b). To be able to estimate the value of characters for taxonomic decisions correctly a very good overview over the world's complex genera, species, subspecies and individual forms and their character variability is essential.

In *Adscita* Retzius, 1783 and *Jordanita*, the two genera discussed in this paper, characters such as size, wing shape and the colour of the specimens are so variable in single populations that for some species only genitalia characters can guarantee a certain identification. In *Jordanita* especially even size can vary within one and the same population as many species of this genus have larvae that live at least a part of their life endophagous in leaves and stems and the size of the adults also depends on the fitness and size of the larvae before pupation.

If entomologists do not know the variability of characters in the studied groups, sometimes they can describe new taxa based on insufficient knowledge and false arguments.

Recently, two publications appeared (Zolotuhin, 2020; Zolotuhin & Nedoshivina, 2020) with information about three new nominal taxa of Procridinae from the Volga Region, viz. *Jordanita* (*Roccia*) *scintillosa* Zolotuhin, 2020, *J*. (*R*.) *smaragdonna* Zolotuhin, 2020, and *Adscita* (*Adscita*) *albanica accola* Zolotuhin & Nedoshivina, 2020. As we are currently preparing a World Catalogue of Procridinae verification of the systematic position of these taxa is required.

Adscita albanica accola Zolotuhin & Nedoshivina, 2020

The nominal taxon *Procris albanica* was described by Naufock in 1926 from Pashtrik, Albania ("Gefangen wurden die Stücke von H. Zerny und K. Predota auf dem Pashtrik in Albanien in der Zeit vom 4.-14. VII. 1918"). The contemporary status of this species is *Adscita albanica* (Naufock, 1926) (Efetov & Tarmann, 1995, 1999b, 2012, 2014b). The closely related species *Adscita dujardini* was described on the base of morphology and DNA data by Efetov & Tarmann (2014b) (type locality: Italy, Marche, Prov. Macerata, Monte San Vicino W, ca 3 km SW Pian dell'Elmo). The latter species is distributed in southern France (Alpes Maritimes, Aveyron, Herault), Switzerland (Wallis/Valais, Graubünden), Italy (southern and south-western Alps and Apennines southwards to Calabria), and Slovenia. *Adscita albanica* is known from Serbia, Albania, Republic of North Macedonia, Bulgaria, Greece, northern and central Ukraine, as well as in Crimea, Northern Caucasus and the Volga Basin in Russia (Efetov & Tarmann, 2014b; Nahirnic et al. 2016, 2019).

Zolotuhin & Nedoshivina (2020) described the Volga population as a new subspecies, viz. *Adscita albanica accola*. In the description and diagnosis, they write: "External characters of the new subspecies are identical to those of representatives of other populations". The only difference from specimens from other regions is that in some male specimens the process at the apex of sacculus is curved. However, this character is not found in all specimens from the Volga Region. Moreover, as we know, there is significant variability in this character in specimens from other territories. The so-called dentations on the ventral margin of sacculus mentioned by Zolotuhin & Nedoshivina (2020) in some specimens from the Volga Region as well as from the Northern Caucasus is also a variable character and often can be found in the Crimean population. We consider that the above mentioned unstable characters are insufficient for the description of a new subspecies. *Adscita albanica accola* is therefore here synonymised (**syn. n.**) with *Adscita albanica albanica* (Naufock, 1926).

Jordanita scintillosa Zolotuhin, 2020, and *Jordanita smaragdonna* Zolotuhin, 2020

The vast majority of species in Palaearctic Procridinae have good genitalia differences (Efetov, 1996a, 1996b, 1997a, 1997b, 1998, 2001a, 2006, 2010; Efetov et al. 2014b, 2019a; Efetov & Tarmann, 1999a, 2013a, 2013b, 2014a, 2016a, 2016b, 2017a, 2017b).

However, Zolotuhin erected two "valid" species of the genus *Jordanita* Verity, 1946, which have the same genitalia structure as *Jordanita* (*Roccia*) *paupera* (Christoph, 1887). *Jordanita scintillosa* Zolotuhin, 2020, was proposed as nomen novum for *Procris hamifera* f. (ssp.?) *minor* Alberti, 1937 (Zolotuhin, 2020). *Jordanita smaragdonna* was described as a new species and includes populations of *Jordanita paupera* (Christoph, 1887) from the Volga Region and western Kazakhstan. Both, *J. scintillosa* and *J. smaragdonna*, have no stable genitalia differences from *J. paupera* and only weakly differ by habitus from the latter.

For example, Zolotuhin (2020) mentions the following characters for *J. scintillosa*: "proboscis pale (yellow to brownish), short and only reaches a medial part of prothorax, sometimes not spiralled". We examined this character in the lectotype (see below, this specimen is figured by Zolotuhin in his publication as "holotype" on Figure 5) and found (Figure 3) that the proboscis is brown and forms a spiral. In addition, we checked a series of specimens of *Jordanita paupera* from Kopet-Dag in Turkmenistan (from where *Ino paupera* Christoph, 1887, was described) and found that the length and colour of the proboscis is a variable character even in these populations.

All other diagnostic characters of *Jordanita scintillosa* and *J. smaragdonna* mentioned by Zolotuhin (2020) are also very variable within intraspecific variability. These two above mentioned taxa have been already synonymised with *Jordanita paupera* (Christoph, 1887) (Efetov et al. 2022).

It is necessary to discuss here the type series of *Procris hamifera* f. (ssp.?) *minor* Alberti, 1937. Alberti mentions four specimens without a designation of a holotype. It means that all four specimens are syntypes. However, Zolotuhin (2020) on page 8 writes: "Holotype ♂ (ZSM)" (Zoologische Staatssammlung München). Moreover, later, on page 9 Zolotuhin suddenly writes that the male holotytpe [second holotype!] and two male paratypes are in "ZMHUB" (Zoologisches Museum der A. Humboldt Universität, Berlin) and one male paratype [sic] is in "ZSM". We examined the male specimen in Munich (Figure 1) and found that it had the following 6 labels (Figure 2): 1. "Inter Sar-dirja / et Mont. Mugol / Eversmann" (handwritten by Alberti on white paper); 2. "Holotypus" (printed on red paper); 3. "Holotype ♂ / Procris paupera / f. minor" (printed with handwritten inscription "♂" on pink paper); 4. "6858" (handwritten on yellowish white paper); 5. "Abgebildet d.Berlin. / Zoolog.Museum / 1939. B.Alberti" (printed on white paper); 6. "↑. minor Alb." (handwritten by Alberti with black printed frame on white paper).

According to the International Code of Zoological Nomenclature (Code) the pin-label "holotype" under the specimen is not a designation of the holotype. The Code (1999) in article 73.1.3. states: "The holotype of a new nominal species-group taxon can only be fixed in the original publication and by the original author". As Alberti (1937) did not designate a holotype in the original publication, it is necessary for the correct fixation of the nominal taxon *Procris paupera minor* to designate a lectotype. As **Lectotype** we designate here the above mentioned male specimen (Figure 1) with the pin-label "Holotypus" deposited in the ZSM (now ZSBS Zoologische Sammlungen des Bayerischen Staates, München). Moreover, this is the same specimen that is figured in Alberti (1954: 477, plate LX, Figure 4d). This specimen has no right forewing now. As now is visible from label 5, Alberti planned to publish the photo of this specimen in 1939, but in fact it was published later in 1954.

Some mistakes and misprints in the book of Zolotuhin & Nedoshivina (2020)

It is also necessary to mention some mistakes in Zolotuhin & Nedoshivina (2020).

Page 29. It is written that Phaudinae is a subfamily of Zygaenidae. However, it is now generally accepted that Phaudidae is a separate family within Zygaenoidea (Niehuis et al. 2006; Efetov et. al. 2014a).

Page 64. Zolotuhin & Nedoshivina (2020) mentioned *Jordanita* Agenjo, 1940 as a title of the chapter. This name is unavailable according to the Code (designation of a type-species missing). The correct name is *Jordanita* Verity, 1946.

Page 64. *Solaniterna* Efetov, 2004 is not a synonym of the genus *Jordanita* but a valid subgenus of this genus in which it was originally described (Efetov, 2004). Zolotuhin & Nedoshivina (2020) writes that *Solaniterna* was described as a subgenus of *Procris* Fabricius, 1807. This is incorrect.

Page 69. Distribution map of *Jordanita volgensis* (Möschler, 1862). It is not shown that this species also occurs in the Crimea (Efetov & Savchuk, 2009; Efetov & Knyazev, 2014; Knyazev et al. 2015), but in the text on the same page it is mentioned for the Crimea.

Page 74. *Jordanita* (*Roccia*) *notata* (Zeller, 1847) is mentioned. However, this species belongs to the subgenus *Tremewania* Efetov & Tarmann (1999b). The correct combination is: *Jordanita* (*Tremewania*) *notata* (Zeller, 1847).

Page 79. The photo (taken in the Crimea by V. Savchuk) of the larva is figured as *Jordanita* (*Jordanita*) *graeca* (Figure 4). However, this is the larva of another species, viz. *J.* (*J.*) *chloros* (Hübner, 1813).

Page 87. In the distribution of *Adscita albanica* (map and text) southern France and Italy are included (Figure 5). However, this is the distribution of another species, viz. *Adscita dujardini* Efetov & Tarmann, 2014.

Page 88. In the chapter about *Adscita geryon* the male genitalia of *Adscita statices* are figured as those of *A. geryon* (Figure 6).

Page 109. In the chapter about *Zygaena* (*Mesembrynus*) *minos* ([Denis & Schiffermüller], 1775) it is written that the host-plants of this species are *Pimpinella* and *Eryngium*. However, on the same page there is a photo of the larva feeding on *Falcaria vulgaris*, a well-known host-plant from the Crimea (Efetov, 2005).

Page 109. On the distribution map of *Zygaena* (*Mesembrynus*) *minos* Turkey is included in the distribution of this species. However, according to Nahirnić (2019) this species is absent from Turkey. In Turkey the related species *Z.* (*M.*) *diaphana* Staudinger, 1887, occurs.

Some misprints from the above mentioned book are listed below.

Page 29. *Preyeria* (the correct name is *Pryeria*).
Page 29. Callyzygaeninae (the correct name is Callizygaeninae).
Page 30. *Pollanistis* (the correct name is *Pollanisus*).
Page 30. *Harrisona* (the correct name is *Harrisina*).
Page 30. Inuelinae (the correct name is Inouelinae).
Page 95. *Z. caentaureae* (the correct name is *Z. centaureae*).
Page 96. *Z. brazae* (the correct name is *Z. brizae*).

We also found correct citations missing in some cases.

Page 29. Figure 8 of *Inouela* is taken from the papers of Efetov (1999) and Efetov & Tarmann (2017a) without citations.

Page 56. Figures 38.4 and 38.5 are taken from Efetov & Tarmann (1999) without citation.

Acknowledgments

We thank Mr Ulf Buchsbaum (Germany) for taking photos of the type specimen of *Procris hamifera minor* Alberti, 1937. We are indebted to Dr O. G. Gorbunov (Russia) for fruitful discussions. Last but not least we thank Dr A. Spalding (Great Britain) for editing the English text.

References

Alberti, B. (1937/1938). Revision und Neubeschreibungen asiatischer *Procris*-Arten. *Mitteilungen der Münchner Entomologischen Gesellschaft, 27*, 67-101 (25-VI-1937), 116-126 (15-II-1938).

Alberti, B. (1954). Über die stammesgeschichtliche Gliederung der Zygaenidae nebst Revision einiger Gruppen (Insecta, Lepidoptera). *Mitteilungen aus dem Zoologischen Museum der Humboldt-Universität Berlin, 30*, 115-480.

Can, F., Efetov, K. A., Burmann, J., Kaya, K., Kucherenko, E. E., Ulaşli, B., & Tarmann, G. M. (2019). A study of the Zygaenidae (Lepidoptera) fauna of Central Anatolia, Turkey. *Turkish Journal of Entomology (Türkiye Entomoloji Dergisi), 43*(2), 189-199.

Can Cengiz, F., Efetov, K. A., Kaya, K., Kucherenko, E. E., Okyar, Z., & Tarmann, G. M. (2018). Zygaenidae (Lepidoptera) of Thrace Region of Turkey. *Nota lepidopterologica, 41*(1), 23-361.

Efetov, K. A. (1996a). The description of the female of *Adscita* (*Zygaenoprocris*) *rjabovi* (Alberti, 1938) (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 47*(1), 31-35.

Efetov, K. A. (1996b). The description of the female of *Illiberis* (*Alterasvenia*) *yuennanensis* Alberti, 1951 (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 47*(2), 111-113.

Efetov, K. A. (1997a). Two new species of the genus *Artona* Walker, 1854 (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 48*(3), 165-177.

Efetov, K. A. (1997b). Three new species of the genus *Illiberis* Walker, 1854, from Taiwan and Vietnam (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 48*(4), 231-244.

Efetov, K. A. (1998). A revision of the genus *Goe* Hampson, [1893] (Lepidoptera: Zygaenidae, Procridinae), with descriptions of two new species. *Entomologist's Gazette, 49*(1), 49-62.

Efetov, K. A. (1999). *Inouela* gen. n. from Japan and Taiwan (Lepidoptera: Zygaenidae, Chalcosiinae). *Entomologist's Gazette, 50*(2), 91-95.

Efetov, K. A. (2001a). On the systematic position of *Zygaenoprocris* Hampson, 1900 (Lepidoptera: Zygaenidae, Procridinae) and the erection of two new subgenera. *Entomologist's Gazette, 52*(1), 41-48.

Efetov, K. A. (2001b). An annotated check-list of Forester moths (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 52*(3), 153-162.

Efetov, K. A. (2004). *Forester and Burnet Moths (Lepidoptera: Zygaenidae). The genera Theresimima Strand, 1917, Rhagades Wallengren, 1863, Zygaenoprocris Hampson, 1900, Adscita Retzius, 1783, Jordanita Verity, 1946 (Procridinae), and Zygaena Fabricius, 1775 (Zygaeninae)*. CSMU Press.

Efetov, K. A. (2005). *The Zygaenidae (Lepidoptera) of the Crimea and other regions of Eurasia*. CSMU Press.

Efetov, K. A. (2006). Nine new species of the genus *Chrysartona* Swinhoe, 1892 (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 57*(1), 23-50.

Efetov, K. A. (2010). *Illiberis* (*Hedina*) *louisi* sp. nov. (Lepidoptera: Zygaenidae, Procridinae) from China. *Entomologist's Gazette, 61*(4), 235-241.

Efetov, K. A. (2018). *Zygaena* (*Agrumenia*) *sedi cimmerica* Efetov, a new subspecies from the Crimea (Lepidoptera: Zygaenidae, Zygaeninae). *SHILAP Revista de lepidopterología, 46*(182), 347-351.

Efetov, K. A., & Hayashi, E. (2008). On the chaetotaxy of the first instar larva of *Artona martini* Efetov, 1997 (Lepidoptera: Zygaenidae, Procridinae, Artonini). *Entomologist's Gazette, 59*(2), 101-104.

Efetov, K. A., Hofmann, A., & Tarmann, G. M. (2014b). Application of two molecular approaches (use of sex attractants and DNA barcoding) allowed to rediscover *Zygaenoprocris eberti* (Alberti, 1968) (Lepidoptera, Zygaenidae, Procridinae), hitherto known only from the female holotype. *Nota lepidopterologica, 37*(2), 151-160. https://doi.org/10.3897/nl.37.7871

Efetov, K. A., Hofmann, A., Tarmann, G. M., & Tremewan, W. G. (2014a). Taxonomic comments on the treatment of the Zygaenidae (Lepidoptera) in volume 3 of *Moths of Europe*, Zygaenids, Pyralids 1 and Brachodids (2012). *Nota lepidopterologica, 37*(2), 123-133. https://doi.org/10.3897/nl.37.7940

Efetov, K. A., Kirsanova, A. V., Lazareva, Z. S., Parshkova, E. V., Tarmann, G. M., Rougerie, R., & Hebert, P. D. N. (2019b). DNA barcoding of Zygaenidae (Lepidoptera): results and perspectives. *Nota lepidopterologica, 42*(2), 137-150.

Efetov, K. A., & Knyazev, S. A. (2014). New records of *Jordanita* (*Roccia*) *volgensis* (Möschler, 1862) (Lepidoptera: Zygaenidae, Procridinae) from Siberia (Russia) and Ukraine. *Entomologist's Gazette, 65*(3), 175-178.

Efetov, K. A., Knyazev, S. A., & Kucherenko, E. E. (2022). The first record of *Jordanita* (*Solaniterna*) *subsolana* (Staudinger, 1862) from Kazakhstan (Lepidoptera: Zygaenidae, Procridinae). *SHILAP Revista de lepidopterología, 50*(198), 233-239.

Efetov, K. A., Koshio, C., & Kucherenko, E. E. (2018). A new synthetic sex attractant for males of *Illiberis* (*Primilliberis*) *pruni* Dyar, 1905 (Lepidoptera: Zygaenidae, Procridinae). *SHILAP Revista de lepidopterología, 46*(182), 263-270.

Efetov, K. A., Kucherenko, E. E., Parshkova, E. V., & Tarmann, G. M. (2016). 2-butyl 2-dodecenoate, a new sex attractant for *Jordanita* (*Tremewania*) *notata* (Zeller, 1847) and some other Procridinae species (Lepidoptera: Zygaenidae). *SHILAP Revista de lepidopterología, 44*(175), 519-527.

Efetov, K. A., Parshkova, E. V., Baevsky, M. Y., & Poddubov, A. I. (2014c). *Sec*-butyl ester of dodecenoate: synthesis and attractive properties. *Ukrainian Biochemical Journal, 86*(6), 175-182. https://doi.org/10.15407/ubj86.06.175

Efetov, K. A., Parshkova, E. V., & Koshio, C. (2004). The karyotype of *Illiberis* (*Primilliberis*) *rotundata* Jordan, [1907] (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 55*(3), 167-170.

Efetov, K. A., Parshkova, E. V., Tarasova, L. G., & Tarmann, G. M. (2015a). The karyotypes of Procridinae (Lepidoptera: Zygaenidae), with the first record of the karyotype of *Pollanisus commoni* Tarmann, 2004, a representative of the tribe Artonini. *Entomologist's Gazette, 66*(2), 121-125.

Efetov, K. A., & Savchuk, V. V. (2009). The first record of *Jordanita* (*Roccia*) *volgensis* (Möschler, 1862) (Lepidoptera: Zygaenidae, Procridinae) from the Crimea. *Entomologist's Gazette, 60*(3), 155-158.

Efetov, K. A., & Savchuk, V. V. (2013). Newly discovered morphs of *Zygaena dorycnii* Ochsenheimer, 1808 (Lepidoptera: Zygaenidae, Zygaeninae) in the Crimea, Ukraine. *Entomologist's Gazette, 64*(2), 111-115.

Efetov, K. A., & Tarmann, G. M. (1995). An annotated checklist of the Palaearctic Procridinae (Lepidoptera: Zygaenidae), with descriptions of new taxa. *Entomologist's Gazette, 46*(1), 63-103.

Efetov, K. A., & Tarmann, G. M. (1999a). On the systematic position of *Procris fusca* Leech, [1889] (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 50*(3), 163-168.

Efetov, K. A., & Tarmann, G. M. (1999b). *Forester Moths*. Apollo Books.

Efetov, K. A., & Tarmann, G. M. (2012). *A checklist of the Palaearctic Procridinae (Lepidoptera: Zygaenidae)*. CSMU Press.

Efetov, K. A., & Tarmann, G. M. (2013a). *Illiberis* (*Alterasvenia*) *cernyi* sp. nov. (Lepidoptera: Zygaenidae, Procridinae) from northern Thailand. *Entomologist's Gazette, 64*(1), 33-39.

Efetov, K. A., & Tarmann, G. M. (2013b). *Chrysartona* (*Chrystarmanna*) *mineti* sp. nov. (Lepidoptera: Zygaenidae, Procridinae) from northern Vietnam. *Entomologist's Gazette, 64*(3), 197-206.

Efetov, K. A., & Tarmann, G. M. (2014a). *Illiberis* (*Alterasvenia*) *banmauka* sp. nov. (Lepidoptera: Zygaenidae, Procridinae) from China and Myanmar. *Entomologist's Gazette, 65*(1), 62-70.

Efetov, K. A., & Tarmann, G. M. (2014b). A new European species, *Adscita dujardini* sp. nov. (Lepidoptera: Zygaenidae, Procridinae) confirmed by DNA analysis. *Entomologist's Gazette, 65*(3), 179-200.

Efetov, K. A., & Tarmann, G. M. (2016a). *Pseudophacusa multidentata* Efetov & Tarmann, a new genus and species of Procridini from Myanmar, China and Laos (Lepidoptera: Zygaenidae, Procridinae). *SHILAP Revista de lepidopterología, 44*(173), 81-89.

Efetov, K. A., & Tarmann, G. M. (2016b). A new *Illiberis* species: *I.* (*Alterasvenia*) *kislovskyi* (Lepidoptera: Zygaenidae, Procridinae) from Myanmar. *Entomologist's Gazette, 67*(2), 137-142.

Efetov, K. A., & Tarmann, G. M. (2017a). The hypothetical ground plan of the Zygaenidae, with a review of the possible autapomorphies of the Procridinae and the description of the Inouelinae subfam. nov. *Journal of the Lepidopterists' Society, 71*(1), 20-49. https://doi.org/10.18473/lepi.v71i1.a5

Efetov, K. A., & Tarmann, G. M. (2017b). *Thibetana keili* Efetov & Tarmann, a new species of the genus *Thibetana* Efetov & Tarmann, 1995, from Tibet (Lepidoptera: Zygaenidae, Procridinae, Artonini). *SHILAP Revista de lepidopterología, 45*(180): 581-587.

Efetov, K. A., Tarmann, G. M., Hayashi, E., & Parshkova, E. V. (2006). New data on the chaetotaxy of the first instar larvae of Procridini and Artonini (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 57*(4), 229-233.

Efetov, K. A., Tarmann, G. M., & Parshkova, E. V. (2019a). *"Ino Budensis* var. *Mollis*" Grum-Grshimailo, 1893 (Lepidoptera: Zygaenidae) from Eastern Asia recognized as a valid species on the base of morphological and molecular analysis. *Zootaxa, 4619*(3), 518-526. http://dx.doi.org/10.11646/zootaxa.4619.3.5

Efetov, K. A., Tarmann, G. M., Toshova, T. B., & Subchev, M. A. (2015b). Enantiomers of 2-butyl 7*Z*-dodecenoate are sex attractants for males of *Adscita mannii* (Lederer, 1853), *A. geryon* (Hübner, 1813), and *Jordanita notata* (Zeller, 1847) (Lepidoptera: Zygaenidae, Procridinae) in Italy. *Nota lepidopterologica, 38*(2), 161-169.

Efetov, K. A., Tarmann, G. M., & Tremewan, W. G. (2011). *Zygaena nevadensis* Rambur, 1858 (Lepidoptera: Zygaenidae, Zygaeninae) newly recorded from the southern tip of the Penisola Appenninica (Apennine Peninsula), Italy. *Entomologist's Gazette, 62*(2), 123-129.

Hofmann, A. F., & Tremewan, W. G. (2017). The Natural History of Burnet Moths (*Zygaena* Fabricius, 1775) (Lepidoptera: Zygaenidae), Part 1. *Proceedings of the Museum Witt Munich, 6*(2), 1-631.

Knyazev, S. A., Efetov, K. A., & Ponomaryov, K. B. (2015). Zygaenidae (Lepidoptera) from Omsk Region. *Zoologicheskii Zhurnal, 94*(11), 1297-1302.

Nahirnić, A. (2019). *Zygaena diaphana* Staudinger, 1887 bona species (Lepidoptera: Zygaenidae). *SHILAP Revista de lepidopterología, 47*(186), 341-347.

Nahirnić, A., Jakšić, P., Marković, M., & Zlatković, B. (2016). New data on rare Zygaenidae and their habitats from eastern Serbia. In G. M. Tarmann, W. G. Tremewan & A. Spalding (eds). *XV International Symposium on Zygaenidae 11-18 September 2016 Mals/Malles, Südtirol/Alto Adige, Italy*. Book of Abstracts: 29.

Nahirnić, A., Jakšić, P., Marković, M., & Zlatković, B. (2019). New data on rare Zygaenidae (Lepidoptera) and their habitats from eastern Serbia. *Acta zoologica bulgarica, 71*(4), 491-500, 1 map, 2 tabs, 6 figs.

Niehuis, O., Yen, S.-H., Naumann, C. M., & Misof, B. (2006). Higher phylogeny of zygaenid moths (Insecta: Lepidoptera) inferred from nuclear and mitochondrial sequence data and the evolution of larval cuticular cavities for chemical defence. *Molecular Phylogenetics and Evolution, 39*, 812-829. https://doi.org/10.1016/j.ympev.2006.01.007

Razov, J., Efetov, K. A., Franin, K., Toshova, T. B., & Subchev, M. A. (2017). The application of sex pheromone traps for recording the Procridinae fauna (Lepidoptera: Zygaenidae) in Croatia. *Entomologist's Gazette, 68*(1): 49-53.

Subchev, M. A., Efetov, K. A., Toshova, T. B., & Koshio, C. (2016). Sex pheromones as isolating mechanisms in two closely related *Illiberis* species - *I.* (*Primilliberis*) *rotundata* Jordan, 1907, and *I.* (*P.*) *pruni* Dyar, 1905 (Lepidoptera: Zygaenidae, Procridinae). *Entomologist's Gazette, 67*(1), 51-57.

Vrenozi, B., Toshova, T. B., Efetov, K. A., Kucherenko, E. E., Rredhi, A., & Tarmann, G. M. (2019). The first well-documented record of the vine bud moth *Theresimima ampellophaga* (Bayle-Barelle, 1808) in Albania established by field screening of sex pheromone and sex attractant traps (Lepidoptera: Zygaenidae, Procridinae). *SHILAP Revista de lepidopterología, 47*(187), 567-576.

Zolotuhin, V. V. (2020). What is *Jordanita paupera* (Christoph, 1887) in the Lower Volga Region? (Lepidoptera: Zygaenidae). *Eversmannia, 62*, 3-11.

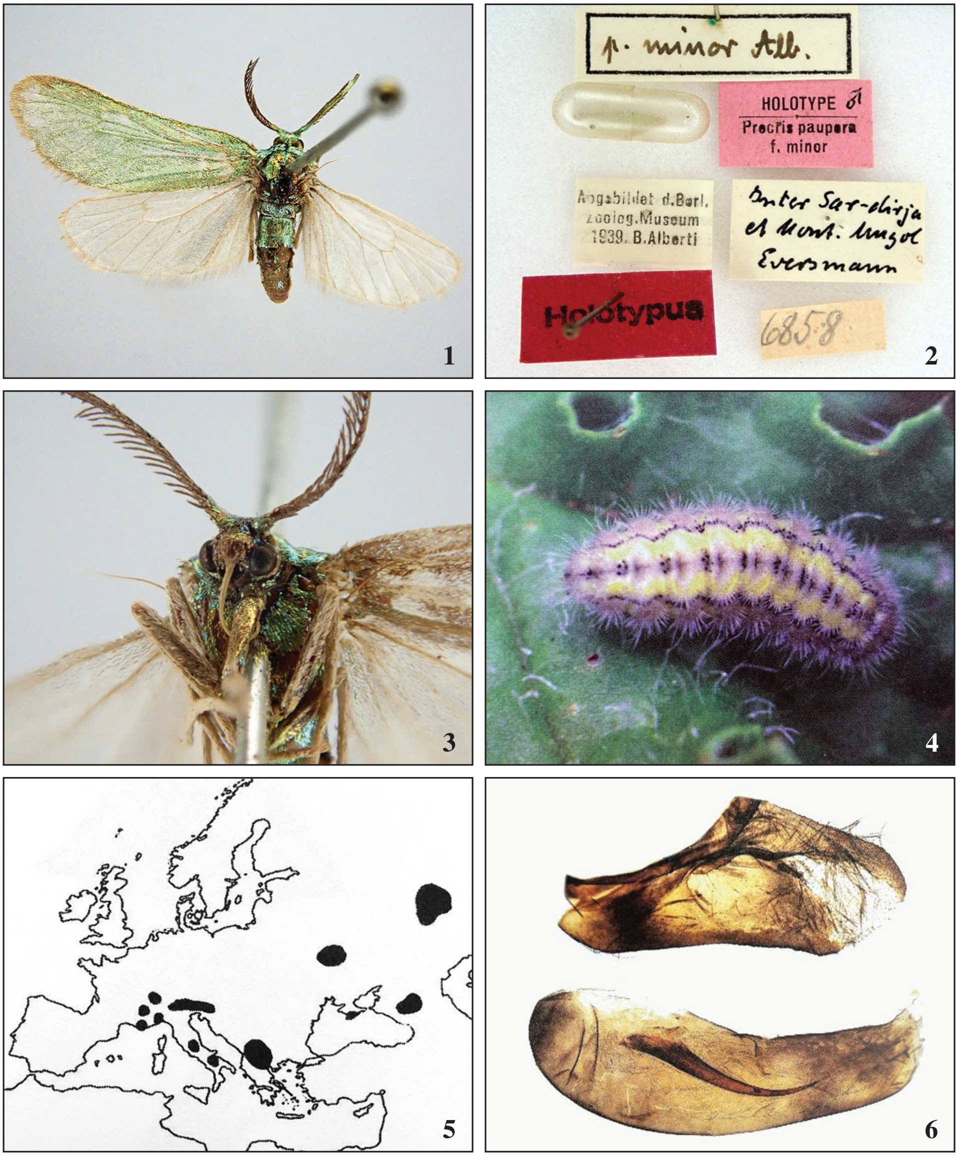
Zolotuhin, V. V., & Nedoshivina, S. V. (2020). *Zygaenoid moths (Lepidoptera: Zygaenoidea) of the Middle and Lower Volga Region*. Korporatsiya Technologiy Prodvizhenia.

*Konstantin A. Efetov
V. I. Vernadsky Crimean Federal University
RU-295051 Simferopol
CRIMEA / *CRIMEA*
E-mail: shysh1981@mail.ru
https://orcid.org/0000-0003-1468-7264

Gerhard M. Tarmann
Sammlungs und Forschungszentrum der Tiroler Landesmuseen
Krajnc-Straße, 1
A-6060 Hall
AUSTRIA / *AUSTRIA*
E-mail: g.tarmann@tiroler-landesmuseen.at
https://orcid.org/0000-0002-7360-5698

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 12-III-2022)
(Revisado y aceptado / *Revised and accepted* 17-III-2022)
(Publicado / *Published* 30-XII-2022)



Figures 1-6. 1. Lectotype male of *Procris hamifera minor* Alberti, 1937 (ZSM, Munich). **2.** Pin-labels of lectotype male of *Procris hamifera minor*. **3.** The head of lectotype male of *Procris hamifera minor*. **4.** The larva of *Jordanita chloros* (Hübner, 1813) figured in Zolotuhin & Nedoshivina (2020, p. 81) as the larva of *Jordanita graeca* (Jordan, 1907). **5.** Distribution of *Adscita dujardini* Efetov & Tarmann, 2014 (southern France, Switzerland, Italy and Slovenia) and *Adscita albanica* (Naufock, 1926) (Balkans, Ukraine, Russia) figured in Zolotuhin & Nedoshivina (2020, p. 87) as the distribution of *Adscita albanica* only. **6.** Male genitalia of *Adscita statices* (Linnaeus, 1758) figured in Zolotuhin & Nedoshivina (2020, p. 88) as those of *A. geryon* (Hübner, 1813).

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 673-676 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.256

Nuevas aportaciones sobre *Ocnogyna breveti* (Oberthür, 1882) en España (Lepidoptera: Erebidae, Arctiinae)

Ramón Macià & Josep Ylla

Resumen

Se registra la captura de un nuevo ejemplar de *Ocnogyna breveti* (Oberthür, 1882) en territorio peninsular español, siendo esta la segunda cita de dicha especie para la Península Ibérica y Europa. Así mismo, se dan a conocer otras capturas en territorio español y marroquí y se proporcionan datos sobre el ciclo biológico y la distribución geográfica. Se proporcionan ilustraciones con las imágenes de los ejemplares indicados.

Palabras clave: Lepidoptera, Erebidae, Arctiinae, *Ocnogyna breveti*, faunística, España.

New contributions on *Ocnogyna breveti* (Oberthür, 1882) in Spain (Lepidoptera: Erebidae, Arctiinae)

Abstract

The capture of a new specimen of *Ocnogyna breveti* (Oberthür, 1882) in the Spanish peninsular territory is recorded, this being the second mention of this species for the Iberian Peninsula and Europe. Likewise, other captures in Spanish and Moroccan territory are reported and data on the biological cycle and geographical distribution are included. Illustrations are provided with images of the specimens indicated.

Keywords: Lepidoptera, Erebidae, Arctiinae, *Ocnogyna breveti*, faunistic, Spain.

Introducción

Ocnogyna breveti (Oberthür, 1882) fue descrita por Oberthür (1882) como *Trichosoma breveti* sobre un macho capturado en los alrededores de Tlemcen (Argelia).

Freina & Witt (1984) crearon el género *Maurica* en el cual incluyeron a *T. breveti*; posteriormente Witt & Ronkay (2011) consideraron mantenerla dentro del género *Ocnogyna* Lederer, 1853. Estos autores, fijándose en caracteres como el número de pares de espolones de la tibia del tercer par de patas (un par en *Maurica* y dos pares en *Ocnogyna*) o la reducción del tamaño de las alas en las hembras (completamente aladas en *Maurica* y ápteras o braquípteras en *Ocnogyna*), llegan a la conclusión de que por el momento es mejor mantener a *T. breveti* dentro del género *Ocnogyna*. En su opinión admiten que la relegación supraespecífica del grupo de especies *breveti* (*Maurica*) es discutible, y el contenido taxonómico de *Ocnogyna* sigue siendo una cuestión abierta. Se precisa una investigación más a fondo, estudio molecular incluido.

Ocnogyna breveti se ha considerado como una especie endémica del norte de África, donde ha sido citada de Marruecos y Argelia. Es bivoltina, con una primera generación, de enero a junio y otra de septiembre a noviembre. Vive en altitudes desde el nivel del mar hasta los 1.200 m o más, siendo sus biotopos preferidos los terrenos baldíos y cauces de ríos con cantos rodados y escasa vegetación. Sus orugas son polífagas (Ylla et al. 2011).

Material y métodos

Los especímenes representados fueron capturados mediante la utilización de trampas de luz actínica tipo Heath de 6W o UV de 4W, alimentadas por batería, a excepción del ejemplar de Losar de la Vera (Cáceres, España), que fue capturado de día posado en una pared de una gasolinera atraído por la luz de esta. El ejemplar de Ikebbouzene (cerca de Nador, Marruecos) se recolectó como larva en su último estadio.

Las fotografías representadas están tomadas con una cámara digital Nikon D90. El programa Adobe Photoshop © se ha utilizado para la edición de las ilustraciones.

Resultados

Hasta el presente solo se conocía en España la captura, hace más de 30 años, de un único ejemplar macho, que por lo insólito de su presencia y ausencia de avistamientos posteriores nos podría llevar a pensar que dicho ejemplar hubiese llegado como consecuencia de un transporte accidental (Blázquez et al. 1998) (Figura 1).

Muy recientemente (31-III-2022), el primero de los autores, capturó el segundo ejemplar español de *O. breveti*. La captura tuvo lugar en la playa almeriense de Torregarcía, en el transcurso de una prospección nocturna. A priori se podría pensar que *O. breveti* hubiera ya colonizado la costa almeriense, sin embargo, lo más probable es que el ejemplar capturado procediera de Marruecos, desde donde hubiera sido arrastrado por las fuertes borrascas que tuvieron lugar durante varios días del mes de marzo, con un muy fuerte viento de siroco dotado con una notable capacidad de arrastre, como quedó de manifiesto por la gran cantidad de polvo transportado hacia la Península Ibérica. Sólo, mediante futuras prospecciones se podrá saber si *O. breveti* ha colonizado o no la costa de Almería. De momento, ésta es la segunda cita para la Península Ibérica y el continente europeo.

Otro hallazgo interesante, aunque menos sorprendente, ha sido el encuentro de dos machos en la península del cabo de Tres Forcas, Melilla (España), dentro territorio español por D. Sochi el 31-I-2000 (Figuras 2-3). Dicho cabo está situado en el extremo de una pequeña península situada en aguas del mediterráneo, administrativamente en la actualidad, la mayor parte pertenece a Marruecos (Nador) pero la parte oriental pertenece a España (Melilla).

Aparte de la presencia de *O. breveti* en esta pequeña península, los autores dan a conocer dos nuevas citas en los alrededores de Midar y Nador, localidades del norte de Marruecos (Figuras 5-6).

Material estudiado

ESPAÑA, ALMERÍA, Playa Torregarcía, a 18 m, 1 ♂, 31-III-2022, R. Macià, M. Rondós y J. Muñoz leg.; CÁCERES, Losar de la Vera, a 400 m, 1 ♂, 16-IV-1991, J. Martín leg.; MELILLA, península del cabo de Tres Forcas, 2 ♂♂, 31-I-2000, D. Sechi leg.

MARRUECOS, Ikebbouzene, alrededores de Nador, a 50 m, 1 ♂ ex larva, 30-V-2000, R. Macià y J. Ylla leg.; 3 km al este de Midar, a 450 m, 1 ♂, 26-V-2017, R. Macià, J. Ylla y M. Rondós leg.

Agradecimientos

A Martí Rondós y Josep Muñoz por su compañía en los muestreos; al Sr. Sechi por cedernos los dos especímenes capturados en la península del cabo de Tres Forcas (Melilla, España) y a la Dirección General de Medio Natural, Biodiversidad y Espacios Protegidos de la Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible de Andalucía (España) por concedernos los permisos necesarios para la realización de los muestreos.

Referencias

Blázquez, A., Macià, R., & Ylla, J. (1998). *Maurica breveti* (Obth., 1882), especie nueva para la Península Ibérica y Europa (Lepidoptera: Arctiidae). *SHILAP Revista de lepidopterologia, 26*(104), 231-233.

Freina, J. J., & Witt, T. J. (1984). Taxonomische Veränderungen bei den Bombyces und Sphinges Europas und Nordwestafrikas. Zwei neue Arctiidaegattungen für den westpaläarktischen Faunenbereich: *Watsonarctia* gen. n. und *Maurica* gen. n. (Lepidoptera, Arctiidae). *Entomofauna, 5*(28), 323-334.

Oberthür, C. (1882). Description d'une nouvelle espèce de Lépidoptère Hétérocère d'Algérie: *Trichosoma breveti* Oberthür. *Bulletin de la Société Entomologique de France, 6*(2), 174.

Witt, T. J., & Ronkay, L. (2011). Lymantriinae and Arctiinae including Phylogeny and Check List of the Quadrifid Noctuoidea of Europe. *Noctuidae Europaea* (Vol. 13). Entomological Press.

Ylla, J., Macià, R., & Gastón, J. (2010). *Manual de Identificación y Guía de Campo de los Árctidos de la Península Ibérica y Baleares*. Argania editio.

*Ramón Macià
Bisbe Morgades, 41-3º-1ª
E-08500 Vic (Barcelona)
ESPAÑA / *SPAIN*
E-mail: rmaciavila@gmail.com
https://orcid.org/0000-0002-2166-1540

Josep Ylla
Principal, 8
Urbanización Serrabonica
E-08503 Gurb (Barcelona)
ESPAÑA / *SPAIN*
E-mail: josep.ylla@gmail.com
https://orcid.org/0000-0001-7280-9421

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 19-IV-2022)
(Revisado y aceptado / *Revised and accepted* 20-IV-2022)
(Publicado / *Published* 30-XII-2022)


1


2


3


4


5


6

Figuras 1-6. *Ocnogyna breveti*. **1.** Losar de la Vera (Cáceres), España, 50 m, 16-IV-1991. **2-3.** Península del cabo de Tres Forcas (Melilla), España, 31-I-2000. **4.** Playa Torregarcía (Almería), España, 18 m, 31-III-2022. **5.** 3 Km este de Midar, Marruecos, 450 m, 26-V-2017. **6.** Ikebbouzene (alrededores de Nador), Marruecos, 50 m, 30-V-2000.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 677-679 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.257

On the presence of *Ephestia woodiella* Richards & Thomson, 1932 in the Maltese Islands (Lepidoptera: Pyralidae, Phycitinae)

Paul Sammut, Anthony Seguna, John J. Borg & Aldo Catania

Summary

The species *Ephestia woodiella* Richards & Thomson, 1932 is recorded for the first time from the Maltese Islands.

Keywords: Lepidoptera, Pyralidae, Phycitinae, *Ephestia* woodiella, new records, Maltese Islands.

Sobre la presencia de *Ephestia woodiella* **Richards & Thomson, 1932 en Malta**
(Lepidoptera: Pyralidae, Phycitinae)

Resumen

Se registra por primera vez para Malta, la especie *Ephestia woodiella* Richards & Thomson, 1932.

Palabras clave: Lepidoptera, Pyralidae, Phycitinae, *Ephestia woodiella*, nuevo registro, Malta.

Introduction

The taxon *E. woodiella* Richards & Thomson, 1932, at one time was considered a subspecies of *Ephestia unicolorella* Staudinger, 1881 (Roesler, 1973). Gumhalter (2019), following Fauna Europaea, considered *Ephestia woodiella* Richards & Thomson 1932, as a subspecies of *Ephestia unicolorella* Staudinger, 1881.

Leraut (2014) established that *E. unicolorella* is distinct both from *E. parasitella* and from *E. woodiella*. According to Leraut (2014), *E. unicolorella* is known from Morocco, Turkey, Iran, and Syria, but not from Europe.

According to Sammut (2020), Roesler (1973) included Malta in the distribution of the species *E. parasitella unicolorella*. Karsholt & Razowski (1996) in their checklist of European Lepidoptera listed Malta in the distribution of *E. parasitella parasitella* Staudinger, 1859. Recently, Gumhalter (2019) included Malta in the distribution of *E. unicolorella woodiella* (Richards & Thomson, 1932). This is incorrect.

From some "old" material sent to F. Slamka by one of the authors (PS) for identification, he identified a male *Ephestia* as belonging to the taxon *E. woodiella*. Independently, a second author (AS) had sent similar material to J. Asselbergs, amongst which two *Ephestia* specimens were determined by genitalia as belonging also to *E. woodiella*.

Ephestia woodiella is a widespread European species, occurring also in countries along the Mediterranean and the larger islands within it. The larvae are said to feed on dry vegetable matter. Unlike the other *Ephestia* species occurring in Malta, this does not appear to be a pest of stored grain and foods. The localities from where the three specimens have been recorded are open countryside, mostly garigue. All specimens have been recorded using 150w MV light.

Material examined

MALTA: Siġġiewi, Għar Lapsi, 1 ♂, 23-IV-1999 [GP. Slamka 2157), P. Sammut leg; Qormi, Wied il-Kbir, 1 ♂, 21-IV-1999 [GP. Asselbergs 5800], Seguna leg; Dwejra, l/o Rabat, 1 ♀, 9-VI-2007 [GP. Asselbergs 5810], Seguna leg.

Ephestia woodiella Malta, Siġġiewi, Għar Lapsi, 23-IV-1999

Conclusion

Locally, the genus *Ephestia* Guenée, 1845, is represented by five species, namely *Ephestia kuehniella* Zeller, 1879, *Ephestia welseriella* (Zeller, 1848), *Ephestia elutella* (Hübner, 1796), *Ephestia parasitella* Staudinger, 1859 and the new *Ephestia woodiella* Richards & Thomson, 1932. We propose the Maltese vernacular name “Efestja ta’ Wood” for the new record *E. woodiella.*

Acknowledgement

We would like to thank František Slamka of Bratislava, Slovakia, and Jan Asselbergs (†) of Bergen op Zoom, The Netherlands, who both identified and prepared genitalia of *Ephestia woodiella*, and Dr Antonio Vives, Madrid, Spain for taking care of the Spanish text.

References

Gumhalter, D. (2019). A revised checklist of the Pyraloid moths (Lepidoptera: Pyraloidea) in Croatia. *Natura Croatica, 28*(2), 271-287.
Karsholt, O., & Razowski, J. (1996). *The Lepidoptera of Europe - A Distributional Checklist*. Apollo Books.
Leraut, P. (2014). *Moths of Europe. Pyralids 2* (Vol. 4). N. A. P. Editions.
Sammut, P. (2020). *Systematic and Synonymic list of the Lepidoptera of the Maltese Islands.* Malta.
Richards, O. W., & Thomson, M. A. (1932). A contribution to the study of the genera *Ephestia* Gn. (including *Strymax* Dyar) and *Plodia* Gn. (Lepidoptera, Phycitidae) with notes on the parasites of the larvae. *Transactions of the Entomological Society of London, 80*(2), 169-247.
Roesler, U. (1973). Phycitinae. In H. G. Amsel, F. Gregor & H. Reisser (eds). *Microlepidoptera Palaearctica* (Vol. 4). Verlag Georg Fromme & Co.

Paul Sammut
137/2, Dingli Road, Pjazza San Publju
MT-Mdina MDN 1011
MALTA / *MALTA*
E-mail: farfett@onvol.net
https://orcid.org/0000-0002-2019-9577

Anthony Seguna
68 Redeemer, Triq l-Emigrant
MT-Naxxar NXR3200
MALTA / *MALTA*
E-mail: seguna@onvol.net
https://orcid.org/0000-0002-6264-0690

John J. Borg
National Museum of Natural History
Pjazza San Publju
MT-Mdina MDN 1011
MALTA / *MALTA*
E-mail: john.j.borg@gov.mt
https://orcid.org/0000-0002-0587-3682

*Aldo Catania
27, Rama-Rama, Triq Mons, Anton Cilia
MT- ebbug ZBG3140
MALTA / *MALTA*
E-mail: aldocatania47@gmail.com
https://orcid.org/0000-0001-7559-143X

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 11-IV-2022)
(Revisado y aceptado / *Revised and accepted* 23-IV-2022)
(Publicado / *Published* 30-XII-2022)

PUBLICACIONES DISPONIBLES EN LA SOCIEDAD *SOCIETY PUBLICATIONS AVAILABLE*

Los precios que a continuación se detallan son especiales para los Socios de SHILAP. Estos precios incluyen el envío por correo aéreo y el embalaje. El pago se efectuará al **CONTADO** (en un doble sobre), **GIRO POSTAL, WESTERN UNION**, **TARJETA DE CRÉDITO** (VISA / MASTERCARD), o por **TRANSFERENCIA BANCARIA** (IBAN: ES06 0182 1216 2802 0151 5543, BIC: BBVAESMMXXX) (costes bancarios para el remitente) y enviado a: SHILAP; Apartado de correos, 331; E-28080 Madrid (España) / *Prices mentioned below are specials for members of SHILAP. These prices include air mail and packing. Payment may be by* ***CASH*** *(under double envelope),* ***INTERNATIONAL POSTAL MONEY ORDER****,* ***WESTERN UNION, CREDIT CARD*** *(VISA / MASTERCARD), or* ***BANK TRANSFER*** *(IBAN: ES06 0182 1216 2802 0151 5543, BIC: BBVAESMMXXX) (bank charges for the customer) and sent to: SHILAP; Apartado de correos, 331; E-28080 Madrid (Spain).*

	España *Spain*	Europa *Europe*	Otros países *Other countries*
CALLE, J. A., 1982.– Noctuidos españoles	15 euros	20 euros	25 euros
GARCIA-BARROS, E., MUNGUIRA, M. L. STEFANESCU, S. & VIVES MORENO, A., 2013.– Papilionoidea. Fauna Ibérica volumen 37	97 euros	124 euros	130 euros
GÓMEZ DE AIZPÚRUA, C. & ARROYO VARELA, M., 1994.– Principales Noctuidos actuales de interés agrícola	15 euros	20 euros	25 euros
GÓMEZ DE AIZPÚRUA, C., 1985.– Biología y morfología de las orugas. Lepidoptera, tomo I: Noctuidae-Dilobidae	26 euros	30 euros	40 euros
GÓMEZ DE AIZPÚRUA, C., 1987.– Biología y morfología de las orugas. Lepidoptera, tomo III: Geometridae	26 euros	30 euros	40 euros
GÓMEZ DE AIZPÚRUA, C., 1992.– Biología y morfología de las orugas. Lepidoptera, tomo X: Noctuidae	15 euros	20 euros	25 euros
MASÓ PLANES, A., 2020.– Ecología y Evolución de los Papilionoidea del Paleártico Occidental (Hexapoda: Lepidoptera)	40 euros	50 euros	60 euros
KENNEL, J. (1908-1921) 1921.– Die Palearktischen Tortriciden. Eine monographische Darstellung. 24 planchas a todo color, todas las planchas, no texto, encuadernadas con las tapas originales	100 euros	125 euros	150 euros
VIVES MORENO, A., 1988.– Catálogo mundial sistemático y de distribución de la familia Coleophoridae Hübner, [1825] (Insecta: Lepidoptera)	10 euros	15 euros	20 euros
VIVES MORENO, A., 2014.– 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)	90 euros	99 euros	110 euros
SHILAP Revista de lepidopterología			
Números / *Numbers* 1-104, cada uno / *each one*	10 euros	15 euros	20 euros
Números /*Numbers* 105-180, cada uno / *each one*	15 euros	20 euros	25 euros
Números /*Numbers* 181-200, cada uno / *each one*	19 euros	24 euros	29 euros

(Todos los números están disponibles / *All numbers are available*)

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 681-684 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.258

The identity of the type material of the subspecies of *Melitaea phoebe* ([Denis & Schiffermüller], 1775) described by Emilio Turati (Lepidoptera: Nymphalidae)

Peter J. C. Russell

Abstract

Two taxa described by Turati in 1920 as subspecies of *Melitaea phoebe* ([Denis & Schiffermüller], 1775), are examined from high resolution photographs. *M. phoebe phoebina* Turati, 1920 is identified from morphological features as *M. ornata* Christoph, 1893, and *M. phoebe rostagnoi* Turati, 1920, is confirmed as *M. phoebe*. The quadrinomial *M. phoebe rostagnoi sterlineata* Turati, 1920 from the same locality as subsp. *rostagnoi* is also confirmed as *M. phoebe*.
Keywords: Lepidoptera, Nymphalidae, *Melitaea phoebe*, type material, Turati.

La identidad del material tipo de las subespecies de *Melitaea phoebe* **([Denis & Schiffermüller], 1775)**
descritas por Emilio Turati
(Lepidoptera: Nymphalidae)

Resumen

Se examinan dos taxones descritos por Turati en 1920 como subespecies de *Melitaea phoebe* ([Denis & Schiffermüller], 1775), a partir de fotografías de alta resolución. *M. phoebe phoebina* Turati, 1920, se identifica a partir de las características morfológicas como *M. ornata* Christoph, 1893 y *M. phoebe rostagnoi* Turati, 1920, se confirma como *M. phoebe*. El cuadrinomio *M. phoebe rostagnoi sterlineata* Turati, 1920, procedente de la misma localidad que la subespecie *rostagnoi*, también se confirma como *M. phoebe*.
Palabras clave: Lepidoptera, Nymphalidae, *Melitaea phoebe*, material tipo, Turati.

Introduction

In the article by Russell et al. (2020), the authors were unable to report on the identities of the subspecies of *Melitaea phoebe* ([Denis & Schiffermüller], 1775) described by Emilio Turati in 1920, because the entomological collections in the Museo Regionale di Scienze Naturali, Torino, Italy (MRSN) were not accessible, due to ongoing building works. However, the collections have now become available. Thus, it is now possible to confirm the specific identities of *M. pheobe phoebina* Turati, 1920 (p. 222 and Tav. II, Figures 4 ♂♂ and 5 ♀♀) [Type Locality: Italy, Calabria, Aspromonte, 1400 m] and *M. phoebe rostagnoi* Turati, 1920 (p. 223 and Tav. II, Figures 10-12) [Type Locality: Italy, Roma, Monte Autore]. Two figures (Figures 1-2) are included to demonstrate the differences in morphology between *M. phoebe* and *M. ornata*.

Identifications

Melitaea phoebe phoebina: Nekrutenko (1993, p. 129) recorded the details of the labels present on the pins of the two females of this subspecies, which he recognized as syntypes and added appropriate labels indicating this. From an examination of the detailed photographs provided (Figures 3A, B) (see Acknowledgements), it can be seen that the antennae are spatulate and the pre-marginal black markings on the undersides are triangular, not touching the intervening veins. These characters are typical of *M. ornata* Christoph, 1893 (see Figure 1) rather than those of *M. phoebe*, in which the antennae are club shaped and the submarginal black markings arcuate and touching the intervening veins (see Figure 2). Only the figured specimen has the orange “Type” label in Turati’s handwriting on the pin. A label has been added indicating that taxon *phoebina* is *M. ornata* and not *M. phoebe* (Figure 3C); a similar label indicating its correct identity has been added to the other syntype.

Note: San Luca, Calabria (the origin of the syntype not illustrated), lies at the eastern end of the Aspromonte Mountain range; thus Nekrutenko gave the Type Locality of this subspecies as “Aspromonte dai 1400 m”.

Melitaea phoebe rostagnoi: Nekrutenko (1993, p. 129) recorded the details of the labels on the pins of the 2 ♂♂ and 3 ♀♀ specimens he recognised as syntypes, added appropriate labels and provided a Type Locality of ‘Monte Autore, province of Roma, Italy’. None of these specimens has a ‘type’ label in Turati’s handwriting. A female syntype is figured (Figures 4A, B), from which it can be seen that it exhibits the morphological characters typical of *M. phoebe*: club shaped antenna, pointed forewing apices and the submarginal black markings are arcuate and touching the intervening veins. The specimens were captured as follows: ♂ 20 August 1909, ♂ 10 September 1909, ♀ 5 September 1909, ♀ 5 September 1909 and ♀ 12 September 1909, indicating that these are all second brood specimens. It is possible that this is the reason why Turati gave them subspecific status. It is confirmed that the taxon *rostagnoi* is a subspecies of *M. phoebe* (Figure 4C).

The variety(?) of this form, *M. phoebe rostagnoi sterlineata* Turati, 1920, is represented in the collection by a pair of specimens taken on 5 and 26 June 1908, thus first brood specimens, also from Monte Autore. The quadrinomial infrasubspecific name *Melitaea phoebe rostagnoi sterlineata* Turati, 1920, is not regulated by the nomenclatural Code; for the record it is a homonym of the quadrinomial *Melitaea aurinia comacina sterlineata* Turati, 1920.

Acknowledgements

Fulvio Giachino and Matteo Ruzzon (MRSN, Italy) are thanked for their diligent work in finding the specimens and photographing them, placing appropriate labels on some of the specimens and re-photographing them. John Tennent (Oxford, UK) is thanked for commenting on the manuscript and improving its construction.

References

Nekrutenko, Y. P. (1993). An annotated catalogue of Butterflies and Skippers (Lepidoptera: Hesperioidea, Papilionoidea) named by Emilio Turati. *Bollettino del Museo Regionale de Scienze Naturali. Torino, 11*(1), 121-135.

Russell, P. J. C., Bartolozzi, L., Hawkins, R. L., Tennent, W. J., & Leger, T. (2020). 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). *SHILAP Revista del lepidopterología, 48*(191), 449-472.

Turati, E. (1920). Nuove forme di Lepidotteri IV: Correzione e note critiche. *Il Naturalista Siciliano, 23*, 203-351, plates 1-4.

Peter J. C. Russell
Oakmeadow
Wessex Avenue, East Wittering
GB-West Sussex PO20 8NP
REINO UNIDO / *UNITED KINGDOM*
E-mail: peterjcrussell82@yahoo.com
https://orcid.org/0000-0001-6211-4706

(Recibido para publicación / *Received for publication* 1-IV-2022)
(Revisado y aceptado / *Revised and accepted* 10-IV-2022)
(Publicado / *Published* 30-XII-2022)

phoebina Trti.
SYNTYPUS
coll. E. TURATI
Y. Nekrutenko des.

Italia mer
Calabria
San Luca
V.1917
Mus. Turati E.

Typ.

phoebina
Trts

Misident.:
Melitaea ornata
Christoph, 1893,
Russell, 2022.

rostagnoi Trti.
SYNTYPUS
coll. E. TURATI
Y. Nekrutenko des.

Mus. TURATI
coll. HARTIG

Jtalia centr.
Mt. Autare
800' 12.9.09
Geo. C. Krüger
Mus. Turati E.

Ident.:
Melitaea phoebe
([Denis & Schiffermüller],
1775), Russell, 2022.

Figures 1-4. 1. *Melitaea ornata* female underside, Italy, Calabria, Consenza, San Fili, Monte Martinello, 600 m, 3 June 1913 (Stauder Leg) © W. J. Tennent. **2.** *Melitaea phoebe* female underside, Italy, Calabria, Consenza, San Fili, Monte Martinello, 880 m, 10 June 2007. © P. Russell. **3 A-C.** *Melitaea phoebe phoebina* Turati, 1920, female upperside, underside and labels on pin, respectively. **4 A-C.** *Melitaea phoebe rostagnoi* Turati, 1920, female upperside, underside and labels on pin, respectively. © MRSN, Italy.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 685-687 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.259

Eremopola lenis magnifica (Rothschild, 1914) a species new for lepidopterofauna of the Maltese Islands (Lepidoptera: Noctuidae, Xyleninae)

Aldo Catania, Paul Sammut, John J. Borg & Anthony Seguna

Abstract

The genus *Eremopola* Warren, 1911 and *Eremopola lenis magnifica* (Rothschild 1914) are recorded for the first time from the Maltese Islands.

Keywords: Lepidoptera, Noctuidae, Xyleninae, *Eremopola lenis magnifica*, Malta.

Eremopola lenis magnifica **(Rothschild, 1914) una especie nueva para la lepidopterofauna de Malta (Lepidoptera: Noctuidae, Xyleninae)**

Resumen

Los géneros *Eremopola* Warren, 1911 y *Eremopola lenis magnifica* (Rothschild, 1914) se citan por la primera vez para Malta.

Palabras clave: Lepidoptera, Noctuidae, Xyleninae, *Eremopola lenis magnifica*, Malta.

Introduction

The genus *Eremopola* Warren, 1911 is a western Palaearctic eremic group comprising two subgenera, *Eremopola* and *Eremochlaena* Boursin, 1953 (Ronkay et al. 2001). Both subgenera include two species and are represented in Europe by a single species, *Eremopola (Eremopola) lenis* (Staudinger, 1892) and *Eremopola (Eremochlaena) orana* (H. Lucas, 1894). In the past, other taxa have been associated with *Eremopola*, however, they are actually placed into other genera of the subfamily Noctuinae.

Eremopola (Eremopola) lenis is known to occur in the African Mediterranean from the Atlas region in the Maghreb area to Libya, in the Near East and the Iberian Peninsula. It is polymorphic, the local populations are easily separable from each other by their external appearance while their genitalia show no mentionable distinctive features, therefore they are interpreted as different geographic races, The nominotypical subspecies *lenis* (Staudinger, 1892) is known only from Israel (Ronkay et al. 2001); the subspecies *magnifica* (Rothschild, 1914) is known from the western parts of Mediterranean Africa (the Atlas region in Morocco and Algeria); the subspecies *marmarides* was described from Libya by Turati (1924) while the subspecies *radoti* (Boursin, 1928) has been recorded from Spain, where it is locally frequent.

The early stages have not yet been described but it is presumed that the larval host plants include herbaceous plants. The species is univoltine and the adults are on the wing from September to mid-November (Ronkay et al. 2001).

Both the genus *Eremopola* and the species *lenis* are new to the Lepidopterofauna of the Maltese Islands. We propose the Maltese name “Harira fina”, after the transliteration of the Latin word *“lenis*”.

In the latest check-list of Maltese Lepidoptera (Sammut, 2020), the genus *Eremopola* Warren, 1911, should be placed after the genus *Episema* Ochsenheimer, 1816 and before the genus *Agrochola* Hübner, [1821].

Material examined: MALTA, 1 ♂, Żebbug, 5-XI-2021, at light, leg. A. Catania.

Discussion: The presence of *Eremopola lenis magnifica* (Rothschild, 1914) in the Maltese archipelago is very interesting and may be attributed to the southerly winds blowing from the direction of North Africa. Between November 5 and 11, over the Maltese Islands we experienced warm and fairly strong South and South-easterly winds of variable force between 28 and 35km/hr. Besides *Eremopola lenis magnifica*, other rare Noctuidae, such as *Agrotis haifae* Staudinger, 1897*, Agrotis herzogi* Rebel, 1911*, Agrotis catalaunensis* (Millière, 1873), *Cerocala algiriae* Oberthür, 1876 and *Agrotis lasserrei* (Oberthür, 1881), which normally reach Malta by migration during this period, were recorded in a rather unusually large numbers from Rabat, Żebbuġ, Naxxar, Pembroke and Żurrieq. *Agrotis trux* (Hübner, [1824])*, Autographa gamma* (Linnaeus, 1758), *Noctua pronuba* (Linnaeus, 1758) and *Spodoptera littoralis* (Boisduval, 1833)*,* usually common species, were also recorded in unusually large numbers at light during this period. Whether these have reached the Maltese Islands by normal migration or wind assisted, cannot be established with certainty.

It is worth to note that the only specimen found in Malta differs externally from both subspecies *radoti* and subspecies *magnifica*. It is associated here with this latter subspecies due to its closest occurrence to Malta though it is far not impossible that the moth was driven with the southern wind from the coastal area of Libya to the island of Malta. The comparison of the Maltese specimen with the western Libyan populations will be desirable but authentic material from Tripolitania was actually not available.

Acknowledgements

We would like to thanks, Dr L. Ronkay and Dr G. Ronkay of the Hungarian Natural History Museum for their great help in the confirmation of the identity of the species and for sending us images of specimens of *Eremopola lenis* subspecies for comparison. We would also like to thank Dr A. Vives for the Spanish translation.

References

Calle, J. A. (1982). Noctuidos Espanoles. *Boletín del Servicio contra Plagas e Inspección Filopatológica. Fuera de Serie, nº 1*. Ministerio de Agricultura, Pesca y Alimentación.

Sammut, P. M. (2020). *Systematic and Synonymic list of the Lepidoptera of the Maltese Islands.* Malta.

Ronkay, L., Yela, J. L., & Hreblay, M. (2001). Hadeninae II. *Noctuidae Europaeae* (Vol. 5). Entomological Press.

*Aldo Catania
27, Rama-Rama, Triq Mons
Anton Cilia
MT-Żebbug ZBG3140
MALTA / *MALTA*
E-mail: aldocatania47@gmail.com
https://orcid.org/0000-0001-7559-143X

Anthony Seguna
68 Redeemer, Triq l-Emigrant
MT-Naxxar, NXR3200
MALTA / *MALTA*
Email: seguna@onvol.net
https://orcid.org/0000-0002-6264-0690

Paul Sammut
137/2, Dingli Road
MT-Rabat RBT9023
MALTA / *MALTA*
E-mail: farfett@onvol.net
https://orcid.org/0000-0002-2019-9577

John J. Borg
National Museum of Natural History
Vilhena Palace
St Publius Square
MT-Mdina MDN1010
MALTA / *MALTA*
E-mail: john.j.borg@gov.mt
https://orcid.org/0000-0002-0587-3682

*Autor para la correspondencia /*Corresponding author*

(Recibido para publicación / *Received for publication* 27-I-2022)
(Revisado y aceptado / *Revised and accepted* 24-II-2022)
(Publicado / *Published* 30-XII-2022)

NOTICIAS GENERALES / *GENERAL NEWS*

SHILAP REVISTA DE LEPIDOPTEROLOGÍA, AHORA DISPONIBLE EN VERSIÓN ELECTRÓNICA / *SHILAP REVISTA DE LEPIDOPTEROLOGÍA, NOW AVAILABLE IN ELECTRONIC VERSION*.– *SHILAP Revista de lepidopterología*, desde 1973 solo estaba publicándose en versión impresa (ISSN: 0300-5267) y desde este año 2022, ya dispone de la versión electrónica (eISSN: 2340-4078) en la siguiente dirección **https://shilap.org**, consideramos que es un paso muy importante al cumplir los 50 años de existencia. / *SHILAP Revista de lepidopterología, since 1973 was only published in printed version (ISSN: 0300-5267) and from this year 2022, already has an electronic version (eISSN: 2340-4078) in the following address* ***https://shilap.org****, we consider it a very important step to celebrate 50 years of existence*.– **DETALLE / DETAILS**: SHILAP, Apartado de correos, 331; E-28080 Madrid, ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

SHILAP REVISTA DE LEPIDOPTEROLOGÍA **EN LOS ÍNDICES DE IMPACTO INTERNACIONALES 2021 / SHILAP REVISTA DE LEPIDOPTEROLOGIA *IN THE INTERNATIONAL IMPACT INDEXES 2021*.–** Según SCOPUS en su Índice SJR 2021 de *SCImago Journal Rank*, aparecemos con un **Indicador SJR: 0,262** FI, **Índice H: 13**, **Categoría: Ciencia Animal y Zoología: 334/416 (Q3), Ecología, Evolución, Comportamiento y Sistemática: 549/647 (Q3), Ciencia de los Insectos: 130/153 (Q3)**. Según CLARIVATE ANALYTICS en su Índice JCR 2021 de *Journal Citation Reports*, aparecemos con un **Índice de Impacto: 0,313, Categoría: 97/100 (Q4, Entomología)**, el **Influencia del artículo: 0,053**, el **Índice de inmediatez: 0,111**, el **Eigenfactor: 0,00016** y la **Categoría Eigenfactor: Ecología y Evolución.** / *According to SCOPUS in their Index SJR 2021 of* SCImago Journal Rank*, we appear with a* ***SJR Indicator: 0,262*** *FI,* ***H Index: 13****,* ***Rank: Animal Science and Zoology 334/416 (Q3), Ecology, Evolution, Behavior and Systematic: 549/647 (Q3), Insect Science*****: 130/153 (Q3)***. According to CLARIVATE ANALYTICS in their Index JCR 2021 of* Journal Citation Reports, *we appear with an* ***Impact Index: 0,313, Rank: 97/100 (Q4, Entomology)****,the* ***Article influence: 0,053****, the* ***Inmediacy Index: 0,111****, the* ***Eigenfactor: 0,00016****, and the* ***Eigenfactor Category: Ecology and Evolution*****.– DETALLES / *DETAILS*:** SHILAP; Apartado de correos, 331; E-28010 Madrid; ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

ALFILERES ENTOMOLÓGICOS PRECIO ESPECIAL PARA LOS SOCIOS DE SHILAP.– En estos momentos SHILAP pone a disposición de sus socios alfileres entomológicos pavonados en negro y fabricados en la República Checa con una excelente calidad y de dos marcas diferentes a elegir AUSTERLITZ y MORPHO / SPHINX (la marca MORPHO ha cambiado de nombre y se denomina SPHINX), los precios y los números disponibles en estos momentos son:

ELEFANT - IMPERIAL EMIL ARLT

Números: 000, 00, 0, 1, 4, 5, 6 y 7 (hasta final de existencias)	9 euros / 100 alfileres
Minucias: 0’10 y 0’20 (hasta final de existencias)	15 euros / 500 alfileres
Minucias (KARLSBADER): 0’15 (hasta final de existencias)	15 euros / 500 alfileres

AUSTERLITZ

Números: 000, 00, 0, 1, 2, 3, 4, 5, 6 y 7	5’50 euros / 100 alfileres

MORPHO / SPHINX

Números: 000, 00, 0, 1, 2, 3, 4, 5, 6 y 7	5 euros / 100 alfileres
Minucias: 0’10, 0’15 y 0’20	12 euros / 500 alfileres

A estos precios hay que incluir los gastos de envío.– **DETALLES / *DETAILS*:** SHILAP; Apartado de correos, 331; E-28080 Madrid, ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 689-703 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.260

Two new species of the genus *Klimeschiopsis* Povolný, 1967 from southern Siberia discovered as a result of study cryptic diversity in *K. discontinuella* (Rebel, 1899) (Lepidoptera: Gelechiidae)

Jan Šumpich & Oleksiy Bidzilya

Abstract

Klimeschiopsis varia Šumpich & Bidzilya, sp. n. and *Klimeschiopsis confusella* Šumpich & Bidzilya, sp. n. are described as new species for science based on differences from congeners in external appearance, genitalia of both sexes and genetic data. *Klimeschiopsis varia* is most similar to *Klimeschiopsis discontinuella* (Rebel, 1899) and *Klimeschiopsis maritimaealpina* Nel & Varenne, 2011 but can be distinguished by the genitalia characters. *Klimeschiopsis confusella* resembles *Klimeschiopsis kiningerella* (Duponchel, [1843]) and *Klimeschiopsis terroris* (Hartig, 1938) by absence of yellowish suffusion on forewings, but the coloration of new species is not so much contrasting, and the species is unmistakable according to the genitalia. Both new species occur sympatricaly in Russian Altai Mountains, Tuva and Buryatia.

Keywords: Lepidoptera, Gelechiidae, *Klimeschiopsis varia*, *Klimeschiopsis confusella*, checklist, barcoding, Russia.

Dos nuevas especies del género *Klimeschiopsis* Povolný, 1967 del sur de Siberia descubiertas como resultado del estudio de la diversidad críptica en *K. discontinuella* (Rebel, 1899) (Lepidoptera: Gelechiidae)

Resumen

Se describen como nuevas especies para la ciencia *Klimeschiopsis varia* Šumpich & Bidzilya, sp. n. y *Klimeschiopsis confusella* Šumpich & Bidzilya, sp. n., basándose en las diferencias con sus congéneres en cuanto al aspecto externo, la genitalia de ambos sexos y los datos genéticos. *Klimeschiopsis varia* es más similar a *Klimeschiopsis discontinuella* (Rebel, 1899) y *Klimeschiopsis maritimaealpina* Nel & Varenne, 2011, pero se puede distinguir por los caracteres de la genitalia. *Klimeschiopsis confusella* se parece a *Klimeschiopsis kiningerella* (Duponchel, [1843]) y a *Klimeschiopsis terroris* (Hartig, 1938) por la ausencia de espolvoreado amarillento en las alas anteriores, pero la coloración de las nuevas especies no es tan contrastada y la especie es inconfundible según la genitalia. Las dos nuevas especies se encuentran simpáticamente en las montañas rusas del Altai, Tuva y Buriatia.

Palabras clave: Lepidoptera, Gelechiidae, *Klimeschiopsis varia*, *Klimeschiopsis confusella*, lista, código de barras, Rusia.

Introduction

The genus *Klimeschiopsis* Povolný, 1967 has so far included six species, exclusively from the

Palearctic region (Povolný, 1968; Huemer & Karsholt, 2010, 2020; Nel & Varenne, 2011; Bidzilya, 2012). Adults of *Klimeschiopsis* are often variable in external appearance, and the genitalia of most of species are very similar to each other that resulted in underestimated species diversity. A detailed study of morphological characters as well as barcoding of the available material yielded in the recent description of an Alpine endemic *K. maritimaealpina* Nel & Varenne, 2011. However, additional taxa displayed in the BOLD differing genetically remain formally undescribed so far (one BIN from Pakistan and two BINs even from North America). The aim of this paper is to summarize the existing information on the already described species of the genus and to describe two additional new species from southern Siberia of Russia. Both new species can be distinguished by unique combination of external and genitalia characters, and their separate status is supported by molecular data.

Material and methods

The present study based on material from the following collections

MZH	Finnish Museum of Natural History, Helsinki, Finland
MNCN	Museo Nacional de Ciencias Naturales, Madrid, Spain
NHMW	Naturhistorisches Museum, Vienna, Austria
NMPC	National Museum, Prague, Czech Republic
NUPP	Research collection of Kari & Timo Nupponen, Espoo, Finland
ZIN	Zoological Institute, Russian Academy of Sciences, Sankt-Petersburg, Russia
ZMKU	Zoological Museum, Kyiv Taras Shevchenko National University, Kyiv, Ukraine

Study material collected by the first author was attracted at ultraviolet light (8W/12V tubes) installed in portable light traps. Oleksiy Bidzilya collected the specimens by attracting at light of "Petromax" gasoline lamp.

Preparations of genitalia slides followed standard techniques for Gelechiidae, and the descriptive terminology follows Huemer & Karsholt (2010). The order of species in the checklist is alphabetical. Pinned specimen were photographed with a camera Canon 750D in the combination of a Canon MP-E-65 mm lens (Jan Šumpich). Slide-mounted genitalia were photographed with a Canon EOS 200D DSLR camera mounted on an Olympus CX-31 stereomicroscope (Jan Šumpich). For each photographs sets of 10-20 images were taken at different focal planes and focused-stacked using Helicon Focus 6 with the final image edited in Adobe Photoshop CS5.

A tissue samples (dry legs) from *Klimeschiopsis* specimens were successfully processed at the Canadian Centre for DNA Barcoding (CBG, Biodiversity Institute of Ontario, University of Guelph) (DeWaard et al. 2008), resulting in a 610 -658 base-pair DNA barcode segment of the mitochondrial COI gene (cytochrome c oxidase 1). The sequences together with details of the sequenced specimens were uploaded to the Barcode of Life Data Systems (BOLD; Ratanassingham & Hebert, 2007). Degrees of intra- and interspecific variation of DNA barcode fragments were calculated under the Kimura 2-parameter model of nucleotide substitution using the analytical tools of BOLD. A neighbor-joining tree of DNA barcode data of selected taxa (Figures 42) and the group mean distance (Table 1) were constructed using MEGA 6 (Tamura et al. 2013) under the Kimura 2 parameter model for nucleotide substitutions.

Results

Klimeschiopsis varia Šumpich & Bidzilya, sp. n.

Material examined: Holotype ♂, Russia, Altai Republic, Kosh-Agach Distr., Kurai env. (15 km SW), Dzhangyskol lake (or Salagana lake), 1830 m, 50º10'49''N; 87º44'19''E, coniferous forest/steppe, 24-25-VI-2015, J. Šumpich leg. (gen. slides 17076, J. Šumpich; Barcode NMPC-Lep-0086) (NMPC).

Paratypes: Russia: 1 ♀, same data as for holotype; Altai Republic, Kosh-Agach Distr., Beltir env. (16 km W), Chagan valley, 49º57'06"N; 87º53'39"E, coniferous forest / rocks, 2150 m, 3 ♂♂, 2 ♀♀, 2-3-VII-2014, J. Šumpich leg. (Barcode NMPC-Lep-0317) (gen. slide 196/21&&, O. Bidzilya); Altai Republic, Aktash vill., 50º19'12"N; 87º36'00"E, grassy steppe, rocks, 1400 m, 1 ♂, 1 ♀, 11-VII-2014, J. Šumpich leg. (gen. prep. 22098, J. Šumpich); 4 ♂♂, 2 ♀♀, same data but 21-VI-2015 (gen. prep. 17075 and 22092, J. Šumpich; Barcode NMPC-Lep-0084 and NMPC-Lep-0085); 2 ♂♂, same data but 24-VI-2019; Altai Republic, Kosh-Agach Distr., Chagan-Uzun env., Krasnaya Gorka hill, 50º05'00"N; 8825'15"E, rocky steppe, 1870 m, 1 ♂, 29-VI-2015, J. Šumpich leg.; 2 ♂♂, same data but 1-3-VII-2019 (gen. slide 22048, J. Šumpich; gen. prep. 22094, J. Šumpich); Altai Republic, Belyashi (Dzhazator) env. (25 km NW), confluence of Argut and Karagem rivers, 49º51'56"N, 87º10'22"E, rocky steppe, 1400 m, 4 ♂♂, 1 ♀, 27-28-VII-2017, J. Šumpich leg. (gen. prep. 22055, J. Šumpich; gen. slide 197/21, ♀, O. Bidzilya) Barcode NMPC-Lep-0318 and NMPC-Lep-0319); Altai Republic, Ulagan vill., Chulyshman valley, 51º01'03"N; 88º00'39"E, grassy steppe, rocks, 600 m, 3 ♂♂, 27-28-VI-2015, J. Šumpich leg. (gen. prep. 22054, J. Šumpich; Barcode NMPC-Lep-0088); 7 ♂♂, 16 ♀♀, same data but 26-27-VI-2019 (gen. prep. 22056, J. Šumpich); 2 ♂♂, 1 ♀, same data but 4-5-VII-2019 (gen. prep. 22057, J. Šumpich) (all NMPC, 2 ♀♀ MNCN, 2 ♀♀ ZMKU); 4 ♂♂ Russia, Altai, Ongudai distr., Tchuya river bank 15 km downstream of Iodro village, 6-7-VIII-2000, O. Bidzilya (Barcode Bidz. 00098, 00099, 00100, 00101 [all failed]) (gen. slide 132/14, 376/14, O. Bidzilya) (ZMKU); 1 ♂, USSR, SW-Altai, Katun valley 10 km W Katanda, 1200 m, 15-19-VII-1983, K. Mikkola, H. Hippa & J. Jalava leg.; 1 ♂, USSR, SW-Altai, 5 km W Katanda, light trap, 1200 m, 1-VII-1983, K. Mikkola, H. Hippa & J. Jalava leg. (gen. slide 100/22, O. Bidzilya) (MZH); 1 ♀ Russia, Tuva rep., 50º44N 93º08'E, E Tannu-Ola, Irbitel r., stony steppe slopes, 1000 m, 13-16-VI-1995, J. Jalava & J. Kullberg leg. (gen. slide 99862, PH); 1 ♂ Russia, Tuva rep., 52º04N 94º22'E, Ust-Ujuk steppe hills, 570 m, 3-5-VI-1995, J. Jalava & J. Kullberg leg. (gen. slide 100/22, O. Bidzilya) (MZH); 1 ♂, Russia, SW Buryatia, 51º47-48'N 100º55-58', E Sayan Mts., Mondy vill. 2 km E, forest-steppe, 15-VI-2002, K. Nupponen leg. (gen. slide 346/16, O. Bidzilya) (NUPP); 1 ♂, 3 ♀♀, Altai Republic, Ulagan district, 12 km SSE Koo, 50º58'N 87º56'E, 550 m, 6-8-VII-2013, S. Sinev leg. (ZIN).

Diagnosis: *Klimeschiopsis varia* is difficult to distinguish from *K. discontinuella* and *K. maritimaealpina* by external appearance. In the series, *K. varia* is a smaller species and compared to the latter's it appears darker. Within comparison of Siberian species, the largest specimens of *K. varia* reach the size of the smallest specimens of *K. confusella*. Reliable identification is only possible by examination of the genitalia or genetic data. Male genitalia of *K. varia* are characterized by stout sacculus (slender in *K. confusella*), a very narrow saccus, only slightly widening at the base (broader in *K. confusella*, wider and shorter in *K. maritimaealpina*), narrow and comparatively long phallus (broader and shorter in *K. confusella* and *K. discontinuella*) and broad base of tegumen (narrower in *K. confusella*, *K. maritimaealpina* and *K. discontinuella*). Female genitalia of *K. varia* are distinguished by elongated funnel-shaped antrum (in the shape of an almost regular triangle in *K. discontinuella*) and signum that is about half length of apophysis anterioris (one quarter in *K. discontinuella*, one third in *K. confusella*).

Description Adult (Figures 1-8, 21-22): Wingspan 10.0-14.0 mm. Head creamy yellow, tegulae covered with brown and creamy yellow scales with brown tips, thorax dark brown, labial palpi light yellow, base of third and second segment with brown scales, tip of third segment brown. Antennae dark, ringed with yellow, more conspicuous in their ending, filiform. Forewing brown-grey with two dark fasciae near base and in first third, and wide dark transversal line in two third. Apex more or less suffused with creamy yellow scales, bright, slightly angulated fascia near apex that tends to be more conspicuous in darker specimens. Fringes yellowish mixed with brown scales. Hindwing and its cilia grey, slightly darker in apical area.

Variation: Sexual dimorphism is not observed. In the most specimens, fascia in the first third of forewing reaches the costal margin only, but in some specimens, it connects costal and dorsal margins. Individual specimens may look brighter and more contrasting due to more intensive creamy yellow suffusion between dark fasciae and in the apical area. Based on study of the available collection material it seems that the specimens collected in higher altitudes and in colder conditions (Figures 1-2) have larger wingspan than the moths collected at lower altitudes.

Male genitalia (Figures 25-28): Tegumen narrow with deep anteromedial emargination, uncus broader than long, rounded, distal sclerite of gnathos small and rounded, valva slightly curved, blunt-ended, distinctly shorter than top of uncus. Sacculus comparatively broad, significantly bent, regularly tapering, pointed at end. Posterior margin of vinculum with U-shaped emargination, lateromedial projections broad and rounded. Saccus very narrow, comparatively long, only slightly widening at base. Phallus narrow, long, hook-ended.

Female genitalia (Figures 32, 34-37): Apophysis anterioris three times shorter than apophysis posterioris. Antrum funnel-shaped with slightly concave outer margin, ductus bursae nearly as long as corpus bursa, membranous, slightly widening proximally, corpus bursa oval, signum hook-shaped, sharply pointed. Signum half-length of apophysis anterioris.

Molecular data: BIN: BOLD:ADR5392. The intraspecific average distance of the barcode region is 0.18% (n=7). According to the BOLD, the minimum distance to the nearest neighbour, *Klimeschiopsis confusella*, is 4.98 % (p-dist), respectively 5.18 distance computed by MEGAX software using another algorithm (Table 1).

Biology: Host plant unknown. Adults have been collected from early June to early August at altitudes between 600 and 2150 m in rocky steppes (Figures 43, 45). It is obvious that the species is occurring in the habitats in lower altitudes compared with *K. confusella*.

Distribution: Russia (Altai Mts., Tuva, Buryatia).

Etymology: The species name is derived from the Latin *varius* which points to diversity in external appearance as well as to different size of individual specimens.

Klimeschiopsis confusella **Šumpich & Bidzilya, sp. n.**

Material examined: Holotype ♀, Russia, Altai Republic, Belyashi (Dzhazator) env. (56 km SE), 49º39'45"N, 88º14'28"E, rocky steppe and mountain meadows near Tara River, 2400 m, 25-26-VII-2017, Jan Šumpich leg. (gen. prep. 18576, J. Šumpich; Barcode NMPC-Lep-0320) (NMPC).

Paratypes: Russia: 2 ♂♂, 1 ♀, same data as for holotype (gen. slide 22058 J. Šumpich, gen. prep. 22099, J. Šumpich); Altai Republic, Kosh-Agach Distr., Kurai env. (15 km SW), Dzhangyskol lake (or Salagana lake), 1830 m, 50º10'49"N; 87º44'19"E, coniferous forest/steppe, 4 ♂♂, 24-25-VI-2015, J. Šumpich leg. (Barcode NMPC-Lep-0321 [failed]) (gen. slide 22053, J. Šumpich, gen. prep. 22095 and 22096, J. Šumpich); same data but 29-30-VI-2019 (gen. prep. 22050, J. Šumpich); Altai Republic, Aktash vill., 5019'12"N; 8736'00"E, grassy steppe, rocks, 1400 m, 1 ♂, 11-VII-2014, J. Šumpich leg. (gen. prep. 22097, J. Šumpich); 2 ♂♂, same data but 21-VI-2015 (gen. prep. 22093, J. Šumpich); Altai Republic, Aktash env., road to 9. station ("Zavod"), 50º19'34"N; 87º43'54"E, mountain meadows, 2400-2900 m, 1 ♂, 23-VI-2015, Jan Šumpich leg. (Barcode NMPC-Lep-0087 [failed]) (all NMPC, 1 ♂ ZMKU); 1 ♂, Buryatia, 54º52'N 110º55'E, Barguzin range, 1400-1800 m, rocky creek, 4-5-VII-1996, J. Kullberg leg. (gen. slide 99861, PH) (MZH).

Diagnosis: *Klimeschiopsis confusella* has no yellowish suffusion on the forewings and it is much darker compared with *K. varia, K. maritimaealpina* and *K. discontinuella*. The new species somewhat resembles *K. kinigerella* (Duponchel, [1843]) and *K. terroris* (Hartig, 1938) too, but it is less contrasting. Reliable identification of some specimens is only possible by examination of the genitalia or genetic data. Male genitalia of *K. confusella* are characterized by stout saccus broad in its base (slender in *K. varia*), and by toothed termination of phallus which seems to be unique within genus. Generally, male genitalia of *K. confusella* are very similar to those of *K. discontinuella*, but these species are easily separated by their external appearance. Female genitalia of *K. confusella* are characterized by a signum with two sclerotised plates at its base which seems to be unique within genus.

Description Adult (Figures 9-16, 23-24): Wingspan 12.0-15.0 mm. Head light yellow, tegulae and thorax dark brown, labial palpi light yellow, base of third and second segment with brown scales, tip of third segment brown, antennae dark, filiform. Forewing narrow strikingly elongated and almost pointed distally, brown-grey with black fasciae at base and apical area, and two blackish transversal fasciae in second and third fifth of wing. Fringes yellowish suffused with dark scales usually in an irregular row. Hindwing grey, slightly darker in apical area.

Variation: Sexual dimorphism is not observed. Based on our study of available collection material, the specimens collected in higher altitudes and in colder conditions (Figures 11, 14) have larger wingspan and more contrasting forewing than the moths collected at lower altitudes.

Male genitalia (Figures 29-31): Tegumen broad proximally, with deep anteromedial emargination, uncus comparatively small, rounded, distal sclerite of gnathos small and rounded, valva slightly curved, blunt-ended, reaching top of uncus. Sacculus narrow, broader at base, significantly bent, regularly tapering, pointed apically. Posterior margin of vinculum with V-shaped emargination and two triangular lateromedial projections. Saccus broader, comparatively shorter, distinctly widening at base. Phallus broad, comparatively shorter, hook-ended with several thin spines.

Female genitalia (Figures 33, 38-41): Apophysis anterioris 2.7x shorter than apophysis posterioris. Antrum funnel-shaped with straight outer margin, ductus bursae distinctly shorter than corpus bursa, membranous, slightly widening proximally, corpus bursa oval, signum hook-shaped, sharply pointed, with two sclerotised plates at its base. Signum one third length of apophysis anterioris.

Molecular data: BIN: BOLD:ADR5393. The intraspecific average distance of the barcode region is unknown (n=1). According to the BOLD, the minimum distance to the nearest neighbors, an unidentified species of *Klimeschipsis* from Pakistan (BIN: BOLD:ACI9729) and *K. varia* sp. n., is 4.98 % (p-dist). The comparable similarity shows the results computed by MEGAX software in Table 1 with 5.17 and 5.18 distances.

Table 1. The group mean distance according to the tree in fig. 42 computed by MEGAX

		1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**
1.	*K. kinigerella* (a)								
2.	*K. kinigerella* (b)	0,0266							
3.	*K. terroris*	0,0978	0,0981						
4.	*K. discontinuella*	0,0734	0,0763	0,1070					
5.	*K. maritimaealpina*	0,0746	0,0781	0,0979	0,0484				
6.	*K. varia* sp. n.	0,0572	0,0656	0,0805	0,0763	0,0728			
7.	*K. confusella* sp. n.	0,0670	0,0765	0,0998	0,0698	0,0736	0,0518		
8.	*K.* sp.	0,0565	0,0672	0,0894	0,0721	0,0635	0,0592	0,051	

Biology: Host plant unknown. Adults have been collected from late June to end July at altitudes between 1400 and 2900 m in rocky steppes (Figures 44-45). It seems the species is preferring the habitats in higher altitudes compared with *K. varia*.

Distribution: Russia (Altai Mts., Buryatia).

Etymology: The species name is derived from the Latin *confusus* which points to easy confusion of a new species with *K. varia*.

Checklist of species of *Klimeschiopsis* Povolný, 1967

Klimeschiopsis afghana Povolný, 1968 (Figure 20)

Distribution: Afghanistan (Povolný, 1968).

Remark: The species is hitherto known only from holotype which is stored in NHMW. Unfortunately, genitalia slide was not found there (S. Gaal-Haszler, pers. comm.). At the same time, this species is not listed as a part of Dalibor Povolný collection according to Kubáň & Jakeš (2006), therefore genitalia slide seems to be lost.

Klimeschiopsis confusella Šumpich & Bidzilya, **sp. n.**

Distribution: Russia (Altai Mts., Buryatia) (this paper).

Klimeschiopsis discontinuella (Rebel, 1899)

Distribution: central Europe (Alps) (Huemer & Karsholt, 2010).

Remark: Record from the Altai Mountains (Bidzilya, 2005) must be referred to *K. varia*. Records from Zabaikalskiy kray of Russia (Ponomarenko, 2004, 2008) and China (Li, 2002) need confirmation, as specimens from neighboring territories examined by us turned out to be either *K. varia* or *K. confusella*.

Klimeschiopsis kiningerella (Duponchel, [1843])

Distribution: Europe (from France to southern Ural Mts.), Turkey (Huemer & Karsholt, 2010).

Klimeschiopsis maritimaealpina Nel & Varenne, 2011

Distribution: France (Maritime Alps) (Nel & Varenne, 2011)

Klimeschiopsis sinevi Bidzilya, 2012

Distribution: Northern Iran (Mazandaran), Eastern Georgia, Azerbaijan (Talysh) (Bidzilya, 2012).

Remark: An unidentified barcoded specimen from Azerbaijan (BIN: BOLD:ADI2598) is strikingly reminiscent of *K. sinevi* (cf. BOLD).

Klimeschiopsis terroris (Hartig, 1938)

Distribution: Spain (Andalusia, Castellón, Teruel) (Huemer & Karsholt, 2010).

Klimeschiopsis varia Šumpich & Bidzilya, **sp. n.**

Distribution: Russia (Altai Mts., Tuva, Buryatia) (this paper).

Acknowledgements

The authors thank Sabine Gaal-Haszler (NHMW), Lauri Kaila (MZH) and Sergey Sinev (ZIN) for assistance during the work with collections under their care. We are grateful to Antonio Vives for preparing the Spanish text. The work was supported by the Ukrainian State Budget Program “Support for the Development of Priority Areas of Scientific Research” (Code: 6541230) (O. Bidzilya). J. Šumpich carried out his part of the work on this article with support from the Ministry of Culture Czech Republic (DKRVO 2019-2023 / 5.I.d, National Museum, 00023272).

References

Bidzilya, O. (2005). On the distribution of Gelechiid-Moths (Lepidoptera, Gelechiidae) in Siberia. *Proceeding of the Zoological Museum of Kiev Taras Shevchenko National University*, *3*, 7-19. [in Russian].

Bidzilya, O., (2012). Two new species of the tribe Gnorimoschemini (Lepidoptera, Gelechiidae) from Palaearctic Asia. *Entomofauna, Zeitschrift für Entomologie*, *33*(11), 157-164.

De Waard, J., R., Ivanova, N., V., Hajibabaei, M., & Hebert, P. D. N. (2008). Assembling DNA Barcodes: Analytical Protocols. In C. C. Mmastin (Ed.). *Methods in Molecular Biology: Environmental Genomics* (pp. 275-293). Humana Press Inc., Totowa.

Hartig, F., (1938). Sechs neue Mikrolepidopteren. *Zeitschrift des Österreichischen Entomologischen Vereins*, *23*, 82-83, 88-90, 109.

Huemer, P., & Karsholt, O., 2010. Gelechiidae II (Gelechiinae: Gnorimoschemini). In P. Huemer, O. Karsholt & M. Nuss (eds.). *Microlepidoptera of Europe*, (Vol. 6). Apollo Books.

Huemer, P., & Karsholt, O., (2020). Commented checklist of European Gelechiidae (Lepidoptera). *ZooKeys*, *921*, 65-140. https://doi.org/10.3897/zookeys.921.49197

Kubáň, V., & Jakeš, O. (2006). The Dalibor Povolný collection of Gnorimoschemini (Lepidoptera, Gelechiidae) in the keeping of the Moravian Museum, Brno. Part 1: Type material purchased in 1997-1998. *Acta Musei Moraviae, Scientiae biologicae (Brno), 91*, 97-101.

Li, H. H. (2002). *The Gelechiidae of China (I) (Lepidoptera, Gelechiidae)*. Nankai University Press. [in Chinese]

Nel, J., & Varenne, T. (2011). *Klimeschiopsis maritimaealpina* n. sp. (Lep. Gelechiidae, Gnorimoschemini). *Oreina, 12*, 14-15.

Ponomarenko, M. G. (2004). *Sem. Gelechiidae - vyemchatokrylye moli. Biodiversity of Sokhondinsky Nature Reserve. Novosibirsk-Chita* (pp. 195-203). [in Russian]

Ponomarenko, M. G. (2008). Gelechiidae. In S. Yu. Sinev (ed.) *Katalog Cheshuekrylyh (Lepidoptera) Rossii [Catalogue of the Lepidoptera of Russia]* (pp. 87, 106, 327-329). KMK Scientific Press.[in Russian]

Povolný, D. (1968). Neue und wenig bekannte Taxone aus der Tribus Gnorimoschemini Povolný, 1964 (Lepidoptera, Gelechiidae). *Acta scientiarum naturalium Academiae scientiarum Bohemoslovacae Brno, 2*(3), 1-44.

Ratnasingham, S., & Hebert, P. D. N. (2007). BOLD: The Barcode of Life Data System. *Molecular Ecology Notes, 7,* 355-364.

Ratnasingham, S., & Hebert, P. D. N. (2013). A DNA-based registry for all animal species: The Barcode Index Number (BIN) system. *PLoS ONE*, *8*(7), e66213. https://doi.org/10.1371/journal.pone.0066213

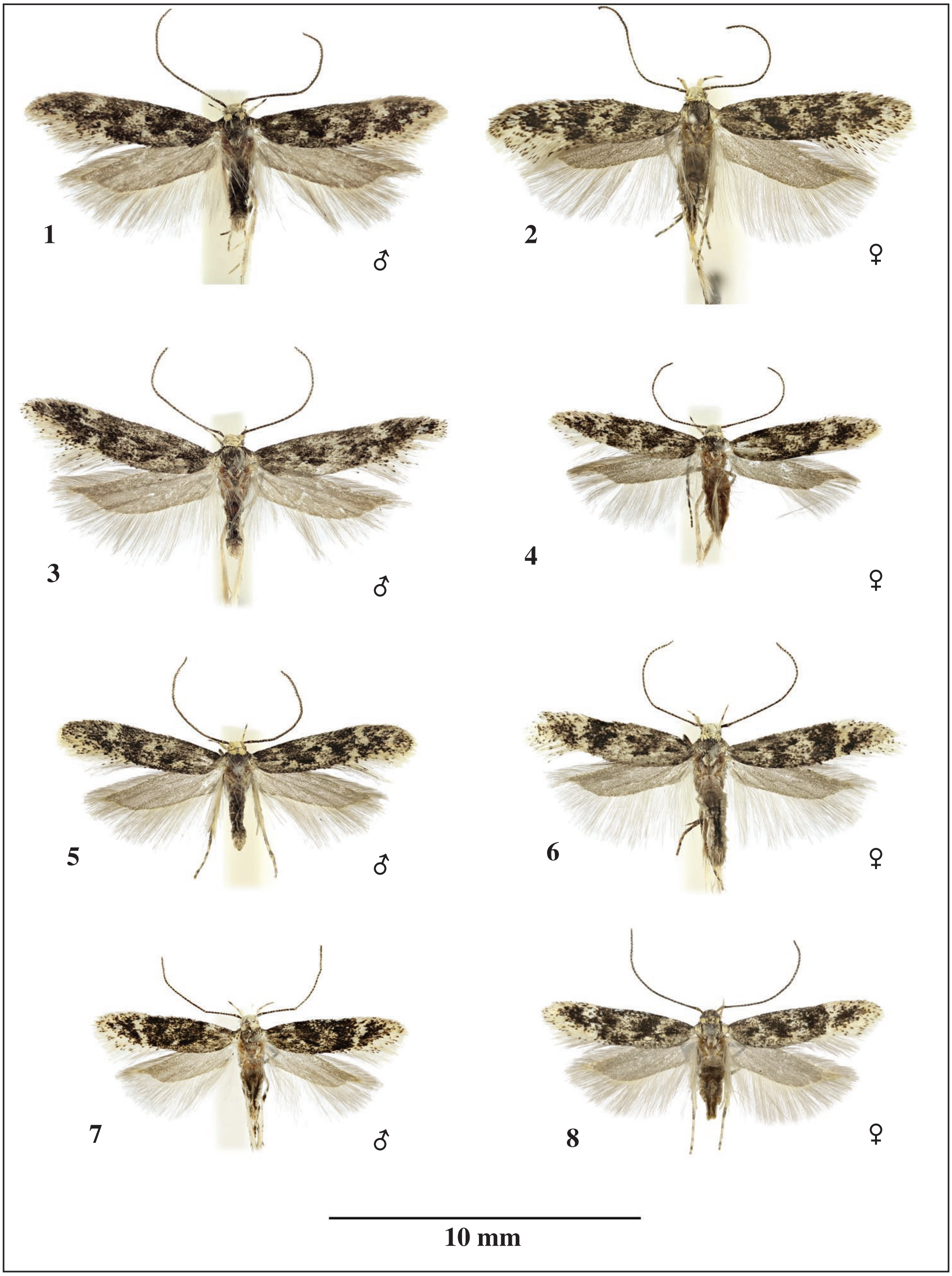
Tamura, K., Stecher, G., Peterson, D., Filipski, A., & Kumar, S. (2013). MEGA6: Molecular Evolutionary Genetics Analysis version 6.0. *Molecular Biology and Evolution, 30*, 2725-2729. https://doi.org/10.1093/molbev/mst197

*Jan Šumpich
National Museum
Department of Entomology
Cirkusová, 1740
CZ-193 00 Praha 9 - Horní Poèernice
REPÚBLICA CHECA / *CZECH REPUBLIC*
E-mail: jansumpich@seznam.cz
https://orcid.org/0000-0002-0262-2941

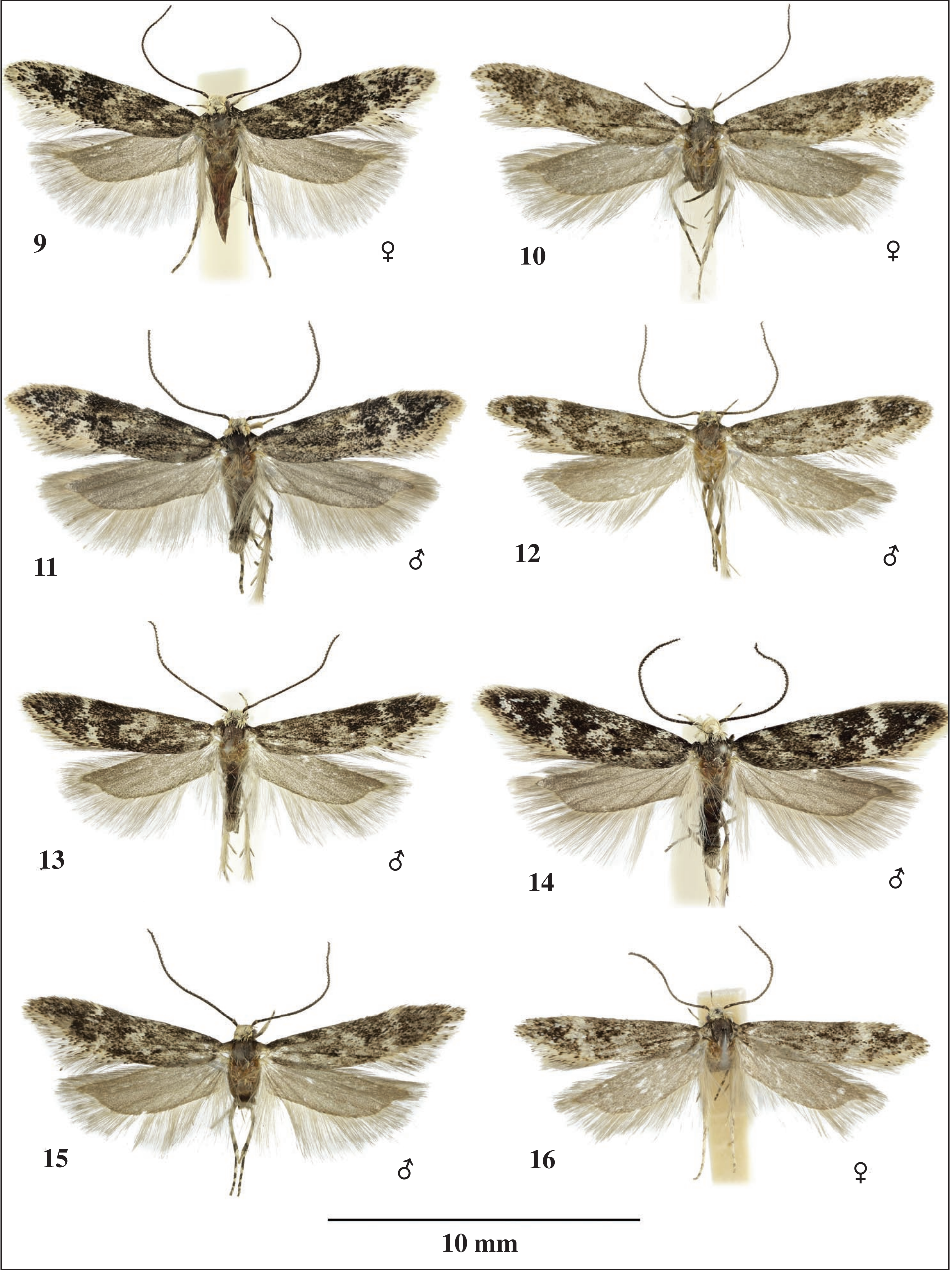
Oleksiy Bidzilya
Institute for Evolutionary Ecology
National Academy of Sciences of Ukraine
37, Academician Lebediev str.
UA-03143 Kyiv
UCRANIA / *UKRAINE*
E-mail: olexbid@gmail.com
https://orcid.org/0000-0001-9243-2481

*Autor para la correspondencia / *Corresponding author*

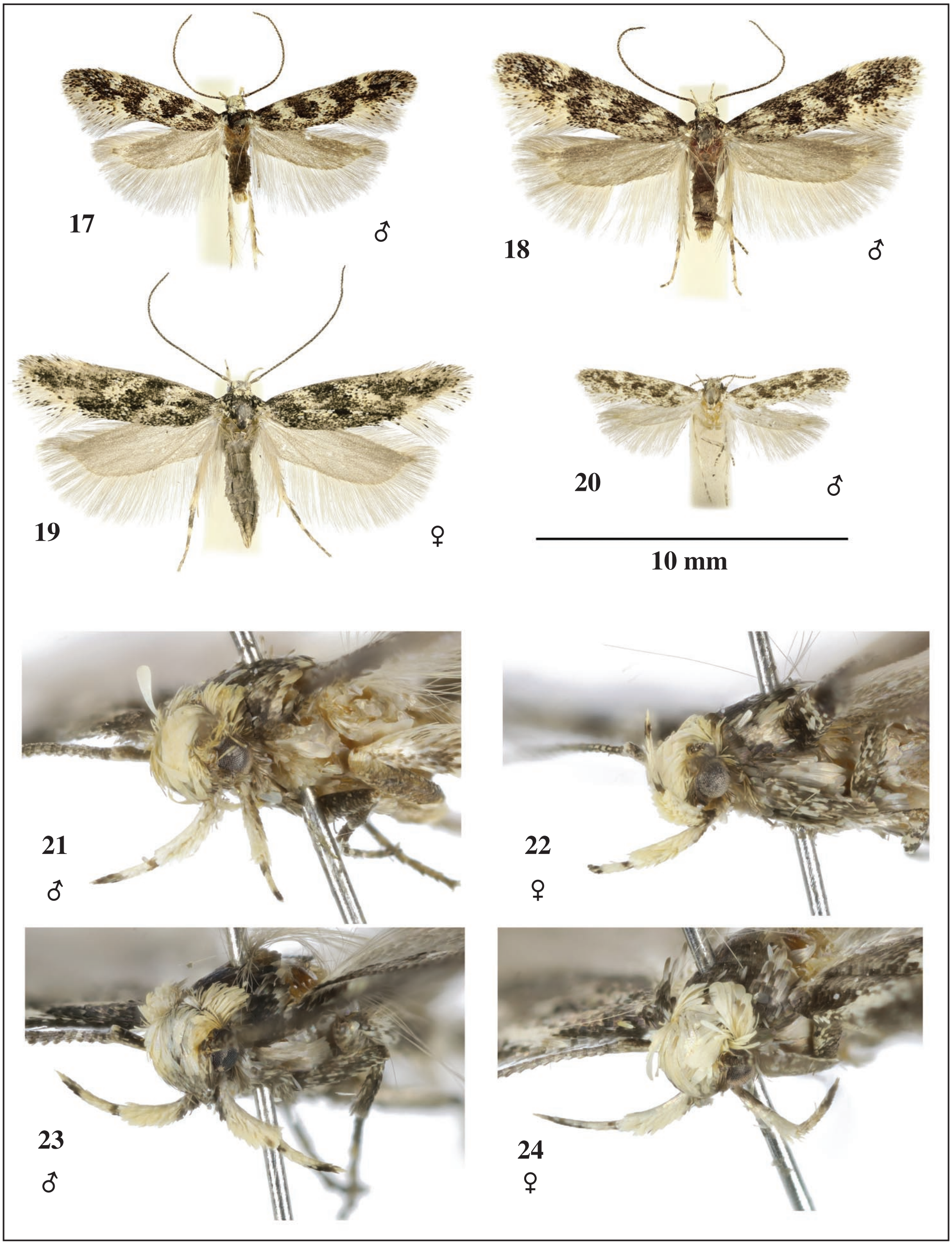
(Recibido para publicación / *Received for publication* 23-V-2022)
(Revisado y aceptado / *Revised and accepted* 27-VI-2022)
(Publicado / *Published* 30-XII-2022)



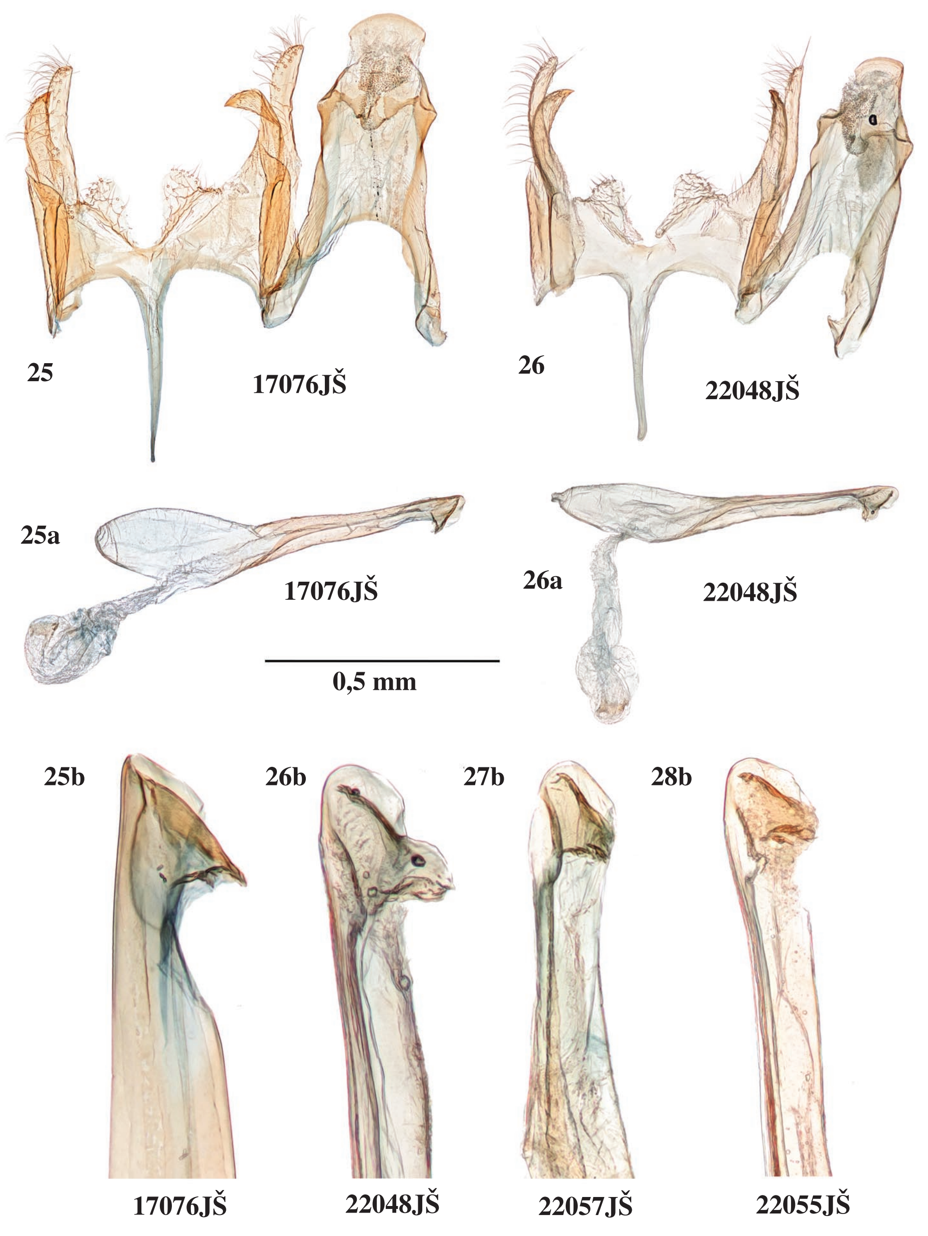
Figures 1-8. *Klimeschiopsis varia* Šumpich & Bidzilya, sp. n., Russia, Altai Mts., adults. **1.** Holotype, Dzhangyskol lake. **2-8.** Paratypes. **2.** Beltir. **3-4.** Aktash. **5-6.** Confluence of Karagem and Argut rivers. **7-8.** Chulyshman valley. (1-7 barcoded).



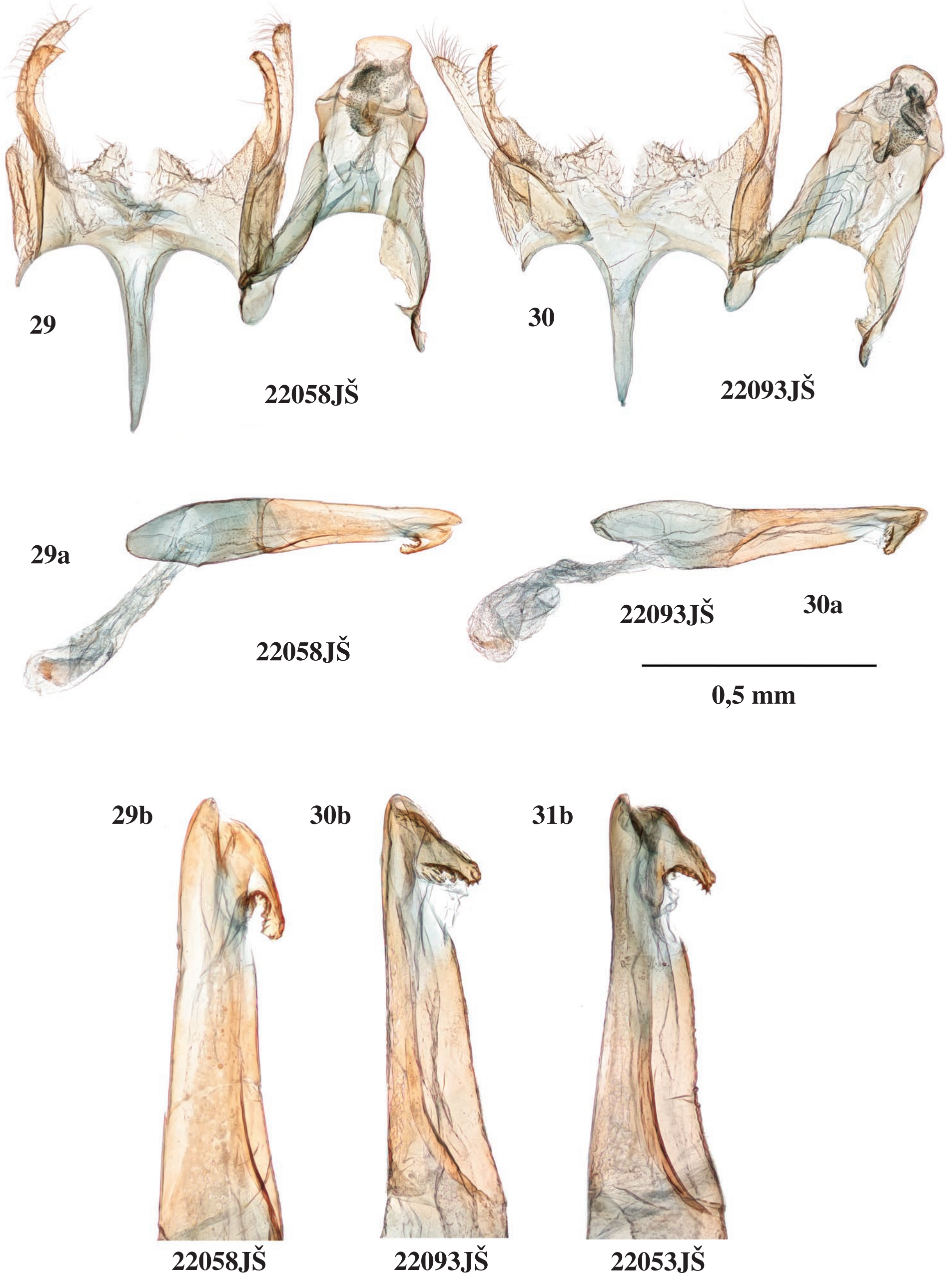
Figures 9-16. *Klimeschiopsis confusella* Šumpich & Bidzilya, sp. n., Russia, Altai Mts., adults. **9.** Holotype, Dzhazator, Tara valley. **10-16.** Paratypes. **10.** Dzhazator, Tara valley. **11-13.** Dzhangyskol lake. **14.** Zavod. **15-16.** Aktash. (9 barcoded).



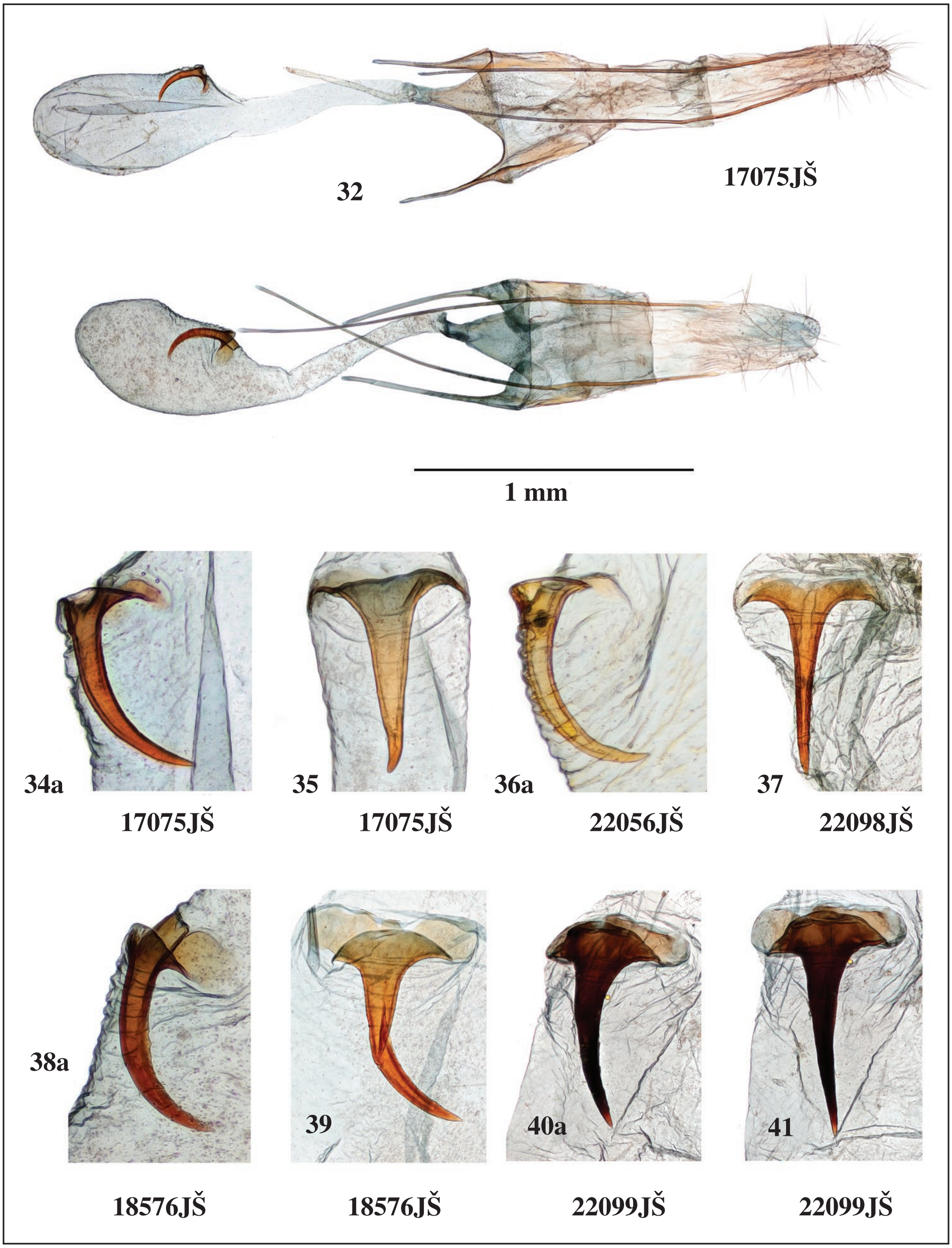
Figures 17-24. *Klimeschiopsis* species. **17-20.** Adults. **17-19.** *K. discontinuella* (Rebel, 1899), Italy, S Tirol. **13.** Lasa, J. Šumpich leg. **14.** Laatsch, J. Šumpich leg. **15.** Stelvio, J. Liška leg. **20.** *K. afghana* Povolný, 1968. (17-19 in coll. NMPC, 20 in coll NHMW). **21-24.** Heads. **21-22.** *K. varia* Šumpich & Bidzilya, sp. n. **23-24.** *K. confusella* Šumpich & Bidzilya, sp. n. (21 and 24 holotypes).



Figures 25-28. Male genitalia of *Klimeschiopsis varia* Šumpich & Bidzilya, sp. n. **25.** Holotype, Dzhangyskol lake. **26-28.** Paratypes. **26.** Krasnaya Gorka. **27.** Chylushman valley. **28.** Karagem. (a - phallus, b - detail of tip of phallus: 25-26. Lateral view, 27-28. Frontal view).



Figures 29-31. Male genitalia of *Klimeschiopsis confusella* Šumpich & Bidzilya, sp. n., paratypes. **29.** Dzhazator, Tara valley. **30.** Aktash. **31.** Dzhangyskol lake. (a - phallus, b - detail of tip of phallus, lateral view).



Figures 32-41. Female genitalia of *Klimeschiopsis*. **32-33.** General view. **32.** *K. varia* Šumpich & Bidzilya, sp. n., Aktash, paratype. **33.** *K. confusella* Šumpich & Bidzilya, sp. n., Dzhazator, Tara valley, holotype. **34-41.** Detail of signum. **34-37.** *K. varia* Šumpich & Bidzilya, sp. n. **34-35.** Aktash. **36.** Chulyshman valley. **37.** Aktash. **38. 41.** *K. confusella* Šumpich & Bidzilya, sp. n., Dzhazator, Tara valley. **38-39.** Holotype (a - lateral view).

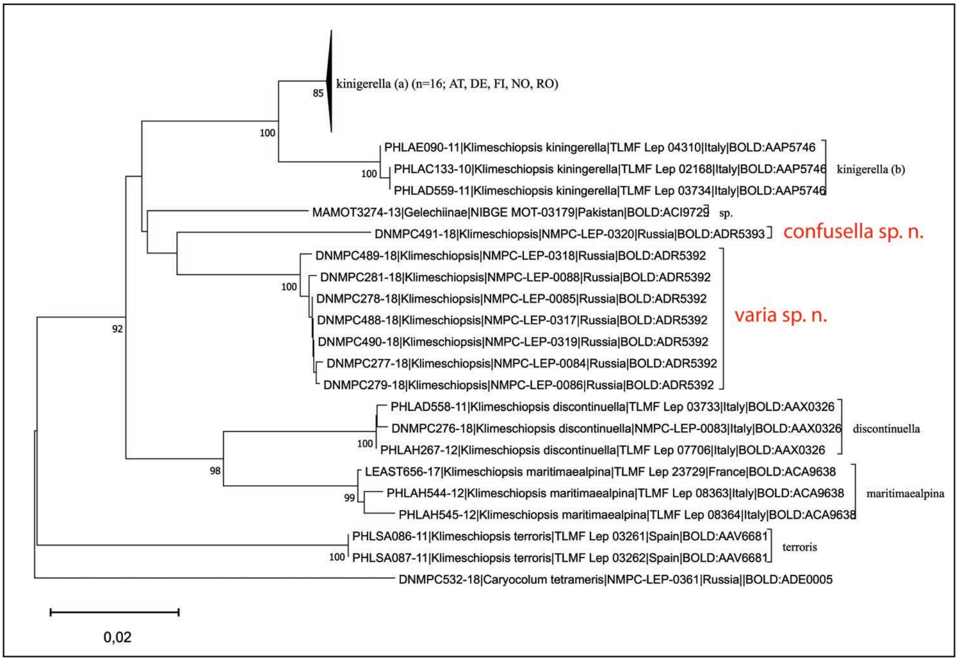
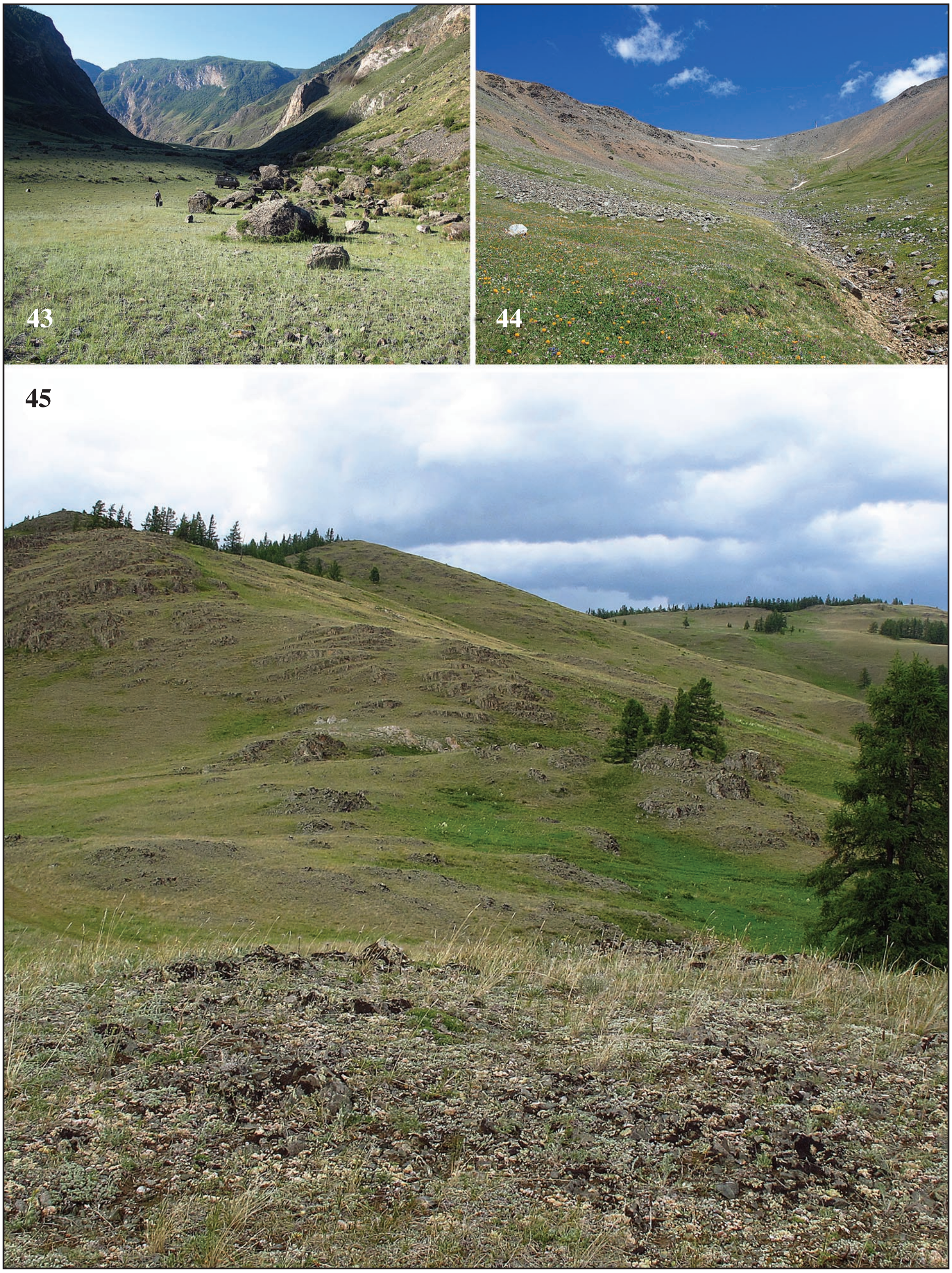
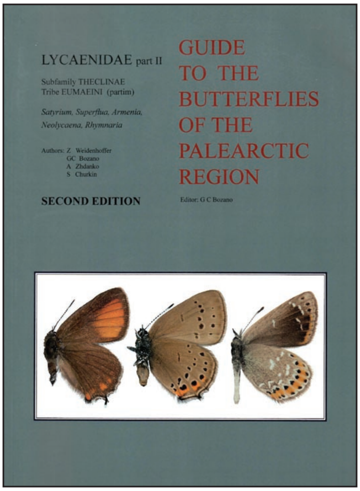


Figure 42. Neighbor-Joining tree of *Klimeschiopsis* species created from public records in BOLD, with *Caryocolum tetrameris* (Meyrick, 1926) as outgoroup. Source: Barcode of Life. Database, cf. RATNASINGHAM & HEBERT (2007).



Figures 43-45. Habitats of new *Klimeschiopsis* species in Altai Mts. **43.** Chulyshman valley, 600 m a.sl., habitat of *K. varia* Šumpich & Bidzilya, sp. n. **44.** Zavod, 2900 m a.sl., habitat of *K. confusella* Šumpich & Bidzilya, sp. n. **45**. Steppe near Dzhangyskol lake, 1830 m a.sl., where both species occur sympatrically.

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS



Z. Weidenhoffer, G. C. Bozano, A. Zhdanko & S. Churkin
Guide to the Butterflies of the Palaearctic Region: Lycaenidae part II (Second Edition)
106 páginas
Formato 29’5 x 21 cm
Omnes Artes, Milano, 2022
ISBN: 978-88-87989-18-9

Tenemos en nuestras manos, una nueva entrega de esta interesante serie conocida como *Guide to the Butterflies of the Palearctic Region*, concretamente se trata de la segunda parte de los Lycaenidae Leach, [1815], estudiándose la subfamilia Theclinae Swainson, 1831 y la Tribu Eumaeini Doubleday, 1847 (en parte) y, dentro de ella, los géneros *Satyrium* Scudder, 1876 (con tres subgéneros *Satyrium* Scudder, 1876, *Superflua* Strand, 1910 y *Armenia* Dubatolov & Koeshunov, 1984) y *Neolycaena* Niceville, 1890 (con dos subgéneros *Neolycaena* Niceville, 1890 y *Rhymnaria* Zndanko, 1983).

Se trata de una Segunda Edición de esta interesante subfamilia, que anteriormente fue publicada hace ya doce años, en esta ocasión fruto del resultado de las investigaciones realizadas en Asia Central y China, principalmente ampliándose el conocimiento del género *Neolycaena*, con estudios genéticos de ADN.

En esta entrega se tratan 50 especies (cinco más que en la primera edición) y, para *Satyrium pruni* (Linnaeus, 1758), se establece una nueva combinación subespecífica, concretamente *Satyrium pruni pseudopruni* Murayama 1992 y también se establecen dos nuevas sinonimia *Styrmonidia pruni dujianensis* Sichua, 1992 y *Styrmonidia pruni gansuensis* Sugiyama, 1992.

De todas y cada una de las especies, nos presentan la descripción original, así como de todas las sinonimias consideradas, al igual que ocurre con las subespecies que los autores consideran como válidas en este trabajo. También nos encontramos con las principales características que nos permiten diagnosticarlas, datos sobre la morfología de la genitalia del macho, interesantes notas taxonómicas, datos sobre su distribución (que podemos ver en un mapa de la región Paleártica) y las principales referencias bibliográficas consideradas.

Es importante destacar, que se presentan excelentes fotografías de los ejemplares, no sólo de la especie original, si no de un gran número de subespecies consideradas. Termina la obra con una detallada bibliografía específica, que recoge todas las referencias contempladas a lo largo del trabajo y que consideramos imprescindibles en su conjunto.

No podemos terminar estas líneas, sobre este excelente trabajo y, de la que ya podemos considerar como una serie clásica, sin felicitar a los autores por la realización de tan importante trabajo, así como a la Editorial una vez más, por su dedicación en publicar esta obra básica, que no debe de faltar en ninguna biblioteca que se precie, tanto institucional como particular. El precio de este libro es de 32 euros y los interesados lo pueden pedir a:

Omnes Artes
Via Castel Morrone, 19
I-20133 Milano
ITALIA / *ITALY*
E-mail: giancristoforo.bozano@fastwebnet.it

A. Vives Moreno
E-mail: avives1954@outlook.es
https://orcid.org/0000-0003-3772-2747

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 705-708 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.262

First record of *Celaenorrhinus ratna daphne* Evans, 1949 from Himachal Pradesh and its first photographic record from the Western Himalayas (Lepidoptera: Hesperiidae, Pyrginae)

Lovish Garlani

Abstract

The *daphne* subspecies of *Celaenorrhinus ratna* Fruhstorfer, [1908] reported first by Evans (1949) from Uttarakhand and has not been reported in the past from the neighbor state Himachal Pradesh. In July 2017, Author recorded and photographed about eight specimens of *Celaenorrhinus ratna daphne* Evans, 1949 for the first time near McLeodganj town of Himachal Pradesh.

Keywords: Lepidoptera, Hesperiidae, Pyrginae, Western Himalayas, Himachal Pradesh, India.

Primer registro de *Celaenorrhinus ratna daphne* Evans, 1949 del Himachal Pradesh y su primer registro fotográfico del Himalaya occidental (Lepidoptera: Hesperiidae, Pyrginae)

Resumen

La subespecie *daphne* de *Celaenorrhinus ratna* Fruhstorfer, [1908] citada por primera vez por Evans (1949) de Uttarakhand y no ha sido citada en el pasado del estado vecino Himachal Pradesh. En julio de 2017, el autor registró y fotografió unos ocho ejemplares de *Celaenorrhinus ratna daphne* Evans, 1949 por primera vez cerca de la ciudad de McLeodganj de Himachal Pradesh.

Palabras clave: Lepidoptera, Hesperiidae, Pyrginae, Himalaya occidental, Himachal Pradesh, India.

Introduction

Himachal Pradesh is a northern Indian state and extends from the latitudes 30º 22’ 40”N to 33º 12’ 40’’ N and longitude 75º 45’ 55” E to 79º 04’ 20” E in the western Himalayan Mountain range. The elevation of this hill state extends from 350 meters in the southern lowlands and reaches up to 7000 meters in the high Himalayan ranges. Such a great variation in elevation supports vast species of Rhopalocera. The Rhopalocera of Himachal are well studied in the past. Shimla was the summer capital of India during British times and hence it attracted many research workers to study the Rhopalocera of Himachal Pradesh. All the scientific work done on Rhopalocera of Himachal from mid to late 19th century was included in publications by Evans (1932) and Tablot (1939, 1947). Mani (1986) reported 377 species of Rhopalocera from Himalayas, but he did not include Hesperiidae family.

Tytler’s Multi-spotted Flat *Celaenorrhinus ratna tytleri* Evans, 1926 is uncommon in Himalayas and its range is from Central and Eastern Himalaya to NE India and Nepal, Bhutan, Myanmar (Varshney & Smetacek 2015; Kehimkar, 2016; Sondhi & Kunte, 2018). The West Himalayan Ratna

Flat *Celaenorrhinus ratna daphne* Evans, 1949 is very rare in Western Himalayas and has been recorded in Northwest Frontier Province NWFP (Kaghan Valley, Mansehra) in Pakistan and in Uttarakhand (Kumaon) between the ranges of 2300-3300 m (Gasse, 2018).

Materials and Methods

On 12-VII-2017, during a visit to McLeodganj, Kangra district in Himachal Pradesh, I recorded the West Himalayan Ratna Flat *Celaenorrhinus ratna daphne* Evans, [1949] around 13:15h (Figure 1). It was observed for the first time near St. John Church, on the way to McLeodganj, at ForsythGunj (32.2427949 N, 76.3182040 E) at an altitude of 1775 m. There were about 8 specimens of *Celaenorrhinus ratna daphne* Evans, 1949 resting under the leaves of *Colocasia sp.* plants. Some of the specimens were fresh while few had damaged wings. After planning several visits to the same locations in subsequent years, no other specimen was recorded.

Results and Discussion

Description (Adult) (Figure 1): *Celaenorrhinus ratna* Fruhstorfer, 1908 is a 4-5 mm sized flat of Hesperiidae family which can be seen in the hill forests between June and September. Two subspecies of *Celaenorrhinus ratna* Fruhstorfer, 1908 which are known to occur in India were reported by Evans (1926, 1949) as *Celaenorrhinus ratna tytleri* Evans, 1926 and *Celaenorrhinus ratna daphne* Evans, 1949.

Figure 1. Upper side of *Celaenorrhinus ratna daphne* Evans, 1949 ForsythGunj, Himachal Pradesh, India.

Celaenorrhinus ratna Fruhstorfer, 1908 is very similar to *Celaenorrhinus pulomaya* (Moore, [1866]) but yellow spots on Upper Hindwings are smaller in the Western Himalayan subspecies. The abdomen is prominently yellow-striped, Hindwing cilia are checkered, and basal half of the antenna is white *Celaenorrhinus ratna daphne* Evans, 1949 (Sondhi & Kunte, 2018).

A detailed study of old literature on Indian Rhopalocera reveals that Evans (1949) was the first to report *daphne* subspecies of *Celaenorrhinus ratna* Fruhstorfer, 1908 from Kumaon, Uttarakhand and there is no any recent published or photographic record from the state of Uttarakhand (Sondhi & Kunte, 2018). Other publications specifically focused on Himachal Pradesh (Moore 1882; de Rhe-Philipe 1931; Talbot 1939, 1947; Wynter-Blyth 1940-1946) do not list this species from the state. Considering the recent publications (Mehta et al. 2002; Thakur et al. 2002; Singh, 2008; Arora et al. 2009; Saini et al. 2009; Singh & Banyal, 2013; Chandel et al. 2014; Sharma et al. 2015) reveals no records of this species from Himachal Pradesh. It is worth to mention that there is no photographic record of *Celaenorrhinus ratna daphne* Evans, 1949 is given on the Rhopalocera of India website (Kunte et al. 2020).

Hence the record of *Celaenorrhinus ratna daphne* Evans, 1949 is the first record from Himachal Pradesh and also the first photographic record from the Western Himalayas.

Acknowledgements

This record is part of a long-term survey and study in McLeod Ganj town of Himachal Pradesh. The author acknowledges cooperation from the local people. The present study is self-funded by the author.

References

Arora, G. S., Mehta, H. S., & Walia, V. K. (2009). *Handbook on Butterflies*. Zoological Survey of India.

Chandel, S., Kumar, V., Sharma, B. P., & Patiyal, R. (2014). Butterfly fauna of Shivalik hills areas of Kangra and Hamirpur districts of Himachal Pradesh in India. *Life Sciences Leaflets, 55,* 25-38.

De Rhe-Philipe, G. W. V. (1931). *The butterflies of the Simla Hills*. *Journal of the Bombay Natural History Society, 35*(2), 172-184, 415-429, 620-634.

Evans, W. H. (1926). The Identification of Indian butterflies. Part. IX. *Journal of the Bombay Natural History Society, 31*(1), 49-83, pl. 30.

Evans, W. H. (1932). *The Identification of Indian Butterflies*. The Bombay Natural History Society.

Evans, W. H. (1949). *A Catalogue of the Hesperiidae from Europa, Asia, and Australia in the British Museum (Natural History)*. Trustees of the British Museum.

Kehimkar, I. (2016). *Butterflies of India*. Bombay Natural History Society.

Kumar, A., & Juneja, D. P. (1977). Some distributional records of butterflies (Lepidoptera: Rhopalocera) from Himachal Pradesh (Western Himalayas). *Newsletter Zoological Survey of India, 3*(6), 410-415.

Kunte, K., Sondhi, S., & Roy, P. (2020). *Butterflies of India, v. 2.88*. Indian Foundation for Butterflies.

Mehta, H. S., Thakur, M. S., Sharma, R. M., & Mattu, V. K. (2002). Butterflies of Pong Dam wetland, Himachal Pradesh. *India Binotes, 4*(2), 37-38.

Moore, F. (1882). List of the Lepidoptera collected by the Rev. J. H. Hocking in the Kangra District, N. W. Himalaya; with descriptions of new genera and species. *Proceedings of the Zoological Society of London, 1882,* 234-263.

Saini, K., Sidhu, A. K., & Mehta, H. S. (2009). Insecta: Lepidoptera: Rhopalocera. In *Faunal Diversity of Pong Dam and its Catchment Area (District Kangra, Himalaya Pradesh)* (pp. 21-41). Zoological Survey of India.

Singh, A. P. (2008). Butterflies of Renuka Wildlife Sanctuary, Sirmaur District, Himachal Pradesh, India. *The Indian Forester, 134*(10), 1326-1338.

Singh, V., & Banyal, H. S. (2013). Insect Fauna of Khajjiar Lake of Chamba District, Himachal Pradesh, India. *Pakistan Journal of Zoology, 45*, 1053-1061.

Sondhi, S., & Kunte, K. (2018). *Butterflies of Uttarakhand: A Field Guide*. National Centre for Biological Sciences and Indian Foundation for Butterflies.

Thakur, M. S., Mehta, H. S., & V. K. Mattu, V. K. (2002). Butterflies of Kalatop-Khajjiar Wildlife Sanctuary, Himachal Pradesh. *Zoos Print Journal, 17*(10), 909-910. https://doi.org/10.11609/JoTT.ZPJ.17.10.909-10

Uniyal, V. P. (2007). Butterflies in the Great Himalayas Conservation Landscape in Himachal Pradesh, Western Himalayas. *Entomon, 32*(2), 119-127.

Varshney, R. K., & Smetacek, P. (2015). *A Synoptic Catalogue of the Butterflies of India*. Bhimtal and Indinov Publishing.

Wynter-Blyth, M. A. (1940-1947). A list of butterflies of the Shimla hills. *The Journal of the Bombay Natural History Society, 41*, 719-741, *42,* 448; *43,* 672-673; *45,* 256-257; *46,* 735-736.

Wynter-Blyth, M. A. (1957). *Butterflies of the Indian Region*. Bombay Natural History Society.

Lovish Garlani
Village & P. O: Garli, Tehsil
Rakkar, District Kangra
Himachal Pradesh 177108
INDIA / *INDIA*
E-mail: lovishgarlani.natgeo123@gmail.com
https://orcid.org/0000-0002-0663-9775

y / *and*

Himachal Pradesh University
Summerhill, Shimla
Himachal Pradesh 171005
INDIA / *INDIA*

(Recibido para publicación / *Received for publication* 7-VIII-2022)
(Revisado y aceptado / *Revised and accepted* 9-VIII-2022)
(Publicado / *Published* 30-XII-2022)

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 709-728 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.263

Perturbación antrópica afectando a los patrones de diversidad en Satyrinae de montaña Pronophilina Reuter, 1896 en un bosque altoandino en Colombia (Lepidoptera: Nymphalidae)

Vanessa Díaz-Suárez, Oscar Mahecha-J., Miguel Gonzalo Andrade-C. & Thomasz W. Pyrcz

Resumen

Los Lepidoptera de la subtribu Pronophilina Reuter, 1896 se encuentran ampliamente distribuidas en la región Neotropical, específicamente en los ecosistemas altoandinos/páramos. Estos, en las últimas décadas se han visto altamente afectados por diversas actividades antrópicas, logrando alterar la relación biocenosis-biotopo. Por lo tanto, es de vital importancia conocer los patrones de diversidad y distribución de las especies que se encuentran relacionadas en un área perturbada, para implementar estrategias de conservación. Por consiguiente, en el presente estudio se analizó el efecto de la actividad antrópica en los patrones de diversidad de las mariposas Pronophilina en un bosque alto andino en la región del Frailejonal, Cundinamarca, Colombia. Se realizaron muestreos empleando métodos estándar tanto pasivos como activos para estudios ecológicos en mariposas. Se establecieron tres estaciones de estudio según el grado de perturbación del hábitat: "Alto", "Medio" y "Bajo". Para analizar los patrones de diversidad se realizaron los estimativos de números de Hill (basados en especies efectivas) y se analizó el recambio de especies mediante un análisis de similitud de Bray Curtis corroborado por una prueba NMDS, basado en esto se encontró que este grupo de mariposas presenta menor riqueza y mayor presencia de especies dominantes en la zona de "Alta" perturbación. A su vez, en el estado "Medio" y "Bajo" se evidenció una mayor diversidad de mariposas. Se propone a *Panyapedaliodes drymaea* (Hewitson, 1858), *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867) y *Pedaliodes polla* Thieme, 1905 como especies sinantrópicas, dada su alta abundancia en las áreas perturbadas, puesto que al parecer responden mejor a procesos antrópicos. No obstante, se reportan especies endémicas de Pronophilina como *Lymanopoda samius* Westwood, 1851, *Manerebia apiculata* (C. Felder & R. Felder, 1867), y *Manerebia levana* (Godman, 1905), destacando la importancia de generar estrategias de restauración ecológica y de conservación en la zona de estudio.

Palabras clave: Lepidoptera, Nymphalidae, Satyrinae, fragmentación del hábitat, riqueza, especies sinantrópicas, endemismo, variación altitudinal, Colombia.

Anthropic disturbance affecting the patterns of diversity in the Mountain Satyrinae Pronophilina Reuter, 1896 in an upper Andean Forest in Colombia (Lepidoptera: Nymphalidae)

Abstract

Lepidoptera of the subtribe Pronophilina Reuter, 1896 are widely distributed in the Andes, specifically in high Andean/Paramo ecosystems. These ecosystems in the last decades have severely suffered from diverse anthropic activities, managing to affect the biocenosis-biotope relationship. Therefore, it is highly important to uncover the patterns of diversity and distribution of the species that are related in a disturbed area, in order to implement conservation strategies. Therefore, in the present study, the effect of anthropic disturbance on the diversity patterns of Pronophilina butterflies in a high Andean Forest in the village of Frailejonal, La Calera, Colombia was analyzed. Samples were conducted using standard passive and active methods for ecological studies in butterflies. Three study stations were established according to the degree of habitat disturbance: “High”, “Medium”, and “Low”. To analyze the diversity patterns, Hill number estimates (based on effective species) were performed and species turnover was analyzed by a Bray Curtis similarity analysis corroborated by an NMDS test, based on this it was found that this group of butterflies present less richness and the greater presence of dominant species in the zone of “High” disturbance. In turn, in the “Medium” and “Low” states, there was a greater diversity of butterflies. *Panyapedaliodes drymaea* (Hewitson, 1858), *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867) and *Pedaliodes polla* Thieme, 1905 are proposed as synanthropic species, given their high abundance in disturbed areas, since they appear to respond better to anthropic processes. However, endemic species of Pronophilina are reported such as *Lymanopoda samius* Westwood, 1851, *Manerebia apiculata* (C. Felder & R. Felder, 1867), and *Manerebia levana* (Godman, 1905), highlighting the importance of generating ecological restoration and conservation strategies in the study area.

Keywords: Lepidoptera, Nymphalidae, Satyrinae, habitat fragmentation, richness, synanthropic species, endemism, altitudinal variation, Colombia.

Introducción

Algunos de los efectos negativos de la perturbación antrópica es ocasionar la pérdida de la diversidad biológica y variación en los patrones de distribución de muchos grupos taxonómicos, como también cambiar la configuración espacial de los diferentes ecosistemas (Andrade-C., 2011; Fahring, 2003; Primack, 2006; Mahecha-Jiménez et al. 2011; Fonseca-F. & Mahecha-J., 2018; Murillo-P. et al. 2018; Cruz-Cabrera & Contreras, 2019), perdida del hábitat, producir alteraciones en el clima, disminución de los recursos naturales provocando un aumento en la competencia inter e intraespecífica y aislamiento de las poblaciones naturales, generando una disminución del flujo genético, conllevando a la formación de cuellos de botella, y en consecuencia, posibles extinciones locales (Montero et al. 2009; Pimm et al. 2014; Murillo-P. et al. 2018). Las alteraciones en el hábitat pueden originarse por actividades de urbanización, procesos de industrialización, agricultura, ganadería, silvicultura intensiva, fenómenos de expansión de las infraestructuras, lo cual genera un gran impacto en la pérdida de la superficie neta, formando parches, efectos de borde, generando una desestabilización en la homeostasis del ecosistema y provocando una disminución de nichos ecológicos presentes en los hábitats naturales (Fahring, 2003; Fonseca-F. & Mahecha-J., 2018). En este sentido, la pérdida en la conectividad del hábitat conlleva diferentes consecuencias, que según Forman (1995), indica que dichos cambios en el ambiente están determinados por un proceso en el cual el hábitat va quedando reducido a parches o islas de menor tamaño, más o menos conectadas entre sí, e inmersos en una matriz del paisaje.

Las consecuencias negativas de las actividades antrópicas se pueden evidenciar en diferentes grupos taxonómicos como los Lepidoptera, los cuales son usados como bioindicadores debido a su alta sensibilidad a las modificaciones del hábitat (Fahring, 2003; Brown Jr. & Freitas, 2000; Uehara-Prado et al. 2007; Andrade-C., 2011; Mahecha-Jiménez et al. 2011; Pyrcz & Garlacz, 2012; Marín et al. 2014; Mahecha-J. & Díaz-S., 2015; Enkhtur et al. 2017; Martins et al. 2017; Ramírez-Restrepo & Macgregor-Fors, 2017). Los Pronophilina Reuter, 1896, son un grupo de especies exclusivas de los bosques andinos de montaña, se distribuyen en altitudes comprendidas entre 1.000 y 4.000 m., presenta un alto grado de endemismo debido a sus patrones de distribución altitudinal restringidos a través de la cordillera de los Andes(Adams, 1985; Pyrcz & Wojtusiak, 2002; Viloria, 2007; Pyrcz et al. 2009; Casner & Pyrcz, 2010; Pyrcz & Garlacz, 2012; Marín et al. 2014; Pyrcz et al. 2016; Álvarez-Hincapié et al. 2017; Ávila-R. & Triviño, 2019; Mahecha et al. 2019). No obstante, los Pronophilina se han visto afectadas por las actividades antrópicas que se vienen llevando a cabo en las últimas décadas en los Andes colombianos, como por ejemplo la minería, la agricultura, la deforestación, la urbanización, y ganadería extensiva, lo que ha ocasionado una reducción y pérdida del hábitat de muchas especies de Pronophilina (Prieto, 2003; Pyrcz & Rodríguez, 2007; Andrade-C., 2011; Marín et al. 2014; Marín et al. 2015;

Ávila-R. & Triviño, 2019). Trabajos realizados por Mahecha-Jiménez et al. (2011) y Marín et al. (2014) han demostrado que los Pronophilina son uno de los grupos de Lepidoptera más afectados en la región andina a causa de las diferentes actividades antrópicas, reportándose variaciones en los patrones de diversidad y distribución. a lo anterior, el usó de Pronophilina como modelo biológico para analizar y evaluar el estado de conservación de los ecosistemas de montaña, es muy eficiente ya que son muy representativos en los Andes por su abundancia, riqueza de especies, la presencia de varios estudios ya existentes sobre el tema pueden servir de comparación, como también la facilidad de obtener datos estadísticamente analizables (ver: Pyrcz & Garlacz, 2012; Marín et al. 2015; Pyrcz et al. 2016; Álvarez-Hincapié et al. 2017; Mahecha et al. 2019).

Actualmente, en el Municipio de la Calera-Cundinamarca, ubicado a 25 kilómetros de Bogotá, en la Cordillera Oriental de Colombia, presenta una notable densidad de asentamientos urbanos relacionados con diversas actividades antrópicas como la ganadería, agricultura, minería, entre otras. Por consiguiente, es muy notable la perturbación del hábitat y el impacto en las poblaciones de flora y fauna de esta área. Estas actividades antrópicas han ocasionado un cambio en la configuración del paisaje natural, originando posibles cambios en los patrones de diversidad y distribución de varios grupos taxonómicos como lo son los Pronophilina que habitan en esta zona del país (Mahecha-Jiménez et al. 2011; Marín et al. 2014; Pyrcz et al. 2016; Ávila-R. & Triviño, 2019). El municipio de la Calera es de vital importancia biológica, debido a la estructura ecológica que lo compone: desde áreas de reserva forestal de índole protectora y productora, áreas protegidas del Sistema de Parques Nacionales Naturales como lo es el Parque Nacional Natural Chingaza, áreas de gran importancia ecosistémica como los páramos de Chingaza y Sumapaz y varios subpáramos, con conexión a los cerros orientales de Bogotá, áreas de recarga de acuíferos, márgenes hídricas, rondas hidráulicas, entre otros servicios ecosistémicos, por estas razones es considerada una zona estratégica de amortiguación, el cual cumple una función del sustento de procesos ecológicos esenciales del territorio (Castro et al. 2009).

Se requieren acciones para evitar la pérdida de hábitat y biodiversidad en esta zona del país, siendo indispensable realizar estudios que permitan conocer la diversidad de especies de fauna y flora que presentan algún tipo de vulnerabilidad, como el caso de los Pronophilina y que a la vez ayuden a comprender las causas que amenazan la biodiversidad regional en Colombia (Krieger et al. 2000). Por tal motivo, el objetivo del presente estudio fue analizar los efectos de la perturbación antrópica en los patrones de diversidad de los Pronophilina en un bosque altoandino en la Calera, Colombia, y de esta forma dar una idea de cómo se comportan estas especies de Lepidoptera ante un evento de perturbación antrópica, encontrándose una disminución de la diversidad y presencia de especies sinantrópicas en las áreas con una alta perturbación antrópica. Sin embargo, se destaca la presencia de especies endémicas de Pronophilina en el área de estudio.

Materiales y métodos

Área de Estudio

El estudio se realizó en la Vereda Frailejonal, ubicada en el municipio de la Calera en el departamento de Cundinamarca sobre la vertiente Oriental de la Cordillera Oriental de Colombia (4º40’14.26” N y 73º57’13.78” O) (Figure1). La máxima precipitación anual en el municipio se encuentra en las cabeceras del Río Blanco, con valores estimados de 1.700 mm anuales; los mínimos en la cuenca del Río Teusacá, hacia la parte media nororiental, con valores de 700 mm. La temperatura media anual oscila entre 10ºC en las partes más altas y 16ºC en la parte más baja del municipio (Castro et al. 2009; Andrade, 2019). La Vereda Frailejonal se encuentra ubicada en la parte sur del municipio y blinda por el suroriente y oriente con el municipio de Choachí y la vereda de Jerusalén, por el nororiente con la vereda El Volcán, por el noroccidente con la vereda El Rodeo y por el occidente con las veredas El Salitre y El Hato. Se extiende sobre la vertiente derecha de las hoyas hidrográficas de la quebrada Socha, perteneciente a la cuenca del río Teusacá. Estando cerca otras afluentes de cuerpos de agua. Esta zona y sus alrededores se caracterizan por el predominio de explotación agropecuaria, ganadería de doble propósito y cultivos transitorios y adicionalmente la cría de cerdos en algunas áreas (Castro et al. 2009; Andrade, 2019).

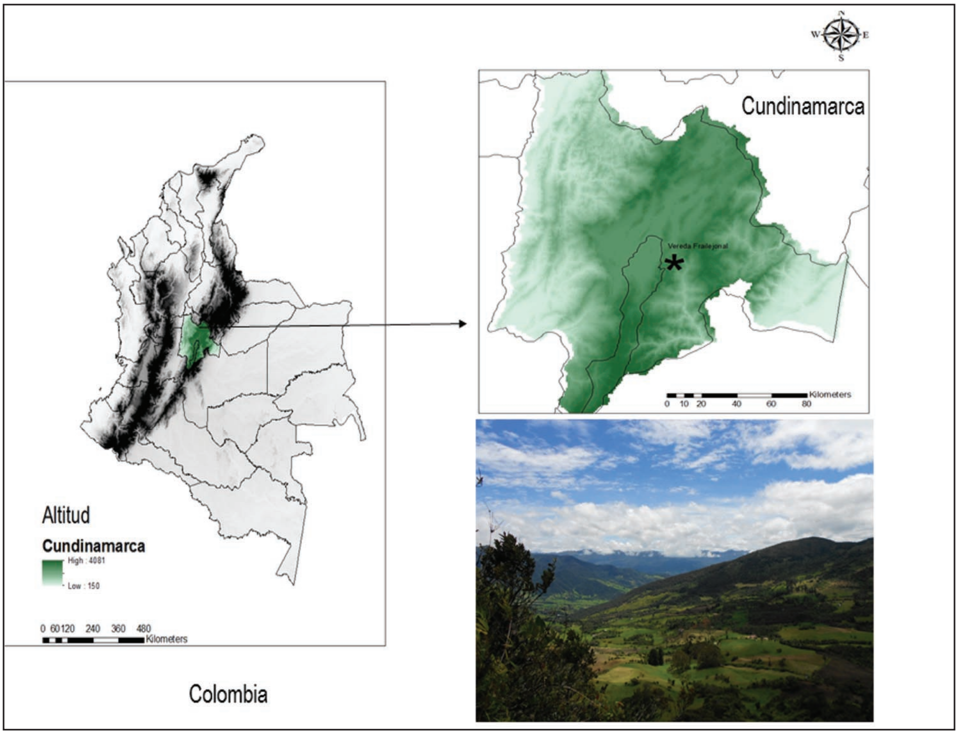


Figure 1. Área de estudio, Vereda Frailejonal, Municipio la Calera, Cundinamarca, Colombia.

Fase de Campo

La fase de campo se realizó con un intervalo de cada 15 días entre las fechas de 2-VI-2013 a 30-IX-2015, con el fin de poder abarcar periodos de lluvias y de sequía. Se establecieron tres estaciones de estudio según el estado de perturbación del hábitat: Alto, Medio y Bajo. Cabe aclarar que las estaciones de estudio se encontraban a diferentes altitudes debido a que el área de estudio corresponde a un hábitat de montaña, además, la actividad antrópica se está originando desde la parte baja hacia la parte alta de la misma. No obstante, no hubo un efecto de la elevación en la investigación, puesto que el gradiente altitudinal del área de estudio está entre los 3.030 m hasta los 3.210 m, teniendo un gradiente total de 180 m, y varios estudios que han evaluado el efecto de la altitud en patrones de diversidad, han presentado gradientes muy amplios que pueden llegar abarcar más de 800 m (Pyrcz & Wojtusiak, 2002; Jaime-Escalante et al. 2016; Xu et al. 2017). A su vez, la escala recomendada para observar patrones altitudinales de diversidad es a partir de intervalos de 300 m (Grytnes et al. 2008; Jaime-Escalante et al. 2016).

Por lo anterior, el estado “Alto” presentó una altitud de 3.030 m, se caracterizó por tener una cobertura vegetal dominada por especies exóticas como *Pinus patula* Schiede ex Schltdl. & Cham, (Pino), *Pinus radiata* D. Don (Pino candelabro), *Rumex* spp. (Lengua de Vaca), *Holcus lanatus* L. (Falsa poa), *Thunbergia alata* Bojer ex Sims, entre otras. A su vez, este estado presenta una fuerte intervención antrópica causada por la agricultura y ganadería, lo que ha conllevado a la desaparición de especies nativas de la zona como las pertenecientes al bambu del género *Chusquea* Kunth. El estado "Medio" tuvo una altitud de 3.150 m, presentó una cobertura vegetal conformada por especies exóticas: *P. patula*, *Rumex* sp., pastizales, y por especies nativas del género *Chusquea*, *Puya* Molina (Cardosanto), entre otras; en cuanto al nivel de intervención antrópica se observaron menos cultivos y ninguna presencia de ganado. Finalmente, el estado "Bajo", estuvo a una altitud e 3.210 m, caracterizándose por presentar una cobertura vegetal conformada por remanentes de especies nativas principalmente, como *Chusquea* spp. *Weinmannia tomentosa* L., *Vallea stipularis* L. (Raque), *Espeletia chocontana* Cuatrecasas (Frailejón), También, se observó una gran abundancia de briófitos, líquenes y hepáticas que no eran muy comunes en los otros dos estados de perturbación. El impacto de las actividades antrópicas es mínimo, donde apenas se puede observar algunas viviendas y cultivos de *Solanum tuberosum* L.

Métodos de captura

Para cada área de estudio se empleó un transecto lineal de 250 m con dos métodos de recolecta: pasivo y activo. En el método pasivo se colocaron cinco trampas de tipo Van Someren-Rydon en cada estación de estudio, a una distancia de 2 m al nivel de suelo y a una distancia entre trampas de 30 m. Las trampas fueron cebadas aleatoriamente con excremento de perro, fruta y pescado en descomposición, puesto que varios autores como Pyrcz & Wojtusiak (2002), Mahecha-Jiménez et al. (2011) y Pyrcz & Garlacz (2012) mencionan que resultan ser muy buenos atrayentes para los Pronophilina. Las trampas se revisaron cada tres horas en un intervalo de tiempo comprendido entre las 09.00 y las 17.00 horas (Villarreal et al. 2004; Andrade-C. et al. 2013). Adicionalmente, con el método activo se efectuaron muestreos manuales con red entomológica, en un periodo de tiempo entre las 08.30 y las 17.00 horas, recorriendo cada estación de estudio en zigzag durante dos horas, logrando abarcar diferentes horarios de recolecta en cada estación. Para cada ejemplar capturado se registró la información siguiendo el protocolo propuesto por Andrade-C. et al. (2013).

Análisis taxonómico

El material recolectado fue preparado, determinado y conservado en el Museo de Historia Natural de la Universidad Distrital Francisco José de Caldas, Bogotá, Colombia. La determinación taxonómica se llevó a cabo mediante un análisis de caracteres morfológicos como: patrón alar y de coloración, estructura de los genitales del macho, los cuales se extrajeron siguiendo el procedimiento estándar de maceración de la estructura en KOH al 10%, y siendo preservados en viales con glicerol (Andrade-C. et al. 2013). El arreglo taxonómico se basó en los trabajos de Adams (1985) y Pyrcz et al. (2009, 2013, 2016). Para los fines de comparación se manejó el material depositado en el Instituto de Ciencias Naturales de la Universidad Nacional de Colombia (ICN), Bogotá, Colombia y la colección del Nature Education Centre (anteriormente Zoological Museum) de la Universidad Jaguelona, Kraków, Polonia. Los nombres de las especies y subespecies determinadas fueron contrastados con la lista de Lamas et al. (2004) y la página de Warren et al. (2013).

Análisis de datos

Se calculó el estimativo de diversidad en términos de especies efectivas o números equivalentes de Hill, el cual permite aproximarse mejor a la riqueza de especies, puesto que incorpora la abundancia relativa de las mismas, permitiendo dar importancia a las especies menos abundantes y poco comunes (raras), o teniendo presente la dominancia, es decir, este método da mayor énfasis a las especies más abundantes, logrando solucionar el problema de "Ala abundancia", un tema bastante discutido en los diferentes estudios sobre diversidad al momento de hacer comparaciones entre ensamblajes de comunidades (Hill, 1973; Jost, 2006; Moreno et al. 2011; Chao et al. 2014). Además, se ha demostrado que, para un mejor análisis de la diversidad en un ensamblaje, los números de especies efectivas son los más adecuados en comparación con los estimativos basados en la teoría de la comunicación como es el caso del índice de entropía de Shannon (Ellison, 2010; Moreno et al. 2011). Por lo tanto, las especies efectivas consisten en: diversidad de orden 0 (0D) o riqueza de especies, orden 1 (1D), que es el exponencial de la entropía del índice de Shannon, y orden 2 (*2D*), que es el inverso del índice de Simpson (Moreno et al. 2011; Chao et al. 2014; Marín et al. 2014). Además, se calculó un Bootstrap como estimativo en la diversidad esperada para el orden 0 (0D), el estimativo de Chao & Shen (2003) para la diversidad esperada de orden 1 (1D) y para la diversidad esperada de orden 2 (2D) el estimador MVUE (Minimun variance unbiased estimator) (Gotelli & Colwell, 2011; Moreno et al. 2011; Gotelli & Chao, 2013; Marín et al. 2014; Casas-Pinilla et al. 2017). Teniendo en cuenta la frecuencia de cada especie durante todo el muestreo, se agruparon por clases de abundancia siguiendo lo propuesto por Montero & Ortiz (2013): - Especies abundantes: más de 10 registros - Especies comunes: entre 6-10 registros - Especies escasas: de 2 a 5 registros y -Especies raras: 1 solo registro.

Se realizó un análisis de Rarefacción/Extrapolación (R/E) por cobertura de la muestra (sample covarage), realizando 100 aleatorizaciones, en donde se calcularon las estimaciones de diversidad (números de Hill) para muestras enrarecidas y extrapolando al doble del número de individuos de la comunidad con la menor cobertura de muestra de referencia (Chao & Jost, 2012; Hsieh et al. 2016). Asimismo, el R/E permite comparar sitios que tienen diferentes tamaños en sus muestras, y conocer qué tan representativo fue el muestreo realizado en cada zona de muestreo (Cleary & Genner, 2006; Gotelli & Colwell, 2011; Chao & Jost, 2012; Chao et al. 2014; Hsieh et al. 2016).

Para determinar la similitud entre las altitudes según la abundancia y composición de especies se realizó un análisis de Clúster empleando como medida de disimilitud el índice de Bray-Curtis y como método de agrupamiento el UPGMA (Unweighted Pair Group Method with Arithmetic Mean). Así mismo, para soportar los resultados obtenidos en el análisis de Clúster, se llevó a cabo una prueba de ordenación de Escalamiento Multidimensional No-Métrico (NMDS) utilizando el índice de similitud de Bray-Curtis (Brehm et al. 2003b; Urbano et al. 2018). Para establecer si existían diferencias significativas en la composición de especies basados en datos de abundancia entre los sitios de muestreos, se empleó una estadística de tipo no-paramétrica, pues al realizar la prueba de normalidad de K-S Lilliefors, los datos no presentaron una distribución normal (p-value = 0.00002). Por consiguiente, se realizó un análisis de Kruskal-Wallis (Zar, 1974). Todos los análisis estadísticos y ecológicos se precisaron bajo un nivel de significancia del 95% utilizando el programa R versión 3.6.1 (R Core Team, 2019), mediante los paquetes BiodiversityR (Kindt & Coe, 2005), “diverse” (Guevara et al. 2016),”vegan” (Oksanen et al. 2019), iNEXT (Hsieh et al. 2016).

Resultados

Patrones de diversidad

Se recolectaron 639 individuos, distribuidos en 11 géneros, 23 especies y 10 subespecies (Tabla 1). El género *Pedaliodes* A. Butler, 1867 presentó la mayor riqueza con 7 especies, seguido por los géneros *Corades* E. Doubleday, [1849] *y Lymanopoda* Westwood, 1851, con tres especies respectivamente. *Pedaliodes polla* Thieme, 1905, *Corades medeba columbina* Staudinger, 1894, *Panyapedaliodes drymaea* (Hewitson, 1858) y *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867) se presentaron en todos los estados de perturbación antrópica con variación en sus abundancias en cada estado de perturbación (Tabla 1). Según la agrupación por clases de abundancias según la frecuencia durante el muestreo, se identificaron especies abundantes: *Lymanopoda samius* Westwood, 1851, *Lasiophila circe* C. Felder & R. Felder, 1859, *Panyapedaliodes drymaea* (Hewitson, 1858), *Pedaliodes empusa* (C. Felder & R. Felder, 1867), *Pedaliodes polla* Thieme, 1905*, Pedaliodes phaea ochrotaenia* (C. Felder & R.

Felder, 1867), entre otras; comunes: *Corades chelonis* Hewitson, 1863, *Corades medeba columbina* Staudinger, 1894, *Manerebia apiculata* (C. Felder & R. Felder, 1867), *Manerebia levana* (Godman, 1905) y *Steremnia pronophila* (C. Felder & R. Felder, 1867); escasas: *Lymanopoda ionius* Westwood, 1851, *Eretris porphyria* (C. Felder & R. Felder, 1867), *Eretris apuleja bogotana* E. Krüger, 1924, *Junea doraete* (Hewitson, 1858); raras: *Corades chirone* Hewitson, 1863 y *Lymanopoda lebbaea* C. Felder & R. Felder, 1867, llamadas también especies "singletons" (Tabla 2). Además, se encontraron varias especies endémicas de la Cordillera Oriental, todas representadas por sus subespecies nominales, tales como: *Lymanopoda samius* Westwood, 1851, *Lymanopoda ionius* Westwood, 1851, *Manerebia apiculata* (C. Felder & R. Felder, 1867) y *Manerebia levana* (Godman, 1905). Adicionalmente, se propone una nueva especie para el género *Pedaliodes*, convirtiendo al área de estudio en el topotipo de la misma. Cabe aclarar que la descripción taxonómica se está realizando en un artículo a parte junto con el análisis filogenético de las especies que conforman a lo que Pyrcz et al. (2013) denominaron como grupo "*Pedaliodes phaea*".

Tabla 1. Abundancia por especie/subespecie de Pronophilina por estado de perturbación.

Especie/Subespecie	**Estado "Alto"**	**Estado "Medio"**	**Estado "Bajo"**
Corades chelonis Hewitson, 1863	0	2	4
Corades chirone Hewitson, 1863	0	0	1
Corades medeba columbina Staudinger, 1894	2	3	1
Lymanopoda samius Westwood, 1851	0	4	31
Lymanopoda lebbaea C. Felder & R. Felder, 1867	0	0	1
Lymanopoda ionius Westwood, 1851	0	3	0
Eretris porphyria (C. Felder & R. Felder, 1867)	0	3	0
Eretris apuleja bogotana E. Krüger, 1924	0	3	2
Junea doraete doraete (Hewitson, 1858)	0	0	2
Lasiophila circe C. Felder & R. Felder, 1859	0	13	18
Manerebia apiculata (C. Felder & R. Felder, 1867)	0	0	10
Manerebia levana (Godman, 1905)	0	0	6
Panyapedaliodes drymaea (Hewitson, 1858)	34	14	4
Pedaliodes empusa (C. Felder & R. Felder, 1867)	0	7	73
Viloriodes manis (C. Felder & R. Felder, 1867)	0	3	34
Pedaliodes phaea ochrotaenia (C. Felder & R. Felder, 1867)	15	13	132
Pedaliodes n. sp.	0	1	26
Pedaliodes phoenissa (Hewitson, 1862)	0	1	40
Pedaliodes polla Thieme, 1905	3	8	103
Pedaliodes porcia (Hewitson, 1869)	0	0	2
Pedaliodes fuscata (C. Felder & R. Felder, 1867)	0	5	0
Pronophila unifasciata bogotensis Juriaanse, 1926	0	3	0
Steremnia pronophila (C. Felder & R. Felder, 1867)	0	0	9
Total	54	86	499

Según la abundancia en cada estado de perturbación, se encontró que en el estado "Bajo" el número de individuos fue mayor, 499 individuos en relación con los otros dos estados, en dónde, la abundancia del estado "Medio" y "Alto" disminuyó considerablemente (Tabla 1). En cuanto a los perfiles de diversidad expresado en el número de especies efectivas, se evidenció que los valores 0D, 1D y 2D variaron entre los estados de perturbación tanto en lo observado como en lo esperado (Tabla 3), además, se encontraron diferencias significativas entre los perfiles de diversidad (Kruskal-Wallis: p-value = 0.00013). Por lo tanto, se evidenció una variación en la riqueza (0D) entre los estados de perturbación, en donde para el estado "Bajo" se registraron 19 especies, "Medio" 16 especies, y "Alto" 4 especies, logrando observar una reducción de la riqueza a medida que aumenta el estado de perturbación antrópica en el área de estudio, aunque se evidencia que la riqueza entre el estado "Bajo" y "Medio" es muy similar. Igualmente, se observó que el estado con mayor valor de diversidad (1D) fue el estado "Bajo", seguido por el estado "Medio" y "Alto". Por su parte, la dominancia (2D) fue más alta en el estado "Alto", seguida por el estado "Medio" y "Bajo", lo que concuerda con los valores de diversidad (0D) y (1D), indicando que el estado "Bajo" y "Medio" son más equitativos y diversos en comparación con el estado "Alto" (Tabla 3). Se encontró que para el estado "Alto" *Panyapedaliodes drymaea* (Hewitson, 1858) (34 individuos) y *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867) (15 inddividuos) fueron dominantes; para el estado "Medio" *Panyapedaliodes drymaea* (Hewitson, 1858) (14 individuos), *Lasiophila circe* C. Felder & R. Felder, 1859 (13 individuos) y *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867) (13 individuos) fueron codominantes, y para el estado "Bajo" son codominantes *Pedaliodes polla* Thieme, 1905 (103 individuos) y *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867) (132 individuos).

Tabla 2. Agrupación de especies por clases de abundancia según la frecuencia de cada especie durante todo el muestreo.

Especie/subespecie	**Abundante**	**Común**	**Escasa**	**Rara**
Corades chelonis		**X**		
Corades chirone				**X**
Corades medeba columbina		**X**		
Lymanopoda samius	**X**			
Lymanopoda lebbaea				**X**
Lymanopoda ionius			**X**	
Eretris porphyria			**X**	
Eretris apuleja bogotana			**X**	
Junea doraete			**X**	
Lasiophila circe	**X**			
Manerebia apiculata		**X**		
Manerebia levana		**X**		
Panyapedaliodes drymaea	**X**			
Pedaliodes empusa	**X**			
Viloriodes manis	**X**			
Pedaliodes phaea ochrotaenia	**X**			
Pedaliodes sp.	**X**			
Pedaliodes phoenissa	**X**			
Pedaliodes polla	**X**			
Pedaliodes porcia			**X**	
Pedaliodes fuscata			**X**	
Pronophilina unifasciata bogotensis			**X**	
Steremnia pronophila		X		

En cuanto a las especies raras, según su abundancia, para cada estado de perturbación se observó que para el nivel "Alto" hubo un "doubletons" (*Corades medeba columbina* Staudinger, 1894); para el estado "Medio" se encontraron "singletons" (*Pedaliodes phoenissa* (Hewitson, 1862) y *Pedaliodes* sp. y "doubletons" (*Corades chelonis chelonis* Hewitson, 1863) y en el estado "Bajo" se observaron "doubletons" (*Corades chirone* Hewitson, 1863, *C. medeba columbina* Staudinger, 1894 y *Lymanopoda lebbaea* C. Felder & R. Felder, 1867), y "singletons" (*Eretris apuleja bogotana* E. Krüger, 1924, *Junea doraete* (Hewitson, 1858) y *Pedaliodes porcia* (Hewitson, 1869)) (Tabla 1). Por último, se puede observar que en el estado "Bajo" aún es probable registrar más especies de Lepidoptera según los valores de los perfiles de diversidad estimados, en donde la probabilidad de encontrar más especies en relación con lo observado es de siete especies para el estado "Bajo", cuatro especies en el estado "Medio" y tan solo de una especie para el estado "Alto" (Tabla 3).

Tabla 3. Diversidad de especies (Número de especies efectivas) observadas y estimadas para cada estado de perturbación.

	Observado			Estimado		
Estado	**0D**	**1D**	**2D**	**0D**	**1D**	**2D**
Alto	4	2.72	1.97	5	2.83	2.23
Medio	16	12.03	7.77	20	14.48	8.78
Bajo	19	15.80	9.50	26	19.97	10.94

Análisis de rarefacción/extrapolación

Al observar el análisis R/E se puede inferir que el esfuerzo de muestreo fue óptimo para todos los tres estados de perturbación (Figure 2). Además, al comparar los valores de los perfiles de diversidad (Tabla 3) para cada zona de estudio, se aprecia que los valores observados son similares a los estimados, corroborando lo encontrado en el análisis R/E, lo que permite inferir que los valores de diversidad, como la riqueza, son más altos en el estado de perturbación "Bajo" seguido del estado "Medio" y con valores muy bajos de diversidad el estado "Alto". Teniendo en cuenta la composición y abundancia de especies en el análisis clúster, se logró observar que el estado "Alto" presenta una alta disimilitud (0.65) en relación con los estados "Medio" y "Bajo", siendo estos dos últimos menos disímiles entre ellos (0.46) (Figure 3A). Lo anterior es corroborado mediante el análisis NMDS (stress de Kruskal-Wallis P-value = 0.000) (Figure 3B).

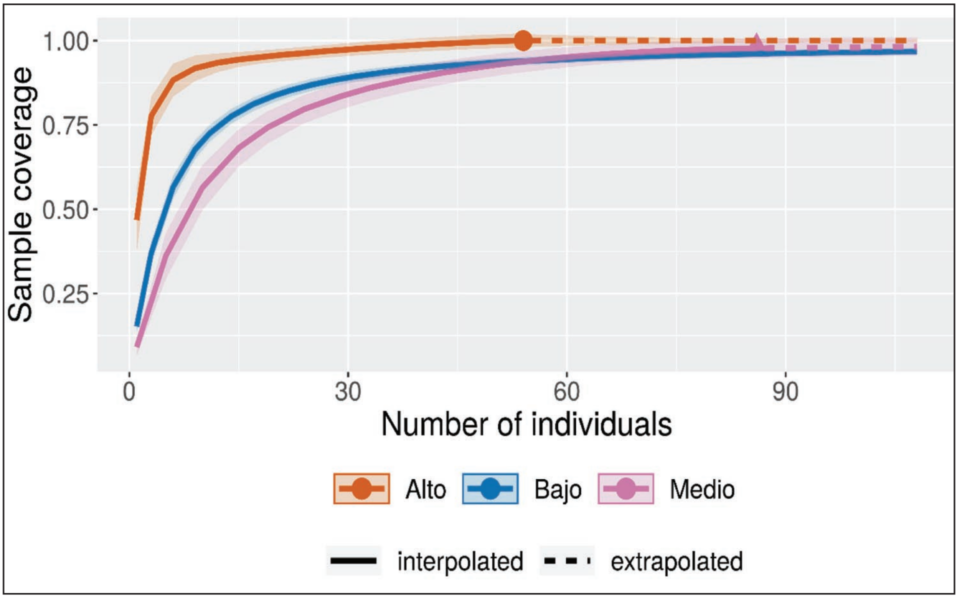


Figure 2. Análisis R/E (cobertura/completitud de la muestra) para cada estado de perturbación en la zona de estudio.

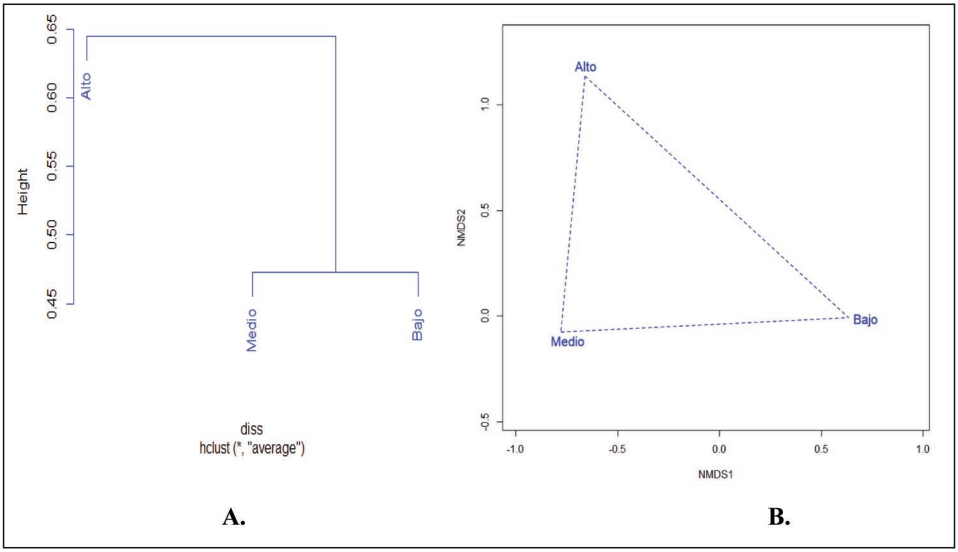


Figure 3. A. Análisis Clúster usando el índice de disimilitud de Bray-Curtis **B.** Análisis de ordenación por Escalamiento Multidimensional No-Métrico (NMDS).

Estados de perturbación y variación altitudinal

Según la composición de Lepidoptera en relación con los estados de perturbación y el rango altitudinal en que se encontraban establecidos, se observó que *Corades medeba columbina* Staudinger, 1894, *Panyapedaliodes drymaea* (Hewitson, 1858), *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867) y *P. polla* Thieme, 1905 estuvieron distribuidas a lo largo de los tres rangos altitudinales/estados de perturbación (3.030-3.150-3.210 m). Sin embargo, no se encontraron especies exclusivas en el rango altitudinal de los 3.030 msnm (estado "Alto"), pero sí una mayor frecuencia de *P. drymaea* (Hewitson, 1858). A los 3.150 m (estado "Medio") fueron exclusivos para este rango altitudinal: *Lymanopoda ionius* Westwood, 1851, *Eretris porphyria* (C. Felder & R. Felder, 1867) y *Pronophila unifasciata bogotensis* Juriaanse, 1926, mientras que para los 3.210 m (estado "Bajo") se reporta el mayor número de especies exclusivas (7 spp.): *Corades chirone* Hewitson, 1863, *Lymanopoda lebbaea* C. Felder & R. Felder, 1867, *Junea doraete* (Hewitson, 1858), *Manerebia apiculata* (C. Felder &.R. Felder, 1867), *M. levana* (Godman, 1905), *Pedaliodes porcia* (Hewitson, 1869) y *Steremnia pronophila* (C. Felder & R. Felder, 1867). En cuanto a las especies compartidas entre los estados de perturbación "Medio" y "Bajo" se observaron a *Corades chelonis* Hewitson, 1863, *Lymanopoda samius* Westwood, 1851, *Eretris apuleja bogotana* E. Krüger, 1924, *Lasiophila circe* C. Felder & R. Felder, 1859, *Pedaliodes empusa* (C. Felder & R. Felder, 1867), *V. manis* (C. Felder & R. Felder, 1867), *P. fuscata* (C. Felder & R. Felder, 1867) y *P. phoenissa* (Hewitson, 1862) (Tabla 4).

Discusión

Con los resultados obtenidos en el presente estudio se logra ratificar el impacto negativo de la transformación del hábitat, dada por la perturbación antrópica, en los patrones de diversidad de las especies de Pronophilina en un bosque altoandino, corroborando lo reportado por Mahecha-Jiménez et al. (2011), Pyrcz & Garlacz (2012), Marín et al. (2014) y Álvarez-Hincapié et al. (2017), en donde se indica una disminución en la diversidad de los Pronophilina en ambientes con una alta perturbación antrópica (estado “Alto”), encontrándose una alta dominancia de unas pocas especies como *Panyapedaliodes drymaea* (Hewitson, 1858) y *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867). Por otra parte, se ha demostrado que la heterogeneidad topográfica y la diversidad del hábitat pueden reducir la variabilidad de la población de las diferentes especies de Lepidoptera (Oliver et al. 2010; De Palma et al. 2016; Murillo-P. et al. 2018), como se observó en los perfiles de diversidad del estado “Alto”. Lo anterior, puede ser importante en el contexto de eventos extremos, como por ejemplo: eventos de fragmentación y pérdida del hábitat, ya que las poblaciones más estables con menor variabilidad serán menos propensas a sufrir una extinción local, lo que podría explicar el patrón de diversidad de *P. drymaea* (Hewitson, 1858*)* y *P. phaea ochrotaenia* (C. Felder & R. Felder, 1867), especies cuyas poblaciones al parecer son más estables en el área de estudio, puesto que se encontraron en los tres estados de perturbación, con una codominancia en el estado de perturbación “Alto”. En particular, *P. phaea ochrotaenia* (C. Felder & R. Felder, 1867) presentó una dominancia en los tres estados de perturbación, mostrando una mayor abundancia en el estado “Bajo”. A nivel de la sabana de Bogotá, tanto *P. drymaea* (Hewitson, 1858) como *P. phaea ochrotaenia* (C. Felder & R. Felder, 1867), se han registrado como dominantes en sitios con un alto grado de perturbación antrópica (Mahecha-Jiménez et al. 2011) y poco abundantes en sitos con un bajo grado de perturbación (Montero & Ortiz, 2013; Henao-Bañol et al. 2018; Henao-B & Stiles, 2018). Adicionalmente, *P. drymaea* (Hewitson, 1858) es indicadora de áreas de pastizales y matorrales secundarios (Pyrcz, 2004; Pyrcz & Viloria, 2007; Mahecha-Jiménez et al. 2011). Lo anterior nos permite catalogar a *P. drymaea* (Hewitson, 1858) y *P. phaea ochrotaenia* (C. Felder & R. Felder, 1867), como posibles especies sinantrópicas debido a su alta relación con ambientes altamente perturbados.

Tabla 4. Presencia y ausencia de especies de Pronophilina por estado de perturbación: “Bajo” - “Medio” - “Alto” con su respectiva altitud en m.s.n.m. (0- Ausencia; 1- Presencia).

	Estado de Perturbación		
Especie/Subespecie	**Alto (3.030)**	**Medio (3.150)**	**Bajo (3.210)**
Corades chelonis	0	1	1
Corades chirone	0	0	1
Corades medeba columbina	1	1	1
Lymanopoda samius	0	1	1
Lymanopoda lebbaea	0	0	1
Lymanopoda ionius	0	1	0
Eretris porphyria	0	1	0
Eretris apuleja bogotana	0	1	1
Junea doraete	0	0	1
Lasiophila circe	0	1	1
Manerebia apiculata	0	0	1
Manerebia levana	0	0	1
Panyapedaliodes drymaea	1	1	1
Pedaliodes empusa	0	1	1
Viloriodes manis	0	1	1
Pedaliodes phaea ochrotaenia	1	1	1
Pedaliodes sp.	0	1	1
Pedaliodes phoenissa	0	1	1
Pedaliodes polla	1	1	1
Pedaliodes porcia	0	0	1
Pedaliodes fuscata	0	1	0
Pronophila unifasciata bogotensis	0	1	0
Steremnia pronophila	0	0	1

Colias dimera Doubleday, 1847, un Pieridae de montaña considerado como una especie eurioica, puesto que se ha reportado abundante en ambientes con un alto grado de perturbación antrópica, aunque es posible observarla en áreas con poca intervención hasta en áreas conservadas (Montero & Ortiz, 2013). Asimismo, estas especies eurioicas toleran variaciones fuertes en el medio, lo que les permite responder fácilmente a distintos ambientes (Ospina et al. 2010; Montero & Ortiz, 2013) y son consideradas como posibles especies colonizadoras en estados de sucesión ecológica temprana (Andrade & Amat, 1996; Montero & Ortiz, 2013). Lo anterior podría explicar las abundancias de varias especies de Pronophilina registradas en los diferentes estados de perturbación en el estudio como *Pedaliodes polla* Thieme, 1905, *P. empusa* (C. Felder & R. Felder, 1867), *V. manis* (C. Felder & R. Felder, 1867), *P. phaea ochrotaenia* (C. Felder & R. Felder, 1867), *P. phoenissa* (Hewitson, 1862), *P. fuscata* (C. Felder & R. Felder, 1867), *Corades chelonis* Hewitson, 1863, *Lasiophila circe* C. Felder & R. Felder, 1859 y *Lymanopoda samius* Westwood, 1851, las cuales podrían ser catalogadas como posibles especies eurioicas y colonizadoras de estadios temprano de sucesión ecológica en hábitats de montaña.

Por otra parte, el patrón de abundancia de varias especies de Pronophilina observado en la zona de estudio, podría ser explicado por lo propuesto por Spaniol et al. (2019, 2020) en un estudio sobre Lepidoptera y el efecto de diferentes gradientes de perturbación antrópica en el Amazonas en Brasil, en donde proponen que pueden estar empleando distintas estrategias funcionales para atenuar los efectos del cambio de hábitat. Los Lepidoptera más grandes, con una baja habilidad de dispersión (ej. *Morpho* Fabricius, 1807, *Caligo* Hübner, [1819], *Catoblepia* Stichel, 1901 y *Pierella* Westwood, 1851), son más susceptibles a las extinciones locales en los ambientes de sucesión temprana, principalmente cuando el hábitat boscoso y sus recursos se restringen espacialmente. A su vez, varias estrategias antidepredadoras relacionadas con colores llamativos pueden estar perdiendo su funcionalidad en áreas abiertas (fenómeno llamado “descoloración”), donde no ser distintivo, es decir tener una coloración opaca y poco brillante, se convierte en la principal defensa contra la depredación, razón quizás por la cual en el estado “Alto” hay una predominancia de especies poco brillantes y de tamaños relativamente “pequeños” como *P. drymaea* (Hewitson, 1858), *P. polla* Thieme, 1905 y *P. phaea ochrotaenia* (C. Felder & R. Felder, 1867), y ya en el estado “Medio” y “Bajo”, es más frecuente encontrar especies con fenotipos un poco más brillantes como *L. samius* Westwood, 1851, y de diferentes tamaños, desde “grandes” (*Corades* spp.) a “pequeños” (*Lymanopoda* spp. y *Manerebia* spp.). Cabe resaltar que la mayoría de Pronophilina tienden a tener colores oscuros, pero el brillo, dado muchas veces por la reflexión de la luz en las escamas androconiales, varía según la especie y algunas pueden ser más opacas que otras sin implicar cierta asociación a algún estado de perturbación, pero sí como una estrategia para evitar la depredación en ecosistemas de montaña, en donde la vegetación es menos alta y densa al aumentar la altitud, y tener colores llamativos no sería un buen carácter evolutivo para mantener la eficacia biológica en estos ambientes. Igualmente, las especies de la subtribu Pronophilina tienen una capacidad de dispersión limitada, sujeta a la distribución de las plantas hospederas (Pyrcz & Rodríguez, 2007; Pyrcz & Viloria, 2007; Pyrcz & Garlacz 2012; Mahecha et al. 2019), lo que las hace más susceptibles a extinciones locales ocasionado por cuellos de botella en los diferentes escenarios de perturbación antrópica (Mahecha-Jiménez et al. 2011).

Las especies *Pedaliodes polla* Thieme, 1905, *P. phoenissa* (Hewitson, 1862), *P. empusa* (C. Felder & R. Felder, 1867), *V. manis* (C. Felder & R. Felder, 1867), *P. fuscata* (C. Felder & R. Felder, 1867), *Corades chelonis* Hewitson, 1863, *Lymanopoda samius* Westwood, 1851 y *Lasiophila circe* C. Felder & R. Felder, 1859 se encontraron solamente en el estado de perturbación “Medio” y “Bajo”, corroborando lo reportado por Gonzales-Montaña (2010), Mahecha-Jiménez et al. (2011), Montero & Ortiz (2013) y Henao-Bañol et al. (2018), en donde reportaron que estas especies de Pronophilina están relacionadas a zonas de borde de bosque y claros con distintos grados de perturbación antrópica, siendo más abundantes en zonas con una perturbación intermedia (Mahecha-Jiménez et al. 2011). Lo anterior, nos permite hipotetizar que el estado de perturbación “Bajo”, a pesar de haber presentado los valores más altos en los perfiles de diversidad, en su configuración espacial, es muy similar al estado “Medio”, en donde para el presente estudio, ambos estados se podrían considerar áreas con una perturbación antrópica intermedia, lo que generaría una matriz en el paisaje, permitiendo la formación de diferentes microhábitats que pueden ser aprovechados por varias especies de Pronophilina, lo que explicaría la alta riqueza y abundancia de Lepidoptera en estos estados de perturbación en comparación con el estado “Alto”, un patrón que puede también ser explicado por la hipótesis del efecto de borde, disturbio intermedio, y la heterogeneidad espacial (Macarthur & Wilson, 1967; Connell, 1978; Tews et al. 2004; Mahecha-Jiménez et al. 2011; Urbano et al. 2013; Urbano et al. 2018).

Cabe destacar que estructuralmente, la zona de estudio en general presentó una dominancia por *P. phaea ochrotaenia* (C. Felder & R. Felder, 1867) y *P. polla* Thieme, 1905, especialmente en los estados “Medio” y “Bajo”, en donde estos dos taxa representaron más de la mitad de todas las especies de Pronophilina reportadas en el estudio, lo cual es un resultado atípico a otros estudios en Pronophilina, en donde es mucho más representativo encontrar varias especies codominantes (Pyrcz & Wojtusiak, 2002; Pyrcz, 2004; Pyrcz et al. 2011; Pyrcz & Garlacz, 2012). Por su parte, Pyrcz & Garlacz (2012) encontraron en la Cordillera de Mérida en Venezuela un patrón similar en donde solo una especie (*Pedaliodes minabilis* Pyrcz, 2008) representó más de la mitad de todos los especímenes en el área de estudio. Este mismo resultado fue reportado por Mahecha-Jiménez et al. (2011) en Bogotá (*P. phaea ochrotaenia* (C. Felder & R. Felder, 1867) - *P. polla* Thieme, 1905) y Marín et al. (2014) en Medellín-Colombia (*Pedaliodes baccara* Thieme, 1911 - *P. praemontagna* Pyrcz & Viloria, 2007), en donde encontraron una codominancia por parte de estas especies, por lo que la dominancia por parte de solo algunas especies de Pronophilina es considerado al parecer un indicador de zonas con un grado intermedio de perturbación antrópica (Pyrcz & Garlacz, 2012).

Al comparar las clases de abundancia según la frecuencia de las especies de Pronophilina durante el muestreo en el área de estudio con las reportadas por Montero & Ortiz (2013) para un bosque altoandino-páramo en el Tablazo, Cundinamarca-Colombia, y que para el año del estudio, esta zona presentaba un nivel de perturbación antrópica intermedio, reportaron que *Lymanopoda samius* Westwood, 1851, y *Pedaliodes phoenissa* (Hewitson, 1862) fueron especies comunes, y en nuestro estudio se catalogaron como especies abundantes; *Corades medeba columbina* Staudinger, 1894 estuvo clasificada como especie rara, mientras que para nuestro estudio fue una especie común; *Steremnia pronophila* (C. Felder & R. Felder, 1867) en el estudio del Tablazo aparece como una especie abundante, y para nuestra investigación fue considerada una especie común. Por su lado, *Panyapedaliodes drymaea* (Hewitson, 1858) fue clasificada como una especie escasa por Montero & Ortiz (2013), y para nuestro estudio como abundante. No obstante, en la actualidad, se ha visto un aumento de la perturbación en la zona del Tablazo, generada por varias actividades antrópicas como la deforestación para la agricultura y ganadería, al impacto ocasionado por el aumento de la presencia de ciclistas quienes se introducen dentro de las zonas conservadas deteriorando el hábitat natural de la zona, entre otras, han ocasionado un cambio en la configuración del paisaje de la zona, encontrándose una dominancia ahora de *P. drymaea* (Hewitson, 1858), lo que nos permite confirmar que ésta especie es sinantrópica, y que responde muy bien a eventos de perturbación.

Por otra parte, nuestros resultados podrían corroborar lo planteado por Brown (1989) en donde propone que las especies especialistas podrían ser reemplazadas por especies generalistas y tolerantes a las perturbaciones, como podría ser el caso de *Panyapedaliodes drymaea* (Hewitson, 1858), *Pedaliodes phaea ochrotaenia* (C. Felder & R. Felder, 1867), *P. empusa* (C. Felder & R. Felder, 1867), *P. polla* Thieme, 1905, *V. manis* (C. Felder & R. Felder, 1867), y *Lymanopoda samius* Westwood, 1851, que podrían estar desplazando a especies raras en su abundancia en el estudio, posibles especialistas como *Junea doraete* (Hewitson, 1858), *Manerebia levana* (Godman, 1905), *M. apiculata* (C. Felder & R. Felder, 1867), *Eretris apuleja bogotana* E. Krüger, 1924 y *Corades chirone* Hewitson, 1863. Sin embargo, son pocos los estudios encaminados a evaluar qué especies son generalistas o especialistas en Pronophilina y se necesitarían más investigaciones al respecto para corroborar lo propuesto en el presente estudio.

Otros efectos negativos de la perturbación antrópica es la deforestación, en donde se presentan la pérdida de vegetación nativa y cambios en la cobertura vegetal (Fahring, 2003 Carrero et al. 2013). Por lo tanto, especies vegetales como las Poaceae y en particular el bambú de montaña del género *Chusquea* Kunth, algunas Sellaginellaceae y Cyperaceae, consideradas las plantas hospederas de los Pronophilina, podrían verse afectadas y posiblemente desaparecer de la zona (Pyrcz & Wojtusiak, 2002; Greeney et al. 2009; Montero et al. 2009; Pyrcz & Garlacz, 2012; Montero & Ortiz, 2013; Marín et al. 2014; Mahecha et al. 2019). La desaparición de estas especies vegetales se evidenció en el estado "Alto", lo que impide que las hembras de Pronophilina no puedan ovipositar en esta zona, conllevando a una disminución de la diversidad de las mismas, contrario a lo observado en el estado "Medio" y "Bajo", en donde se observó la presencia de abundante chusque, lo que permitiría el aumento de la riqueza y abundancia de las especies de Pronophilina en estos estados de perturbación. Así mismo, en el estado "Alto", se observó una gran abundancia de especies vegetales exóticas como *Ulex europaeus* L., pinos, eucaliptos, entre otras, lo que imposibilita una recolonización de las especies vegetales nativas de la zona, por ende, a pesar de que el estado "Alto" no alcanzo la asíntota en el análisis R/E, la probabilidad de registrar especies diferentes de Pronophilina es imposible sí no se realizan estrategias de restauración ecológica en esta parte del área de estudio.

Finalmente, con el presente estudio se confirma el efecto negativo que tiene la perturbación antrópica en los patrones de diversidad de los Pronophilina en un bosque altoandino en Colombia. Además, se infiere que los ensamblajes de los Pronophilina, especialmente las que habitan entre los 1.800 y 3.200 m, podrían estar desapareciendo debido al aumento de las áreas agrícolas, urbanas, a la introducción de especies de plantas exóticas, minería, entre otros aspectos, lo que estaría conllevando al establecimiento de especies eurioicas y sinantrópicas en estas áreas perturbadas causando una disminución de la diversidad local. Por lo tanto, es indispensable generar estrategias de gestión, planificación y conservación de la biodiversidad en los diferentes ecosistemas, no solo de montaña, en el país y el mundo (Andrade-C., 2011; Ramírez & Macgregor, 2017).

Agradecimientos

Los autores agradecen a Alexander García (Universidad Distrital F. J. C.) por su acompañamiento durante la elaboración de este estudio. A la Universidad Distrital F. J. C. y Universidad INCCA de Colombia por el apoyo logístico en campo. Al Instituto de Ciencias Naturales de la Universidad Nacional de Colombia y al Nature Education Centre, Jagiellonian University-Polonia por permitir el acceso al material de referencia de Pronophilina. Esta investigación estuvo en parte financiada por fondos del Proyecto "NCN grant Harmonia-10 2018/30/M/NZ8/00293 *"Evolutionary biogeography and diversification of the predominantly Andean butterfly subtribe Pronophilina (Nymphalidae, Satyrinae) based on phylogenetic data generated using modern molecular methods*". Finalmente, el viaje de investigación a Polonia de O. Mahecha-J. contó con el apoyo del Programa PROM-Intercambio internacional de becas de estudiantes de doctorado y académicos de la Universidad Jagiellonian y la Agencia Nacional Polaca de Intercambio Académico, número de acuerdo: PPI / PRO / 2018/1/00001 / U / 001.

Referencias

Adams, M. J. (1985). Speciation in the pronophiline butterflies (Satyridae) of the northern Andes. *Journal of Research on the Lepidoptera*, (suppl 1), 33-49.

Andrade, M. G., & Amat, G. (1996). Estudio regional de las mariposas altoandinas en la cordillera Oriental de Colombia. *Insectos de Colombia, 1*, 149-180.

Andrade-C., M. G. (2011). Estado del conocimiento de la biodiversidad en Colombia y sus amenazas. Consideraciones para fortalecer la interacción ambiente-política. *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales, 35*(137), 491-507.

Andrade-C., M. G., Henao, E. R., & Triviño, P. (2013). Técnicas y procesamiento para la recolección, preservación y montaje de Mariposas en estudios de biodiversidad y conservación. (Lepidoptera: Hesperioidea-Papilionoidea). *Revista Academia Colombiana Ciencias Exactas, 37*(144), 311-325. https://doi.org/10.18257/raccefyn.12

Andrade, J. E. (2019). *Actualización del perfil ambiental del municipio de la Calera, Cundinamarca. Universidad Universidad Santo Tomas*. https://repository.usta.edu.co/bitstream/handle/11634/21459/2020jenyferandrade.pdf?sequence=1&isAllowed=y

Álvarez-Hincapié, C. F., Clavijo, A., Rojas, H., Uribe, S., Pyrcz, T. W., & Marín, M. A. (2017). Aporte del área de influencia del páramo de Belmira (Santa Inés) a la diversidad regional de Pronophilina (Lepidoptera: Satyrinae) del norte de los Andes. *Revista Mexicana de Biodiversidad, 88*(2), 402-409.

Ávila-R., L., & Triviño, P. (2019). Descripción del hábitat de cuatro especies del género *Lymanopoda* (Lepidoptera: Nymphalidae: Satyrinae) en áreas de páramo de Colombia. *Acta Biológica Colombiana, 24*(1), 125-138.

Brehm, G., Sõssenbach, D., & Fiedler, K., 2003b. Unique elevational diversity patterns of geometrid moths in an Andean montane rainforest. *Ecography, 26*, 456-466.

Brown, J. H. (1989). Patterns, modes and extent of invasions by vertebrates. In J. A. Drake, H. A. Mooney, F. Di Castri, R. H. Groves, F. J. Kruger, M. Rejmánek & M. Williamson. *Biological invasions: A global perspective* (pp. 85-109). Chichester Wiley.

Brown, J. R., & Freitas, A. V. L. (2000). Atlantic Forest butterflies: indicators for landscape conservation. *Biotropica, 32*, 934-956.

Carrero, D., Sánchez, L. R., & Tobar-López, D. (2013). Diversidad y distribución de mariposas diurnas en un gradiente altitudinal en la región nor-oriental andina de Colombia. *Boletín Científico Centro de Museos Historia Natural, 17*(1), 168-188.

Casas-Pinilla, L. C., Mahecha-J., O., Dumar, J. C., & Ríos-Málaver, I. C. (2017). Diversidad de mariposas en un paisaje de bosque seco tropical, en la Mesa de los Santos, Santander, Colombia (Lepidoptera: Papilionoidea). *SHILAP Revista de lepidopterología, 45*(177), 83-108.

Casner, K. L., & Pyrcz, T. W. (2010). Patterns and timing of diversification in a tropical montane butterfly genus, *Lymanopoda* (Nymphalidae, Satyrinae). *Ecography, 33*(2), 251-259.

Castro, J., Vanegas, D., Ramírez, E., Sotelo, J., & Pinzón, E. (2009). *Del estado plan de desarrollo y el plan de ordenamiento territorial del municipio la calera en el departamento de Cundinamarca*. Universidad Distrital Francisco José de Caldas, Facultad del Medio Ambiente y Recursos Naturales.

Chao, A., & Jost, L. (2012). Coverage-based rarefaction and extrapolation: standardizing samples by completeness rather than size. *Ecology, 93*, 2533-2547. http://dx.doi.org/10.1890/11-1952.1

Chao, A., Gotelli, N. J., Hsieh, T. C., Sander, E. L., Ma, K. H., Colwell, R. K., & Ellison, A. M. (2014). Rarefaction and extrapolation with Hill numbers: a framework for sampling and estimation in species diversity studies. *Ecological Monographs, 84*(1), 45-67.

Chao, A., & Shen, T. J. (2003). Nonparametric estimation of Shannon's index of diversity when there are unseen species in the sample. *Environmental and Ecological Statistics, 10*, 429-433.

Cleary, D. F. R., & Genner, M. J. (2006). Diversity patterns of Bornean butterfly assemblages. *Biodiversity and Conservation, 15*, 503-524.

Connell, M. L. (1978). Diversity in tropical rain forests and coral reefs. *Science, 199*, 1302-1310.

Cruz-Cabrera, V. D., & Contreras, M. (2019). Alteraciones ambientales por perturbaciones antropogénicas en dos fragmentos de bosques: un sistema de agroforestería y un bosque natural secundario en regeneración. *Orbis Cognita, 3*(2), 57-72.

De Palma, A., Dennis, R. L., Brereton, T., Leather, S. R., & Oliver, T. H. (2017). Large reorganizations in butterfly communities during an extreme weather event. *Ecography, 40*(5), 577-585.

Ellison, A. M. (2010). Partitioning diversity. *Ecology, 91*, 1962-1963.

Enkhtur, K., Pfeiffer, M., Lkhagva, A., & Boldgiv, B. (2017). Response of moths (Lepidoptera: Heterocera) to livestock grazing in Mongolian rangelands. *Ecological Indicators, 72*, 667-674.

Fahring, L. (2003). Effects of habitat fragmentation on biodiversity. *Review Ecology, evolution and Systematic, 34*, 487-515.

Fonseca-F., A. N., & Mahecha-J., Ó. (2018). Contribución al estudio de los arácnidos (Arachnida) asociados a un bosque de galería en Meta (Colombia). *Revista ibérica de aracnología, 33*, 123-128.

Forman, R. T. (1995). Some general principles of landscape and regional ecology. *Landscape Ecology, 10*(3), 133-142.

Gonzales-Montaña, L. A. (2010). Las mariposas Satyrinae (Lepidoptera: Papilionoidea: Nymphalidae) en dos sectores de la Cordillera Oriental de Colombia con anotaciones ecológicas. *Revista Nicaraguense de Entomología, 70*, 1-20.

Gotelli, N. J., & Colwell, R. K. (2011). Estimating species richness. In A. E. Magurran & B. J. Mcgill. *Biological diversity: frontiers in measurement and assessment* (pp. 39-54). Oxford University Press.

Gotelli, N. J., & Chao, A. (2013). Measuring and estimating species richness, species diversity, and biotic similarity from sampling data. In S. A., Levin. *The encyclopedia of biodiversity, 5* (pp. 195-211) Academic Press.

Greeney, H. F., Pyrcz, T. W., Devries, P. J., & Dyer, L. A. (2009). The Early Stages of *Pedaliodes poesia* (Hewitson, 1862) in Eastern Ecuador (Lepidoptera: Satyrinae: Pronophilina). *Journal of Insect Science, 9*(38), 1-9.

Grytnes, J. A., Beaman, J. H., Romdal, T. S., & Rahbek, C. (2008). The mid-domain effect matters: simulation analyses of range-size distribution data from Mount Kinabalu, Borneo. *Journal of Biogeography, 35,* 2138-2147.

Guevara, M., Hartmann, D., & Mendoza, M. (2016). diverse: An R Package to Analyze Diversity in Complex Systems. *The R Journal, 8*(2), 60-78.

Henao-Bañol, E. R., Páez, A., & Rodríguez-M., J. V. (2018). Inventario de mariposas diurnas (Lepidoptera: Hesperioidea-Papilionoidea) de la reserva forestal productora protectora de la cuenca alta del río Bogotá (RFPP-CARB*). Boletín Científico. Centro de Museos. Museo de Historia Natural, 22*(2), 144-171. https://dx.doi.org/10.17151/bccm.2018.22.2.11

Henao-B., E., & Stiles, F. G. (2018). Un inventario de las mariposas diurnas (Lepidoptera: Hesperioidea-Papilionoidea) de dos reservas altoandinas de la cordillera oriental de Colombia. *Revista de la Facultad de Ciencias, 7*(1), 71-87.

Hill, M. O. (1973). Diversity and evenness: a unifying notation and its consequences. *Ecology, 54*, 427-432.

Hsieh, T. C., Ma, K. H., & Chao, A. (2016). iNEXT: An R package for rarefaction and extrapolation of species diversity (Hill numbers). *Methods in Ecology and Evolution, 7*, 1451-1456. doi:10.1111/2041-210X.12613

Jaime-Escalante, N. G., Figueroa-Esquivel, E. M., Villaseñor-Gómez, J. F., Jacobo-Sapien, E. A., & Puebla-Olivares, F. (2016). Distribución altitudinal de la riqueza y composición de "ensamblajes" de aves en una zona montañosa al sur de Nayarit, México. *Revista de Biología Tropical, 64*(4), 1537-1551. https://dx.doi.org/10.15517/rbt.v64i4.20255

Jost, L. (2006). Entropy and diversity. *Oikos, 113*, 363-375.

Kindt, R., & Coe, R. (2005). *Tree diversity analysis. A manual and software for common statistical methods for ecological and biodiversity studies.* World Agroforestry Centre (ICRAF).

Krieger, R. S., Salcedo, M., Escobar, J., & Ríos, C. (2000). *Colombia Megadiversa: cinco años explorando la riqueza de un país biodiverso*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt.

Lamas, G., Viloria, A. L., & Pyrcz, T. W. (2004). Subtribe Pronophilina. In G. Lamas. *Atlas of Neotropical Lepidoptera, Checklist: Part 4A, Hesperioidea-Papilionoidea* (pp. 206-215). Association for Tropical Lepidoptera.

Macarthur, R. H., & Wilson, E. O. (1967). *The theory of island biogeography*. Princeton University Press.

Mahecha-Jiménez, O. J., Dumar-Rodríguez, J. C., & Pyrcz, T. W. (2011). Efecto de la fragmentación del hábitat sobre las comunidades de Lepidoptera de la tribu Pronophilini a lo largo de un gradiente altitudinal en un bosque andino en Bogotá (Colombia) (Lepidoptera: Nymphalidae, Satyrinae). *SHILAP Revista de lepidopterología, 39*(153), 117-126.

Mahecha-J., O., & Díaz-S, V. (2015). Aproximación a la diversidad taxonómica de las mariposas diurnas (Lepidoptera: Papilionoidea) en la Vereda Cafrería, Municipio Icononzo, Tolima. *Revista Científica Unincca, 20*(2), 83-91.

Mahecha, O., Garlacz, R., Andrade, M. G., Prieto, C., & Pyrcz, T. (2019). Island biogeography in continental areas: inferring dispersal based on distributional patterns of Pronophilina butterflies (Nymphalidae: Satyrinae) in the north Andean massifs. *Revista Mexicana de Biodiversidad, 90*, e902796. http://dx.doi.org/10.22201/ib.20078706e.2019.90.2796

Marín, M. A., Álvarez, C. F., Giraldo, C. E., Pyrcz, T. W., Uribe, S. I., & Vila, R. (2014). Mariposas en un bosque de niebla andino periurbano en el valle de Aburrá, Colombia. *Revista Mexicana de Biodiversidad, 85*(1), 200-208.

Marín, M. A., Giraldo, C. E., Marín, A. L., Álvarez, C. F., & Pyrcz, T. W. (2015). Differences in butterfly (Nymphalidae) diversity between hillsides and hilltop forest patches in the northern Andes. *Studies on Neotropical Fauna and Environment, 50*(3), 194-203.

Martins, L. P., Junior, A., Da-Costa, E., Martins, A. R. P., Duarte, M., & Azevedo, G. G. (2017). Species diversity and community structure of fruit-feeding butterflies (Lepidoptera: Nymphalidae) in an eastern Amazonian Forest. *Papéis Avulsos de Zoologia, 57*(38), 481-489.

Montero, F., Moreno, M., & Gutiérrez, L. C. (2009). Mariposas (Lepidoptera: Hesperioidea y Papilionoidea) asociadas a fragmentos de bosque seco tropical en el departamento del Atlántico, Colombia. *Boletín Científico del Museo de Historia Natural, 13*(2), 157-173.

Montero, F., & Ortiz, M. (2013). Aporte al conocimiento para la conservación de las mariposas (Hesperioidea y Papilionoidea) en el Páramo del Tablazo, Cundinamarca (Colombia). *Boletín Científico Centro de Museos de Historia Natural, 17*(2), 197-227.

Moreno, C. E., Barragán, F., Pineda, E., & Pavón, N. P. (2011). Reanalizando la diversidad alfa: alternativas para interpretar y comparar información sobre comunidades ecológicas. *Revista Mexicana de Biodiversidad, 82*, 1249-1261.

Murillo-P., A., Robayo-Ch., G., & Mahecha-J., O. (2018). Mariposas asociadas a humedales en el municipio de Soacha, Cundinamarca, Colombia (Lepidoptera: Papilionoidea). *SHILAP Revista de lepidopterología, 46*(182), 207-219.

Oksanen, J., Guillaume, F., Blanchet, Friendly, B. M., Kindt, R., Legendre, P., Mcglinn, D., Minchin, P. R, O'Hara, R. B., Simpson, G. L., Solymos, P. M., Stevens, H. H., Szoecs, E., & Wagner, H. (2019). *Vegan: Community Ecology Package. R package version 2.5-6*. https://CRAN.R-project.org/package=vegan

Oliver, T., Roy, D. B., Hill, J. K., Brereton, T., & Thomas, C. D. (2010). Heterogeneous landscapes promote population stability. *Ecology Letters, 13*, 473-484.

Ospina, L. A., García. J. F., Villa, F. A., & Reinoso, G. (2010). Mariposas Pieridae (Lepidoptera: Papilionoidea) de la cuenca del Río Coello (Tolima), Colombia. *Acta Biológica, 32*(93), 173-188.

Pimm, S. L., Jenkins, C. N., Abell, R., Brooks, T. M., Gittleman, J. L., Joppa, L. N., Raven, P. H., Roberts, C. M., & Sexton, J. O. (2014). The biodiversity of species and their rates of extinction, distribution, and protection. *Science, 344*, 987-997.

Prieto, C. H. (2003). Satírinos (Lepidoptera, Nymphalidae, Satyrinae) del Parque Nacional Natural Munchique. Diversidad de especies y distribución altitudinal. *Revista Colombiana de Entomología, 29*, 203-210.

Primack, R. B. (2006). Essentials of Conservation Biology. Habitat destruction. *Ecoscience, 14*, 133-134. https://doi.org/10.2980/1195-6860

Pyrcz, T. W., & Wojtusiak, J. (2002). The vertical distribution of pronophiline butterflies (Nymphalidae, Satyrinae) along a elevational transect in Monte Zerpa (Cordillera de Mérida, Venezuela) with remarks on their diversity and parapatric distribution. *Global Ecology Biogeography, 11*, 211-221.

Pyrcz, T. W. (2004). Pronophiline butterflies of the highlands of Chachapoyas in northern Peru: faunal survey, diversity, and distribution patterns (Lepidoptera, Nymphalidae, Satyrinae). *Genus, 15,* 455-622.

Pyrcz, T. W., & Rodríguez, G. (2007). Mariposas de la tribu Pronophilini en la cordillera occidental de los andes de Colombia (Lepidoptera: Nymphalidae, Satyrinae). *SHILAP Revista de lepidopterología, 35*(140), 455-489.

Pyrcz, T. W., & Viloria, A. (2007). Erebiine and pronophiline butterflies of the Serranía del Tamá, Venezuela-Colombia border (Lepidoptera: Nymphalidae: Satyrinae). *Tropical Lepidoptera, 15*(1-2), 18-52.

Pyrcz, T. W., Wojtusiak, J., & Garlacz, R. (2009). Diversity and distribution patterns of Pronophilina butterflies (Lepidoptera: Nymphalidae: Satyrinae) along an altitudinal transect in north-western Ecuador. *Neotropical Entomology, 38*(6), 716-726.

Pyrcz, T. W., Viloria, A. L., Lamas, G., & Boyer, P. (2011). La fauna de mariposas de la subfamilia Satyrinae del macizo del Ampay (Perú): diversidad, endemismo y conservación (Lepidoptera: Nymphalidae). *SHILAP Revista de lepidopterología, 39*(154), 205-232.

Pyrcz, T. W., & Garlacz, R. (2012). The presence-absence situation and its impact on the assemblage structure and interspecific relations of Pronophilina butterflies in the Venezuelan Andes (Lepidoptera: Nymphalidae). *Neotropical entomology, 41*(3), 186-195.

Pyrcz, T. W., Prieto, C., Viloria, A. L., & Andrade-C., G. (2013). New species of high elevation cloud forest butterflies of the genus *Pedaliodes* Butler from the northern Colombian Andes (Lepidoptera, Nymphalidae, Satyrinae). *Zootaxa, 3716*(4), 528-538.

Pyrcz, T. W., Clavijo, A., Uribe, S., Marin, M. A., Alvarez, C. F., & Zubek, A. (2016). Páramo de Belmira as an important centre of endemism in the northern Colombian Andes: New evidence from Pronophilina butterflies (Lepidoptera: Nymphalidae, Satyrinae, Satyrini). *Zootaxa, 4179*(1), 77-102.

R Core Team (2019). R: *A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria*. https://www.R-project.org/

Ramírez-Restrepo, L., & Macgregor-Fors, I. (2017). Butterflies in the city: a review of urban diurnal Lepidoptera. *Urban ecosystems, 20*(1), 171-182.

Spaniol, R. L., Duarte, L. D. S., Mendonça Jr, M. D. S., & Iserhard, C. A. (2019). Combining functional traits and phylogeny to disentangling Amazonian butterfly assemblages on anthropogenic gradients. *Ecosphere, 10*(8), e02837.

Spaniol, R. L., Mendonça, M. D. S., Hartz, S. M., Iserhard, C. A., & Stevens, M. (2020). Discolouring the Amazon Rainforest: how deforestation is affecting butterfly coloration. *Biodiversity and Conservation, 29*, 2821-2838. https://doi.org/10.1007/s10531-020-01999-3

Tews, J., Brose, U., Grimm, V., Tielbörger, K., Wichmann, M. C., Schwager, M., & Jeltsch, F. (2004). Animal species diversity driven by habitat heterogeneity/diversity: the importance of keystone structures. *Journal of biogeography, 31*, 79-92.

Uehara-Prado, M., Brown Jr., K. S., & Freitas, A. V. L. (2007). Species richness, composition, and abundance of fruit-feeding butterflies in the Brazilian Atlantic Forest: comparison between a fragmented and a continuous landscape. *Global Ecology and Biogeography, 16*, 43-54.

Urbano, P., Munevar, J., Mahecha-J., O., & Hincapié, E. (2014). Diversidad y estructura de las comunidades de Lepidoptera en la zona del ecotono entre el piedemonte llanero y sabana inundable en Casanare-Colombia (Lepidoptera: Papilionoidea). *SHILAP Revista de lepidopterología, 42*(167), 433-437.

Urbano, P., Mahecha-J., O., Suárez, E., Izquierdo, V., & Díaz-S, V. (2018). Variación temporal del ensamblaje de mariposas asociadas a la Cuenca de la Calaboza, Yopal, Casanare, Colombia (Lepidoptera: Papilionoidea). *SHILAP Revista de lepidopterología, 46*(184), 533-550.

Viloria, A. L. (2007). The Pronophilina: Synopsis of their biology and systematics (Lepidoptera: Nymphalidae: Satyrinae). *Tropical Lepidoptera Research, 15*(1-2), 1-17.

Villarreal, H., Álvarez, M., Córdoba, S., Escobar, F., Fagua G., Gast, F., Mendoza, H., Ospina, M., & Umaña, A. M. (2004). *Manual de métodos para el desarrollo de inventarios de biodiversidad. Programa inventarios de Biodiversidad*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt.

Warren, A. D., Davis, K. J., Stangeland, E. M., Pelham, J. P., & Grishin, N. V. (2013). *Illustrated Lists of American Butterflies*. http://www.butterfliesofamerica.com/

Xu, M., Ma, L., Yanyan, Y., & Liu, M. (2017). Integrating the effects of latitude and altitude on the spatial differentiation of plant community diversity in a mountainous ecosystem in China. *PLoS ONE, 12*(3), e0174231. https://doi.org/10.1371/journal.pone.0174231

Zar, J. H. (1974). *Biostatistical Analysis.* Prentice Hall Inc.

*Vanessa Díaz-Suárez
Nature Education Centre
Jagiellonian University
ul. Gronostajowa, 5
PL-30-387 Kraków
POLONIA / *POLAND*
E-mail: diazsvane@gmail.com
https://orcid.org/0000-0003-2938-2324

y / *and*

Grupo en Ecología Evolutiva y Biogeografía Tropical ECOBIT
Universidad INCCA de Colombia
Bogotá
COLOMBIA / *COLOMBIA*

y / *and*

Semillero en Biogeografía y Ecología Evolutiva Neotropical BEEN
Universidad Distrital F. J. C.
Bogotá
COLOMBIA / *COLOMBIA*

Oscar Mahecha-J.
Nature Education Centre
Jagiellonian University
ul. Gronostajowa, 5
PL-30-387 Kraków
POLONIA / *POLAND*
E-mail: oscarmahecha23@gmail.com
https://orcid.org/0000-0002-8682-0020

y / *and*

Instituto de Ciencias Naturales ICN
Universidad Nacional de Colombia
Carrera 30, No. 45-03
Bogotá D. C.
COLOMBIA / *COLOMBIA*

y / *and*

Grupo en Ecología Evolutiva y Biogeografía Tropical ECOBIT
Universidad INCCA de Colombia
Bogotá
COLOMBIA / *COLOMBIA*

Miguel Gonzalo Adrade-C.
Instituto de Ciencias Naturales ICN
Universidad Nacional de Colombia
Carrera 30, No. 45-03
Bogotá D. C.
COLOMBIA / *COLOMBIA*
E-mail: mgandradec@unal.edu.co
https://orcid.org/0000-0002-9181-4653

Tomasz W. Pyrcz
Nature Education Centre
Jagiellonian University
ul. Gronostajowa, 5
PL-30-387 Kraków
POLONIA / *POLAND*
E-mail: tomasz.pyrcz@uj.edu.pl
https://orcid.org/0000-0003-4822-0670

y / *and*

Department of Invertebrate Evolution
Institute of Zoology and Biomedical Research
Jagiellonian University
ul. Gronostajowa, 9
PL-30-387 Kraków
POLONIA / *POLAND*

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 11-III-2021)
(Revisado y aceptado / *Revised and accepted* 5-V-2021)
(Publicado / *Published* 30-XII-2022)

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 729-738 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.265

Adult population fluctuation of *Comadia redtenbacheri* (Hammerschmidt, 1847) (Lepidoptera: Cossidae)

Manuel Jiménez-Vásquez, Celina Llanderal-Cázares,
Kalina Miranda-Perkins, Mateo Vargas-Hernández,
Rosa María López-Romero & Manuel Campos-Figueroa

Abstract

Comadia redtenbacheri (Hammerschmidt, 1847) is an insect highly regarded for its commercial and nutritional value. Adult fluctuation in a plantation of *Agave salmiana* Otto ex Salm-Dyck was determined using ultraviolet light traps. Trapped adults were counted weekly during three periods (December 2013 to December 2014, December 2014 to December 2015, and December 2015 to June 2016), and temperature and relative humidity were recorded. Adult population was present 157 days on average, from December to May, with peak capture on day 83. The average sex ratio of females to males was 1:14. Average environmental conditions that favoured the highest capture in the three periods were 17.8º C and 47.1% relative humidity. Knowledge of the period of adult presence and the influence of temperature and relative humidity are important for management and conservation of the insect population by farmers and gatherers.

Keywords: Lepidoptera, Cossidae, *Comadia*, ultraviolet light, trapping, Mexico.

Fluctuación poblacional de adultos de *Comadia redtenbacheri* (Hammerschmidt, 1847) (Lepidoptera: Cossidae)

Resumen

Comadia redtenbacheri (Hammerschmidt, 1847) es un insecto muy apreciado por su valor comercial y nutricional. Se determinó la fluctuación de adultos en una plantación de *Agave salmiana* Otto ex Salm-Dyck, utilizando trampas de luz ultravioleta. Los adultos atrapados se contabilizaron semanalmente durante tres períodos (de diciembre de 2013 a diciembre de 2014, de diciembre de 2014 a diciembre de 2015 y de diciembre de 2015 a junio de 2016), en los que se registraron la temperatura y la humedad relativa. La población adulta estuvo presente 157 días en promedio, de diciembre a mayo, con un pico de captura en el día 83. La proporción de sexos promedio de hembras y machos fue de 1:14. Las condiciones ambientales promedio que favorecieron la mayor captura en los tres períodos fueron 17.8º C y 47.1% de humedad relativa. El conocimiento del período de presencia de los adultos y la influencia de la temperatura y la humedad relativa son importantes para el manejo y conservación de las poblaciones de insectos por parte de los agricultores y recolectores.

Palabras clave: Lepidoptera, Cossidae, *Comadia*, luz ultravioleta, captura, México.

Introduction

Comadia redtenbacheri (Hammerschmidt, 1847) (Lepidoptera: Cossidae) is an economically and nutritionally important insect. Due to its high commercial value, it has been overexploited and red worm populations have diminished on agave plants (Ramos-Elorduy, 2006). This situation has generated much interest in protecting and preserving this natural resource in Mexico through controlled production units. However, there is no information on all stages of its life cycle, mainly because most studies have focused on the larval stage in the laboratory and greenhouse (Hernández-Livera et al. 2005; Llanderal-Cázares et al. 2007*,* 2010).

The species *C. redtenbacheri* is distributed from south-eastern Texas, USA, to Mexico, where it is widely distributed in the states of Guanajuato, Hidalgo, México, Michoacán, Oaxaca, Puebla, Querétaro, Tlaxcala, Zacatecas, Veracruz and Mexico City. Its main hosts are *Agave salmiana* Otto ex Salm-Dyck*, Agave atrovirens* Karw. ex Salm-Dyck and *Agave mapisaga* Trel. (Ancona, 1931; Brown, 1975; Ramos-Elorduy et al. 2011). Information exists on its biology and behaviour (Miranda-Perkins et al. 2013; Llanderal et al. 2017), associated organisms parasitoids (Zetina et al. 2009, 2012; Zetina & Llanderal, 2014) and bacteria (Hernández-Flores et al. 2015), reproduction (Ramírez-Cruz & Llanderal-Cázares, 2015), morphology of all its developmental stages (Castro-Torres & Llanderal-Cázares, 2015, 2016), adult emergence in laboratory (Miranda-Perkins et al. 2016), cultivation by induced infestation in agaves (Delgado-Tejeda et al. 2017; Espinosa-García et al. 2018), bionomics (Llanderal-Cázares et al. 2017) and molecular delineation (Cárdenas-Aquino et al. 2018). However, the biology, behaviour, and ecology of adults has not been studied, and the abiotic factors (temperature, relative humidity and rainfall) that affect its emergence are unknown. Knowledge of these conditions is important to protect the adults in the field and to improve their reproduction under controlled conditions. Moreover, availability of a seasonal resource is important for its management. Yen (2012) mentioned that, regarding coleopterans and lepidopterans that are eaten in their larval stage, there is a lack of information on the different developmental stages and on adults, which has created confusion in the identification of the species.

There are several important methods for sampling insect populations in the field. Light traps are one of the most efficient methods used to determine the behaviour of populations of nocturnal insects (Truman, 1974; Truxa & Fiedler, 2012; Shimoda & Honda, 2013). In most cases, a single light trap is used in or around the sampling site. Through periodic sampling, it is possible to detect the presence of insects and obtain quantitative data on their abundance, which can be used to predict changes in the population and its trend throughout the season (Szentkirályi, 2002). Light traps have been used in several types of studies (Hienton, 1974). Ultraviolet light (UV) traps are used to catch insects belonging to orders such as Coleoptera, Orthoptera, Isoptera and Dictyoptera in India (Ramamurthy et al. 2010) and Lepidoptera from different families such as Noctuidae, Geometridae, Drepanidae and Pyralidae in Austria (Truxa & Fiedler, 2012).

Information on *C. redtenbacheri* adult presence throughout the season is indispensable for its management and conservation, through timely detection to avoid agricultural practices that may affect the adults in their reproductive stages. The objective of this work was to determine the population fluctuation of adults of *C. redtenbacheri* in native populations of *Agave salmiana* and its relationship with temperature and humidity. If last instar larvae emerge from agave plants in September and October (Llanderal et al. 2007), it can be assumed that the adult stage will appear at the end of the year.

Materials and methods

Adult population fluctuation of the agave red worm was recorded in Teotihuacan, State of Mexico (19º 42’07” N and 98º 54’58” W, altitude 2319 m), Cwb climate (subtropical or temperate with dry summers) in an *A. salmiana* plantation (Figure 1), about three years old and 30 cm tall. Density was approximately 10,000 plants/ha, and about one tenth was infested with *C. redtenbacheri* larvae. Distance to the closest town was 612 m. Adult capture was recorded during three periods: **1**) December 2013 to December 2014, **2**) December 2014 to December 2015, and **3**) December 2015 to June 2016, because in previous years we had observed the presence of *C. redtenbacheri* adults as of January, as Nolasco et al. (2002) and Llanderal-Cázares et al. (2007) reported. Two UV traps (ITRAP®, Naucalpan, State of Mexico), designed and modified by ITRAP from the Pennsylvania® type (Frost, 1957), were used. The traps were placed at a height of 1.25 meters so that the catch container would not touch the ground but would stand above the plants. They were distributed 40 m apart in a neighboring lot with dispersed agave plants. The study area, 6522 m^2, was enclosed with a screen to protect the agaves infested by *C. redtenbacheri* , and it was also useful for protecting the traps that remained in the same places throughout the experiment. The traps consisted of four acrylic panels placed at 90º angles to form a square and an LED lamp suspended in the centre. The catch container is a plastic funnel supported by a polyvinyl chloride (PVC) pipe and a collecting bucket with antifreeze (Bardahl®, Toluca, State of Mexico) recommended to preserve trapped insects (Thomas, 2008). The trap was secured to the ground by means of three stainless steel tubes screwed to the funnel. The electrical system of the UV traps works with the energy provided by a 10 w, solar panel (Enesol®, model DS-A18-10, State of Mexico); the energy is stored in a rechargeable 12 volt lithium battery, which has a circuit that regulates the charge to be stored during daylight hours and turns the lamp on at night. Sampling was conducted every week from the date the experiment was set up. Samples were taken to the Insect Physiology Laboratory of the Colegio de Postgraduados, campus Montecillo, State of Mexico. Each sample was placed on absorbent paper to dry. Later, *C. redtenbacheri* adults were identified, using the taxonomic keys of Triplehorn & Johnson (2005). Also, adult females and males were separated and counted, and their morphological traits were corroborated with those reported by Brown (1975) and Castro-Torres & Llanderal-Cázares (2015), who mention bands of scales on the wings that form two whitish inverted V-shaped marks when the moth is in resting position; the body is light brown densely covered with spatulate and filiform scales, serrated antennae on females and bipectinate on males, and atrophied mouthparts.

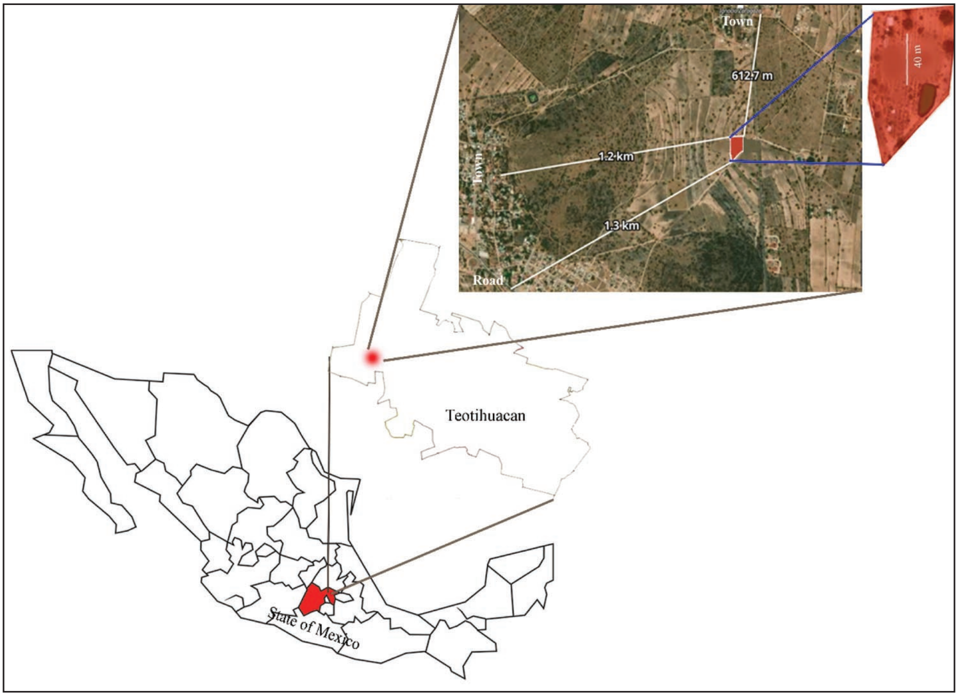


Figure 1. Study area, Teotihuacan, State of Mexico, Mexico.

Temperature and relative humidity were recorded hourly by a data logger, model RHT10 version 5.6 (Extech(r) instruments, United States), placed at the same location as the traps. Daily and weekly averages were calculated. Precipitation data were taken from weather station 15090 in Tecámac, State of Mexico (CONAGUA, 2020).

An analysis of variance was performed with the adults trapped in the three periods evaluated using a completely randomized design. Comparison of means of sex and total adults was conducted with a Tukey test (P=0.05). Pearson's correlation coefficient was calculated during the three sampling periods in the months of highest adult capture with temperature and relative humidity variables (SAS Institute 2015).

Results

The season of adult *C. redtenbacheri* capture during the three evaluated periods was similar, occurring from December to May and lasting an average of 157 days. Capture of males and females was 5163 in the first period, 2023 in the second period, and 1480 in the third period, a total catch of 8666 adults. In this study, the largest catches occurred on day 72 in the first period, on day 92 in the second, and on day 85 in the third. Males were more abundant than females in all the periods, as can be observed in the average capture of the two traps (Figure 2). The average percentages of females and males trapped on all sampling dates was 7.1% females and 92.9% males during the three evaluated periods, with significant differences (α=0.05) in the number of insects trapped in the first period compared with those caught in the second and third. The sex ratio was similar in all periods. Moreover, the total number of insects captured decreased over the sampling periods (Table 1); this could be attributed to the small area of the lot where traps were placed and to the successive captures that may have reduced the insect population. In the first period, the highest peak of adult capture occurred when the temperature reached 20.2º C (Figure 3), followed by capture at 16.3º C (Figure 4) in the second period and at 16.8º C in the third period (Figure 5).

Table 1. Comparisons of means and sex ratios of catches of *Comadia redtenbacheri* adults in the three periods evaluated. SE: Standard error, Pr: Probability, HSD: Honestly Significant Difference, mean in a column with the same letter are not statistically different (P=0.05; Tukey), n= 162.

Periods	Means ± SE Females	Means ± SE Males	Total ± SE Females+Males	Ratio Females:Males
First	7.24± 0.78 a	88.37±9.57 a	95.61±10.28a	1:12a
Second	2.09 ± 0.78 b	35.37±9.57 b	37.46±10.28b	1:17a
Third	2.04± 0.78 b	25.37±9.57 b	27.41±10.28b	1:13a
Pr	<.0001	<.0001	<.0001	<0.9801
HSD	2.57	31.76	34.11	4.6721

When the number of trapped *C. redtenbacheri* adults is correlated with temperature averages using Pearson correlation coefficients during the months of highest capture (January, February, and March) in the three evaluated periods, a statistically significant relationship was found for temperature (r = 0.53, P<0.0001). Correlation of this abiotic factor explains the behaviour and the population fluctuation of this insect; that is, at higher temperatures, catches of *C. redtenbacheri* adults increase and vice versa. During adult capture in the first period, the average relative humidity was lower (46%) than in the second (70%) and third (53%) periods. The largest peaks of capture in each period were found with a relative humidity of 45.5%, 47.1%, and 48.7% for the first, second and third year, respectively. When the number of trapped *C. redtenbacheri* adults is correlated with averages of humidity using Pearson correlation coefficients during the months of highest capture (January, February, March) in the three evaluated periods, a statistically significant relationship was found for relative humidity (r = -0.44, P<0.0001). Correlation of this abiotic factor explains that catches of *C. redtenbacheri* adults decrease at higher relative humidity. The highest capture of adults in traps occurred when precipitation was scarce, and vice versa, during February and March with variation in each of the periods (Figures 3-5).

Discussion

The capture of *C. redtenbacheri* adults occurred from December to May, differing from Llanderal-Cázares et al. (2007), who reported that adults in the field emerged as if the first week of January. In contrast, Miranda-Perkins et al. (2016) mention that in captivity, after observing larvae pupating in September and October, emergence begins in early April and ends by the third week of May, with a duration of 49 days and maximum values of emergence on days 19 and 20.

The number of males was consistently higher than the number of females in each of the periods, and in the laboratory, Miranda-Perkins et al. (2013) reported that last instar larvae and pupae of males are smaller than those of females. Moreover, Miranda-Perkins et al. (2016) also found a sex ratio of 1:1 after larvae with a weight ranging from 0.30 to almost 1.0 g were induced to pupate in a substrate of soil and vermiculite, which in laboratory conditions produces similar proportions of *C. redtenbacheri* individuals of both sexes, according to larva weight. Solomon (1976) observed that in the cossid *Prionoxystus robiniae* (Peck, 1818), the sex ratio was stable from one year to the other over three years, with an average of three males to two females. The lower number of females of *C. redtenbacheri* in the traps could be due to their reduced ability to fly, while the males fly as soon as they emerge, as observed by Solomon & Neel (1973) in *P. robiniae*, who mention that the males have a rapid zigzag flight pattern, while females will remain on the host, near the site of emergence. Also, in *Zeuzera pyrina* (L., 1761) (Lepidoptera: Cossidae), Durán et al. (2004) observed that males have greater mobility than females, whose voluminous abdomens limit their movement. Also, Ramírez-Cruz & Llanderal-Cázares (2015) reported that the female *C. redtenbacheri* is proovigenic and emerges with 104 mature ovocytes ready to be fertilized and oviposited, limiting its flight capacity. This is the characteristic that could have reduced female arrival in the traps.

In *C. redtenbacheri,* the highest adult capture for the three periods was found at an average of temperature of 17.8º C and 47.1% relative humidity, and consistently, as temperature increased, relative humidity diminished, and vice versa. The effect of abiotic factors on the populations has previously been discussed in other species of insects, with behaviour similar to that found in *C. redtenbacheri*. For example, in *Chilo partellus* (Swinhoe, 1885) (Lepidoptera: Crambidae), several temperatures and relative humidity percentages were evaluated to determine the interval of these factors in which the species develops better (Tamiru et al., 2012). Another example of the importance of these two factors, *Z. pyrina*, is reported by Ismail et al. (1992), who showed that temperature and relative humidity were the main environmental conditions that influenced adult activity. Zada et al. (2014) found that temperature and relative humidity are paramount to fluctuations in population distribution and abundance of *Cydia pomonella* (L. 1758) (Lepidoptera: Tortricidae). In the first period, the highest adult peak of capture occurred when the temperature reached 20.2º C, followed by 16.3º C and at 16.8º C, suggesting that the ideal temperature for *C. redtenbacheri* capture is found within this range. Miranda-Perkins et al. (2013) mention that in the laboratory *C. redtenbacheri* adult emergence was higher when no moisture was applied to the substrate, coinciding with data found in the field since, in all three years, capture was inversely proportional to the level of environmental humidity.

The efficacy of UV light traps enabled determination of *C. redtenbacheri* population fluctuation in the three evaluated periods, as has been shown with a large number of nocturnal insects that can perceive light radiation, especially in the region near 320-380 nanometers (Hienton, 1974; Shimoda & Honda, 2013). The use of UV traps has been successful in several species of insects, mainly agricultural and forest pests (Szentkirályi, 2002; Al-Deeb et al. 2012; Nielsen et al. 2013; Sermsri &

Torasa, 2015). In later studies, it would be useful to increase the number of traps and rotate their positions as well as to increase the study area.

Knowledge of the capture period of adults is important for producers and gatherers. Care and protection of this species from December to May, the most vulnerable season for reproduction of the insects, will enable them to increment populations and to better use and conserve the species. The insect's attraction to UV light traps can be useful to determine whether there are populations of *C. redtenbacheri* in an area and their abundance. The influence of temperature and relative humidity must be considered to manage the insect under possible production systems.

References

Al-Deeb, M. A., Mahmoud, S. T., & Sharif, E. M. (2012). Use of light traps and differing light colour to investigate seasonal abundance of the date palm pest, *Oryctes agamemnon arabicus* (Coleoptera: Scarabaeidae). *Journal of Economic Entomology, 105*(6), 2062-2067.

Ancona, L. H. (1931). Los chilocuiles o gusanitos de la sal de Oaxaca. *Anales del Instituto de Biología de la Universidad Nacional Autónoma de México, 2*(1), 265-277.

Brown, R. M. (1975). A revision of the North American *Comadia* (Cossidae). *Journal of Research on the Lepidoptera, 14*(4), 189-212.

Cárdenas-Aquino, M. R., Alarcón-Rodríguez, N. Rivas-Medrano M., González-Hernández, H., Vargas-Hernández, M., Sánchez-Arroyo, H., & Llanderal-Cázares, C. (2018). Molecular delineation of the agave red worm *Comadia redtenbacheri* (Lepidoptera: Cossidae). *Zootaxa, 4375*(3), 358-370.

Castro-Torres, R. E., & Llanderal-Cázares, C. (2015). Principales caracteres morfológicos para el reconocimiento de *Comadia redtenbacheri* Hammerschmidt (Lepidoptera: Cossidae). *Entomología Mexicana, 2*(6), 798-803.

Castro-Torres, R., & Llanderal-Cázares, C. (2016). Detailed morphology of all life stages of the agave red worm, *Comadia redtenbacheri* (Hammerschmidt) (Lepidoptera: Cossidae). *Neotropical Entomology, 45*(6), 698-711.

CONAGUA (2020). *Información de Estaciones Climatológicas. Estación 15090. San Jerónimo Xonocahuacan, Tecámac, Estado de México, México.* https://smn.conagua.gob.mx/tools/RESOURCES/Diarios/15022.txt

Delgado-Tejeda, I., Llanderal-Cázares, C., Miranda-Perkins, K., & De Los Santos-Posadas, H. M. (2017). Pupación, emergencia de adultos y oviposición de *Comadia redtenbacheri* (Lepidoptera: Cossidae) en vivero. *Agrociencia, 51*(4), 447-454.

Durán, J. M., Alvarado, M., González, M., Jiménez, N., Sánchez, A., & Serrano, A. (2004). Control del taladro amarillo, *Zeuzera pyrina* L. (Lepidoptera, Cossidae), en olivar mediante confusión sexual. *Boletín de Sanidad Vegetal de Plagas, 30*(2), 451-462.

Espinosa-García, N., Llanderal-Cázares, C., Miranda-Perkins, K., Vargas-Hernández, M., González-Hernández H., & Romero-Nápoles, J. (2018). Infestación inducida de gusano rojo *Comadia redtenbacheri* en *Agave salmiana*. *Southwestwern Entomologist, 43*(4), 1009-1019.

Frost, S. W. (1957). The Pennsylvania insect light trap. *Journal of Economic Entomology, 50*(3), 287-292.

Hernández-Flores, L., Llanderal-Cázares, C., Guzmán-Franco, A. W., & Aranda-Ocampo, S. (2015). Bacteria present in *Comadia redtenbacheri* larvae (Lepidoptera: Cossidae). *Journal of Medical Entomology, 52*(5), 1150-1158.

Hernández-Livera, R. A., Llanderal-Cázares, C., Castillo-Márquez, L. E., Valdez-Carrasco, J., & Nieto-Hernández, R. (2005). Identificación de instares larvales de *Comadia redtenbacheri* (Hamm) (Lepidoptera: Cossidae). *Agrociencia, 39*(5), 539-544.

Hienton, T. E. (1974). Summary of investigations of electric insect traps. *Technical Bulletin Nº 1498. Agricultural Research Service. United States Department of Agriculture*. Washington, D. C.

Ismail, I. I., Abou-Zeid, N. A., & Abdallah, F. F. (1992). Population dynamics of the leopard moth, *Zeuzera pyrina* L., and its control on olive trees in Egypt. *Journal of Plant Diseases and Protection, 99*(5), 519-524.

Llanderal-Cázares, C., Nieto-Hernández, R., Almanza-Valenzuela, I., & Ortega-Álvarez, C. (2007). Biología y comportamiento de *Comadia redtenbacheri* (Hamm) (Lepidoptera: Cossidae). *Entomología Mexicana, 6*(1), 252-255.

Llanderal-Cázares, C., De Los Santos-Posadas, H. M., Almanza-Valenzuela, I., Nieto-Hernández, R., & Castillejos-Cruz, C. (2010). Establecimiento del gusano rojo de maguey en invernadero. *Acta Zoológica Mexicana* (n. s.), *26*(1), 25-31.

Llanderal-Cázares, C., Castro-Torres, R., & Miranda-Perkins, K. (2017). Bionomics of *Comadia redtenbacheri* (Hammerschmidt, 1847) (Lepidoptera: Cossidae). *SHILAP Revista de lepidopterología, 45*(179), 373-383.

Miranda-Perkins, K., Llanderal-Cázares, C., De Los Santos-Posadas, H. M., Portillo- Martínez, L., & Vigueras-Guzmán, A. L. (2013). *Comadia redtenbacheri* (Lepidoptera: Cossidae) pupal development in the laboratory. *Florida Entomologist, 96*(4), 1424-1433.

Miranda-Perkins, K., Llanderal-Cázares, C., Cadena-Barajas, M., & López-Sauceda, J. (2016). Adult emergence and reproductive behavior of *Comadia redtenbacheri* in confinement. *Southwestern Entomologist*, *41*(3), 657-665.

Nielsen, A. L., Holmstrom, K., Hamilton, G. C., Cambridge, J., & Ingerson-Mahar, J. (2013). Use of black light traps to monitor the abundance, spread, and flight behavior of *Halyomorpha halys* (Hemiptera: Pentatomidae). *Journal of Economic Entomology, 106*(3), 1495-1502.

Nolasco, M. A., Jiménez-Luna, J. E., & Camacho, A. D. (2002). Inducción a la pupación y colonización del gusano rojo del maguey *Comadia redtenbacheri* H. (Lepidoptera: Cossidae). *Entomología Mexicana, 1*, 125-130.

Ramamurthy, V. V., Akhtar, M. S., Patankar, N. V., Menon, P., Kumar, R. K., Singh, S., Ayri, S., Parveen, S., & Mittal, V. (2010). Efficiency of different light sources in light traps in monitoring insect diversity. *Munis Entomology & Zoology, 5*(1), 109-114.

Ramírez-Cruz, A., & Llanderal-Cázares, C. (2015). Morfología del sistema reproductor de la hembra de *Comadia redtenbacheri* (Hammerschmidt) (Lepidoptera: Cossidae). *Acta Zoológica Mexicana* (n. s.), *31*(3), 431-455.

Ramos-Elorduy, J. (2006). Threatened edible insects in Hidalgo, and some measures to preserve them. *Journal of Ethnobiology and Ethnomedicine*, *2*(51), 1-10.

Ramos-Elorduy, J., Pino-Moreno, J. M., Vázquez, A. I., Landero, I., Oliva-Rivera, H., & Camacho, V. H. M. (2011). Lepidoptera in Mexico: Geographic distribution, ethnicity, economic and nutritional importance for rural people. *Journal of Ethnobiology and Ethnomedicine, 7*, 2-22.

SAS Institute (2015). *Statistical Analysis System*. Copyright© SAS Institute Inc., versión 9.4. Cary, North Carolina.

Sermsri, N., & Torasa, C. (2015). Solar energy-based insect pest trap. *Procedia-Social and Behavioral Sciences*, *197*(1), 2548-2553.

Shimoda, M., & Honda, K. (2013). Insect reactions to light and its applications to pest management. *Applied Entomology and Zoology, 48*(4), 413-421.

Solomon, J. D., & Neel, W. W. (1973). Mating behavior in the carpenterworm moth, *Prionoxystus robiniae* (Lepidoptera: Cossidae). *Annals of the Entomological Society of America, 66*(2), 312-314.

Solomon, J. D. (1976). Sex ratio of the carpenterworm moth (*Prionoxystus robiniae*) (Lepidoptera: Cossidae). *The Canadian Entomologist, 108*(3), 317-318.

Szentkirályi, F. (2002). Fifty-year-long insect survey in Hungary: T. Jermy's contributions to light-trapping. *Acta Zoologica Academiae Scientiarum Hungaricae, 48*(1), 85-105.

Tamiru, A., Getu E, Jembere, B., & Bruce, T. (2012). Effect of temperature and relative humidity on the development and fecundity of *Chilo partellus* Swinhoe (Lepidoptera: Crambidae). *Bulletin of Entomological Research, 102*(1), 9-15.

Thomas, D. B. (2008). Nontoxic antifreeze for insect traps. *Entomological News*, *119*(4), 361-365.

Triplehorn, C. A., & Johnson, N. F. (2005). *Borror and Delong's Introduction to the Study of Insects*. Thomson Brooks/Cole.

Truman, E. H. (1974). Summary of investigations of electric insect traps. *Agricultural Research Service. United State Department of Agriculture. Technical Bulletin 1498.*

Truxa, C., & Fiedler, K. (2012). Attraction to light-from how far do moths (Lepidoptera) return to weak artificial sources of light? *European Journal Entomology, 109*(1), 77-84.

Yen, A. L. (2012). Edible insects and management of country. *Ecological Management & Restoration, 13*(1), 97-99.

Zada, H., Saljoqi, A. U. R., Farid, A., Ullah, F., & Alikhan, I. (2014). Influence of weather parameters on population dynamics of apple codling moth *Cydia pomonella* (Lepidoptera; Tortricidae) at Matta Swat valley. *Sarhad Journal of Agriculture*, *30*(3), 351-356.

Zetina, D. A. H., Llanderal-Cázares, C., Ruíz-Cancino, E., & Khalaim, A. I. (2009). Registro para México de *Lissonota fascipennis* Townes (Hymenoptera: Ichneumonidae), como parasitoide del gusano rojo del maguey. *Acta Zoológica Mexicana* (n. s.), *25*(3), 655-657.

Zetina, D. A., Llanderal, C., & Huerta, H. (2012). *Acantholespesia texana*: A new report for Mexico, as a parasitoid of *Comadia redtenbacheri* Hamm. *Southwestern Entomologist*, *37*(2), 235-237.

Zetina, D. A., & Llanderal, C. (2014). Signs and symptoms in *Comadia redtenbacheri* Hamm. (Lepidoptera: Cossidae) larvae affected by parasitoids. *Southwestern Entomologist*, *39*(2), 285-290.

Manuel Jiménez-Vásquez.
IFIT. Entomología y Acarología
Colegio de Postgraduados
Km. 36.5 Carretera México-Texcoco
56230 Montecillo, Texcoco, Edo. de México
MÉXICO / *MEXICO*
E-mail: manuel.jimenez@colpos.mx
E-mail: jimvasman@gmail.com
https://orcid.org/0000-0003-1920-8349

*Celina Llanderal-Cázares
IFIT. Entomología y Acarología
Colegio de Postgraduados
Km. 36.5 Carretera México-Texcoco
56230 Montecillo, Texcoco, Edo. de México
MÉXICO / *MEXICO*
E-mail: llcelina@colpos.mx
https://orcid.org/0000-0002-7049-2931

Kalina Miranda-Perkins.
Secretaría del Medio Ambiente y Recursos Naturales
Subsecretaría de Planeación y Política Ambiental
Ejército Nacional 223
Miguel Hidalgo. 11320 Ciudad de México
MÉXICO / *MEXICO*
E-mail: kalinaperkins@gmail.com
https://orcid.org/0000-0002-3815-1491

Mateo Vargas-Hernández
Departamento de Suelos
Universidad Autónoma Chapingo
56230 Chapingo, Edo. de México
MÉXICO / *MEXICO*
E-mail: Vargas_Mateo@hotmail.com
https://orcid.org/0000-0002-0735-3242

Rosa María López-Romero
Edafología
Colegio de Postgraduados
Km. 36.5 Carretera México- Texcoco
56230 Montecillo, Texcoco, Edo. de México
MÉXICO / *MEXICO*
E-mail: rosal@colpos.mx
https://orcid.org/0000-0002-0601-4687

Manuel Campos-Figueroa
ITrap Consulting Services
College Station TX 77845
EEUU / *USA*
E-mail: camposmf@yahoo.com
https://orcid.org/0000-0002-9277-6740

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 8-VI-2021)
(Revisado y aceptado / *Revised and accepted* 26-III-2022)
(Publicado / *Published* 30-XII-2022)

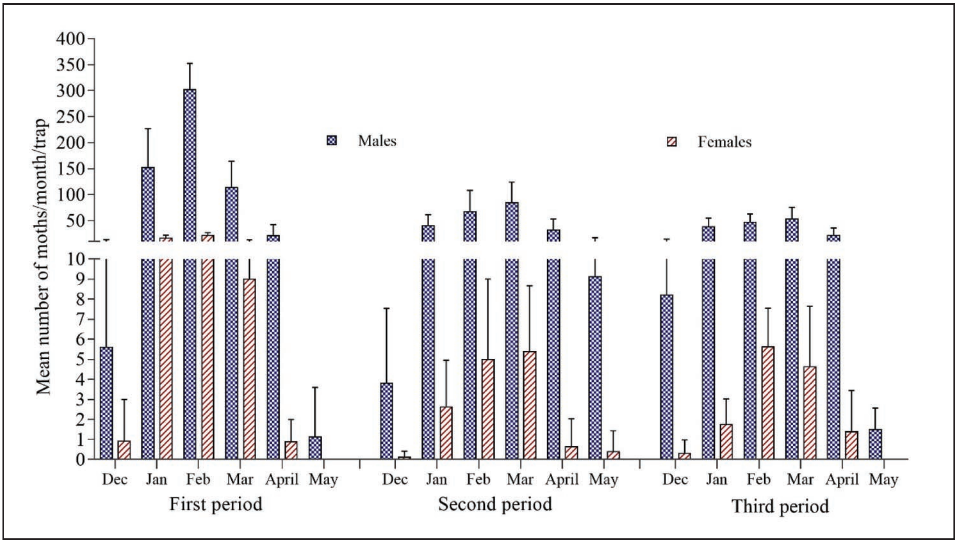


Figure 2. Average capture of moths during the three periods of evaluation. Teotihuacan, Mexico.

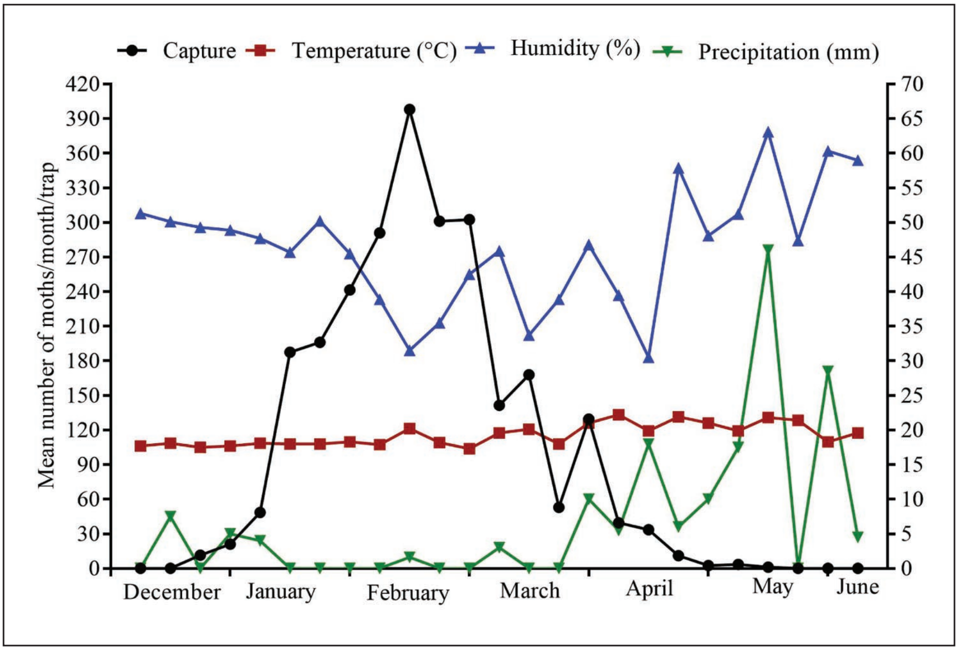


Figure 3. Average weekly capture of adult *Comadia redtenbacheri* in two light traps during the first period.

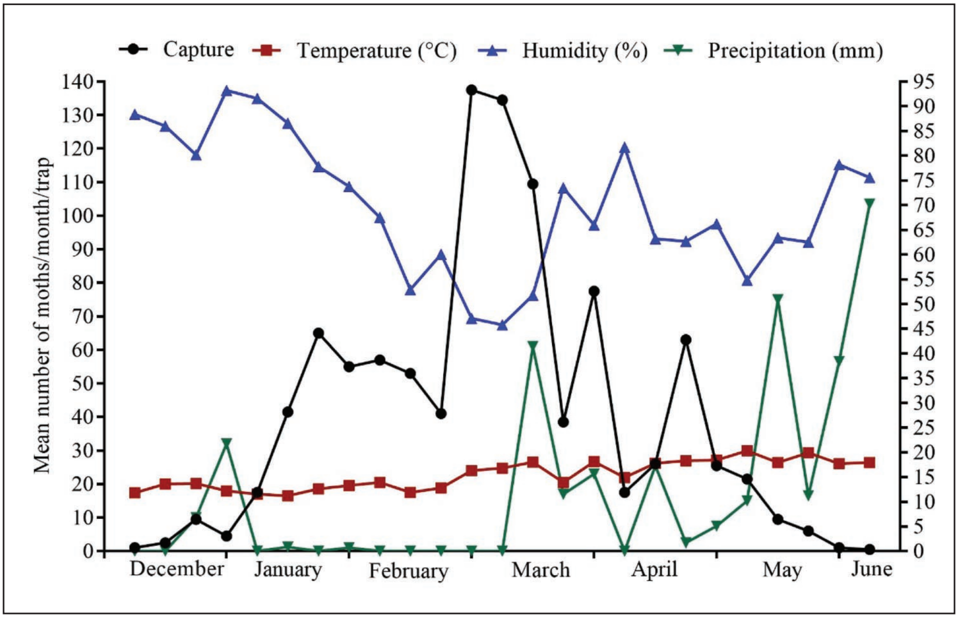


Figure 4. Average weekly capture of adult *Comadia redtenbacheri* in two light traps during the second period.

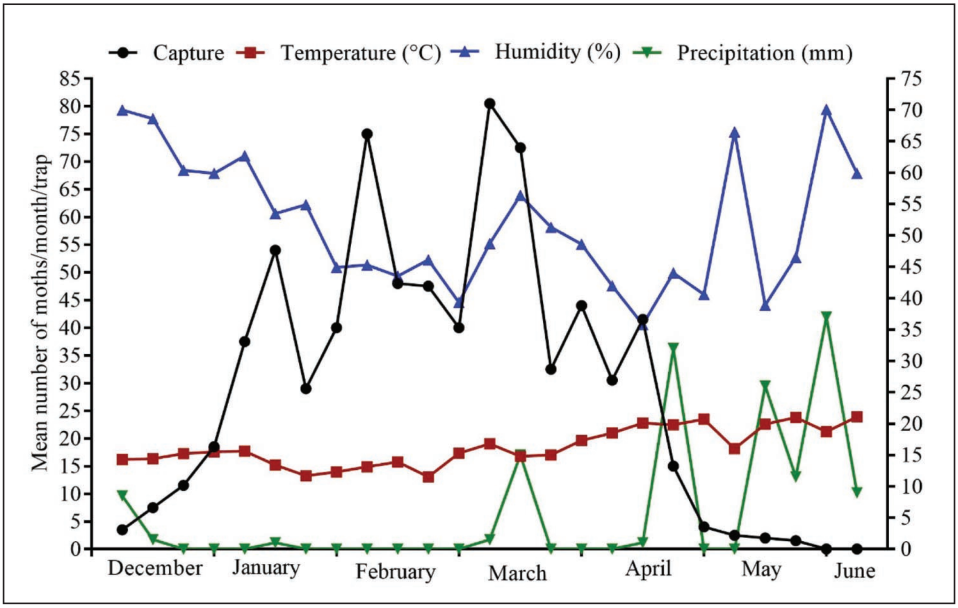


Figure 5. Average weekly capture of adult *Comadia redtenbacheri* in two light traps during the third period.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 739-747 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.266

Biología de *Brassolis sophorae* (Linnaeus, 1758) en condiciones de laboratorio usando *Roystonea oleracea* (Jacq.) O. F. Cook (Arecaceae), como alimento, Venezuela
(Lepidoptera: Nymphalidae, Brassolinae)

Yasmín Contreras-Peña, José Clavijo-Albertos &
Rodolfo Marcano-Brito

Resumen

Se determinó el tiempo de desarrollo de las fases y estadios larvales de *Brassolis sophorae* (Linnaeus, 1758), así como algunos aspectos de su comportamiento, usando *Roystonea oleracea* (Jacq.) O. F. Cook como alimento, en condiciones de laboratorio, especie considerada plaga en plantaciones de Araceae. Se estableció que el tiempo promedio de incubación de los huevos fue de 27,67 días y su viabilidad varió entre 97,64% y 84,74%. El desarrollo total del estado larval pasa a través de siete estadios en un tiempo promedio de 120,61 días. Al llegar al séptimo estadio la larva abandona el nido o refugio, busca un ambiente seguro y seco, esto lo hace de forma solitaria y la agregación larval ya no se observa. La prepupa tiene una duración promedio de 3,15 días y se caracteriza por el cese de la alimentación y del movimiento. La duración promedio de las pupas hembras fue de 15 días y para los machos, la duración fue de 14,44 días. La longevidad promedio en condiciones de laboratorio para el estado adulto fue de 9,66 días. Se encontró que los machos comienzan su actividad de vuelo rápido e irregular más temprano que las hembras, a las 5:30 p.m. y las hembras a las 6:00 p.m. pero las hembras permanecen activas más tiempo que los machos.

Palabras clave: Lepidoptera, Nymphalidae, Brassolinae, *Brassolis, Roystonea,* Venezuela.

Biology of *Brassolis sophorae* (Linnaeus, 1758) under laboratory conditions using *Roystonea oleracea* (Jacq.) O. F. Cook (Arecaceae), as food, Venezuela
(Lepidoptera: Nymphalidae, Brassolinae)

Abstract

The development time of the larval stages of *Brassolis sophorae* (Linnaeus, 1758) was determined, as well as some aspects of their behavior, using *Roystonea oleracea* (Jacq.) O. F. Cook as food, under laboratory conditions. This species is considered a pest in Araceae plantations. The average incubation time of the eggs was 27.67 days and their viability varied between 97.64% and 84.74%. The total development of the larval stage passes through seven instars in an average time of 120.61 days. When the larvae reach the seventh instar, they leave the nest or shelter and look for a safe and dry environment, this is done solitarily, and larval aggregation is no longer observed. The prepupa lasts an average of 3.15 days and is characterized by the cessation of feeding and movement. The average duration of female pupae was 15 days and for males, the duration was 14.44 days. The average longevity under laboratory conditions for the adult stage was 9.66 days. Males were found to start their rapid and irregular flight activity earlier than females, at 5:30 p.m. and females at 6:00 p.m. but females remained active longer than males.

Keywords: Lepidoptera, Nymphalidae, Brassolinae, *Brassolis*, *Roystonea*, Venezuela.

Introducción

*Brassolis sophor*ae (Linnaeus, 1758), es una especie considerada como una de las plagas presentes en plantaciones de Araceae (Lepesme, 1947; Lima, 1950; Trasvassos, 1954; Lever, 1970; Rai, 1973; Fusagri Foncopal 1976; Genty et al. 1978; Yépez et al. 1985; Remillet, 1988; Stauffer et al. 1993). La especie está distribuida a lo largo del continente suramericano, desde la costa del Caribe hasta Argentina, además de Trinidad y Tobago.

Aspectos de la biología de *B. sophorae* han sido señalados en la bibliografía. Stichel (1932) y Lever (1970) describen que la hembra coloca los huevos en masas, las cuales pueden ser de 200 o más y eclosionan entre 20 y 25 días. Las larvas, construyen grandes refugios sedosos impermeables, denominados "nidos" que según Menezes & Zamith (1954) los realizan, uniendo las pinnas de las hojas de la palma junto con la seda que ellas mismas producen; en éstos se albergan durante el día y durante la noche salen para alimentarse, defoliando las palmas.

Zanetti et al. (1999) describen el período de alimentación diario y el comportamiento de marcación de trillo de las larvas de esta especie en condiciones de campo, encontrando que una larva se coloca al frente de cada grupo y lo guía, depositando un hilo de seda en zigzag mediante movimientos oscilatorios con la cabeza; este comportamiento es imitado por las larvas que la siguen formando así, un trillo de hilos en forma de red, desde el nido hasta el lugar de alimentación. Los autores concluyen que basta que una larva marque trillo de exploración y reclutamiento, para que sea seguido por las compañeras, sin necesidad de contacto físico entre ellas.

Trasvassos (1954) señala que, al terminar la fase larval, las mismas abandonan las palmas y buscan activamente una superficie vertical donde ascienden hasta alcanzar una posición oblicua favorable, allí se inmovilizan y terminan suspendidas por las garras de las patas traseras, se encogen poco a poco y, después de dos a cuatro días, pasando a la fase inamovible de pupa o crisálida.

Mediante el presente estudio ampliamos los conocimientos acerca de la biología de *B. sophorae* en el laboratorio, usando *Roystonea oleracea* (Jacq.) O. F. Cook (Araceae), como alimento, así como algunos aspectos de su comportamiento.

Materiales y métodos

Los estudios de biología se realizaron en el Laboratorio de Investigaciones en Diversidad Zoológica (LIDZ) del Instituto Pedagógico de Caracas, Departamento Capital, ubicada a 905 m.s.n.m., con una temperatura y humedad relativa promedio de 26,30ºC y 64,99% respectivamente, registrados diariamente a través de un termo higrómetro.

Para el inicio de los experimentos, se estableció una base de cría, mediante la recolección en el campo de 40 pupas de la especie en estudio, con igual proporción de hembras y machos; las cuales se distribuyeron en una jaula construida con malla de tul blanco, y con soportes de alambre de 1,45 m x 1,45 m de ancho y 2,5 metros de altura, la misma, contenía una planta de *R. oleracea* de l,4 m de altura, sembrado en una maceta de 80 cm de diámetro (Figura 1). Después de la emergencia de los adultos y que estos lograron copular, se revisó cada 24 horas las paredes de la jaula, para recolectar las masas de huevos; las cuales se retiraron cuidadosamente y se llevaron al laboratorio en cápsulas de Petri con papel de filtro ligeramente humedecido.

Se eligió, al azar, una masa de huevos de las seis obtenidas en la base de cría, ésta poseía 170 huevos, de la que emergieron 166 larvas. A intervalos de 24 horas se contó y registró el número total de huevos eclosionados y no eclosionados. Las larvas fueron colocadas en un envase de vidrio de cinco litros y allí permanecieron mientras crecieron desde el primer al segundo estadio; después se pasaron a una jaula de cría de 60 cm de largo x 60 cm de ancho y 80 cm de altura. Se alimentaron las larvas con foliolos de *Roystonea oleracea* que se introdujeron en una especie de esponja humedecida, denominada "oasis" (usada en arreglos florales) para mantenerlos turgentes. El alimento fue reemplazado diariamente. Las larvas construyeron su refugio hilando los foliolos con seda en uno de los extremos de la jaula de cría, se les perturbó sólo en lo estrictamente necesario intentando minimizar la manipulación para no afectar su comportamiento ni desarrollo.

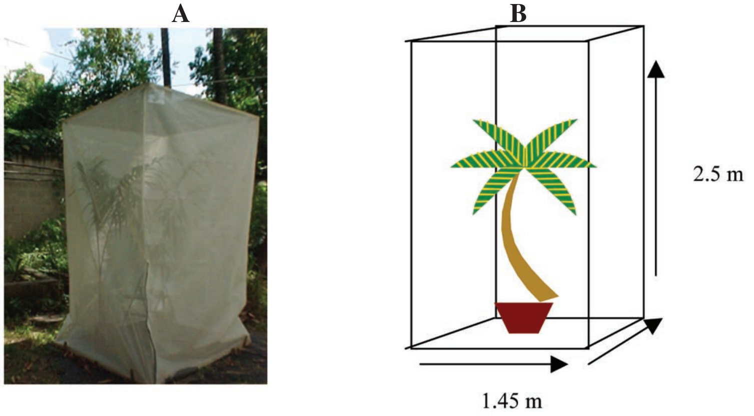


Figura 1. A. Jaula para la cópula de la especie (1,45 m x 1,45 m de ancho y 2,5 metros de altura). **B.** Esquema.

Diariamente se revisó la jaula para recuperar las cápsulas cefálicas desprendidas de las larvas en ecdisis y se registró la fecha de la muda. La presencia de cápsulas cefálicas provenientes de las mudas fue un criterio tomado para anotar el cambio de estadío. Se realizó la medición de 873 cápsulas cefálicas a través de una escala micrométrica ajustada a un estereoscopio Wild M8. Posteriormente, para la determinación del número de estadíos larvales, se interpretaron los datos de las mediciones de acuerdo a la ley de Dyar (Gaines & Capell, 1935), la cual, generalmente, resulta adecuada para la mayoría de los lepidópteros. Durante el seguimiento del desarrollo larval de *B. sophorae* se recuperaron todas las cápsulas cefálicas que se encontraron diariamente fuera del “nido” o refugio que estas construyen. Se aplicó el método de Peterson & Haeussler (1928).

Se obtuvieron 64 prepupas, que se reconocen según Bastos (1967) por el cese del acto de alimentación por parte de las larvas. Cada prepupa se colocó en envases plásticos de 700 ml donde se observaron diariamente hasta pupar. Se pudo determinar el sexo de los individuos en el estado de pupa, para ello se utilizó el procedimiento de Ruszczyk (1996) en el que se reconoce la presencia (hembras) o la ausencia (machos) de una hendidura transversal en la porción ventral del penúltimo segmento abdominal, que es un carácter propio de su dimorfismo sexual. Se revisaron diariamente hasta que emergieron los adultos y se registró la fecha del evento.

Resultados y discusión

B. sophorae coloca los huevos en agregaciones, por lo que se estimó el tiempo de eclosión de cada una promediando los valores del número total de seis de ellas (Tabla I). El tiempo promedio de incubación de los huevos fue de 27,67 ± 3,56 días. Además, se observó que la viabilidad fue muy alta, siendo la mayor de 97,64% y la menor de 84,74%. Esto, nos indica la alta probabilidad de supervivencia que puede tener la especie en condiciones de laboratorio.

Al observar la relación entre el tiempo de desarrollo y el número de huevos de cada masa a través de un gráfico de regresión (Figura 2), se puede notar que aquellas agregaciones que presentaban mayor número de huevos tomaban mayor tiempo en eclosionar que las que poseían menor número, por lo que se podría colegir que estas dos variables están directamente relacionadas (R^2 0,95).

Tabla 1. Duración y viabilidad de la fase de huevo de *B. sophorae*.

Número de agregación de huevos	Duración (días)	Número de huevos	Número de larvas emergidas	Viabilidad %
1	25	85	79	92,94
2	29	170	166	97,64
3	31	242	232	95,86
4	22	59	50	84,74
5	28	155	148	95,48
6	31	239	228	95,39
$\bar{X}$	27,67	158,33	150,5	93,68
DE	3,56	76,03	74,97	4,63

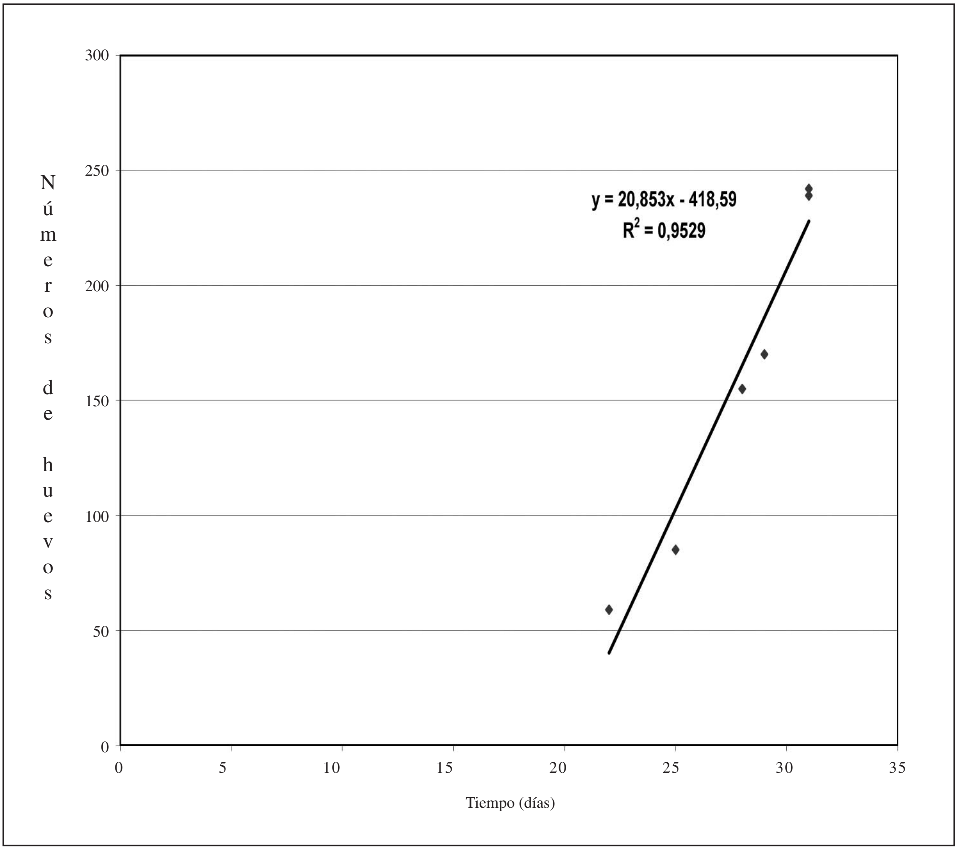


Figura 2. Relación entre el número de huevos de *B. sophorae* y su duración en días.

Se agruparon las medidas del promedio del ancho de las cápsulas cefálicas en una curva de distribución de frecuencias, se observa claramente que no hay solapamiento entre ellas, siendo el número de estadíos igual al número de picos en el diagrama (Figura 3). Lo que indica que la mariposa, para completar su desarrollo larval debe pasar por siete estadíos en un tiempo promedio de 120,61 días en condiciones de laboratorio. Los promedios del ancho máximo de la cabeza pueden ser vistos en la Tabla II, además se señalan las relaciones (r) entre un estadío y el que le precede, observándose que este valor presentó poca variación.

Tabla II. Ancho máximo promedio (mm) de la cabeza de larvas *de Brassolis sophorae* criadas en condiciones de laboratorio.

I			**II**			**III**			**IV**			**V**			**VI**			**VII**	
n	X±DE	r II/I	n	X±DE	r III/II	n	X±DE	r IV/III	n	X±DE	r V/IV	n	X±DE	r VI/V	n	X±DE	r VII/VI	n	X±DE
166	1,039 ±0,018	1,221	159	1,269 ±0,034	1,368	159	1,737 ±0,344	1,363	159	2,368 ±0.056	1,399	147	3,315 ±0,085	1,382	147	4,582 ±0,150	1,179	102	5,403 ±0,301

$\bar{X}$ = promedio del ancho máximo de la cabeza. DE = desviación estándar. r = relación entre instares. N = número de individuos.

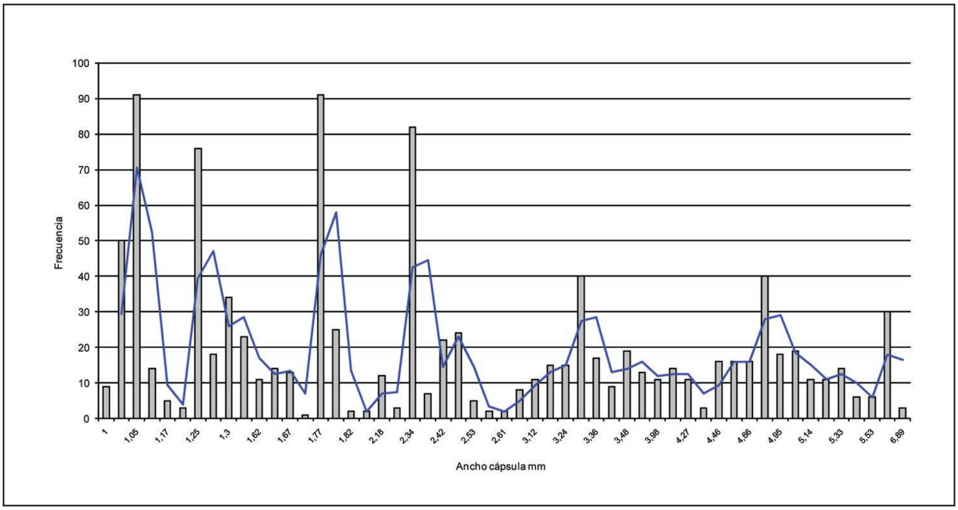


Figura 3. Distribución de frecuencia del ancho máximo de la cápsula cefálica (mm) de larvas de *Brassolis sophorae*.

Se observó que las pequeñas larvas comienzan a romper el corion antes de la eclosión, el proceso se observa desde las 8:00 a.m. hasta las horas del mediodía, sale primero una larva y, luego, ésta continúa comiendo del corion de los otros huevos y de esta manera ayuda a salir al resto de las larvas, este comportamiento se repite en el resto de las larvas a medida que van saliendo, multiplicando el efecto de asistencia colectiva. El desarrollo total del estado larval pasa a través de siete estadíos en un tiempo de 120,61 días. La duración promedio de los estadíos larvales, fue de 14; 11,03; 13,2; 14,41; 17,12; 26,68 y 24,17 días para el 1º, 2º, 3º, 4º, 5º, 6º y 7º estadío respectivamente. Como se observa, los dos últimos estadíos fueron en promedio los de mayor duración (Tabla III).

Tabla III. Duración de la fase larval y los estadíos de *B. sophorae*.

Estadio larval	Población (N)	Promedio días ($\bar{X}$)	Desviación Estándar (DE)
Larva (total)		120,61	5,25
I	166	14	0,25
II	159	11,03	0,33
III	159	13,2	0,65
IV	159	14,41	0,68
V	147	17,12	1,94
VI	145	26,68	1,53
VII	100	24,17	2,05

En la Figura 4, se muestra la relación entre el número de estadíos larvales (x) y el ancho de la cápsula cefálica (y) previa transformación de los datos a Ln (x). El modelo utilizado fue Ln y = a + bx, obteniéndose la línea de regresión Ln= -0,2938 + 0,2913 x con un coeficiente de determinación R^2= 0,994, el cual corrobora su alto valor predictivo para estimar el estadío larval de la especie en estudio. Se puede notar que el gráfico muestra una recta, lo cual es indicativo del cumplimiento de la ley de Dyar (1890).

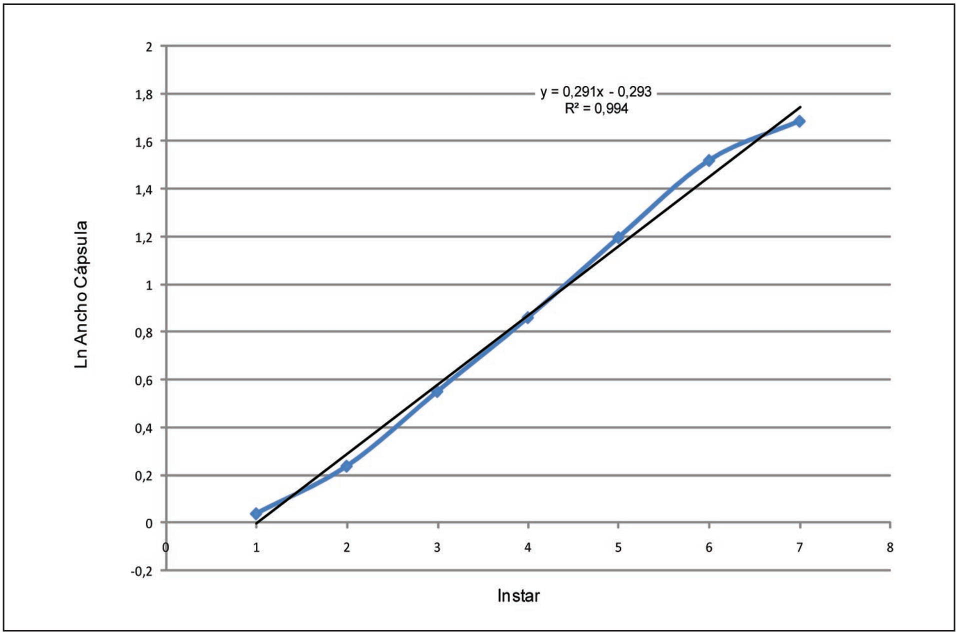


Figura 4. Relación entre el número de estadíos larvales y el ancho máximo de la cápsula cefálica (mm) de larvas de *Brassolis sophorae*.

A pesar de que las larvas de *B. sophorae* se encontraban en condiciones de laboratorio, marcaban una trilla de seda a la hora de la alimentación, siempre en horas de la noche (6:00 a 9:00 pm). Una de las larvas salía primero del nido y le servía de guía a las restantes, todas realizaban movimientos oscilatorios con la cabeza, hasta llegar a las hojas colocadas como alimento. Lo anterior coincide con lo reportado por Zanetti et al. (1999) en condiciones de campo. Además, cuando no existe una trilla de seda vieja, las larvas se guían por el hilo de seda que va produciendo la primera y si alguna se pierde, inmediatamente trata de alcanzar a la larva más cercana, le toca la región posterior con su cabeza y continúa caminando. A la hora de la alimentación todas lo hacen de una sola pina, pareciera que se turnaran para el forrajeo, pues se observó que mientras unas se alimentaban el resto permanecía en espera caminando alrededor hasta que llegara su "turno".

Al llegar al séptimo estadío la larva abandona el nido o refugio, busca un ambiente seguro y seco, esto lo hace individualmente de forma solitaria, disolviéndose la agregación larval. Así, entra en el período de prepupa, que se caracterizó por el cese de la alimentación y del movimiento; la larva acorta su longitud y su coloración cambia, sobre todo en la región pleuroventral, la cual se torna de un color amarillento a uno verdusco y luego a rosado. El estado de prepupa tiene una duración aproximada de 3,15 ± 0,58 días (Tabla IV).

Tabla IV. Duración de las fases de prepupa y pupa de *B. sophorae* en condiciones de laboratorio

Estadio larval	Población (N)	Promedio días ($\bar{X}$)	Desviación Estándar (DE)
Prepupa	64	3,15	0,58
Pupa	64	14,70	2,71
Hembra	21	15,23	2,73
Macho	43	14,44	2,69

La fase de pupa tuvo una duración promedio de 14,70 ± 2,71 días para una muestra de 64 individuos totales (hembras y machos). Para 21 pupas hembras, la duración promedio fue de 15,23 ± 2,73 días y para las pupas de 43 individuos machos, la duración fue de 14,44 ± 2,69 días (Tabla IV). Se encontró que los machos emergen primero que las hembras.

La longevidad promedio en condiciones de laboratorio para el estado adulto (Tabla V) de la especie en estudio fue de 9,66 ± 2,51 días (N=64). Discriminando los sexos, para 21 individuos adultos hembras, la duración fue de 10,57 días ± 0,53 días, y para 47 individuos machos el promedio de días fue de 9,29 ± 2,91. La proporción hembra-macho fue de 1:2.

Tabla V. Duración de la fase de adultos de *B. sophorae* en condiciones de laboratorio.

Estadio larval	Población (N)	Promedio días ($\bar{X}$)	Desviación Estándar (DE)
Adultos	64	9,66	2,51
Hembra	21	10,57	0,53
Machos	43	9,29	2,91

Agradecimientos

Este estudio fue posible gracias al apoyo, de los asistentes de laboratorio: Said Gómez, Francisco Rivera, Juan Linares e Ibelia Rivera en el laboratorio del Instituto Pedagógico de Caracas (IPC-UPEL); la asistencia en la salida de campo del Sr. Chacón personal de Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépez" (MIZA) y al Dr. Ángel Viloria por la revisión del manuscrito final.

Referencias

Bastos, J. A. M. (1967). Notas biológicas sobre *Brassolis sophorae* L. (Lep., Brassolidae) I. Perda de peso no periodo pupal. *Revista Brasilera de Entomología, 12*, 67-71.

Dyar, H. G. (1890). The number of molts of lepidopterous larvae. *Psyche, 5*, 420-422.

FUSAGRI FONCOPAL (1976). Coco (Serie A. 40). Cagua.

Gaines, J. C., & Campbell, F. L., 1935. Dyar's rule as related to the number of instars of the corn ear worm *Heliothis obsoleta* (Fab.) collected in the field. *Annals of the Entomological Society of America, 18*, 445-461.

Genty, P. H., Desmer De Chenon, R., & Morin, J. P. (1978). Les ravageurs du palmier a'huile en Amérique Latine. *Olégineux, 33*(7), 321-419.

Lever, R. J. (1970). Las plagas del cocotero. *Estudios Agropecuarios* (Vol. 77). FAO.

Lepesme, P. (1947). *Les insectes des palmiers.* Paul Lechevalier.

Lima, A. Da Costa (1950). *Insetos do Brasil. 6º Tomo. Lepidópteros 2da. Parte*. Serie Didática No. 8. Escola Nacional.

Menezes, F., & Zamith, A. (1954). Contribuição para o conhecimento da *Brassolis sophorae* (Linnaeus, 1758), *B. astyra* Godart, 1821 (Lepid. - Brassolidae) e de seus inimigos naturais. *Anais da Escola Superior de Agricultura Luiz de Queiroz, 11*(1), 61-207.

Rai, B. K. (1973). *Brassolis sophorae* and *Castnia daedalus*: chemical control of the major pests of coconut in Guyana. *Journal of Economic Entomology, 66*(1), 177-180.

Peterson, A., & Haeussler, G. (1928). Some observations on the numbers of larval instar of the oriental peach moth *Laspeyresia molesta* Busk. *Journal of Economic Entomology, 21*, 846-852.

Remillet, M. (1988). Catalogue des insectes ravageurs des cultures en Guyane Française. *Institut Francais de Reserche Scientifique pour le Développment en Coopération, Collection Etudes et Théses*. Editions de L'ORSTOM.

Ruszczyk, A. (1996). Spatial patterns in pupal mortality in urban palm caterpillars. *Oecologia, 107*, 356-363.

Stauffer, F., Clavijo, J., & Bevilacqua, M. (1993). Ataque de *Brassolis sophorae* (L., 1758) (Lepidoptera: Nymphalidae: Brassolinae) a las palmas (Palmae) del Parque del Este "Rómulo Betancourt", Caracas, Venezuela. *Boletín de Entomología Venezolana, N. S., 8*(1), 95-103.

Stichel, H. (1932). Brassolidae. In E. Strand. *Lepidopterorum Catalogus* (Vol. 51). W. Junk.

Taylor, R. L. (1931). On "Dyar's rule" and application to saw fly larvae. *Annals of the Entomological Society of America, 23*, 451-466.

Travassos Filho, L. (1954). As lagartas que comem as folhas das palmeiras. *Flores do Brasil, 1954*, 35-38.

Yépez, G., Fernández, Y., F., & Clavijo, J. (1985). Presencia de *Brassolis sophorae* (L.) (Lepidoptera: Brassolidae) causando daños en palmas de chaguaramos, *Roystonea oleraceae* (Jacq.), en el Estado Carabobo, Venezuela. *Boletín de Entomología Venezolana N. S., 4*(3), 23-24.

Zanetti, R., Vilela, E., Zanuncio, J., & Moura, J. (1999). Búsqueda de alimento y marcación de trillo por larvas de *Brassolis sophorae*. *Revista de Biología Tropical, 47*(4), 1035-1038.

*Yasmín Y. Contreras-Peña
Universidad Pedagógica Experimental Libertador
Instituto Pedagógico de Caracas
Centro de Investigación en Ciencias Naturales "Manuel González Sponga" (CICNAT)
Avenida Páez el Paraíso
Distrito Capital
Caracas
VENEZUELA / *VENEZUELA*
E-mail: yasmincontreras@gmail.com
https://orcid.org/0000-0003-1236-1690

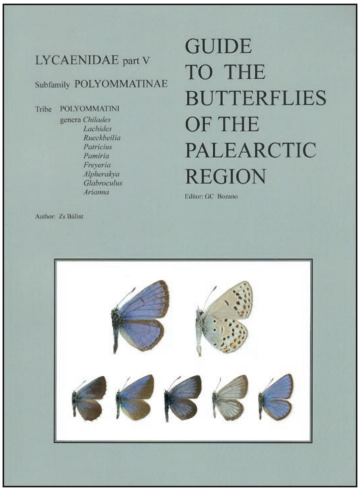
José Clavijo-Albertos
Museo del Instituto de Zoología Agrícola Francisco Fernández Yépez (MIZA)
Avenida 19 de abril
Casanova Godoy Maracay
Aragua Maracay
Aragua
VENEZUELA / *VENEZUELA*
E-mail: pepeclavijoa@gmail.com
https://orcid.org/0000-0003-2770-4131

Rodolfo Marcano-Brito
Universidad Central de Venezuela
Facultad de Agronomía
Avenida 19 de abril
Casanova Godoy Maracay
Aragua Maracay
Aragua
VENEZUELA / *VENEZUELA*
E-mail: marcanorodolfo16@gmail.com
https://orcid.org/0000-0002-2360-8356

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 20-V-2022)
(Revisado y aceptado / *Revised and accepted* 2-VII-2022)
(Publicado / *Published* 30-XII-2022)

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS



LYCAENIDAE part V
Subfamily POLYOMMATINAE
Tribe POLYOMMATINI
genera *Chilades*
Lachides
Rueckbeilia
Patricius
Pamiria
Freyeria
Alpherakya
Glabroculus
Arianna
Author: Zs Bálint

GUIDE TO THE BUTTERFLIES OF THE PALEARCTIC REGION
Editor: GC Bozano

Zs Bálint
Guide to the Butterflies of the Palaearctic Region: Lycaenidae part V
106 páginas
Formato 29’5 x 21 cm
Omnes Artes, Milano, 2022
ISBN: 978-88-87989-28-1

Una nueva entrega de esta interesante serie conocida como *Guide to the Butterflies of the Palearctic Region*, ha sido publicada, se trata de los Lycaenidae Leach, [1815], estudiándose la subfamilia Polyommatinae Swainson, 1827 y la Tribu Polyommatini Swainson, 1827 y, dentro de ella, los géneros *Chilades* Moore, 1881, *Lachides* Nekrutenko, 1984, *Rueckbeilia* Talavera, Lukhtanov, Pierce & Vila, 2012, *Patricius* Bálint, 1991, *Pamira* Zhdanko, 1994, *Freyeria* Couvoisier, 1920, *Alpherakya* Zhdanko, 1994, *Glabroculus* Lvovsky, 1993 y *Arianna* Bálint, 2022.

En esta entrega se tratan 48 especies, se designa un Neotipo (*Lycaena galathea* Blanchard, 1844), se establecen dos nuevas combinaciones, catorce nuevas sinonimias, y el estatus de dos nuevas subtribus (Itylosia Bánit, 2022, Nabakovina Bálint, 2022) y también se describen dos nuevas especies (*Pamira wojtusiaki* Bálint, 2022 y *Pamiria zhdankoi* Bálint, 2022).

De todas y cada una de las especies, nos presentan la descripción original, así como de todas las sinonimias consideradas, al igual que ocurre con las subespecies que los autores consideran como válidas en este trabajo. También nos encontramos con las principales características que nos permiten diagnosticarlas, datos sobre la morfología de la genitalia del macho, interesantes notas taxonómicas, datos sobre su distribución (que podemos ver en un mapa de la región Paleártica) y las principales referencias bibliográficas consideradas.

Es importante destacar, que se presentan excelentes fotografías de los ejemplares, no sólo de la especie original, si no de un gran número de subespecies consideradas. Termina la obra con una detallada bibliografía específica, que recoge todas las referencias contempladas a lo largo del trabajo y que consideramos imprescindibles en su conjunto.

No podemos terminar estas líneas, sobre este excelente trabajo y, de la que ya podemos considerar como una serie clásica, sin felicitar al autor por la realización de tan importante trabajo, así como a la Editorial una vez más, por su dedicación en publicar esta obra básica, que no debe de faltar en ninguna biblioteca que se precie, tanto institucional como particular. El precio de este libro es de 32 euros y los interesados lo pueden pedir a:

Omnes Artes
Via Castel Morrone, 19
I-20133 Milano
ITALIA / *ITALY*
E-mail: giancristoforo.bozano@fastwebnet.it

A. Vives Moreno
E-mail: avives1954@outlook.es
https://orcid.org/0000-0003-3772-2747

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 749-754 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.268

The taxonomic position of the Neotropical genus *Casandria* Walker, 1857, with new synonymies and combinations (Lepidoptera: Erebidae, Catocalinae)

Vitor O. Becker

Abstract

Casandria Walker, 1857, is transferred from the Nolidae (Collomeninae) to the Erebidae (Catocalinae), as the senior synonym of *Acathodica* Schaus, 1894. Consequently, the species formerly associated with *Acanthodica* are herein transferred to *Casandria*: *C. albiplena* (L. B. Prout, 1919) (*Acanthodica*), comb. n., *C. cabra* (Dognin, 1894) (*Acanthodica*), comb. n., *C. chiripa* (Dognin, 1894) (*Acanthodica*), comb. n., *C. coelebs* (L. B. Prout, 1919) (*Acanthodica*), comb. n., *C. drucei* (Dognin, 1889) (*Calocampa*), comb. n., *C. emittens* Walker, 1857 [=*Agrotis daunus* Druce, 1894)], syn. n., [=*Acanthodica grandis* (Schaus, 1894)], syn. n., *C. fassli* (Zerny, 1916) (*Acanthodica*), comb. n., *C. fosteri* (Hampson, 1913) (*Acanthodica*), comb. n., *C. frigida* (Jones, 1921) (*Acanthodica*), comb. n., *C. hages* (Druce, 1900) (*Acanthodica*), comb. n., *C. lignaris* (Schaus, 1894) (*Acanthodica*), comb. n., *C. penicillum* (Felder & Rogenhofer, 1874 (*Agrotis*), comb. n., *C. sinuilinea* (L. B. Prout, 1919) (*Acanthodica*), comb. n., *C. splendens* (Druce, 1889) (*Agrotis*), comb. n., *C. xylinoides* (Schaus, 1894) (*Acanthodica*), comb. n. The following species, formerly associated to *Casandria* are herein transferred to *Motya* Walker, 1859: *M. araea* (Schaus, 1911) (*Casandria*), comb. n., *M. flotsama* (Dyar, 1914) (*Casandria*), comb. n., *M. insignis* (Dognin, 1914) (*Casandria*), comb. n., *M. steniptera* (Schaus, 1911) (*Casandria*), comb. n. A table of all taxa formerly associated with both *Casandria* and *Acanthodica* are presented in the "Nommenclature summary", and illustrations of both the types of *C. emittens* Walker, 1857 and of *A. grandis* Schaus, 1894, as well of a live *C. splendens* (Druce, 1889), are also presented.

Keywords: Lepidoptera, Erebidae, Catocalinae, *Acanthodica, Casandria,* new combinations, new synonymies, Neotropical.

La posición taxonómica del género neotropical *Casandria* Walker, 1857, con nuevas sinonimias y combinaciones (Lepidoptera: Erebidae, Catocalinae)

Resumen

Casandria Walker, 1857, es transferida de los Nolidae (Collomeninae) hacia los Erebidae (Catocalinae), como el sinónimo senior de *Acathodica* Schaus, 1894. Consecuentemente, las especies anteriormente asociadas con *Acanthodica* son aquí transferidas hacia *Casandria*: *C. albiplena* (L. B. Prout, 1919) (*Acanthodica*), comb. n., *C. cabra* (Dognin, 1894) (*Acanthodica*), comb. n., *C. chiripa* (Dognin, 1894) (*Acanthodica*), comb. n., *C. coelebs* (L. B. Prout, 1919) (*Acanthodica*), comb. n., *C. drucei* (Dognin, 1889) (*Calocampa*), comb. n., *C. emittens* Walker, 1857 [=*Agrotis daunus* Druce, 1894)], syn. n., [=*Acanthodica grandis* (Schaus, 1894)], syn. n., *C. fassli* (Zerny, 1916) (*Acanthodica*), comb. n., *C. fosteri* (Hampson, 1913) (*Acanthodica*), comb. n., *C. frigida* (Jones, 1921) (*Acanthodica*), comb. n., *C. hages* (Druce, 1900) (*Acanthodica*), comb. n., *C. lignaris* (Schaus, 1894) (*Acanthodica*), comb. n., *C. penicillum* (Felder & Rogenhofer, 1874 (*Agrotis*), comb. n., *C. sinuilinea* (L. B. Prout, 1919)

(*Acanthodica*), comb. n., *C. splendens* (Druce, 1889) (*Agrotis*), comb. n., *C. xylinoides* (Schaus, 1894) (*Acanthodica*), comb. n. Las species siguientes, anteriormente asociadas con *Casandria* transferidas hacia *Motya* Walker, 1859: *M. araea* (Schaus, 1911) (*Casandria*), comb. n., *M. flotsama* (Dyar, 1914) (*Casandria*), comb. n., *M. insignis* (Dognin, 1914) (*Casandria*), comb. n., *M. steniptera* (Schaus, 1911) (*Casandria*), comb. n. Se presenta una tabla de todos los taxas anteriormente asociadas con *Casandria* y *Acanthodica* y son también presentados en un “Resumen nomenclatural” e ilustraciones de los tipos de *C. emittens* Walker, 1857 y de *A. grandis* Schaus, 1894, así como en vivo de *C. splendens* (Druce, 1889).

Palabras clave: Lepidoptera, Erebidae, Catocalinae, *Acanthodica, Casandria*, nuevas combinaciones, nuevas sinonimias, Neotropical.

Introduction

Casandria Walker, 1857 is a monotypic genus described in the Noctuidae, which present a peculiar position at rest: wings rolled along the body, looking like dead twigs (Figure 4). It has been used, by early authors (Schaus, 1894, 1906; Hampson, 1912; Dyar, 1914; Dognin, 1914; Draudt, 1940), to accommodate species that are not congeneric with *C. emittens* Walker, 1857 the type-species, who they treated in the Sarrothripinae, to include several species (transferred herein to *Collomena* Möschler, 1890, *Motya* Walker, 1859, and *Neostictoptera* Druce, 1900). This confusion about its identity was first created by Walker (1857, p. 606) who described two species: *C. emittens,* the type species, and, surprisingly, again, as *Agrotis emittens* (Walker, 1859, p. 737), based on the same specimen: a female from the Dominican Republic, deposited in the Oxford Museum Collection, England! This kind of incorrection is commonly found throughout Walker’s work. Good examples are his treatment of several Chrysauginae (Pyralidae) species, that he described in the Tortricidae (Ragnot, 1891, p. 114), and the case of *Etiella zinckenella* (Treitschke, 1832), that he described four times in four different genera proposed by himself (Whalley, 1973, p. 8). Schaus (1896, p. 638), examined the types of the species described by Walker deposited in the Oxford Museum Collection, listing *C. emittens* as an unidentified species, and transferring *A. emittens* to *Acanthodica,* a genus he had described two years before (Schaus, 1894, p. 241). Further confusion was created by Schaus (1906, p. 108), when he described *Casandria chirica,* from Mexico, establishing a concept that was followed by himself, and by several subsequent authors (Dyar, 1914, Dognin, 1914; Hampson, 1918), as can be seen in the list of species given below. Following Schaus’ concept, *Casandria* was treated in the Sarrothripinae [now Collomeninae, Nolidae], by Hampson (1912, p. 350), who synonymized six genus names, and included 18 species, but curiously did not treat *C. emittens* Walker, 1857, the type species of *Casandria.* However, curiously he listed the name at the end of Sarrthripinae (Hampson, 1912, p. 454), as one of the unrecognized species. Nye (1975, p. 104), examined the female specimen, compared the two original descriptions, and concluded that they fit the characters of this specimen, recognizing it as the holotype of both names, transferring *Casandria* to the Catocalinae. Poole (1989, p. 209) followed Nye’s concept, retained *Casandria* in the Catocalinae, and revalidated three of the six synonyms, assigning most of the 18 species to these synonyms, except for five species that were left as *Casandria* of authors.

Results

The type specimens of nearly all the names involved were examined revealing that *Acanthodica grandis* Schaus, 1894 is a junior synonym of *Casandria emittens* Walker, 1857, and that the five unplaced species also belong in the Collomeninae, and are here assigned to *Motya* Walker, 1859. All these changes are summarized below.

Nomenclature summary

(The list of countries gives the type locality only, not distribution).

EREBIDAE

Catocalinae

Casandria Walker, 1857
= *Acanthodica* Schaus, 1894, **syn. n.**
= *Cassandria* Hampson, 1918, misspl.

albiplena (L. B. Prout, 1919) (*Acanthodica*), **comb. n.**	Colombia
cabra (Dognin, 1894) (*Acanthodica*), **comb. n.**	Ecuador
chiripa (Dognin, 1894) (*Acanthodica*), **comb. n.**	Ecuador
coelebs (L. B. Prout, 1919) (*Acanthodica*), **comb. n.**	Colombia
= *caelebs* Draudt, 1940, misspl.	
drucei (Dognin, 1889) (*Calocampa*), **comb. n.**	Ecuador
emittens Walker, 1857	Dominican Republic
= *daunus* Druce, 1894 (*Agrotis*), **syn. n.**	Mexico (Ver)
= *emittens* Walker, 1857 (*Agrotis*)	Dominican Republic
= *grandis* Schaus, 1894 (*Acanthodica*), **syn. n.**	Mexico (Ver)
fassli (Zerny, 1916) (*Acanthodica*), **comb. n.**	Bolivia
fosteri (Hampson, 1913) (*Acanthodica*), **comb. n.**	Paraguay
frigida (Jones, 1921) (*Acanthodica*), **comb. n.**	Brazil (SP)
hages (Druce, 1900) (*Acanthodica*), **comb. n.**	Colombia
lignaris (Schaus, 1894) (*Acanthodica*), **comb. n.**	Peru
penicillum (Felder & Rogenhofer, 1874) (*Agrotis*), **comb. n.**	Guatemala
= *pamela* Schaus, 1906 (*Acanthodica*)	Brazil (Pr)
sinuilinea (L. B. Prout, 1919) (*Acanthodica*), **comb. n.**	Peru
splendens (Druce, 1889) (*Agrotis*), **comb. n.**	Panama
= *apicimacula* Maassen, 1890 (*Magusa*)	Ecuador
xylinoides (Schaus, 1894) (*Acanthodica*), **comb. n.**	Ecuador

NOLIDAE

Collomeninae

Collomena Möschler, 1890

chirica (Schaus, 1906) (*Casandria*)	Mexico (Ver)
filifera (Walker, 1857) (*Laphygma*)	Dom. Rep.
= *inflexa* Morrison, 1875 (*Laphygma*)	USA (Fl)
= **elota* Möschler, 1890	Puerto Rico
fugax (Dyar, 1914) (*Casandria*)	Panama
haematopis Hampson, 1912) (*Casandria*)	Argentina
illegitima (Dyar, 1914) (*Casandria*)	Panama
interstitia (Dyar, 1914) (*Casandria*)	Panama
leucopis (Schaus, 1910) (*Casandria*)	Costa Rica
metaphaea (Hampson, 1912) (*Casandria*)	Panama
murora (Dyar, 1914) (*Casandria*)	Panama
olivaris (Dyar, 1912) (*Casandria*)	Mexico (Ver)
= *olivaris* Hampson, 1912 (*Casandria*)	
siopera (Dyar, 1914) (*Casandria*)	Panama

Motya Walker, 1859	
= *Lussa* Grote, 1883	
= *Pleurasympieza* Möschler, 1890	
abseuzalis Walker, 1859	Brazil (RJ)
= *nigroguttata* Grote, 1883 (*Lussa*)	USA (Fl)
= *smithii* Möschler, 1890 (*Pleurasympieza*)	Puerto Rico
= *tumidicosta* Hampson, 1898 (*Stictoptera*)	Grenada
araea (Schaus, 1911) (*Casandria*), **comb. n.**	Costa Rica
arcuata (Schaus, 1910) (*Casandria*)	Costa Rica
ferrocana (Walker, 1857) (*Laphygma*)	Dominican Republic
= *nigriscripta* Walker, 1865 (*Laphygma*)	Dominican Republic
flotsama (Dyar, 1914) (*Casandria*), **comb. n.**	Panama
griselda (Dyar, 1914) (*Casandria*)	Panama
insignis (Dognin, 1914) (*Casandria*), **comb. n.**	French Guiana
mythias (Schaus, 1921) (*Casandria*)	Guatemala
purpurscens (Schaus, 1911) (*Casandria*)	Costa Rica
= *steniptera* Schaus, 1911 (*Casandria*), **comb. n.**	Costa Rica

Neostictoptera Druce, 1900	
= *Aeschradia* Hampson, 1912	
amplipennis (Hampson, 1912) (*Casandria*)	Brazil (SP)
chlorotica (Schaus, 1910) (*Casandria*)	Costa Rica
mammida (Druce, 1898) (*Apamea*)	Guatemala
melanographa (Hampson, 1912) (*Casandria*)	French Guiana
**nigropuncta* Druce, 1900	Colombia
stroca (Schaus, 1906) (*Iscadia*)	Brazil (Pr)

Acknowledgements

Diego Dolibaina and Robiara S. Becker (Reserva Serra Bonita) prepared the illustrations. Ken Preston-Mafham, Premaphotos Wildlife, England supplied the image of *C. emitens* holotype, and Jerry Harrison, Panama, kindly supplied the image of *C. splendens*. S. E. Miller (USNM) reviewed the manuscript, made several corrections, and suggested some changes that improved the article. Dr. Antonio Vives, the editor of SHILAP, did a careful and competent job, as usual. To all of them the sincerest gratitude.

References

Dognin, P. (1914). *Hétérocères nouveaux de l'Amérique du Sud*, *7*, 1-32.

Draudt, M. (1939-1940). Subfamily Catocalinae. In A. Seitz (ed.). *The Macrolepidoptera of The World* (Vol. 6, pp. 33-230). A. Kernen.

Dyar, H. G. (1914). Descriptions of new species and genera of Lepidoptera from Mexico. *Proceedings United States National Museum, 47,* 139-350.

Hampson, G. H. (1911). *Catalogue of the Lepidoptera Phalaenae in the British Museum* (Vol. 12). British Museum.

Nye, I. W. B. (1975). Noctuidae. In I. W. B. Nye (ed.) *The generic names of moths of the World* (Vol. 1). British Museum (Natural History).

Poole, R. W. (1989). Noctuidae. *Lepidopterorum catalogus, 118*, 1-1013.

Ragonot, E.-L. (1891). Essai sur la classification des Pyralites. *Annales de la Société Entomologique de France, 11*, 15-114.

Schaus, W. (1894). New species of Noctuidae from tropical America. *Transaction of the Entomological Society of America, 21*, 223-244.

Schaus, W. (1896). On Walker's types of Lepidoptera in the Oxford University Collection. *Proceedings of the Zoological Society of London, 1896*, 634-650.

Schaus, W. (1906). Descriptions of South American moths. *Proceedings of United States National Museum, 30*, 85-141.

Walker, F. (1857). *List of the specimens of Lepidopterous insects in the collections of the British Museum, 11*, 493-764.

Walker, F. (1859). *List of the specimens of Lepidopterous insects in the collection of the British Museum, 18*, 509-798.

Whalley, P. E. S. (1973). The genus *Etiella* Zeller (Lepidoptera: Pyralidae): a zoogeographic and taxonomic study. *Bulletin of the British Museum (Natural History) (Entomology), 25*, 31-72.

Vitor O. Becker
Reserva Serra Bonita
P. O. Box 01
45.880-000 Camacan, BA
BRASIL / *BRAZIL*
E-mail: becker.vitor@gmail.com
https://orcid.org/0000-0001-9904-1176

(Recibido para publicación / *Received for publication* 29-VI-2022)
(Revisado y aceptado / *Revised and accepted* 30-VIII-2022)
(Publicado / *Published* 30-XII-2022)

Figures 1-6. *Casandria* adults, dorsal view. **1-5.** *C. emittens*: **1.** holotype (♂), Dominican Republic. **2.** *C. emittens* [=*A. grandis* Schaus], holotype female, Mexico). **3.** male, Cuba. **4.** male, Mexico. **5.** *C. emittens,* holotype, watercolour ordered by Schaus in the USNM. **6.** *C. splendens* (Druce), in resting position, Panama.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 755-761 eISSN: 2340-4078 ISSN: 0300-5267
https://doi.org/10.57065/shilap.269

Two new species of the genus *Epermenia* Hübner, [1825] and some new distributional and taxonomic records (Lepidoptera: Epermeniidae)

Reinhard Gaedike

Abstract

Two new species are described and illustrated: *Epermenia (Calotripis) similella* Gaedike, sp. n. and *Epermenia (Cataplectica) lusitanica* Gaedike, sp. n. The lectotype of *Epermenia (Calotripis) strictellus* (Wocke, 1867) and *Epermenia (Cataplectica) iniquellus* (Wocke, 1867) is designated. The first records of thirteen species are established for different countries.
Keywords: Lepidoptera, Epermeniidae, new species, lectotype designation.

Dos nuevas especies del género *Epermenia* Hübner, [1825] y algunos registros nuevos de distribución y taxonómicos (Lepidoptera: Epermeniidae)

Resumen

Dos nuevas especies se describen e ilustran: *Epermenia (Calotripis) similella* Gaedike, sp. n. y *Epermenia (Cataplectica) lusitanica* Gaedike, sp. n. Se designa el lectotipo de *Epermenia (Calotripis) strictellus* (Wocke, 1867) y *Epermenia (Cataplectica) iniquellus* (Wocke, 1867). Se establecen los primeros registros de trece especies, para diferentes países.
Palabras clave: Lepidoptera, Epermeniidae, nuevas especies, designación del lectotipo.

Introduction

The kindness of several colleagues enabled me in recent years to study a lot of material from several Palaearctic regions. As result it is possible to describe two new species and to establish first records for several countries. Additionally, lectotypes are designated for two species, which were studied a long time ago during a visit to the ZIN. In the Palaearctic region three genera with 47 species of the family Epermeniidae are currently known.

Abbreviations used

coll. Larsen	Knud Larsen, Dyssegaard, Denmark
coll. Mayr	Anton Mayr, Feldkirch, Austria
coll. Tokar	Zdeno Tokar, Sal'a, Slovakia

FMNH	Finnish Museum of Natural History, Helsinki, Finland
MFSN	Museo Friulano di Storia Naturale, Udine, Italy
SDEI	Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
SMNK	Staatliches Museum für Naturkunde, Karlsruhe, Germany
ZIN	Zoological Institute, Russian Academy of Sciences, St. Peterburg, Russia
ZMHB	Museum für Naturkunde, Leibniz-Institut für Evolutions- und Biodiversitätsforschung , Berlin, Germany
ZMUC	Zoological Museum, Copenhagen, Denmark

Results

Epermenia (Calotripis) insecurella (Stainton, 1849)
Elachista insecurella Stainton, 1849. *Cat. Br. Tineidae & Pteroph*, 24

Material examined: Lebanon, Batroun, 34º16’50,72”N, 35º47’23,99”E, Tel Ras Nhascl, 3 ♂♂, 1 ♀, 1-VI-2012, leg. J. Kullberg & T. Lievonen; FMNH; SDEI: **First record from Lebanon**. Montenegro, Durmitor NP, 13 km SW Zabljak, Sedlo Pass, 1900 m, 43º05’50”N, 19º03’16”E, 1 ♂, 19-24.VII-2014, leg. C. Hviid & O. Karsholt; ZMUC: **First record from Montenegro.**

Epermenia (Calotripis) aequidentellus (Hofmann, 1867)
Chauliodus aequidentellus Hofmann, 1867. *Stett. ent. Ztg*., *38*, 206

Denmark, Aarvik et al. (2021). **First record from Denmark**.

Material examined: Armenia, prov. Vayots Dzor, 10 km SE Areni Noravank, 1600 m, 39º41’07”N, 45º14’02”E, 1 ♂, 15-17-VII-2011, leg. O. Karsholt; ZMUC. **First record from Armenia.**

Epermenia (Calotripis) strictellus (Wocke, 1867)
Chauliodus strictellus Wocke, 1867. *Stett. ent. Ztg., 28*, 209

In the collection Wocke (ZIN) is one female with locality label “Sponsberg, 12.10.1856” [near to Breslau]. This specimen with the genitalia preparation No. 10184 (Zagulajev), erroneously labelled as holotype, is here designated as the lectotype. One male, labelled as holotypus, is not a member of the type series, it was collected in Vienna.

Material examined: Greece, Crete, W, Agia lake, 10 km SW Chania, 1 ♀, 30-VI-2000, leg. A. Madsen et al.; ZMUC. **First record from Crete;** 1 ♀, Nepal, NW Pokhara Banthati, 2350m, 30.vii.1996, leg. M. Fibiger; ZMUC: **First record from Nepal.**

***Epermenia (Calotripis) similella* Gaedike, sp. n.** (Figures 1, 3-4)

Holotype 1 ♂, India: Kaschmir, 10km N Srinagar, 20-VII-1982, leg. M. u. E. Arenberger;” “Gen. präp. [Genitalia slide] R. Gaedike 3880; Holotypus ♂, Epermenia similella sp. n., det. R. Gaedike 2022; ex coll. Arenberger, ded. 2021 SDEI.

Paratype: India: Himachal Pradesh, Distr. Soian, Kakra bei Sallaghat, 31º04’N, 77º05’E, 1400 m, 1 ♀, 17-XI-1992, leg. Hacker & Peks; Gen. präp. [Genitalia slide] R. Gaedike 10079; ZMHB.

Description (Figure 1): Wingspan 10 mm; head greyish-brown, tips of scales lighter, antenna and pecten with the same colouration, labial palpus on outside also greyish-brown, on inside nearly white; thorax and tegulae greyish brown, tips of tegulae lighter; forewing on dorsum with four tufts of raised dark brown scales, the largest at 1/3, the second at 1/2, the minute third and fourth at 2/3 and 3/4; the basal third of wing light brown, the area between the first and the fourth tuft to costa dark brown, the apical area lighter brown, costa from base to apex and termen edged dark brown; hindwing grey.

Male genitalia (Figure 3): Uncus narrow, apically pointed, tegumen basally and in the middle with more sclerotized edges; valva nearly as long as uncus-tegumen, ampulla curved to cucullus, with pointed tip, border to valva strongly sclerotized, sacculus with needle-shaped tip below border; phallus as long as valva, cornutus about two thirds of the length of the phallus, parallel-sided, with rounded apex.

Female genitalia (Figure 4): Proximal edge of segment VIII in the middle with sickle-shaped invagination with more strongly sclerotized edge, ostium and the beginning of ductus bursae more strongly sclerotized, enlagred in the middle, covered with minute sclerotized thorns, signum narrow, with strongly sclerotized keel, basally broader, narrowed to apex.

Biology: Foodplant of larvae unknown.

Etymology: Named because of similarity to *Epermenia chaerophyllella* (Goeze, 1783).

Diagnosis: Superficially not clearly distinguishable from *E. chaerophyllella*, but clear differences in the genitalia structure are visible. Male with one cornutus, sacculus with needle-shaped tip, while *chaerophyllella* has two cornuti, sacculus with broad rounded tip. Female with sickle-shaped invagination of segment VIII and minute thorns in the middle of ductus bursae, while *chaerophyllella* with V-shaped invagination, with ring-shaped and strongly sclerotized ostium and the area with strongly sclerotized thorns in ductus prolonged to corpus bursae.

Epermenia (Calotripis) falciformis (Haworth, 1828)
Recurvaria falciformis Haworth, 1828. *Lep. Brit*., *4*, 555

Material examined: Spain, Aragón, Carretera a Moscardón, 1600 m, 1 ♂, 5-VII-2010, leg. et coll. Tokar: **First record from Spain**. Italy, Toscana, Firenze, Marradi, Badia della valle, 430 m, 1 ♂, 6-IX-1999, leg. A. Usvelli; MFSN: **First record from Italy**.

Epermenia (Cataplectica) iniquellus (Wocke, 1867)
Chauliodus iniquellus Wocke, 1867. *Stett. ent. Ztg., 28*, 209

In the collection Wocke (ZIN) are three specimens (2 ♂♂, 1 ♀ [hills near Breslau, on flowers of *Athamanta oreoselinum* Moench, Middle of June]), the male with the genitalia preparation No. 10185 (Zagulajev) was erroneously labelled as holotype, it is here designated as lectotype, one other male and one female are paralectotypes.

Epermenia (Cataplectica) lusitanica **Gaedike sp. n.** (Figures 2, 5-6)

Holotype ♂, "Portugal, Ext. Ericeira, 30 m, 4-8-VII-1986, [leg.] O. Karsholt;" "Coll. ZMUC Copenhagen Denmark;" "Holotypus ♂, Epermenia lusitanica sp. n. det. R. Gaedike;" ZMUC. Paratypes: 1 ♂, with the same location dates;"Gen.präp. [Genitalia slide] R. Gaedike 3153;" "ex coll. ZMUC, ded. 1986 SDEI;" 1 ♀, with the same location dates; "Gen.präp. [Genitalia slide] R. Gaedike 3154;" ZMUC.

Description (Figure 2): Wingspan 11mm; head cream-coloured, antenna and pecten dark grey, labial palpus on outside also dark grey, on inside and the apical segment cream-coloured; neck and thorax cream-coloured, tegulae basally dark grey; forewing at dorsum with three tufts of raised scales, the first and largest at 1/4, the two others before and behind 1/2; wing from base to the first tuft light cream-coloured, along the cell, above the tufts, a light brown band, a patch of same colour before apex separated from the band by minute black dot, the area behind and above the band and at the apex is dark grey, some cream-coloured smaller patches between the first two tufts and subapically at costa; hindwing light grey.

Male genitalia (Figure 5): Uncus straight, with pointed tip, proximal edge of tegumen more strongly sclerotized; valva as long as uncus-tegumen complex, ampulla curved to cucullus, border to valva only somewhat more strongly sclerotized, sacculus proximal with needle-shaped tip; phallus shorter than valva, slightly curved, cornutus more than a half of the length of phallus, lensed-shaped, with pointed tip.

Female genitalia (Figure 6): Proximal edge of segment VIII straight, more strongly sclerotized than the other part of segment, corpus bursae without signum.

Biology: Foodplant of larvae unknown.

Etymology: Named after the ancient name “Lusitania” for Portugal.

Diagnosis: Superficially very similar to *E. iniquellus*, and not surely distinguishable. Differences are seen in the genitalia structure. Male genitalia with straight uncus with pointed tip, cornutus lens-shaped, proximally pointed, while *iniquellus* with proximal rounded uncus, cornutus longer, narrow; female genitalia with more strongly sclerotized proximal edge of segment VIII, while *iniquellus* with lens-shaped, somewhat more strongly sclerotized area at proximal edge of segment VIII, the beginning of ductus bursae somewhat enlarged.

Epermenia (Cataplectica) wockeellus (Staudinger, 1880)
Chauliodus wockeellus Staudinger, 1880. *Horae Soc. ent. Ross., 25*(1879/1880), 382

Material examined: IRAN, S-Iran, 15 km wnw Djahrom, 1150 m, 1 ♂, 27-III-1973, Tamarisken-Steppe, leg. H. G. Amsel; SMNK; S-Iran, Tangetchogan, 930 m, 30 km n Kazerun, 1 ♀, 23-III-1973, leg. H. G. Amsel; SMNK: **First records from Iran**. CYPRUS, N-Cyprus, Hisarköy, 250 m, 35º18’E, 33º06’E, 1 ♂, 22-29-III-2008, leg. B. Skule, ZMUC: **First record from Europe**.

Epermenia (Cataplectica) theimeri Gaedike, 2001
Epermenia theimeri Gaedike, 2001. *Ent. Zeitschrift, 111*(8), 230-231, 4 figs

Material examined: AUSTRIA, Vorarlberg, Bregenzerwald, Kanisfluh, Umg. GH Edelweiß, 1405 m, N 47º19’32”, E 9º55’53”, 1 ♂, 21-VII-2019, leg. and coll. T. Mayr: **First record beside types, first record from Austria.**

Epermenia (Epermenia) scurella (Stainton, 1851)
Elachista scurella Stainton, 1851. *Suppl. Cat. Br. Tineidae & Pteroph.*, 25

Material examined: MONTENEGRO, Durmitor NP, 13 km SW Zabljak, Sedlo Pass, 1900m, 43º05’50”N, 19º03’16”E, 1 ♂, 19-24-VII-2014, leg. C. Hviid & O. Karsholt; ZMUC:
First record from Montenegro.

Epermenia (Epermenia) ochreomaculellus asiatica Gaedike, 1979
Epermenia ochreomaculella asiatica Gaedike, 1979. *Beitr. Ent., 29*(1), 278, figures 6-8, 10

Material examined: IRAN, Khorasan: Quchan, 1 ♂, 19-V-2010, leg. G. Petrányi & P. Hentschel; ZMUC. **First record from Iran.**

Epermenia (Epermeniola) thailandica Gaedike, 1987
Epermenia thailandica Gaedike, 1987. *Tinea, Suppl., 12*, 155, figures 1-7

Material examined: NEPAL, NW Pokhara Banthati, 2350 m, 2 ♀♀, 30-VII-1996, leg. M. Fibiger; ZMU. **First record from Nepal.**

Epermenia (Epermeniola) pseudofuscomaculata Kuroko & Gaedike, 2006
Epermenia pseudofuscomaculata Kuroko & Gaedike, 2006. *Trans. lepid. Soc. Japan, 57*(1), 65, figures 28, 39, 50-S2

Material examined: NEPAL, Nepal, Godavari, 15 km SE Kathmandu, 1500 m, 1 ♂, 23-25-V-1996, 27º40’N, 85º25’E, Exp. A. Albrecht, O. Biström, K. Mikkola & A. Wikberg; FMNH: **First record from Nepal**.

Ochromolopis ictella (Hübner, 1796)
Tinea ictella Hübner, 1796. *Samml. eur. Schmett.*, pl. 53, fig. 361

Material examined: DENMARK, Lolland: Rodbyhaven, 1 specimen, early July 2010, leg. et coll.

Larsen [Karsholt, pers. comm.]. **First record from Denmark.** The specimen is surely introduced, it is not native.

Ole Karsholt informed me about the location: "Rødbyhavn is where the ferryboat from Puttgarden to Denmark enters. There is a very interesting biotope originating from a former, large railway area. However, *Thesium* is not growing there, and I believe that the specimen arrived with the strong, southern winds which we had early July."

This seems to be a situation similar to that in the year 1967, when this species was discovered in Finland (Krogerus, 1969).

Ochromolopis zagulajevi Budashkin & Sachkov 1991

Ochromolopis zagulajevi Budashkin & Sachkov, 1991. *Zool. Zhurn., 70*(10), 78, figures 1-2

Material examined: ROMANIA, Donaudelta, Letea, 2 ♂♂, 18-19-V-1993, leg. L. Rakosy; ZMUC. **First record from Romania**. BULGARIA, 5 km N Sandanski, 150-200 m, 2 ♂♂, 23-27-V-2010, leg. O. Karsholt, ZMUC. **First record from Bulgaria.**

Acknowledgements

I wish to thank all colleagues for their kindness in enabling me to examine their material. Special thanks to Margareta Arenberger (Vienna) for permission to retain the holotype of *Epermenia similella* in the collection of SDEI, to Christian Kutzscher (SDEI) for taking the colour pictures, Andrew Liston (SDEI) for his linguistic corrections and Antonio Vives (Madrid) for translation of the abstract into Spanish.

References

Aarvik, L., Bengtsson, B. Å., Elven, H., Ivinskis, P., Jürivete, U., Karsholt, O., Mutanen, M., & Savenkov, N. (2021). Additions and corrections to the Nordic-Baltic Checklist of Lepidoptera. *Norwegian Journal of Entomology, 68*, 1-14.

Budashkin, Yu. I., & Sachkov, S. A. (1991). Novyje taksony zontichnych molej roda *Ochromolopis* (Lepidoptera, Epermeniidae) fauny SSSR i opredelenije blizkich vidov. *Zoologicheskij Zhurnal, 70*(10), 78-83, 6 figures.

Gaedike, R. (1971). Die Epermeniidae und Acrolepiidae des Vorderen und Mittleren Orients (Lepidoptera). *Beiträge zur Entomologie, 21*(1/2), 43-54, 13 figs.

Gaedike, R. (1979). Katalog der Epermeniidae der Welt (Lepidoptera). *Beiträge zur Entomologie, 29*(1), 271-288, 11 figs.

Gaedike, R. (1987). A new *Epermenia* species (Epermeniidae) from Thailand. *Tinea, Supplement, 12*, 155-157, 7 figs.

Gaedike, R. (2001). Eine neue *Epermenia* Hübner, [1825], vom Monte Baldo (Lepidoptera: Epermeniidae). *Entomologische Zeitschrift, 111*(8), 230-231, 4 figs.

Haworth, A. H. (1828). *Lepidoptera Britannica, sistens digestionem novam insectorum Lepidopterorum quae in magna Britannia reperiuntur, larvarum pabulo, temporeque pascendi; expansione alarum, mensibusque volandi, synonymis atque locis observationibusque variis* (Vol. 4). London.

Hofmann, E. (1867). Drei neue Gelechien und ein neuer *Chauliodus*. *Stettiner Entomologische Zeitung, 28*, 200-207.

Hübner, J. (1796-[1838]). *Sammlung europäischer Schmetterlinge, 7* (9 Horden). Augsburg.

Krogerus, H. (1969). *Ochromolopis ictella* Hb. (Lepidoptera, Epermeniidae) in Finnland, wahrscheinlich mit Windströmungen transportiert. *Notulae Entomologicae, 49*, 86-88 3 figs.

Kuroko, H., & Gaedike, R. (2006). Epermeniidae of Japan (Lepidoptera, Epermenioidea), with description of six new species. *Transactions of the Lepidopterological Society of Japan, 57*(1), 49-69, 50 figs.

Millière, P. (1854). Description de nouvelles espèces de Microlépidoptères. *Annales de la Société Entomologique de France,* (3) *2*, 59-68 col. Plate 3: figs I-II.

Stainton, H. T. (1849). *An attempt at a Systematic Catalogue of the British Tineidae & Pterophoridae*. J. van Voorst.

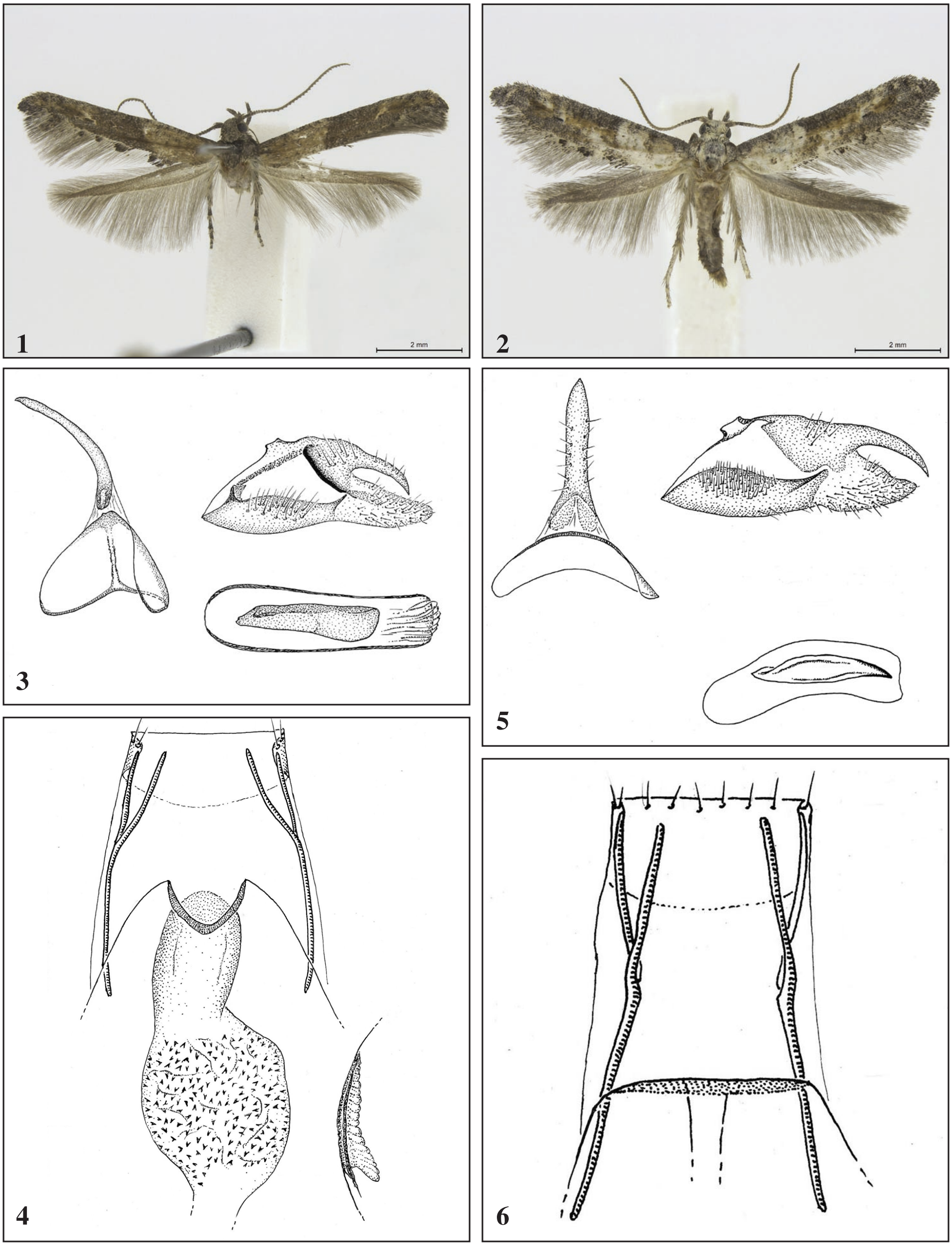
Stainton, H. T. (1851). *A Supplementary Catalogue of the British Tineidae & Pterophoridae*. J. van Voorst.
Staudinger, O. (1879-1880). Lepidopteren-Fauna Kleinasien's. (Fortsetzung). *Horae Societatis Entomologicae Rossicae, 15*(1879/1880), 159-435 [pp. 159-368: 13-XI-1879; pp. 369-435: 13-II-1880].
Wocke, M. F. (1867). Zwei neue Arten von *Chauliodus*. *Stettiner Entomologische Zeitung, 28*(4/6), 208-209.

Reinhard Gaedike
Florusstraße, 5
D-53225 Bonn
ALEMANIA / *GERMANY*
E-mail: paratinea@outlook.de
https://orcid.org/0000-0002-9347-6678

y / *and*

Senckenberg Deutsches Entomologisches Institut
Eberswalder Straße, 90
D-15374 Müncheberg
ALEMANIA / *GERMANY*

(Recibido para publicación / *Received for publication* 22-VI-2022)
(Revisado y aceptado / *Revised and accepted* 24-VII-2022)
(Publicado / *Published* 30-XII-2022)



Figures 1-6. 1. *Epermenia similella* Gaedike, sp. n., holotype. **2.** *Epermenia lusitanica* Gaedike, sp. n., holotype. **3.** *Epermenia similella* Gaedike, sp. n., male genitalia. **4.** *Epermenia similella* Gaedike, sp. n., female genitalia. **5.** *Epermenia lusitanica* Gaedike, sp. n., male genitalia. **6.** *Epermenia lusitanica* Gaedike, sp. n., female genitalia.

SHILAP Revista de lepidopterología, 50 (200) diciembre 2022: 762-768 eISSN: 2340-4078 ISSN: 0300-5267

SUMARIO DEL VOLUMEN 50 / *CONTENTS OF VOLUME 50*

Nuevas taxa y cambios nomenclaturales propuestos en el Volumen 50 /
New Taxa and Nomenclatural changes proposed in Volume 50

Nuevos géneros / *New genus*

Nuevos subgéneros / *New subgenus*

Nuevas especies / *New species*

Alucitidae

Coleophoridae

Cossidae

Crambidae

Nuevas subespecies / *New subspecies*

Nuevas sinonimias / *New synonymies*

Nuevas combinaciones / *New combinations*

Fechas de publicación en números / *Dates of Publications in Numbers*

Nº 197. 1-192 ....30-III-2022

Nº 198. 193-384 ....30-VI-2022

Nº 199. 385-576 ....30-IX-2022

Nº 200. 577-768 ....30-XII-2022