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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

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Nomenclatorial novelties of the genus *Leucania* Ochsenheimer, 1816 that occur in Central America (Lepidoptera: Noctuidae)

Morton S. Adams & Timothy L. McCabe

Abstract

We treat five species of *Leucania* Ochsenheimer, 1816 originally described in *Cirphis* Walker, [1865, p. 623] by Draudt (1924), whose name-bearing types were destroyed in the bombing during World War II. These species are *Cirphis biforis* Draudt, 1924*, C. macellaria* Draudt, 1924*, C. clara* Draudt, 1924*, C. opalisans* Draudt, 1924*,* and *C. carnea* Draudt, 1924. We make the latter three species objective synonyms of *Leucania multipunctata* Druce, 1889. A neotype is designated for *Cirphis biforis* Draudt, 1924 and its original description is provided. *Cirphis macellaria* is recognized as a subjective synonym of *L. clarescens* Möschler, 1890. A total of eleven synonyms are proposed: four Draudt objective synonyms and seven additional synonymies for Central American *Leucania* species. Lectotypes are designated for *Cirphis pyrastis* Hampson, 1905 and *C. seteci* Dyar, 1914. Illustrations of the imago, valvae, everted endophallus, and bursa copulatrix are provided for *L. biforis* (Draudt, 1924), *L. multipunctata* Druce, 1889, *L. pyrastis* (Hampson, 1905), and *L. sarcistis* (Hampson, 1905). Photographs of the types of *L. extenuata* Guenée, 1852 and *L. infatuans* are provides. New character states of the forewing and genitalia are described. A list of nomenclatorial changes is provided.
Keywords: Lepidoptera, Noctuidae, *Leucania,* neotype, lectotypes, Draudt types, new synonyms, new characters states, Central America.

Novedades nomenclaturales del género *Leucania* Ochsenheimer, 1816 que se encuentran en América Central
(Lepidoptera: Noctuidae)

Resumen

Tratamos cinco especies de *Leucania* Ochsenheimer, 1816 descritas originalmente en *Cirphis* Walker, [1865, p. 623] e ilustradas por Draudt (1924), cuyos tipos homónimos fueron destruidos en los bombardeos durante la Segunda Guerra Mundial. Estas especies son *Cirphis biforis* Draudt, 1924, *C. macellaria* Draudt, 1924, *C. clara* Draudt, 1924, *C. opalisans* Draudt, 1924 y *C. carnea* Draudt, 1924. Hacemos de las tres últimas especies sinónimos objetivos de *Leucania multipunctata* Druce, 1889. Se designa un neotipo para *Cirphis biforis* Draudt, 1924 y se proporciona su descripción original. *Cirphis macellaria* se reconoce como sinónimo subjetivo de *L. clarescens* Möschler, 1890. Se propone un total de once sinonimias: cuatro sinonimias objetivas de Draudt y siete sinonimias adicionales para especies de *Leucania* centroamericanas. Se designan lectotipos para *Cirphis pyrastis* Hampson, 1905 y *C. seteci* Dyar, 1914. Se proporcionan ilustraciones del imago, las valvas, el endofalo evertido y la bursa copulatrix para *L. biforis* (Draudt, 1924), *L. multipunctata* Druce, 1889, *L. pyrastis* (Hampson, 1905) y *L. sarcistis* (Hampson, 1905). Se proporcionan fotografías de los tipos de *L. extenuata* Guenée, 1852 y *L. infatuans*. Se describen nuevos caracteres del ala anterior y de la genitalia. Se proporciona una lista de cambios nomenclatoriales.
Palabras clave: Lepidoptera, Noctuidae, *Leucania*, neotipo, lectotipos, tipos Draudt, nuevas sinonimias, nuevos estados de caracteres, América Central.

Introduction

Two primary constraints of biodiversity research are lack of information (undescribed species) and misinformation (synonyms). We addressed the first of these issues for the genus *Leucania* Ochsenheimer, 1816 in a recent publication (McCabe & Adams, 2023). Here we continue revisionary studies of the New World *Leucania* and propose new synonyms and a neotype designation. We have examined the type specimens and dissections, original descriptions, diagnoses, illustrations, synonyms, and bibliographic citations of all available names of *Leucania* in Central America.

The name-bearing specimens of Draudt, 1924, *in* Seitz are lost and presumed destroyed in the WWII bombing (Dr. Wolfgang A. Nässig, former curator of Lepidoptera at Naturmuseum Senckenberg, Frankfurt am Main, in litt.). Mr. Massimo Terragni, former Technical Assistant to Dr. Nässig, carefully searched for the Draudt *Leucania* types. He checked the main noctuid collection, the Seitz collection and the Hadeninae type drawers, but did not find these types despite other type specimens being clearly marked by type labels. The lost species were not contained in the Senckenberg catalogue.

The following lightly edited letter from Dr. Nässig is published with permission. It clarifies the circumstances surrounding the destruction of many of the type specimens of species described by Draudt, 1924, *in* Seitz.

"I fear that the types got lost in World War II, when mainly American bombing airplanes bombed the area of Darmstadt, ca. 25 km south of Frankfurt. Draudt then lived in a small house outside part of Darmstadt and did not expect bombing in this housing area in midst of the forest, so he took most of the material he was working on to his home, as the city of Frankfurt am Main was severely bombed. When then there fell bombs into this housing area, he came away alive, but his house burned out, including the entire insect collection drawers. As there obviously never was a catalogue of Draudt's collection and all the type of material borrowed by him from other collections and museums, we have no idea which irreplaceable type specimens got lost then. Sorry. War time in Germany was very hard, and the survivors did not look for such "details", and later generations of curators had no information to produce such a catalogue later. I cannot say for sure that this is the real and only explanation, but in the past 25 years I found at several occasions that types and material said to be in Frankfurt Senckenberg (or also in other collections or museums) and said to be worked on/described by Draudt were missing at all places where they were expected to be, and the most likely explanation for this is the bombing of Draudt's house in WW-II, although we cannot definitively say for sure. I do not know where Poole took the information that the types are in Senckenberg; he did not correspond with me about them, and Heinz G. Schröder, the Lepidoptera curator in Senckenberg Frankfurt before me, is over 90 years old now, his health is down, and he does no more work in science."

We have found several previously unrecognized character states, which have proven useful for identification of several species. These states pertain to only a subset of the species but are constant within a species. We have not seen these states discussed elsewhere and describe and illustrate them to make them available for use in species' descriptions.

Undulating uncus (Fig. 10). Typically, in *Leucania,* the uncus is sickle-shaped (a smoothly curving semicircular structure with a sharp tip) (Fig. 9). McCabe & Adams (2023) noted a claw-like modification of the uncus tip in several species. We add to this another modification, an undulating uncus, i.e., with an undulating profile, observed in: *L. multipunctate* Druce, 1889*, L. pyrastis* (Hampson, 1905)*, L. sarcistis* (Hampson, 1905)*,* and *L. misteca* Schaus, 1898. An intermediate or incomplete condition occurs in *L. clarescens* Möschler, 1890*, L. inconspicua* Herrich-Schäffer, 1868*, L. dorsalis* Walker, [1856]*,* and *L. extenuatae* Guenée, 1852. Other species discussed have a sickle-shaped uncus.

Reduced reniform. The reniform is an element of the typical noctuid forewing pattern. It occupies the lower corner of the distal end of the cell. It is always reduced in *Leucania.* It may be either a small, black spot or a white spot. Among the species considered in this publication, the white spot condition occurs in: *L. pyrastis, L. multipunctata, L. rawlinsi* Adams, 2001*,* and *L. misteca.* This state is variable in *L. senescens* Möschler, 1890. The remaining Central American species have a small, black, reniform spot.

Material and methods

The expanse of adult moths was measured from forewing apex to apex of spread specimens. Dissections were performed after an 8-12 hour treatment of the entire abdomen in unheated 10% sodium hydroxide solution. If spermatophores persisted within the corpora bursae, after this initial treatment, they were further treated with hot 10% sodium hydroxide solution for 3-4 minutes. A soft brush was used to remove scales. Transparent tissue was stained with mercurochrome, the endophallus, and bursa copulatrix were inflated with 95% ethanol followed by dehydration in oil of cloves and clearing in xylene (McCabe, 1980). The valvae were gently spread under a glass chip. The genitalia and abdominal plates were mounted in Canada Balsam. Adults were photographed with a Canon R5 with a 60mm macro lens and a ring flash. Permanent Canada balsam mount of dissections was photographed with the Canon R5 with extension rings. Plates were assembled with Photoshop SC6. The endophalli are presented in optimal view, i.e., they are orientated to allow study of the most diagnostic features. Female genitalia are presented in either ventral or lateral view. The female subgenital plate was detached. Female imagoes are not illustrated as they are similar to the males except for somewhat more infuscated hind wings. The female frenulum, typically with several bristles, may occasionally have only one bristle as is always the condition in the male. Genitalia terminology follows Adams (2001). The publication dates of Draudt *in* Seitz have been verified in Griffin (1936).

Abbreviations for collections consulted.

AMNH	American Museum of Natural History, New York, NY, USA
CMNH	Carnegie Museum of Natural History, Pittsburgh, PA, USA
CNC	Canadian National Collections, Ottawa, Canada
CUIC	Cornell University, Department Entomology, Ithaca, NY, USA
MNHU	Museum fur Naturkunde, Berlin, Germany
MZC	Museo Zoológico Cubano, Habana, Cuba
NHMUK	The Natural History Museum United Kingdom, London, UK
NMNH	Smithsonian Institution National Museum of Natural History, Washington DC, USA
NYSM	New York State Museum, Albany, NY, USA
SMF	Naturmuseum Senckenberg, Frankfurt am Main, Germany

Results / Taxonomic Actions

Leucania biforis (Draudt, 1924)
(Figs: 3) imago, 9) valvae, 13) endophallus, 17) bursa copulatrix)

Cirphis biforis Draudt, 1924, *in* Seitz. *Fauna amer., 7*, p. 168, pl. 24, row k., fig. 23 is a painting in Seitz. Holotype female: Mexico, Veracruz, Zacualpan; Misantla [types destroyed], **neotype** designated this publication.

Leucania biforis (Draudt, 1924, *in* Seitz). Poole, 1989, p. 577

Original Description (Seitz, 1924, English edition). [German edition available at https://www.biodiversitylibrary.org]

"*C. biforis* sp. n. (24 k) is similar to the preceding [see comment below]. Forewing light reddish-yellow, the costal part densely dusted and strewn with a lilac grey, the median, subcostal and proximal-marginal vein lilac grey, the end of the median thickly white, the branches from it whitish, finely edged with grayish-brown; the cell is filled up with red-brown in which the yellow maculae are very conspicuous; the ring-macula is horizontally elliptical, the reniform macula below with a black dot; the posterior transverse line is red-brown, intensified by blackish interneural dots and behind it a series of thick black dots on the veins; below the yellowish oblique apical stripe there is a lilac grey marginal triangle. Hindwing diaphanous whitish, the veins and margin broadly darkened. According to 3 specimens from Mexico (Zacualpan, Misantla), obtained from Mr. Robert Muller."

Comment: Draudt did not specify whether he was referring to the preceding species in the text (*Cirphis colorata* Dognin, 1914) or the one illustrated (*L. extincta* Guenée, 1852). However, as *C. biforis* does not resemble *H. colorata*, we assume he meant the illustration of the similar *L. extincta*

Neotype (*biforis*) male: Draudt, 1924, *in* Seitz described *Cirphis biforis* from a female specimen collected in Mexico: Veracruz, Zacualpan, Misantla. The name-bearing specimen was destroyed as detailed in the introduction to this paper. As the characters that differentiate this species are revealed best by dissection of the male genitalia, it is desirable that a dissected male specimen be available for study. Collecting in Mexico is restricted therefore we have chosen to designate as neotype a specimen from neighboring Guatemala. The neotype specimen can be identified by the hook-shaped left antenna and the straight right antenna, in addition to the images (Figs 3, 13), included with this designation. The neotype is labeled "McCabe 6050 male, Guat.: Finca Firmeza, Dept. Izabal, 15.40718 -88.69060, 28 Feb. 2014, T. McCabe 520 m" and is deposited in the New York State Museum, Albany, New York, USA.

Diagnosis: Draudt compared "*Cirphis*" *biforis* to *Leucania extincta* Guenée, 1852. We compare *L. biforis* with *L. extincta* and to the closely related *L. clarescens* Möschler, 1890. The latter two species have ranges that overlap that of *L. biforis*. Draudt noted that *L. biforis* forewing cell is "filled with red brown in which the yellow maculae are very conspicuous". This pattern is absent in *L. extincta* and *L. clarescens*. The genitalia of the three species are similar but differ in detail. *Leucania biforis* has a long, thin, scimitar-shaped cucullus. *Leucania extincta* has a paddle-shaped cucullus. In *L. clarescens* the cucullus is scimitar-shaped but shorter and less attenuated at the tip than in *L. biforis*. *Leucania biforis* lacks any modification of the clavus. This contrasts with the antler shape in *L. extincta* and the sharp-pointed, cone-like structure in *L. clarescens*. The endophallus of *L. biforis* is a simple tube, thickened in its distal third, with a single, thin, retrorse cornutus at the gonopore (distal end of everted endophallus). In *L. extincta* the endophallus has a cluster of short, stiff cornuti at the base and a group of long, whip-like cornuti at the gonopore. In *L. clarescens* the gonopore is preceded by a thickened portion of the tube that has a patch of small cornuti. The ductus bursae of *L. biforis* is short and straight. The ductus bursae of *L. extincta* is long and narrow. The ductus bursae of *L. clarescens* is longer and coiled.

Description (imago Fig. 3): The neotype is consistent with the original description and illustration (Draudt, 1924, *in* Seitz) (our Fig. 23). Character states of the dissected genitalia were not described in the original description, so they are given here:

Male genitalia (valvae Fig. 9, endophallus Fig. 13): The cucullus is thin and delicate at its base thus fragile and easily detached and lost during preparation. The holotype valvae have lost the cucullus and a non-type specimen (Fig. 9) illustrates the intact cucullus. The holotype endophallus is illustrated (Fig. 13). Uncus, tegumen, and vinculum unmodified; cucullus long, thin, and scimitar-shaped, with a continuous row non-deciduous marginal setae; pore plate at valvula inconspicuous; ampulla long and thin; digitus stout with sharp point; clasper scoop-shaped with a sharp hook-like point; basal sclerite of clasper approximately as long as digitus; editum simple; clavus unmodified. Phallus long and slender; the endophallus is a simple tube, thicker from midpoint with a single, thin, retrorse cornutus at gonopore.

Female genitalia (bursa copulatrix Fig. 17): Ductus bursae is a long, sclerotized tube. The appendix bursae is directed straight upwards to approximately the middle of the ductus bursae. A rotated view of the bursa copulatrix, not illustrated, would show a gap in sclerotization between the appendix bursae and ductus bursae much like that seen in *L. pyrastis* (Fig. 16).

Distribution: Mexico, Belize, Guatemala (neotype locality), Costa Rica, Venezuela, Ecuador, and French Guiana.

Leucania clarescens Möschler, 1890

Leucania clarescens Möschler, 1890. *Abh. Senck, Ges., 16*, 143. Syntypes 1 male, 2 females, Puerto Rico, Lectotype male (designated by Adams, 2001) (ZMHU, Berlin), genitalia dissection (Franclemont) and photograph of the imago examined. Gundlach, 1891, p. 172; Poole, 1989, p. 578; Adams, 2001, p. 209, Fig. 3C imago, 11C-D male genitalia, 15C female genitalia; Pohl & Nanz, 2023, p. 407.

Cirphis macellaria Draudt, 1924, *in* Seitz, *Fauna amer., 7*, 169, pl. 24, row I (our Fig. 21)

Holotype, Panama: Lino [type destroyed], **syn. nov.**

Taxonomic note: The recognition of *C. macellaria* Draudt, 1924 as a junior subjective synonym of *L. clarescens* Möschler, 1890 is based on the original description and illustration of the Draudt type that has been compared with a photograph of the *L. clarescens* lectotype.

Leucania inconspicua Herrich-Schäffer, 1886

Leucania inconspicua Herrich-Schäffer, 1868. *Corresp. Blatt. zool.-min. Ver. Regensb*., p. 148 Gundlach, 1881, p. 301; Möschler, 1890, p. 141; Gundlach, 1891, p. 172; Poole, 1989, p. 580; Adams, 2001, p. 192, figs 1E, 6A-B, 13E; Becker, 2002, p. 372-373, figs 34-35. Dissection of holotype male by Becker. Illustration of dissection examined. [MZC], "The specimen is in poor condition, almost totally descaled and the hind wings are partially destroyed by museum pests. It is externally unrecognizable, but the genitalia are preserved" (Becker, 2002). Pohl & Nanz (2023, p. 408)

Cirphis inconspicua (Herrich-Schäffer): Hampson, 1905, p. 554, pl. 94, fig. 16; Dyar, 1914, p. 176; Draudt, 1924 *in* Seitz, p. 167, pl. 24, row l; Wolcott, 1936, p. 161; Schaus, 1940, p. 187

Cirphis hildrani Schaus, 1938. *Ann. Mag. n. H.,* (11)*2*, 510
Holotype male Brazil: Santa Catarina, New Teutonia [NMNH]. A junior synonym of *L. inconspicua* (Becker, 2002, p. 373).

Cirphis ezrami Schaus, 1938. *Ann. Mag. n. H.,* (11)*2*, 510
Holotype male Brazil: Rio de Janeiro, Itatiaya. [NMNH]. A junior synonym of *L. inconspicua* (Becker, 2002, p. 373).

Cirphis fagani Schaus, 1938. *Ann. Mag. n. H.,* (11)*2*, 511
Holotype male Brazil: Rio [de Janeiro], Itatiaya. [NMNH]. Photograph of holotype and dissection of genitalia examined, **syn. nov.**

Taxonomic note: Our recognition of *C. fagani* Schaus (1938) as a junior subjective synonym of *L. inconspicua* Herrich-Schäffer (1886) is based on comparison of an illustration of the dissected male genitalia of the holotype of *L. inconspicua* with a photograph of the dissected male genitalia of the holotype of *C. fagani.*

Leucania multipunctata Druce, 1889
(Figs: 1-2) imago, 7) valvae, 11) endophallus, 15) bursa copulatrix)

Leucania multipunctata Druce, 1889, *in* Godman & Salvin. *Biol. Centr.-Amer., Lep. Het., I*, 261, pl. 26, fig. 1. Holotype, female. Panama: Volcan de Chiriqui. [MNHU] holotype photograph of imago and dissection examined. Hampson, 1905, p. 611; Poole 1989, p. 583

Cirphis multipunctata: Draudt, 1924, *in* Seitz, 163, pl. 24, row a

Cirphis clara Draudt, 1924, *in* Seitz. *Fauna amer., 7*, 166, pl. 24, row e. Holotype, female. Colombia: [Tolima] Cañón del Monte. [type destroyed], **syn. nov.**

Leucania clara (Draudt, 1924, in Seitz): Poole, 1989, p. 587 (our Fig. 20)

Cirphis tritonia Hampson, 1905. *Cat. Lepid. Phalaenae Br. Mus., 5*, 542, pl. 93, fig. 2 Holotype, female. Brazil: Amazonas, Rio Jurua, [NHMUK] photo of holotype and dissection examined. **Syn. nov.**

Leucania tritonia (Hampson*,* 1905): Poole, 1989, p. 587

Cirphis opalisans Draudt, 1924, *in* Seitz. *Fauna amer., 7*, 164. pl. 24 row c
Holotype, female. Colombia: Tolima, Cañón del Monte, [type destroyed], **syn. nov.**

Leucania opalisans (Draudt, 1924, *in* Seitz): Poole, 1989, p. 583; Dickel, 1991, p. 57 (our Fig. 19)

Cirphis carnea Draudt, 1924, *in* Seitz. *Fauna amer., 7*, 165, pl. 24, row d
Holotype, female. Colombia: Medina, [type destroyed], **syn. nov.**

Leucania carnea (Draudt, 1924, *in* Seitz): Poole, 1989, p. 577 (our Fig. 22)

Leucania lobrega Adams, 2001. *Ann. Carnegie Mus., 70*(3), 189, figs. 1C, 5-B, 13C. Holotype male: Dominican Republic: Pedernales [CMNH] examined, **syn. nov.**

Taxonomic notes: The name-bearing types of three Draudt species, collected in Colombia, were

destroyed. The original descriptions and illustrations (Figs 19, 20, 22) were not sufficient to allow definitive identifications. The three species are determined as objective synonyms of the phenotypically variable *L. multipunctata* Druce, 1889. We based this decision by comparing the original illustrations with a photograph of the holotype of *L. multipunctata* (Figs 2, 15) and with many conspecifics showing the considerable phenotypic variability.

The recognition of *L. lobrega* Adams, 2001 as a junior subjective synonym of *L. multipunctata* Druce, 1889 was based on comparison of a female paratype of *L. lobrega* with photographs of the female holotype of *L. multipunctata* (Figs 2, 15).

The recognition of *C. tritonia* Hampson, 1905 as a junior subjective synonym of *L. multipunctata* Druce, 1889 was based on comparison of a photograph of the female holotype and its dissection with those of holotype of *L. multipunctata* (Figs 2, 15).

There are two related but not congeneric taxa bearing the epithet *multipunctata*: *Leucania multipunctata* Druce, 1889, *in* Godman & Salvin (type locality Panama) and *Cirphis multipunctata* Hampson, 1918 extralimital (type locality Shillong, India). Poole (1989, p. 583) made *Cirphis* a synonym of *Leucania,* recognizing the Hampson name as a junior secondary homonym of *L. multipunctata* Druce. However, in his judgment the two species were, according to ICZN (1999) Article 59.2, secondary homonyms, and did not require a replacement name. We follow M. Hreblay (Hacker et al. 2002, p. 163), where *Cirphis multipunctata* (Hampson) is placed in *Mythimna.*

Leucania pyrastis (Hampson, 1905)
(Figs: 4) imago, 8) valvae, 12) endophallus, 16) bursa copulatrix)

Cirphis pyrastis Hampson, 1905. *Cat. Lepid. Phalaenae Br. Mus., 5*, 518, pl. 92, fig. 19 Two male syntypes, Paraguay, [Sapucai, Paraquari Department], (Foster), Jun 1902. A code NHMUK 010914803 has been added to one specimen. Dissection: Noctuidae BM(NH) slide No. 21539. Photograph of imago and dissection examined. We hereby designate the dissected specimen as **Lectotype** Adams and McCabe**.**

Leucania pyrastis (Hampson, 1905): Poole 1989, p. 585

Cirphis velva Schaus, 1921. *Proc. U. S. Nat. Mus., 59*, 360 Holotype male, Chejel, Guatemala. August. Type number NMNH 23379. Photograph examined. Dissection: MS Adams USNM 50179. A code USNM ENT 00973506 has been added to the specimen. Draudt, 1924, *in* Seitz, *7*, 164, plate 24, row b. **Syn. nov.**

Leucania velva (Schaus, 1921): Poole, 1989, p. 587

A lectotype is designated to establish nomenclatorial stability in the genus as a dissected specimen is necessary to accurately differentiate this species from *L. rawlinsi* Adams (2001). The specimen selected as lectotype bears a rectangular white label with hand-written "pyrastis type ♂ Hmpsn." by an unknown hand. There is also a circular, white, blue-bordered syntype label. This specimen is hereby selected as lectotype. The lectotype specimen also can be identified by the absent left antenna and associated dissection.

The *L. pyrastis* dissection (Fig. 8) shows an angled valve margin. This is an artifact of preparation. The *L. pyrastis* valve is unusually thin and tends to curl back on itself at the margins after being subjected to the clearing agent during preparation.

Taxonomic note: It would have been desirable to have examined a dissection of the lectotype of *L. pyrastis*, however Dr. Diego Dolibaina (in litt. October 2017) was unable to locate the dissection on a recent visit to the NHMUK.

The recognition of *C. velva* Schaus, 1921 as a junior subjective synonym of *C. pyrastis* Hampson, 1905 is based on comparison of photographs of the imago and dissected male genitalia of the lectotype of *Cirphis pyrastis* with a photograph of the dissected male genitalia of the holotype of *C. velva*.

Leucania seteci (Dyar, 1914)

Cirphis seteci Dyar, 1914. *Proc. U. S. nat. Mus., 47*, 176. Was described from 5 co[syn]types, 2 males and 3 females from PANAMA: Alhajuela; Cabima; La Chorrera; Corozal, Canal Zone, (NMNH, Washington, D.C.) examined. A well-marked male specimen, Adams dissection USNM 50177 is hereby designated

and labeled as Lectotype Adams and McCabe.

Leucania seteci (Dyar): Poole, 1989, p. 586.

Cirphis incognita Barnes & McDunnough, 1918, *Contr., 4*, 99, pl. 17, figs 6 and 9

In the original description a holotype was not designated, however J. F. Gates-Clarke dissected a male NMNH JFGC 615 and labeled it Holotype. [NMNH] USA: Texas, Brownsville, [examined], **syn. nov.**

Leucania incognita (Barnes & McDunnough): Franclemont & Todd, 1983, p. 150; Poole, 1989, p. 580; Adams, 2001, pp. 211-113, figs. 3D, 12A-B, 15D; Lafontaine & Schmidt, 2010, p. 91; Pohl et al. 2016, p. 681.

A lectotype of *L. seteci* is designated to establish nomenclatorial stability in the genus as a dissected specimen is necessary to accurately differentiate this species from *L. cinereicollis* Hampson, 1905. Dyar (1914) did not indicate a holotype from among his *L. seteci* syntypes. We have chosen a well-marked male, Adams dissection USMN 50177, and provided a lectotype label. The specimen can be uniquely identified by the following characters: right antenna with a hook and right hind wing split. Dyar (1914) recognized that *L. seteci* was superficially similar but less contrasting than *L. cinereicollis*. Likewise, Barnes & McDunnough (1918), pointed out that *L. incognita* "bears quite a resemblance to the figure of *cinereicollis* Wlk. given by Hampson (Cat. Lep. Phal. B.M., V, Pl. 93, Fig. 18) but lacks the black streak below base of cell of this species." Barnes and McDunnough were apparently unfamiliar with the Dyar description when they described a short series of unidentified moths from south Texas as *L. incognita*.

Taxonomic note: The recognition of *C. incognita* Barnes & McDunnough, 1918 as a junior subjective synonym of *C. seteci* Dyar, 1914 is based on comparison of the J. F. Gates-Clarke dissection of the holotype of *C. incognita* with the Adams (2005) dissection of the lectotype of *C. seteci*. The two taxa are conspecific, sharing a similar shaped cucullus that is diagnostic. This synonymy was proposed by Dr. Albert Legrain and included on the website of Mr. Savela. (https://ftp.funet.fi/pub/sci/bio/life/insecta/lepidoptera/ditrysia/noctuoidea/noctuidae/hadeninae/leucania/#seteci)

Leucania sarcistis (Hampson, 1905)
(Figs: 5-6) imago, 10) valvae, 14) endophallus, 18) bursa copulatrix)

Cirphis sarcistis Hampson, 1905. *Cat. Lepid. Phalaenae Br. Mus., 5*, 527, pl. 93, fig. 2. Holotype male, Costa Rica, [NHMUK, London]. Not dissected. Photograph examined. Draudt, 1924, *in* Seitz, *7*, p.165, Plate 24, row d.

Leucania sarcistis (Hampson, 1905): Poole, 1989, p. 585

Cirphis microsticha Hampson, 1905. *Cat. Lepid. Phalaenae Br. Mus., 5*, 529, pl. 93, fig. 7. Holotype male, Costa Rica, Candelaria Mountains [NHMUK, London]. Dissection: No. 10278, photographs of imago and dissection examined. Dyar, 1914, p. 176. Draudt, 1924, *in* Seitz, *7*, p. 166, Plate 24, row L, **syn. nov.**

Leucania microsticha: (Hampson, 1905): Poole, 1989, p. 582

Taxonomic note: The recognition of *C. microsticha* Hampson, 1905 as a junior subjective synonym of *L. sarcistis* is based on examination of photographs of the holotypes of the imagoes of both species. Both are within the range of variation of *L. sarcistis.* The description of *C. sarcistis* has page priority over *C. microsticha*. To evaluate the phenotypic variation of this species we have dissected slightly less striated specimens that match the condition found in the undissected *L. sarcistis* holotype. The eversion of the endophallus of the holotype of *C. microsticha* was unsuccessful. We have provided, in its place, an image of a completely everted endophallus of a topotypical specimen of *L. sarcistis* (Fig. 14). *Cirphis microsticha*: Wolcott (1936), Schaus (1940), and Costa Lima & Silva (1968) (not Hampson, 1905) are misidentifications. *Leucania sarcistis* is not known in the Antilles.

Leucania extenuata Guenée, 1852 (Fig. 24, imago)

Leucania extenuata Guenée, 1852, *in* Boisduval & Guenée. *Hist. nat. Ins., Spec. gén. Lépid.,* (Noct. 1), *1*, 90. Holotype male, Brazil. dissection BM NOCT 5769. Photographs of imago (Fig. 24) and dissection examined. Walker, 1856, p. 100

Leucania infatuans Franclemont, 1972. *Proc. ent. Soc. Wash., 74*(2), 143. Holotype, male USA: Florida

[CUIC] (Fig. 25). Examined. Franclemont & Todd, 1983, p. 150; Poole, 1989, p. 580; Adams, 2001, p. 214 figs. 3E, 12 C-D, 15E; Lafontaine & Schmidt, 2010, p. 92; Pohl et al. 2016, p. 681. **syn. nov.**

Taxonomic note: Butler (1890, p. 658) mistakenly made *L. extenuata* and *L. dorsalis* Walker, 1856 junior synonyms of *L. humidicola. Leucania extenuata, L. dorsalis* and *L. humidicola* are all valid species. Franclemont (1972) misidentified *L. extenuata* as *L. humidicola,* which resulted in confusion regarding the identification of both species. In the original description of *L. infatuans* [etymology: "the fooler"]. Franclemont (1972) noted the similarity of *L. infatuans* (Fig. 25) to *L. extenuata* (Fig. 24) but did not recognize the intraspecific variation over the entire range of the species, as he confined his description solely to the population of south Florida, USA, which is at the northern extent of its distribution. The recognition of *L. infatuans* as a junior subjective synonym of *L. extenuata* is based on comparison of the dissections of the male genitalia of the holotypes of both species, which are within the range of variation of *L. extenuata*. We have examined 63 additional dissections of specimens of this taxon from throughout its range including specimens from Bolivia, Brazil, Ecuador, French Guiana, Panama, Costa Rica, Belize, Guatemala, Mexico, and USA: Texas, Mississippi, Florida.

List of Proposed Nomenclatorial Changes

Leucania biforis (Draudt, 1924, *in* Seitz), **neotype**
Leucania clarescens Möschler, 1890
    Cirphis macellaria Draudt, 1924, *in* Seitz, **syn. nov.**
Leucania extenuata Guenée, 1852
    Leucania infatuans Franclemont, 1972, **syn. nov.**
Leucania inconspicua Herrich-Schäffer, 1868
    Cirphis fagani Schaus, 1938, **syn. nov.**
Leucania multipunctata Druce, 1889, *in* Godman & Salvin
    Cirphis tritonia Hampson, 1905, **syn. nov.**
    Cirphis clara Draudt, 1924, *in* Seitz, **syn. nov.**
    Cirphis opalisans Draudt, 1924, *in* Seitz, **syn. nov.**
    Cirphis carnea Draudt, 1924, *in* Seitz, **syn. nov.**
    Leucania lobrega Adams, 2001, **syn. nov.**
Leucania pyrastis (Hampson, 1905), **lectotype**
    Cirphis velva Schaus, 1921, **syn. nov.**
Leucania seteci (Dyar, 1914), **lectotype**
    Cirphis incognita Barnes & McDunnough, 1918, **syn. nov.**
Leucania sarcistis (Hampson, 1905)
    Cirphis microsticha Hampson, 1905, **syn. nov.**

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Conflict of Interest

The authors declare that they have no financial interest or personal relationship that could influence the work presented in this article.

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Morton S. Adams
Research & Collections
New York State Museum
222 Madison Ave.
Albany, New York 12230
EE.UU. / *USA*
E-mail: mortonsadams@gmail.com
https://orcid.org/0000-0003-0118-7295

*Timothy L. McCabe
Research & Collections
New York State Museum
222 Madison Ave.
Albany, New York 12230
EE.UU. / *USA*
E-mail: timothy.mccabe@nysed.gov
https://orcid.org/0000-0002-2657-2694

*Autor para la correspondencia / *Corresponding author*

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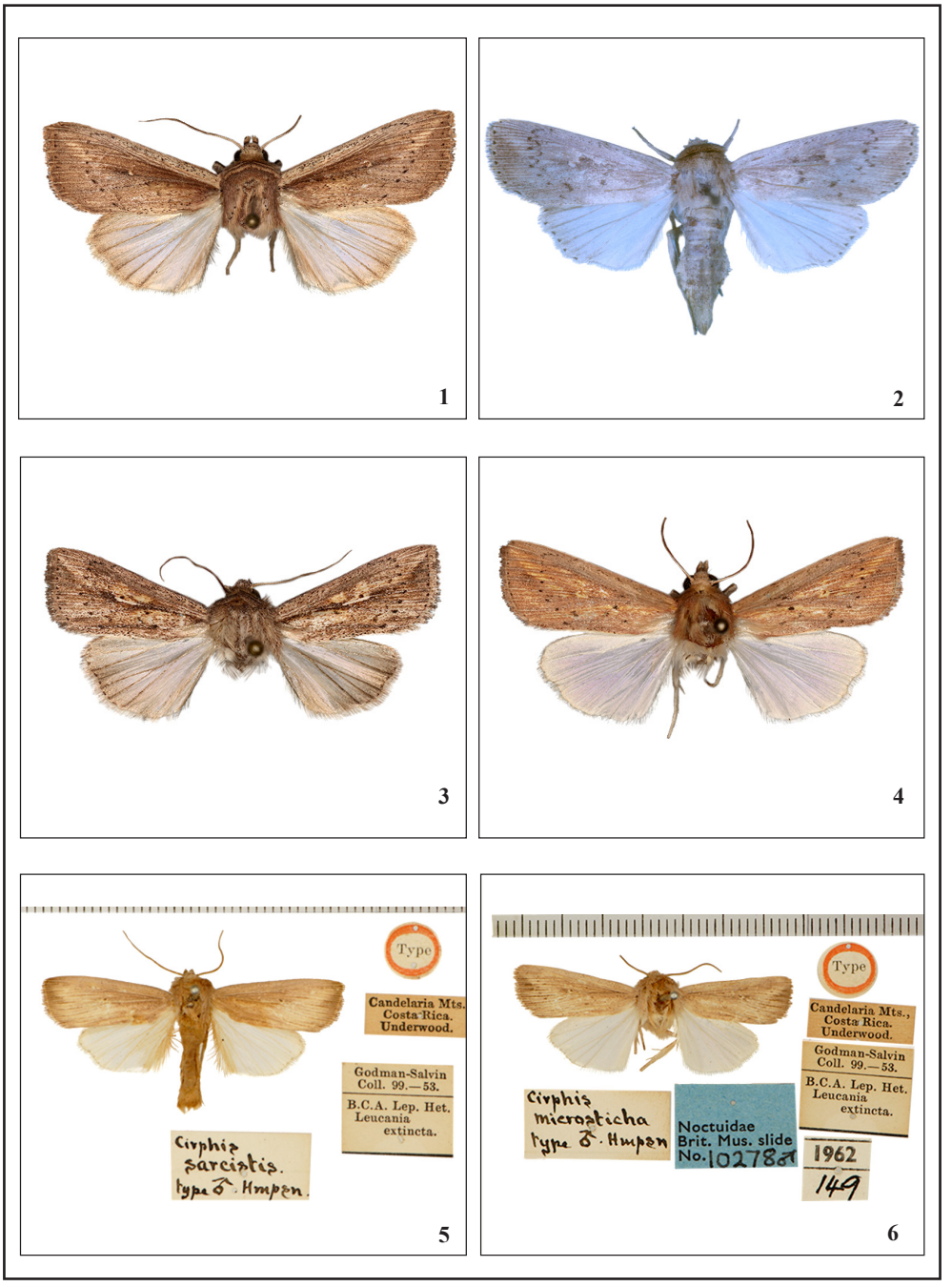
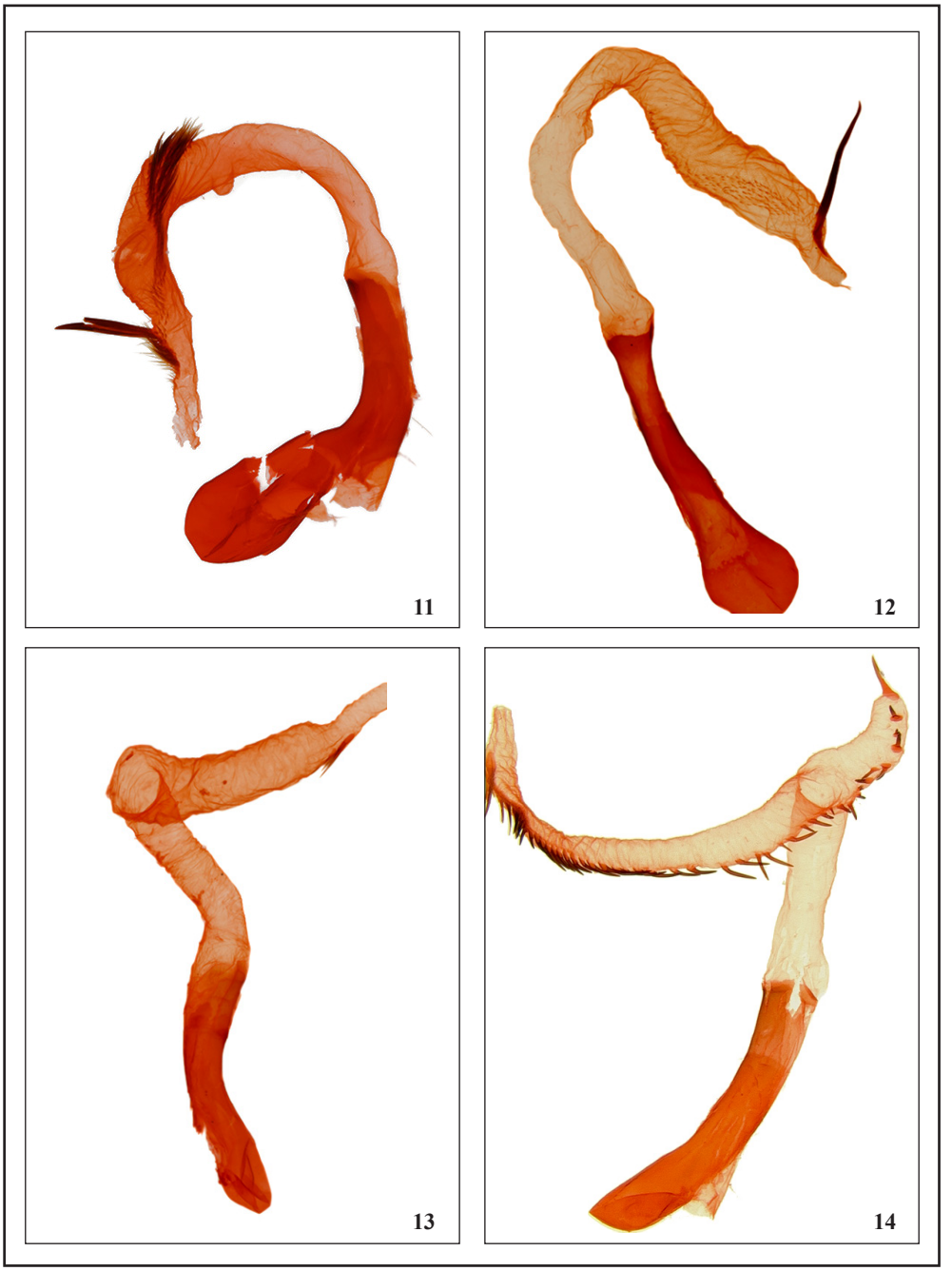
Figures 1-6. Imagos: **1.** *L. multipunctata* ex Belize, TLM 6273 ♂. **2.** *L. multipunctata* ex Panama, Holotype, relatively enlarged, wingspan 44 mm. **3.** *L. biforis* ex Guatemala, Neotype TLM 60508 ♂. **4.** *L. pyrastis* ex Argentina, TLM 4133 ♂. **5.** *L. sarcistis* ex Costa Rica, Holotype. **6.** *L. sarcistis* ex Costa Rica (Holotype of *L. microsticha*, jr. syn.).

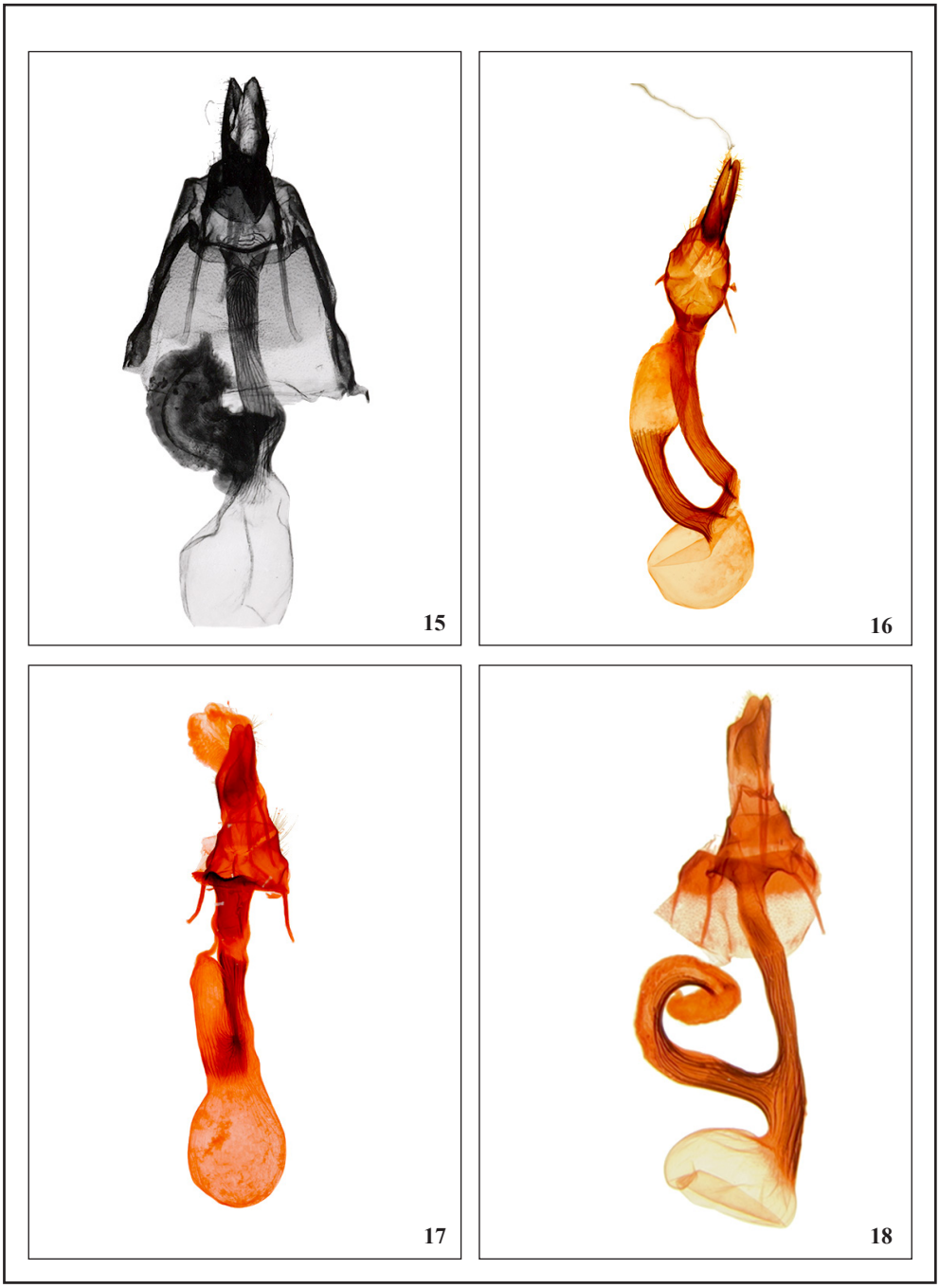


Figures 7-10. Valves: **7.** *L. multipunctata*, ex Belize, TLM 6273 ♂. **8.** *L. pyrastis*, ex Argentina, TLM 4133 ♂. **9.** *L. biforis*, ex Guatemala, TLM 6050 ♂. **10.** *L. sarcistis* ex Costa Rica, Holotype slide of *microsticha,* BM Noct slide 10278 ♂ (prep by Tams).

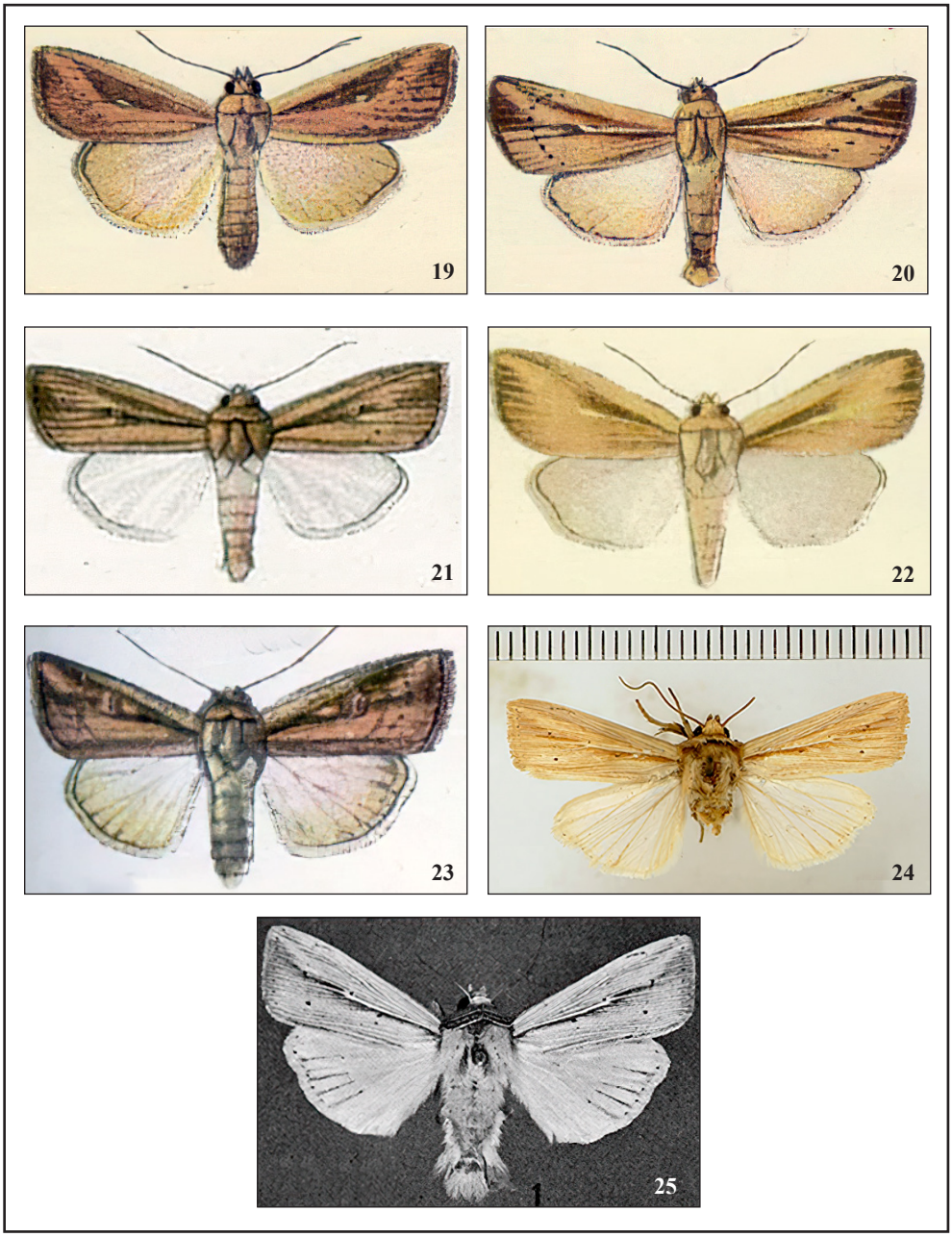
Figures 11-14. Vesicae: **11**. *L. multipunctata*, ex Panama, Holotype. **12**. *L. pyrastis*, ex Argentina, TLM 4133 ♂. **13**. *L. biforis*, ex Guatemala, TLM 6050 ♂. **14**. *L. sarcistis*, ex Costa Rica, TLM 6015 ♂ [in USNM].



Figures 15-18. Corpora bursa: **15.** *L. multipunctata*, ex Panama, Holotype. **16.** *L. pyrastis* ex French Guiana, TLM 4582 ♀**. 17.** *L. biforis*, ex Guatemala, TLM 6543 ♀**. 18.** *L. sarcistis*, ex Costa Rica, TLM 6016 ♀.



Figures. 19-25. 19-23. Paintings in Seitz of Draudt's destroyed types placed in synonymy with the exception of *L. biforis* (the painting of *L. biforis* had features that allowed it to be associated with modern, extant specimens). **19.** *L. opalisans*, Plate 24, row c of Seitz. **20.** *L. clara*, Plate 24, row e of Seitz. **21.** *L. macellaria*, Plate 24, row i of Seitz. **22.** *L. carnea*, Plate 24, row d of Seitz; **23.** *L. biforis* Plate 24, row k of Seitz. **24-25.** Types: **24.** *L. extenuata* holotype (in NHMUK). **25.** *L. infatuans* holotype (in CU) black and white image from Franclemont, 1972.



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

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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.

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Primeras citas para España peninsular y Europa continental de *Ancylosis nubeculella* (Ragonot, 1887) (Lepidoptera: Pyralidae, Phycitinae)

Javier Gastón, Dave Grundy & Stephen Knapp

Resumen

Se presentan las primeras citas de *Ancylosis nubeculella* (Ragonot, 1887) para España peninsular y Europa continental (Lepidoptera: Pyralidae, Phycitinae), junto con imágenes de su hábitus y genitalia del macho y de la hembra.
Palabras clave: Lepidoptera, Phycitinae, *Ancylosis nubeculella,* primeras citas, España peninsular, Europa continental.

First records of *Ancylosis nubeculella* (Ragonot, 1887) from mainland Spain and continental Europe

(Lepidoptera: Pyralidae, Phycitinae)

Abstract

First records of *Ancylosis nubeculella* (Ragonot, 1887) from mainland Spain and continental Europe (Lepidoptera: Pyralidae, Phycitinae) are provided, along with images of the moth as live and set specimens, plus male and female genitalia.
Keywords: Lepidoptera, Phycitinae, *Ancylosis nubeculella,* first records, mainland Spain, continental Europe.

Introducción

Durante los últimos meses del año 2024 y el comienzo de 2025, España peninsular ha sido azotada por once importantes borrascas con nombre (Aitor, Caetano, Dorothea, Enol, Floriane, Garoé, Herminia, Ivo, Jana, Konrad y Laurence) con similares capacidades y características ya que todas ellas se desarrollaban en el Atlántico al sur de Portugal, accediendo a España peninsular por el golfo de Cádiz, lo que ha propiciado una aportación de vientos ábregos intensos que han transportado calima desde el norte de África. Estos fenómenos meteorológicos han sido, según nuestra opinión, los causantes de una importante abundancia de Lepidoptera, que aunque ya han sido citados puntualmente de España, en esta ocasión se han observado con mayor abundancia, entre los que podemos contar especies como *Hodebertia testalis* (Fabricius, 1794), *Aproaerema polychromella* (Rebel, 1902), *Heliothis nubigera* Herrich-Schäffer, [1851], *Cornifrons ulceratalis* Lederer, 1858, *Euchromius ocellea* (Haworth, 1811), *Ancylodes pallens* Ragonot, 1887, *Tathorhynchus exsiccata* (Lederer, 1855), *Ancylosis convexella* (Lederer, 1855) o *Agrotis herzogi* Rebel, 1911.

Entre los días 21 de noviembre y 7 de diciembre del año 2024 se produjo una llegada excepcional de Lepidoptera, alcanzado los picos los días 25, 27 y 29 de noviembre. Fue en estas fechas cuando se registraron por los dos últimos coautores, en la provincia de Cádiz (España), los ejemplares de *Ancylosis nubeculella* (Ragonot, 1887) a los que se les realizó la preparación de su correspondiente genitalia para comprobar correctamente su identidad. Los patrones morfológicos externos de estos especímenes presentan gran variabilidad, siendo lo más frecuentes los que presentan un fondo ocre claro en sus alas anteriores (Figuras

1-4) y, menos frecuentes, los que manifiestan tonos y manchas ocre oscuro (Figura 5).

La primera cita de esta especie para España se produjo en las Islas Canarias (Asselbergs, 2009) con ejemplares capturados entre los años 1980 al 2004 en las islas de Fuerteventura, Tenerife y La Palma.

La especie se distribuye por Sudán, Arabia Saudí, Turquía, Anatolia, sur del Cáucaso, Irán, Pakistán, Azerbaiyán y Afganistán (Roesler, 1973) y también de Egipto (Asselbergs, 2009). Las citas en la franja sudoeste de la Península Ibérica, en la provincia de Cádiz, suponen las primeras para España y Europa continental.

Recientemente hemos recibido información (J. Agius com. pers.) de la captura de ocho ejemplares en Malta: cinco en Zurrieq, a 101 m, 03-X-2024; uno en Imgiebah, a 83 m, 07-X-2024; uno en Zurrieq, a 101 m, 08-X-2024 y uno en Zurrieq-Bassasa, a 91 m, 20-X-2024.

Material y métodos

El material utilizado para este trabajo se ha obtenido mediante muestreos nocturnos con trampas lumínicas distribuidas en los biotopos apropiados. Estas trampas son del tipo Skinner con lámparas de 125 vatios MV, 60 ó 15 vatios Actinic ó 2 vatios UV LED diseño. Para su identificación nos hemos basado en el examen comparativo de los caracteres morfológicos externos y, sobre todo, en el análisis de la estructura genital de los ejemplares. La preparación de la genitalia se ha efectuado siguiendo las técnicas estándar de Robinson (1976), con modificaciones.

Para la documentación fotográfica de las preparaciones de la genitalia se han utilizado los microscopios Nikon Eclipse E400, Nikon SMZ1 Stereo microscope y la cámara digital NIKON D3100. Para la documentación fotográfica de los ejemplares adultos se ha utilizado la cámara digital Sony, alfa 100 con objetivo macro Minolta AF 100 mm, Panasonic Lumix DMC-FZ50 con Raynox M-250 lens y Nikon COOLPIX 900 con un objetivo macroscópico Raynox M-250. Los retoques fotográficos se han realizado con el programa Adobe Photoshop©.

Resultados

Ancylosis (Heterographis) nubeculella (Ragonot, 1887)
Heterographis nubeculella Ragonot, 1887. *Annls. Soc. ent. Fr.,* (Ser, 6) *7*, 247
LT: Ordubad [AZERBAIYÁN].

Material examinado 3 ♂ y 6 ♀: Forma pálida: Cádiz, Casa Athene, Vejer de la Frontera, a 125 m, 1 ♂, 28-XI-2024, S. Knapp leg., J. Gastón col., preparación de genitalia 10653JG (Figura 6); Idem, 1 ♀, 29-XI-2024, S. Knapp leg., J. Gastón col., preparación de genitalia 10665JG (Figura 7); Idem, 1 ♀, 26-XI-2024, S. Knapp leg., J. Gastón col., preparación de genitalia 10708JG (Figura 8); Bolonia, Tarifa, a 155 m, 1 ♂, 25-XI-2024, D. Grundy leg. y col., preparación de genitalia 2025-28A; Ídem, 1 ♀, preparación de genitalia 2025-31A; Centro Internacional de Migración de Aves (CIMA), Tarifa, a 54 m, 1 ♂, 29-XI-2024, D. Grundy leg. y col., preparación de genitalia 2025-30C; Ídem, 1 ♀, preparación de genitalia 2025-29B. Forma oscura: Cádiz, Centro Internacional de Migración de Aves (CIMA), Tarifa, a 54 m, 1 ♀, 27-XI-2024, D. Grundy leg. y col., preparación de genitalia 2025-32B; Ídem, 1 ♀, 29-XI-2024, preparación de genitalia 2025-33C.

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Conflicto de interés

Los autores declaran que no tienen ningún interés financiero conocido, ni relaciones personales, que pudieran haber influido en el trabajo que se presenta en este artículo.

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*Javier Gastón
Amboto, 7-4ª-Dcha.
E-48993 Getxo (Vizcaya)
ESPAÑA / *SPAIN*
E-mail: fjgaston@yahoo.es
https://orcid.org/0000-0003-3382-3874

Dave Grundy
Fundación Migres
N-340, Km 85
E-11380 Tarifa (Cádiz)
ESPAÑA / *SPAIN*
E-mail: dgcountryside@btinternet.com
https://orcid.org/0000-0001-8575-0895

Stephen Knapp
La Muela, 164, Camino de Paralejos
E-11150 Vejer de La Frontera (Cádiz)
ESPAÑA / *SPAIN*
E-mail: forest28@hotmail.co.uk
https://orcid.org/0009-0002-2986-928X

*Autor para la correspondencia / *Corresponding author*

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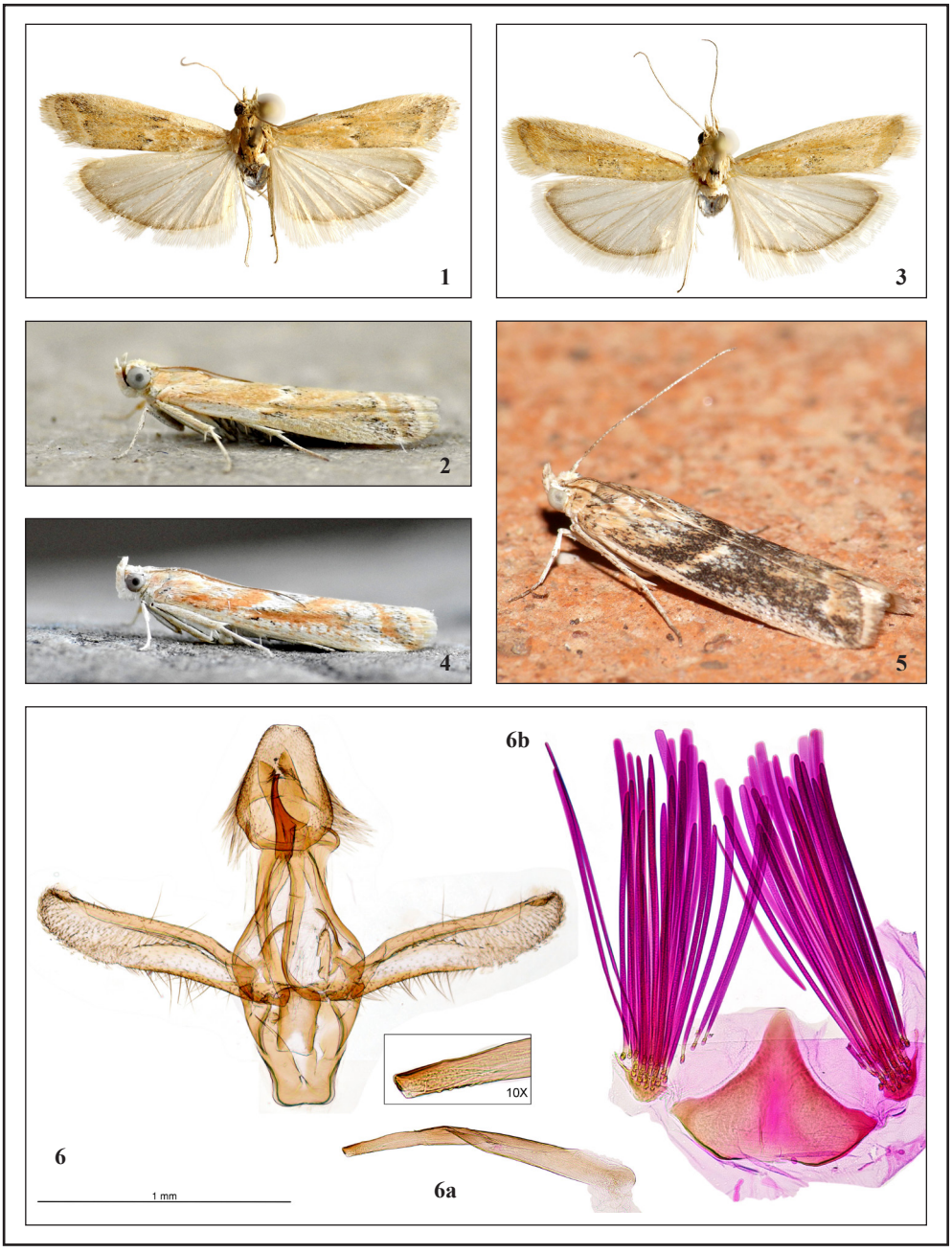
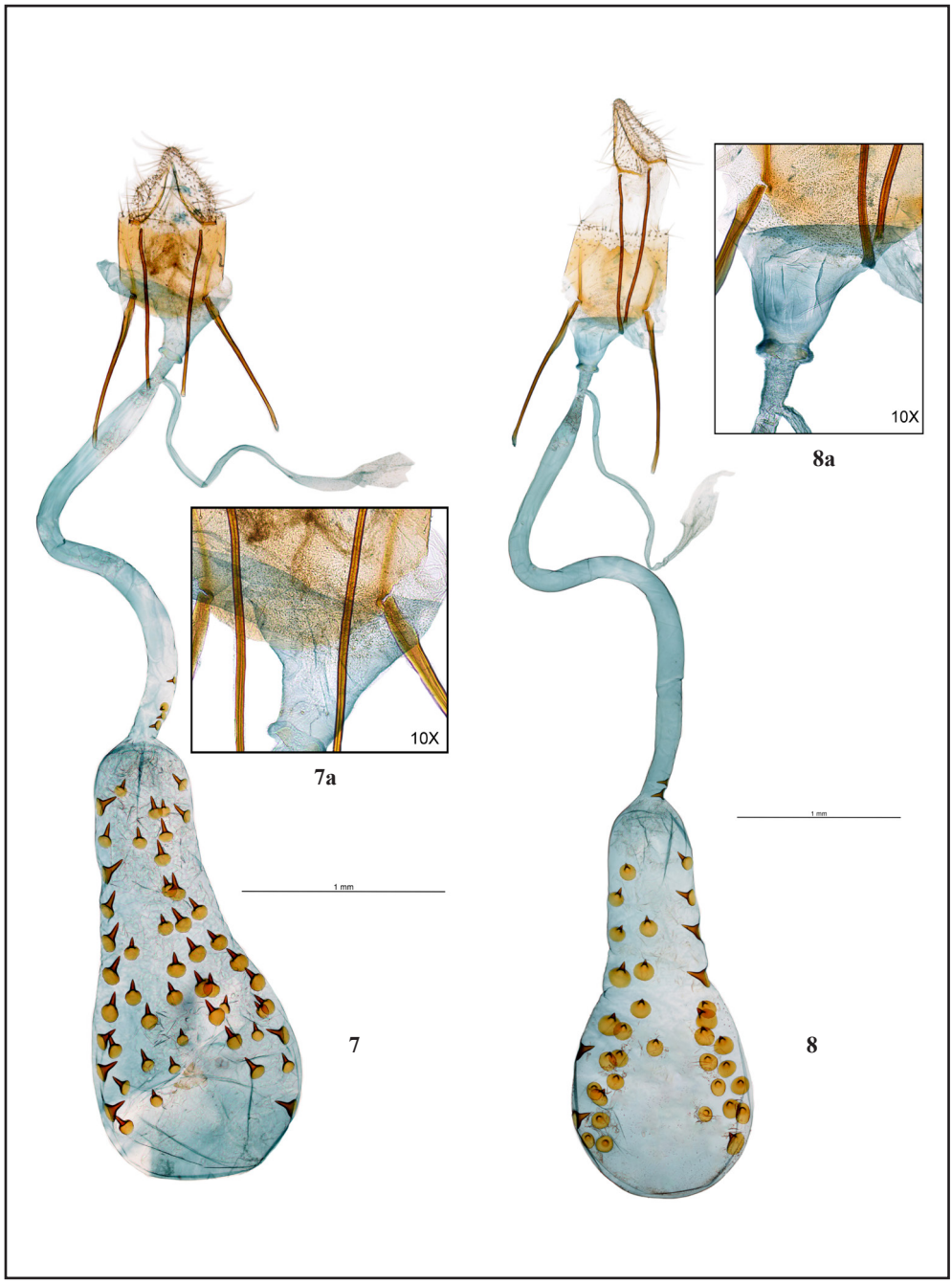
Figuras 1-6. *Ancylosis nubeculella* (Ragonot, 1887). **1.** Adulto ♂, Casa Athene, Vejer de la Frontera, (Cádiz), a 125 m, 28-XI-2024. **2.** Adulto ♂, Idem. Mismo ejemplar in vivo. **3.** Adulto ♀, Casa Athene, Vejer de la Frontera, (Cádiz), a 125 m, 29-XI-2024. **4.** Adulto ♀, Casa Athene, Vejer de la Frontera, (Cádiz), a 125 m, 26-XI-2024. **5.** Adulto ♀, Centro Internacional de Migración de Aves (CIMA), Tarifa, (Cádiz), a 54 m, 27-XI-2024. **6.** Genitalia del macho 10653JG, escala 1 mm, Casa Athene, Vejer de la Frontera, (Cádiz), a 125 m, 28-XI-2024. **6a.** Idem, Aedeagus. **6b.** Idem, culcita.



Figuras. 7-8. *Ancylosis nubeculella* (Ragonot, 1887). **7**. Genitalia de la hembra 10665JG, escala 1 mm, Casa Athene, Vejer, (Cádiz), a 125 m, 29-XI-2024. **7a**. Idem, detalle del antrum. **8**. Genitalia de la hembra 10708JG, escala 1 mm, Casa Athene, Vejer, (Cádiz), a 125 m, 26-XI-2024. **8a**. Idem, detalle del antrum.



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Sympatric and partially synchronic populations of *Melitaea phoebe* ([Denis & Schiffermüller], 1775) and *M. ornata* Christoph, 1893 are well known; how common are hybrids? (Lepidoptera: Nymphalidae)

Peter J. C. Russell

Abstract

Locations where *Melitaea phoebe* ([Denis & Schiffermüller], 1775) and *M. ornata* Christoph, 1893 are sympatric and at least partially synchronic, across 10 countries, are listed. Comments are made on specimens that are known hybrids and others which have a hybrid appearance, having some characters associated with both species. Albania (nine) and Spain (six) currently record the most locations where both species occur together. Difficulties in species identification of some individual specimens are believed to be the result of hybridisation between these two species.
Keyword: Lepidoptera, Nymphalidae, *Melitaea phoebe*, *Melitaea ornata*, sympatric, synchronic, hybrids, Europe.

Las poblaciones simpátricas y parcialmente sincrónicas de *Melitaea phoebe* ([Denis & Schiffermüller], 1775) y *M. ornata* Christoph, 1893 son bien conocidas ¿hasta qué punto son comunes los híbridos? (Lepidoptera: Nymphalidae)

Resumen

Se enumeran las localidades donde *Melitaea phoebe* ([Denis & Schiffermüller], 1775) y *M. ornata* Christoph, 1893 son simpátricas y al menos parcialmente sincrónicas, en 10 países. Se comentan los especímenes que son híbridos conocidos y otros que tienen apariencia híbrida, al presentar algunos caracteres asociados a ambas especies. Albania (nueve) y España (seis) registran actualmente el mayor número de localidades en las que ambas especies aparecen juntas. Se cree que las dificultades en la identificación de las especies de algunos especímenes individuales son el resultado de la hibridación entre estas dos especies.
Palabra clave: Lepidoptera, Nymphalidae, *Melitaea phoebe*, *Melitaea ornata*, simpátricas, sincrónicas, híbridos, Europa.

Introduction

As far as the author is aware, there are only two published incidents of hybridisation between *Melitaea phoebe* ([Denis & Schiffermüller], 1775) and *M. ornata* Christoph, 1893, in Hungary (Bálint & Ilonczai,

2001) and in Slovenia (Russell et al. 2014). There are, however, multiple instances of the two species flying in close proximity, within the parameters of the species' known flight range. There have been many occasions when the author has experienced difficulty in determining the specific identity of a particular specimen, particularly in the case of historical museum material. Known locations where the two species occur in close proximity are listed here, together with comments on known or supposed hybridisation between them.

Locations where *M. phoebe* and *M. ornata* are sympatric and often partly synchronic, listed under country in alphabetical order

Albania:

1) Gjirokastër, Tepelenë, Bënçë, at the old bridge S. of the village (220 m). Rocky and bushy/shrubby slopes, meadows. 17-V-2014 (Micevsky et al. 2015).

2) Korçë, Drenovë, three sites very near the village and each other: two with *M. phoebe* and one with *M. ornata*, 21-VII-2013 (Šašić et al. 2015). The presence of *M. ornata* in July is unusual but not unknown and this is very probably a second-generation specimen. These are often the result of larvae being exposed to humid conditions when, instead of entering diapause, they continue to feed, pupate and adults emerge (cf. Russell et al. 2007, p. 145; Russell & Pateman, 2019, pp. 88-89).

3) South of Dejë-Macukull [41.6581N; 20.1354E], 3-VII-2023, by barcode readings.

4) Northeast of Hotolisht [41.1842N; 20.4406E) *M. ornata* and [41.1852N; 20.4433E] *M. phoebe,* 21-VI-2023, by barcode.

5) Hasi district [42.3464N; 20.1660E] 28-VI-2023, by barcode.

6) West of Zhulat (40.12N 19.98 E) at 360 m.

7) Ujesjellesi i Ali Pashait (40.264N 20.006E) at 210 m.

8) South of Cerujë (41.23N 20.08E and 41.27N 20.089) at 1040 m.

9) North of Vishaj (41.27N 19.82E) at 120 m.

Armenia:

1) Populations of both species are located in close proximity around the southern tip of Armenia (Tshikolovets & Nekrutenko, 2013). There are also records of both species from the Khosrov Nature Reserve, but this occupies an area of nearly 7000 hectares and populations could be beyond the usual flight of the two species (Tshikolovets & Nekrutenko, 2013).

France:

1). Var, Near Fayence, (Saint Paul en Forêt) at different times. A female taken in 2008 deposited an egg batch which produced adult *M. ornata* in 2009 (Figures 1A-1B). All females from this area taken since have produced *M. phoebe* offspring (Gascoigne-Pees, pers. comm.).

2). Var, Massif de la Sainte Baume, Nans-les-Pins, the type locality of *M. phoebe* race *subtusca* Verity, 1952; the syntypic series of 7 specimens (4 ♂, 3♀) are housed in the Museo Zoologico de "La Specola" dell'Università, Firenza, Italy and were taken between 24-V-1926 and 24-V-1936. High resolution photographs of the seven specimens were examined by Russell et al. (2020), who concluded that both *M. phoebe* and *M. ornata* were present; in fact, a specimen of each species was taken at Nans-les-Pins on the same day, 24-V-1926 by two different collectors, verified by the different handwriting on the data labels (see Figures 2 A-C and 3 A-C). From figures 2B (*M. phoebe*) and 3B (*M. ornata*) the distinguishing characters of the two species are clearly visible: submarginal black markings arcuate, touching the intervening veins and club shaped antennae (*M. phoebe*) and the submarginal black markings more triangular, not touching the intervening veins and spatulate antenna (*M. ornata*). It is considered highly likely that hybrids emerged in this area of La St. Baume between 1926 and 1936; for example, compare the figures of a known hybrid reared from a Slovenian *M. ornata* female (Figure 4) and a female from La Ste Baume (Figure 5). If both species remain present, it may be possible to rear hybrids.

Greece:

1). Males of both species have been observed at Thráki, East Rodópi Mts., near Essími, 900 m, evidenced from a list of species provided by John Coutsis (Athens, Gr., in litt.).
2). Mt. Órvilos, Macedonia, GR., 800 m, 13-VI-1992 and 700 m, 15-VII-1992, Pamperis (2009).

Hungary:

See Bálint & Ilonczai 2001 (in Hugarian).

Italy:

Both species have been recorded from Calabria, Cosenza, San Fili, Monte Martinelli but at different times: *M. phoebe* at 880 m on 10-VI-2007 and *M. ornata* at 600 m on 3-VI-1913 (Russell et al. 2020).

Kazakhstan:

M. phoebe var. *alatauica* Wagner, 1913 [TL: Kazakhstan, Taldi Kurgan and mountains near Issyk-Kul Lake and Ili River], was described from Kazakhstan by Wagner but this name was preoccupied by *M. parthenie alatauica* Staudinger, 1881. It was replaced by *M. phoebe wagneri* by Wnukowsky (1929). In his original article Wagner illustrated the upper and undersides of males of what he considered to be typical *M. phoebe* and the variety *alatauica* (Wagner, 1913, p. 89, figs 5-6), exemplifying the heavy post discal black spotting, differentiating the latter from typical *M. phoebe*.

Russell & Tennent (2016), in their article on the identities of the names of various taxa associated with *M. phoebe*, considered that the name *wagneri* (= *alatauica*) should continue to be associated with *M. phoebe* rather than *M. ornata*. However, on close examination of the Wagner's figures (see Figures 6A-B), it is noted that the uppersides and undersides figured are of different specimens (the positions of the antennae do not match); also, the specimen of "*M. phoebe*" figured underside (Figure 6B) shares a remarkable resemblance to the figure of *M. ornata* in Tshikolovets et al. (2016, plate LIII, fig. 2), a specimen from Kazakhstan, Province Aqtöbe, Alimbet, 22-V-2001 (see Figures 7A-B). Unfortunately, the precise locality where Wagner's illustrated specimens were collected is unknown. Thus, although it remains possible that the illustrated specimen of var. *alatauica* is *M. phoebe*, the present author considers that Wagner's 'typical *M. phoebe*' specimen underside, is almost certainly *M. ornata.*

In south-eastern Kazakhstan, populations of *M. ornata* are concentrated along the border with Kyrgyzstan, adjacent to the type locality of *M. ornata adversaria* Korb, Stradomsky & Kuznetsov, 2015, on the northern slopes of the western end of the Tian Shan Mountains. However, there are additional populations to the north, near Zharkent in the Almaty Region, where there is a small concentration of populations of *M. phoebe* (assuming the identifications of the two species were correct [see Tshikolovets et al. 2016, plate LIII]). In the northeast, Tshikolovets et al. (2016, p. 329, map) marked the locality of a specimen of 'uncertain status', which could be a hybrid.

Russian Federation:

Freshly emerged male *M. phoebe* (Figures 8A-B) and two worn females of *M. ornata* were observed on the calcareous hills south of the village of Krasnoznamenka, Orenburgskaya, on 2-VI-2012; thus, indicating the earlier emergence of the latter species (Russell & Tennent, 2022) and the possibility of hybridisation. A male *M. ornata* from the same region is figured for comparison (Figures 9A-B).

Serbia:

M. ornata has been recorded from two localities:
1). Trgovište, Šaprance, near the border of North Macedonia on 31-V-2016 (Popović & Verovnik, 2018, p. 514).

2). Izvor, Mt. Rudina Planina, southeast of Pirot on 12-V-2020 (Vujić et al. 2020).

A group of final instar larvae of *M. phoebe* were observed by the author feeding on *Centaurea grisebachii* (Nyman) Heldr. just to the east of Pirot on 6-VI-2013; further nests of larvae were observed feeding on *C. scabiosa* L. on a sloping meadow to the northeast of Pirot. Thus, *M. phoebe* appears to be common in this area and it would be unsurprising if the two species came into contact with one another.

Slovenia:

A batch of ova obtained from a captured female *M. ornata* from a colony two km northwest of Rakitovec, Koper, 525 m, produced what were, from larval morphological features, adults and biochemical analysis *M. phoebe* adults but they were clearly hybrids (see Figure 5). A female *M. ornata* taken the following year from the same location produced offspring typical of *M. ornata*. Males taken from the colony all appeared to be *M. ornata*. However, within two km of that colony, male *M. phoebe* was captured at the same time as the *M. ornata* female was taken (see Russell et al. 2014).

Spain:

1). Granada, Monachil, 1600 m, and this location *M. phoebe* larvae were observed feeding on *Centaurea ornata* Willd. & *C. boissieri* DC. and *M. ornata* larvae were found on *Onopordium acanthium* L. and *Carduus nutans platypus* (Lange) Greuter (Sánchez Mesa & Muñoz Sariot, 2017).

2). Granada, Beas, 1200 m, *M. phoebe* larvae observed on *Centaurea ornata* Willd. and *M. ornata* larvae feeding on both *Cirsium arvense* (L.) Scop. and *Carduus nutans platypus* (Sánchez Mesa & Muñoz Sariot, 2017).

3). Granada, Güéjar Sierra, *circa* 1100 m, in north-western Sierra Nevada was a locality provided for *M. phoebe* captured on 24-IV and *M. ornata* taken on 11-V, 3-VI (no years given) (Hinojosa et al. 2022, supplementary material pages 2-3).

4). Granada / Almería, Puerto de la Ragua, both *M. phoebe* (Hinojosa et al. 2022 supplementary material, page 3 et Russell & Vives Moreno, 2023) and *M. ornata* (Russell et al. 2020) have been reported from this location.

5). Albacete, Riopar, *M. phoebe* larvae at 1170 m, feeding on *Centaurea ornata* and *M. ornata* larvae at 1300 m feeding on *Cirsium pyrenaicum* (Jacq.) All., *Carduus nutans platypus* and *Onopordum illyricum* L. (Muñoz Sariot & Sánchez Mesa, 2019a).

6). La Sagra was listed as a locality for both *M. phoebe* captured on 21-V and *M. ornata* on 19-23-V (no years given); however, this is a wide area covering 1322 km^2 (Wikipedia, accessed 4-VII-2023), and no definitive locations were mentioned (Hinojosa et al. 2022, supplementary material, pages 2-3).

Discussion

Sánchez Mesa & Muñoz Sariot (2017, p. 317) reported a larva with a black head carapace that proved to be *pseudornata* (= *M. ornata*). It is suggested that this was probably a hybrid between *M. phoebe* and *M. ornata*. Recently *M. ornata* was found to occur in previously unrecorded Spanish Provinces, including Cuenca, Guadalajara, Palencia, Toledo and Zaragoza; *M. ornata* and has now been confirmed from 25 of the 47 Provinces of mainland Spain (Russell & Vives Moreno, 2023). Thus, it is anticipated that further hybrid specimens will be identified in the future from Spain and Albania. It is suspected that the larger numbers of locations with sympatry of these two species reported in Albania and Spain results from intensified fieldwork in the last few years, since *M. ornata* was recognised as a separate species from *M. phoebe*.

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both species from the La Sainte Baume, Var, France taken by S. Bambi. Martin Gascoigne-Pees is thanked for providing photographs of *M. ornata* reared from an egg batch produced by a female captured near Fayence, Var, France in 2008. John Tennent is thanked for his valuable comments on the manuscript, from which it was greatly improved.

Conflict of Interest

The author declares that he has no financial interest or personal relationship that could influence the work presented in this article.

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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

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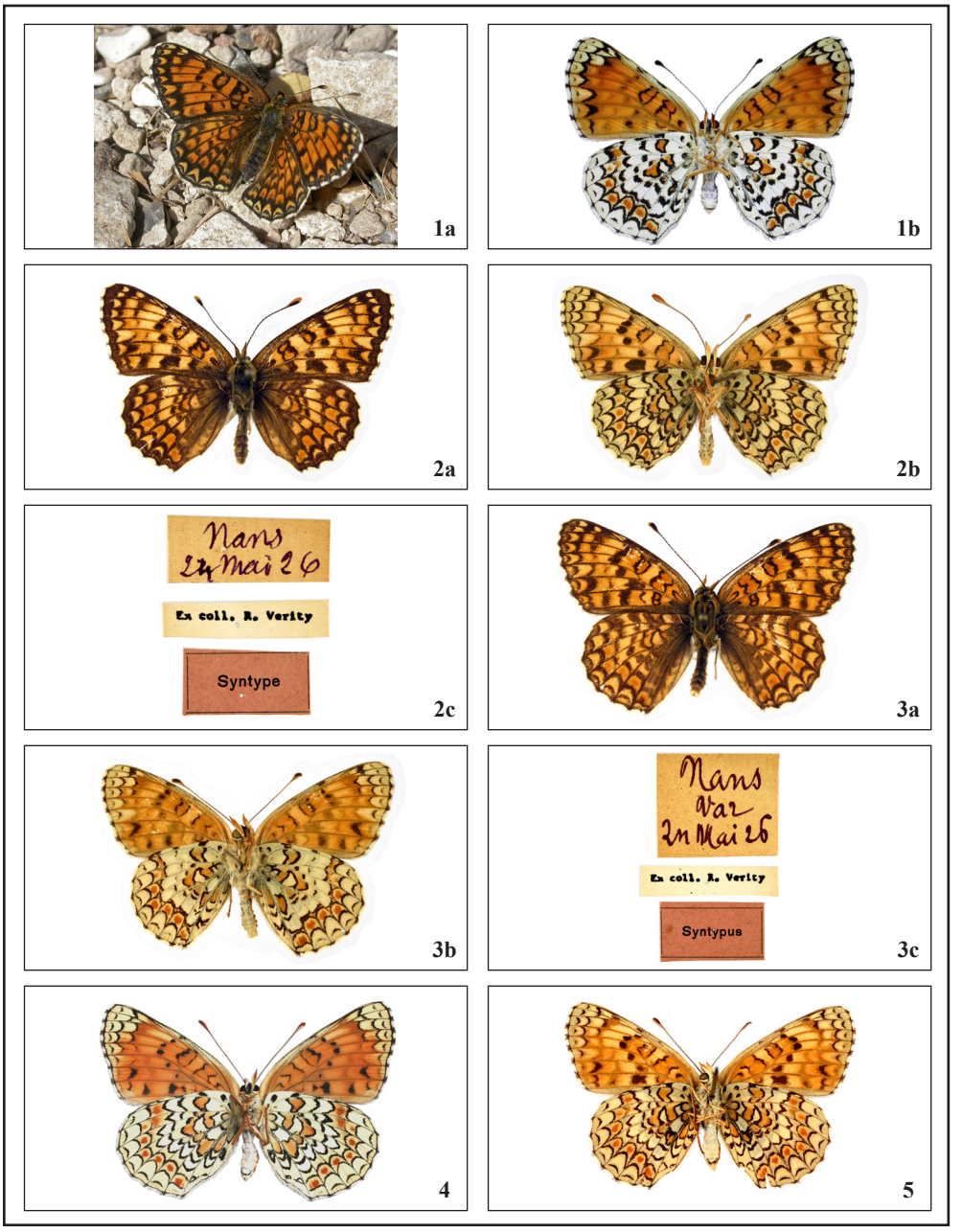
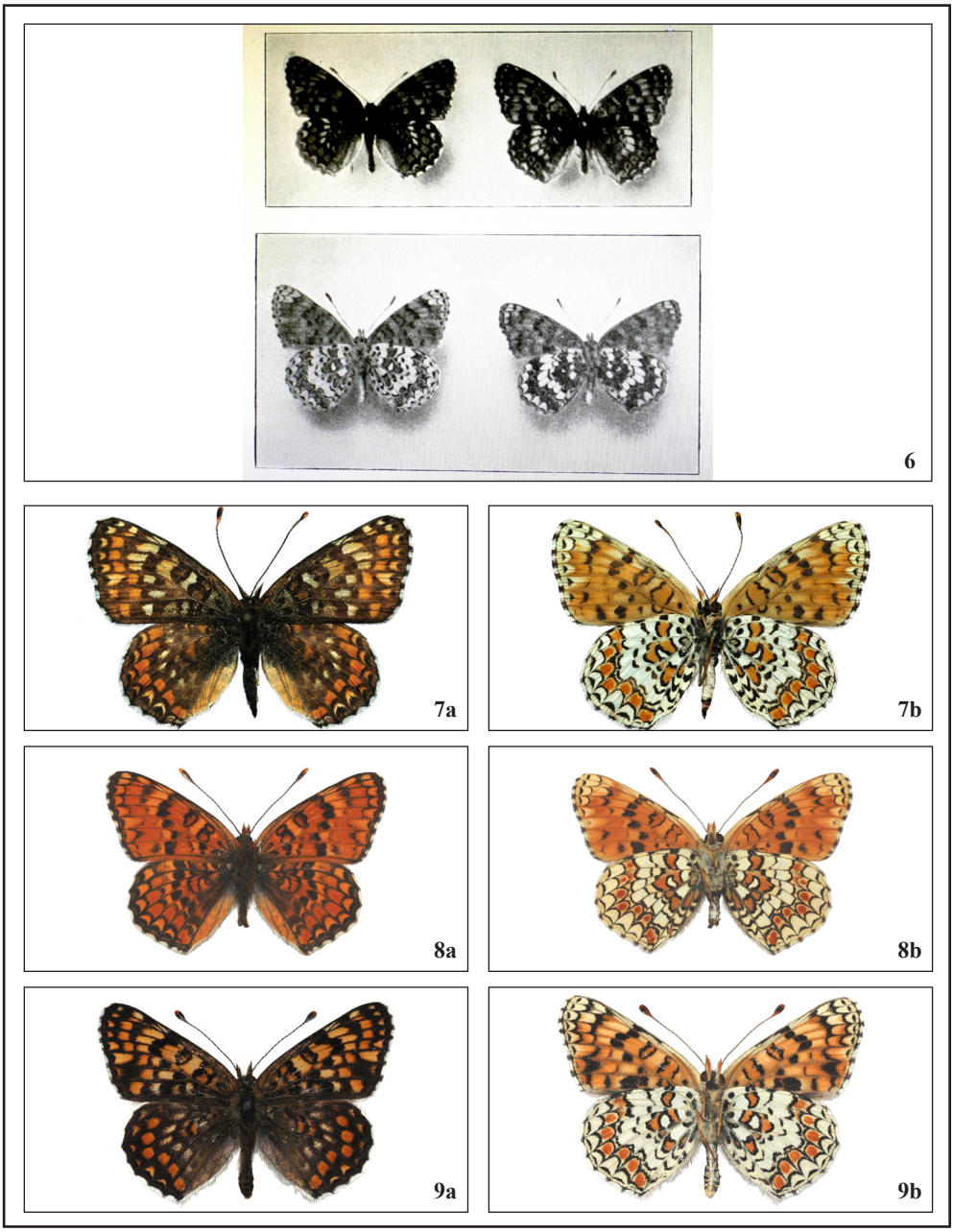
Figures 1-5. 1. *Melitaea ornata* female upperside (A) and underside (B) reared from an egg batch produced by a captive female originating from Fayence, Var, France, emerged IV-2009. © Gascoigne-Pees. **2.** *M. phoebe* male upperside (A), underside (B) and labels on pin (C), Nans, Var, France, 24-V-1926. © S. Bambi. **3.** *M. ornata* male upperside (A), underside (B) and labels on pin (C), Nans, Var, France, 24-V-1926. © S. Bambi. **4.** *M. phoebe / M. ornata* hybrid female underside, reared from egg batch produced by captive *M. ornata* female, Rakitovec, Slovenia, emerged 17-V-2012. © Russell. **5.** Possible *M. phoebe / M. ornata* hybrid female underside, Nans, Var, France, 24-V-1936. © S. Bambi.



Figures 6-9. 6. Screen shot of figures 5 and 6 in Wagner, 1913 (A); detail of the underside of one of the two 'typical *M. phoebe*' specimens in figure 5 from Wagner, 1913 (B). © expired. **7.** *M. ornata* female upperside (A), underside (B), Alimbet, Kazakhstan, 22-V-2001. © Gorbunov. **8.** *M. phoebe* male upperside (A), underside (B), Krasnoznamenka, Orenburgskaya, Russian Federation, 02-VI-2012. © Russell. **9.** *M. ornata* male upperside (A), underside (B), Guberlya, Orenburgskaya, Russian Federation, 18-V-2014. © Russell.



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A preliminary checklist of Papilionoidea fauna of Tehsil Bani, Jammu and Kashmir, India (Insecta: Lepidoptera)

Taslima Sheikh, Wasim Sajad Malik, Sat Paul Pakhru & Muhammad Asghar Hassan

Abstract

Protected areas are pivotal in preserving biodiversity by providing a safe habitat and shielding wildlife from human-induced threats. Establishing additional protected sites like wildlife sanctuaries, biosphere reserves, and national parks significantly mitigates risks to various species, especially endemic and endangered species. Prior to effective management of these protected areas, a comprehensive understanding of regional fauna, particularly the endemic and endangered or vulnerable species and the elements that require preservation is imperative. In this context, an examination of Papilionoidea diversity was conducted in Tehsil Bani including newly established Bani Wildlife Sanctuary over five and a half years, spanning from March 2014 to September 2019. This study revealed a diverse species of fauna within this data-deficient wildlife sanctuary. A five- and half-year study revealed the occurrence of 219 species across six families that includes 26 species listed in the wildlife conservation status in India as per WLP, Act 1972 (Amendment 2022). These species were documented on 40 host plant families. The majority of these were documented on host plant families, Fabaceae (25), Poaceae (19 species) being the most prevalent, followed by Malvaceae (9), Rutaceae (8), Acanthaceae (7), Rhamnaceae (6), Brassicaceae (5), Cannabaceae (5), and Apocynaceae (5), and the additional 31 families hosting less than five species. However, information on host plants is available for 140 species (64%), but 79 species (36 %) were recorded without host plant information from Jammu & Kashmir. In addition to the host plant data, a complete bibliographic reference representing the previously published literature on the Papilionoidea fauna of Jammu & Kashmir has also been incorporated to enhance the comprehensiveness of the checklist.
Keywords: Insecta, Lepidoptera, Papilionoidea, checklist, Tehsil Bani, Bani Wildlife Sanctuary, Kathua, Jammu & Kashmir, India.

Una lista preliminar de la fauna de Papilionoidea del Tehsil Bani, Jammu y Cachemira, India (Insecta: Lepidoptera)

Resumen

Las zonas protegidas son fundamentales para preservar la biodiversidad, ya que proporcionan un hábitat seguro y protegen a la fauna de las amenazas inducidas por el hombre. El establecimiento de nuevos lugares protegidos, como santuarios de vida salvaje, reservas de la biosfera y parques nacionales, mitiga significativamente los riesgos para diversas especies, especialmente las endémicas y en peligro de extinción. Antes de proceder a una gestión eficaz de estas zonas protegidas, es imprescindible conocer a fondo la fauna regional, en particular las especies endémicas y en peligro o vulnerables y los elementos que requieren preservación. En este contexto, se llevó a cabo un examen de la diversidad de Papilionoidea en el Tehsil Bani, incluido el recién creado Santuario de Vida Silvestre de Bani, durante cinco años y medio, desde marzo de

2014 hasta septiembre de 2019. Este estudio reveló una diversa fauna de especies dentro de este santuario de vida silvestre carente de datos. Un estudio de cinco años y medio reveló la presencia de 219 especies de seis familias que incluyen 26 especies incluidas en el estado de conservación de la vida silvestre en la India según el WLP, Ley 1972 (Enmienda 2022). Estas especies se documentaron en 40 familias de plantas hospedadoras. La mayoría de ellas se documentaron en familias de plantas huésped, siendo Fabaceae (25), Poaceae (19 especies) las más prevalentes, seguidas de Malvaceae (9), Rutaceae (8), Acanthaceae (7), Rhamnaceae (6), Brassicaceae (5), Cannabaceae (5) y Apocynaceae (5) y las 31 familias adicionales albergan menos de cinco especies. Sin embargo, se dispone de información sobre plantas hospedadoras para 140 especies (64 %), pero 79 especies (36 %) se registraron sin información sobre plantas hospedadoras en Jammu y Cachemira. Además de los datos sobre plantas hospedadoras, también se ha incorporado una referencia bibliográfica completa que representa la literatura publicada anteriormente sobre la fauna de Papilionoidea de Jammu y Cachemira para aumentar la exhaustividad de la lista de control.
Palabras clave: Insecta, Lepidoptera, Papilionoidea, lista de comprobación, Tehsil Bani, Bani Wildlife Sanctuary, Kathua, Jammu & Kashmir, India.

Introduction

Lepidoptera constitute the second-largest insect order following Coleoptera and stand as one of the most species-rich insect order in India, including more than 1,379 extant described species (Varshney & Smetacek, 2015; Upadhaya et al. 2020; Das et al. 2023). This diversity of Papilionoidea in the country is reflected due to a significant number of global biodiversity hotspots. India, being one of the Mega-biodiverse countries is recognized as one of the top ten most biodiverse countries, constitute a significant number of global biodiversity hotspots (Myers et al. 2000; Balasubramanian, 2017; Singh, 2020). This diversity of Papilionoidea in the country is reflected due to a significant number of global biodiversity hotspots and the following complex factors: holometabolous life cycle, seasonal variations, and diverse range of ecological habitats. It plays a vital role in natural ecosystems, serving as significant pollinators and playing an essential role in the ecological food chain.

Within the Indian Himalaya, there exists a rich diversity of about 1,013 species. When considering subspecies, this diversity expands to encompass 1,249 members, spread across 343 genera and six families. Notably, the Papilionoidea diversity in the Indian Himalaya is significant, constituting a substantial 67% of the total Papilionoidea diversity known throughout the entire country. This underscores the critical role that the Himalayan region plays as a vital habitat, contributing significantly to India's overall biodiversity. In the Jammu and Kashmir Union Territory alone, the latest checklist documents a total of 308 species (Sheikh et al. 2021). Recent papers, such as those by Sheikh et al. (2021), Gupta & Sheikh (2021), Sheikh (2021), Khan & Sheikh (2022), Sheikh & Mishra, (2022), and Sheikh & Hassan (2023a, 2023b) have further added new additions to the Papilionoidea fauna of Jammu and Kashmir, India. As per the available literature on Jammu and Kashmir Rhopalocera fauna, the current total number of species in the Union Territory is 314.

The history of the study of Papilionoidea fauna in the region of Jammu and Kashmir (J&K) can be traced back to the mid-19th century. During that time, Austrian entomologist Vincenz Kollar played a significant role in exploring and describing many new taxa from the region. Kollar's work, published in 1844 and 1848, laid the foundation for the understanding of species in J&K. The British rule on the Indian subcontinent, spanning from 1857 to 1947, saw the active involvement of British entomologists in collecting and studying Papilionoidea in Kashmir. Notable contributors during this period include Lang (1868), Moore (1872, 1875), Holland (1896), and Tytler (1926). After the independence, there was no comprehensive studies on the Papilionoidea fauna from J&K for several decades. However, in the last decade, there has been a renewed interest and effort by local researchers and photographers to explore and document the Papilionoidea fauna in the region. Some of these researchers include Qureshi et al. (2013a, 2013b, 2014), Sharma & Sharma (2017, 2018a, 2018b, 2020), Sheikh (2018), and Sheikh & Parey (2019a, 2019b). These recent studies not only added to the known distribution of Papilionoidea in the Union Territory (UT) of J&K but also resulted in the publication of numerous new records for the region. The works of Sharma & Sharma (2017, 2018a, 2018b), Sheikh (2018), and Sheikh & Parey (2019a, 2019b) have contributed significantly to our understanding of the Papilionoidea diversity in Jammu and Kashmir. All misidentified literature has either been avoided or sorted out in the current study. We have made sure to include only those species in this checklist which are known to

be found in our study area. The aim of this research is to assemble an initial list of Rhopalocera species that could potentially exist within the recently established sanctuary.

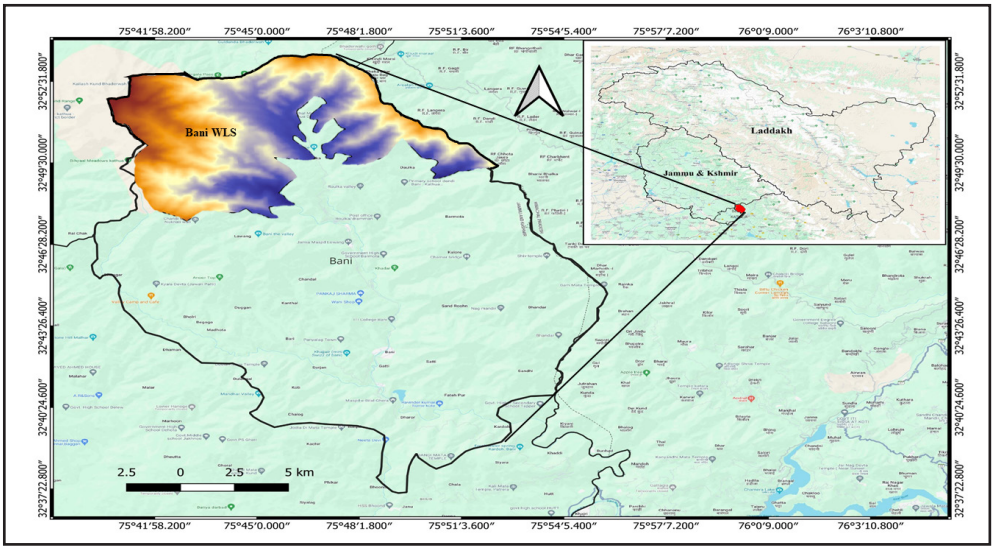
Materials and methods

More than 50 field trips were undertaken during 2014 to 2019 in different seasons to explore the Papilionoidea fauna of Tehsil Bani including Bani Wildlife Sanctuary, Jammu and Kashmir, India. No specimens were killed or collected during these visits; live species were photographed using a NIKON D 3400 Digital SLR camera. Gasse (2018) has been used as baseline work for this study, as he clearly defined the distributional ranges of the Papilionoidea which occur in the UT J&K. Additionally, Tshikolovets (2005) has also being used for understanding the Papilionoidea range in J&K. Furthermore, the current checklist on this species of Jammu and Kashmir (Sheikh et al. 2021) and other recent available literatures: Sheikh & Parey (2019a, b), Parey & Sheikh (2021), Gupta & Sheikh (2021), Singh & Sheikh (2021), Sheikh (2021), Sheikh & Gupta (2022), Khan & Sheikh (2022), Sheikh & Mishra (2022), Sheikh & Mishra (2023), and Sheikh & Hassan (2023a, b) on this species of the region is also consulted to check the distribution in Tehsil Bani. A representative photograph of 21 species in the fields are provided (Figures 2-4).

The following acronyms have been used in this paper are given below:

J&K	Jammu & Kashmir
UT	Union Territory
NP	National Park
BWLS	Bani Wildlife Sanctuary
BGSBU	Baba Ghulam Shah Badshah University
WLS	Wildlife Sanctuary
WPA	Wildlife Protection Act

Figure 1. Map of study area (original map based on QGis with OSM plug in).



Study area

The present study was carried out the Tehsil Bani including Bani Wildlife Sanctuary, Jammu and Kashmir, India (Figure 1). Bani is a small glacial valley nestled amidst towering mountains, situated at an

elevation of 4200 ft. The town of Bani thrives along the banks of the Sewa River. The climate in Bani exhibits characteristics of both temperate and polar climates, marked by harsh winters and moist summers. Covering a total geographical area of 689 hectares, the Bani tehsil is bordered by Kailash-Sarthaldhar to the north (the source of the Sewa River), Himachal Pradesh to the east, Banjal-Chaladhar to the south, and Dhar Mandi-Nooknal to the west. Meanwhile, BWLS is situated between the Chattergala Ridge and Sunbain Glaciers in the northern region, the Jammu and Kashmir and Himachal Pradesh to the northeast, Kunsun Da Naal to the southwest, and a spur originating from Kaplash Kund towards the south, extending up to Nukunwal in the west. This area is favourable to the preservation, propagation, and development of wildlife and its surrounding environment because of its abundant flora and fauna, noteworthy geomorphological features, and natural significance. The designated sanctuary covers an area of 99.6 km^2, situated at an elevation ranging from 1939 to 4293 meters (Farooq et al. 2021). Geographically, it spans from coordinates 32º78'16"N to 32º89'33"N and 75º68'92"E to 75º87'55"E. This area is dominated by major flora like *Pinus roxburghii* Sarg., *Cedrus deodara* (Roxb.) G. Don, *Senegalia catechu* (L.f.) P.J.H. Hurter & Mabb., *Ficus carica* L., *Juglans regia* L., *Robinia pseudoacacia* L., *Alnus nitida* (Spach) Endl., *Aegle marmelos* (L.) Corrêa, *Albizia lebbeck* (L.) Benth., *Ziziphus jujuba* Mill., *Azadirachta indica* A. Juss., *Bambusa bambos* (L.) Voss, *Carissa spinarum* L., *Dodonaea viscosa* Jacq., and *Lantana camara* L. There are 33 villages in Tehsil Bani, and all have rich and rare flora and ultimately that rare flora attracts rare fauna with it like butterflies, birds etc. Almost all these areas in this sanctuary receives snowfall and thus these areas are classified as temperate region.

Results

As a result of the present study, a preliminary checklist of 219 species under 127 genera in six families are provided in the Tehsil Bani including Bani Wildlife Sanctuary, Jammu & Kashmir, India: Nymphalidae (9 subfamilies, 46 genera, 86 species), Lycaenidae (4 subfamilies, 35 genera, 59 species), Hesperiidae (4 subfamilies, 25 genera, 36 species), Papilionidae (2 subfamilies, 6 genera, 14 species), Pieridae (2 subfamilies, 11 genera, 21 species), and Riodinidae (1 subfamily, 1 genus, 3 species). Out of 219 species, 80 species are found in BWLS (Table 1).

Taxonomy

Family Hesperiidae Latreille, 1809
Subfamily Coeliadinae Evans, 1937

Genus *Burara* Swinhoe, 1893

Burara oedipodea belesis (Mabille, 1876)

Distribution in Jammu & Kashmir: Jalandhar (Muradpur), Rajouri (Sharma & Sharma, 2020), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Hasora* Moore, [1881]

Hasora chromus (Cramer, [1780])

Distribution in Jammu & Kashmir: Jammu (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Badamia* Moore, [1881]

Badamia exclamationis (Fabricius, 1775)

Distribution in Jammu & Kashmir: Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Choaspes* Moore, [1881]

Choaspes xanthopogon (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Kathua (Bani & BWLS) (present study).

Choaspes benjaminii japonicus Murray, 1875

Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Kathua (Bani), (Sheikh & Hassan, 2023), Kathua (Bani & BWLS) (present study).

Subfamily Eudaminae Mabille, 1877

Genus *Lobocla* Moore, 1884

Lobocla liliana ignatius (Ploetz, 1882)

Distribution in Jammu & Kashmir: Kashmir (Swinhoe, 1912), Kathua (Bani & BWLS) (present study).

Subfamily Pyrginae Burmeister, 1878
Tribe Celaenorrhinini Swinhoe, 1912

Genus *Celaenorrhinus* Hübner, [1819]

Celaenorrhinus leucocera (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015), Ramban (Batote) (Kunte et al. 2024), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Celaenorrhinus munda (Moore, 1884)

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015), Kathua (BANI) (present study).

Celaenorrhinus dhanada (Moore, 1865)

Distribution in Jammu & Kashmir: Ramban (Batote) (Kunte et al. 2024), Rajouri, Ramban, Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Sarangesa* Moore, [1881]

Sarangesa dasahara (Moore, [1866])

Distribution in Jammu & Kashmir: Kathua (Jasrota) (Kunte et al. 2024), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Sarangesa purendra Moore, 1882

Distribution in Jammu & Kashmir: Kathua (Billawar) (Gupta & Sheikh, 2021, Kathua (BANI) (present study).

Genus *Pseudocoladenia* Shirozu & Saigusa, 1962

Pseudocoladenia fatih (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Ramban (Batote) (Kunte et al. 2024), Rajouri, Ramban, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Coladenia* Moore, [1881]

Coladenia indrani (Moore, [1866])

Distribution in Jammu & Kashmir: Kathua (Jasrota WLS) (Kunte et al. 2024), Rajouri, Ramban, Kathua

(Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Tagiadini Mabille, 1878

Genus *Seseria* Matsumura, 1919

Seseria dohertyi Watson, 1893
Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Kathua (Bani & BWLS) (present study).

Genus *Tagiades* Hübner, [1819]

Tagiades menaka (Moore, [1866])
Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Jammu (Chatha, Manda, Raika) (Sheikh, 2018), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tagiades cohaerens cynthia Evans, 1934
Distribution in Jammu & Kashmir: Doda (Bhaderwah) (Kunte et al. 2024), Kathua (BANI) (present study).

Genus *Odontoptilum* de Niceville, 1890

Odontoptilum angulata angulatum (Felder, 1862)
Distribution in Jammu & Kashmir: Jammu (Sunjwan) (Sheikh, 2022), Kathua (BANI) (present study).

Tribe Carcharodini Verity, 1940

Genus *Carcharodus* Hübner, [1819]

Carcharodus alceae gooraisa Evans, 1949
Distribution in Jammu & Kashmir: Kashmir (Goorais) (Evans, 1949), Doda (Bhaderwah) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Genus *Spialia* Swinhoe, [1912]

Spialia galba (Fabricius, 1793)
Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Jammu (Sunjwan), Rajouri (Chingus) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Pyrgini Burmeister, 1878

Genus *Pyrgus* Hübner, [1819]

Pyrgus cashmirensis Moore, 1874
Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kathua (Bani & BWLS) (present study).

Subfamily Hesperiinae Letreille, 1809
Tribe Aeromachini Tutt, 1906

Genus *Aeromachus* de Niceville, 1890

Aeromachus stigmatus (Moore, 1878)

Distribution in Jammu & Kashmir*:* Kashmir (Varshney & Smetacek, 2015), Kathua (Bani & BWLS) (present study).

Genus *Actinor* Watson, 1893

Actinor radians (Moore, 1878)

Distribution in Jammu & Kashmir: J&K (Varshney & Smetacek, 2015), Kathua (Bani & BWLS) (present study).

Genus *Udaspes* Moore, [1881]

Udaspes folus (Cramer, [1775])

Distribution in Jammu & Kashmir: Rajouri (BGSBU) (Sheikh & Parey, 2019b), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Suastus* Moore, [1881]

Suastus gremius (Fabricius, 1798)

Distribution in Jammu & Kashmir: Jammu (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Taractrocerini Voss, 1952

Genus *Taractocera* Butler, [1870]

Taractrocera maevius sagara (Moore, [1866])

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Taractrocera danna (Moore, 1865)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Kathua (BANI) (present study).

Genus *Potanthus* Scudder, 1872

Potanthus pseudomaesa clio (Evans, 1932)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Kathua (BANI) (present study).

Potanthus dara (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Mabille, 1909), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Baorini Doherty, 1886

Genus *Parnara* Moore, [1881]

Parnara guttatus mangala (Moore, [1866])

Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Parnara bada (Moore, 1878)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Jammu (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Borbo* Evans, 1949

Borbo cinnara (Wallace, 1866)

Distribution in Jammu & Kashmir: Jammu (Samba, Manda, Raika) (Sheikh, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Borbo bevani (Moore, 1878)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Pelopidas* Walker, 1870

Pelopidas mathias (Fabricius, 1798)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1949), Jammu (Kunte et al. 2024), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Pelopidas sinensis (Mabille, 1877)

Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Polytremis* Mabille, 1904

Polytremis discreta (Elwes & Edwards, 1897)

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015), Kathua (BANI) (present study).

Polytremis eltola (Hewitson, 1869)

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015), Jammu (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Family Papilionidae Latreille, [1802]
Subfamily Parnassiinae Swainson, 1840
Tribe Parnassiini Swainson, 1840

Genus *Parnassius* Latreille, 1804

Parnassius hardwickii Gray, 1831

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kashmir (Zojila Pass, Pir Panjal, Sham Chalsi) (Eisner, 1958), Kashmir (Zoji-La) (Sakai et al. 2002), Doda (Bhaderwah) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Subfamily Papilioninae Latreille, [1802]
Tribe Troidini Ford, 1944

Genus *Pachliopta* Reakirt, [1865]

Pachliopta aristolochiae (Fabricius, 1775)

Distribution in Jammu & Kashmir: Kathua (Bani) (Sheikh et al. 2021), Kathua (BANI) (present study).

Genus *Byasa* Moore, 1882

Byasa polyeuctes letincius (Fruhstorfer, 1908)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Doda (Bhaderwah) (Baidya & Karmakar, 2020), Ramban (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2021), Kathua (Bani & BWLS) (present study).

Byasa dasarada ravana (Moore, 1858)

Distribution in Jammu & Kashmir: Kashmir (Talbot, 1939), Kathua (Bani) (Kunte et al. 2024), Ramban (Sheikh et al. 2021), Jammu, Rajouri, Doda, Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Tribe Papilionini Latreille, [1802]

Genus *Papilio* Linnaeus, 1758

Papilio polyctor Boisduval, 1836

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Samba, Udhampur (Ramnagar), Rajouri (Sheikh, 2018), Kathua (Bani), Udhampur (Mantalai) (Kunte et al. 2024), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Papilio arcturus arius Rothschild, 1908

Distribution in Jammu & Kashmir: Kashmir (Evans, 1932), Rajouri, Poonch, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Papilio protenor euprotenor Fruhstorfer, 1908

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Doda, Kathua (Bani) (Karmakar, 2023), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2021), Kathua (BANI) (present study).

Papilio polytes romulus Cramer, [1775]

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kathua (Bani), Doda, Jammu (Raika), Doda (Bhaderwah), Kathua (Jasrota) (Sheikh, 2018), Jammu, Rajouri (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2021), Kathua (BANI) (present study).

Papilio demoleus Linnaeus, 1758

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kathua (Bani), Doda, Jammu (Raika) (Sheikh, 2018), Jasrota WLS, Kathua (Kunte et al. 2024), Jammu, Rajouri (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2021), Kathua (BANI) (present study).

Papilio machaon asiatica Menetries, 1855

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kashmir (Goorias valley) (South, 1902), Doda (Kunte et al. 2024), Rajouri (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Chilasa* Moore, 1881

Chilasa agestor govindra (Moore, 1864)

Distribution in Jammu & Kashmir: Kashmir (Bingham, 1907), Kathua (Bani) (Sheikh & Mishra, 2023a), Kathua (Bani & BWLS) (present study).

Chilasa clytia (Linnaeus, 1758)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Jammu (Sharma & Sharma, 2017b), Samba, Jammu (Manda, Raika), Kathua (Bani) (Sheikh, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2021), Kathua (BANI) (present study).

Tribe Leptocircini Kirby, 1896

Genus *Graphium* Scopoli, 1777

Graphium cloanthus (Westwood, 1841)
Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kathua (Bani) (Kunte et al. 2024), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2021), Kathua (Bani & BWLS) (present study).

Graphium sarpedon sirkari Page & Treadaway, 2013
Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Samba, Kathua (Jasrota, Bani, Billawar) (Sheikh, 2018), Jammu (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2021), Kathua (BANI) (present study).

Family Pieridae Swaison, [1820]
Subfamily Pierinae Swainson, [1820]
Tribe Pierini Swainson, [1820]

Genus *Aporia* Hübner, [1819]

Aporia agathon phryxe (Boisduval, [1836])
Distribution in Jammu & Kashmir: Kashmir (Evans, 1932), Kathua (Bani & BWLS) (present study).

Genus *Pieris* Schrank, 1801

Pieris brassicae nepalensis Gray, 1846
Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kashmir (Northeast) (Tshikolovets, 2005), Srinagar (Dal Lake) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Pieris canidia indica Evans, 1926
Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kashmir (Sonamarg) (Tshikolovets, 2005), Samba, Jammu (Manda, Raika), Doda (Bhaderwah), Kathua (Bani) (Sheikh, 2018), Anantnag (Pahalgam), Srinagar (Dal Lake) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Pieris rapae (Linnaeus, 1758)
Distribution in Jammu & Kashmir: Kashmir (South, 1902), Kashmir, Rajouri (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Pieris ajaka Moore, 1865
Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Bandipora (Goorais valley) (South, 1902), Rajouri (BGSBU) Doda, Rajouri, Kashmir (Sheikh et al. 2021), Kathua (Bani & BWLS) (present study).

Genus *Pontia* Fabricius, 1807

Pontia daplidice moorei (Roeber, [1907])
Distribution in Jammu & Kashmir: Kashmir (Lang, 1868; Moore, 1874; Holland, 1896; Rober, 1907; Antram, 1924; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kashmir (Goorais valley), Rajouri (South, 1902), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Ganderbal, Doda, Srinagar, Anantnag (Kunte

et al. 2024). Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Belenois* Hübner, [1819]

Belenois aurota (Fabricius, 1793)

Distribution in Jammu & Kashmir: Kashmir (Bingham, 1907), Samba, Jammu (Chatha, Raika) (Sheikh, 2018), Doda (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Cepora* Billberg, 1820

Cepora nerissa phryne (Fabricius, 1775)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Rajouri (Akhnoor), Jammu (Manda, Chatha) (Sheikh, 2018), Jammu (Kunte et al. 2024), Jammu, Rajouri (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Delias* Hübner, [1819]

Delias sanaca (Moore, 1857)

Distribution in Jammu & Kashmir: Kashmir (Kehimkar, 2016), Ramban (Banihal pass) (Roberts, 2001), Kathua (Bani & BWLS) (present study).

Delias belladonna horsfieldi (Gray, 1831)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Anantnag (Amarnath) (Mitis, 1893), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Reasi (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Euchloeini Klots, 1930

Genus *Euchloe* Hübner, [1819]

Euchloe daphalis (Moore, 1865)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Bandipora (Goorais valley) (South, 1902), Kathua (Bani & BWLS) (present study).

Subfamily Coliadinae Swainson, [1821]

Genus *Catopsilia* Hübner, [1819]

Catopsilia pyranthe (Linnaeus, 1758)

Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Jammu (Manda, Chatha, Raika) (Sheikh, 2018), Jammu, Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Catopsilia pomona (Fabricius, 1775)

Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Samba, Jammu (Manda, Raika), Kathua (Sheikh, 2018), Doda (Kunte et al. 2024), Jammu, Rajouri (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Gonepteryx* Leach, [1815]

Gonepteryx nepalensis Doubleday, 1847

Distribution in Jammu & Kashmir: Kashmir (Holland, 1896), Kashmir (Goolmurg) (Lang, 1868), Doda (Kunte et al. 2024), Rajouri (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Gonepteryx mahaguru Gistel, 1857

Distribution in Jammu & Kashmir: Kashmir (Evans, 1927), Rajouri Kathua (Bani & BWLS) (present study).

Genus *Eurema* Hübner, [1819]

Eurema laeta (Boisduval, 1836)

Distribution in Jammu & Kashmir: Kashmir (Fruhstorfer, 1910c), Samba, Jammu (Manda, Raika) (Sheikh, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Eurema drona (Horsfield, 1829)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Rajouri (South, 1902), Rajouri, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Eurema hecabe (Linnaeus, 1758)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Rajouri (Moore, 1906), Samba, Jammu (Manda, Raika) (Sheikh, 2018), Doda (Kunte et al. 2024), Jammu (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Colias* Fabricius, 1807

Colias erate lativitta Moore, 1882

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Bandipora (Goorais valley) (South, 1902), Doda (Kunte et al. 2024), Rajouri (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Colias fieldii Menetries, 1855

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Ganderbal (Sonamarg-Srinagar Road) (Tshikolovets, 2005), Doda, Anantnag (Pahalgam), Baramula (Gulmarg) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Colias eogene C. & R. Felder, 1865

Distribution in Jammu & Kashmir: Kashmir (Bingham, 1907, Gasse, 2018), Kishtwar (Gumri, Zoji-La pass vicinity) (Tshikolovets, 2005), Kathua (Bani & BWLS) (present study).

Family Lycaenidae Leach, [1815]
Subfamily Polyommatinae Swainson, 1827
Tribe Polyommatini Swainson, 1827

Genus *Prosotas* Druce, 1891

Prosotas nora ardates (Moore, [1875])

Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Poonch (Moore, 1875), Samba, Jammu (Manda, Mubarakmandi) (Sheikh, 2018), Jammu (Environmental Park Raika) (Kunte et al. 2024), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Catochrysops* Boisduval, 1832

Catochrysops strabo (Fabricius, 1793)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1923), Samba, Jammu (Manda) (Sheikh, 2018), Jammu (Environmental Park Raika), Doda (Bhaderwah) (Bhakre, 2020b), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Lampides* Hübner, [1819]

Lampides boeticus (Linnaeus, 1767)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), 3 km W. Zoji La pass (Tshikolovets, 2005), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Doda (Bhaderwah), Srinagar (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Leptotes* Scudder, 1876

Leptotes plinius (Fabricius, 1793)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909), Samba, Kathua (Bani) (Sheikh, 2018), Jammu (Environmental park Raika), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Zizeeria* Chapman, 1910

Zizeeria karsandra (Moore, 1865)

Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Samba, Jammu (Manda, Raika) (Sheikh, 2018), Anantnag (Pahalgam) (Kunte et al. 2024), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Pseudozizeeria* Beuret, 1955

Pseudozizeeria maha (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1890; Seitz, 1909; Varshney & Smetacek, 2015; Gasse, 2018), Samba, Jammu (Manda, Raika), Doda (Sheikh, 2018), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Zizina* Chapman 1910

Zizina otis indica (Murray, 1874)

Distribution in Jammu & Kashmir: Jammu (Sunjwan, Environmenal park Raika), Rajouri (BGSBU) (Sheikh et al. 2021), Jammu, Rajouri (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Zizula* Chapman, 1910

Zizula hylax (Fabricius, 1775)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909; Smith, 1994), Jammu (Manda, Raika,

Chatha), Kathua (Jasrota), (Sheikh, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Tarucus* Moore, [1881]

Tarucus indica Evans, 1932

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909; D'Abrera, 1993), Srinagar (Nishat gardens) (Gasse, 2018), Kathua (BANI) (present study).

Tarucus callinara Butler, 1886

Distribution in Jammu & Kashmir: Kashmir (Evans, 1955; Gasse, 2018; Basu et al. 2019), Kathua (BANI) (present study).

Tarucus venosus Moore, 1882

Distribution in Jammu & Kashmir: Kashmir (Evans, 1955; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018; Basu et al. 2019), Rajouri (South, 1902), Srinagar (Shankaracharya temple road), Rajouri (BGSBU) (Kunte et al. 2024), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tarucus hazara Evans, 1932

Distribution in Jammu & Kashmir: Kashmir (Evans, 1955; Varshney & Smetacek, 2015; Gasse, 2018; Basu et al. 2019), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Kathua (BANI) (present study).

Genus *Everes* Hübner, [1819]

Everes huegelii (Gistel, 1857)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Seitz, 1923; Evans, 1925; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Srinagar (Shankaracharya temple road), Anantnag (Pahalgam), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Everes lacturnus assamica Tytler, 1915

Distribution in Jammu & Kashmir: Rajouri (BGSBU) (Sheikh & Parey, 2019b), Jammu (Sunjwan) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Azanus* Moore, [1881]

Azanus ubaldus (Stoll, [1782])

Distribution in Jammu & Kashmir: Jammu (Sunjwan) (Sheikh et al. 2021), Rajouri, Jammu, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Azanus uranus Butler, 1886

Distribution in Jammu & Kashmir: Jammu (Sunjwan) (Sheikh et al. 2021), Rajouri, Jammu, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Celastrina* Tutt, 1906

Celastrina argiolus kollari (Westwood, [1852])

Distribution in Jammu & Kashmir: Kashmir (Kollar, 1844; Moore, 1874; de Niceville, 1890; Bingham, 1907; Varshney & Smetacek 2015; Kehimkar, 2016; Gasse, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Celastrina gigas (Hemming, 1928)

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek 2015; Kehimkar, 2016; Gasse, 2018), Kathua (BANI) (present study).

Celastrina huegelii (Moore, 1882)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909; Evans 1912; Wynterblyth, 1957; Varshney & Smetacek 2015; Kehimkar, 2016; Gasse, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Acytolepis* Toxopeus, 1927

Acytolepis puspa gisca (Fruhstorfer, 1910)

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Samba, Jammu (Manda, Raika) (Sheikh, 2018), Jammu (Environmental park Raika) (Kunte et al. 2024), Rajouri (Chingus) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Oreolyce* Toxopeus, 1927

Oreolyce vardhana (Moore, [1875])

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909; Evans, 1927; Peile, 1937; Wynterblyth, 1957; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kathua (Bani & BWLS) (present study).

Genus *Euchrysops* Butler, 1900

Euchrysops cnejus (Fabricius, 1798)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909), Jammu (Environment park Raika) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Polyommatus* Latreille, 1804

Polyommatus pseuderos Moore, 1879

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909; Evans, 1925; Bollow, 1930; D'Abrera, 1993; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Anantnag (Pahalgam) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Polyommatus ariana Moore, 1865

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1890; Holland, 1896; Varshney & Smetacek, 2015; Gasse, 2018), Anantnag (Pahalgam), Bandipora (Gurais valley) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Genus *Aricia* Reichenbach, 1817

Aricia agestis nazira (Moore, 1865)

Distribution in Jammu & Kashmir: Kashmir (de Niceville, 1890; Holland, 1896; Bingham, 1907; Swinhoe, 1910; Seitz, 1923; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Bandipora (Goorais valley), Rajouri (Dana) (South, 1902), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Srinagar (Dachigam N.P.)) (Qureshi et al. 2014), Srinagar (Shankaracharya temple road), Anantnag (Pahalgam), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Pamiria* Zhdanko, 1995

Pamiria omphisa (Moore, [1875])

Distribution in Jammu & Kashmir: Kashmir (Holland, 1896; Seitz, 1909; Evans, 1927; Kehimkar, 2016; Gasse, 2018), Kathua (Bani & BWLS) (present study).

Pamiria galathea (Blanchard, [1844])

Distribution in Jammu & Kashmir: Kashmir (Blanchard, 1844; Holland, 1896; Swinhoe 1910; Evans, 1925; Mani, 1986; Smith, 1994), Baramulla (Goolmurg) (Lang, 1868), Kathua (BANI) (present study).

Genus *Freyeria* Courvoisier, 1920

Freyeria putli (Kollar, [1844])

Distribution in Jammu & Kashmir: Jammu (Chatha) (Sheikh et al. 2021), Rajouri, Jammu (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Luthrodes* Druce, 1895

Luthrodes pandava (Horsefield, [1828])

Distribution in Jammu & Kashmir:Kathua (Jasrota), Jammu (Kachi Chawni) (Sheikh, 2018), Jammu (Environmental park Raika) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Chilades* Moore, 1881

Chilades parrhasius (Fabricius, 1793)

Distribution in Jammu & Kashmir: Kathua (Bani) (Sheikh & Hassan, 2023), Kathua (BANI) (present study).

Chilades lajus (Stoll, [1780])

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909), Samba, Jammu (Manda, Raika, Kachi Chawni) (Sheikh, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Subfamily Lycaeninae Leach, [1815]
Tribe Lycaenini Leach, [1815]

Genus *Lycaena* Fabricius, 1807

Lycaena panava (Westwood, 1852)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1890; Evans, 1932; Wynterblyth, 1957; D'Abrera, 1993; Varshney & Smetacek, 2015; Gasse, 2018), Kathua (Bani), (Sheikh & Gupta, 2022), (Bani & BWLS) (present study).

Lycaena phlaeas baralacha (Moore, 1884)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Holland, 1896; Evans, 1932; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Bandipor (Goorais valley) (Ford, 1924), Kishtwar (Gumri, Zoji La pass vicinity) (Tshikolovets, 2005), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Anantnag (Pahalgam), Baramula (Gulmarg), Doda (Bhaderwah, Mathola) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Kathua, Doda, Kashmir Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Lycaena kasyapa (Moore, 1865)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1923; Peile, 1937; D'Abrera, 1993; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Ganderbal (Sonamurg) (Moore, 1874), Kishtwar (Gumri) (Zoji La pass vicinity) (Tshikolovets, 2005), Kishtwar (Paddar), Baramula (Gulmarg) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Genus *Heliophorus* Geyer, [1832] in Hübner

Heliophorus sena (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909; D'Abrera, 1993; Gasse, 2018), Udhampur (Chenani), Srinagar (Shankaracharya temple road), Anantnag (Pahalgam), Doda (Bhaderwah), Kathua (Bani), Rajouri (BGSBU) (Kunte et al. 2024), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Heliophorus bakeri (Evans, 1927)

Distribution in Jammu & Kashmir: Kashmir (Swinhoe, 1911; D'Abrera, 1993; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Bandipora (Goorais valley) (Riley, 1929), Doda (Bhaderwah) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Heliophorus oda (Hewitson, 1865)

Distribution in Jammu & Kashmir: Kishtwar (Marwah) (Sharma & Sharma, 2018a), Kathua (Bani & BWLS) (present study).

Heliophorus moorei coruscans (Moore, 1882)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1932; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kathua (Bani), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Doda, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Subfamily Aphnaeinae Distant, 1884

Genus *Cigaritis* Donzel, 1847

Cigaritis vulcanus (Fabricius, 1775)

Distribution in Jammu & Kashmir: Kashmir (Kollar, 1848), Jammu (Sunjwan, Environmental park Raika,) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Cigariis ictis (Hewitson, 1865)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Jammu (Environmental park Raika) (Sheikh & Parey, 2019a) Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Subfamily Theclinae Swainson, [1830]
Tribe Theclini Swainson, [1830]

Genus *Chaetoprocta* de Niceville, 1890

Chaetoprocta odata (Hewitson, 1865)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Kehimkar, 2016; Gasse, 2018), Ganderbal (Sind valley, Mohanmerg), (Forster, 1980), Kishtwar (Paddar), Doda (Bhaderwah), Anantnag (Pahalgam) (Kunte et al. 2024), Rajouri, Kathua, Doda(Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Euaspa* Moore, 1884

Euaspa milionia (Hewitson, [1869])

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1926; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kathua (Bani & BWLS) (present study).

Euaspa ziha (Hewitson, 1865)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1926; Kehimkar, 2016), Kathua (BANI) (present study).

Genus *Esakiozephyrus* Shirozu & Yamamoto, 1956

Esakiozephyrus icana (Moore, [1875])

Distribution in Jammu & Kashmir: Doda (Sunbain) (Kunte et al. 2024), Kathua (BANI) (present study).

Genus *Chrysozephyrus* Shirozu & Yamamoto, 1956

Chrysozephyrus syla (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909), Varshney & Smetacek, 2015, Kehimkar, 2016, Gasse, 2018), Doda (Sunbain) (Kunte et al. 2024), Kathua (Sarthal, Bani), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Kathua, Doda (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Thermozephyrus* Inomata & Itagaki, 1986

Thermozephyrus ataxus (Westwood, 1851)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909; Varshney & Smetacek, 2015; Gasse, 2018), Kathua (Bani & BWLS) (present study).

Tribe Arhopalini Bingham, 1907

Genus *Arhopala* Boisduval, 1832

Arhopala atrax (Hewitson, 1862)

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015; Smetacek, 2018; Gasse, 2018), Kathua (BANI) (present study).

Arhopala amantes apella (Swinhoe, 1887)

Distribution in Jammu & Kashmir: Samba, Udhampur (Ramnagar), Doda (Sheikh, 2018), Jammu (Mahamaya Forest), (Sheikh & Parey, 2019b), Kathua (BANI) (present study).

Arhopala rama (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Seitz, 1909; Evans, 1932; Peile, 1937; Wynterblyth, 1957; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kathua (BANI) (present study).

Arhopala dodonea (Moore, [185)

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1909; Peile, 1937; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Doda (Khelani) (Kumar, 2020), Kathua (BANI) (present study).

Arhopala ganesa (Moore, [1858])

Distribution in Jammu & Kashmir: Kashmir (de Niceville, 1890; Seitz, 1909; Swinhoe, 1911; D'Abrera, 1993; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Doda (Bhaderwah) (Kunte et al. 2024), Kathua (BANI) (present study).

Tribe Amblypodiini Doherty, 1829

Genus *Iraota* Moore, [1881]

Iraota timoleon (Stoll, [1790])

Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Jammu (Government Gandhi memorial science college) (Sharma & Sharma, 2018a), Rajouri (Bal Jarallan) (Kunte et al. 2024), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Horagini Cowan, 1966

Genus *Horaga* Moore, 1881

Horaga onyx (Moore, 1858)

Distribution in Jammu & Kashmir: Samba, Mubarakmandi, Doda (Sheikh, 2018), Rajouri (Bhambla), Jammu (Environmental park Raika, Government Gandhi memorial science college) (Sharma & Sharma, 2018a) Jammu (University of Jammu, Kalidhar forest) (Kunte et al. 2024), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Deudorigini Doherty, 1886

Genus *Deudorix* Hewitson, 1863

Deudorix epijarbas ancus Fruhstorfer, 1912

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; De Niceville, 1890; Varshney & Smetacek, 2015; Gasse, 2018), Rajouri, Kashmir (South, 1902), Samba, Jammu (Manda, Raika) (Sheikh, 2018), Jammu (Kalidhar) (Kunte et al. 2024), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Rapala* Moore, [1881]

Rapala manea schistacea (Moore, 1879)

Distribution in Jammu & Kashmir: Samba, Jammu (Manda, Raika) (Sheikh, 2018), Jammu (Environmental park Raika) (Kunte et al. 2024), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Rapala iarbus sorya (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1908c; Varshney & Smetacek, 2015; Gasse, 2018), Samba, Jammu (Manda), Doda (Sheikh, 2018), Jammu (Environmental park Raika), Udhampur (Manwal) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Jammu, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Rapala nissa (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1908c; Evans, 1932; Peile, 1937; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kashmir (South, 1902), Kupwara (Qureshi et al. 2013), Kathua (Bani & BWLS) (present study).

Rapala selira (Moore, 1874)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Seitz, 1908c; Swinhoe, 1911; Evans, 1927; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Doda (Bhaderwah) (Kunte et al. 2024), Udhampur, Rajouri, Poonch, Doda, Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Tribe Eumaeini Doubleday, 1847

Genus *Satyrium* Scudder, 1876

Satyrium deria (Moore, 1865)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1890; Holland, 1896; Seitz, 1908c; D'Abrera, 1993; Varshney & Smetacek, 2015; Gasse, 2018), Kishtwar (Paddar) (Sondhi, 2020), Udhampur, Rajouri, Poonch, Doda (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Family Riodinidae Grote, 1895
Subfamily Riodininae Grote, 1895
Tribe Hamearini Tutt, [1906]

Genus *Dodona* Hewitson, 1861

Dodona durga (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1886; Bigham, 1905; Seitz, 1908c; Antram, 1924; Evans, 1932; D'Abrera, 1993; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Udhampur, Rajouri, Poonch, Doda, Kathua, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Dodona dipoea nostia Fruhstorfer, 1912

Distribution in Jammu & Kashmir: Kashmir (Fruhstorfer, 1914; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Dodona eugenes Bates, [1868]

Distribution in Jammu & Kashmir: Kashmir (Moore, 1901; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Doda (Khelani) (Kunte et al. 2024), Rajouri, Doda (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Family Nymphalidae Rafinesque, 1815
Subfamily Libytheinae Boisduval, [1833]

Genus *Libythea* Fabricius, 1807

Libythea lepita Moore, [1858]

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Seitz, 1908c; Evans, 1932; Peile, 1937; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Doda (Bhaderwah), Rajouri (BGSBU) (Kunte et al. 2024), Rajouri, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Libythea myrrha sanguinalis Fruhstorfer, 1898

Distribution in Jammu & Kashmir: Kashmir (Moore, 1901; Seitz, 1908c; Fruhstorfer, 1914; Gasse, 2018), Rajouri (Bal Jarallan) (Kunte et al. 2024), Rajouri, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Subfamily Danainae Boisduval, [1833]
Tribe Danaini Boisduval, [1833]

Genus *Parantica* Moore, [1880]

Parantica aglea melanoides Moore, 1883

Distribution in Jammu & Kashmir: Kashmir (Moore, 1890; Bingham, 1905; Evans, 1932; Talbot, 1947; Varshney & Smetacek, 2015; Gasse, 2018), Doda, Kathua (Jasrota WLS) (Kunte et al. 2024), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Parantica sita (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Bingham, 1905; Evans, 1932; Talbot, 1947; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Doda (Bhaderwah) (Kunte et al. 2024), Kathua (Sarthal village, Bani), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Tirumala* Moore, [1880]

Tirumala limniace exotica (Gmelin, 1790)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Holland, 1896; Seitz, 1907a; Gasse, 2018), Rajouri (South, 1902), Samba, Jammu (Manda, Raika) (Sheikh, 2018), (Ramnagar wildlife sanctuary), Kathua (Jasrota WLS) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Kathua, Doda, Kashmir(Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Danaus* Kluk, 1780

Danaus genutia (Cramer, [1779])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; D'Abrera, 1990; Gasse, 2018), Samba, Jammu (Manda, Akhnoor) (Sheikh, 2018), Doda, (Raika Environmental Park), (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Danaus chrysippus (Linnaeus, 1758)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Holland, 1896; Seitz, 1907a; D'Abrera, 1990; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Samba, (Manda, Raika, Akhnoor) (Sheikh, 2018), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribu Euploeini Moore, [1880]

Genus *Euploea* Fabricius, 1807

Euploea harata (Cramer, [1777])

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015; Gasse, 2018; Smetacek, 2018), Doda (Kunte et al. 2024), Jammu (Raika Environmental Park), Kathua (Sarthal village, Bani), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Euploea core (Cramer, [1780])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Jammu (Manda, Chatha, Raika) (Sheikh, 2018), Jammu (Kalidhar forest) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Subfamily Satyrinae Boisduval, [1833]
Tribe Melanitini Reuter, 1896

Genus *Melanitis* Fabricius, 1807

Melanitis leda (Linnaeus, 1758)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Seitz, 1907b; Gasse, 2018), Samba, Jammu (Manda, Raika) (Sheikh, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Melanitis phedima galkissa Fruhstorfer, 1911

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Evans, 1932; Talbot, 1947; Varshney & Smetacek, 2015; Smetacek, 2018; Gasse, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Kathua (BANI) (present study).

Tribe Satyrini Boisduval, [1833]

Genus *Lethe* Hübner, [1819]

Lethe sidonis (Hewitson, 1863)

Distribution in Jammu & Kashmir: Rajouri (Budhal) (Sheikh et al. 2021), Rajouri Kathua (Parey & Sheikh, 2019), (Bani & BWLS) (present study).

Lethe harata Aurivillius, 1898

Distribution in Jammu & Kashmir: Kashmir (Kehimkar, 2016; Gasse, 2018), Rajouri (BGSBU) (Sheikh & Parey, 2019a), Rajouri, Doda (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Lethe rohria Fabricius, 1787

Distribution in Jammu & Kashmir: Kashmir (Moore, 1891; Fruhstorfer, 1911; Evans, 1932; Peile, 1937; Talbot, 1947; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Samba, Jammu (Manda, Raika), Doda (Sheikh, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Lethe verma (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Seitz, 1907b; Fruhstorfer, 1911; Evans, 1927; Peile, 1937; Talbot, 1947; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Doda (Bhaderwah) (Kunte et al. 2024), Kathua (BANI) (present study).

Genus *Lasiommata* Westwood, 1841

Lasiommata schakra (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Seitz, 1908a; Fruhstorfer, 1911; D'Abrera, 1990; Bozano, 1999; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Gulmarg (Hegner, 1978), Samba, Jammu (Manda, Akhnoor), Kathua (Bani), Doda (Bhaderwah) (Sheikh, 2018), Doda (Bhaderwah), Baramula (Gulmarg) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Udhampur, Kathua, Doda, Kashmir(Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Kirinia* Moore, 1893

Kirinia eversmanni cashmirensis (Moore, 1874)

Distribution in Jammu & Kashmir: Kashmir (Bingham, 1905; Seitz, 1908a; Evans, 1932; Talbot, 1947; D'Abrera, 1990; Bozano, 1999; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Baramulla (Goolmurg) (Moore, 1874), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Kupwara (Rajwar, Langate forest range) (Singh, 2016), Bandipora (Gurais), Anantnag (Pahalgam), Baramula (Gulmarg) (Venkatesh, 2020), Kathua (Bani & BWLS) (present study).

Genus *Mycalesis* Hübner, [1818]

Mycalesis perseus harata (Fabricius, 1798)

Distribution in Jammu & Kashmir: Jammu (Raika Environmental Park), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Ypthima* Hübner, [1818]

Ypthima nareda (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Marshall & de Niceville, 1883; Seitz, 1907b; Antram, 1924; Evans, 1932; Peile, 1937; Talbot, 1947; Wynterblyth, 1957; Mani, 1986; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Kathua, Doda (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Ypthima kasmira Moore, 1884

Distribution in Jammu & Kashmir: Kashmir (Moore, 1892; Bingham, 1905; Seitz, 1907b; Antram, 1924; Evans, 1932; Peile, 1937; Talbot, 1947; Smith, 1994; Varshney & Smetacek, 2015; Gasse, 2018), Rajouri, Kashmir (South, 1902), Doda (Bhaderwah) (misidentified as *Y. huebneri*) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Ypthima lisandra avanta Moore, [1875]

Distribution in Jammu & Kashmir: Kashmir (Marshall & de Niceville, 1883; Bingham, 1905; Seitz, 1907b; Fruhstorfer, 1911; Antram, 1924; Evans, 1932; Peile, 1937; Talbot, 1947; Wynterblyth, 1957; Mani, 1986; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Ypthima baldus (Fabricius, 1775

Distribution in Jammu & Kashmir: Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Ypthima nikaea Moore, [1875]

Distribution in Jammu & Kashmir: Kashmir (Moore, 1892; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Doda (Bhaderwah, Khelani) (Kunte et al. 2024), Kathua (Bani), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Doda, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Ypthima sakra (Moore, 1857)

Distribution in Jammu & Kashmir: J&K (Varshney & Smetacek, 2015), Kathua (Bani) (Sheikh & Mishra, 2023b), Kathua (Bani & BWLS) (present study).

Ypthima hyagriva (Moore, 1857)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1932; Talbot, 1947; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Callerebia* Butler, 1867

Callerebia harata harat Moore, 1874

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Talbot, 1947; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Anantnag (Pahalgam), Doda (Bhaderwah), Baramula (Gulmarg) (Kunte et al. 2024), Kathua (Bani), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Callerebia scanda (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Bingham, 1905; Fruhstorfer, 1911; Antram, 1924; Evans, 1932; Peile, 1937; Talbot, 1947; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Callerebia annada caeca (Moore, [1858])

Distribution in Jammu & Kashmir: Kashmir (Bingham, 1905; Seitz, 1907b; Evans, 1932; Peile, 1937; Talbot, 1947; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Callerebia hybrida Butler, 1880)

Distribution in Jammu & Kashmir: Mendhar, Poonch (Khan & Sheikh, 2022), Kathua (BANI) (present study).

Genus *Hyponephele* Muschamp, 1915

Hyponephele kashmirica Moore, 1892

Distribution in Jammu & Kashmir: Kashmir (Holland, 1896; Seitz, 1908[a]; Fruhstorfer, 1911; Tytler, 1926[a]; Evans, 1932; Peile, 1937; Talbot, 1947; Varshney & Smetacek, 2015; Gasse, 2018), Baramulla (Gulmur), Doda (Bhaderwah, Jora) (Moore, 1892), Kathua (Bani & BWLS) (present study).

Genus *Aulocera* Butler, 1867

Aulocera brahminus (Blanchard, 1853)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Bingham, 1905; Fruhstorfer, 1911; Antram, 1924; Evans, 1932; Talbot, 1947; Wynterblyth, 1957; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Baramulla (Goolmurg) (Lang, 1868), Kishtwar (Zoji-La) (Vis & Coene, 1987), Kishtwar (3 km W. Zoji La pass, 5 km E. Gumri) (Tshikolovets, 2005), Baramula (Kunte et al. 2024), Kathua (BANI) (present study).

Aulocera padma (Kollar, 1844)

Distribution in Jammu & Kashmir: Kashmir (Fruhstorfer, 1911: Evans, 1932; Peile, 1937; Talbot, 1947; Smith, 1994; Kehimkar, 2016; Gasse, 2018), Kupwara (Qureshi et al. 2013), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Aulocera swaha garuna Fruhstorfer, 1911

Distribution in Jammu & Kashmir: Kashmir (Evans, 1927; Talbot 1947; Varshney & Smetacek, 2015), Kashmir, Bandipora (Goorais valley) (D'Abrera, 1990), Ganderbal (Sonamarg) (Tshikolovets, 2005), NE Kashmir (Gasse, 2018), Bandipora (Gurais), Baramula (Gulmarg) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Aulocera harata (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Bingham, 1905; Seitz, 1908a; Fruhstorfer, 1911; Antram, 1924; D'Abrera, 1990; Kehimkar, 2016; Gasse, 2018), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Hipparchia* Fabricius, 1807

Hipparchia parisatis shiva (Le Cerf, 1913)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1892; Seitz, 1908a; Fruhstorfer, 1911; Evans, 1927; Peile, 1937; Talbot, 1947; Wynterblyth, 1957; D'Abrera, 1992; Smith, 1994; Varshney & Smetacek,

2015; Kehimkar, 2016; Gasse, 2018), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Subfamily Biblidinae Boisduval, 1833
Tribe Biblidini Boisduval, 1833

Genus *Ariadne* Horsfield, [1829]

Ariadne merione tapestrina (Moore, 1884)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1932; Peile, 1937; Varshney & Smetacek, 2015; Gasse, 2018), Samba, Jammu (Manda), Rajouri (Sheikh, 2018), Jammu (Raika Environmental Park), Poonch (Chinchwad) (Kunte et al. 2024), Rajouri, Poonch, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Subfamily Heliconiinae Swainson, [1822]
Tribe Argynnini Swainson, [1833]

Genus *Argynnis* Fabricius, 1807

Argynnis hyperbius (Linnaeus, 1763)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Kathua (Bani), Doda (Thathri), Rajouri (BGSBU) (Kunte et al. 2024), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Argynnis childreni sakontala (Kollar, 1848)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1886; Bingham, 1905; Fruhstorfer, 1912; D'Abrera, 1992; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Doda (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Argynnis kamala (Moore, 1857)

Distribution in Jammu & Kashmir: Kashmir (Lang, 1868; Moore, 1874; Bingham, 1905; Fruhstorfer 1912b; Antram, 1924; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Ganderbal (Sonamarg) (Tshikolovets, 2005), Baramula (Gulmarg) (Kunte et al. 2024), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Argynnis jainadeva (Moore, 1864)

Distribution in Jammu & Kashmir: Kashmir (Lang, 1868; Moore, 1874; South, 1902; Seitz, 1908b; Fruhstorfer, 1912; D'Abrera, 1992; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kishtwar (3 km S. Zoji La pass, 5 km E. Gumri) (Zoji La pass vicinity), Ganderbal (Sonamarg), 10 km road Sonamarg-Srinagar (Tshikolovets, 2005), Kathua (Bani & BWLS) (present study).

Genus *Issoria* Hübner, [1819]

Issoria issaea (Doherty, 1886)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1886; Seitz, 1908b; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), 5 km E. Gumri (Zoji La pass vicinity) (Tshikolovets, 2005), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Baramula (Gulmurg), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Clossiana* Reuss, 1920

Clossiana jerdoni (Lang, 1868)

Distribution in Jammu & Kashmir: Kashmir (Holland, 1896; Bingham, 1905; Seitz, 1908b; Evans, 1932; Wynterblyth, 1957; Varshney & Smetacek, 2015; Gasse, 2018), Baramulla (Goolmurg), (Lang, 1868), Ganderbal (Soonamurg) (Moore, 1874, de Niceville, 1886), Zoji La (South, 1902), Kishtwar (Paddar) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Tribe Heliconiini Swainson, [1822]

Genus *Phalanta* Horsfield, [1829]

Phalanta phalantha (Drury, [1773])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Seitz, 1908b; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Samba, Jammu (Manda, Raika) (Sheikh, 2018), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Jammu, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Vagrans* Hemming, 1934

Vagrans egista hara (Kollar, [1844])

Distribution in Jammu & Kashmir: Samba (Mansar Lake) (Sharma & Sharma, 2018b), Udhampur (Manwal) (Kunte et al. 2024), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Nymphalini Rafinesque, 1815

Genus *Symbrenthia* Hübner, [1819]

Symbrenthia lilaea khasiana Moore, [1875]

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Samba, Jammu (Manda, Raika, Mubarakmandi), Kathua (Billawar) (Sheikh, 2018), Udhampur (Manwal), Jammu (Kalidhar) (Sharma & Sharma, 2018b), Jammu (Kalidhar Forest and Environmetal park), Doda (Khelani) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Reasi, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Symbrenthia niphanda hysudra Moore, 1874

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Evans, 1932; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Doda (Khelani) (Kunte et al. 2024), Kathua (BANI) (present study).

Symbrenthia brabira sivokana Moore, 1899

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Evans, 1932; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Kathua (BANI) (present study).

Genus *Nymphalis* Kluk, 1780

Nymphalis xanthomelas fervescens (Stichel, [1908])

Distribution in Jammu & Kashmir: Kashmir (Lang, 1868; Moore, 1874; Fruhstorfer, 1912; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Rajouri (BGSBU) (Kunte et al. 2024), Rajouri, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Aglais* Dalman, 1816

Aglais caschmirensis (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Lang, 1868: Moore, 1874; Ruhl, 1893; Bingham, 1905; Fruhstorfer, 1912; D'Abrera, 1992; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Zoji La (Vis & Coene, 1987; Hanus et al. 1988), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam) (Qureshi et al. 2014), Anantnag (Pahalgam), Srinagar, Doda (Bhaderwah), Shopian (Herman) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Udhampur, Reasi, Ramban, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Kaniska* Moore, 1899

Kaniska canace (Linnaeus, 1763)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Holland, 1896; Stichel, 1908; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Polygonia* Hübner, [1819]

Polygonia calbum harata Evans, 1932

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1886; Leech, 1892; Moore, 1899; Bingham, 1905; Stichel, 1908; Frushstorfer, 1912; Evans, 1932; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Baramulla (Goolmurg) (Moore, 1872), Bandipora (Goorais valley) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Genus *Vanessa* Fabricius, 1807

Vanessa cardui (Linnaeus, 1758)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Holland, 1896; Moore, 1899; Gasse, 2018), Zoji La (Hanus et al. 1988), Kupwara (Qureshi et al. 2013a), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Doda (Bhaderwah), Shopian (Herman) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Vanessa indica (Herbst, 1794)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Evans, 1932; Peile, 1937; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Samba, Kathua (Billawar), Jammu (Raika) (Sheikh, 2018), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Tribe Junoniini Reuter, 1896

Genus *Junonia* Hübner, [1819]

Junonia hierta (Fabricius, 1798)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Samba, Jammu (Manda) (Sheikh, 2018), Jammu (Raika Environmental Park), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Junonia orithya swinhoei Butler, 1885

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Varshney & Smetacek, 2015; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Samba, Jammu (Manda) (Sheikh, 2018), Doda (Bhaderwah), Jammu (Raika Environmental Park), Jammu (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Junonia lemonias persicaria (Fruhstorfer, 1912)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Fruhstorfer, 1912; Evans, 1932; Peile, 1937; Wynterblyth, 1957; Varshney & Smetacek, 2015; Gasse, 2018), Samba, Jammu (Manda), Kathua (Jasrota, Bani) (Sheikh, 2018), Jammu (Raika Environmental Park) (Kunte et al. 2024), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Junonia harata (Linnaeus, 1758)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Samba, Jammu (Manda, Raika), Kathua (Billawar) (Sheikh, 2018), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Junonia atlites (Linnaeus, 1763)

Distribution in Jammu & Kashmir: Kathua (Lakhanpur) (Kunte et al. 2024), Rajouri, Poonch, Jammu, Kathua (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Junonia iphita (Cramer, [1779])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Stichel, 1908; Fruhstorfer, 1912; Evans, 1932; Wynterblyth 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Samba, Jammu (Manda, Chatha) (Sheikh, 2018), Jammu (Raika Environmental Park, Kalidhar forest), (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Tribe Kallimini Doherty, 1886

Genus *Kallima* Doubleday, [1849]

Kallima inachus huegelii (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; de Niceville, 1886; Bingham, 1905; Stichel, 1908; Fruhstorfer, 1912; Evans, 1924; Peile, 1937; Wynterblyth, 1957; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Samba, Doda, Ramban (Sheikh, 2018), Jammu (Raika Environmental park), Ramban (Batote) (Kunte et al. 2024), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Hypolimnas* Hübner, [1819]

Hypolimnas misippus (Linnaeus, 1764)

Distribution in Jammu & Kashmir: Kashmir (Gasse, 2018), Kupwara (Qureshi et al. 2013a), Baramulla (Gulmarg) (Qureshi et al. 2013b), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Samba, Udhampur (Ramnagar), Kathua (Sheikh, 2018), Jammu (Raika Environmental Park), Udhampur (Manwal), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Hypolimnas bolinajacintha (Drury, 1773)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Subfamily Cyrestinae Guenée, 1865
Tribe Cyrestini Guenée, 1865

Genus *Cyrestis* Boisduval, 1832

Cyrestis thyodamas ganescha (Kollar, 1848)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Evans, 1924; Peile, 1937; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Samba, Udhampur (Ramnagar), Kathua (Bani) (Sheikh, 2018), Doda (Khelani), Udhampur (Chenani), Ramban (Batote),(Kunte et al. 2024), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Subfamily Limenitidinae Behr, 1864
Tribe Limenitidinae Behr, 1864

Genus *Neptis* Fabricius, 1807

Neptis harat astola Moore, 1872

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Evans, 1924; Peile, 1937; Varshney & Smetacek, 2015; Gasse, 2018), Srinagar (Dachigam N.P.) (Qureshi et al. 2014), Jammu (Sunjwan), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Neptis soma butleri Eliot, 1969

Distribution in Jammu & Kashmir: Kashmir (Kehimkar, 2016; Gasse, 2018), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Neptis nata yerburii Butler, 1886

Distribution in Jammu & Kashmir: Kashmir (Moore, 1898; Evans, 1924; Peile, 1937; Wynterblyth, 1957; Varshney & Smetacek, 2015; Gasse, 2018), Kathua (BANI) (present study).

Neptis harata Moore, 1872

Distribution in Jammu & Kashmir: Kashmir (Moore, 1898; South, 1902; Stichel, 1908; Fruhstorfer, 1912; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kathua (BANI) (present study).

Neptis hara (Doubleday, [1848])

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Kathua (BANI) (present study).

Genus *Pantoporia* Hübner, [1819]

Pantoporia hordonia (Stoll, [1790])

Distribution in Jammu & Kashmir: Kathua (Jasrota WLS) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Athyma* Westwood, 1850

Athyma perius (Linnaeus, 1758)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Jammu (Surinsar Lake) (Sharma & Sharma, 2017b), Samba, Jammu (Manda), Doda (Sheikh, 2018), Jammu (Raika Environmental Park) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Jammu, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Athyma harata (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Stichel, 1908; Fruhstorfer, 1912; Evans, 1924; Peile, 1937; Wynterblyth, 1957; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Udhampur (Mantalai) (Kunte et al. 2024), Rajouri (BGSBU) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Limenitis* Fabricius, 1807

Limenitis ligyes Hewitson, 1864

Distribution in Jammu & Kashmir: Kashmir (Lang, 1868; Bingham, 1905; Fruhstorfer, 1912; Evans, 1924; Gasse, 2018), Bandipora (Goorais valley) (South, 1902), Kashmir (Pir Panjal) (Varshney & Smetacek, 2015), Kishtwar (Paddar) (Kunte et al. 2024), Kathua (Bani & BWLS) (present study).

Limenitis trivena Moore, 1864

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Bingham, 1905; Stichel, 1908; Fruhstorfer, 1912; Antram, 1924; D'Abrera, 1993; Smith, 1994; Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Bhaderwah, Doda (Kunte et al. 2024), Rajouri, Doda (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Auzakia* Moore, [1898]

Auzakia danava (Moore, [1858])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Doda (Bhaderwah) (Sharma & Sharma, 2018b; Kunte et al. 2024), Rajouri, Doda (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Euthalia* Hübner, [1819]

Euthalia patala (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Varshney & Smetacek, 2015; Kehimkar, 2016; Gasse, 2018), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Tribe Pseudergolini Jordan, 1898

Genus *Pseudergolis* C. & R. Felder, [1867]

Pseudergolis wedah (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Bingham, 1905; Stichel, 1908; Gasse, 2018), Samba, Jammu (Manda), Udhampur (Ramnagar) (Sheikh, 2018), Rajouri (Dalhori), Jammu (Kalidhar) (Sharma & Sharma, 2018b), Udhampur (Chenani) (Kunte et al. 2024), Rajouri, Poonch, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Stibochiona* Butler, [1869]

Stibochiona nicea (Gray, 1846)

Distribution in Jammu & Kashmir: Kashmir (Moore, 1896; Gasse, 2018), Kathua (Sarthal) (Singh & Sheikh, 2021), Kathua (Bani & BWLS) (present study).

Subfamily Apaturinae Boisduval, 1840
Tribe Apaturini Boisduval, 1840

Genus *Mimathyma* Moore, [1896]

Mimathyma ambica (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Bingham, 1905; Fruhstorfer, 1912; Antram, 1924; Evans, 1932; Peile, 1937; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Rajouri, Reasi, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Mimathyma chitralensis (Evans, 1912)

Distribution in Jammu & Kashmir: Kashmir (Evans, 1927; Varshney & Smetacek, 2015; Smetacek, 2018), Kishtwar (Kunte et al. 2024), Rajouri, Reasi, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Genus *Dilipa* Moore, 1857

Dilipa morgiana (Westwood, [1851])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Fruhstorfer, 1912; Evans, 1927; Varshney & Smetacek, 2015; Kehimkar, 2016; Smetacek, 2018; Gasse, 2018), Kathua (Bani & BWLS) (present study).

Genus *Sephisa* Moore, 1882

Sephisa dichroa (Kollar, [1844])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Bingham, 1905; Stichel, 1908; Kehimkar, 2016; Gasse, 2018), Doda (Bhaderwah) (Kunte et al. 2024), Rajouri, Doda, Kathua (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Genus *Euripus* Doubleday, 1848

Euripus consimilis (Westwood, [1851])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874), Kathua (Bani & BWLS) (present study).

Genus *Hestina* Westwood, 1850

Hestina persimilis hara Butler, 1869

Distribution in Jammu & Kashmir: Kashmir (Fruhstorfer, 1912; Varshney & Smetacek, 2015; Gasse, 2018), Kathua (Bani & BWLS) (present study).

Tribe Charaxini Guenée, 1865

Genus *Charaxes* Ochsenheimer, 1816

Charaxes harata (C. & R. Felder, [1867])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Bingham, 1905; Stichel, 1908; Gasse, 2018), Jammu, (Raika Environmental Park, University of Jammu) (Kunte et al. 2024), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Charaxes agrarius (Swinhoe, [1887])

Distribution in Jammu & Kashmir: Samba (Uttarbehni), Jammu (University of Jammu) (Sharma & Sharma, 2017b), Kashmir (Gasse, 2018), Rajouri, Jammu, Udhampur, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (BANI) (present study).

Subfamily Acraeinae Boisduval, 1833
Tribe Acraeini Boisduval, 1833

Genus *Acraea* Fabricius, 1807

Acraea issoria (Hübner, [1819])

Distribution in Jammu & Kashmir: Kashmir (Moore, 1874; Gasse, 2018), Ramban (Batote) (Sharma & Sharma, 2018b), Rajouri (Budhal) (Sheikh et al. 2021), Rajouri, Poonch, Kathua, Doda, Kashmir (Parey & Sheikh, 2019), Kathua (Bani & BWLS) (present study).

Discussion

The exploration of Papilionoidea diversity within Tehsil Bani including Bani Wildlife Sanctuary unveils a captivating tapestry of 219 Papilionoidea species across six families. This comprehensive five-and-a-half-year study not only provides a meticulous account of the sanctuary's biodiversity but also emphasizes its pivotal role in safeguarding endangered and vulnerable species. A notable highlight is the identification of 26 species listed in the Wildlife Protection Act, 1972 (Amendment 2022) (Table 1), categorizing them into the distinguished schedules I and II. This legislative backdrop adds a layer of complexity to our understanding, prompting contemplation on the evolving legal frameworks and their implications for Papilionoidea conservation. The inclusion of bibliographic references enriches the checklist, augmenting our understanding of Jammu & Kashmir's Papilionoidea fauna. The prevalence of certain host plant families, particularly Fabaceae and Poaceae, underscores the intricate relationships between Papilionoidea and their habitats. However, the study reveals a critical gap, with 36% of species lacking host plant information, highlighting the imperative for continued research and documentation. This research not only expands our knowledge of Papilionoidea diversity but also transcends the scientific realm by delving into the legislative nuances that shape conservation efforts. The sanctuary's remarkable contribution, hosting 70% of the union territory's species, underscores its ecological significance. The border adjacency with Himachal Pradesh emerges as a key factor influencing biodiversity patterns, portraying the interconnected dance of ecosystems. In this paper authors have strategically incorporated visual representations of 21 species (Figures 2-3) out of the comprehensive list of 219 species presented in the checklist. The selection process focused on highlighting uncommon species that serve as representative examples in the context of S research. By featuring these specific species, we aimed to provide a nuanced and focused insight into the key findings of the study. These chosen species play a crucial role in illustrating the unique aspects and characteristics explored in the research paper. This deliberate selection allows readers to engage with visually impactful examples without being overwhelmed by the entirety of the checklist. Each species depicted in the photo plates contributes to the narrative, reinforcing the significance of the study's outcomes. In essence, the inclusion of these 21 species in Figures 2 and 3 serves as a visual distillation of the broader checklist, offering a concise yet comprehensive overview that aligns with the objectives and findings of the research. In essence, this study is more than a mere exploration of Papilionoidea; it is a testament to the delicate balance between legislation, biodiversity, and conservation imperatives. As we unravel the intricacies of Tehsil Bani including Bani Wildlife Sanctuary, we are compelled to recognize the urgency of our role as stewards of these fragile ecosystems, ensuring the sustained flourishing of Papilionoidea populations within protected areas.

Conclusion

Exploring the diversity of Papilionoidea in this unique sanctuary not only expands our understanding of diverse species but also highlights the critical role that protected areas like Tehsil Bani including newly established Bani Wildlife Sanctuary play in conserving and sustaining delicate ecosystems. This study has the potential to provide more information regarding the status of known species in this region and to discuss the conservation efforts, ensuring the long-term survival of these intricate and enchanting creatures. Tehsil Bani stands as a living testament to the remarkable biodiversity of the Jammu and Kashmir Union Territory, particularly in its role as a haven for Pailionoidea. The significant number of Papilionoidea in the sanctuary is serves as a beacon of hope, highlighting the importance of preserving and cherishing such natural wonders for generations to come.

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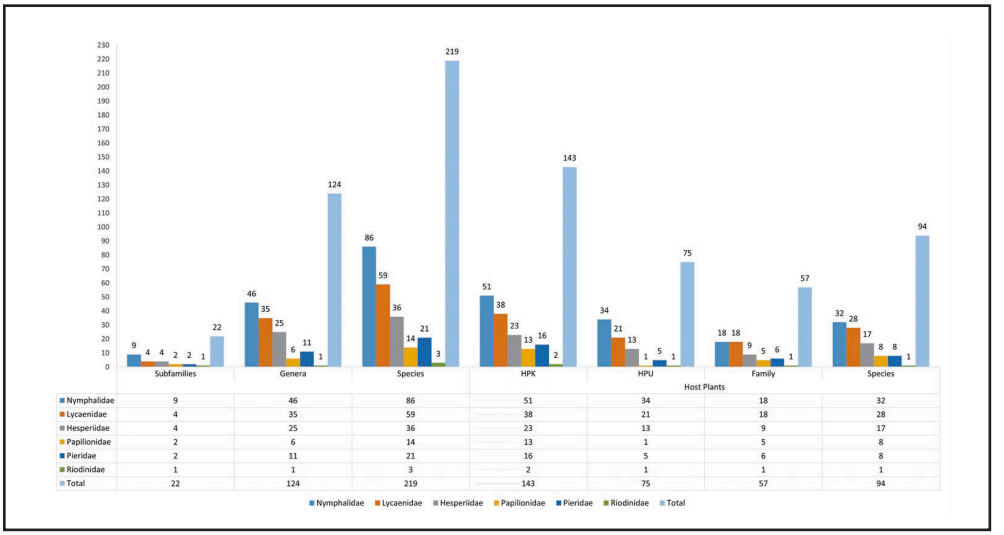
Figure 5. Species diversity of families, subfamilies, genera, and species of Papilionoidea in the Tehsil Bani including Bani Wildlife Sanctuary, Jammu and Kashmir, India. HPK and HPU indicates the species with host plan data known, and host plant data known in Bani.



	Subfamilies	Genera	Species	HPK	HPU	Family	Species
Nymphalidae	9	46	86	51	34	18	32
Lycaenidae	4	35	59	38	21	18	28
Hesperiidae	4	25	36	23	13	9	17
Papilionidae	2	6	14	13	1	5	8
Pieridae	2	11	21	16	5	6	8
Riodinidae	1	1	3	2	1	1	1
Total	22	124	219	143	75	57	94

Conflict of Interest

The authors declare that they have no known financial interest or personal relationship that could have influence the work presented in this article.

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*Taslima Sheikh
Department of Zoology
Sunrise University Alwar Rajasthan
INDIA / *INDIA*
E-mail: sheikhtass@gmail.com
https://orcid.org/0000-0002-8112-1562

y / *and*

Bhulri Village
Tehsil Bani, District Kathua
184206, Jammu and Kashmir
INDIA / *INDIA*

Wasim Sajad Malik
Department of Botany
University of Kashmir
Hazratbal Srinagar
INDIA / *INDIA*
E-mail: waseemmalik48111@gmail.com
https://orcid.org/0000-0001-7279-2842

Sat Paul Pakhru
Regional Director Jammu
J&K Pollution Control Committee
INDIA / *INDIA*
E-mail: satpaulpakhru@gmail.com
https://orcid.org/0009-0005-0302-1995

y / *and*

Bhulri Village
Tehsil Bani, District Kathua
84206, Jammu and Kashmir
INDIA / *INDIA*

Muhammad Asghar Hassan
Institute of Entomology
The Provincial Special Key Laboratory
for Development and Utilization of Insect
Resources
Guizhou University
Guiyang 550025
R. P. CHINA / *P. R. CHINA*
E-mail: kakojan112@gmail.com
https://orcid.org/0000-0003-2590-5781

*Autor para la correspondencia / *Corresponding authors*

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Figure 2. Representative field photographs of Papilionoidea in Bani. **1.** *Celastrina gigas.* **2.** *Heliophorus sena.* **3.** *Heliophorus moorei.* **4.** *Gonepteryx rhamni.* **5.** *Acraea issoria.* **6.** *Lethe verma.* **7.** *Callerebia scanda.* **8.** *Hestina persimilis.*

Figure 3. Representative field photographs of Papilionoidea in Bani. **9.** *Pantoporia hordonia.* **10.** *Sephisa dichroa.* **11.** *Aglais caschmirensis.* **12.** *Pseudergolis wedah*. **13.** *Argynnis childreni.* **14.** *Byasa polyeuctes.* **15.** *Graphium sarpedon.* **16.** *Graphium cloanthus.*

Figure 4. Representative field photographs of Papilionoidea in Bani. **17.** *Papilio machaon.* **18.** *Hasora chromus.* **19.** *Spialia galba.* **20.** *Pseudcoladenia faith.* **21.** *Polytremis eltola*.

Table 1. Summary of families, subfamilies, genera, and species of Papilionoidea within Bani, including species host plants, conservation status and observed period.

Papilionoidea				Host Plants		Conservation Status as per (Amendment 2022) WLP, Act 1972	Observed period in Thesil Bani
Family	**Subfamily**	**Genus**	**Species**	**Scientific name**	**Family**		
Hesperiidae	**Coeliadinae**	*Burara* Swinhoe, 1893	*Burara oedipodea*	*Hiptage* sp.	Malpighiaceae		April-Oct
		Hasora Moore, [1881]	*Hasora chromus*	*Toddalia asiatica*	Rutaceae		April-Nov
		Badamia Moore, [1881]	*Badamia exclamationis*	*Combretum latifoliumi* *Hiptage* sp.	Combretaceae, Malpighiaceae		April-June
		Choaspes Moore, [1881]	*Choaspes xanthopogon*	*Meliosma* sp.	Sabiaceae		April-May
			Choaspes benjaminii	*Meliosma* sp.	Sabiaceae		April-Mav
	Eudaminae	*Lobocla* Moore, 1884	*Lobocla liliana*	Unknown			April-Oct
	Pyrginae	*Celaenorrhinus* Hübner, [1819]	*Celaenorrhinus leucocera*	*Strobilanthes* sp.	Acanthaceae		Sept-Oct
			Celaenorrhinus munda	Unknown			Aug-Oct
			Celaenorrhinus dhanada	Unknown			April-Oct
		Sarangesa Moore, [1881]	*Sarangesa dasahara*	*Lepidagathis* sp.	Acanthaceae		March-Nov
			Sarangesa purendra	*Blepharis* sp.	Acanthaceae		March- Sept
		Pseudocoladenia Shirozu & Saigusa, 1962	*Pseudocoladenia fatih*	Unknown			March- Nov
		Coladenia Moore, [1881]	*Coladenia indrani*	*Triumfetta rhomboidea*	Malvaceae		March- Nov
		Seseria Matsumura, 1919	*Seseria dohertyi*	Unknown			May-Oct
		Tagiades Hübner, [1819]	*Tagiades menaka*	Unknown			March-Nov
			Tagiades cohaerens	Unknown			May-Oct
		Odontoptilum de Niceville, 1890	*Odontoptilum angulata*	*Urena lobata*	Malvaceae		March-Nov
		Carcharodus Hübner, [1819]	*Carcharodus alceae*	*Alcea rosea*	Malvaceae		April-Aug
		Spialia Swinhoe, [1912]	*Spialia galba*	*Alcea rosea, Sida* sp.	Malvaceae		March-Nov
		Pyrgus Hübner, [1819]	*Pyrgus cashmirensis*	Unknown			May- Aug
	Hesperiinae	*Aeromachus* de Niceville, 1890	*Aeromachus stigmatus*		Poaceae		May-June
		Actinor Watson, 1893	*Actinor radians*	Unknown			Sept-Oct
		Udaspes Moore, [1881]	*Udaspes folus*	*Oryza* sp.	Poaceae		Sept-Oct
		Suastus Moore, [1881]	*Suastus gremius*	*Borassus* sp.	Arecaceae		May- June
		Taractocera Moore, 1865	*Taractocera maevius*		Poaceae		June-Oct
			Taractocera danna		Poaceae		May
		Potanthus Scudder, 1872	*Potanthus pseudomaesa*	*Axonopus compressus*	Poaceae		Oct
			Potanthus dara		Poaceae		Aug-Oct
		Parnara Moore, [1881]	*Parnara guttata*	Unknown			April-Oct
			Parnara bada	*Oryza sativa*	Poaceae		April-Nov
		Borbo Evans, 1949	*Borbo cinnara*	*Oryza sativa*	Poaceae		April-Nov
			Borbo bevani	*Saccharum* sp.	Poaceae		May-Oct
		Pelopidas Walker, 1870	*Pelopidas mathias*	*Oryza sativa, Saccharum* sp.	Poaceae		April-Oct
			Pelopidas sinensis	Unknown			May-Oct
		Polytremis Mabille, 1904	*Polytremis discreta*	Unknown			May-Oct
			Polytremis eltola	Unknown			May-Oct

Papilionidae	**Parnassiinae**	*Parnassius* Latreille, 1804	*Parnassius hardwickii*	Unknown			June-Sept
	Papilioninae	*Pachliopta* Reakirt, [1845]	*Pachliopta aristolochiae*	*Aristolochia punjabensis*	Aristolochiaceae		April-Aug
		Byasa Moore, 1882	*Byasa polyeuctes*	*Aristolochia punjabensis*	Aristolochiaceae		April-June
			Byasa dasarada	*Aristolochia punjabensis*	Aristolochiaceae		April June
		Papilio Linnaeus, *1758*	*Papilio polyctor*	*Zanthoxylum armatum*	Rutaceae		March-Nov
			Papilio arcturus		Rutaceae		May-Sept
			Papilio protenor	*Citrus limon*, *Citrus* sp.	Rutaceae		May-Oct
			Papilio polytes	*Citrus limon, Zanthoxylum armatum*	Rutaceae		March-Nov
			Papilio demoleus	*Citrus sp.*, *Ziziphus* sp.	Rutaceae, Rhamnaceae		March-Nov
			Papilio machaon	*Foeniculum vulgare*	Apiaceae	WLPA Sch II	March-Nov
		Chilasa Moore, [1881]	*Chilasa agestor*	*Machilus* sp.	Lauraceae		April-June
			Chilasa clytia	*Litsea* sp.	Lauraceae	WLPA Sch II	April-June
		Graphium Scopoli, 1777	*Graphium cloanthus*		Lauraceae	WLPA Sch II	April-Oct
			Graphium sarpedon	*Listea* sp.	Lauraceae, Rutaceae	WLPA Sch II	Aug-Oct
Pieridae	**Pierinae**	*Aporia* Hübner, [1819]	*Aporia agathon*		Berberidaceae		April-Aug
		Pieris Schrank, 1801	*Pieris brassicae*		Brassicaceae		Feb-Dec
			Pieris canidia		Brassicaceae		Feb-Dec
			Pieris rapae		Brassicaceae		Feb-Oct
			Pieris ajaka		Brassicaceae		March-Oct
		Pontia Fabricius, 1807	*Pontia daplidice*	*Lepidium virginicum*	Brassicaceae		Feb-Dec
		Belenois Hübner, [1819]	*Belenois aurota*	*Capparis* sp., *Jasminum* sp.	Capparaceae, Oleaceae		Feb-Nov
		Cepora Billberg, 1820	*Cepora nerissa*	*Capparis* sp.	Capparaceae		March-Oct
		Delias Hübner, [1819]	*Delias sanaca*	Unknown		WLPA Sch I	April-Oct
			Delias belladonna	Unknown			April-Oct
		Euchloe Hübner, [1819]	*Euchloe daphalis*	Unknown			April-June
	Coliadinae	*Catopsilia* Hübner, [1819]	*Catopsilia pyranthe*	*Cassia fistula*	Fabaceae		Feb-Dec
			Catopsilia pomona	*Cassia fistula*	Fabaceae		Feb-Nov
		Gonepteryx Leach, [1815]	*Gonepteryx nepalensis*	*Rhamnus* sp.	Rhamnaceae		Feb-Nov
			Gonepteryx mahaguru	Unknown			March-June
		Eurema Hübner, [1819]	*Eurema laeta*	*Cassia fistula*	Fabaceae		March-Oct
			Eurema drona		Fabaceae		March-Oct
			Eurema hecabe	*Cassia fistula*	Fabaceae		Feb-Nov
		Colias Fabricius, 1807	*Colias erate*	*Vicia sativa*	Fabaceae		Feb-Nov
			Colias fieldii	*Trifolium repens*	Fabaceae		Feb-Nov
			Colias eogene	Unknown		WLPA Sch II	May-Sept
Lycaenidae	**Polyommatinae**	*Prosotas* Druce, 1891	*Prosotas nora*	*Acacia* sp.	Fabaceae		March- Nov
		Catochrysops Boisduval, 1832	*Catochrysops strabo*	*Tephrosia purpurea*	Fabaceae		April-Oct
		Lampides Hübner, [1819]	*Lampides boeticus*	*Pisum sativum*	Fabaceae		Feb-Dec
		Leptotes Scudder, 1876	*Leptotes plinius*	*Plumbago zeylanica*	Plumbaginaceae		March-Nov
		Zizeeria Chapman, 1910	*Zizeeria karsandra*	*Oxalis corniculata*	Oxalidaceae		Feb-Dec
		Pseudozizeeria Beuret, 1955	*Pseudozizeeria maha*	*Oxalis corniculata*	Oxalidaceae		Feb-Dec

Lycaenidae	**Lycaeninae**	*Zizina* Chapman, 1910	*Zizina otis*	*Amaranthus viridis*	Amaranthaceae		Feb-Dec
		Zizula Chapman, 1910	*Zizula hylax*	*Vicia* sp.	Fabaceae		April-Nov
		Tarucus Moore, [1881]	*Tarucus indica*	*Ziziphus* sp.	Rhamnaceae		Feb-Nov
			Tarucus callinara	*Ziziphus* sp.	Rhamnaceae	WLPA Sch II	April-Nov
			Tarucus venosus	*Ziziphus* sp.	Rhamnaceae		April-Nov
			Tarucus hazara	*Ziziphus* sp.	Rhamnaceae		April-Nov
		Everes Hübner, [1819]	*Everes huegelii*	Unknown			April-Nov
			Everes lacturnus	*Lotus corniculatus*	Fabaceae		April-Nov
		Azanus Moore, [1881]	*Azanus ubaldus*	*Acacia nilotica*	Fabaceae		April-Nov
			Azanus uranus	*Acacia nilotica*	Fabaceae		April-Nov
		Celastrina Tutt, 1906	*Celastrina argiolus*	*Prinsepia utilis*	Rosaceae		Jan-Dec
			Celastrina gigas	*Prinsepia utilis*	Rosaceae		Jan-Dec
			Celastrina huegelii	*Prinsepia utilis*	Rosaceae		Jan-Dec
		Acytolepis Toxopeus, 1927	*Acytolepis puspa*	*Hiptage* sp.	Malpighiaceae		March-Oct
		Oreolyce Toxopeus, 1027	*Oreolyce vardhana*	*Berberis lycium*	Berberidaceae		May-June
		Euchrysops Butler, 1900	*Euchrysops cnejus*	*Pisum sativum*	Fabaceae		April-Nov
		Polyommatus Latreille, 1804	*Polyommatus pseuderos*	*Trifolium repens*	Fabaceae		April-Oct
			Polyommatus ariana	*Trifolium repens*	Fabaceae		April-Oct
		Aricia Reichenbach, 1817	*Aricia agestis*	*Geranium nepaliensis*	Geraniaceae		April-Oct
		Pamiria Zhdanko, 1995	*Pamiria omphisa*	Unknown			April-Oct
			Pamiria galathea	Unknown			April-Oct
		Freyeria Courvoisier, 1920	*Freyeria putli*	*Indigofera* sp	Fabaceae		April-Sept
		Luthrodes Druce, 1895	*Luthrodes pandava*	*Acacia nilotica*	Fabaceae		April-Oct
		Chilades Moore, [1881]	*Chilades parrhasius*	*Acacia nilotica*	Fabaceae		April-Oct
			Chilades lajus	*Citrus* sp.	Rutaceae		April-Oct
		Lycaena Fabricius, 1807	*Lycaena panava*	*Rumex hastatus*	Polygonaceae		April-Oct
			Lycaena phlaeas	*Rumex dentatus*	Polygonaceae		April-Nov
			Lycaena kasyapa	Unknown			May-Sep
		Heliophorus Geyer, [1832]	*Heliophorus sena*	*Rumex hastatus*	Polygonaceae		Jan-Dec
			Heliophorus bakeri	Unknown			April-Sept
			Heliophorus oda	Unknown			April-Sept
			Heliophorus moorei	Unknown			April-Nov
	Aphnaeinae	*Cigaritis* Donzel, 1847	*Cigaritis vulcanus*	Unknown			March-Nov
			Cigaritis ictis	*Senna* sp.	Fabaceae		March-Nov
	Theclinae	*Chaetoprocta* de Niceville, 1890	*Chaetoprocta odata*	*Juglans regia*	Juglandaceae		May-Sept
		Euaspa Moore, 1884	*Euaspa milionia*	Unknown			May-Sept
			Euaspa ziha	Unknown			May-Sept
		Esakiozephyrus Shirozu & Yamamoto, 1956	*Esakiozephyrus icana*	Unknown			May-Sept
		Chrysozephyrus Shirozu & Yamamoto, 1956	*Chrysozephyrus syla*	Unknown			May-Sept

Lycaenidae	**Theclinae**	*Thermozephyrus* Inomata & Itagaki, 1986	*Thermozephyrus ataxus*	Unknown		WLPA Sch II	May-Sept
		Arhopala Boisduval, 1832	*Arhopala atrax*	Unknown			May- Oct
			Arhopala amantes	*Lagerstroemia* sp., *Xylia* sp., *Shorea* sp.	Lythraceae, Fabaceae, Dipterocarpaceae		May- Oct
			Arhopala rama	Unknown			May- Oct
			Arhopala dodonaea	Unknown			May- Oct
			Arhopala ganesa	Unknown			May-Oct
		Iraota Moore, [1881]	*Iraota timoleon*	*Ficus carica*	Moraceae		April-Oct
		Horaga Moore, [1881]	*Horaga onyx*	*Coriaria sp.*	Coriariaceae	WLPA Sch IIA	pril-Oct
		Deudorix Hewitson, 1863	*Deudorix epijarbas*	*Aesculus indica*	Sapindaceae		March-Nov
		Rapala Moore, [1881]	*Rapala manea*	*Urena lobata*	Malvaceae		March-Nov
			Rapala iarbus	Unknown			April-Oct
			Rapala nissa	Unknown			April-Nov
			Rapala selira	Unknown			April-Oct
		Satyrium Scudder, 1876	*Satyrium deria*	Unknown			April-Oct
Riodinidae	**Riodininae**	*Dodona* Hewitson, 1861	*Dodona durga*	*Myrsine semiserrata*	Myrsinaceae		March-Nov
			Dodona dipoea	Unknown		WLPA Sch II	April-Oct
			Dodona eugenes	*Myrsine semiserrata*	Myrsinaceae		May-Sept
Nymphalidae	**Libytheinae**	*Libythea* Fabricius, 1807	*Libythea lepita*		Cannabaceae	WLPA Sch II	March-Nov
			Libythea myrrha		Cannabaceae		April-Nov
	Danainae	*Parantica* Moore, [1880]	*Parantica aglea*		Apocynaceae		April-Nov
			Parantica sita	Unknown			April-Oct
		Tirumala Moore, [1880]	*Tirumala limniace*		Apocynaceae		April-Oct
		Danaus Kluk, 1780	*Danaus genutia*		Apocynaceae		April-Nov
			Danaus chrysippus		Apocynaceae		April-Nov
		Euploea Fabricius, 1807	*Euploea mulciber*	*Ficus carica*	Moraceae		March-Oct
			Euploea core	*Ficus* sp., *Carissa* sp.	Moraceae, Apocynaceae		April-Nov
	Satyrinae	*Melanitis* Fabricius, 1807	*Melanitis leda*	*Zea mays* Poaceae			April-Nov
			Melanitis phedima	*Zea mays*, *Oryza sativa*	Poaceae		April-Nov
		Lethe Hübner, [1819]	*Lethe sidonis*		Poaceae		March-Nov
			Lethe confusa		Poaceae		March-Nov
			Lethe rohria		Poaceae		March-Nov
			Lethe verma		Poaceae		March-Nov
		Lasiommata Westwood, 1841	*Lasiommata schakra*	Unknown			April-Nov
		Kirinia Moore, 1893	*Kirinia eversmanni*	Unknown			April-Sept
		Mycalesis Hübner, 1818	*Mycalesis perseus*	*Oryza sativa*	Poaceae		March-Nov
		Ypthima Hübner, 1818	*Ypthima nareda*	Unknown			March-Nov
			Ypthima kasmira	Unknown			March-Nov
			Ypthima lisandra	Unknown			March-Nov
			Ypthima baldus		Poaceae		April-Oct
			Ypthima nikaea	Unknown			March-Nov
			Ypthima sakra	Unknown			March-Nov
			Ypthima hyagriva	Unknown		WLPA Sch II	Aug-Sept

Nymphalidae	Satyrinae	*Callerebia* Butler, 1867	*Callerebia nirmala*	Unknown			April-Nov
			Callerebia scanda	Unknown		WLPA Sch II	April-Nov
			Callerebia annada	Unknown		WLPA Sch II	April-Nov
			Callerebia hybrida	Unknown			April-Nov
		Hyponephele Muschamp, 1915	*Hyponephele kashmirica*	Unknown			May, Sept
		Aulocera Butler, 1867	*Aulocera brahminus*	Unknown			March-Nov
			Aulocera padma	Unknown			March-Nov
			Aulocera swaha	Unknown			March-Nov
			Aulocera saraswati	Unknown			March-Nov
		Hipparchia Fabricius, 1807	*Hipparchia parisatis*	Unknown			March-Nov
	Biblidinae	*Ariadne* Horsfield, [1829]	*Ariadne merione*	*Tragia* sp.	Euphorbiaceae		March-Nov
	Heliconiinae	*Argynnis* Fabricius, 1807	*Argynnis hyperbius*	Viola sp.	Violaceae		April-Oct
			Argynnis childreni	Unknown			April-Oct
			Argynnis kamala	Unknown			April-Oct
			Argynnis jainadeva	Unknown		WLPA Sch II	April-Oct
		Issoria Hübner, [1819]	*Issoria issaea*	*Viola* sp.	Violaceae	WLPA Sch II	March-Nov
		Clossiana Reuss, 1920	*Clossiana jerdoni*	Unknown			May-Sept
		Phalanta Horsfield	*Phalanta phalantha*	*Flacourtia* sp., *Salix* sp.	Salicaceae		March-Nov
		Vagrans Hemming, [1829]	*Vagrans egista*	Unknown			April-Nov
		Symbrenthia Hübner, [1819]	*Symbrenthia lilaea*	*Debregeasia hypoleuca*	Urticaceae		April-Nov
			Symbrenthia niphanda	Unknown		WLPA Sch II	May-Oct
			Symbrenthia brabira	Unknown			May-Oct
		Nymphalis Kluk, 1780	*Nymphalis xanthomelas*	*Salix* sp.	Salicaceae		March-Oct
		Aglais Dalman, 1816	*Aglais caschmirensis*	*Urtica dioica*	Urticaceae		March-Dec
		Kaniska Moore, [1899]	*Kaniska canace*	*Smilax* sp.	Smilacaceae		April-Oct
		Polygonia Hübner, [1819]	*Polygonia c-album*	Unknown		WLPA Sch II	April-Sept
		Vanessa Fabricius, 1807	*Vanessa cardui*	*Cirsium arvense*, *Urtica dioica*	Asteraceae, Urticaceae		March-Dec
			Vanessa indica	*Girardinia heterophylla*, *Urtica dioica*	Urticaceae		March-Dec
		Junonia Hübner, [1819]	*Junonia hierta*	*Hygrophila* sp.	Acanthaceae		March-Dec
			Junonia orithya	*Lepidagaths* sp.	Acanthaceae		March-Dec
			Junonia lemonias	*Sida rhombifolia*	Malvaceae		March-Dec
			Junonia almana	*Oryza sativa*, *Pennisetum* sp.	Poaceae		March-Dec
			Junonia atlites	*Barleria* sp., *Hygrophila* sp.	Acanthaceae		April- Sep
			Junonia iphita	*Strobilanthes* sp.	Acanthaceae		March-Dec
		Kallima Doubleday, [1849]	*Kallima inachus*	*Girardinia heterophylla*	Urticaceae		March-Nov
		Hypolimnas Hübner, [1819]	*Hypolimnas misippus*	*Abelmoschus* sp., *Hibiscus* sp., *Sida* sp., *Portulaca* sp.	Malvaceae, Portulacaceae	WLAP Sch II	April-Oct
			Hypolimnas bolina	*Alternanthera* sessilis, *Sida rhombifolia*, *Portulaca* sp.	Amaranyhaceare, Malvaceae		April-Oct
	Cyrestinae	*Cyrestis* Boisduval, 1832	*Cyrestis thyodamas*	*Ficus carica*	Moraceae		April-Oct

Nymphalidae	**Limentidinae**	*Neptis* Fabricius, 1807	*Neptis sappho*	Unknown			April-Nov
			Neptis soma	Unknown		WLPA Sch II	April-Nov
			Neptis nata		Cannabaceae		April-Nov
			Neptis mahendra	Unknown			April-Oct
			Neptis zaida	Unknown		WLPA Sch II	April-June
		Pantoporia Hübner, [1819]	*Pantoporia hordonia*	*Acacia* sp.	Fabaceae		September
		Athyma Westwood, [1850]	*Athyma perius*		Phyllanthaceae		April-Oct
			Athyma opalina	Unknown			March-Nov
		Limenitis Fabricius, 1807	*Limenitis ligyes*	Unknown			April-Sept
			Limenitis trivena	Unknown			April-Sept
		Auzakia Moore, [1898]	*Auzakia danava*	Unknown		WLPA Sch II	November
		Euthalia Hübner, [1819]	*Euthalia patala*	Unknown		WLPA Sch II	July
		Pseudergolis C. & R. Felder, [1867]	*Pseudergolis wedah*	*Debregeasia hypoleuca*	Urticaceae		March-Nov
		Stibochiona Butler, [1869]	*Stibochiona nicea*	*Boehmeria* sp.	Urticaceae		May
	Apaturinae	*Mimathyma* Moore, [1896]	*Mimathyma ambica*	*Ulmus* sp.	Ulmaceae		Sept
			Mimathyma chitralensis	*Ulmus* sp.	Ulmaceae		Aug-Sept
		Dilipa Moore, 1857	*Dilipa morgiana*	Unknown		WLPA Sch I	May
		Sephisa Moore, 1882	*Sephisa dichroa*	*Quercus* sp.	Fagaceae		Aug-Oct
		Euripus Doubleday, [1848]	*Euripus consimilis*		Cannabaceae		Aug-Oct
		Hestina Westwood, [1850]	*Hestina persimilis*	*Celtis* sp.	Cannabaceae	WLPA Sch II	Aug-Oct
		Polyura Billberg, 1820	*Polyura athamas*	*Albizia* sp., *Grewia* sp.	Fabaceae, Malvaceae	WLPA Sch II	Aug-Oct
			Polyura agraria	*Acacia nilotica*	Fabaceae		Aug-Oct
	Acraeinae	*Acraea* Fabricius, 1807	*Acraea issoria*	*Debregeasia hypoleuca*, *Rubus ellipticus*	Urticaceae, Rosaceae		Jan-Dec

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A phylogenetically isolated and endemic Geometridae discovered from montane forests in the Canary Island of Tenerife (Spain) (Lepidoptera: Geometridae, Larentiinae)

Pasi Sihvonen, Peder Skou, Per Falck, Leidys Murillo-Ramos, Elina Laiho, Max Söderholm, Hermann Staude & Mikael Englund

Abstract

The Lepidoptera fauna of Europe is among the best studied in the world, and new species are only rarely discovered that do not fit in the existing classification. We present an unknown Geometridae from the Canary Islands (Spain), which, according to the multi-gene molecular phylogeny and morphology, represents a phylogenetically isolated lineage and does not fit into any known Geometridae genus or tribe. Using an integrative approach, we classify it in the subfamily Larentiinae, in a lineage that is included in the Larentiini complex of tribes. The new taxon, named *Atlanticola mystica* Sihvonen, Skou & Falck (new genus, new species) is an island endemic, occurring in Tenerife only and it is restricted to the montane forests above 500 m AMSL. We also illustrate an unrelated *Herbulotina grandis* (Prout, 1914) for comparison, which has a similar wing pattern, but is structurally different, and it is transferred here from Larentiini to the Xanthorhoini complex of tribes, supporting its original systematic position (original classification revived).
Keywords: Lepidoptera, Geometridae, Larentiinae, new genus, new species, systematics, Tenerife, Spain.

Un Geometridae filogenéticamente aislado y endémico descubierto en los bosques montanos de la isla canaria de Tenerife (España) (Lepidoptera: Geometridae, Larentiinae)

Resumen

La fauna de Lepidoptera de Europa se encuentra entre las mejor estudiadas del mundo y sólo en raras ocasiones se descubren nuevas especies que no encajan en la clasificación existente. Presentamos un Geometridae desconocido de las Islas Canarias (España) que, según la filogenia molecular multigénica y la morfología, representa un linaje filogenéticamente aislado y no encaja en ningún género o tribu de Geometridae conocidos. Utilizando un enfoque integrador, lo clasificamos en la subfamilia Larentiinae, en un linaje que se incluye en el complejo de tribus Larentiini. El nuevo taxón, denominado *Atlanticola mystica* Sihvonen, Skou & Falck (nuevo género, nueva especie) es un endemismo insular, que sólo se da en Tenerife y está restringido a los bosques montanos por encima de los 500 m de altitud. También ilustramos una *Herbulotina grandis* (Prout, 1914) no relacionada para su comparación, que tiene un patrón alar similar, pero es estructuralmente diferente y se transfiere aquí de Larentiini al complejo de tribus Xanthorhoini, apoyando

su posición sistemática original (clasificación original revivida).
Palabras clave: Lepidoptera, Geometridae, Larentiinae, nuevo género, nueva especie, sistemática, Tenerife, España.

Introduction

The Lepidoptera fauna of Europe has been studied intensively since mid-1700s (e.g. Linnaeus, 1758), and arguably, it is among the best studied areas in the world. Currently, over 11000 Lepidoptera species are recorded from the continent (https://lepiforum.org Rodeland & Rennwald, 2006-2024). Within the order Lepidoptera, the Geometridae fauna of Europe has been recently revised in the monograph series *Geometrid Moths of Europe* and was concluded to contain about 1000 species (Müller et al. 2019 and references therein). In recent years, few additional, mostly cryptic species or subspecies have been described (e.g. Tautel & Lévêque, 2020; Beshkov, 2022), or taxonomic status has been changed (e.g. Lévêque & Tautel, 2023), and therefore those taxa have been easy to place in the existing classification (Hausmann & Sihvonen, 2019). A notable exception is the discovery of an enigmatic geometrid species from Croatia, *Mirlatia arcuata* Hausmann, László, Mayr & Huemer, 2023, whose classification even on subfamily level is uncertain and it awaits further research (Hausmann et al. 2023).

The Lepidoptera fauna of the Canary Islands was not included in the revision of the European fauna (Müller et al. 2019). The fauna differs from the mainland Europe in the sense that many of its taxa are endemic, occurring only on one or several of its islands. The Canary Islands have been rather intensively studied for more than 100 years (e.g. Rebel & Rogenhofer, 1894; Rebel, 1896-1938; Pinker, 1960, 1963, 1971, 1978), at least partly because the islands are a popular holiday destination. The Lepidoptera fauna of the islands is illustrated by Báez (1998), catalogued by Báez & Martín (2010) and Vives Moreno (2014), and new species are described annually. Based on these, we estimate the fauna consists of about 855 species, of which about 65 species belong to Geometridae. The numbers are indicative only, because in-depth studies on focused taxa have reported notable increases in species diversity and changes in the classifications (e.g. Falck et al. 2019; Falck & Hausmann, 2020; Falck & Karsholt 2022).

In 2018, Peder Skou sent two small, sand-colored male specimens to Pasi Sihvonen for morphological study and DNA barcoding, hoping such information would help to identify the species that did not externally match any western Palearctic taxa. The specimens were collected from the Canary Islands (Spain): Tenerife, Güímar in November 2003. It was noted that several morphological characters supported classification in the subfamily Larentiinae, for instance the long fusion of hindwing veins Sc + R1 with Rs (Meyrick, 1892), the multiple forewing fasciae (e.g. Meyrick, 1892; Minet & Scoble, 1999; Murillo-Ramos et al. 2021), and the hammer-headed tip in tympanal organ's ansa pointed to Sterrhinae + Larentiinae lineages (e.g. Cook & Scoble, 1992). The male genitalia did not match any western Palearctic species. Unfortunately, attempts to extract DNA failed. The studies were paused due to the limited material, and we asked colleagues if they had more specimens on this mysterious species. Per Falck replied that he had found a female of the species from Tenerife: Arona in March 2017. Like the male, the female genitalia did not match any western Palearctic species. Fortunately, a 652 bp COI DNA barcode was recovered from this specimen, but there was no close genetic match on BOLD database (see Results below). Attempts to get nuclear genes from this female specimen by Sanger sequencing failed. The final missing piece was a targeted field trip to Tenerife by Mikael Englund in November 2022. He visited the Güímar area, where the first specimens were found and managed to collect four males and a female by light at around 650 m altitude from the steeply sloping outskirts of coniferous mountain forests covered by dense scrub vegetation (Figure 17). Fresh tissue samples from these specimens yielded high-quality DNA, and several mitochondrial and nuclear genes were successfully extracted and sequenced.

This undescribed species is illustrated on page 30 (Figure 49) without spatial or temporal data in the monograph of Báez (1998), but in our opinion, it is misidentified as *Herbulotina grandis* Prout, 1914.

Here we describe this mysterious, endemic species from Tenerife in the Canary Islands and clarify its relationship against *Herbulotina grandis*. Using an integrative taxonomic approach, including multi-gene molecular phylogeny and morphology, we show that it represents a phylogenetically isolated lineage in the subfamily Larentiinae, and it cannot be classified in any described genus or tribe. It is known only from the scrubby mountain slopes and coniferous montane forests above 500 m AMSL.

Material and methods

Study material, abbreviations, and identification

Altogether, 50 specimens of an undescribed taxon from Tenerife in the Canary Islands were available for study. The oldest specimen is from 2003, and fresh specimens were collected during targeted field trips in 2022-2023, which were used in the molecular studies.

coll. Englund	Research collection of Mikael Englund, Järvenpää, Finland
coll. Falck	Research collection of Per Falck, Årsdale, Denmark
coll. Skou	Research collection of Peder Skou, Ollerup, Denmark
FMNH	Finnish Museum of Natural History, Helsinki, Finland
MNCN	Museo Nacional de Ciencias Naturales, Madrid, Spain
NHMUK	Natural History Museum, London, United Kingdom
ZSM	Bavarian State Museum of Natural History, Munich, Germany

For identification, specimens (including external and internal structures) were compared against relevant literature, online sources, and collections. These include Prout (1912-1916, 1934-1939, particularly North African fauna), Báez (1998) Báez & Martín (2010) and Vives Moreno (2014, Canary Islands), *The Geometrid Moths of Europe* series (Müller et al. 2019 and references therein for previous volumes, Europe), Rodeland & Rennwald, 2006-2024 (Europe and Canary Islands), while DNA barcodes (658 bp region near the 5' terminus of the COI mitochondrial gene) of molecular vouchers ME13 (*Atlanticola mystica*) and PS1529 (*Herbulotina grandis*) processed in the current study were compared against the publicly available genetic material available on Barcode of Life Data Systems BOLD https://v4.boldsystems.org (Ratnasingham & Hebert, 2007; Ratnasingham & Hebert, 2013) and GenBank (Benson et al. 2013). The material in the relevant public and private collections were examined as listed above.

Label data of specimens are presented according to the SHILAP requirements, not verbatim as they appear on the actual labels. A semicolon separate labels, and additional information about specimens or labels is enclosed in square brackets.

Morphological examination

Specimens were first photographed, and following this, male and female abdomens were removed, and the genitalia were dissected following established preparation protocols (e.g. Hardwick, 1950; Robinson, 1976; Sihvonen, 2001, described in detail in Sihvonen, 2005). Some structures were photographed during dissection in situ, to allow an optimal angle for observing and illustrating certain structures. All structures were stained with Chlorazol black. Preparations of genital and abdominal structures were eventually mounted in Euparal. Structural characters were examined and photographed using a Leica S9D stereomicroscope, Leica DM1000 LED microscope and Canon EOS 5D digital camera with MP-E 65 mm EF 100 mm macro lenses. Photos were taken with StackShot automated macro rail and focus stacked in Image Manager software (Zerene Stacker). Image files were edited in Photoshop v. 24 (2023) and the final plates arranged using CorelDraw v. 24 (2023).

Wing venation was studied using non-destructive micro-CT imaging, following the imaging and CT image reconstruction protocols described in Souza Moraes et al. (2023) and Englund et al. (2024), except the imaging parameters, which were different in the current study. Specifically, we used multimetal-target with molybdenum setting, 70 kV beam energy, 100 uA beam current, 500 ms exposure time, and 9998 projections with average of eight frames per projection. Detector binning was set to 1 x 1 and gain to 24 dB and the imaging was conducted using limited dynamic range. X-ray tube warm-up of 15 minutes and shading correction of 5 minutes 23 seconds was performed before the imaging. Total imaging time was 11 hours 6 minutes 40 seconds and the resulting voxel size 8 µm.

Genitalia terminology follows Klots (1970) and Sibatini (1972), wing venation terminology follows McGuffin (1977). In ambiguous cases, descriptive terms were used and were accompanied by illustrations.

Molecular data, techniques, and phylogenetic inference

DNA was extracted from 1-3 legs of dry voucher specimens: an unknown taxon (voucher code ME13: Spain: Tenerife, Güímar, 14-XI-2022, Mikael Englund leg.) and *Herbulotina grandis* (Prout, 1914) (voucher code PS1529: Spain, Tenerife, Adeje, 737 m, 26-XI-2021, Mikael Englund leg.). Genomic DNA was extracted and purified using a QIACEN DNeasy Blood & tissue kit, and QIAcube extraction robot was used, both following the manufacturer's protocols. DNA amplification and sequencing were carried out following protocols proposed by Wahlberg and Wheat (2008) and Wahlberg et al. (2016). PCR products were cleaned enzymatically and sent to Macrogen Europe (Amsterdam) for Sanger sequencing. One mitochondrial gene (cytochrome oxidase subunit I, (COI) and 10 protein-coding nuclear gene regions, carbamoylphosphate synthetase (CAD), Ribosomal Protein S5 (RpS5), wingless (wg), cytosolic malate dehydrogenase (MDH), glyceraldehydes-3-phosphate dehydrogenase (GAPDH), Elongation factor 1 alpha (EF-1alpha), Arginine Kinase (ArgK), Isocitrate dehydrogenase (IDH), sorting nexin-9-like (Nex9), and sarco/endoplasmic reticulum calcium ATPase (Ca-ATPase) were targeted for sequencing. To check for potential misidentifications, DNA barcode sequences (COI) were compared to those in BOLD (Ratnasingham & Hebert, 2007) where references of more than 21,000 geometrid species are available, some 10,000 of them identified to Linnean species names (Ratnasingham & Hebert, 2007). GenBank accession numbers for new sequences used in this study are provided in Table 1.

Table 1. GenBank accession numbers for the new sequences used in this study.

Voucher	COI	RpS5	Wg	EF-1alpha	Ca-ATPase	MDH	ArgK	Nex9
ME13	PP704417	PP707614	PP707616	-	PP707609	-	PP707607	-
PS1529	PP704418	PP707615	PP707617	PP707611	PP707610	PP707612	PP707608	PP707613

Multiple sequence alignments were carried out in MAFFT as implemented in Geneious v.11.0.2 https://www.geneious.com for each gene based on a reference sequence of Geometridae downloaded from the database VoSeq (Peña & Malm, 2012).

We successfully amplified five genes for ME13 (COI, RpS5, wg, CA-ATPase, ArgK) and eight genes for PS1529 (COI, RpS5, wg, EF-1alpha, Ca-ATPase, MDH, ArgK, Nex9). To analyse the data of these two taxa, we added them to the 11 gene geometrid data set of Murillo-Ramos et al. (2019, 2023), having in total 1386 taxa. The dataset included representative taxa of all subfamilies recognized in Geometridae.

We conducted a phylogenetic analysis under a Maximum-likelihood (ML) approach in IQ-TREE2 V2.0.7 (Minh et al. 2020). The dataset was partitioned by genes. The best substitution models that fit our data were selected with ModelFinder (Kalyaanamoorthy et al. 2017). Support for nodes were evaluated with 1000 ultrafast bootstrap (UFBoot2) approximations (Hoang et al. 2018), and SH-like approximate likelihood ratio test (Guindon *et al.*, 2010). To reduce the risk of overestimating branch supports in UFBoot2 test, we implemented the *-bnni* option. We visualized and edited the trees in FigTree v1.4.3 and CorelDraw v. 24 (2023).

Results

Taxonomy

When examining our target taxon from Tenerife, we did not find morphologically similar taxa in the literature, in collections, in DNA barcode reference library on BOLD, and in a multi-gene molecular phylogeny including global taxon sampling, the species did not group inside any included genera. For these reasons, we describe it as a new species in a new genus. However, we refrain from describing a monotypic tribe for it, acknowledging that further taxon sampling may bring clarity to its tribal association inside the Larentiinae: Larentiini complex. Even without a formal tribal description, its phylogenetic position is evident from the phylogenetic hypothesis. The focus of our description is on illustrations, rather than on extensive

text, because good illustrations can capture the diagnostic and other features in a more informative way.

***Atlanticola* Sihvonen, Skou & Falck, gen. nov.**
https://zoobank.org/D98AB49C-1D00-4DF2-84F1-6707778A8B06
Type species: *Atlanticola mystica* sp. nov. (by monotypy).

Systematic position and differential diagnosis (Figures 1-12, 14-16): The Larentiinae position is supported by the multi-gene molecular data, the long fusion of hindwing veins Sc + R1 with Rs (Meyrick, 1889), multiple forewing fasciae (e.g. Minet & Scoble, 1999), forewing veins R1-R4 arise from the (second) areole (Õunap et al. 2008), and the socii are absent (Hausmann & Viidalepp, 2012. The new species has a hammer-headed tip in the ansa of the tympanal organ, which is shared by Sterrhinae + Larentiinae (e.g. Cook & Scoble, 1992, see also Murillo-Ramos et al. 2021 for on overview of diagnostic subfamily characters). Multi-gene molecular data places our target taxon in the Larentiini complex of tribes, as sister to Larentiini and an unnamed clade + Ennadini + six other tribes. It represents the only species of an isolated lineage. *Atlanticola* is distinguished from other larentiine genera by the unique wing pattern, vaguely resembling that of *Larentia clavaria* (Haworth, 1809), but the forewings are more sand-colored, fasciae are more pronounced, and postmedial line has a distinct outwards projecting angle in middle (see e.g. Hausmann & Viidalepp, 2012). The genitalia structures do show similarities with *Larentia* Treitschke, 1825, but in *Atlanticola* males the uncus is setose, and valva is without dorsal projection (uncus bare, and valva is with dorsal and setose projection in *L. clavaria*) (Hausmann & Viidalepp, 2012). In *Atlanticola* females, signum is absent (large in *L. clavaria*, weakly developed with diffuse borders in *L. malvata* (Rambur, 1833)) (Hausmann & Viidalepp, 2012). *Atlanticola mystica* is only superficially like *Herbulotina grandis*, as it is shown here to belong in the Xanthorhoini complex of tribes (see below).

Among the European Geometridae, we classify *Atlanticola mystica* in Larentiinae: Larentiini complex of tribes and place it in the linear list of taxa (Hausmann & Sihvonen 2019, the phylogenetic relationships are refined in Õunap et al. 2024) after Larentiini as "Not assigned to tribus".

Description: See text below.

Etymology: *Atlanticola* refers to the Atlantic Ocean and the suffix -cola refers to "inhabiting". This indicates the collecting locality of the species on the Canary Islands in the Atlantic Ocean.

***Atlanticola mystica* Sihvonen, Skou & Falck, sp. nov.**
https://zoobank.org/2177288C-058A-4CAB-AFBD-5702FBB0E5B6

Holotype: ♂ [SPAIN] Tenerife, Güímar, Bco. de Badajoz, 705 m, 24-X-2003, leg. O. Czadek L[ight]; Pasi Sihvonen, prep. number 2223; HOLOTYPE, *Atlanticola mystica*, Sihvonen, Skou & Falck [red label]". Currently in coll. Skou, to be deposited at Zoological Museum, University of Copenhagen, Denmark. Holotype illustrated on figures 1, 11a, 11c-e, 11g, 15b.

Paratypes: Altogether 35 ♂, 14 ♀. [Spain] Tenerife, Güímar, Bco. de Badajoz, 705 m, ♂, 11-X-2003, leg. O. Czadek L[ight] (coll. Skou). Tenerife, Arona 500-700 m, ♀, 1-20-III-2017, P. Falck leg.; Pasi Sihvonen, prep. number 2758 (coll. Falck). [Spain] Tenerife, Arona, 650 m, ♀, 9-21-I-2023, P. Falck leg. (coll. Falck). [Tenerife] Güímar, 700 m, 24 ♂, 7 ♀, 9-24-I-2023, P. Falck leg. (coll. Falck, Skou, MNCN). [Tenerife] La Tierra del Trigo, 500 m, ♂, 19-IX-2-X-2023, P. Falck leg. (coll. Falck). Tenerife: Arona, Ifonce, 28º13'N-16º68'W, alt. 1010 m, 3 ♂ 2 ♀, 2-XI-2023, Mikael Englund leg. (coll. Englund). Tenerife: Arona, Ifonce, 28º13'N-16º68'W, alt. 1010 m, 4 ♂ 2 ♀, 4-XI-2023, Mikael Englund leg. (coll. Englund). Tenerife: Arona, Ifonce, 28.13, -16.68 alt. 1010 m, ♀, 4-XI-2023, Mikael Englund leg. (coll. MNCN). Tenerife: Güímar, 28º30'N-16º44'W, 650 m, ♂, 14-XI-2022, Mikael Englund leg (coll. Englund). Tenerife: Güímar, 28º30'N-16º44'W, 650 m, ♂, 14-XI-2022, Mikael Englund leg (MNCN). Tenerife: Güímar, 28º30'N-16º44'W, 650 m, ♂, 14-XI-2022, Mikael Englund leg.; Sihvonen prep. no. 2894; Mikael Englund DNA # 13; http://id.luomus.fi/GBT.28 (coll. FMNH). Tenerife: Güímar, 28º30'N-16º44'W, 650 m, ♀, 18-XI-2022, Mikael Englund leg.; Sihvonen prep. no. 2895; Mikael Englund DNA # 17; http://id.luomus.fi/GBT.29 (coll. FMNH). All paratypes have red label "PARATYPE, *Atlanticola mystica*, Sihvonen, Skou & Falck".

Differential diagnosis: See text above.

Description (Figures 1-12, 15-16): Wings: Wingspan males 20-28 mm (n=34), females 22-30 (n=14). Forewings sand-colored, wing base and medial area darker brown, sub-basal and terminal area lighter brown. Sexes similar, except females slightly paler. Antemedial line rather straight, evenly curved inwards on costa. Postmedial line with distinct outwards pointing angle in middle. Apex with small blackish streak. Terminal lines on fore and hindwings blackish, interrupted. Hindwing paler, rather uniform grey, with suffuse postmedial line. Fore- and hindwings with small, blackish discal spot. Wings below greyish, postmedial line most distinct, bordered with paler area near forewing costa. Blackish, suffuse spot near forewing apex. Frons slightly paler than thorax and abdomen. Male antenna bipectinate, female antenna filiform. Male and female hind tibia with 2 +2 spurs. Tympanal organ large, ansa hammer headed. Sternites and tergites 3-8 of both sexes undifferentiated.

Variation: Wing color varies from pale sand-colored to dark brown, and degree of contrast between medial area and rest of wing can be minor or distinct.

Male genitalia: Uncus long, narrow, setose. Membrane surrounding tuba analis setose. Tegumen dome shaped. Vinculum narrow sclerotized band, slightly angled laterally. Saccus large, rounded, anterior margin medially elongated. Juxta / manica complex densely setose, easily detached when aedeagus removed (in Figure 11d manica partly attached to aedeagus, Figure 11e manica not attached to aedeagus). Each end of transtilla with membranous, inwardly curved, setose lobe. Valva wide, with medial ridge, apex acute and weakly curved inwards. Costa wide, bare, basal part weakly dentate. Ventral part setose apically, margin concave in middle. Aedeagus slightly curved ventrally, narrow, with long caecum. Vesica membranous, narrow at base, wide and rounded in middle. Small batch of needle-like cornute at vesica base.

Female genitalia: Papillae anales massive, round, setose. Apophyses posteriors longer than apophyses anteriores. Lamella postvaginalis sclerotized, with few horizontal striations. Lamella antevaginalis weakly sclerotized on margin. Ductus bursae sclerotized, wide, evenly narrowing anteriorly. Ductus seminalis opens ventrally. Corpus bursae membranous, posterior part narrow and wrinkled, anterior part round. Signum absent.

Distribution and abundance: Known only from three locations in Tenerife in the Canary Islands, Güímar, Arona and La Tierra del Trigo. The first two male specimens of this species were caught from Güímar in 2003. During the recent years several specimens have been caught per night.

Phenology: Adults have been observed from October to March, and majority of those between November and January. Both males and females come to light.

Biology: The host plant of the caterpillars is unknown. By using a headlamp, many specimens were observed just after dark flying actively nearby or disturbed from *Bencomia caudata* (Ait.) Webb & Berthel bushes, indicating a possible host plant. It is endemic to the Canary Islands and known from Gran Canaria, Tenerife, and La Palma.

Habitat: Species has been found in fluvial ravines of open montane coniferous woodland. These habitats are on sandy or rocky soil with rich growth of shrubs and herbs in the upper part of the thermophilus woodland belt and the lower part of the *Pinus canariensis* C. Sm. ex DC. forest belt.

Similar species: No similar species in Europe.

Genetic data: The barcode of *Atlanticola mystica* is represented in BOLD by the BIN BOLD:AEB8667 (n = 2). The uncorrected pairwise distance to the nearest neighbor, *Austrocidaria similata* (Walker, 1862) (BOLD:ACP1376, n = 2) from New Zealand is 7.25 %. Genetic similarity potentially due to long branch attraction, and the lack of assumedly closely related Larentiini taxa from North Africa in BOLD. Therefore, the current nearest neighbor match likely does not reflect true relationship. The external morphology of *A. mystica* and *A. similata* does not support close relationship.

Etymology: Mystica (Latin), feminine form of the adjective mysticus, pertaining to the mysterious nature of the species. It has remained overlooked and undescribed in relatively well-studied Canary Islands for such a long time.

Herbulotina Pinker, 1971

Type species: *Cataclysme grandis* Prout, 1914

The original description of *Cataclysme grandis* is based on external characters only (Prout, 1914 in

Prout, 1912-1916). The original genus combination was questioned by Pinker (1963), in a publication, where he described two additional subspecies: C. *grandis grancanariae* Pinker, 1963 from Gran Canaria and *C. grandis lapalmae* Pinker, 1963 from La Palma. In the same paper, Pinker provided the first illustrations of the male and female genitalia of taxon *grandis*, in addition to the cremaster of the pupa, and reported the caterpillar to feed in captivity on the leaves of *Rubia* L. and *Galium album* Mill., both Rubiaceae. Following this, Pinker (1971) described a new genus *Herbulotina*, and he included two species in it: *H. grandis* with three subspecies and *H. maderae* Pinker, 1971.

In the latest Spanish (Vives Moreno, 2014) and European checklists (Sihvonen & Hausmann, 2019 in Müller et al.), *Herbulotina* was classified in Larentiini, the latter listing five valid species from the Canary Islands, Madeira, Morocco, and Algeria. We show here, using multi-gene molecular phylogeny and morphology, that genus *Herbulotina* is not a Larentiini, but belongs in the tribe Cataclysmini in the Xanthorhoini complex (Figure 16). Our results therefore support the original classification of taxon *H. grandis* being a part of *Cataclysme* group of genera (Prout, 1912-1916) (original classification revived). As regards the DNA barcodes, *H. grandis* (BIN BOLD:AFS5230, n = 1) has as its nearest neighbor *Obila* AH02Ec (BIN BOLD: :AAI3506, n = 6) from Ecuador with 8.49 % (p-dist) genetic difference.

With the respect to morphology (Figures 13-14), the position in Xanthorhoini complex is supported for instance by the presence of the coremata and strongly modified 7th and 8th segments in the male abdomen (Hausmann & Viidalepp, 2012), illustrated by us in Figure 14. Within the Xanthorhoini complex, the Cataclysmini position is supported for instance by numerous thin lines on wings, the paired uncus (see details on Figures 13g-13i), and the entirely sclerotized valva, the pupa cremaster has two curved hooks only (based on comparison of our material against the illustrations in Pinker (1963) (Figures 4, 5) and those of *Cataclysme riguata* and *Phibalapteryx virgata* in Patočka & Turčáni, 2005 (plate 197). Several other synapomorphies, as listed by Hausmann & Viidalepp (2012, p. 41), are not found. Among these, forewing veins R5 and M1 are not stalked in *H. grandis* and it has two areoles (Figure 12), while R5 and M1 are reported as stalked and forewing has only a single areole in the Cataclysmini genera examined by Hausmann & Viidalepp (2012). We illustrate here for the first time the vesica of *H. grandis*, showing it to contain a large, curved diverticulum with a row of massive, sclerotized spikes, the base of vesica is covered with minute "goose bump" like sclerotizations, and the base of ductus ejaculatorius has an elongated, sclerotized plate. The uncus-socii-gnathos complex is unusual, and we illustrate it therefore from ventral, lateral, and dorsal views (Figures 13g-13i).

The three *Herbulotina* species (as classified in Müller et al. 2019) from North Africa are tentatively placed in Xanthorhoini here, but we did have access to authentic material, and highlight that their systematic position needs further study: *H. berberina* (Herbulot, 1981) from Morocco; *H. carolata* (Lucas, 1938) from Morocco; *H. feliciaria* (Rungs, 1950) from Morocco (Herbulot, 1981; Lucas, 1938; Rungs, 1950).

Discussion

The current described fauna of Geometridae comprises about 24000 species, but it has been estimated the true diversity is at least 40000 species (Rajaei et al. 2022). The taxonomic impediment is huge, particularly in the tropics, and our understanding of the phylogenetic relationships and classification varies greatly geographically and by taxon. Our results enforce this message. While the fauna of continental Europe is well studied, the fauna of the adjacent Canary Islands in the Western Palearctic needs more research. *Atlanticola mystica* has been overlooked for a long time and it represents an isolated lineage that may need to be formally described as a tribe, while *Herbulotina grandis* was classified in the recent literature (Müller et al. 2019) in Larentiini, and here we propose Cataclysmini in the Xanthorhoinin complex. We highlight that the exact position of *A. mystica* in the tree of life will be fine-tuned when more extensive molecular and morphological taxon sampling is available.

Of particular interest from the phylogeographic point of view is the Catalysmini clade in Figure 16, where *Herbulotina grandis* from the Canary Islands is sister to a clade containing both North American (*Zenophleps* Hulst, 1896) and Palearctic taxa (*Phibalapteryx* Stephens, 1829 and *Cataclysme* Hübner, [1825]). As regards DNA barcodes, *H. grandis* has its genetically nearest neighbor in BOLD database an *Obila* species from Ecuador (*Obila* AH02Ec, BIN BOLD:AAI3506), further highlighting the potential cross-Atlantic connection. Potential relationship between the lineages of Canary Islands and North America would

be exceptional because most geometrid species occurring in the Canary Islands have their closely related taxa in Macaronesia, North Africa, or (western) Palearctic. Tens of such cases are listed in the European checklist of geometrid moths (Hausmann & Sihvonen 2019) and examples include several *Microloxia* Warren, 1893 (Geometrinae); *Crocallis* Treitschke, 1825 (Ennominae), *Menophra abruptaria* Moore, 1887 (Ennominae) and its subspecies; *Oar* Prout, 1913 (Scopulini) and several species of *Idaea* Treitschke, 1825 (Sterrhinae) and *Scopula* Schrank, 1802 (Scopulini). Although our phylogenetic analysis included all Cataclysmini genera of Europe (Hausmann & Sihvonen, 2019 in Müller et al.) and North America (Pohl & Nanz, 2023), and is therefore extensive on genus level, more species are needed from North America, North Africa, and Europe, to test the robustness of our results.

Atlanticola mystica has so far been found from few locations on Tenerife, in high altitude montane habitats only. The current evidence suggests the species is endemic. However, the data on this species are so deficient at the moment that its risk of extinctions cannot be assessed using the IUCN criteria https://www.iucnredlist.org/ (IUCN 2022). We place it in Data Deficient (DD) category. Among the first steps is the identification of the caterpillar's host plant, because this will give indication about its habitat, and whether conservation measures are needed to maintain this phylogenetically isolated species viable and a part of the Canary Islands unique fauna.

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Conflict of Interest

The authors declare that they have no known financial interest or personal relationship that could have influence the work presented in this article.

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*Pasi Sihvonen
Finnish Museum of Natural History
P. O. Box 17
Pohjoinen Rautatiekatu 13
University of Helsinki
FINLANDIA / *FINLAND*
E-mail: pasi.sihvonen@helsinki.fi
https://orcid.org/0000-0003-2237-9325

Peder Skou
Aamosen 1
Ollerup
DK-5762 Vester Skerninge
DINAMARCA / *DENMARK*
E-mail: pederskou1@gmail.com
https://orcid.org/0009-0009-2526-986X

Per Falck
Aarsdalevej 22
DK-3730 Neksø
DINAMARCA / *DENMARK*
E-mail: per.falck@live.dk
https://orcid.org/0000-0002-0030-9214

Leidys Murillo-Ramos
Departamento de Biología y Química
Universidad de Sucre
Cra. 28 #5-267
Barrio Puerta Roja
Sucre
COLOMBIA / *COLOMBIA*
E-mail: leidys.murillo@unisucre.edu.co
https://orcid.org/0000-0002-8256-105X

Elina Laiho
Finnish Museum of Natural History
P. O. Box 17
Pohjoinen Rautatiekatu 13
University of Helsinki
FINLANDIA / *FINLAND*
E-mail: elina.laiho@helsinki.fi
https://oricd.org/0009-0004-6497-4178

Max Söderholm
Finnish Museum of Natural History
P. O. Box 17
Pohjoinen Rautatiekatu 13
University of Helsinki
FINLANDIA / *FINLAND*
E-mail: max.salvador@helsinki.fi
https://orcid.org/0009-0003-2877-1341

Hermann Staude
The Lepidopterists' Society of Africa
Magaliesburg
SUDÁFRICA / *SOUTH AFRICA*
E-mail: staudehermann@gmail.com
https://orcid.org/0000-0002-2549-4372

Mikael Englund
Finnish Museum of Natural History
P. O. Box 17
Pohjoinen Rautatiekatu 13
University of Helsinki
FINLANDIA / *FINLAND*
E-mail: mikael.englund@helsinki.fi
https://orcid.org/0009-0001-4778-9905

*Autor para la correspondencia / *Corresponding author*

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Figures 1-10. Adults and egg of *Atlanticola mystica* (new genus, new species). **1.** male (holotype): Tenerife, Güímar, Barranco de Badajoz, 705 m, 24-X-2003 (coll. Skou), dissected (slide # 2223 Sihvonen). **2.** male (paratype): Tenerife, Arona, Ifonce, 1010 m, 4-XI-2023 (coll. Englund). **3.** male (paratype): Tenerife, Arona, Ifonce, 1010 m, 2-XI-2023 (coll. Englund). **4.** male (paratype): Tenerife: Güímar, 650 m, 14-XI-2022 (coll. Englund), dissected (slide # 2894, Sihvonen). **5.** female (paratype): Tenerife, Arona, 500-700 m, 1-20-III-2017 (coll. Falck), dissected (slide # 2758 Sihvonen). **6.** female (paratype): Tenerife, Arona, Ifonce, 1010 m, 4-XI-2023 (coll. Englund). **7.** female (paratype): Tenerife, Arona, Ifonce, 1010 m, 4-XI-2023 (coll. Englund). **8.** female (paratype): Tenerife: Güímar, 650 m, 18-XI-2022 (coll. Englund). **9.** Female adult in situ, Tenerife, 28-XI-2023. **10.** Egg.

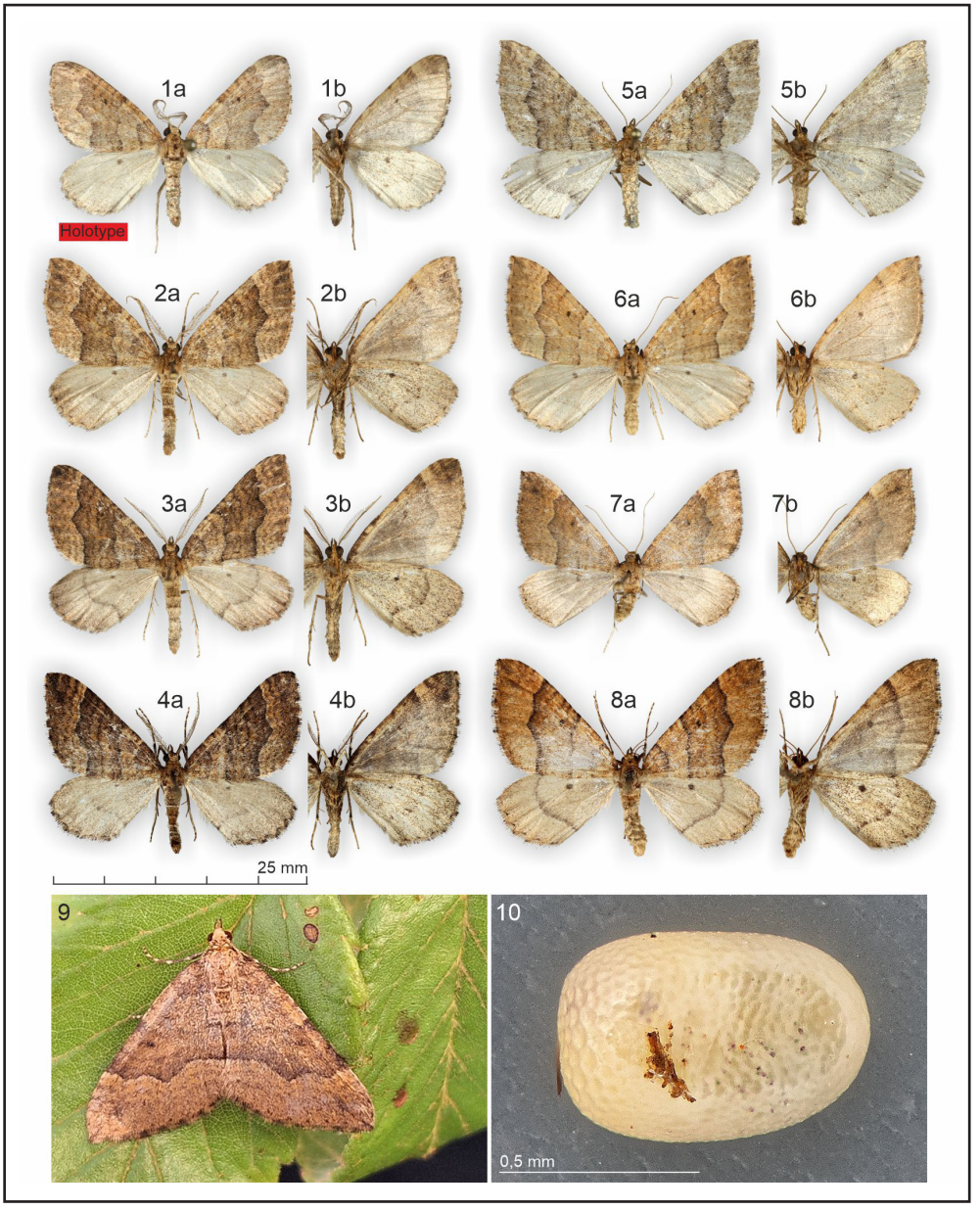


Figure 11. Adults and genitalia of *Atlanticola mystica* (new genus, new species). **a.** adult male (holotype): Tenerife, Güímar, Barranco de Badajoz, 705 m, 24-X-2003 (coll. Skou). **b.** adult female (paratype): Tenerife: Güímar, 650 m, 18-XI-2022 (coll. Engund). **c.** male genitalia (holotype): Tenerife, Güímar, Barranco de Badajoz, 705 m, 24-X-2003 (coll. Skou) (slide # 2223 Sihvonen). **d.** male aedeagus with vesica everted and uneverted with spinose manica attached (paratype): Tenerife: Güímar, 650 m, 14-XI-2022 (coll. Englund) (slide # 2894 Sihvonen). **e.** male aedeagus with vesica everted and uneverted, spinose manica removed (holotype): Tenerife, Güímar, Barranco de Badajoz, 705 m, 24-X-2003 (coll. Skou) (slide # 2223 Sihvonen). **f.** female genitalia, point of origin of ductus seminalis indicated with circle (paratype): Tenerife, Güímar, 650 m, 18-XI-2022 (coll. Englund) (slide # 2895 Sihvonen). **g.** juxta region (holotype): Tenerife, Güímar, Barranco de Badajoz, 705 m, 24-X-2003 (coll. Skou) (slide # 2223 Sihvonen). **h.** uncus, dorsal view (holotype): Tenerife, Güímar, Barranco de Badajoz, 705 m, 24-X-2003 (coll. Skou) (slide # 2223 Sihvonen). **i.** cornuti (holotype): Tenerife, Güímar, Barranco de Badajoz, 705 m, 24-X-2003 (coll. Skou) (slide # 2223 Sihvonen).

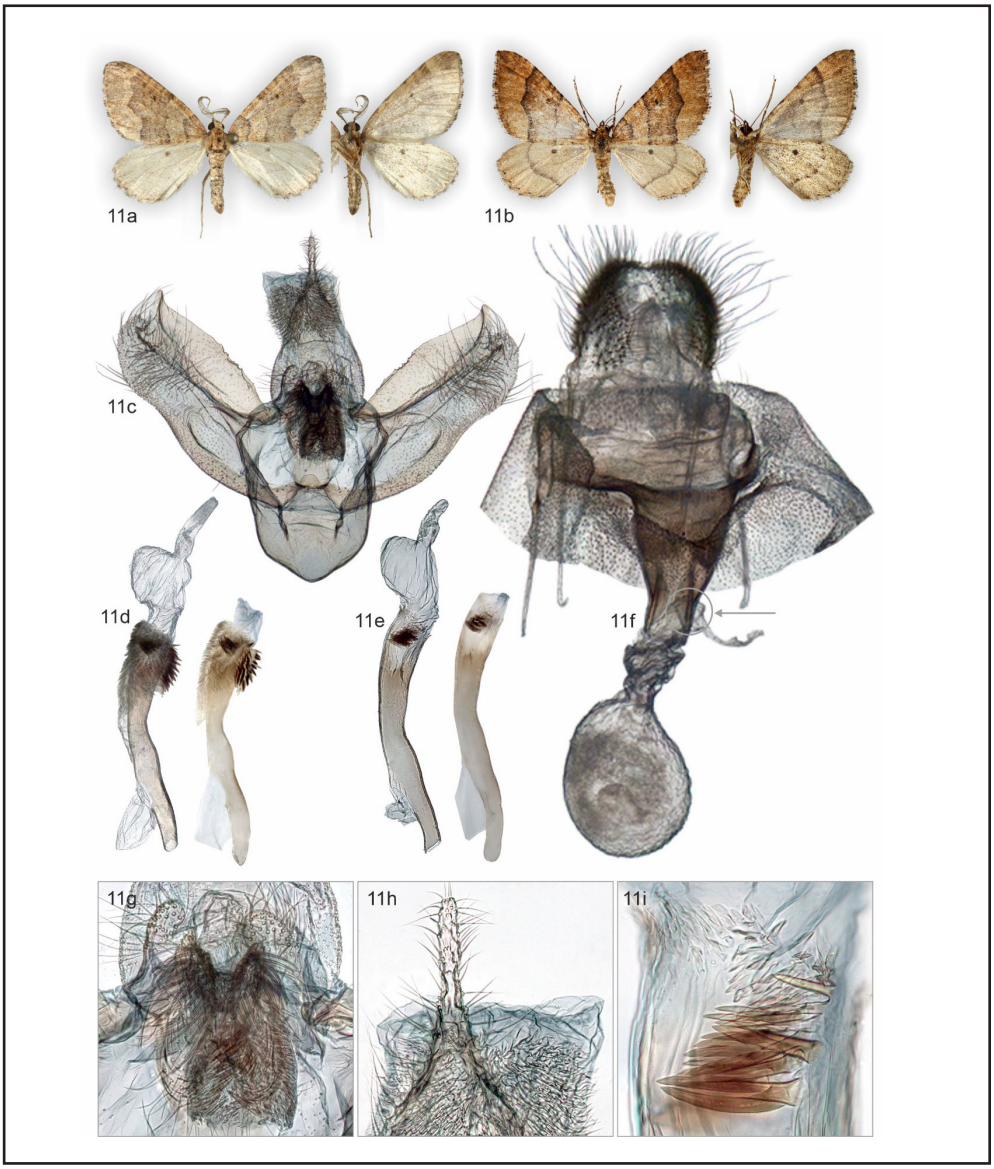


Figure 12. Wing venation of *Atlanticola mystica* (new genus, new species), based on non-destructive micro-CT scan. Male (paratype): Tenerife: Güímar, 14-XI-2022 (coll. Englund) (micro-CT scan # 8 Söderholm).

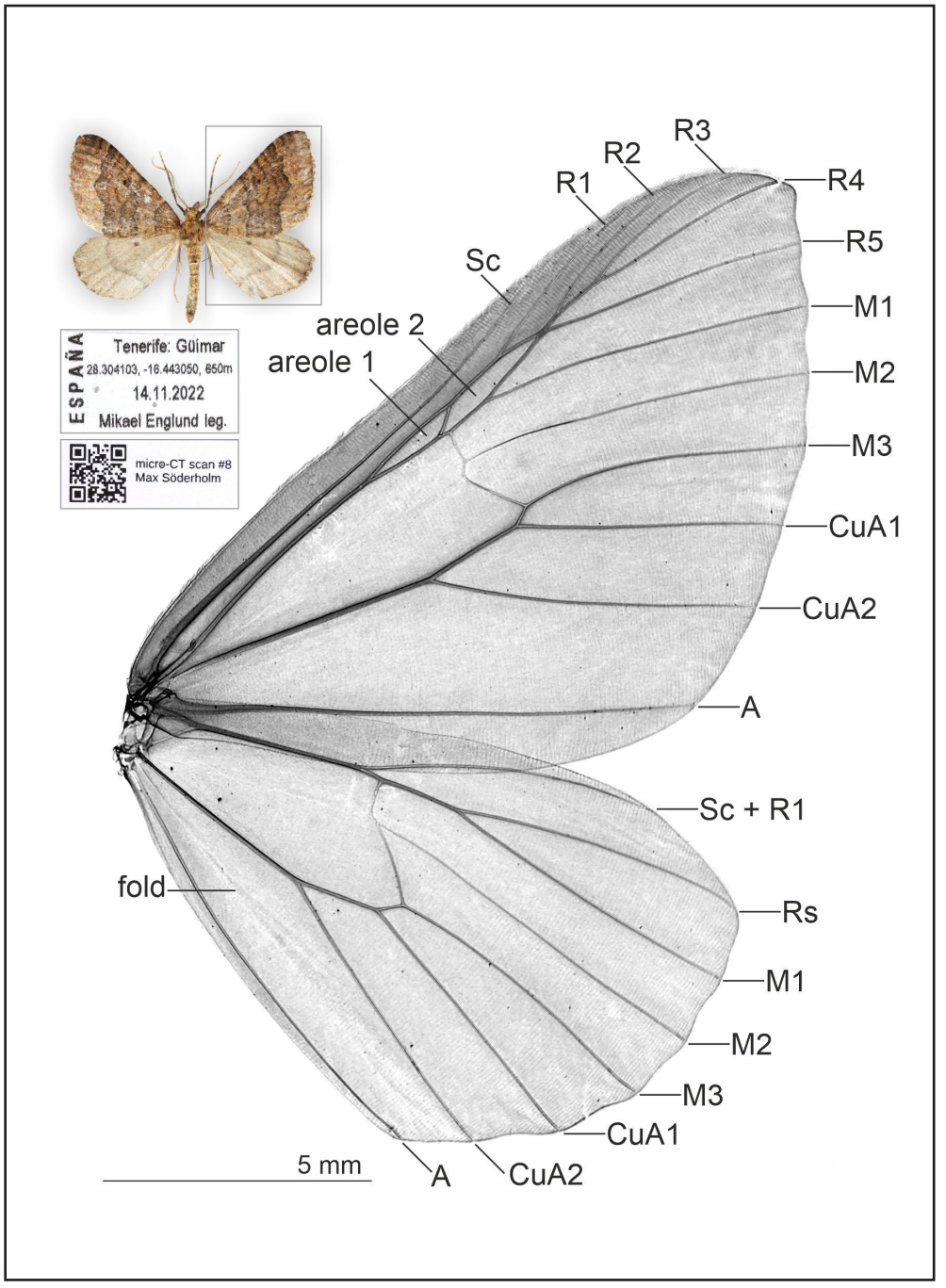
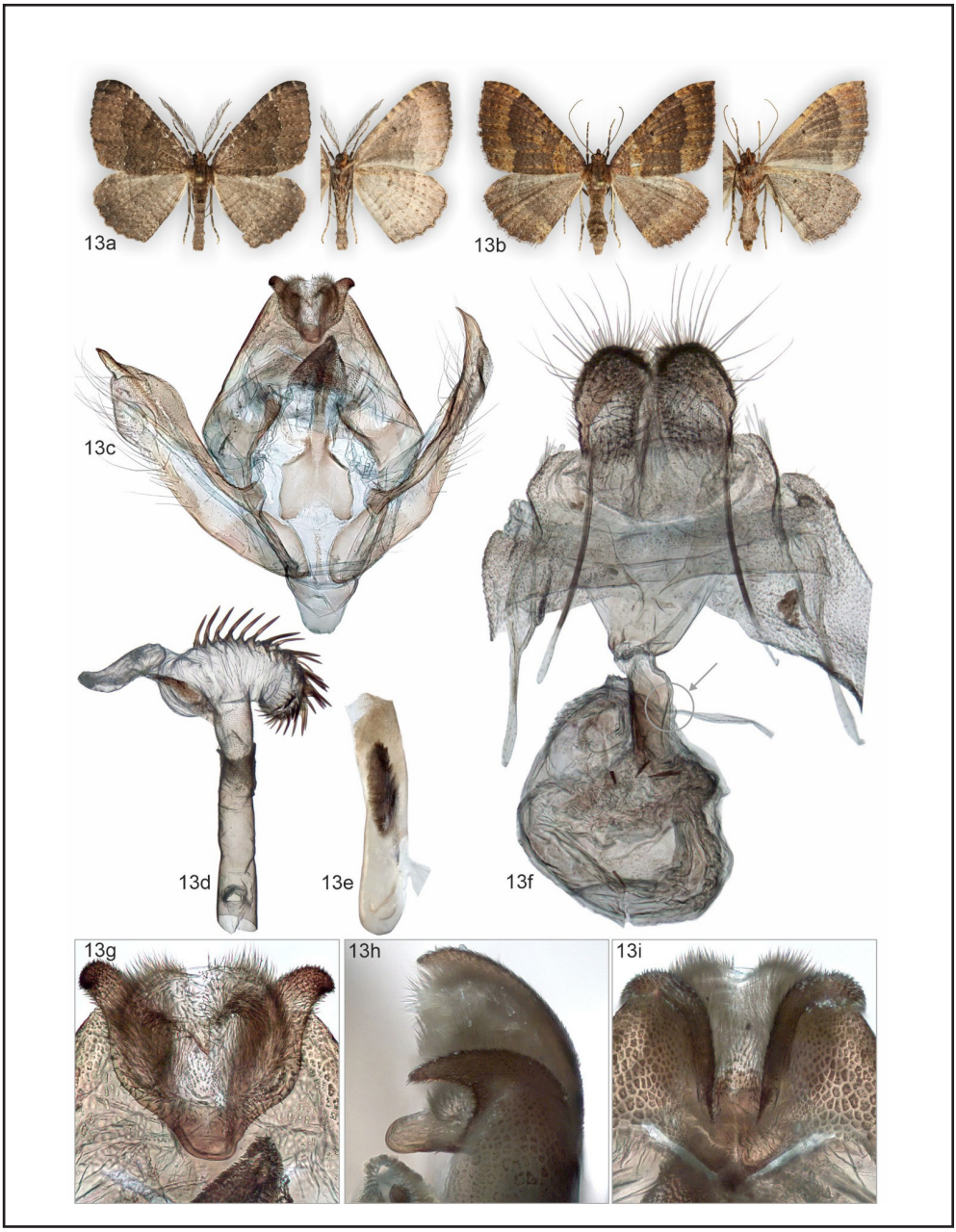


Figure 13. Adults and genitalia of *Herbulotina grandis*. **a.** adult male: Tenerife, Güímar, 650 m, 14-XI-2022 (coll. Englund). **b.** adult female: Tenerife: Adeje, 737 m, 25-XI-2021 (coll. Englund). All male genitalia structures photographed from the same specimen: Tenerife, Güímar, 650 m, 14-XI-2022 (coll. Englund) (slide # 2896 Sihvonen). **c.** male genitalia, **d.** aedeagus with everted vesica, **e.** aedeagus, **g.** uncus region in ventral view, **h.** uncus region in lateral view, **i.** uncus region in dorsal view. **f.** female genitalia, point of origin of ductus seminalis indicated with circle: Tenerife, Adeje, 737 m, 25-XI-2021 (coll. Englund) (slide # 2897 Sihvonen).



Figures 14-15. Structures of descaled male abdomens of *Herbulotina grandis* and *Atlanticola mystica* (new genus, new species). **14a.** terminal segments (A6-A8), showing the paired coremata and reduced sclerites, which are typical in Xanthorhoini: Tenerife, Güímar, 650 m, 14-XI-2022 (coll. Englund) (slide # 2896 Sihvonen). **14b.** Abdomen: Tenerife, Güímar, 650 m, 14-XI-2022 (coll. Englund) (slide # 2896 Sihvonen). **14c.** Tympanal organ's ansa: Tenerife, Güímar, 650 m, 14-XI-2022 (coll. Englund) (slide # 2896 Sihvonen). **15a.** Adbomen (paratype): Tenerife, Güímar, 650 m, 14-XI-2022 (coll. Englund) (slide # 2894 Sihvonen). **15b.** Tympanal organ's ansa (holotype): Tenerife, Güímar, Barranco de Badajoz, 705 m, 24-X-2003 (coll. Skou) (slide # 2223 Sihvonen).

Figure 16. Systematic position of the study species based on a maximum likelihood analysis of 1386 taxa and up to 11 genes per sample used in the study. **A.** The condensed phylogenetic hypothesis of Geometridae. Larentiinae (with tribes visible) are highlighted with violet rectangle, and the focus taxa of our study are highlighted with green and shown in detail in Figure 16B

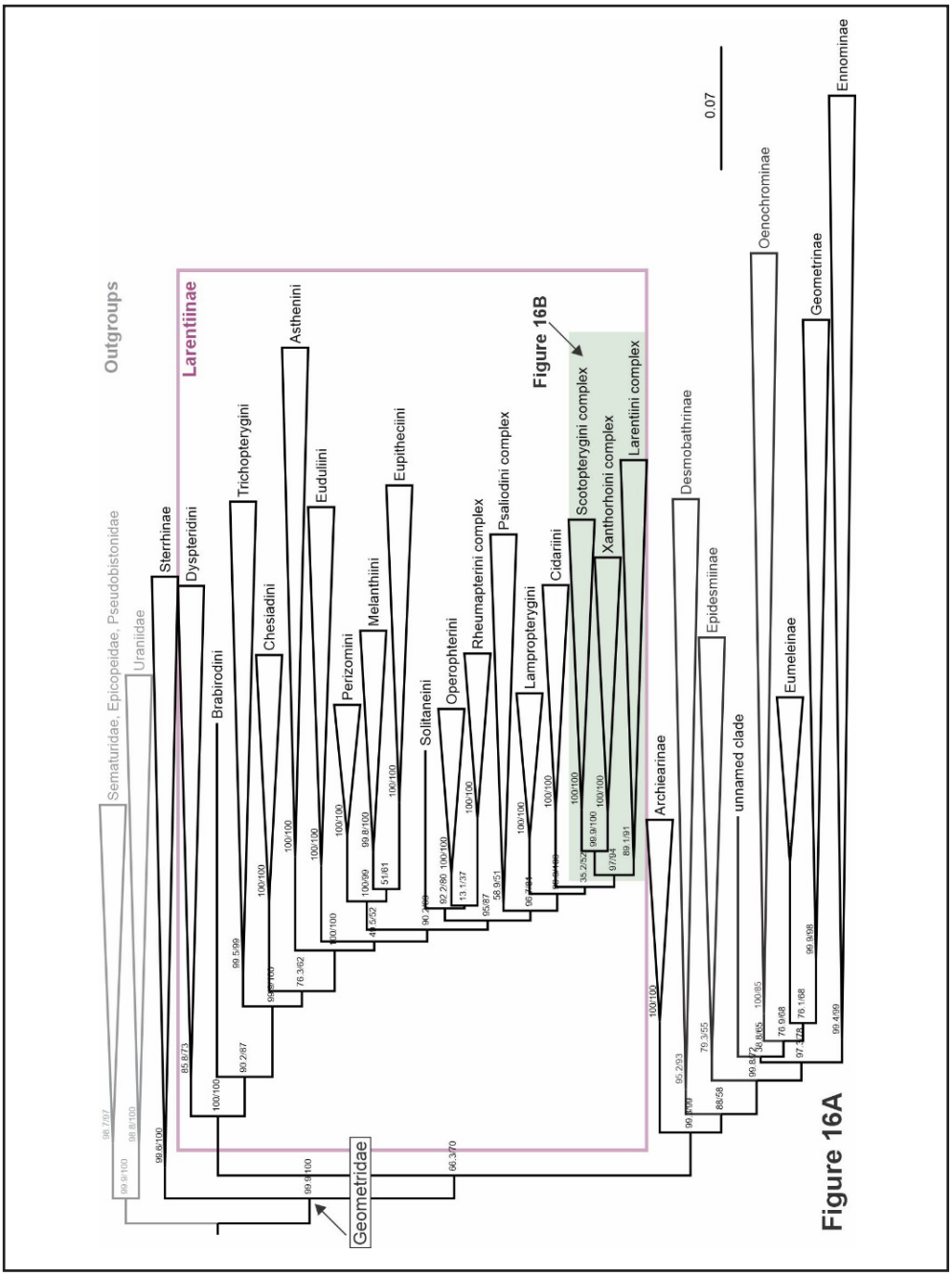


Figure 16B. B. Full phylogenetic hypothesis trimmed to show a part of Larentiinae subfamily. The focus taxa of our study from the Canary Islands are illustrated and voucher numbers are marked with red, showing that *Atlanticola mystica* (new genus, new species) is part of the Larentiini complex of tribes and *Herbulotina grandis* is part of the Xanthorhoini complex of tribes.

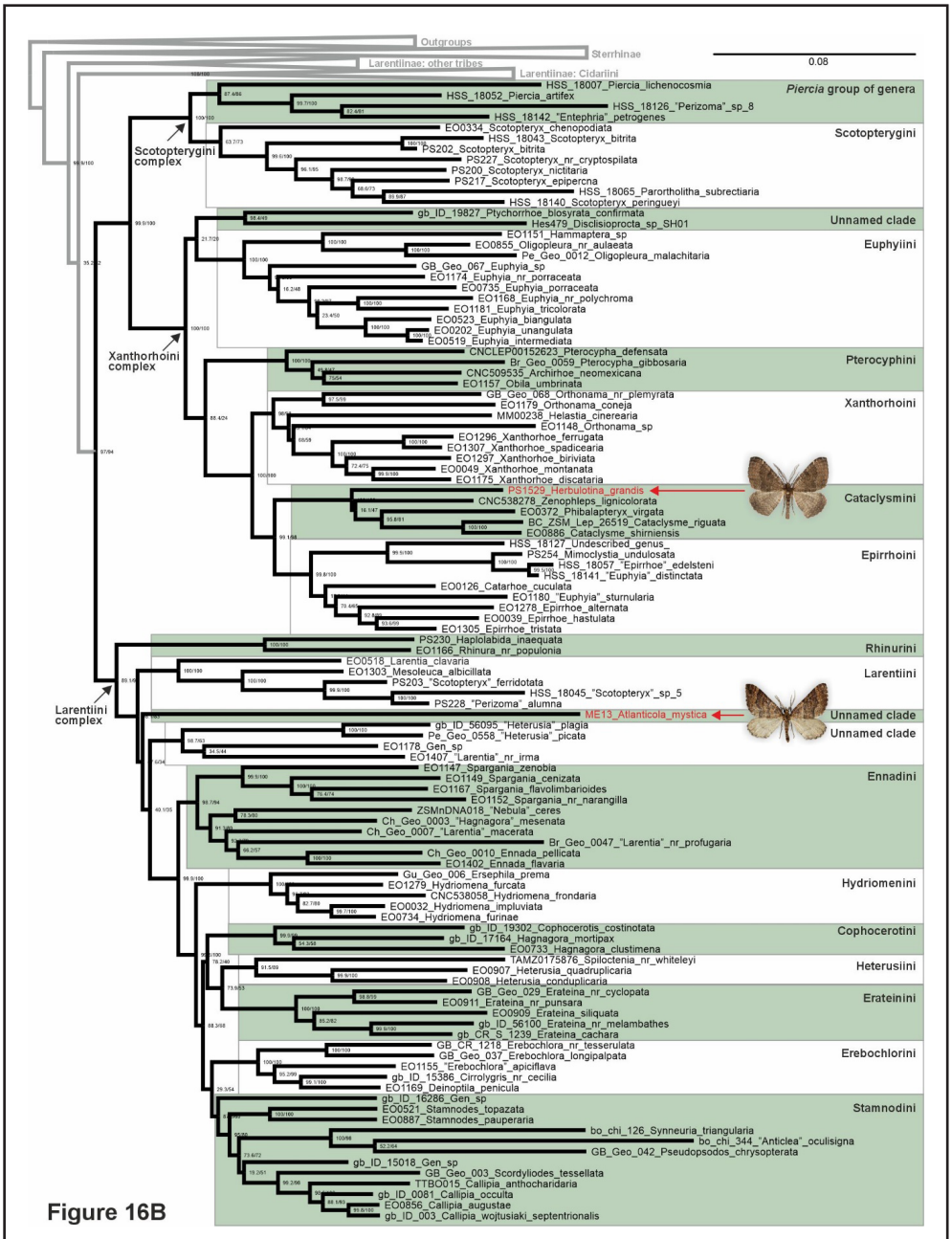


Figure 16B

Figures 17-18. Collecting localities of *Atlanticola mystica* (new genus, new species). **17.** Tenerife, Güímar, 650 m, 20-XI-2022. **18.** Tenerife, Arona, Ifonce, 1010 m, 2-XI-2023.

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On the eastern boundary of the distribution of *Zygaena ephialtes* (Linnaeus, 1767) (Lepidoptera: Zygaenidae, Zygaeninae)

Konstantin A. Efetov, Svyatoslav A. Knyazev & Gerhard M. Tarmann

Abstract

In the contemporary maps of the distribution of *Zygaena ephialtes* (Linnaeus, 1767) there is a large gap between the Ural Mountains and points in the surroundings of Omsk in western Siberia (to the East of Omsk). Our investigation of the historical material collected by S. M. Tshugunov and now deposited in the Omsk State Agrarian University named after P. A. Stolypin shows that the determination of specimens of "*Zygaena ephialtes*" from the surroundings of Omsk are based on misidentifications of *Zygaena cynarae* (Esper, 1789) and *Zygaena centaureae* Fischer von Waldheim, 1832.
Keywords: Lepidoptera, Zygaenidae, *Zygaena ephialtes*, distribution, eastern boundary.

Sobre el límite oriental de la distribución de *Zygaena ephialtes* (Linnaeus, 1767) (Lepidoptera: Zygaenidae, Zygaeninae)

Resumen

En los mapas contemporáneos de la distribución de *Zygaena ephialtes* (Linnaeus, 1767) existe un gran vacío entre los montes Urales y los puntos de los alrededores de Omsk, en Siberia occidental (al este de Omsk). Nuestra investigación del material histórico recogido por S. M. Tshugunov y ahora depositado en la Universidad Estatal Agraria de Omsk que lleva el nombre de P. A. Stolypin demuestra que la determinación de los especímenes de "*Zygaena ephialtes*" de los alrededores de Omsk se basa en identificaciones erróneas de *Zygaena cynarae* (Esper, 1789) y *Zygaena centaureae* Fischer von Waldheim, 1832.
Palabras clave: Lepidoptera, Zygaenidae, *Zygaena ephialtes*, distribución, límite oriental.

Introduction

Clarifying the distributions of biological species is an actual task in studying the Zygaenidae family (Can Cengiz et al. 2018; Efetov et al. 2015a, 2015b, 2018, 2019a, 2019b; Efetov & Tarmann, 2016; Razov et al. 2017; Subchev et al. 2016). In the works of Naumann et al. (1984) and Hofmann & Tremewan (2020) the eastern boundary of the distribution of *Zygaena ephialtes* (Figures 1, 2) is situated in western Siberia to the East of Omsk (now in the Novosibirsk Region). These most eastern localities were mentioned by Meinhard (1905) and Tshugunov (1911) and later cited by Holik & Sheljuzkho (1958). However, as there is a large gap in the distribution points between the Ural Mountains and the Novosibirsk Region, we decided to find and examine the original material.

Results and discussion

Holik & Sheljuzhko (1958, p. 249) wrote on *Zygaena ephialtes*: "Siberian territory. So far, the species has only been recorded in the Baraba Steppe in Tomsk Governorate. According to Meinhard (1905, p. 171), in the Lepidoptera collection of Tomsk University there were two specimens of f. *medusa* Pall., one specimen of

f. *athamanthae* Esp. and one specimen of f. *peucedani* Esp. For f. *medusa* Pall. only the designation of origin "Baraba Steppe, June 1899" is indicated. In f. *peucedani* Esp. it is noted: "Captured on 28 June at the station Tatarskaya (Baraba)". Tshugunov (1911, p. 341), from whom the latter piece is taken, notes the discovery of eight specimens of f. *athamanthae* Esp. near Tatarskaya and Zabulga in 1907. According to these data, it must be assumed that a predominantly five-spotted red-peucedanoid population flies in the Baraba steppe, but that it also has a certain percentage of six-spotted and ephialtoid individuals."

We studied the original publication of Meinhard (1905) and found that Holik & Sheljuzhko made a mistake. Meinhard (1905, pp. 172, 173) wrote that there are three specimens of *Zygaena ephialtes* in the collection of the Zoological Museum of the Emperor's Tomsk University, two specimens "ab. Medusa" (38 mm) "Barabinskaya steppe, June 1899" and one specimen "ab. Peucedani" (30 mm) "28th June 1899 near station Tatarskaya (Baraba)". Holik & Sheljuzhko (1958, p. 249) erroneously mentioned "one specimen of f. *athamanthae* Esp." The term "ab. Athamanthae Esp." in the text of Meinhard refers to the figures in the book by Ernst Hofmann "Die Grossschmetterlinge Europa's. 2-te Auflage, Taf. 20, fig. 5 b.". Moreover, in the introduction to his paper Meinhard (1905, p. 107) wrote that the entomological material of 1899 in the Barabinskaya steppe (Baraba steppe) was collected by S. M. Tshugunov and his son M. S. Tshugunov. It means that the two specimen of *Z. ephialtes* morph *medusa* must have been collected by Tshugunov.

In the paper by Tshugunov (1911) the author wrote about the whole material of *Zygaena ephialtes* collected by him in 1899 and also later in 1907. However, from 1899 he mentioned only one specimen of *Z. ephialtes* "ab. *peucedani*" collected on 28th June 1899 and wrote nothing about two specimens of *Z. ephialtes* "ab. *medusa*". We also did not find these two specimens in the Omsk State Agrarian University named after P. A. Stolypin where the collection of Tshugunov is now deposited. Most probably these two specimens of "*medusa*" did not exist, and this was a mistake by Meinhard. We studied the entomological collection in the Tomsk State University and found the box with the materials mentioned by Meinhard. There are labels on the bottom of this drawer "Ephialtes L. ab. *Medusa* Pall." (handwritten with printed text "Ephialtes L.") and "*Ephialtes* L. ab. *pseucedani* [sic] Esp." (completely handwritten), but among the specimens of different *Zygaena* species in this box the material of *Zygaena ephialtes* is absent.

The full text of Tshugunov (1911) on page 15 is as following: "ab. *peucedani* Esp. - 28-VI-[18]99, 1 specimen. - ab. *athomanthae* [sic] Esp. - 24-30-[VI], 1-VII-[19]07 near station Tatarskaya and 7-15-VII-[19]07, Zab[ulga]. - 8 specimens".

In the collection of the Omsk State Agrarian University, we found seven specimens collected in 1907 and mentioned by Tshugunov. All of them are determined as *Zygaena ephialtes*. The list of these specimens is presented below.

Three specimens with pin-label "Zabulga":
Male of *Z. centaureae* "15-VII-[19]07",
Male of *Z. centaureae* "7-VII-[19]07",
Female of *Z. cynarae* "7-VII-[19]07".

Four specimens with pin-label "Tatarskaya":
Female of *Z. cynarae* "25-VI-[19]07",
Male of *Z. cynarae* "24-VI-[19]07",
Male of *Z. cynarae* "30-VI-[19]07",
Female of *Z. cynarae* "28-VI-[19]07".

All this material is determined as "*Zygaena ephialtes* L. ab. *athamanthae* Esp." by the label fixed under the vertical row of these seven *Zygaena* specimens on the bottom of the drawer (Figures 3-4). The localities Zabulga, Baraba and Tatarskaya are now situated in the Novosibirsk Region, approximately 140 km to the East of Omsk.

It should be noted that there are some other misidentifications in the material of Tshugunov. For example, the specimen of *Zygaena loti* ([Denis & Schiffermüller], 1775) is determined as "*Z. meliloti* Esp. v. *confusa* Stgr.".

After Meinhard, Tshugunov and Holik & Sheljuzhko the information on the distribution of *Zygaena ephialtes* in the southern part of western Siberia appeared in many publications (e.g. Naumann et al. 1984; Efetov, 2005 [with the mark "?"]; Hofmann & Tremewan, 2020). While studying the Zygaenidae fauna of the Omsk Region (Knyazev et al. 2015a, 2015b) *Z. ephialtes* was not included in the list of possible species in this territory.

Moreover, the second author has studied Zygaenidae specimens in the collections of the Siberian

Zoological Museum of the Institute of Systematics and Ecology of Animals of the Siberian Branch of the Russian Academy of Sciences (Novosibirsk, Russia), of the Zoological Museum of the Russian Academy of Sciences (Saint Petersburg, Russia) as well as in private collections of Siberian entomologists. *Zygaena ephialtes* from the territory of Siberia is absent in all of them.

Conclusion

The material of so-called "*Zygaena ephialtes* ab. *athamanthae*" collected by Tshugunov in 1907 and mentioned in his paper in 1911 is a result of misidentification of *Z. centaureae* and *Z. cynarae*. The information of the publication of Meinhard (1905) on *Z. ephialtes* is also doubtful. It means that the confirmed eastern limit of the distribution of *Zygaena ephialtes* lies much further to the west and most likely coincides with the Ural Mountains. For example, there are data from the western side of Southern Urals (Holik & Sheljuzhko, 1958; Hofmann & Tremewan, 2020).

Acknowledgments

We thank Dr Mikhail V. Shcherbakov (Tomsk, Russia) for his information on the entomological collection of Tomsk State University, Mr Eric Drouet (Gap, France) for his assistance in copying distribution maps and Dr Adrian Spalding (Truro, Great Britain) for editing the English text. The work of S. A. Knyazev was funded by the state assignment of the Ministry of Science and Higher Education of the Russian Federation (project FZMW-2023- 0006 "Endemic, local and invasive arthropods (Arthropoda) of the mountains of South Siberia and Central Asia: a unique gene pool of a biodiversity hotspot".

Conflict of Interest

The authors declare that they have no known financial interest or personal relationship that could have influence the work presented in this article.

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*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

Svyatoslav A. Knyazev
Altai State University
Lenina Str., 61
RU-656049 Barnaul
RUSIA / *RUSSIA*
E-mail: konungomsk@yandex.ru
https://orcid.org/0000-0002-3887-0971

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

*Autor para la correspondencia / *Corresponding author*

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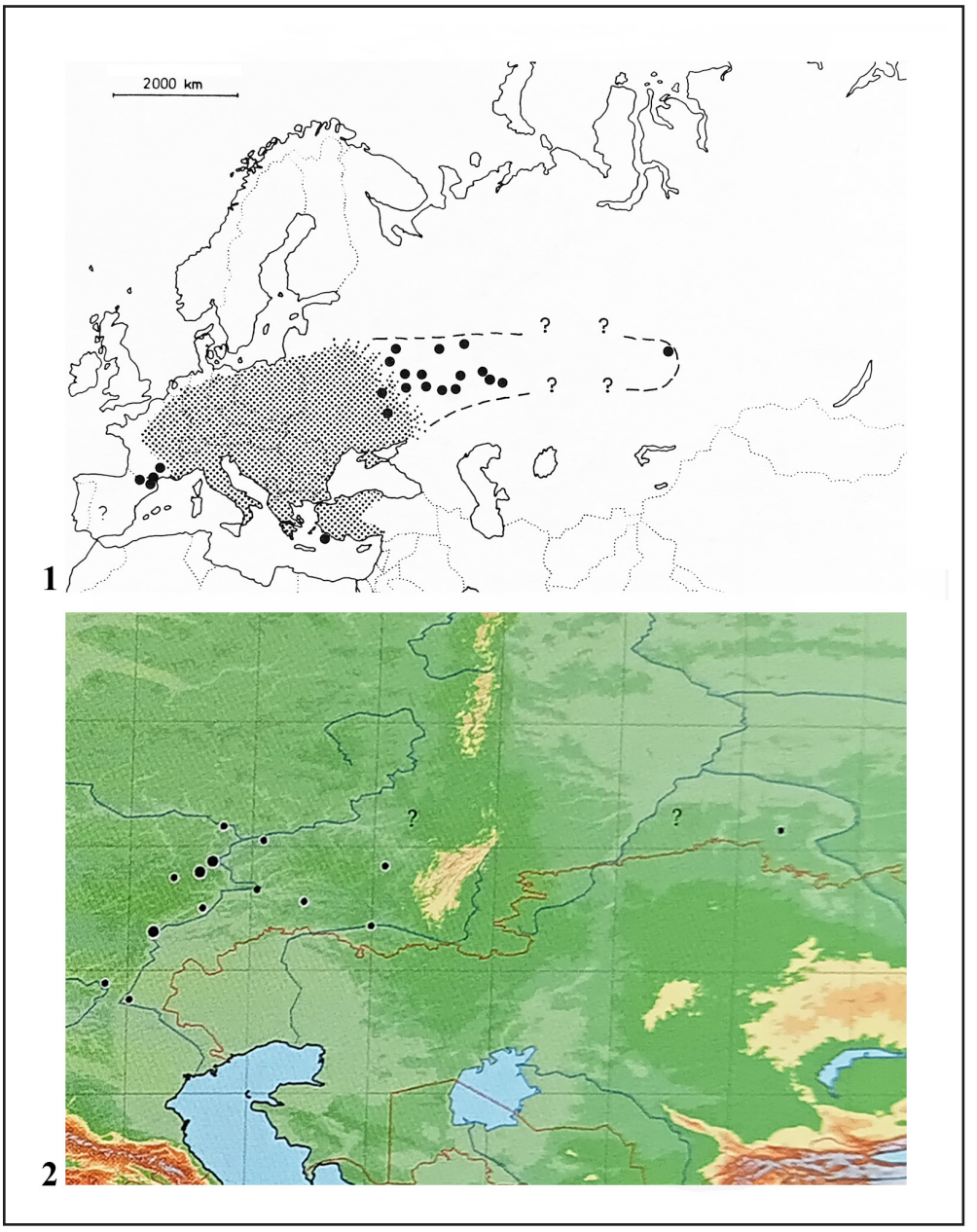
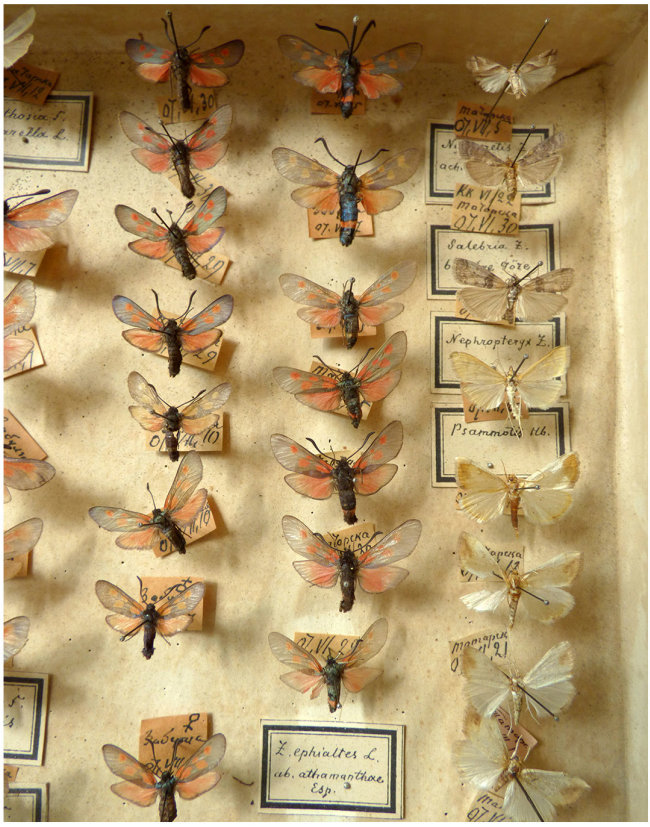
Figures 1-2. Maps of distribution of *Zygaena ephialtes* from different literature sources. **1.** Ex Naumann et al., 1984. **2.** Ex Hofmann & Tremewan, 2020 (eastern part of distribution).



Figures 3-5. 3. View of Tshugunov collection with wrong determinations of different *Zygaena* species as *Zygaena ephialtes* ab. *athamanthae* Esp. **4.** Determination label from Tshugunov collection "*Z. ephialtes* L. ab. *athamanthae* Esp.". **5.** Male of *Zygaena cynarae* from Tshugunov collection determined as "*Z. ephialtes* L. ab. *athamanthae* Esp.", with pin label "Tatarskaya 24-VI-[19]07". (All photos by S. A. Knyazev).



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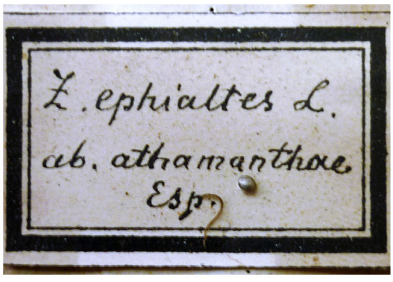

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Datos preliminares sobre la familia Crambidae en la provincia de Córdoba (España) (Lepidoptera: Pyraloidea)

Ginés Gomariz

Resumen

Se presenta una relación de especies de la familia Crambidae registradas en la provincia de Córdoba (España) mediante muestreos realizados desde 1981. El total de la relación comprende a 72 especies, lo que constituye algo menos de un tercio de los Crambidae ibéricos. La gran mayoría son nuevas citas para esta provincia y seis de ellas para Andalucía. Tras hacer un análisis corológico del conjunto de las especies registradas, se observa el predominio de las asiático-mediterráneas y la existencia de tres endemismos ibéricos.
Palabras clave: Lepidoptera, Pyraloidea, Crambidae, biodiversidad, Córdoba, Andalucía, España.

Preliminary data on the family Crambidae in the province of Cordoba (Spain) (Lepidoptera: Pyraloidea)

Abstract

A list of species of the family Crambidae recorded in the province of Cordoba (Spain) by means of surveys carried out since 1981 is presented. The total list comprises 72 species, which constitutes slightly less than one third of the Iberian Crambidae. The great majority are new records for this province and six of them for Andalusia. A chorological analysis of all the species recorded shows the predominance of Asian-Mediterranean species and the existence of three Iberian endemism's.
Keywords: Lepidoptera, Pyraloidea, Crambidae, biodiversity, Córdoba, Andalusia, Spain.

Introducción

Actualmente se conocen 256 especies de la familia Crambidae en la península ibérica, según se enumeran en el catálogo de Vives-Moreno (2014). Sin embargo, el conocimiento de cómo se distribuyen por la totalidad del territorio peninsular es muy desigual, ya que la mayoría de los estudios que se han realizado sobre la diversidad de este grupo se concentran en áreas próximas a la costa mediterránea y sudatlántica, siendo más escasos en las provincias interiores.

Así por ejemplo, apenas se dispone de información sobre los Crambidae que habitan en la provincia de Córdoba, del que solo existe un trabajo publicado: Huertas-Dionisio & Fuentes (2004), donde se incluyen siete especies. El presente estudio pretende contribuir a mejorar el conocimiento de la biodiversidad de los Crambidae en esta provincia.

Material y métodos

Desde 1981 hasta 2022 se realizaron registros y muestreos sobre la fauna de Crambidae en diferentes localidades de la provincia de Córdoba (Tabla I). Hasta 2015 las observaciones fueron esporádicas, cen-

trándose en la campiña alrededor de Bujalance y en varias localidades próximas en Sierra Morena. Dichas observaciones se realizaron sobre ejemplares que acudían al alumbrado público, algunos que aparecían en el interior de casas, otros por sus hábitos de vuelo diurno y también algunos que fueron obtenidos en cautividad a partir de orugas halladas en el campo.

A partir de 2016 comenzaron unos muestreos más sistemáticos en las localidades de la ermita de la Virgen de la Sierra (Cabra) y la ermita de Nuestra Señora de Araceli (Lucena), donde al alumbrado acudían muchos ejemplares de microlepidópteros. Fuera de estos parajes urbanizados se establecieron otros puntos de muestreo donde se utilizó una trampa de luz convencional con una lámpara de vapor de mercurio de 500 watios.

Los ejemplares colectados fueron identificados siguiendo a Leraut (2012) y a Slamka (2008, 2013). También se consultó la página web Lepiforum (2024). Los ejemplares de difícil identificación fueron determinados mediante la preparación de su genitalia. Para ello se procedió de la siguiente forma: 1) se retiró el abdomen y se maceró en potasa líquida; 2) se seccionó el abdomen lateralmente, se extrajo la genitalia y se limpió; 3) se examinó a la lupa su morfología y luego se conservó en DMHF. En los casos que persistió la duda sobre la identidad del ejemplar, éste fue excluido de su registro formal en este estudio.

Para el análisis corológico de las especies se consideraron los datos de distribución aportados por Leraut (2012) y Slamka (2008, 2013), a los que se les aplicó criterios basados en Calle (1982) para determinar la zona biogeográfica. Así, los corotipos considerados son:

Asiático-mediterráneo: pertenecen a este corotipo aquellas especies distribuidas por los territorios próximos al mar Mediterráneo, adentrándose en mayor o menor medida por Asia en latitudes similares.

Atlanto-mediterráneo: comprende especies que están presentes en el Mediterráneo occidental y regiones atlánticas próximas, o sea, que se distribuyen por Europa sudoccidental y África noroccidental.

Cosmopolita: a este corotipo pertenece cualquier especie que se distribuya por una gran parte del planeta, normalmente presente en casi todos los continentes.

Euroasiático: pertenecen a este corotipo aquellas especies cuya presencia es mayor o frecuente en el centro y norte de Europa y Asia, siendo más raras y locales hacia el Mediterráneo. En la península ibérica aparecen en la mitad septentrional y algunos enclaves montañosos más al sur.

Tropical: comprende cualquier especie que se distribuye ampliamente por las zonas tropicales del planeta. En este caso, las especies que están bien distribuidas por el continente africano y presentan en la península ibérica y el área mediterránea su límite septentrional.

Paleártico: a este corotipo pertenece cualquier especie que se distribuya principalmente por los continentes del hemisferio boreal, salvo el continente norteamericano.

Holártico: comprende las especies que se distribuyen por todo el hemisferio boreal.

Endémico: pertenecen a este corotipo las especies que aparecen exclusivamente en la península ibérica.

Tabla I. Localización de los puntos de muestreo de Crambidae en la provincia de Córdoba.

Código	Localidad	Paraje	Coordenadas	Altitud
ALME-1	Almedinilla	Los Ríos	37°27'26" N - 4°04'48" W	600 m
AZUE-1	Azuel	Río del Pueblo Pardillo	38°21'30" N - 4°19'07" W	550 m
BAEN-1	Baena	Arroyo Marbella	37º37'28" N - 4º20'51" W	320 m
BAEN-2	Baena	Las Roblizas	37°38'47" N - 4°22'08" W	300 m
BELA-1	Belalcázar	Arroyo de Malagón	38º35'36" N - 5º09'44" W	450 m
BUJA-1	Bujalance	Núcleo urbano	37°53'38" N - 4°22'41" W	350 m
CABR-1	Cabra	Ermita Virgen de la Sierra	37°29'12" N - 4°22'50" W	1200 m
CABR-2	Cabra	Fuente el Marajal	37°31'48" N - 4°23'11" W	700 m
CABR-3	Cabra	Puente de los Frailes	37°27'40" N - 4°23'50" W	600 m
CAÑE-1	Cañete de las Torres	Pilón de Rabanera	37°50'38" N - 4°20'30" W	320 m
CARC-1	Carcabuey	Arroyo del Palancar	37º28'03" N - 4º18'03" W	580 m
CARC-2	Carcabuey	Camino del Navazuelo	37°28'47" N - 4°20'06" W	1000 m

CARD-1	Cardeña	Río Yeguas	38º18’04" N - 4º12’41" W	400 m
CORD-1	Córdoba	Arroyo de Santo Domingo	37º56'53" N - 4º47'44" W	270 m
CORD-2	Córdoba	Núcleo urbano	37°53'17" N - 4°47'35" W	180 m
CORD-3	Córdoba	Urbanización las Jaras	37°57'50" N - 4°50'06" W	470 m
ESPE-1	Espejo	El Borbollón	37°38'25" N - 4°33'39" W	300 m
HORN-1	Hornachuelos	Finca La Cañada Verde	37º49'22" N - 5º15’24" W	200 m
HORN-2	Hornachuelos	Mirador de la Alcaidía	37º50'29" N - 5º14'55" W	250 m
HORN-3	Hornachuelos	San Calixto	37°57'04" N - 5°19'09" W	500 m
HORN-4	Hornachuelos	Sierra Albarrana	38°05'01" N - 5°27'04" W	420 m
LUCE-1	Lucena	Río Anzur	37º18'50" N - 4º31’45" W	320 m
LUCE-2	Lucena	Sierra de Aras	37º22'34" N - 4º28’02" W	863 m
LUQE-1	Luque	Arroyo del Cañaveral	37º34'58" N - 4º13’07" W	400 m
LUQE-2	Luque	Laguna del Salobral	37º34'55" N - 4º12'15" W	350 m
LUQE-3	Luque	Los Castillarejos	37°33'41" N - 4°18'17" W	600 m
LUQE-4	Luque	Puente de San Juan	37º34'50" N - 4º09’43" W	400 m
MNTE-1	Montemayor	Cerro La Alcoba	37°38'32" N - 4°41'30" W	330 m
MNTO-1	Montoro	Presa Martín Gonzalo	38º05'15" N - 4º20’20" W	250 m
NCAR-1	Nueva Carteya	Núcleo urbano	37°35'18" N - 4°27'39" W	450 m
OBEJ-1	Obejo	Río Guadalbarbo	38º05'50" N - 4º49’57" W	300 m
PRIE-1	Priego de Córdoba	Sierra de Albayate	37°22'35" N - 4°10'07" W	950 m
PRIE-2	Priego de Córdoba	Sierra de la Horconera	37º24'05" N - 4º13’30" W	950 m
PRIE-3	Priego de Córdoba	Zagrilla Alta	37º29'15" N - 4º14’34" W	600 m
SEUF-1	Santa Eufemia	Arroyo de las Tejeras	38º37'42" N - 4º54'37" W	500 m
SMDT-1	Santa María de Trassierra	Arroyo Bejarano	37º56'16" N - 4º52’24" W	400 m
SMDT-2	Santa María de Trassierra	Núcleo urbano	37°55'16" N - 4°53'27" W	400 m
SMDT-3	Santa María de Trassierra	Río Guadiato	37°56'28" N - 4°53'42" W	290 m
VVCO-1	Villaviciosa de Córdoba	Arroyo de las Navas	38º01'06" N - 5º01'12" W	500 m
VVCO-2	Villaviciosa de Córdoba	Embalse de Puentenuevo	38°04'51" N - 4°55'50" W	440 m

Tabla III. Frecuencia de los distintos corotipos en los Crambidae observados en la provincia de Córdoba.

Corotipo	**Nº Especies**	**Porcentaje**
Asiático-mediterráneo	24	33
Atlanto-mediterráneo	16	22
Cosmopolita	9	13
Endémico	3	4
Euroasiático	8	11
Holártico	3	4
Paleártico	3	4
Tropical	6	8

Resultados

Durante los muestreos se han obtenido medio millar de registros de especies de Crambidae, correspondiendo a un total de 72 especies diferentes (Tabla II), lo que supone el 28% del total de las censadas en la pe-

nínsula ibérica. Entre estas especies se han registrado las siete especies citadas por Huertas-Dionisio & Fuentes (2004), confirmando su presencia. El resto podrían considerarse nuevas citas para la provincia de Córdoba.

Dentro de la familia Crambidae se han registrado más especies en las subfamilias Crambinae (27), Spilomelinae (18) y Pyraustinae (14). Muchas menos en Scopariinae (4), Evergestiinae (4), Glaphyriinae (2), Odontiinae (2) y Acentropinae (1). No se ha observado ninguna especie de las subfamilias Heliothelinae, Cybalomiinae y Schoenobiinae.

Biogeográficamente, el corotipo más abundante es el asiático-mediterráneo (Tabla III), con un tercio de las especies. Corotipos frecuentes son el atlanto-mediterráneo, el cosmopolita y el euroasiático. Por último, los corotipos minoritarios son el tropical, el paleártico, el holártico y el endémico.

Los endemismos ibéricos que han sido registrados en los muestreos son:

Chrysocrambus dentuellus (Pierce & Metcalfe, 1938) (Figura 8)

Endemismo ibérico bien extendido por la Península (Slamka, 2008). En Andalucía se conoce del Campo de Gibraltar (Gaona, 2021) y Almería (Ylla et al. 2008). En Córdoba se ha localizado en Arroyo de Malagón (Belalcázar), 1 ♂, 7-V-2022, y en Presa de Martín Gonzalo (Montoro), 1 ♂, 19-V-2018.

Pediasia bolivarella (Schmidt, 1930) (Figura 9)

Endemismo ibérico, que parece ser exclusivo del sur peninsular, existiendo citas del Campo de Gibraltar (Gaona, 2021) y de varias localidades de Huelva (Huertas-Dionisio, 2007). Ylla et al. (2008) la citan de Almería pero Garre et al. (2018) revisan el material y concluyen que se trata *P. serraticornis* (Hampson, 1900). En Córdoba se ha registrado en Río Yeguas (Cardeña), 1 ♂, 13-IX-2018, y en Arroyo Bejarano (Córdoba), 3 ♂ y 1 ♀, 9-X-2021.

Udea zernyi Klima, 1940 (Figura 2)

Especie endémica de España (Slamka, 2013), conocida del Puerto de la Mora (Granada). En Lepiforum (2024) también es citada de la Puebla de Don Fadrique (Granada) y el Torcal de Antequera (Málaga). En Córdoba solo se ha localizado esta especie en la Ermita Virgen de la Sierra (Cabra), 2 ♂ y 1 ♀, 8-VII-2016, 1 ♀, 29-VII-2016, 1 ♂ y 1 ♀, 22-VI-2017 y 1 ♀, 16-VII-2017.

Tras consultar la principal bibliografía sobre especies de Crambidae que están presentes en las distintas provincias andaluzas se ha determinado que las siguientes podrían constituir nuevas citas para Andalucía:

Udea simplicella (La Harpe, 1861) (Figura 1)

Especie conocida del norte de África (Slamka, 2013) y recientemente citada en Murcia (Girdley, 2021). Se han realizado los siguientes registros: Arroyo Marbella (Baena), 1 ♂, 17-VI-2022; Sierra Albayate (Priego de Córdoba), 1 ♀, 3-VII-2019.

Pleuroptya crocealis (Duponchel, 1834) (Figura 3)

Leraut (2012) indica que se distribuye por Europa meridional y Próximo Oriente. Slamka (2013), que la trata como sinonimia de *P. balteata* (Fabricius, 1798), expone que se distribuye por España, Portugal y otros países europeos, pero no indica puntos concretos en el sur peninsular, solo en el noreste. Los registros son: Camino del Navazuelo (Carcabuey), 2 ♂, 1-VIII-2017; Ermita Virgen de la Sierra (Cabra), 1 ♂, 3-VII-2016, 1 ♂, 1 ♀, 29-VII-2016 y 1 ♂, 4-VI-2017; Zagrilla Alta (Priego de Córdoba), 1 ♀, 27-VII-2020.

Agriphila tristella ([Denis & Schiffermüller], 1775) (Figura 7)

Aunque Leraut (2012) indica que esta especie está presente en toda la península ibérica. Posteriormente, Garre et al. (2021) la citan de Murcia. Se han realizado los siguientes registros: Arroyo de las Navas (Villaviciosa de Córdoba), 1 ♂, 14-IX-2020; Arroyo de Malagón (Belalcázar), 2 ♀, 23-IX-2022; Ermita Virgen de la Sierra (Cabra), 2 ♂, 23-IX-2016.

Chilo luteellus (Motschulsky, 1866) (Figura 4)

Leraut (2012) señala que en la península ibérica está distribuida por la mitad suroriental. Slamka (2008) la cita de España pero no indica puntos concretos en el sur peninsular. Se ha registrado esta especie en dos

localidades: Puente de San Juan (Luque), 1 ♀, 16-VI-2018; Río Anzur (Lucena), 4 ♂, 04-VI-2022.

Chilo pulverosellus (Ragonot, 1895) (Figura 5)

La especie es citada por Slamka (2008) en Alicante mientras que Leraut (2012) amplía su distribución a la mitad sudoriental de la península ibérica. Se han hecho los siguientes registros: Arroyo del Cañaveral (Luque), 2 ♀, 30-VIII-2018; Laguna del Salobral (Luque), 2 ♂, 1 ♀, 17-IX-2022.

Thopeutis cicatricella (Hübner, [1824]) (Figura 6)

Leraut (2012) señala su presencia en España y Portugal, al igual que Slamka (2008), pero sin concretar puntos de registro en el sur peninsular. Solo ha sido capturado un ejemplar hembra en el arroyo de las Tejeras (Santa Eufemia), el 11-VI-2022.

Otras especies de la familia Crambidae registradas en los muestreos y con pocas citas en Andalucía se detallan a continuación. *Evergestis dumerlei* (Leraut, 2003), *Udea bipunctalis* (Herrich-Schäffer, 1851), *Mecyna auralis* (Peyerimhoff, 1872) y *Chrysoteuchia culmella* (Linnaeus, 1758), que solo se han citado en Sierra Nevada (Agenjo, 1952; Garre et al. 2020, 2023). *Mecyna lutealis* (Duponchel, 1833) y *Titanio tarraconensis* (Leraut & Luquet, 1982) solo se conocen en Almería (Agenjo, 1952; Garre et al. 2021). Por último, *Pediasia siculella* (Duponchel, 1836) y *Calomotropha paludella* (Hübner, [1824]), solo han sido citadas en el Campo de Gibraltar (Gaona, 2021; Slamka, 2008).

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Ginés Gomariz
Avenida Vía Augusta, 12, bloque 3
E-14011 Córdoba
ESPAÑA / *SPAIN*
E-mail: gingomariz@gmail.com
https://orcid.org/0009-0009-6375-8541

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Figuras 1-9. Especies de Crambidae más singulares registradas en los muestreos. **1.** *Udea simplicella* (La Harpe, 1861). **2.** *Udea zernyi* Klima, 1940. **3.** *Pleuroptya crocealis* (Duponchel, 1834). **4.** *Chilo luteellus* (Motschulsky, 1866). **5.** *Chilo pulverosellus* (Ragonot, 1895). **6.** *Thopeutis cicatricella* (Hübner, [1824]). **7.** *Agriphila tristella* ([Denis & Schiffermüller], 1775). **8.** *Chrysocrambus dentuellus* (Pierce & Metcalfe, 1938). **9.** *Pediasia bolivarella* (Schmidt, 1930).

Tabla II. Relación de Crambidae registrados en los muestreos en la provincia de Córdoba. El significado de cada código de paraje figura en la Tabla I.

Familia Crambidae
Subfamilia Acentropinae Stephens, 1836
Parapoynx stratiotata (Linnaeus, 1758). Paleártica. CORD-3 (10-X-2015, 30-IV-2016, 25-VI-2016), SMDT-3 (20-VII-2017, 13-X-2017)
Subfamilia Odontiinae Guenée, 1854
Aporodes floralis (Hübner, [1809]). Asiático-mediterránea. BUJA-1 (30-VII-1986), CABR-1 (14-VIII-2018), CORD-2 (9-VIII-2018), LUQE-3 (22-VII-2017), SMDT-1 (7-VI-2015) *Titanio tarraconensis* (Leraut & Luquet, 1982). Atlanto-mediterránea. PRIE-2 (1-IV-2018)
Subfamilia Scopariinae Guenée, 1854
Anarpia incertalis (Duponchel, 1832). Asiático-mediterránea. CABR-2 (23-IX-2017), PRIE-2 (16-VII-2018) *Eudonia angustea* (Curtis, 1827). Asiático-mediterránea. BUJA-1 (8-X-1996, 15-XI-2015), CABR-1 (24-II-2017), CORD-1 (5-XI-2015, 17-XI-2015, 3-V-2016), CORD-3 (15-III-2016, 3-V-2016), LUCE-1 (1-XI-2018), PRIE-1 (8-IV-2016), SMDT-3 (5-XI-2015, 17-XI-2015, 3-IV-2016) *Eudonia mercurella* (Linnaeus, 1758). Euroasiática. AZUE-1 (17-VII-2017), CABR-1 (8-VII-2016, 1-VII-2017, 10-VI-2022), CABR-1 (11-VI-2017), CARC-2 (1-VIII-2017), CORD-1 (27-V-2022), CORD-3 (21-IX-2016), SMDT-3 (12-IX-2015, 3-VI-2018, 14-V-2022) *Scoparia staudingeralis* (Mabille, 1869). Asiático-mediterránea. CABR-1 (26-V-2017), MNTO-1 (20-IV-2018)
Subfamilia Evergestinae Marion, 1952
Evergestis desertalis (Hübner, [1813]). Asiático-mediterránea. CABR-1 (22-VI-2017, 3-VII-2022), PRIE-2 (16-VII-2018) *Evergestis dumerlei* (Leraut, 2003). Atlanto-mediterránea. BELA-1 (23-IX-2022), CABR-1 (30-IX-2017), CABR-2 (23-IX-2017) *Evergestis frumentalis* (Linnaeus, 1761). Euroasiática. BAEN-1 (21-V-2022), MNTO-1 (20-IV-2018, 19-V-2018), NCAR-1 (5-V-2016) *Evergestis isatidalis* (Duponchel, 1833). Asiático-mediterránea. CABR-1 (28-X-2016, 3-XII-2016), CORD-1 (5-XI-2015), LUCE-1 (9-XI-2018), SMDT-3 (5-XI-2015, 17-XI-2015)
Subfamilia Pyraustinae Mayrick, 1890
Achyra nudalis (Hübner, 1796). Tropical. HORN-1 (11-VIII-2020), MNTO-1 (6-VII-2018) *Loxostege sticticalis* (Linnaeus, 1761). Holártica. SMDT-3 (6-VIII-2018) *Paracorsia repandalis* ([Denis & Schiffermüller], 1775). Holártica. CABR-1 (8-VII-2016, 29-VII-2016, 30-IX-2016, 22-VI-2017, 3-VII-2022), CARC-2 (16-IX-2017), LUQE-1 (30-VIII-2018), LUQE-3 (22-VII-2017) *Pyrausta aurata* (Scopoli, 1763). Paleártica. ALME-1 (31-V-2020), BAEN-1 (21-V-2022), CAÑE-1 (20-VI-2015, 16-VIII-2018), CARC-1 (10-VI-2022), CORD-3 (13-VI-2015), MNTO-1 (11-V-2019), SMDT-3 (13-X-2017) *Pyrausta despicata* (Scopoli, 1763). Holártica. BELA-1 (25-VI-2022), CABR-1 (29-VII-2016, 7-V-2017, 28-VIII-2018), CORD-3 (23-VII-2016), HORN-2 (10-III-2022), PRIE-1 (12-V-2013), PRIE-2 (1-IV-2018, 5-V-2018, 4-VII-2018, 15-VII-2018, 16-VII-2018), SEUF-1 (12-VI-2022) *Pyrausta neglectalis* Caradja, 1916. Atlanto-mediterránea. BAEN-1 (21-V-2022), MNTO-1 (11-V-2019), SMDT-3 (14-V-2022) *Pyrausta sanguinalis* (Linnaeus, 1767). Euroasiática. AZUE-1 (9-VII-2018), BAEN-1 (21-V-2022, 17-VI-2022), CABR-1 (8-V-2018), CABR-3 (1-VII-2016),

HORN-3 (30-VI-1994), LUQE-4 (16-VI-2018), PRIE-2 (16-VII-2018)
Udea bipunctalis (Herrich-Schäffer, 1851). Asiático-mediterránea.
CABR-1 (4-VI-2016, 11-VI-2016, 1-VII-2016, 26-V-2017), OBEJ-1 (9-VI-2018), PRIE-2 (16-VII-2018)
Udea ferrugalis (Hübner, 1796). Cosmopolita.
CABR-1 (21-IV-2017), CABR-2 (20-X-2017), CABR-3 (4-VI-2016, 11-VI-2016), CARD-1 (5-V-2018), CORD-1 (3-IV-2016, 3-V-2016, 15-V-2016), CORD-3 (7-VI-2016, 21-IX-2016, 22-IX-2016), MNTO-1 (20-IV-2018), PRIE-2 (16-VII-2018), SMDT-3 (13-X-2017, 13-IV-2018)
Udea institalis (Hübner, [1819]). Asiático-mediterránea.
BAEN-1 (21-V-2022), CABR-1 (8-VII-2016), PRIE-1 (3-VII-2019), PRIE-2 (16-VII-2018)
Udea numeralis (Hübner, 1796). Asiático-mediterránea.
BUJA-1 (25-XI-2017), CABR-1 (1-VII-2017), CABR-3 (15-V-2016, 29-VIII-2016), CARC-2 (21-VIII-2017), CORD-1 (3-IV-2016, 15-V-2016), CORD-3 (30-IV-2016, 3-V-2016, 7-X-2016), LUCE-2 (30-IX-2016), SMDT-3 (7-IX-2015, 6-X-2015, 10-X-2015, 13-X-2017)
Udea simplicella (La Harpe, 1861). Atlanto-mediterránea.
BAEN-1 (17-VI-2022), PRIE-1 (3-VII-2019)
Udea zernyi (Klima, 1940). Endémica.
CABR-1 (8-VII-2016, 29-VII-2016, 22-VI-2017, 16-VII-2017)
Uresiphita gilvata (Fabricius, 1764). Cosmopolita.
CABR-1 (8-VII-2016), CABR-3 (11-VI-2016, 8-VII-2016, 29-VII-2016), HORN-3 (24-II-1994, 2-VI-1994, 9-VI-1994, 30-VI-1994, 29-XI-1994), LUCE-2 (23-IX-2016)

Subfamilia Spilomelinae Guenée, 1854

Antigastra catalaunalis (Duponchel, 1833). Tropical.
CABR-1 (22-VI-2016, 23-IX-2016, 7-X-2016), CABR-2 (20-X-2017), LUQE-3 (22-VII-2017), PRIE-3 (27-VII-2020)
Diasemiopsis ramburialis (Duponchel, 1834). Tropical.
AZUE-1 (17-VII-2017, 9-VII-2018), CORD-3 (7-VI-2016), SMDT-3 (13-VII-2017)
Dolicharthria aetnaealis (Duponchel, 1833). Atlanto-mediterránea.
ALME-1 (31-V-2020), CARD-1 (5-V-2018), CORD-1 (27-V-2022), MNTO-1 (19-V-2018)
Dolicharthria bruguieralis (Duponchel, 1833). Tropical.
CABR-1 (7-VIII-2016, 31-VIII-2016, 16-VII-2017), LUCE-1 (6-X-2018)
Dolicharthria punctalis ([Denis & Schiffermüller], 1775). Euroasiática.
BAEN-1 (21-V-2022), CABR-1 (11-VI-2016, 7-V-2017, 28-VIII-2018), LUCE-2 (30-IX-2016), PRIE-3 (27-VII-2020), SMDT-3 (6-VIII-2018)
Duponchelia fovealis (Zeller, 1847). Cosmopolita.
MNTO-1 (6-VII-2018), SMDT-3 (20-VII-2017, 3-VI-2018)
Herpetogramma licarsisalis (Walker, 1859). Tropical.
CORD-2 (30-X-2016), SMDT-1 (9-X-2021), SMDT-3 (13-X-2017)
Hodebertia testalis (Fabricius, 1794). Tropical.
CARD-1 (13-IX-2018)
Mecyna asinalis (Hübner, [1819]). Asiático-mediterránea.
BAEN-1 (24-VII-2022), CORD-2 (30-X-2016), CORD-3 (7-IX-2015), SMDT-3 (7-IX-2015, 10-VII-2020)
Mecyna auralis (Peyerimhoff, 1872). Atlanto-mediterránea.
CABR-1 (1-VII-2016, 8-VII-2016, 22-VI-2017, 16-VII-2018), PRIE-2 (16-VII-2018)
Mecyna lutealis (Duponchel, 1833). Asiático-mediterránea.
ALME-1 (31-V-2020)
Metasia cuencalis (Ragonot, 1894). Atla nto-mediterránea.
AZUE-1 (11-VI-2016), CARD-1 (13-IX-2018), HORN-1 (11-VIII-2020), PRIE-1 (12-V-2013), PRIE-2 (16-VII-2018), SMDT-3 (20-VII-2017, 19-VIII-2017, 13-VII-2018, 6-VIII-2018)
Metasia hymenalis (Guenée, 1854). Atlanto-mediterránea.
PRIE-1 (3-VII-2019)
Metasia ibericalis (Ragonot, 1894). Atlanto-mediterránea.
AZUE-1 (17-VII-2017, 9-VII-2018), CABR-1 (29-VII-2016), PRIE-1 (3-VII-2019), PRIE-2 (16-VII-2018), PRIE-3 (27-VII-2020)
Metasia suppandalis (Hübner, [1823]). Asiático-mediterránea.
BELA-1 (16-VIII-2022), CABR-1 (1-VII-2016, 29-VII-2016, 7-VIII-2016, 16-VII-2017), CARC-2 (21-VIII-2017)
Nomophila noctuella (Denis & Schiffermüller, 1775). Cosmopolita.
BUJA-1 (17-X-2015, 4-VI-2016), CABR-1 (8-VII-2016, 7-V-2017), CORD-1 (3-IV-2016, 15-V-2016, 1-VI-2016),

CORD-3 (7-VI-2016, 11-VI-2016), ESPE-1 (10-X-2015), NCAR-1 (3-VI-2016), SMDT-3 (13-VI-2015, 28-VI-2015, 7-IX-2015, 8-XI-2015), VVCO-2 (16-VII-2016)
Palpita vitrealis (Rossi, 1794). Cosmopolita.
CABR-1 (8-VII-2016), CORD-3 (27-V-2016, 3-VI-2016, 7-VI-2016), SMDT-3 (25-VI-2015, 28-VI-2015), VVCO-2 (16-VII-2016)
Pleuroptya crocealis (Duponchel, 1834). Asiático-mediterránea.
CABR-1 (3-VII-2016, 29-VII-2016, 4-VI-2017), CARC-2 (1-VIII-2017), PRIE-3 (27-VII-2020)

Subfamilia Glaphyriinae Forbes, 1923

Hellula undalis (Fabricius, 1781). Cosmopolita.
CABR-1 (1-VII-2016, 7-VIII-2016, 15-VIII-2016), CABR-2 (23-IX-2017, 20-X-2017), CAÑE-1 (9-VII-2022), CARC-2 (21-VIII-2017), ESPE-1 (10-X-2015), LUQE-3 (22-VII-2017), VVCO-2 (16-VII-2016)
Hydriris ornatalis (Duponchel, 1832). Cosmopolita.
PRIE-3 (27-VII-2020)

Subfamilia Crambinae Latreille, 1810

Agriphila cyrenaicella (Ragonot, 1887). Asiático-mediterránea.
CARD-1 (13-IX-2018), LUQE-2 (17-IX-2022)
Agriphila geniculea (Haworth, 1811). Euroasiática.
CABR-1 (23-IX-2016), CARC-2 (16-IX-2017), CARD-1 (13-IX-2018), CORD-1 (6-X-2015), CORD-3 (10-X-2015, 21-IX-2016, 11-X-2016), ESPE-1 (10-X-2015), LUCE-1 (6-X-2018), LUCE-2 (23-IX-2016, 21-X-2016), SMDT-1 (9-X-2021), SMDT-3 (10-X-2015)
Agriphila tersella (Lederer, 1855). Asiático-mediterránea.
LUQE-2 (17-IX-2022)
Agriphila trabeatella (Herrich-Schäffer, 1848). Asiático-mediterránea.
CABR-1 (23-IX-2016, 7-X-2016), CARC-2 (16-IX-2017), CORD-3 (21-IX-2016), SMDT-3 (27-IX-2015), VVCO-1 (14-IX-2020)
Agriphila tristella ([Denis & Schiffermüller], 1775). Euroasiática.
BELA-1 (23-IX-2022), CABR-1 (23-IX-2016), VVCO-1 (14-IX-2020)
Ancylolomia disparalis (Hübner, [1825]). Asiático-mediterránea.
CABR-1 (21-X-2016), HORN-3 (17-X-1996), SMDT-1 (9-X-2021)
Ancylolomia tentaculella (Hübner, 1796). Asiático-mediterránea.
CORD-2 (26-IX-2017), NCAR-1 (17-IX-2015), SMDT-2 (7-IX-2015), VVCO-1 (14-IX-2020)
Calamotropha paludella (Hübner, [1824]). Cosmopolita.
BELA-1 (25-VI-2022, 16-VIII-2022, 23-IX-2022), CORD-3 (3-VI-2016, 14-VIII-2016, 4-IX-2016)
Catoptria staudingeri (Zeller, 1863). Atlanto-mediterránea.
BELA-1 (23-IX-2022), CABR-1 (23-IX-2016), CARD-1 (13-IX-2018), CORD-1 (21-IX-2016), CORD-3 (11-X-2016), LUCE-2 (7-X-2016)
Chilo luteellus (Motschulsky, 1866). Euroasiática.
LUCE-1 (4-VI-2022), LUQE-4 (16-VI-2018)
Chilo pulverosellus (Ragonot, 1895). Asiático-mediterránea.
LUQE-1 (30-VIII-2018), LUQE-2 (17-IX-2022)
Chrysocrambus dentuellus (Pierce & Metcalfe, 1938). Endémica.
BELA-1 (7-V-2022), MNTO-1 (19-V-2018)
Chrysocrambus sardiniellus (Turati, 1911). Atlanto-mediterránea.
CABR-1 (7-V-2017, 10-VI-2022), CAÑE-1 (20-VI-2015), LUQE-4 (16-VI-2018)
Chrysoteuchia culmella (Linnaeus, 1758).
BELA-1 (25-VI-2022), CARC-1 (10-VI-2022), SEUF-1 (12-VI-2022)
Euchromius anapiellus (Zeller, 1847). Asiático-mediterránea.
LUCE-1 (4-VI-2022)
Euchromius cambridgei (Zeller, 1867). Asiático-mediterránea.
BAEN-1 (17-VI-2022), BAEN-2 (21-VII-2018), CAÑE-1 (16-VIII-2018), LUCE-1 (4-VI-2022), LUQE-1 (30-VIII-2018)
Euchromius ocelleus (Haworth, 1811). Cosmopolita.
BAEN-1 (21-V-2022), CARC-2 (21-VIII-2017), LUQE-3 (22-VII-2017)
Euchromius ramburiellus (Duponchel, 1836). Asiático-mediterránea.
BAEN-1 (17-VI-2022), BAEN-2 (24-VII-2018), CAÑE-1 (9-VII-2022), CARC-1 (10-VI-2022), HORN-1 (11-VIII-2020), LUQE-1 (30-VIII-2018, 6-X-2018, 17-X-2018, 4-VI-2022), LUQE-4 (30-IV-2022), LUCE-1 (17-X-2018)

Euchromius superbellus (Zeller, 1849). Asiático-mediterránea.
CAÑE-1 (16-VIII-2018)
Euchromius vinculellus (Zeller, 1847). Asiático-mediterránea.
BELA-1 (16-VIII-2022), CARD-1 (13-IX-2018), CORD-3 (19-VIII-2016)
Mesocrambus marabut (Bleszynski, 1965). Atlanto-mediterránea.
CAÑE-1 (9-VII-2022), CARC-2 (1-VIII-2017)
Mesocrambus pallidellus (Duponchel, 1836). Atlanto-mediterránea.
BELA-1 (16-VIII-2022), HORN-1 (11-VIII-2020)
Mesocrambus tamsi (Bleszynski, 1960). Atlanto-mediterránea.
AZUE-1 (11-VI-2016)
Pediasia bolivarella (Schmidt, 1930). Endémica.
CARD-1 (13-IX-2018), SMDT-1 (9-X-2021)
Pediasia siculella (Duponchel, 1836). Atlanto-mediterránea.
CABR-1 (30-IX-2016), SMDT-3 (6-X-2015)
Thopeutis cicatricella (Hübner, [1824]). Euroasiática.
SEUF-1 (11-VI-2022)
Xanthocrambus delicatellus (Zeller, 1863). Atlanto-mediterránea.
BAEN-2 (21-VII-2018), CABR-1 (31-VIII-2016, 14-VIII-2018), CARC-2 (21-VIII-2017)

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Pontia daplidice (Linnaeus, 1758) and *Pontia edusa* (Fabricius, [1777]) in Tajikistan: one or two species? (Lepidoptera: Pieridae)

Abdulaziz M. Davlatov & Vladimir A. Lukhtanov

Abstract

DNA barcoding of *Pontia* Fabricius, 1807 species from Tajikistan has shown that only *Pontia edusa* (Fabricius, [1777]), which was previously considered *Pontia daplidice* (Linnaeus, 1758), is found throughout the country. In fact, these are the only finds of this species in Central Asia, and these data will improve our understanding about distribution of *Pontia edusa*, and in the future will help to form an overall picture of the distribution of both taxa. *Pontia edusa* is also reported for the first time for central Iran. Morphological analysis did not reveal significant features in the structure of the genitalia that could distinguish between *P. edusa* and *P. daplidice*.
Keywords: Lepidoptera, Pieridae, DNA barcoding, morphological features, seasonal forms, Tajikistan, Iran.

Pontia daplidice **(Linnaeus, 1758) y** *Pontia edusa* **(Fabricius, [1777]) en Tayikistán: ¿una o dos especies? (Lepidoptera: Pieridae)**

Resumen

El código de barras del ADN de las especies de *Pontia* Fabricius, 1807 de Tayikistán ha demostrado que sólo la *Pontia edusa* (Fabricius, [1777]), que antes se consideraba *Pontia daplidice* (Linnaeus, 1758), se encuentra en todo el país. De hecho, se trata de los únicos hallazgos de esta especie en Asia Central, estos datos mejorarán nuestra comprensión sobre la distribución de la *Pontia edusa* (Fabricius, 1777) y en el futuro ayudarán a formarse una imagen global de la distribución de ambos taxones. También se informa por primera vez de la presencia de *Pontia edusa* en el centro de Irán. El análisis morfológico no reveló características significativas en la estructura de la genitalia que pudieran distinguir entre *P. edusa* y P. *daplidice*.
Palabras clave: Lepidoptera, Pieridae, código de barras del ADN, características morfológicas, formas estacionales, Tayikistán, Irán.

Introduction

Due to the morphological similarity of *Pontia edusa* (Fabricius, [1777]) and *Pontia daplidice* (Linnaeus, 1758), there is still no consensus among entomologists about their status. Some researchers (Geiger & Scholl 1982; Wagener, 1988; Geigeret al. 1988; John et al. 2013) consider both taxa as a separate species, while other authors (Porter et al. 1997; Kurze et al. 2006) consider *P. edusa* to be a subspecies of *P. daplidice*. Tuzov et al. (1997) refer to the study by Geiger & Scholl (1982) on the assignment of the parapatric species *P. edusa* to the complexes of *P. daplidice* species based on data from electrophoretic analysis of enzymes, and emphasize that due to the lack of such a study in Russia and neighboring territories, the distribution of *P. daplidice* is considered by analogy with the distribution of European-African and the Middle Eastern population. Korb & Bolshakov (2016), in their work on Papilionoidea of the former Soviet Union, consider *P. edusa* a subspecies

of *P. daplidice*, while noting that both of these taxa are certainly different, but their status is still uncertain. As can be seen from the above data, the situation is not simple, and all this uncertainty has led to the fact that researchers still cannot determine the exact distribution of these two taxa.

According to Bruna et al. (2004) the distribution of *P. daplidice* covers Canary Islands, North Africa, Southwest Europe, Southeast Turkey, Middle East, Western and Southern Iran to Afghanistan and, possibly, Kazakhstan and Tajikistan. It is also a rare migrant to South England and Ireland (Thomas & Lewington, 1991). *Pontia edusa* is common on Central, Eastern and Southeastern Europe, Transcaucasia, Turkey, Northeast Iraq, Northwest Iran and, possibly, Central and Eastern Asia to Japan (Bruna et al. 2004).

The occurrence of *P. daplidice* in northern Africa, the Levant and southwestern Europe has been demonstrated based on molecular data (Geiger et al. 1988, John et al. 2013, Dapporto et al. 2019). The presence of *P. edusa* in the Tien Shan mountains in southern Kazakhstan was shown in the work of Lukhtanov et al. (2009) based on the analysis of mitochondrial DNA barcodes.

All published works on the Papilionoidea fauna of Tajikistan (Stshetkin, 1960, 1963, 1975; 1981; Tshikolovets, 2003; Davlatov, 2020, 2022) mention *P. daplidice*. For the first time about the findings of *P. edusa* in Tajikistan (Karategin ridge) is reported in the works of Sharafutdinov & Lukhtanov (2019) based on the study of barcodes of mitochondrial DNA and, in fact, this is the only find in Central Asia. After this publication, doubts arose as to whether *P. daplidice* is found in Tajikistan at all or only *P. edusa* is distributed throughout Tajikistan. As noted by Wagener (1988) and John et al. (2013), there is no reliable morphological feature by which these two taxa can be reliably distinguished. At the same time, these two species differ well in mitochondrial and nuclear genes (John et al. 2013). In such difficult situations, especially when the distribution of both taxa has not been fully clarified, morphological features do not give final results in determining, in addition, populations from all Central Asian countries have not been genetically studied, it is impossible to come to a final conclusion about which of these species occurs in Tajikistan. Thus, we set ourselves the task that it is necessary to study populations from all over Tajikistan at the genetic level, since this is the only way to clarify the situation as to which of these two taxa is reliably distributed in Tajikistan, or all such both species are found in this region.

Material and methods

The material for the description of this paper were a collection of authors from 2014 to 2023 from different parts of Tajikistan at altitudes of 300-3800 m above sea level. In total, over 560 specimens of Papilionidae were studied, in particular 310 males and 240 females. First of all, all our efforts were aimed at studying the morphological features of these species, such as the pattern of wings, as well as the structure of the genitals, followed by their comparison with each other. The wing patterns were studied on both sides of the wings. Dissection and preparation of genitalia slides were performed applying standard protocols. The diagnostic signs of the genitals used in this work are given by Korshunov (2002) and Wu (2010). The photographs of Papilionoidea and their genitalia were taken with a NIKON D7000 digital camera connected to a Crystallite ST-7045 Trinocular Microscope.

DNA barcodes of Lepidoptera from Tajikistan and Iran were obtained and analyzed (Table 1). For comparison, samples of *P. daplidice* from France, Italy, and Spain, as well as *P. edusa* from Kazakhstan were used (Table 1). The species identity of the samples from France, Italy, Spain, and Kazakhstan was previously established using DNA barcodes (Lukhtanov et al. 2009, Dapporto et al. 2019).

Standard mitochondrial DNA barcodes (658 bp fragments of the cytochrome c oxidase subunit I gene) were obtained at the Department of Karyosystematics (Zoological Institute RAS, St. Petersburg). DNA was extracted from single legs removed from dried voucher specimens. The target 658-bp fragment of COI was amplifying using the primers LepF1 and LepR1 (Hebert et al 2004). Sequences were obtained using ABI 3730XL sequencers (Applied Biosystems). Sequences were edited to remove ambiguous base calls and primer sequences and aligned using the BioEdit software (Hall, 1999). All new sequences were submitted to GenBank (Table 1).

The TCS haplotype network (Clement et al. 2000) was created and visualized using the PopArt software (Leigh & Bryant, 2015). The within- and intraspecific uncorrected *COI* p-distances (%) were calculated using the MEGA 11 program (Tamura et al. 2021) (Table 2).

Results and discussion

Morphology and variation

The wingspan reaches 35-45 mm. The wing patterns of the studied Lepidoptera are almost identical. The upper side of the wings is white, with black spots on the apex and the marginal area of the forewings up to Cu1 and the hindwings up to Cu2. There is a black discal spot on the forewings with a white stroke in the middle. The underside of the hindwings has a greenish coloration with white spots. When studying the features of the Papilionoidea wing pattern collected by us from different parts of Tajikistan, it became clear that have the same wing pattern features, except for a small change. The change is as follows: the black pattern on the apex of the forewings is sometimes combined with larger white spots, and sometimes these white spots are slightly smaller; the black color is sometimes mixed with developed white scales; some specimens have a strongly developed black discal spot, others to a lesser extent. The patterns on the underside of the hind wings also have different degrees of development, especially light green patterns, and sometimes colorless ones, are often observed; the number of white spots in the middle transverse row varies, decreases in some specimens, and increases in others (see figures 2-13). It should be noted that all these changes are not a sufficient argument for distinguishing into separate species and these changes are primarily undoubtedly related to the season of the year and the number of generations. Stshetkin (1960) notes the variability of the wing patterns of the *Pontia* (*daplidice*) *edusa* and associates these changes with the transition of shape from one population to another.

There are no major changes in the structure of the genitals, except for the shape of the valva, which is sometimes elongated with a pointed tops, and in large cases it has an oval shape. Bruna et al. (2004) use genital structures to distinguish between both taxa, in particular, it was shown that the discal margin of the valva in *P. edusa* is more angular and pointed than in daplidice, but at the same time it is noted that this feature is insufficiently pronounced and unstable. Wagener (1988) also gives drawings of the valvae of two taxa (see figures 17-22), but as can be seen from the drawings, there is no greatest difference between the structures of these valvae, and such features can be observed in the genitals studied by us (see figures 14-16).

Ecology

P. edusa is one of the most common in Tajikistan. It is found everywhere except in sandy deserts at an altitude of 300-3500 m but is most often found on agricultural lands such as alfalfa fields, orchards, and other crops. Depending on the altitude, locality and weather conditions, this specie's flight begins in late February or early March and lasts until November, while during the year from four to six generations develop, respectively. According to Stshetkin (1960), in the conditions of the Vakhsh valley (Southern Tajikistan), *P. edusa* develops to the 6th generation within a year, and probably the 6th generation is incomplete. In other parts of Tajikistan, it produces up to 4 generations per year.

Molecular work

The TCS network clearly demonstrated that all studied specimens from Tajikistan and Iran form a single cluster together with previously identified specimens of *P. edusa* from Kazakhstan. All *P. daplidice* specimens from France, Italy and Spain form another distant cluster (Fig. 1). Interspecific uncorrected COI p-distance between *P. edusa* and *P. daplidice* was within 7.8 - 8.3%. Intraspecific uncorrected COI p-distance between samples of *P. edusa* was in the range of 0 - 0.6%. Intraspecific uncorrected COI p-distance between samples of *P. daplidice* was within 0.3 - 1.0% (Table 2). Thus, the interspecific distances significantly exceeded the intraspecific distances.

We also checked the species identity of the studied samples using algorithms and the BOLD system database (https://www.boldsystems.org/index.php/IDS_OpenIdEngine).This method also showed unequivocally that all newly studied specimens belonged to *P. edusa*.

Thus, not a single specimen of *P. daplidice* was identified in the sample collected in different parts of Tajikistan. In contrast, all studied specimens from Tajikistan turned out to be *P. edusa*. The only specimen

studied from central Iran was also found to be *P. edusa*.

Table 1. List of the analyzed *COI* barcodes of *Pontia daplidice* and *P. edusa.*

Field/ BOLD ID	GenBank ID	Haplo-type	Species	Country	Locality	Source
RVcoll.11-E86	MN145195	d1Fr	*P. daplidice*	France	Corsica, North Corsica, L'Inzeca	Dapporto et al. 2019
RVcoll.12-O547	MN144058	d2It	*P. daplidice*	Italy	Sardinia, Ogliastra, Tortoli	Dapporto et al.2019
RVcoll.11-H637	MN143626	d3It	*P. daplidice*	Italy	Sicily, Agrigento, Isola di Lampedusa	Dapporto et al.2019
RVcoll.12-O278	MN143616	d4It	*P. daplidice*	Italy	Sardinia, Olbia-Tempio, La Maddalena	Dapporto et al.2019
RVcoll.08-L132	MN143573	d3It	*P. daplidice*	Spain	Granada, Andalucía, Laguna Seca	Dapporto et al.2019
RVcoll.08-H595	MN143491	d6Sp	*P. daplidice*	Spain	Guadalajara, Castilla-La Mancha, Durón	Dapporto et al.2019
RVcoll.14-E068	MN143442	d4It	*P. daplidice*	Italy	Piedmont, Piano della Casa	Dapporto et al.2019
LOWA029-06	FJ664011	e1Ka	*P. edusa*	Kazakhstan	Tienschan, Dzhambul Region, Kurdai Pass, 43.33N 74.95E	Lukhtanov et al. 2009
LOWA029-06	FJ664010	e2Ka	*P. edusa*	Kazakhstan	Tienschan, Dzhambul Region, Kurdai Pass, 43.33N 74.95E	Lukhtanov et al. 2009
LOWA561-06	FJ664009	e3Ka	*P. edusa*	Kazakhstan	Dzhungarsky Alatau, Lepsy River, 45.72N 80.28E	Lukhtanov et al. 2009
LOWA561-06	FJ664008	e3Ka	*P. edusa*	Kazakhstan	Dzhungarsky Alatau, Lepsy River, 45.72N 80.28E	Lukhtanov et al. 2009
VL728	PV793518	e5Ta	*P. edusa*	Tajikistan	Khrebet Khozratisho, A. Davlatov leg.	This study
VL729	PV793519	e6Ta	*P. edusa*	Tajikistan	Hissarsky Khrebet, A.Davlatov	This study
VL730	PV793520	e7Ta	*P. edusa*	Tajikistan	Darvazsky Khrebet, A.Davlatov	This study
VL731	PV793521	e5Ta	*P. edusa*	Tajikistan	Tabakchi, A.Davlatov	This study
VL732	PV793522	e5Ta	*P. edusa*	Tajikistan	Khrebet Petra Pervogo, A. Davlatov	This study
VL733	PV793523	e10Ta	*P. edusa*	Tajikistan	S. Tajikistan, Tabakchi, A.Davlatov	This study
BPAL2653-14	PV793524	e11Ta	*P. edusa*	Tajikistan	Alai Mts, Komarob, 39.14N 70.22E, 1400m, V. Lukhtanov	Sharafutdinov, Lukhtanov, 2019
BPAL2654-14	PV793525	e11Ta	*P. edusa*	Tajikistan	Alai Mts, Komarob, 39.14N 70.22E, 1400m, V. Lukhtanov	Sharafutdinov, Lukhtanov, 2019
BPAL2655-14	PV793526	e11Ta	*P. edusa*	Tajikistan	S. Tajikistan, Sarband, 37.88N 68.94E, 504m, V. Lukhtanov leg.	This study
BPAL2796-15	PV793527	e3Ka	*P. edusa*	Iran	Qamsar, 33.72N 51.5E, 2000m, 16July2009, V. Lukhtanov leg.	This study

Table 2. Inter- and intraspecific uncorrected COI p-distances between specimens of *P. daplidice* (specimens 1-7) and *P. edusa* (specimens 8-21).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	0,0000																				
2	0,0030																				
3	0,0106	0,0076																			
4	0,0091	0,0061	0,0015																		
5	0,0106	0,0076	0,0000	0,0015																	
6	0,0122	0,0091	0,0046	0,0030	0,0046																
7	0,0079	0,0048	0,0016	0,0000	0,0016	0,0032															
8	0,0780	0,0780	0,0810	0,0826	0,0810	0,0856	0,0811														
9	0,0780	0,0780	0,0810	0,0826	0,0810	0,0856	0,0811	0,0031													
10	0,0776	0,0776	0,0809	0,0825	0,0809	0,0858	0,0801	0,0017	0,0017												
11	0,0765	0,0765	0,0795	0,0810	0,0795	0,0841	0,0795	0,0015	0,0015	0,0000											
12	0,0778	0,0778	0,0809	0,0824	0,0809	0,0855	0,0797	0,0047	0,0047	0,0033	0,0031										
13	0,0778	0,0778	0,0809	0,0824	0,0809	0,0855	0,0797	0,0016	0,0016	0,0000	0,0000	0,0031									
14	0,0762	0,0762	0,0793	0,0809	0,0793	0,0840	0,0780	0,0063	0,0063	0,0050	0,0047	0,0016	0,0047								
15	0,0778	0,0778	0,0809	0,0824	0,0809	0,0855	0,0797	0,0047	0,0047	0,0033	0,0031	0,0000	0,0031	0,0016							
16	0,0778	0,0778	0,0809	0,0824	0,0809	0,0855	0,0797	0,0047	0,0047	0,0033	0,0031	0,0000	0,0031	0,0016	0,0000						
17	0,0762	0,0762	0,0793	0,0808	0,0793	0,0838	0,0780	0,0061	0,0061	0,0050	0,0046	0,0016	0,0047	0,0031	0,0016	0,0016					
18	0,0765	0,0765	0,0795	0,0810	0,0795	0,0841	0,0795	0,0046	0,0046	0,0033	0,0031	0,0000	0,0031	0,0016	0,0000	0,0000	0,0015				
19	0,0765	0,0765	0,0795	0,0810	0,0795	0,0841	0,0795	0,0046	0,0046	0,0033	0,0031	0,0000	0,0031	0,0016	0,0000	0,0000	0,0015	0,0000			
20	0,0765	0,0765	0,0795	0,0810	0,0795	0,0841	0,0795	0,0046	0,0046	0,0033	0,0031	0,0000	0,0031	0,0016	0,0000	0,0000	0,0015	0,0000	0,0000		
21	0,0765	0,0765	0,0795	0,0810	0,0795	0,0841	0,0795	0,0015	0,0015	0,0000	0,0000	0,0031	0,0000	0,0047	0,0031	0,0031	0,0046	0,0031	0,0031	0,0031	0,0000

1 – Pontia_daplidice_MN145195_RVcoll.11-E863_France_North_Corsica
2 – Pontia_daplidice_MN144058_RVcoll.12-O547_Italy_Sardinia_Ogliastra_Tortoli
3 – Pontia_daplidice_MN143626_RVcoll.11-H637_Italy_Sicily_Agrigento_Isola_di_Lampedusa
4 – Pontia_daplidice_MN143616_RVcoll.12-O278_Italy_Sardinia_Olbia-Tempio_La_Maddalena
5 – Pontia_daplidice_MN143573_RVcoll.08-L132_Spain_Granada_Andalucia_Laguna_Seca
6 – Pontia_daplidice_MN143491_RVcoll.08-H595_Spain_Guadalajara_Castilla-La_Mancha_Duron
7 – Pontia_daplidice_MN143442_RVcoll.14-E068_Italy_Piedmont_Piano_della_Casa
8 – Pontia_edusa_FJ664011_LOWA029-06_Kazakhstan_Tienschan|Dzhambul_Region|Kurdai_Pass_43.33N_74.95E
9 – Pontia_edusa_FJ664010_LOWA030-06_Kazakhstan_Tienschan|Dzhambul_Region|Kurdai_Pass|43.33N_74.95E
10 – Pontia_edusa_FJ664009_LOWA561-06_Kazakhstan_Dzhungarsky_Alatau_Lepsy_River_45.72N_80.28E
11 – Pontia_edusa_FJ664008_LOWA562-06_Kazakhstan_Dzhungarsky_Alatau_Lepsy_River_45.72N_80.28E
12 – Pontia_edusa_VL728_Tajikistan_Khrebet_Khozratisho_A.Davlatov
13 – Pontia_edusa_VL729_Tajikistan_Hissarsky_Khrebet_A.Davlatov
14 – Pontia_edusa_VL730_Tajikistan_Darvazsky_Khrebet_A.Davlatov
15 – Pontia_edusa_VL731_Tajikistan_Tabakchi_A. Davlatov
16 – Pontia_edusa_VL732_Tajikistan_Khrebet_Petra_Pervogo_A. Davlatov
17 – Pontia_edusa_VL733_Tajikistan_Tabakchi_female_A. Davlatov
18 – Pontia_edusa_BPAL2653-14|CCDB-17967_H04|Tajikistan_Komarob_39.14N_70.22E_1400m_VLukhtanov
19 – Pontia_edusa_BPAL2654-14|CCDB-17967_H05|Tajikistan|Komarob_VLukhtanov
20 – Pontia_edusa_BPAL2655-14|CCDB-17967_H06|Tajikistan|Sarband|37.88N_68.94E_504m_VLukhtanov
21 – Pontia_edusa_BPAL2796-15|CCDB-17969_D05|Iran_Qamsar_33.72N_51.5E_2000m_16July2009_VLukhtanov

Conclusion

As can be seen from the above data, there are no significant morphological differences between these two taxa. The only way to distinguish these two taxa is by the genetic method, which is currently widely used in insect taxonomy. Thanks to the obtained genetic data, it has now become clear that only *P. edusa* reliably inhabitant in Tajikistan, and the taxon *P. daplidice*, which have so far been cited for our fauna, does not occur in Tajikistan at all. It is likely that only *P. edusa* inhabitant in all Central Asian countries, since this is a migratory species, but to clarify this issue, it is necessary to involve material from all these countries for genetic analysis.

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Conflict of Interest

The authors declare that they have no known financial interest or personal relationship that could have influence the work presented in this article.

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* Abdulaziz M. Davlatov
E. N. Pavlovsky Institute of Zoology and Parasitology
National Academy of Sciences of Tajikistan
Dushanbe 734025, box 70
TAYIQUISTÁN / *TAJIKISTAN*
E-mail: abdulaziz19@mail.ru
https://orcid.org/0009-0005-4955-720X

Vladimir A. Lukhtanov
Department of Karyosystematics
Zoological Institute
Russian Academy of Sciences
Universitetskaya nab., 1
St. Petersburg 199034
RUSIA / *RUSSIA*
E-mail: lukhtanov@mail.ru
https://orcid.org/0000-0003-2856-2075

*Autor para la correspondencia / *Corresponding author*
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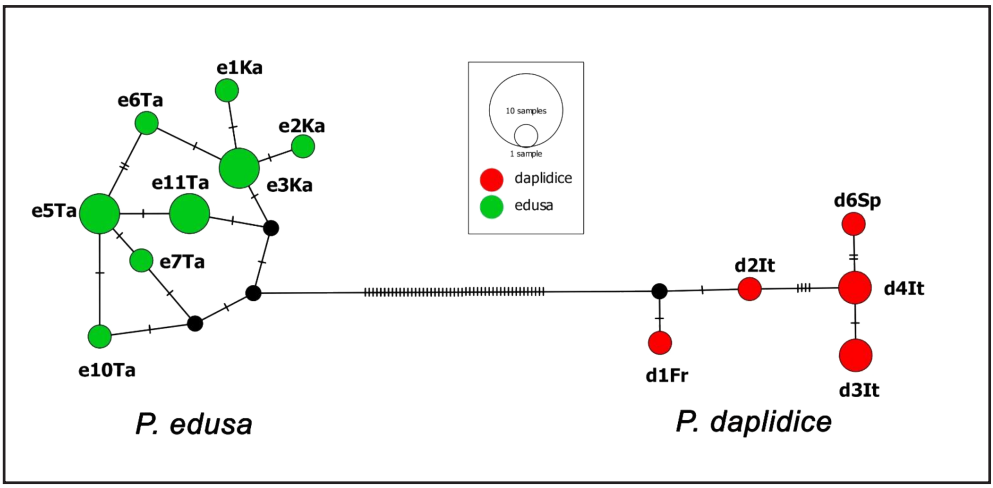
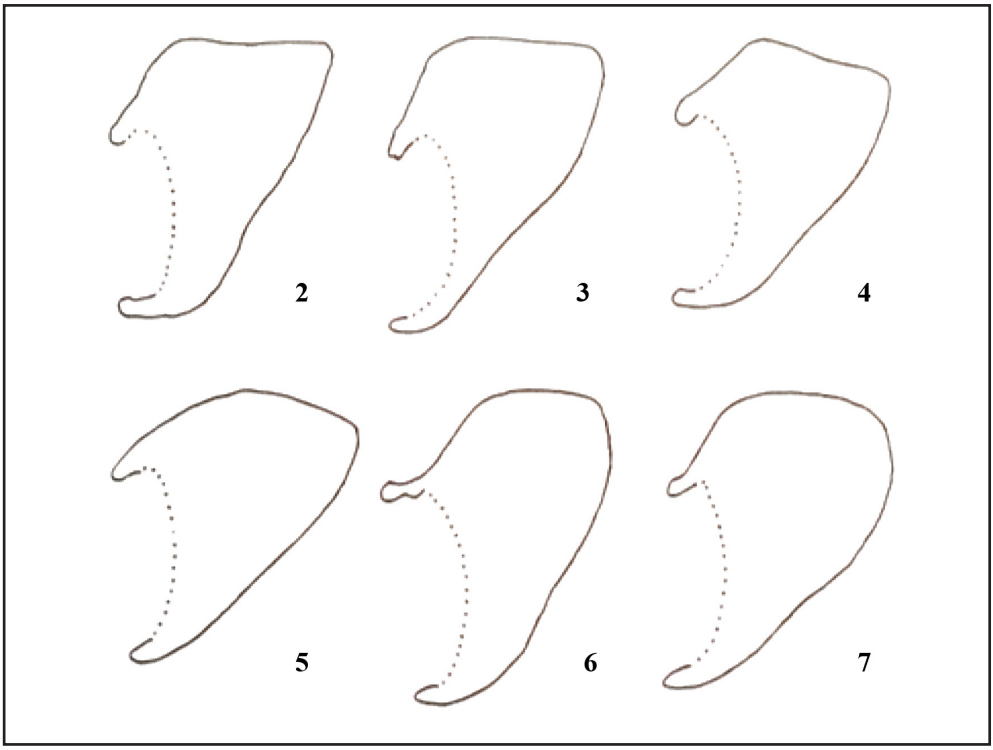
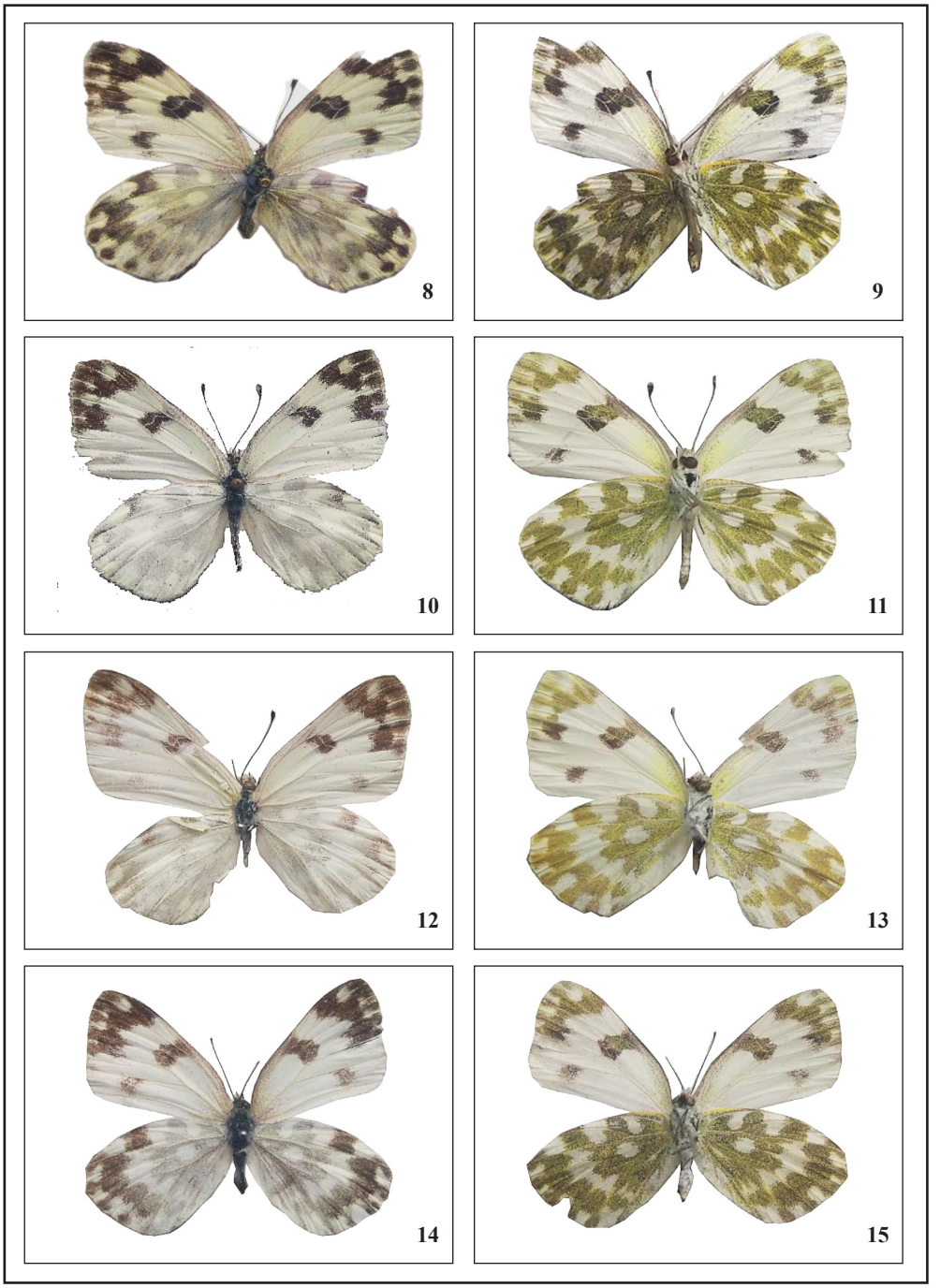
Figure 1. The TCS haplotype network of the analyzed samples of *P. edusa* and *P. daplidice*. Circles are proportional to sample size for each haplotype. Smallest black dots represent unsampled but predicted haplotypes, and mutations are shown as dashes. The species clusters are highlighted in different colors. **Fr** is France, **It** is Italy, **Ka** is Kazakhstan, **Sp** is Spain, and **Ta** is Tajikistan.



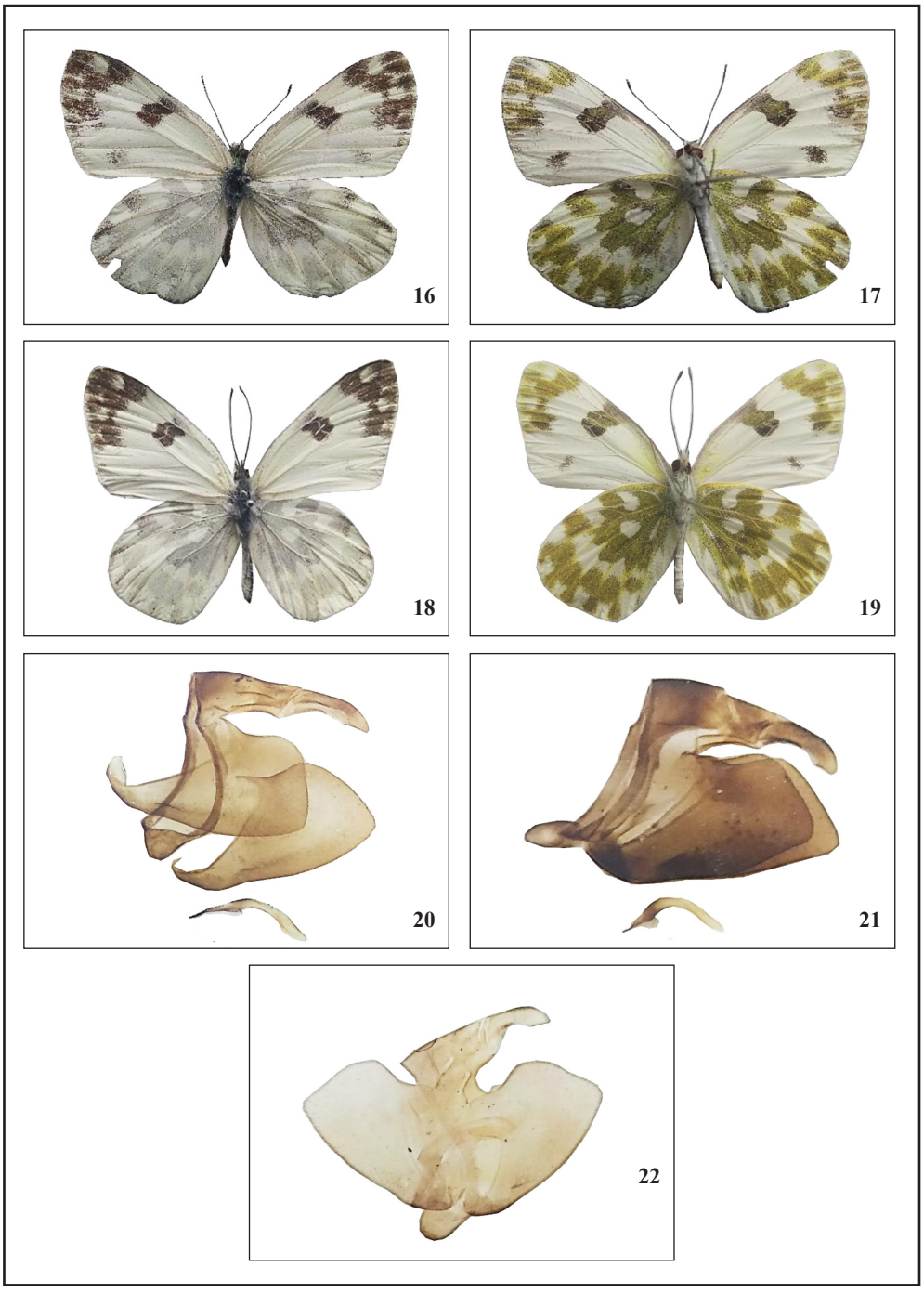
Figures 2-7. Types of valves of *Pontia daplidice* and *Pontia edusa* by Wagener, 1988. **2-4.** *Pontia edusa*. **5-7.** *Pontia daplidice*.



Figures 8-15. *Pontia edusa* in Tajikistan. **8-9**. Tabakchi Mountain. **10-11**. Hazratisho Ridge. **12-13**. Darvaz Ridge. **14-15**. Hissar Ridge.



Figures 16-22. 16-17. Peter the Great Ridge. **18-19.** Turkestan Ridge. **20-22.** Genitalia of *Pontia edusa* in Tajikistan.



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Parochromolopis psittacanthus Heppner, 1980 nuevo registro para México (Lepidoptera: Epermeniidae)

Héctor Rubén Iruegas-Buentello, Héctor Flores-Martínez, Norma Alejandra Mancilla-Margalli & Irma Guadalupe López-Murair

Resumen

Por primera vez se registra para México a *Parochromolopis psittacanthus* Heppner, sobre inflorescencias del muérdago *Psittacanthus calyculatus* (DC.) G. Don de la familia Loranthaceae. Esta especie fue originalmente descrita por Heppner (1980) para Costa Rica y sobre la misma especie de planta.
Palabra clave: Lepidoptera, Epermeniidae, *Parochromolopis*, *Psittacanthus*, nuevo registro, México.

Parochromolopis psittacanthus **Heppner, 1980 new record in México (Lepidoptera: Epermeniidae)**

Abstract

Parochromolopis psittacanthus Heppner, on inflorescences of the mistletoe *Psittacanthus calyculatus* (DC.) G. Don, of the family Loranthaceae, is recorded for the first time for Mexico. This species was originally described by Heppner (1980) for Costa Rica and on the same plant species.
Keywords: Lepidoptera, Epermeniidae, *Parochromolopis*, *Psittacanthus*, new record, Mexico.

Introducción

El género *Parochromolopis* Gaedike, 1977 y se caracteriza por tener agrandado el penúltimo segmento de los palpos labiales y porque las valvas del macho tienen unas proyecciones en forma de dedos formando ampollas, ausencia de gnathos y el aedeago provisto de cornuti de forma variada. Gaedike (1977), Gaedike & Becker (1989) y Gaedike (2010), describen nueve especies de *Parochromolopis* para la región Neotropical, a saber, *P. floridana* Gaedike, 1977 (Florida, EE.UU.), *P. syncrata* (Meyrick, 1921) (Brasil, Perú), *P. parishi* Gaedike, 1977 (Perú), *P. bicolor* (Brasil), *P. parva* Gaedike & Becker, 1989 (Brasil), *P. fuscocostata* Gaedike & Becker (Brasil), *P. mexicana* Gaedike & Becker (Chiapas, México), *P. gielisi* Gaedike, 2010 (Argentina) y *Parochromolopis psittacanthus* Heppner, 1980 (Costa Rica).

Parochromolopis psittacanthus Heppner (1980) fue descrito como una nueva especie de nueve ejemplares adultos, 1 ♂ y 8 ♀, que emergieron de frutos colectados de una planta parásita de la familia Loranthaceae, *Psittacanthus calyculatus* (DC.) G. Don, en Costa Rica. Posteriormente este taxón ha sido mencionado en la descripción de una nueva especie para Chiapas, México (*Parochromolopis mexicana* Gaedike & Becker, 1989), estos autores mencionan que, aunque éstas dos especies están relacionadas, existen diferencias en las estructuras genitales del macho; *P. mexicana* tiene un uncus más largo y el cornuti del aedeago con forma diferente al de *P. psittacanthus*. Heppner (1980), menciona que en ésta última especie el

cornuti está constituido como una columna recurvada en forma de gancho (Figura 5).

La planta hospedera, *Psittacanthus calyculatus* (DC.) G. Don (Figuras 1-2) fue determinada a nivel de especie de acuerdo a Martínez-Ambriz (2018) y presenta las siguientes características: Planta de hasta 1 m de largo; tallos angulados, algo comprimidos, glabros; hojas con pecíolos de 2 a 4 mm de largo, láminas glabras, generalmente hasta 9.5 cm de largo y hasta 4.8 cm de ancho, ovadas a ovado-lanceoladas, ocasionalmente falcadas, margen entero; inflorescencias terminales o subterminales; botones florales rectos a ligeramente curvados menores a 6 cm de largo, ápice redondeado a puntiagudo; flores anaranjadas, pedicelos de 4 a 12 mm de largo; calículo pardo-verdoso, glabro, irregularmente dentado; corola con pétalos de hasta 5.5 cm de largo y de 1.7 a 2.0 mm de ancho, glabros; estambres dimórficos, glabros, anteras de 4 a 6 mm de largo, elípticas; ovario glabro, estilo de 3 a 5.2 cm de largo, recto, estigma papilado; frutos de 11 a 13 mm de largo, de 6 a 9 mm de ancho, negro-purpúreos y glabros.

Castillo-Campos et al. (2018) mencionan que *Psittacanthus calyculatus* es una especie nativa de México, florece y fructifica de septiembre a octubre y parasita árboles de *Acacia* Mill. Stanley (1920) menciona que esta planta parasita a los géneros *Persea*, *Acacia*, *Prosopis*, *Quercus*, *Pithecollobium*, *Prunus persica*, *Citrus*, *Olea*, *Nerium* y *Salix*. En específico, el aguacate, tejocote, capulín y durazno son afectadas por muérdago (Juan-Pérez, 2016).

Por otra parte, Ornelas (2019), agrega que todos los muérdagos (Orden Santalales) comparten la misma forma de crecimiento, conocido como hemiparasitismo obligado, por el cual obtienen agua y nutrientes del árbol hospedero a través de una conexión vascular especializada llamada haustorio y se distribuyen desde el norte de México hasta el norte de Argentina. También menciona que existen más de 50 géneros de plantas que han sido reportadas como hospederas de *Psittacanthus,* sin embargo, muchos insectos polinizadores y aves, que ayudan a su dispersión, se ven beneficiados por la presencia de estas especies y su impacto ecológico promueve muchos recursos a fauna diversa, como colibríes, avispas, mariposas, abejas y abejorros. Se reporta también con actividad antioxidante (Flores-Sierra et al. 2024), con actividad fungistática (Xoca-Orozco et al. 2022).

Actualmente existe una sola especie reportada del género *Parochromolopis* en México (*P. mexicana* Gaedike) y en el presente estudio, *P. psittacanthus* Heppner, se convierte en la segunda especie para el país.

Materiales y métodos

Se realizaron dos colectas en 7-VII-2024 y 14-VII-2024 en varias plantas parásitas en *Acacia farnesiana* (L.) Wight & Arn., vecino de huertas comerciales de *Persea americana* Mill. y *Citrus limon* (L.) Osbeck. Se obtuvieron muestras de ramas, hojas, flores y frutos de la especie *Psittacanthus calyculatus* (DC.) G. Don (Loranthaceae), de donde emergieron tres ejemplares adultos machos de la especie descrita como *Parochromolopis psittacanthus*, utilizando para su identificación la descripción original de Heppner (1980), así como las descripciones del género *Parochromolopis* Gaedike, 1977 y comparando con las ilustraciones de Gaedike & Becker (1989).

Las plantas muestreadas se localizaron a 20º16’17”N y 103º08’29” W, a 1.546 metros m.s.n.m. en el municipio de Tizapán, en el Estado de Jalisco, México. Las partes vegetales fueron colocadas en envases de plástico con capacidad de un litro con tapa de malla No. 30 con aperturas de 600 micrómetros y colocadas en un cuarto de incubación bajo temperatura controlada a 25 grados centígrados (López-Muraira et al. 2022).

Para la disección y tinción de la genitalia de los adultos (Figuras 3-4) se utilizó la técnica mencionada por Robinson (1976), que consiste en colocar el abdomen en una solución de KOH (10%) y calentarlo por 2 a 10 minutos, posteriormente lavarlos con etanol al 10% y separar la estructura genital del abdomen; después teñirlos con Negro de Chlorazol y realizar un montaje temporal en portaobjetos con glicerina. Los insectos y la estructura genital fueron depositados en la colección entomológica ubicada dentro del Herbario CREG del Instituto Tecnológico de Tlajomulco en Jalisco, México.

Resultados y discusión

Superfamily Epermenioidea Spuler, 1910
Familia Epermeniidae Spuler, 1910
Subfamilia Ochromolopinae Gaedike, 1966
Género *Parochromolopis* Gaedike, 1977

Parochromolopis psittacanthus Heppner, 1980 (Figure 6)

Material examinado: Tizapán, Jalisco, México, (20º19'58" N y 103º03´50" W), 3 ♂, 7-VII-2024 y 14-VII-2024, H. R. Iruegas leg.

Las larvas de esta especie barrenan los frutos de la planta hospedera *Psittacanthus calyculatus* (DC.) G. Don y se encontraron alimentándose exclusivamente de esta Loranthaceae.

Distribución: Esta especie sólo se conoce para la Provincia de Guanacaste en Costa Rica, ahora es un nuevo registro para Jalisco, México. Se consultaron los registros previos de las especies de Epermeniidae en México usando como base las publicaciones de Heppner (1984) y de Gaedike & Becker (1989), no mostrando registro previo de *Parochromolopis psittacanthus* en el país, por último, se siguió el sistema de clasificación desarrollado por Mitter et al. (2017).

En esta planta hospedera, *Psittacanthus calyculatus*, se han encontrado en México dos especies de Lepidoptera que se alimentan de hojas y frutos respectivamente, *Phyllocnistis psittacanthusella* Heppner & López-Muraira (2020) y *Parochromolopis psittacanthus* Heppner (1980).

Conclusiones

La presencia de *Parochromolopis psittacanthus*, cuyas larvas fueron colectadas sobre *Psittacanthus calyculatus* en Costa Rica y México, nos indica que este Epermeniidae muestra una distribución mesoamericana con fuerte influencia tropical a través de corredores serranos que comprenden la Zona de Transición Mexicana con el patrón de dispersión Montañosa Mesoamericana (Halfter & Morrone, 2017). Este nuevo registro para México ayuda a entender mejor las rutas de expansión de estos Lepidoptera desde la Sierra de Talamanca de Costa Rica y Panamá hasta México. También ayuda a comprender la relación directa que guarda esta especie con su planta nutricia y su dispersión a través de Mesoamérica gracias a la migración de las aves que se alimentan de sus frutos.

Dada la importancia que tiene *Psittacanthus calyculatus* como parásita de árboles frutales, ornamentales y de los bosques, es importante conocer las especies de insectos relacionados con este tipo de plantas, que podrían ser utilizadas dentro de un programa de control biológico de plantas dañinas.

Conflicto de interés

Los autores declaran que no tienen ningún interés financiero ni relación personal que pudiera influir en el trabajo presentado en este artículo.

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Héctor Rubén Iruegas-Buentello
Instituto Tecnológico de Tlajomulco
Km 10 Carr. Tlajomulco Cto. Metropolitano Sur
45640 Tlajomulco de Zúñiga, Jalisco
MÉXICO / *MEXICO*
E-mail: hector.fm@tlajomulco.tecnm.mx
https://orcid.org/0000-0002-0918-2862

*Héctor Flores-Martínez
Instituto Tecnológico de Tlajomulco
Km 10 Carr. Tlajomulco Cto. Metropolitano Sur
45640 Tlajomulco de Zúñiga, Jalisco
MÉXICO / *MEXICO*
E-mail: hector.fm@tlajomulco.tecnm.mx
https://orcid.org/0000-0001-7214-9785

Norma Alejandra Mancilla-Margalli
Instituto Tecnológico de Tlajomulco
Km 10 Carr. Tlajomulco Cto. Metropolitano Sur
45640 Tlajomulco de Zúñiga, Jalisco
MÉXICO / *MEXICO*
E-mail: a.m.margalli@hotmail.com
https://orcid.org/0000-0003-3182-3969

Irma Guadalupe López-Muraira
Instituto Tecnológico de Tlajomulco
Km 10 Carr. Tlajomulco Cto. Metropolitano Sur
45640 Tlajomulco de Zúñiga, Jalisco
MÉXICO / *MEXICO*
E-mail: lopezmuraira@hotmail.com
https://orcid.org/0000-0003-4857-8701

*Autor para la correspondencia / *Corresponding author*

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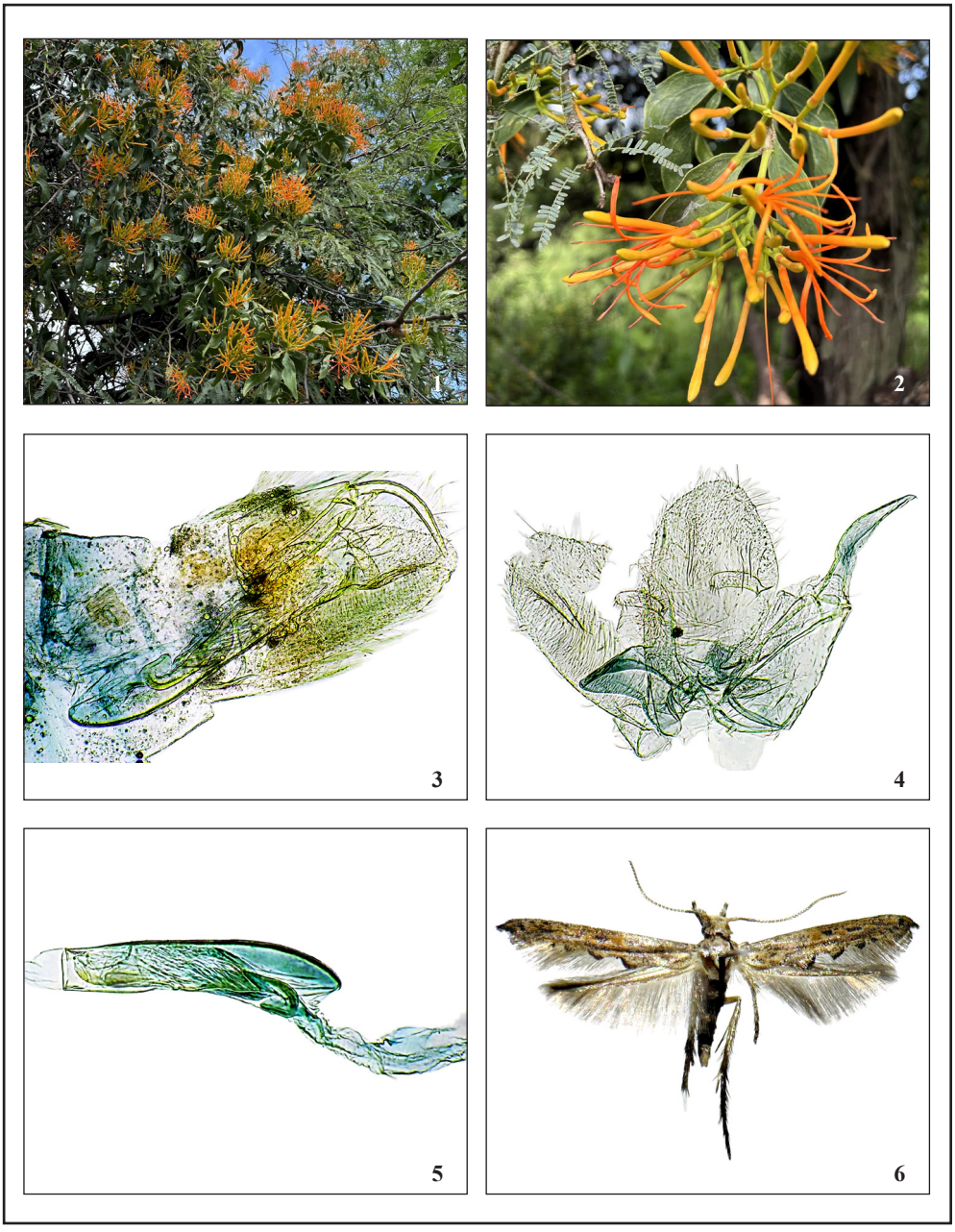
Figuras 1-6. 1. Planta de *Psittacanthus calyculatus*. **2.** Flores de *Psittacanthus calyculatus*. **3.** Genitalia del macho *Parochromolopis psittacanthus*. **4.** Genitalia del macho sin aedeagus. **5.** Aedeagus con cornuti en forma de gancho. **6.** Adulto de *Parochromolopis psittacanthus*.



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Species diversity of Noctuidae in Algeria: a review of the fauna (Insecta: Lepidoptera)

Adjal Izdihar, Merabti Ibrahim, Moussi Abdelhamid, Lebbouz Ismahane, Balázs Benedek & Willy De Prins

Abstract

The objective of this study is to draw up an initial inventory of the diversity of the species of the Noctuidae family in Algeria. The large area of the country offers a variety of bioclimatic stages ranging from semi-humid to Saharan biotopes. This review is the first national list of the most studied species, many of which are known for their negative impact on agricultural crops. Based on a compilation of more than 25 publications since 1876, this study highlights the most representative genera and species of the fauna of Noctuidae in Algeria.
Keywords: Insecta, Lepidoptera, Noctuidae, species diversity, fauna inventory, Algeria.

Diversidad de especies de Noctuidae en Argelia: una revisión de la fauna (Insecta: Lepidoptera)

Resumen

El objetivo de este estudio es elaborar un primer inventario de la diversidad de las especies de la familia Noctuidae en Argelia. La gran extensión del país ofrece una variedad de estadios bioclimáticos que van desde los biotopos semihúmedos a los saharianos. Esta revisión es la primera lista nacional de las especies más estudiadas, muchas de las cuales son conocidas por su impacto negativo en los cultivos agrícolas. Basado en una recopilación de más de 25 publicaciones desde 1876, este estudio destaca los géneros y especies más representativos de la fauna de Noctuidae en Argelia.
Palabras clave: Insecta, Lepidoptera, Noctuidae, diversidad de especies, inventario de fauna, Argelia.

Diversité des espèces de Noctuidae en Algérie: une revue de la faune (Insecta: Lepidoptera)

Résumé

L'objectif de cette étude est de dresser un premier inventaire de la diversité des espèces de la famille des Noctuidae en Algérie. La grande superficie du pays offre une variété de stades bioclimatiques allant des biotopes semi-humides aux biotopes sahariens. Cette revue est la première liste nationale des espèces les plus étudiées, dont beaucoup sont connues pour leur impact négatif sur les cultures agricoles. Utilisant une méthode de compilation, de plus de 25 publications depuis 1876, l'étude met en évidence les genres et les espèces les plus représentatifs de la faune des Noctuidae en Algérie.
Mots-clés: Insecta, Lepidoptera, Noctuidae, diversité des espèces, inventaire de la faune, Algérie.

Introduction

Noctuidae is one of the dominant and economically important families of the order Lepidoptera (Sivasankaran et al. 2011). The name of this family is derived from the fact that night-flying species have eyes which reflect light with an orange gleam (Soomro et al. 2021). Noctuidae are among the most devastating crop pests on the planet. Many of them are polyphagous pests capable of feeding on numerous host plants (Le Goff & Nauen, 2021). As the family has economic importance in agriculture, horticulture, and forest pest management, Noctuidae were assessed for their diversity. Proper control measures can be deployed to control the pests if they are identified correctly (Kalawate et al. 2023). In recent years, the classification of Noctuidae has been the subject of permanent taxonomic changes. These changes concern all the taxonomic categories, from species to family rank, proposed in order to establish natural monophyletic groups (Amer, 2013).

Algeria, one of the largest countries in Africa, has a vast area of 2,381,741 km². The temperature difference reaches 25 degrees during the same day and in the same season between its regions. Algeria is a rich natural and cultural diversity. Its geographical position lies between two barriers: the Mediterranean Sea and the Saharan ecosystems (Tebbouche et al. 2017). The importance of considering insects in the management of a natural ecosystem such as a forest is well established. Insects indeed represent a preponderant part (more than 80%) of forest animal biodiversity (Nageleisen & Bouget, 2009) and the Algerian Sahara is a preferred place for preservation of biodiversity of fauna and flora (Biad et al. 2022).

Studies on moths were started in 1876. Before the memorable era when the French army began the conquest of Algeria, the natural history of this country was very little known. The Lepidoptera in particular were, until recent years, very rare in French collections, and apart from the overall work done by Mr. Lucas (Oberthür, 1876), the Lepidopterological fauna of Algeria was known only through descriptions or isolated notes published in the Annales of the Entomological Society of France (Oberthür, 1876). In different regions of Algeria, humid, semi-humid, semi-arid, arid, and desert: Algiers; Biskra; Bou-Saada; Oran; Djebel-Aures and many other regions. The research revolved around Lepidoptera species, including the Noctuidae family. For example, Oberthür mentioned 34 species of Noctuidae family in his first research. The Noctuidae are sometimes difficult to identify. Some species are extremely variable both in coloration and the accentuation of the spots and lines on the upper side of the wings. It is often necessary to have at one's disposal numerous specimens perfectly fresh and presenting all the necessary transitions, in order to be able to carry out, with full confidence in the value of the work accomplished, the reference of the various samples to their true specific unit (Oberthür, 1918).

This is a preliminary list, based on a review of a range of specialized books to compile an inventory that includes most species found throughout history. However, access to some titles may be difficult, which may limit the possibility of confirming the presence and distribution of other species in different geographic regions.But this publication brings together most of the archival and recent scientific works that dealt with the identification of Lepidoptera in Algeria.

Material and Methods

The study builds on a review of the existing literature on Noctuidae in Algeria. The information was collected from more than 25 scientific publications dating from 1876 to the present day. The criteria for including species in the study are based on their biological importance, their geographical distribution, and their impact on crops. Data were qualitatively analyzed to draw up an updated list of Noctuidae in Algeria.This paper forms part of a planned revision of the Lepidoptera of Algeria with reference to old studies like *Fauna of the Lepidoptera of Algeria* (Oberthür, 1876), *Barbary Lepidoptera Fauna Noctuidae* (Oberthür, 1918), *Descriptions of new species of Algerian Lepidoptera* (Oberthür 1887-1888) and published data on Afrotropical moths of Algeria in the Palaearctic region (https://www.afromoths.net/).

The confirmation of the actual nomenclature and synonyms of species with the distribution maps of some species has been verified in the database of https://inpn.mnhn.fr/

This paper supports the notion that the archival record is valuable for those interested in the history of Noctuidae in Algeria. Archival information is made available regarding the original descriptions of each species, and this is confirmed by subsequent mentions in more recent publications. While species are listed in modern reference insect literature and record groups in Algeria, we have retained the first reference. Therefore, a total of 340 Noctuidae species are recorded in our country.

Results

This study compiles data from more than 25 publications to present the first updated inventory of Noctuidae species in Algeria. Covering various bioclimatic zones, 340 species are listed according to their current classification, with the regions of occurrence indicated and the corresponding references.

Subfamily Acontiinae Guenée, 1841

Acontia Ochsenheimer, 1816
Acontia albicollis Fabricius, 1781
Bou Saada (Oberthür, 1876).
Acontia biskrensis Oberthür, 1887
Hoggar Mountains (Rothschild 1915), Tassili n'Ajjer, Bou Saada, Biskra, Ghardaïa, Ouargla, Oued Mya, Touggourt (Koçak & Kemal, 2015).
Acontia lucida (Hufnagel, 1766)
Algeria (Oberthür, 1876).
Acrobyla Rebel, 1903
Acrobyla kneuckeri (Rebel, 1903)
Algeria (Koçak & Kemal, 2015).
Armada Staudinger, 1884
Armada panaceorum (Ménétriès, 1849)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Aedia Hübner, [1823]
Aedia leucomelas (Linnaeus, 1758)
Staouli (Mouhouche et al. 1996).
Emmelia Hübner, [1821]
Emmelia trabealis (Scopoli, 1763)
Sebdou, El-Outaya (Oberthür, 1918).
Metopistis Warren, 1913 in Seitz
Metopistis picturata (Rothschild, 1909)
Mraier, Hoggar Mountains (Rothschild, 1915).
Metopoceras Guenée, 1850
Metopoceras canroberti (Oberthür, 1918)
El-Outaya (Oberthür, 1918).
Metopoceras codeti Oberthür, 1881
Alegria (Culot, 1909).
Metopoceras khalildja (Oberthür, 1884)
Algeria (Culot, 1909).
Metapoceras omar (Oberthür, 1887)
Hoggar Mountains (Rothschild, 1915).

Subfamily Acronictinae Heinemann, 1859

Acronicta Ochsenheimer, 1816
Acronicta albovenosa (Goeze, 1781)
Mitidja (Barkou et al. 2017).
Acronicta euphorbiae ([Denis & Schiffermüller], 1775)
Algeria (Koçak & Kemal, 2015).
Acronicta rumicis (Linnaeus, 1758)
Sebdou (Oberthür, 1918). In North Africa ssp. *pallida* Rothschild, 1920 (Rothschild, 1920).
Acronicta tridens ([Denis & Schiffermüller], 1775)
Lambese, Djebel-Aures (Oberthür, 1918).
Craniophora Snellen, 1867

Craniophora pontica (Staudinger, 1879)
Algeria (Culot, 1909). In North Africa ssp. *navasi* Boursin, 1935, Batna, Sebdou (Koçak & Kemal, 2015).

Subfamily Amphipyrinae Guenée, 1837

Amphipyra Ochsenheimer, 1816
Amphipyra berbera Rungs, 1949
Algeria (Koçak & Kemal, 2015).
Amphipyra pyramidea (Linnaeus, 1758)
Aflou, Lambese (Oberthür, 1918).
Amphipyra tetra (Fabricius, 1787)
Aflou, Lambese (Oberthür, 1918).
Amphipyra tragopoginis (Clerck, 1759)
Hammam R'hira (Koçak & Kemal, 2015).
Bryonycta Boursin, 1955
Bryonycta pineti (Staudinger, 1859)
Oued Nca (Koçak & Kemal, 2015).

Subfamily Bagisarinae Crumb, 1956

Xanthodes Guenée, 1852 in Boisduval & Guenée
Xanthodes albago (Fabricius, 1794)
Collo (Oberthür, 1876).

Subfamily Bryophilinae Guenée, 1852

Bryophila Treitschke, 1825
Bryophila aerumna Culot, 1912
Sidi-Bel-Abbes, El Bayadh, Sebdou (Koçak & Kemal, 2015).
Bryophila domestica (Hufnagel, 1766)
Theniet El Had (Kacha et al. 2017).
Bryophila microglossa (Rambur, 1858)
Sebdou (Oberthür, 1918).
Bryophila raptricula ([Denis & Schiffermüller], 1775)
Sebdou (Oberthür, 1918).
Bryophila ravula (Hübner, [1813])
Sidi-Bel- Abbes, Batna (Koçak & Kemal, 2015).
Bryophila schwingenschussi (Boursin, 1954
Bone (Vargas-Rodríguez et al. 2020).
Cryphia Hübner, [1818]
Cryphia algae (Fabricius, 1775)
Mitidja (Barkou et al. 2017).
Cryphia antias (Culot, 1912)
Sebdou (Oberthür, 1918).
Cryphia bilineata (Rothschild, 1914)
Aflou, Lambese (Oberthür, 1918).
Cryphia pallida (Bethune-Baker, 1894)
Sidi-Bel-Abbes, Batna, Oran, Sebdou (Koçak & Kemal, 2015).
Cryphia simulatricula (Guenée, 1852)
Algeria (Culot, 1909).
Victrix Staudinger, 1879 in Romanoff
Victrix microglossa (Rambur, 1858)
Sidi-Bel-Abbes, Aflou, Guelt-es-Stel (Koçak & Kemal, 2015).

Victrix moureia (Orfila & Rossi, 1956)
Sidi-Bel-Abbes, Aflou, Guelt-es-Stel (Koçak & Kemal, 2015).
Victrix precisa (Warren, 1909)
Sebdou (Oberthür, 1918).

Subfamily Cuculliinae Herrich-Schäffer, 1850

Cucullia Schrank, 1802
Cucullia nokra (Rungs, 1951)
Lambese, Sebdou (Oberthür, 1918).
Cucullia biskrana Oberthür, 1918
Biskra (Oberthür, 1918).
Cucullia calendulae Treitschke, 1835
Biskra, Lambese, Sebdou (Oberthür, 1918).
Cucullia chamomillae ([Denis& Schiffermüller], 1775)
Sidi-Bel-Abbes, Tlemcen (Koçak & Kemal, 2015).
Cucullia melanoglossa (Berio, 1934)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Cucullia santolinae Rambur, 1834
Hoggar Mountains (Rothschild, 1915).
Cucullia syrtana Mabille, 1888
Hoggar Mountains (Rothschild, 1915).
Cucullia oberthuri (Culot, 1910)
Sidi-Bel-Abbes, Batna, Khenchela, kanatra, Lambese (Koçak & Kemal, 2015).
Cucullia tanaceti ([Denis& Schiffermüller], 1775)
Sebdou (Koçak & Kemal, 2015).
Shargacucullia Ronkay & Ronkay, 1992
Shargacucullia reisseri Boursin 1933
Sebdou, Lambese (Oberthür, 1918).
Shargacucullia verbasci oberthueri (Rothschild, 1911)
Bou Saada (Poole, 1989).
Hypomecia Staudinger, 1897
Hypomecia quadrivirgula Mabille, 1888
Batna, Aflou, Lambese, Biskra (Oberthür, 1918)
Recophora Nye, 1975
Recophora canteneri (Duponchel, 1833)
Bou Saada, Collo, Guelt-es-Stel (Koçak & Kemal, 2015).

Subfamily Eriopinae Herrich-Schäffer, 1851

Callopistria Hübner, [1821]
Callopistria latreillei (Duponchel, 1827)
Bou Saada, Guelt-es-Stel, Sebdou (Koçak & Kemal, 2015).

Subfamily Eustrotiinae Grote, 1882

Deltote Reichenbach, 1817
Deltote pygarga (Hufnagel, 1766)
Forests (oak and cedar) of Algeria (Chambon et al. 1992).
Ozarba Walker, 1865
Ozarba diaphora Berio, 1937
Hoggar Mountains (Rothschild, 1915)(Rothschild 1915).
Thalerastria Staudinger, 1898

Thalerastria diaphora (Staudinger, 1878)
El-Outaya (Oberthür, 1918) - perhaps *T. lehmanni* Hoppe & Fibiger, 2009.

Subfamily Hadeninae Guenée, 1837

Brithys Hübner, [1821]
Brithys crini (Fabricius, 1775)
Bone (Oberthür, 1876).
Crosia Dupont, 1910
Crosia hachem Dupont, 1910
Mascara (Dupont, 1910).
Eremopola Warren, 1911 in Seitz
Eremopola orana (Lucas, 1849)
Algeria (Poole, 1989).
Eremopola faroulti (Rothschild, 1920)
Bou Saada, Constantine, Guelt-es-Stel (Koçak & Kemal, 2015).
Hadena Schrank, 1802
Hadena confusa (Hufnagel, 1766)
Forests (oak and cedar) of Algeria (Chambon et al. 1992).
Hadena compta ([Denis & Schiffermüller], 1775)
Guelt-es-Stel (Oberthür, 1918), ssp. *almoravida* Hacker, 1996.
Hadena magnolii (Boisduval, 1828)
El-Kantara, Lambese (Oberthür, 1918).
Hadena perplexa ([Denis & Schiffermüller], 1775)
El-Outaya, Bone (Oberthür, 1918).
Hadena silenides (Staudinger, 1895)
Bou Saada, Biskra, Guelt-es-Stel, Boghari (Oberthür, 1918).
Hadena silenes (Hübner, [1822])
Sidi-Bel-Abbes, Souk Ahras (Koçak & Kemal, 2015).
Hadena sancta (Staudinger, 1859)
Aflou, Guelt-es-Stel, Lambese (Oberthür, 1918).
Hecatera Guenée, 1852
Hecatera bicolorata (Hufnagel, 1766)
Bou Saada, Biskra (Koçak & Kemal, 2015).
Hecatera cappa (Hübner, [1809])
Sidi-Bel-Abbes (Koçak & Kemal, 2015).
Hecatera dysodea ([Denis & Schiffmüller], 1775)
Geryville, Aflou, El-Outaya (Oberthür, 1918), ssp. *khala* (Rungs, 1972).
Hecatera weissi (Draudt, 1934)
Algeria (Koçak & Kemal, 2015).
Lacanobia Billberg, 1820
Lacanobia aliena (Hübner, [1809])
Ziban Oasis, Biskra (Deghiche-Diab et al. 2015).
Lacanobia oleracea (Linnaeus, 1758)
Staoueli (Mouhouche et al. 1996).
Leucania Ochsenheimer, 1817
Leucania comma (Linnaeus, 1761)
Bone (Oberthür, 1918).
Leucania loreyi (Duponchel, 1827)
Bou Saada, Collo (Oberthür, 1918).
Leucania obsoleta (Hübner, [1803])
Ouargla, Biskra (Bouras, 2019).
Leucania palaestinae (Staudinger, 1897)

Algeria (Oberthür, 1918).
Leucania punctosa (Treitschke, 1825)
Algeria (Oberthür, 1918).
Leucania putrescens (Hübner, [1824])
Bone (Oberthür, 1876).
Leucania zeae (Duponchel, 1828)
Algeria (Fibiger et al. 2006).
Nereisana Strand, 1911
Nereisana oranaria (Lucas, 1849)
Algeria (Poole, 1989).
Mamestra Ochsenheimer, 1816
Mamestra alpigena (Culot, 1909)
Algeria (Culot, 1909).
Melanchra Hübner, [1820]
Melanchra persicariae (Linnaeus, 1761)
Aflou, Batna, Lambese (Koçak & Kemal, 2015).
Mythimna Ochsenheimer, 1816
Mythimna algirica (Oberthür, 1918)
Batna, Hammam R'hira (Koçak & Kemal, 2015).
Mythimna ferrago (Fabricius, 1787)
Sidi-bel Abbès, Sebdou, Setif (Koçak & Kemal, 2015).
Mythimna albipuncta ([Denis & Schiffermüller], 1775)
Lambese, Djebel-Aures (Oberthür, 1918).
Mythimna congrua (Hübner, [1817)
Lambese (Oberthür, 1918).
Mythimna l-album (Linnaeus, 1767)
Bone (Oberthür, 1876).
Mythimna riparia (Rambur, 1829)
Sidi-Bel-Abbes, Batna, Ain Safra (Koçak & Kemal, 2015).
Mythimna sicula (Treitschke, 1835)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Mythimna unipuncta (Haworth, 1809)
Forests (oak and cedar) of Algeria (Chambon et al. 1992).
Mythimna vitellina (Hübner, [1808])
Algeria (Boisduval & Guenée, 1852).
Orthosia Ochsenheimer, 1816
Orthosia boursini (Rungs, 1972)
Tarf (Oberthür, 1918).
Orthosia cruda ([Denis & Schiffermüller], 1775)
Lambese (Oberthür, 1918).
Orthosia gothica (Linnaeus, 1758)
Ziban Oasis, Biskra (Deghiche-Diab et al. 2015).
Pachetra Guenée, 1841
Pachetra sagittigera (Hufnagel, 1766)
Lambese (Oberthür, 1918), ssp. *melanophaea* Zerny, 1934.
Leucochlaena Hampson, 1906
Leucochlaena oditis (Hübner, [1822])
Geryville, Lambese, El-Kantara, Guelt-es-Stel (Oberthür, 1918).
Pseudopanolis Inaba, 1927
Pseudopanolis puengeleri (Standfuss, 1912)
Theniet El Had (Kacha et al. 2017).
Saragossa Staudinger, 1900

Saragossa seeboldi (Staudinger, 1900)
Sebdou, Lambese (Oberthür, 1918).
Sideridis Hübner, [1821]
Sideridis implexa (Hübner, [1809])
Algeria (Poole, 1989).
Thargelia Pungeler, 1899
Thargelia gigantea (Rebel, 1909)
Hoggar Mountains (Rothschild, 1915).
Anarta Ochsenheimer, 1816
Anarta dianthi (Rungs, 1942)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Anarta pugnax (Hübner, [1824])
Hoggar Mountains (Rothschild, 1915).
Anarta sodae (Oberthür, 1918)
Biskra, Geryville, El-Outaya, Bone (Oberthür, 1918).
Anarta trifolii (Hufnagel, 1766)
Hoggar Mountains (Rothschild, 1915).
Episema Ochsenheimer, 1816
Episema glaucina (Esper, 1789)
Bone (Oberthür, 1918).
Episema scillae (Chrétien, 1888)
Theniet El Had (Kacha et al. 2017).
Episema tersa ([Denis & Schiffermüller], 1775)
Sidi-Bel-Abbes, Aflou Batna (Koçak & Kemal, 2015).
Episema haemapasta (Hamspon, 1914)
Algeria (Culot, 1909).
Ulochlaena Lederer, 1857
Ulochlaena hirta (Hübner, [1813])
Batna, Lambese, Sebdou, Aflou, Baïou, (Oberthür, 1918).

Subfamily Heliothinae Boisduval, 1828

Chazaria Moore, 1881
Chazaria incarnata (Freyer, 1838)
Lambese (Oberthür, 1876).
Helicoverpa Hardwick, 1965
Helicoverpa armigera (Hübner, [1808])
Lambese (Oberthür, 1876).
Helicoverpa zea (Boddie, 1850)
Ouargla, Biskra (Bouras, 2019).
Heliothis Ochsenheimer, 1816
Heliothis nubigera (Herrich-Schäffer, 1851)
Guelt-es-Stel (Rothschild, 1914).
Heliothis peltigera ([Denis & Schiffermüller], 1775)
Guelt-es-Stel (Rothschild, 1914).
Heliothis viriplaca (Hufnagel, 1766)
Lambese, Djebel-Aures, Sebdou (Oberthür, 1876).
Periphanes Hübner, [1821]
Periphanes delphinii (Linnaeus, 1758)
El-Hacaïba, Sebdou, Aflou (Oberthür, 1918).
Schinia Hübner, [1818]
Schinia chanzyi (Oberthür, 1876)
Guelt-es-Stel (Rothschild, 1914).

Timora Walker, 1856
Timora albida (Hampson, 1905)
Hoggar Mountains (Rothschild, 1915).

Subfamily Metoponiinae Herrich-Schäffer, 1851

Aegle Hübner, [1823]
Aegle exsiccata (Warren & Rothschild, 1905)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Aegle semicana (Esper, 1798)
Sidi-Bel-Abbes, Djebel Zaccar, Hammam Mekoutine (Koçak & Kemal, 2015).
Alvaradoia Agenjo, 1984
Alvaradoia deserti (Oberthür, 1918)
Sebdou, El-Outaya (Oberthür, 1918).
Synthymia Hübner, [1823]
Synthymia fixa (Fabricius, 1787)
Sebdou (Oberthür, 1876).
Tyta Billberg, 1820
Tyta luctuosa ([Denis & Schiffermüller], 1775)
Staoueli (Mouhouche et al. 1996).

Subfamily Noctuinae Latreille, 1809

Actebia Stephens, 1829
Actebia photophila (Guenée, 1852)
El Maïn (Oberthür, 1876).
Agrotis Ochsenheimer, 1816
Agrotis biconicus (Kollar, 1844)
Sidi-Bel-Abbes, Bou Saada, Blida, Biskra (Koçak & Kemal, 2015).
Agrotis bigramma (Esper, 1790)
Sebdou, Lambese, Aflou (Oberthür, 1876).
Agrotis eos (Oberthür, 1919)
Guelt-es-Stel (Rothschild, 1914).
Agrotis haifae (Staudinger, 1897)
Algeria (Koçak & Kemal, 2015).
Agrotis herzogi (Rebel, 1911)
Tassili n'Ajjer (Rungs, 1958b).
Agrotis ipsilon (Hufnagel, 1766)
Hoggar Mountains (Rothschild, 1915).
Agrotis lata (Treitschke, 1835)
Forests (oak and cedar) of Algeria (Chambon et al. 1992).
Agrotis lasserrei (Oberthür, 1881)
Batna, El-Kantara ‚Sebdou (Oberthür, 1918).
Agrotis obesa (Boisduval, 1829)
Algeria (Boisduval & Guenée, 1852).
Agrotis puta (Hübner, [1808])
Biskra, Geryville, Aflou, Lambese (Oberthür, 1918).
Agrotis rotroui (Rothschild, 1920)
Sidi-Bel-Abbes, Bou Saada, Blida (Koçak & Kemal, 2015).
Agrotis saucia (Oberthür, 1918)
Geryville (Oberthür, 1918).
Agrotis segetum ([Denis & Schiffermüller], 1775)
Guelt-es-Stel (Rothschild, 1914).

Agrotis biconica (Kollar, 1844)
Hoggar Mountains (Rothschild, 1915).
Agrotis trux (Hübner, [1824])
Guelt-es-Stel (Rothschild, 1914).
Anchoscelis Guenée, 1839
Anchocelis haematidea (Duponchel, 1827)
Alger (Oberthür, 1876).
Anchocelis litura (Linnaeus, 1761)
Lambese (Oberthür, 1918).
Anchocelis lunosa (Haworth, 1809)
Sebdou, Aflou, Geryville (Oberthür, 1918).
Anchocelis nitida ([Denis & Schiffermüller], 1775)
Lambese (Oberthür, 1918).
Anchocelis pistacina (Oberthür, 1918)
Lambese (Oberthür, 1918).
Anchocelis rufina (Oberthür, 1918)
Lambese (Oberthür, 1918).
Archaonara dissoluta (Treitschke, 1825)
Hammam Meskoutine, Hammam R'hia (Koçak & Kemal, 2015)
Cerastis Ochsenheimer, 1816
Cerastis faceta (Treitschke, 1835)
Algeria (Fibiger & Hacker, 2005)
Cerastis sebdouensis (Oberthür, 1918)
Aflou (Oberthür, 1918)
Conistra staudigeri sebdouensis (Austaut, 1880).
Cerastis silene (Oberthür, 1918)
Lambese (Oberthür, 1918).
Cerastis veronicae (Oberthür, 1918)
Lambese (Oberthür, 1918)
Chersotis Boisduval, 1840
Chersotis margaritacea (Villers, 1789)
Lambese (Oberthür, 1918)
Cirrhia Hübner, [1821]
Cirrhia austauti Oberthür, 1881
Sebdou (Koçak & Kemal, 2015)
Dichagyris Lederer, 1857
Dichagyris celsicola (Bellier, 1859)
Djebel-Gueddelane, Lambese (Oberthür, 1918)
Dichagyris constanti (Millière, 1860)
Guelt-es-Stel(Rothschild, 1914).
Dichagyris fidelis (Joannis, 1903)
Guelt-es-Stel, Lambese, Aflou, Djebel-Aures (Oberthür, 1918), ssp. *kaaba* Oberthür, 1918.
Dichagyris flammatra ([Denis & Schiffermüller], 1775)
Guelt-es-Stel (Rothschild, 1914).
Dichagyris imperator (Bang-Haas, 1912)
Tassili n'Ajjer (Rungs, 1958b).
Dichagyris mansoura (Chrétien, 1911)
Guelt-es-Stel (Koçak & Kemal, 2015).
Dichagyris melanura (Kollar, 1846)
Ouargla, Biskra (Bouras, 2019).
Epilecta Hübner, [1821]
Epilecta linogrisea ([Denis & Schiffermüller], 1775)
Khenchela (Oberthür, 1918).

Epipsilia Hübner, [1821]
Epipsilia cervantes (Reisser, 1935)
Algeria (Koçak & Kemal, 2015), ssp. *pseudolatens* (Schwingenschuss, 1935).
Eucoptocnemis Grote, 1874
Eucoptocnemis optabilis (Boisduval, 1837)
Algeria (Culot, 1909).
Euxoa Hübner, [1821]
Euxoa aquilina ([Denis & Schiffermüller], 1775)
Biskra (Oberthür, 1876).
Euxoa canariensis (Rebel, 1902)
Algeria (Culot, 1909).
Euxoa christophi (Staudinger, 1870)
Guelt-es-Stel (Rothschild, 1914)
Euxoa cos (Hübner, [1824])
Lambese (Oberthür, 1918).
Euxoa distinguenda (Lederer, 1857)
Lambese (Oberthür, 1918).
Euxoa doufanae (Oberthür, 1918)
Djebel Aurès (Oberthür, 1918).
Euxoa hastifera (Donzel, 1848)
Lambese, Geryville (Oberthür, 1918), ssp. *marocana* Boursin, 1950
Euxoa hodnae (Rothschild, 1914)
Guelt-es-Stel (Rothschild, 1914).
Euxoa messaouda (Rothschild, 1914)
Guelt-es-Stel (Rothschild, 1914).
Euxoa muriicolor (Rothschild, 1914)
Guelt-es-Stel (Rothschild, 1914).
Euxoa obelisca ([Denis & Schiffermüller], 1775)
Sebdou, Batna, Aflou, Lambese (Oberthür, 1918).
Euxoa powelli (Oberthür, 1912)
Algeria (Oberthür, 1918).
Euxoa radius (Rothschild, 1914)
Guelt-es-Stel (Rothschild, 1914).
Euxoa noctambulatrix (Rothschild, 1914)
Guelt-es-Stel (Rothschild, 1914).
Euxoa rugifrons (Mabille, 1888)
Guelt-es-Stel (Rothschild, 1914).
Euxoa temera (Hübner, [1808])
Algeria (Poole, 1989), ssp. *perambulans* Corti, 1931
Euxoa tritici (Linnaeus, 1761)
Algeria (Koçak & Kemal, 2015).
Euxoa wagneri (Corti, 1926)
Algeria (De Vrieze, 2003).
Noctua Linnaeus, 1758
Noctua comes (Hübner, [1813])
Staoueli (Mouhouche et al. 1996).
Noctua janthina ([Denis & Schiffermüller], 1775)
Bone (Oberthür, 1876).
Noctua orbona (Hufnagel, 1766)
Guelt-es-Stel (Rothschild, 1914).
Noctua pronuba (Linnaeus, 1758)
Guelt-es-Stel (Rothschild, 1914).
Ochropleura Hübner, [1821]

Ochropleura leucogaster (Freyer, 1831)
Forests (oak and cedar) of Algeria (Chambon et al. 1992).
Peridroma Hübner, [1821]
Peridroma saucia (Hübner, [1808])
Mitidja (Barkou et al. 2017).
Rhyacia Hübner, [1821]
Rhyacia simulans (Hufnagel, 1766)
Guelt-es-Stel (Rothschild, 1914).
Standfussiana Boursin, 1946
Standfussiana nictymera (Boisduval, 1837)
Bone (Oberthür, 1918).
Xestia Hübner, [1818]
Xestia c-nigrum (Linnaeus, 1758)
Sebdou, Algiers (Oberthür, 1918).
Xestia kermesina (Mabille, 1869)
Aflou (Oberthür, 1918).
Xestia nisseni (Rothschild, 1912)
Guelt-es-Stel (Rothschild, 1914).
Xestia xanthographa ([Denis & Schiffermüller], 1775)
Guelt-es-Stel (Rothschild, 1914).

Subfamily *Oncocnemidinae* Forbes & Franclemont, 1954

Amephana Hampson, 1906
Amephana aurita (Fabricius, 1787)
Bou Saada, Guelt-es-Stel, Aflou, Khenchela (Oberthür, 1918).
Amephana warionis (Oberthür, 1876)
Oued-Djeddi, Bou Saada, El-Outaya (Oberthür, 1918).
Brachygalea Hampson, 1906
Brachygalea albolineata (Blachier, 1905)
Biskra (Oberthür, 1918).
Calophasia Stephens, 1829
Calophasia almoravida (Graslin, 1863)
Bone, Lambese (Oberthür, 1918).
Calophasia angularis (Chrétien, 1911)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Calophasia opalina (Esper, 1794)
Collo (Oberthür, 1876).
Calophasia platyptera (Esper, 1788)
Biskra (Oberthür, 1918).
Cleonymia Berio, 1966
Cleonymia baetica (Rambur, 1837)
Geryville, Aflou, Guelt-es-Stel, El Outaya, Lambese (Oberthür, 1918).
Cleonymia chabordis (Oberthür, 1876)
Hoggar Mountains (Rothschild, 1915).
Cleonymia fatima (A. Bang-Haas, 1907)
Hoggar Mountains (Rothschild, 1915).
Cleonymia jubata (Oberthür, 1890)
Ain Safra, Sebdou (Koçak & Kemal, 2015).
Cleonymia marocana (Staudinger, 1901)
Sebdou (Koçak & Kemal, 2015).
Cleonymia pectinicornis (Staudinger, 1859)
Collo (Oberthür 1876), ssp. *youngi*.

Cleonymia vaulogeri (Staudinger, 1900)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Epimecia Guenée, 1839
Epimecia nelvai (Rothschild, 1920)
Batna, El kantara (Koçak & Kemal, 2015).
Lithophasia Staudinger, 1892
Lithophasia quadrivirgula (Mabille, 1888)
Bou Saada, Guelt-es-Stel (Koçak & Kemal, 2015).
Lophoterges Hampson, 1906
Lophoterges atlas Ronkay, 2005
Khenchela, Lambese (Oberthür, 1918).
Omia Hübner, [1821]
Omia cyclopea (Graslin, 1837)
Djebel-Aures, Lambese (Oberthür, 1876).
Omia oberthueri Allard, 1867
Lambese (Oberthür, 1876).
Omphalophana Hampson, 1906
Omphalophana pauli (Staudinger, 1892)
Aflou, El-Outaya, Guelt-es-Stel (Oberthür, 1918).
Omphalophana serrata (Treitschke, 1835)
Khenchela, Lambese, Bone (Oberthür, 1918).
Metopoceras Guenée, 1850
Metopoceras felicina (Donzel, 1844)
Bou Saada , Hammam Mekoutine, Oran (Koçak & Kemal, 2015).
Rabinopteryx Christoph, 1889
Rabinopteryx subtilis (Mabille, 1888)
Hoggar Mountains (Rothschild, 1915).
Stilbia Stephens, 1829
Stilbia algirica (Culot, 1914)
Lambese (Oberthür, 1918).
Stilbia nisseni (Stertz, 1914)
Guelt-es-Stel (Koçak & Kemal, 2015).
Stilbia turatii (Lucas, 1910)
Lambese (Oberthür, 1918).
Stilbina Staudinger, [1892]
Stilbina numida (Oberthur, 1890)
Guelt-es-Stel, Aflou Biskra (Oberthür, 1918).
Teinoptera Calberla, 1891
Teinoptera culminifera (Calberla, 1891)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Teinoptera gafsana (Blachier, 1905)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).

Subfamily Raphiinae Beck, 1996

Raphia Hübner, [1821]
Raphia hybris (Hübner, [1813])
Sidi-bel-Abbas (Koçak & Kemal, 2015).

Subfamily Plusiinae Boisduval, 1828

Abrostola Ochsenheimer, 1816
Abrostola triplasia (Linnaeus, 1758)

Collo (Oberthür, 1876).
Autographa Hübner, [1821]
Autographa gamma (Linnaeus, 1758)
Algeria (Oberthür, 1876).
Chrysodeixis Hübner, [1821]
Chrysodeixis chalcites (Esper, 1789)
Lambese (Oberthür, 1918).
Ctenoplusia Dufay, 1970
Ctenoplusia accentifera (Lefèbvre, 1827)
Sidi-bel-Abbas Batna (Koçak & Kemal, 2015).
Diachrysia Hübner, [1821]
Diachrysia chrysitis (Linnaeus, 1758)
Bone (Oberthür, 1876).
Plusia Ochsenheimer, 1816
Plusia festucae (Linnaeus, 1758)
Bone (Oberthür, 1876).
Thysanoplusia Ichnosé, 1973
Thysanoplusia daubei (Boisduval, 1840)
Biskra, Geryville (Oberthür, 1918).
Thysanoplusia orichalcea (Fabricius, 1775)
Mitidja (Barkou et al. 2017).
Trichoplusia McDunnough, 1944
Trichoplusia ni (Hübner, [1803])
Hoggar Mountains (Rothschild, 1915).

Subfamily Psaphidinae Grote, 1896

Allophyes Tams, 1942
Allophyes powelli Rungs, 1952
Lambese (Oberthür, 1918).
Azenia Grote, 1882
Azenia templetonae (Clarke, 1937)
Ouargla, Biskra (Bouras, 2019).
Xylocampa Guenée, 1837
Xylocampa mustapha (Oberthür, 1910)
Blida, Guelt-es-Stel, Lambese (Koçak & Kemal, 2015).
Valeria Stephens, 1829
Valeria oleagina ([Denis & Schiffermüller], 1775)
Lambese (Oberthür, 1918).

Subfamily Xyleninae Guenée, 1837

Actinotia Hübner, [1821]
Actinotia polyodon (Clerck, 1759)
Djebel-Aures, Lambese (Oberthür, 1918).
Ammopolia Boursin, 1955[2]
Ammopolia witzenmanni (Standfuss, 1890)
Batna, Gueltes Stel, (Koçak & Kemal, 2015).
Amphipoea Billberg, 1820
Amphipoea oculea (Linnaeus, 1761)
Batna (Oberthür, 1918)(Oberthür 1918).
Apamea Ochsenheimer, 1816
Apamea alpigena (Boisduval, 1837)

Lambès Djebel-Aures, (Oberthür, 1918).
Apamea arabs (Oberthür, 1881)
Algeria (Culot, 1909).
Apamea maroccana (Zerny, 1934)
Bou Saada, Batna, Gueltes Stel (Koçak & Kemal, 2015).
Apamea syriaca (Osthelder, 1933)
Algeria (Koçak & Kemal, 2015).
Anthracia Hübner, [1823]
Anthracia ephialtes (Hübner, [1822])
Sidi-Bel-Abbes, Sebdou (Koçak & Kemal, 2015).
Aporophyla Guenée, 1841
Aporophyla chioleuca (Herrich-Schäffer, 1850)
Aflou, Blida, Hammam R'hia (Koçak & Kemal, 2015).
Aporophyla nigra (Haworth, 1809)
Sidi-Bel-Abbes, Aflou, Biskra (Koçak & Kemal, 2015).
Atethmia Hübner, [1821]
Atethmia algirica (Culot, 1914)
Sidi-Bel-Abbes, Batna (Koçak & Kemal, 2015).
Ariathisa Walker, 1865
Ariathisa abyssinia (Guenée, 1852)
Biskra (Koçak & Kemal, 2015).
Leptologia Prout, 1901
Leptologia lota (Clerck, 1759)
Aflou, Lambese, Geryville (Oberthür, 1918).
Leptologia macilenta (Hübner, [1809])
Aflou (Koçak & Kemal, 2015), perhaps it is *A. blidaensis*
Parabrachylomia Hacker, 1990
Parabrachylomia chretieni (Rothschild, 1914)
Algeria (Poole, 1989).
Caradrina Ochsenheimer, 1816
Caradrina armeniaca (Boursin, 1936)
Algeria (Koçak & Kemal, 2015).
Caradrina aspersa (Rambur, 1834)
Guel-tes Stel (Oberthür, 1918).
Caradrina atriluna (Guenée, 1852)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Caradrina casearia (Staudinger, 1900)
Geryville (Oberthür, 1918).
Caradrina clavipalpis (Scopoli, 1763)
Hoggar Mountains (Rothschild, 1915).
Caradrina flava (Oberthür, 1876)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Caradrina flavirena (Guenée, 1852)
Aflou, Lambese (Oberthür, 1918).
Caradrina fuscicornis (Rambur, 1832)
Lambese, Khenchela, Geryville (Oberthür, 1918).
Caradrina germainii (Duponchel, 1835)
Guelt-es-Stel, Aflou (Oberthür, 1918).
Caradrina hispana (Oberthür, 1918)
Biskra, Geryville, El-Kantara, Sgag, Tinthamam, Djebel-Gueddelane, Khenchela (Oberthür, 1918).
Caradrina ingrata (Staudinger, 1876 in Kalchberg)
Lambese (Oberthür, 1918).
Caradrina jacobsi (Rothschild, 1914)

Batna, Guelt-es-Stel (Koçak & Kemal, 2015).
Caradrina kadenii (Freyer, 1836)
Geryville, Batna, Aflou, Bone, Lambese (Oberthür 1918).
Caradrina latebrosa (Oberthür, 1918)
Biskra, El-Outaya (Oberthür, 1918).
Caradrina melanura (Staudinger, 1901)
Ouargla, Biskra (Bouras, 2019).
Caradrina noctivaga (Bellier, 1863)
Sidi-Bel-Abbes, Souk Ahras, Blida (Koçak & Kemal, 2015).
Caradrina oberthuri (Boursin, 1942)
Hoggar and Tassili n'Ajjer (Speidel & Hassler, 1989).
Caradrina proxima (Rambur, 1837)
Algeria (Fibiger et al. 2006).
Caradrina scotoptera (Püngeler, 1914)
Sidi-Bel-Abbes, Batna (Koçak & Kemal, 2015).
Caradrina selini (Boisduval, 1840)
Algeria (Koçak & Kemal, 2015).
Caradrina soudanensis (Hampson, 1918)
Algeria (Koçak & Kemal, 2015).
Caradrina suavis (Oberthür 1918)
Lambese (Oberthür, 1918).
Catamecia Staudinger, 1898
Catamecia jordana (Staudinger, 1898)
Biskra (Oberthür, 1918).
Catamecia mauretanica (Staudinger, 1901)
South Oranaus (Oberthür, 1918).
Catamecia minima (Swinhoe, 1889)
El-Outaya (Oberthür, 1918).
Chortodes Tutt, 1897
Chortodes mabillei (Lucas, 1907)
Algeria (Poole, 1989).
Conistra Hübner, [1821]
Conistra alicia (Lajonquière, 1939)
Algeria (Koçak & Kemal, 2015).
Conistra erythrocephala ([Denis & Schiffermüller], 1775)
Tarf (Oberthür, 1918).
Conistra iana (Zilli & Grassi, 2006)
Algeria (Zilli & Grassi, 2006).
Conistra ligula (Esper, 1791)
Algeria (Zilli & Grassi, 2006).
Conistra staudingeri (Graslin, 1863)
Afou (Koçak & Kemal, 2015), ssp. *rubigo* (Rambur, 1871).
Conistra vaccinii (Linnaeus, 1761)
Algeria (Koçak & Kemal, 2015).
Conistra veronicae (Hübner, [1813])
Algeria (Koçak & Kemal, 2015).
Dichonia Hübner, [1821]
Dichonia aprilina (Linnaeus, 1758)
Theniet El Had (Kacha et al. 2017).
Dryobota Lederer, 1857
Dryobota labecula (Esper, 1788)
Lambese (Oberthür, 1876).
Dryobota roboris (Boisduval, 1828)

Lambese (Oberthür, 1918).
Dryobotodes Warren, 1910 in Seitz
Dryobotodes eremita (Fabricius, 1775)
Lambese, Sebdou (Oberthür, 1918).
Dryobotodes monochroma (Esper, 1790)
Batna, Guelt-es-Stel (Koçak & Kemal 2015).
Dryobotodes tenebrosa (Esper, 1789)
Sebdou, Lambese (Oberthür, 1918).
Enargia Hübner, [1821]
Enargia jordani (Rothschild, 1920)
Souk Ahras (Koçak & Kemal, 2015).
Eremohadena Ronkay, Varga & Fábián, 1995
Eremohadena chenopodiphaga erubescens (Staudinger, 1901)
Aflou, Djebel-Aures, Biskra, Geryville, Guelt-es-Stel (Oberthür, 1918).
Eremohadena roseonitens (Oberthür, 1887)
Biskra, El-Outaya, Aflou, Lambese (Oberthür, 1918).
Eremotrachea Hacker, 2001
Eremotrachea bacheri (Pungeler, 1901)
Algeria (Rungs, 1942).
Euplexia Stephens, 1829
Euplexia lucipara (Linnaeus, 1758)
Collo (Oberthür, 1876).
Globia Fibiger, Zilli, Ronkay & Goldstein, 2009 in Zilli, Varga, Ronkay & Ronkay
Globia algae (Esper, 1789)
Mitidja (Barkou, Benzehra et al., 2017).
Gortyna Ochsenheimer, 1816
Gortyna rungsi (Boursin, 1963)
Algeria (Poole, 1989).
Gortyna xanthenes (Germar, 1842)
Algeria (Culot, 1909)
Heterographa Staudinger, 1877
Heterographa puengeleri (Bartel, 1904)
Tassili n'Ajjer, Blida (Koçak & Kemal, 2015)
Hoplodrina Boursin, 1937
Hoplodrina ambigua ([Denis & Schiffermüller], 1775)
Lambese, Batna, Djebel-Aures (Oberthür, 1918)
Hoplodrina octogenaria (Goeze, 1781)
Bone (Oberthür, 1876)
Lithophane Hübner, [1821]
Lithophane leautieri (Boisduval, 1829)
Aflou, Lambese (Oberthür, 1918), ssp. *ochreimacula* Rothschild,1914.
Lithophane semibrunnea (Haworth, 1809)
Khenchela, Batna, Lambese (Oberthür 1918), ssp. *wiltshirei* Boursin, 1962
Luperina Boisduval, 1829
Luperina dayensis (Oberthür, 1881)
Aflou, Batna, Geryville (Oberthür, 1918)
Luperina diversa (Staudinger, 1892)
Batna (Culot, 1909).
Luperina dumerilii (Duponchel, 1826)
Aflou, Geryville (Oberthür, 1918)
Luperina nickerlii (Freyer, 1845)
Batna, Lambese, Khenchela (Oberthür, 1918)
Luperina powelli (Culot, 1912)

Geryville, Aflou (Oberthür 1918).
Luperina rubella (Duponchel, 1837)
Bone (Oberthür 1876).
Luperina testacea ([Denis & Schiffermüller], 1775)
Aflou, Guelt-es-Stel (Koçak & Kemal, 2015).
Mesapamea Heinicke, 1959
Mesapamea secalis (Linnaeus, 1758)
Sidi-Bel-Abbes, Batna, Setif (Koçak & Kemal, 2015).
Mesoligia Boursin, 1965
Mesoligia furuncula ([Denis & Schiffermüller], 1775)
Sidi-Bel-Abbes (Koçak & Kemal, 2015).
Mesoligia literosa (Haworth, 1809)
Aflou (Oberthür, 1918)
Mniotype Franclemont, 1941
Mniotype solieri (Boisduval, 1829)
Collo (Oberthür, 1876)
Mormo Ochsenheimer, 1816
Mormo maura (Linnaeus, 1758)
Sebdou, Khenchela, Aflou, Batna (Oberthür, 1918).
Nonagria Ochsenheimer, 1816
Nonagria typhae (Thunberg, 1784)
Forests (oak and cedar) of Algeria (Chambon, Khous et al., 1992).
Omphaloscelis Hampson, 1906
Omphaloscrelis polybela (Joannis, 1903)
Sidi-bel-Abbas, Batna (Koçak & Kemal, 2015).
Oligia Hübner, [1821]
Oligia faroulti (Rothschild, 1914)
Guelt-es-Stel (Rothschild, 1914).
Olivenebula Kishida & Yoshimoto, 1977
Olivenebula xanthochloris (Boisduval, 1840)
Algeria (Culot, 1909).
Oria Hübner, [1821]
Oria musculosa (Hübner, [1808])
Alger, Lambese, Aflou (Oberthür, 1918).
Phlogophora Treitschke, 1825
Phlogophora meticulosa (Linnaeus, 1758)
Batna, DjebelAurès (Oberthür, 1918).
Photedes Lederer, 1857
Photedes dulcis (Oberthür, 1918)
Djebel-Amour (Oberthür, 1918).
Photedes deserticola (Staudinger, 1900)
Biskra (Oberthür, 1918).
Polymixis Hübner, [1820]
Polymixis rungsi Plante, 1975
Algeria (Société entomologique de France, 1916).
Polymixis flavicincta ([Denis & Schiffermüller], 1775)
Oran, Khenchela, Batna, Aflou (Oberthür 1918), ssp. *laportei* Plante, 1975.
Polymixis germana (Rothschild, 1914)
Guelt-es-Stel (Oberthür, 1918).
Polymixis lichenea (Hübner, [1813])
Bone, Lambese, Batna (Oberthür, 1918).
Polymixis sublutea (Turati, 1909)
Algeria (Poole, 1989).

Proxenus Herrich-Schäffer, 1850
Proxenus hospes (Freyer, 1831)
Ouargla, Biskra (Bouras, 2019)
Pseudenargia Boursin, 1956
Pseudenargia ulicisalgirica (Culot, 1914)
Batna, Lambese (Oberthür, 1918)
Sesamia Guenée, 1852 in Boisduval & Guenée
Sesamia cretica (Lederer, 1857)
Sebdou (Koçak & Kemal, 2015).
Sesamia nonagrioides (Lefebvre, 1827)
Collo (Oberthür, 1876).
Spodoptera Guenée, 1852 in Boisduval & Guenée
Spodoptera exigua (Hübner, [1808])
Oran (Oberthür, 1881)
Spodoptera littoralis (Boisduval, 1833)
El-Outaya (Oberthür, 1918)
Spudaea Snellen, 1867
Spudaea ruticilla (Esper, 1791)
Lambese (Oberthür, 1918)
Jodia Hübner, [1818]
Jodia croceago ([Denis & Schiffermüller], 1775)
Sebdou, Lambese (Oberthür, 1918).
Scythocentropus Speiser, 1902
Scythocentropus inquinata (Mabille, 1888)
Batna, Aflou, EI-Kantara (Oberthür, 1918).
Thalpophila Hübner, [1820]
Thalpophila vitalba (Freyer, 1834)
Algeria (Koçak & Kemal, 2015).
Trigonophora Hübner, [1821]
Trigonophora crassicornis (Oberthür, 1918)
Algeria (Oberthür 1918).
Trigonophora flammea (Esper, 1785)
Lambese (Oberthür, 1918).
Xylena Ochsenheimer, 1816
Xylena exsoleta (Linnaeus, 1758)
Aflou, Blida, Guelt-es-Stel (Koçak & Kemal, 2015).
Xylena vetusta (Hübner, [1813])
Algiers (Société entomologique de France, 1916).

Conclusion

The results of this study highlight the high diversity of Noctuidae in Algeria, along with their wide geographical distribution. The most representative genera and species are compiled in an updated list, which notably underscores the presence of numerous taxa potentially harmful to crops. Furthermore, the bibliographic analysis reveals that most studies on Noctuidae in Algeria were published before 1918, reflecting an early but significant interest in the taxonomy of this group within the country. However, due to the limited number of available publications-particularly recent ones-this list remains non-exhaustive and does not provide a comprehensive inventory of the Algerian noctuid fauna. This literature review on Noctuidae in Algeria provides an essential foundation for studying the diversity of nocturnal fauna of Noctuidae species in the country. The findings presented here serve as a valuable reference for future research aimed at better understanding the composition, distribution, and ecological dynamics of this important moth family. Continued efforts, including updated field surveys and taxonomic revisions, are necessary to complete the inventory and to support pest

management strategies and biodiversity conservation initiatives in Algeria.

Conflict of Interest

The authors declare that they have no known financial interest or personal relationships that could have influenced the work presented in this article.

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Adjal Izdihar
Laboratory of Genetics, Biotechnology and Valorization of Bioresources (LGBVB)
University of Biskra
BP 145 RP
Biskra 07000
ARGELIA / *ALGERIA*
E-mail: izdihar.adjal@univ-biskra.dz
https://orcid.org/0009-0005-4244-9468

*Merabti Ibrahim
Laboratory of Genetics, Biotechnology and Valorization of Bioresources (LGBVB)
University of Biskra
BP 145 RP
Biskra 07000
ARGELIA / *ALGERIA*
E-mail: Ibrahim.merabti@univ-biskra.dz
https://orcid.org/0000-0002-4237-7987

Moussi Abdelhamid
Laboratory of Genetics, Biotechnology and Valorization of Bioresources (LGBVB)
University of Biskra
BP 145 RP
Biskra 07000
ARGELIA / *ALGERIA*
E-mail: moussi.ah@univ-biskra.dz
https://orcid.org/0000-0002-5143-6045

Lebouz Ismahane
Laboratory of Genetics, Biotechnology and Valorization of Bioresources (LGBVB)
University of Biskra
BP 145 RP
Biskra 07000
ARGELIA / *ALGERIA*
E-mail: ismahane.lebbouz@univ-biskra.dz
https://orcid.org/0000-0002-1120-715X

Balázs Benedek
Szőlőhegy, 8497/7
H-7700 Mohács
HUNGRÍA / *HUNGARY*
E-mail: benedekia@gmail.com
https://orcid.org/0000-0001-9533-1176

Willy De Prins
Dorpstraat, 401 B
B-3061 Leefdaal
BÉLGICA / *BELGIUM*
E-mail: willy.deprins@gmail.com
https://orcid.org/0000-0002-4430-1425

*Autor para la correspondencia / *Corresponding author*

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Argyresthia cedrusella Falck, sp. nov. from the Canary Islands, Spain (Lepidoptera: Argyresthiidae)

Per Falck

Abstract

Argyresthia cedrusella Falck, sp. nov. is described from Tenerife, Canary Islands, Spain. It is compared with its morphological close relative, *A. chrysidella* Peyerimhoff, 1877. Photographs of the adults and the genitalia of both species are provided. The new species is barcoded.
Keywords: Lepidoptera, Argyresthiidae, *Argyresthia cedrusella*, new species, endemic, DNA barcodes, Canary Islands, Spain.

Argyresthia cedrusella **Falck, sp. nov. de las Islas Canarias, España (Lepidoptera: Argyresthiidae)**

Resumens

Se describe *Argyresthia cedrusella* Falck, sp. nov. de Tenerife, Islas Canarias, España. Se compara con su pariente morfológico más cercano, *A. chrysidella* Peyerimhoff, 1877. Se proporcionan fotografías de los adultos y de la genitalia de ambas especies. La nueva especie tiene código de barras.
Palabras clave: Lepidoptera, Argyresthiidae, *Argyresthia cedrusella*, nueva especie, endemismo, ADN código de barras, Islas Canarias, España.

Introduction

The family Argyresthiidae is consisting of about 206 species with only one single genus, *Argyresthia* Hübner, [1825], which is often separated into two subgenera, *Argyresthia* and *Blastotere* Ratzeburg, 1840 (Santa-Rita et al. 2020). Several species of the subgenus *Blastotere* are unicolorous and very difficult to determine (Bengtsson & Johansson, 2012). During field work in Tenerife by the author two specimens of an unknown *Argyresthia*-species, belonging to the subgenus *Blastotere*, were attracted to artificial light. On a later visit several specimens were disturbed from the branches of *Juniperus cedrus* Webb & Berthel. The genus *Argyresthia* is recorded from the Canary Islands, Spain for the first time (Aguiar & Karsholt, 2006, p. 87, Vives Moreno, 2014, p. 103).

Abbreviations used

PF	Collection of Per Falck, Neksø, Denmark
MNCN	Collection of Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain
NMW	Collection of Naturhistorisches Museum Wien

Material and methods

Most of the specimens were collected by beating the branches of *Juniperus cedrus* Webb & Berthel and two specimens were attracted to an 8-watt super actinic light.

Male and female genitalia were dissected and prepared following Robinson (1976).

Adults were photographed with a Canon EOS 700D camera equipped with a Canon EF 100 mm objective. The genitalia slides were photographed using a Soptop CX40T Trinocular microscope in conjunction with a Toup Tek P10500AE3 / E3ISPM05000KPA-E3 / 5.0MP USB3 camera.

The author examined the morphology and the DNA barcodes from the new species. DNA samples were prepared as described by Falck & Karsholt (2023, p. 271). Details of successfully sequenced voucher specimens are publicly available through the dataset DS-XXXX at www.boldsystems.org. Plant names are according to World Flora Online (2024).

***Argyresthia cedrusella* Falck, sp. nov.** (Figures 1, 2, 5, 5a, 7, 7a)
https://zoobank.org/4E4FA782-D5FF-4A1C-8F96-DD222D82BBDC

Holotype ♀: SPAIN, Tenerife, Aguamansa, 1050 m, 1-13-VI-2022, leg. P. Falck (MNCN).

Paratypes: Spain, Tenerife, Aguamansa, 1050 m, 2 ♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3320PF, DNA samples Lepid Phyl 0216PF/CILEP215-19, 0217PF/CILEP216-19, same data but 5 ♂, 31 ♀, 1-13-VI-2022, leg. P. Falck, genitalia slide 4096PF, 4097PF, 4105PF (all PF).

Diagnosis: *A. cedrusella* -resembles especially *A. chrysidella* Peyerimhoff, 1877 (Figures 3-4) and it is not possible to separate them without dissection of the genitalia. *A. cedrusella* is distinguished from other unicolorous species of the subgenus *Blastotere* by its larger wingspan and the ochreous colour of the forewings.

The male genitalia (Figures 5-5a) of *A. cedrusella* differ from those of *A. chrysidella* (Figures 6-6a) by the phallus. The cornutus is more than half the length of the phallus and the vesica is densely covered with small spines in *A. cedrusella* while in *A. chrysidella* the cornutus is clearly shorter than half the length of the phallus and the number of small spines in the vesica is fewer.

The female genitalia (Figures 7-7a) of *A. cedrusella* are characterized by the heavily sclerotized colliculum, the relatively long and anteriorly widening of ductus bursae and the shape of the signum. In *A. chrysidella* (Figures 8-8a) the colliculum is weakly sclerotized, ductus bursae is short and not widening towards corpus bursae and the oval plate of signum is smaller and the teeth on the lateral horns are larger.

Description (Figures 1-2): Wingspan 13.5-15.5 mm. Labial palp slender, gently upturned, segment 2 off white, laterally mottled with brownish scales, segment 3 off-white. Antenna dark grey, distinctively ringed with white; scapus off-white. Head and neck off-white. Tegula and thorax ochreous. Forewing plain ochreous with a golden sheen, sometimes with a few light-brown scales in the cell. Fringe brownish at apex, towards tornus yellowish grey. Hindwing light grey, with yellowish grey fringe. Abdomen light grey.

Variation: The colour of the palp, head and neck varies from almost pure white to light ochreous.

Male genitalia (Figures 5-5a): Tuba analis membranous, sclerotized laterally; tegumen sub-triangular, antero-laterally a pair of well sclerotized appendices angles; uncus absent: gnathos linear, sclerotized; socius a lateral extension covered by about 20 large scales; valva weakly sclerotized, oblong, cucullus rounded at anterior margin with short bristles; vinculum anteriorly concave; phallus twice as long as valva, almost straight; one large, apically pointed cornutus more than half the length of phallus; vesica densely covered by small spines; sclerotized fork on eighth sternite.

Female genitalia (Figures 7-7a): Papillae anales membranous, relatively narrow, covered with short setae; posterior apophysis twice as long as anterior apophysis; antrum funnel-shaped with minute teeth; colliculum an incomplete, heavily sclerotized ring; ductus bursae long, membranous, widening in anterior third; corpus bursae semi-oval; signum a semi-oval plate covered by microdenticles, anteriorly with two lateral thick, toothed hollow horns, which are standing at an angle of almost 180º to each other.

DNA barcodes: DNA fragments of 545 bp were obtained from two specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEA1155. The maximum intraspecific p-distance within BIN is 0 %. The minimum p-distance to nearest neighbour (*A. praecocella* Zeller, 1839) is 6.49 % with BIN BOLD:

AAV9868.

Biology: Early stages unknown. Most of the specimens were netted during the morning by beating the branches of *Juniperus cedrus* Webb & Berthel, and a few specimens were attracted to actinic light from late May to the end of June. *J. cedrus* is probably the hostplant. It is recorded from the Canary Islands, Spain (Gran Canaria, Tenerife, La Gomera and La Palma) and Madeira, Portugal (World Flora Online, 2024).

Distribution: Known only from the northern part of Tenerife, Spain. Probably endemic to the Canary Islands.

Etymology: The species is named after its supposed hostplant *Juniperus cedrus* Webb & Berthel.

Discussion

Due to their small size and unicolorous wings of many species of the subgenus *Blastotere*, it is likely, that further cryptic diversity will be detected in the future, especially by the use of DNA barcoding. However, the present study is primarily based on morphology. The closest relative to *Argyresthia cedrusella*, based on adult and genitalia morphology, is *A. chrysidella.* During the course of the present study, it proved very difficult to trace specimens of *A. chrysidella.* The two specimens available are from southern France (Figures 3a-4a) (NMW) and very old, why barcoding has not been attempted. The differences in the genitalia morphology supports the status of *Argyresthia cedrusella* sp. nov. as a distinct species. For comparison adults, male- and female genitalia of *A. chrysidella* are figured.

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Conflict of Interest

The author declares that he has no financial interest or personal relationship that could influence the work presented in this article.

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Per Falck
Aarsdalevej, 22
DK-3730 Neksø
DINAMARCA / *DENMARK*
E-mail: per.falck@live.dk
https://orcid.org/0000-0002-0030-9214

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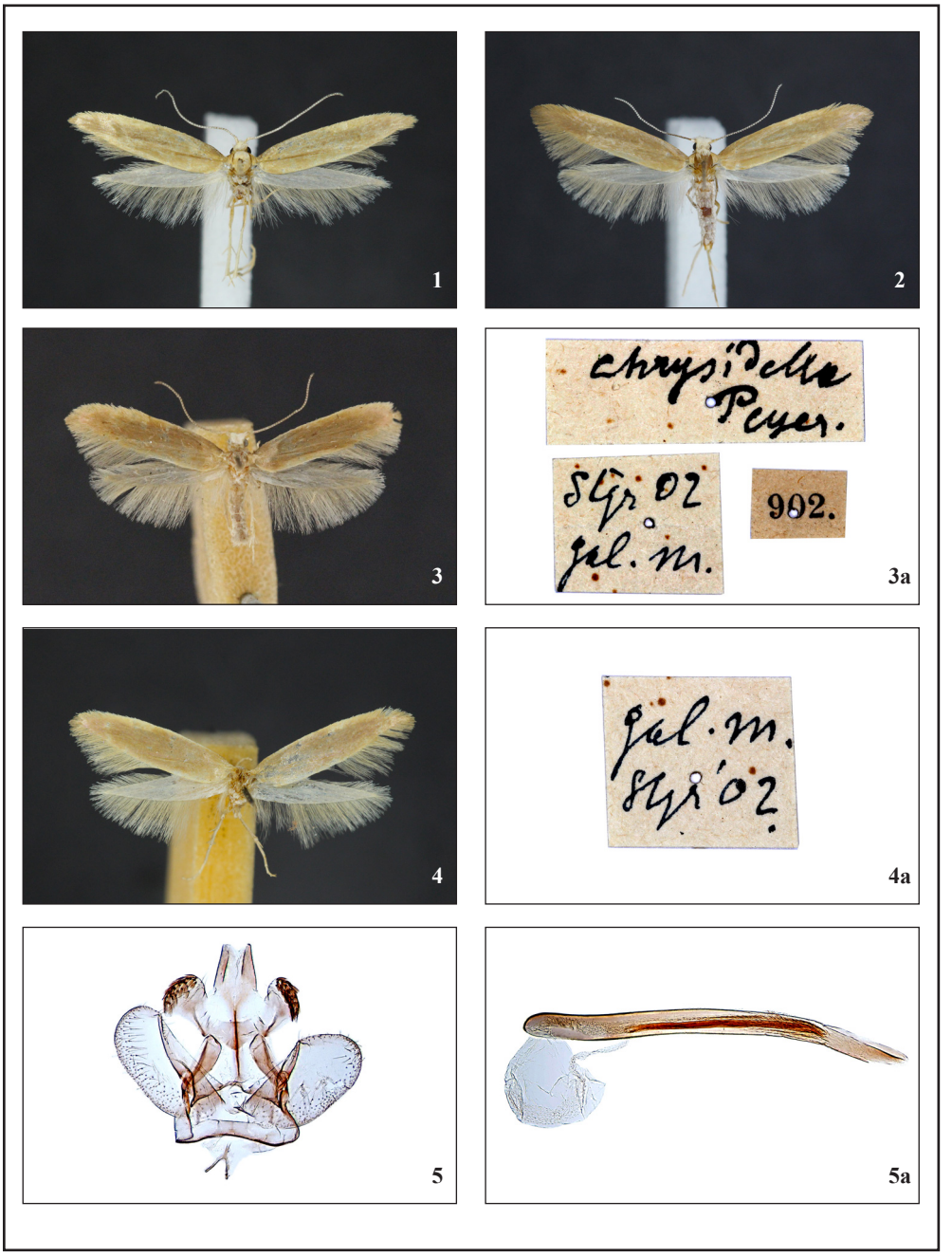
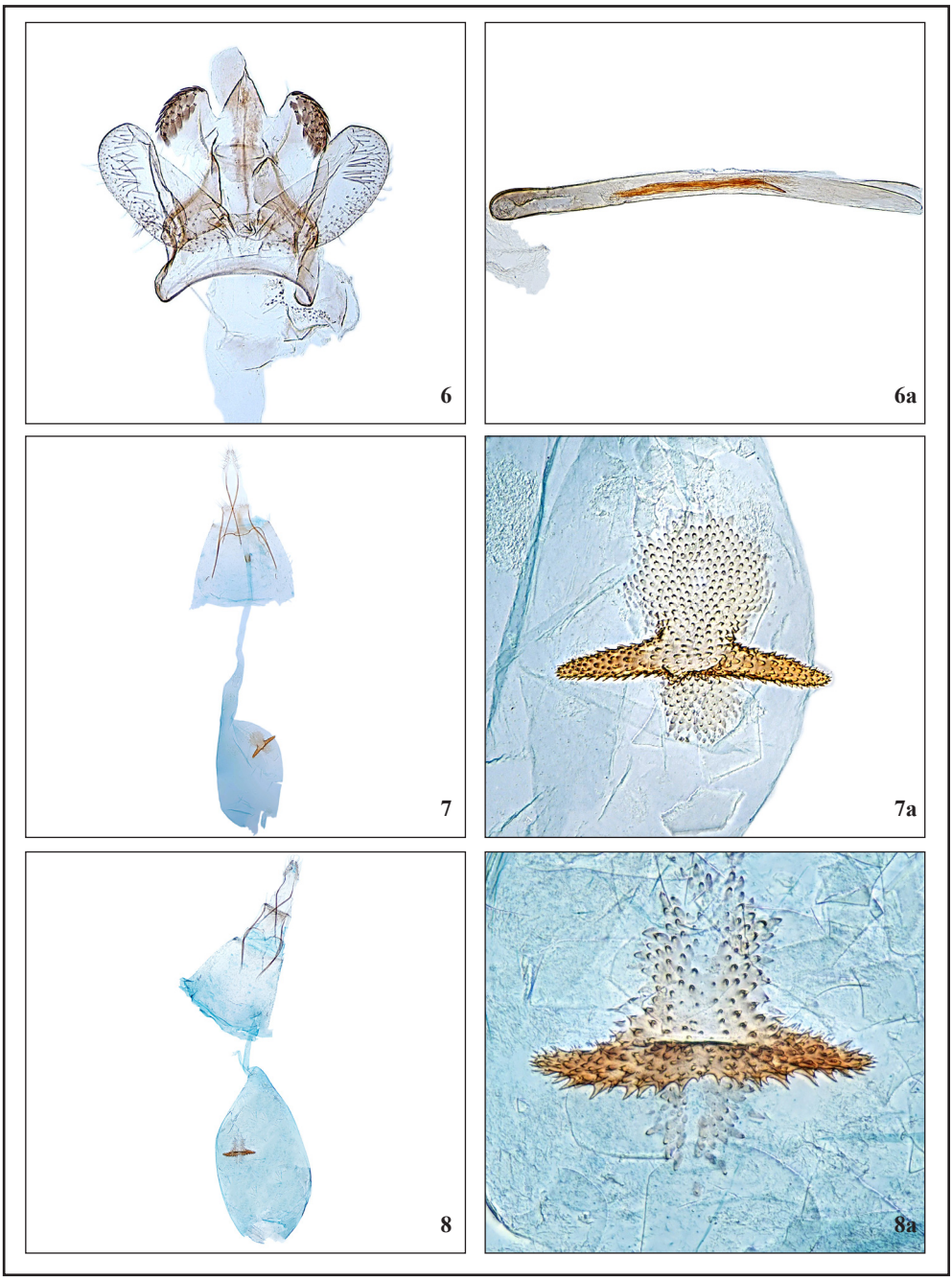
Figures 1-5. 1. *Argyresthia cedrusella* Falck, sp. nov. ♂, Tenerife, 14 mm. **2.** *Argyresthia cedrusella* Falck, sp. nov. ♀, Tenerife, 14 mm. **3.** *Argyresthia chrysidella* Peyerimhoff, 1877, ♂, France, 14 mm. **3a.** Label. **4.** *Argyresthia chrysidella* Peyerimhoff, 1877, ♀, France, 14 mm. **4a.** Label. **5.** *Argyresthia cedrusella* Falck, sp. nov. ♂ genitalia, Tenerife, GP4096PF. **5a.** *Argyresthia cedrusella* Falck, sp. nov. ♂, Tenerife, phallus, GP4105PF.



Figures 6-8. 6. *Argyresthia chrysidella* Peyerimhoff, 1877, ♂ genitalia, France, GP4111PFa. **6a.** *Argyresthia chrysidella* Peyerimhoff, 1877, ♂, phallus, GP4111PFa. **7.** *Argyresthia cedrusella* Falck, sp. nov. ♀ genitalia, Tenerife, GP3320PF. **7a.** *Argyresthia cedrusella* Falck, sp. nov. ♂, signum, GP3320PF. **8.** *Argyresthia chrysidella* Peyerimhoff, 1877, ♀ genitalia, France, GP4004PFa. **8a.** *Argyresthia chrysidella* Peyerimhoff, 1877, ♀, signum, GP4004PFa.



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Descripción de una nueva especie del género *Coleophora* Hübner, 1822 en la península ibérica y sur de Francia, *Coleophora davidiella* Gastón, Vives & Ortiz, sp. nov. (Lepidoptera: Coleophoridae)

Javier Gastón, Antonio Vives Moreno & Antonio S. Ortiz

Resumen

Se describe *Coleophora davidiella* Gastón, Vives & Ortiz, sp. nov. de la península ibérica y sur de Francia. Se presentan caracteres diferenciales con sus especies más próximas *C. valesianella* Zeller, 1849 y *C. berlandella* Toll, 1956; las diferencias se refieren al aspecto externo, genitalia interna y fragmento 5' del código de barras del gen mitocondrial COI con un único BIN.
Palabras clave: Lepidoptera, Coleophoridae, taxonomía, nueva especie, código de barras ADN, España, Francia.

Description of a new species of genus *Coleophora* Hübner,1822 in the Iberian Peninsula and southern France, *Coleophora davidiella* Gastón, Vives & Ortiz, sp. nov. (Lepidoptera: Coleophoridae)

Abstract

Coleophora davidiella Gastón, Vives & Ortiz, sp. nov. from the Iberian Peninsula and southern France described. Differential characters are presented with their closest species *C. valesianella* Zeller, 1849 and *C. berlandella* Toll, 1956; the differences refer to the external appearance, internal genitalia and 5' fragments of the barcode of the mitochondrial COI gene with a single BIN.
Keywords: Lepidoptera, Coleophoridae, taxonomy, new species, DNA barcode, Spain, France.

Description d'une nouvelle espèce du genre *Coleophora* Hübner, 1822 dans la Péninsule Ibérique et le sud de la France, *Coleophora davidiella* Gastón, Vives & Ortiz, sp. nov. (Lepidoptera: Coleophoridae)

Résumé

Coleophora davidiella Gastón, Vives & Ortiz, sp. nov. est décrite de la Péninsule Ibérique et le sud de la France. Les caractères différentiels avec ses espèces les plus proches *C. valesianella* Zeller, 1849 et *C. berlandella* Toll, 1956 sont présentés; les différences concernent l'apparence externe, les organes génitaux internes et le fragment 5' du code-barres du gène mitochondrial COI avec un seul BIN.
Mots clés: Lepidoptera, Coleophoridae, taxonomie, nouvelles espèces, DNA barcoding, Espagne, France.

Introducción

La familia Coleophoridae comprende aproximadamente 1.560 especies en todo el mundo (Baldizzone, 2024), de las que 657 se encuentran en Europa clasificadas en tres géneros: *Augasma* Herrich-Schäffer, 1853, *Ischnophanes* Meyrick, 1891 y *Coleophora* Hübner, 1822 (Vives Moreno, 1987). Solamente en este último género se incluyen 650 especies de las que aproximadamente 300 habitan en la península ibérica (Revilla, 2024; Vives Moreno, 2014). La identificación de especies en un género tan homogéneo como *Coleophora* es complicado, por lo que es necesario estudiar su armadura genital; este es el caso de *Coleophora berlandella* Toll, 1956 y *Coleophora valesianella* Zeller, 1849.

La secuenciación del gen citocromo-oxidasa 1 (COI) es una herramienta eficaz para el diagnóstico de especies en el reino animal que ayuda a resolver problemas que surgen entre la información taxonómica existente y la necesidad de una identificación fiable de las especies, especialmente en el caso de los Lepidoptera (Hebert et al. 2003). Este método es una alternativa rápida para identificar especies descritas y descubrir nuevas especies (Hebert et al. 2003; Savolainen et al. 2005; Mitchell, 2008). La combinación de los métodos morfológicos tradicionales con los métodos moleculares puede ayudar a incrementar el conocimiento de la diversidad y resolver el estatus taxonómico de algunos grupos de especies.

La presente investigación se deriva de los resultados obtenidos durante los estudios morfológicos del grupo de especies pertenecientes al género *Coleophora* que ha permitido separar las diferentes especies según la información disponible de *Coleophora valesianella* (LT: Cantón de Valais, Suiza) y *Coleophora berlandella* (LT: Djebel d'Ougarta, Argelia). Estos resultados se han completado con los análisis moleculares mediante secuenciación del COI (barcoding) que revelaron que los nuevos especímenes de *Coleophora* se agrupan en grupos de secuencias únicas. La especie recogida en España difiere de otras especies de *Coleophora* en caracteres morfológicos y moleculares y se describe como una nueva especie, *Coleophora davidiella* Gastón, Vives & Ortiz, sp. nov.

Material y métodos

El material utilizado para el estudio se ha obtenido mediante muestreos nocturnos y diurnos, con trampas de luz actínica distribuidas en los biotopos apropiados. Para su identificación nos hemos basado en el examen comparativo de los caracteres morfológicos externos y, sobre todo, en el análisis de la estructura genital.

Las preparaciones microscópicas de los órganos genitales se ha efectuado siguiendo a Robinson (1976), con modificaciones. Las preparaciones de la genitalia se estudiaron y fotografiaron utilizando los microscopios Leica DMLB, Leica MZAPO, Nikon Eclipse E400, Nikon SMZ1 Stereo microscope y las cámaras digitales Leica DFC550 y NIKON D3100, mientras que los ejemplares adultos se fotografiaron con una cámara digital Sony α100 DSLR-A100K con objetivo AF 100 MACRO 1:2.8 (32) y los retoques fotográficos se realizaron con el programa Adobe Photoshop 8 ©.

Se han secuenciado cuatro ejemplares en el Canadian Centre for DNA Barcoding (CCDB, Guelph, Canadá) para obtener códigos de barras de ADN utilizando el protocolo estándar descrito por deWaard et al. (2008), disponible en www.dnabarcoding.ca/pa/ge/research/protocols. Los datos de los especímenes, coordenadas GPS, imágenes, secuencias, número de registro en Genbank y los archivos de seguimiento están disponibles a través del conjunto de datos públicos dx.doi.org/10.5883/DS-COLEDAVI en BOLD (https://boldsystems.org/; Ratnasingham & Hebert, 2007). Las secuencias se compararon en la biblioteca de referencia de códigos de barras de lepidópteros utilizando el motor de identificación (BOLD-ID). La base de datos de códigos de barras de referencia para Colephoridae utilizada por BOLD-ID es validada continuamente por especialistas para facilitar la identificación de las especies. Adicionalmente, se han utilizado tres secuencias públicas que coincidían con el mismo BIN (Barcode Index Number: Ratnasingham & Hebert, 2013) que la especie estudiada. En total siete secuencias de *Coleophora davidiella* sp. nov. fueron utilizadas en las comparaciones entre especies (Tabla 1).

Las divergencias de secuencia para la región de código de barras se calcularon utilizando el modelo Kimura 2-Parameter (K2P) (Kimura 1980) y los grados de variación genética interespecífica se calcularon utilizando las herramientas analíticas de BOLD. Todas las secuencias de especies nuevas y públicas se descargaron y se alinearon con el algoritmo CLUSTAL del software MEGA6 (Tamura et al. 2013). Los Joining valores de soporte (boot-strap) se calcularon con 1.000 réplicas, y los árboles iniciales Neighbor-joining (NJ) y

Maximum Likelihood (ML) basados en la distancia se construyeron con el software MEGA6. Se seleccionaron otras especies de *Coleophora* como *C. berlandella* (n=2; BIN BOLD:ADD3241) y *C. valesianella* (n=4; BOLD:AAD3014) y otras especies congenéricas presentes en Europa como *C. cartilaginella* Christoph, 1872 (n=19; BOLD:AAE8803), *C. cyrniella* Rebel, 1926 (n=4; BOLD:AAV9378), *C. ochrea* (Haworth, 1828) (n=20; BOLD:AAL5800), *C. ononidella* Millière, 1879 (n=2; BOLD:AAV9356), *C. spumosella* Staudinger, 1859 (n=10; BOLD:AAY9651) y *Coleophora vicinella* Zeller, 1849 (n=2; BOLD:ABV8797) junto con otras especies europeas de los géneros *Augasma* como *A. aeratella* (Zeller, 1839) (n=6; BOLD:AAI7924) y *A. atraphaxidellum* Kuznetsov, 1957 (n=8; BOLD:AAF7274) e *Ischnophanes* como *I. canariella* Baldizzone, 1984 (n=1; BOLD:ABV9852), *I. aquilina* Baldizzone & van der Wolf, 2003 (n=2; BOLD:ACE0989) e *I. excentra* Baldizzone & van der Wolf, 2003 (n=4; BOLD:ABA0562), que están taxonómicamente relacionadas dentro de la familia Coleophoridae Hübner, 1816, como grupos externos para enraizar los árboles. Todos los árboles presentaron la misma topología por lo que solamente se presenta el árbol de Maximum Likelihood (Figura 12).

Tabla 1. Ejemplares de *Coleophora davidiella* sp. nov., número de registro en BOLD (Process ID), Barcode Index Number (BIN) e información sobre la localidad de captura (Localidad), provincia (Prov.) y código de identificación en GenBank (GenBank Nr.).

Taxon	Process ID	BIN	Exact Site	Prov.	GenBank Nr.
C. davidiella	IBLAO3074-24	BOLD:AAI9240	El Ribero, Burgos	Spain	PV173821
C. davidiella	IBLAO3214-25	BOLD:AAI9240	Castrobarto, Burgos	Spain	PV633818
C. davidiella	IBLAO3264-25	BOLD:AAI9240	Valdevecar, Teruel	Spain	PV633817
C. davidiella	IBLAO-3215-25	BOLD:AAI9240	Baza, Granada	Spain	PV633819
C. davidiella	ELACA175-10	BOLD:AAI9240	Sierra María, Almería	Spain	KX041200
C. davidiella	MPEA651-08	BOLD:AAI9240	Hautes-Alps	France	PV173823
C. davidiella	MPEA652-08	BOLD:AAI9240	Hautes-Alps	France	PV173822

Abreviaturas

BMNH	The Natural History Museum (formalmente British Museum (Natural History), Londres, Reino Unido
ER	Emili Requena, Barcelona, España
GB	Giorgio Baldizzone, Asti, Italia
JG	Javier Gastón, Vizcaya, España
Bldz	Giogio Baldizzone, Italia
MNCN	Museo Nacional de Ciencias Naturales, Madrid, España
MNHN	Muséum National d'Histoire Naturelle, Paris, Francia
ZSM	Zoologische Staatssammlung München, Múnich, Alemania
prep. gen.	preparación de genitalia
sp. nov.	especie nueva
fot.	fotografía
LT	Locus Typicus

Resultados

COLEOPHORIDAE

***Coleophora davidiella* Gastón, Vives & Ortiz, sp. nov.**
https://zoobank.org/FA36A2A3-CBC4-4942-8200-5F50B592A8D8

Material estudiado: Holotipo, 1 ♀, ESPAÑA, Álava, Copegi, a 586 m, 2-VIII-1987, J. Gastón leg. y col., prep. gen. 9996JG, depositado en el Museo Nacional de Ciencias Naturales, en Madrid, España (MNCN).

Paratipos 4 ♂ y 2 ♀: ESPAÑA, Barcelona, Alella, a 90 m, 1 ♀, 12-VIII-1956, R. Agenjo leg. (Baldizzone, 1987, p. 34, como *C. berlandella*); Alt Camp, Querol, Esblada, a 650 m, 1 ♂, 18-VIII-2001, E. Requena leg. y col., prep. gen. ER1076. ídem, Anoia, Jorba, a 357 m, 1 ♂, 31-VIII-1997, E. Requena leg., y col., prep. gen. ER3434. Burgos, Castrobarto, a 770 m, 1 ♂, 12-VIII-2021, J. Gastón leg. y col., BOLD-ID IBLAO3214-25, prep. gen. 10001JG; ídem, El Ribero, a 750 m, 1 ♂, 12-VIII-2021, J. Gastón leg. y col., BOLD-ID IBLAO3074-24, prep. gen. 9994JG. Granada, Barranco El Espartal, Baza, a 750 m, 1 ♀, 25-VI-2019, J. Gastón leg. y col., BOLD-ID IBLAO3215-25, prep. gen. 10092JG. Lérida, Benavent, a 1.100 m, 1 ♂, 6-VII-1991, leg. A. Laštůvka leg. y coll. Baldizzone, prep. gen. PG Bldz 15640. Navarra, Irurzum, a 445 m, 1 ♀, 28-VII-1948, leg. Marten, coll. Baldizzone, PG Bldz 5688. Teruel, Bronchales, a 1.500 m, 1 ♀, 25-30-VII-1981, leg. A. Cox, M. Prick, coll. Baldizzone, prep. gen. PG Bldz 62049; Valdevecar, a 1.100 m, 1 ♀, 25-VII-2008, J. Gastón leg. y col., BOLD-ID IBLAO3264-25, prep. gen. 9997JG; Vivel del Río, a 970 m, 1 ♀, VII-1994, A. & Z. Laštůvka leg. y coll., ex larva (21-VI-1994) sobre *Astragalus* sp., identificada como *C. berlandella* (G. Baldizzone det.).

Material adicional de esta especie, pero no incluido en la serie tipo: ESPAÑA, Álava, Parque Garaio, a 575 m, 1 ♂, 27-28-VIII-2002, H. Hall leg., PG1465 (como *C. berlandella*). Almería, Sierra María, 1 ♀, J. Tabell leg. y coll., BOLD:AAI9240 (como *Coleophora valesianella*). Teruel, Cuevas de Almadón, Sierra de San Just, a 1.400 m, 8-IX-1922, Skyra leg y coll., GP26377. FRANCIA, Hautes-Alpes, Provence-Alpes-Cote d'Azur, Le Villard de Saint-Crepin, 1 ♂, 9-VIII-1990, J. Nel leg.; ídem, 1 ♀, 12-VIII-1990, J. Nel leg., BOLD:AAI9240 (como *Coleophora valesianella*); Herault, Occitanie, St. Michel, a 670 m, 1 ♀, 10-VIII-2020, G. Labonne, leg., BOLD:AAI9240 (como *Coleophora sp.*).

Diagnosis: Especie muy próxima a *Coleophora berlandella* y *Coleophora valesianella* (Figura 3), con las que comparte características morfológicas externas, manteniendo, sin embargo, claras diferencias en su genitalia, especialmente en la femenina. En estas dos especies, la parte posterior del ductus bursae presenta una línea mediana quitinizada de espinas negras paralelas, que pueden alcanzar una longitud cercana a la mitad del ductus bursae (Figuras 14-15), mientras que en *Coleophora davidiella* sp. nov., esas líneas medianas quitinizadas paralelas se transforman en una sola, con el aspecto de placa esclerotizada que partiendo del antrum se va estrechando progresivamente hacia la parte anterior del ductus bursae. En la genitalia del macho, las diferencias son menores, pero apreciables en el cucullus de la valva, más alargado y esbelto en *C. davidiella* sp. nov. que en las otras dos especies y, sobre todo, en el extremo del sacculus, puntiagudo y con un proceso dorsal muy definido dirigido hacia arriba separado del resto de la valva, mientras que en *C. berlandella* y *C. valesianella* (Figuras 5, 6 y 8) este proceso es poco significativo, presentándose fundido con el resto de la valva. La phallotheca de *C. davidiella* sp. nov. es mayor que en las dos otras especies.

Descripción del adulto (Figuras 1-2): Envergadura, macho 20 mm (n=2), hembra 22 mm (n=3). Cabeza bien desarrollada con pelos escamiformes de color blanco, compactos en la frente y en la zona alta del epicráneo, incluyendo las órbitas oculares. Palpos labiales bien desarrollados, blancos, cortos y rectos, dirigidos al frente, aunque ligeramente inclinados hacia abajo. Antenas filiformes recubiertas de pequeñas cerdas de color ocre; el escapo, de gran tamaño, está abundantemente recubierto de largos pelos blancos, exceptuado su parte inferior, donde se tornan de color ocre claro. Abdomen recubierto de escamas ocres. Tanto el fémur como la tibia en los tres pares de patas están recubiertos de largos pelos de color blanco, mezclados con otros de color ocre claro. Alas anteriores con un fondo de escamas ocre amarillento, predominando el color amarillo sobre el ocre; banda cuneiforme de color ocre oscuro que comienza finamente a 1/6 de la base del ala, ensanchándose paulatinamente hasta alcanzar el ápice de la misma y la parte terminal de la costa; las estrías blancas son de un brillante sedoso; la estría dorsal comienza estrecha en la base del ala para, en la mitad de su recorrido, confundirse con el color del fondo del ala en un corto espacio y volver a reaparecer ensanchándose, para acoplarse en su término con la banda marrón oscura anteriormente descrita; la parte terminal, debido a la invasión de escamas del fondo alar en el centro de la estría, tiene forma triangular; estría mediana corta, que comienza a la misma distancia de la base del ala que la banda marrón oscura citada anteriormente y que bordeando dicha franja alcanza la costa del ala para desaparecer. Alas posteriores apuntadas de color de fondo marrón oscuro ligeramente aclaradas con escamas blancas que partiendo de la base del ala recorren los espacios intervenales para desvanecerse rápidamente. La morfología de las hembras difiere de la de los machos en la usencia de escamas blanquecinas en la base de las alas posteriores.

Genitalia del macho (Figuras 7, 9 y 10): Gnathos con brazos laterales basales bien formados y parte espinosa terminal con su extremo aplanado; tegumen levemente trapezoidal; valva bien definida: cucullus levemente esclerotizado, alargado y ensanchado ligeramente en su parte central para cambiar de dirección levemente hacia arriba y rematar su ápice en forma semicircular; valva poco definida; sacculus con dos procesos, el ventral corto y puntiagudo dirigido hacia el exterior y el dorsal más potente, dirigido claramente hacia arriba, con amplia base y punta ligeramente redondeada; el extremo del sacculus presenta una escotadura que lo separa con claridad del resto de la valva; phallotheca gruesa de base ancha con el extremo de la juxta muy potente y un grueso cornuti en la vesica junto a una placa esclerotiza en el tubo externo.

Genitalia de la hembra (Figura 13): VIII segmento trapezoidal y esclerotizado, con el margen anterior claramente arqueado; ostium bursae membranoso con forma de V; antrum grueso y con forma de copa muy esclerotizado con la base anterior hendida en su parte central y los bordes laterales muy pronunciados hacia su parte posterior; papilas anales bien desarrolladas aunque poco esclerotizadas; apófisis posteriores de mucha longitud alcanzando la parte posterior del ductus bursae; apófisis anteriores cortas, de una longitud de 1/3 de las posteriores; parte posterior del ductus bursae membranoso, largo y con una única lámina mediana muy corta, que partiendo de la parte posterior del antrum se estrecha con rapidez formando una pequeña placa esclerotizada; en el límite anterior de la parte posterior del ductus bursae con la anterior se encuentra el ductus seminalis; parte anterior del ductus bursae, membranoso y fuertemente retorcido; corpus bursae esférico y membranoso; signum grueso y de gran tamaño en forma de gancho, muy esclerotizado con la espina central dentada en su parte inferior y una gran base formada por sendas placas laterales de gran tamaño.

Biología: En España, la planta nutricia conocida para esta especie es *Astragalus* sp. y en Francia sobre *Astragalus monspessulanus* L. Los adultos podrían volar en una sola generación desde finales de junio a finales de agosto. El saco larvario (Figura 4) es similar al de *C. valesianella*, de forma semi-ovalado de color amarillento y la cutícula peciolada, con un ángulo bucal de 45º del mismo color. Los adultos podrían ser univoltinos, volando desde finales de junio a finales de agosto.

Distribución: Especie presente en el Mediterráneo occidental desde el sur de Francia hasta el sur de la península ibérica volando entre los 400 y 1.200 m. de altitud.

Etimología: Se dedica esta especie a David Gastón, hijo del primer autor.

Observaciones genéticas: BIN BOLD:AAI9240 (n = 7; Tabla 1; longitud de secuencia 658 pb). Según la divergencia COI, la nueva especie está separada de las especies de *Coleophora* comparadas en nuestro estudio por una diferencia media de 8,4% (n = 9) (Tabla 2). Este valor es alto en comparación con el 7,6% de divergencia media entre todas las especies estudiadas de *Coleophora* (Tabla 2, Figura 16) y se diferencia de las *C. valesianella* y *C. berlandella* en 3,3% y 3,8%, respectivamente, mientras que la diferencia entre estas dos especies es 3.6% (Tabla 2).

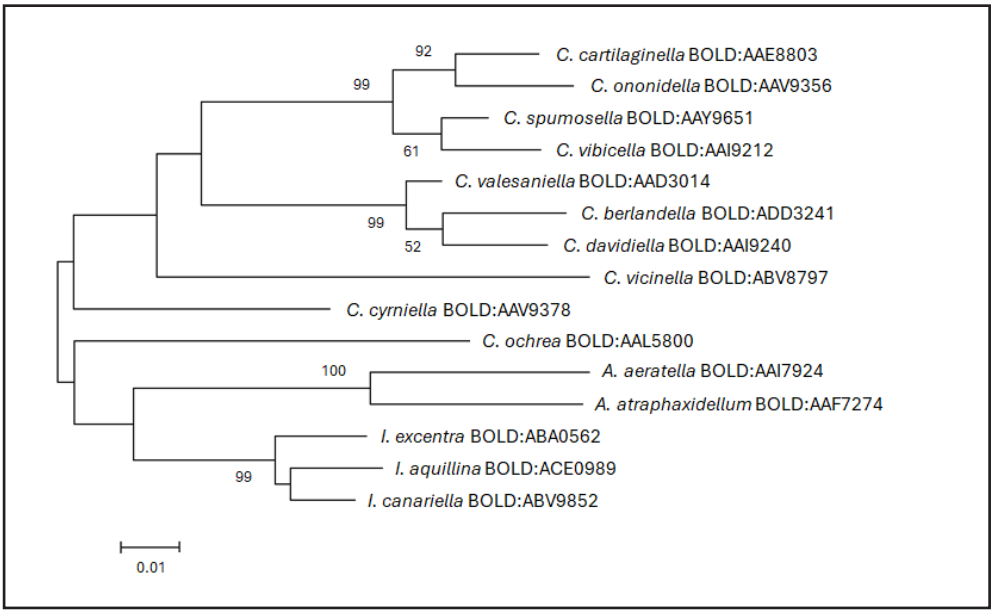
Tabla 2. Diferencias medias interespecíficas K2P (Kimura 2-Parameter) basadas en el estudio de los fragmentos COI (>500 bp) entre *Coleophora davidiella* y otras especies europeas de *Coleophora* (DAV: *C. davidiella;* VAL: *C. valesianella* CAR: *C. cartilaginella*; ONO: *C. ononidella*; SPU: *C. spumosella*; VIB: *C. vibicella*; CYR: *C. cyrniella*; OCH: *C. ochrea*).

	DAV	VAL	CAR	ONO	SPU	VIBA	VIC	CYR	OCH
CberlandellaADD3241	3.8	3.6	10.6	10.1	9.1	9.1	11.1	9.8	11.7
CdavidiellaAAI9240		3.3	8.8	8.6	8.2	9.4	11.4	10.4	11.4
CvalesianellaAAD3014			9	9	8.4	9.4	11.1	9.4	10.9
CcartilaginellaAAE8803				3.5	4	4.9	11.2	10.1	11.9
CononidellaAAV9356					4.4	5.4	11.5	10.6	11.7
CspumosellaAAY9651					2.7	2.7	9.7	9.7	10.8
CvibicellaAAI9212							9.9	10.1	10.9
CvicinellaABV8797								12.1	12.6
CcyrniellaAAV9378									10.3

Discusión

Basándonos en la morfología general, genitalia femenina y divergencia del gen COI, se estudiaron siete ejemplares del norte, este y sureste de la península ibérica y se compararon con otras especies de *Coleophora*. Los resultados de los datos de código de barras de ADN obtenidos en nuestro estudio indican que *Coleophora davidiella* sp. nov. está aislada de otras especies congéneres estudiadas como *C. valesianella* y *C. berlandella* con una divergencia superior al 3% (Tabla 2, Figura 16). Las distancias interespecíficas de la nueva especie variaron desde el 3,3% con *C. valesianella* hasta el 11,4% con *C. vicinella* y *C. ochrea* (Tabla 2). Las diferencias en las secuencias de código de barras fueron superiores al 2% y, según Hausmann et al. (2011), en diferentes grupos de taxones de invertebrados, una divergencia de secuencia en la región del código de barras superior al 2% es típica de la variación interespecífica y se reconoce como especies diferentes, mientras que los valores inferiores a menudo corresponden a diferencias intraespecíficas siendo una consecuencia inmediata del proceso gradual de especiación. Además, las especies de los géneros *Ischnophanes* y *Augasma,* sistemáticamente relacionados con *Coleophora*, forman grupos monofiléticos claramente separados mientras que las especies *C. valesianella, C. berlandella* y *C. davidiella* sp. nov. forman un grupo separado del resto de especies europeas estudiadas de *Coleophora* (Figura 16).

Figura 16. Árbol de Maximum Likelihood de las especies europeas de *Coleophora*, calculado con 105 secuencias del gen COI. La longitud de cada rama del árbol muestra las divergencias entre especies. Los valores de soporte de cada uno de los grupos de especies aparecen en los principales nodos. La escala representa el valor de 0,01 de diferencia genética.



En relación con la distribución de *C. davidiella* sp. nov. en la península ibérica (Figura 12), los especímenes de *Coleophra berlandella* de Barcelona referidos en Requena & Pérez De-Gregorio (2021) han sido examinadas y corresponden a la nueva especie, así como las de Barcelona (Alella), Navarra (Irurzun) y Teruel (Albarracín, Bronchales) citadas en Baldizzone (1987). Por otro lado, la revisión de las fotografías de la genitalia de un macho (Richter det.) y una hembra (Baldizzone det.) identificadas como *C. berlandella* en Richter (2018) permiten afirmar que deberían asignarse a *C. davidiella* sp. nov. En esta misma línea, las citas de *C. valesianella* Zeller 1849 de España y Francia de Baldizzone (2019) corresponden a *C. davidiella* sp. nov. ya que consideramos que *C. berlandella* vuela solamente en el norte de África mientras que *C. valesianella* lo hace desde Suiza (LT Cantón de Valais) y gran parte del Mediterráneo central y oriental hasta Rusia.

Siguiendo a Vives Moreno (2014), *Coleophora davidiella* Gastón, Vives & Ortiz sp. nov., debería de situarse delante de *C. vicinella* Zeller, 1849 y sustituir a *C. berlandella* Toll, 1956 que, de momento, no ha sido registrada en España.

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Conflicto de interés

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*Javier Gastón
Amboto, 7-4ª-Dcha.
E-48993 Getxo (Vizcaya)
ESPAÑA / *SPAIN*
E-mail: fjgaston@yahoo.es
https://orcid.org/0000-0003-3382-3874

Antonio Ortiz
Departamento de Zoología y Antropología Física
Facultad de Veterinaria
Campus de Espinardo
Universidad de Murcia
E-30100 Murcia
ESPAÑA / *SPAIN*
E-mail: aortiz@um.es
https://orcid.org/0000-0002-3877-6096

Antonio Vives Moreno
Cátedra de Entomología Agraria
E. T. S. de Ingeniería Agronómica, Alimentación y Biosistemas
Avenida de Puerta de Hierro, 2
E-28040 Madrid
ESPAÑA / *SPAIN*
E-mail: avives1954@outlook.es
https://orcid.org/0000-0003-3772-2742

*Autor para la correspondencia / *Corresponding author*

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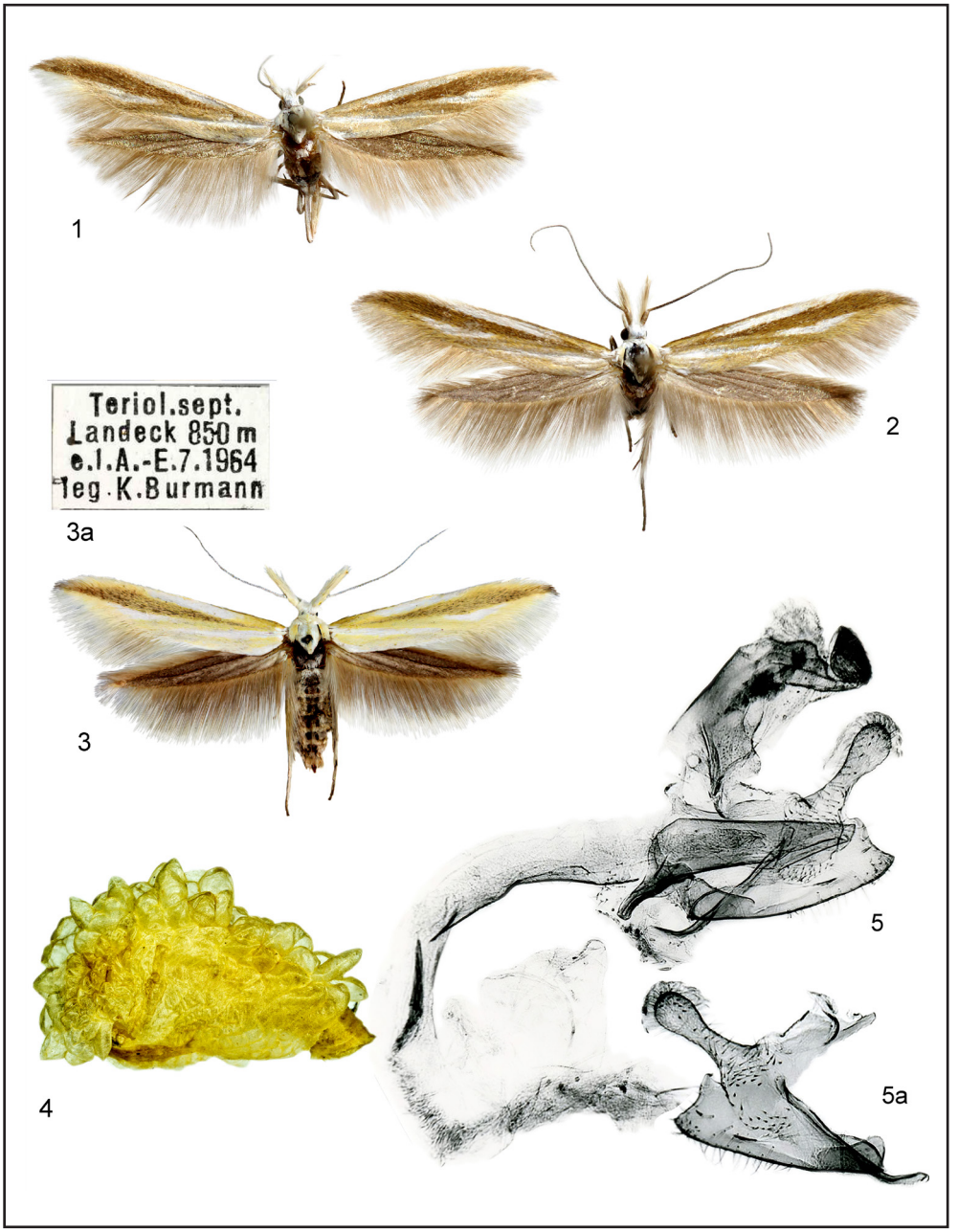
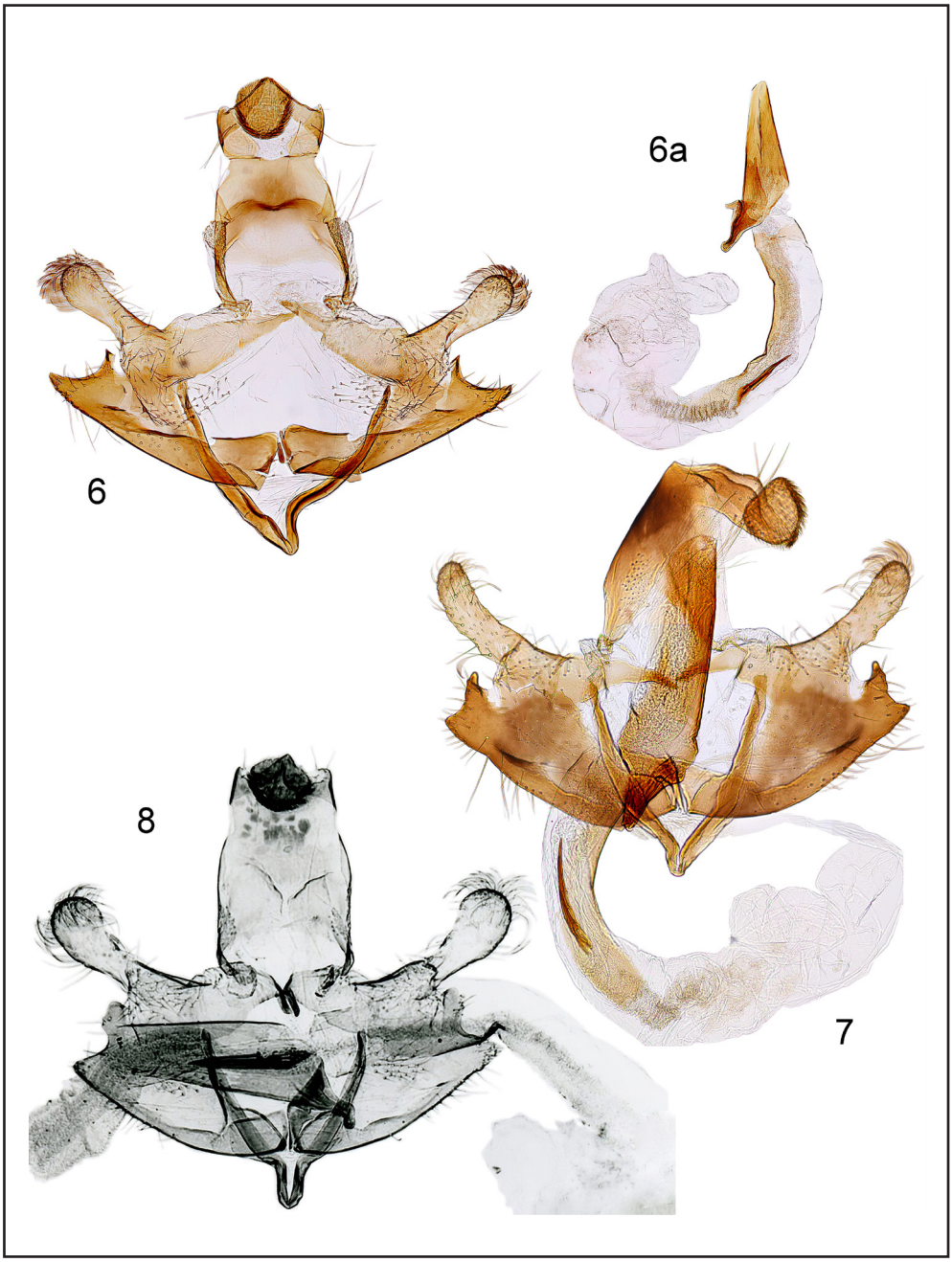
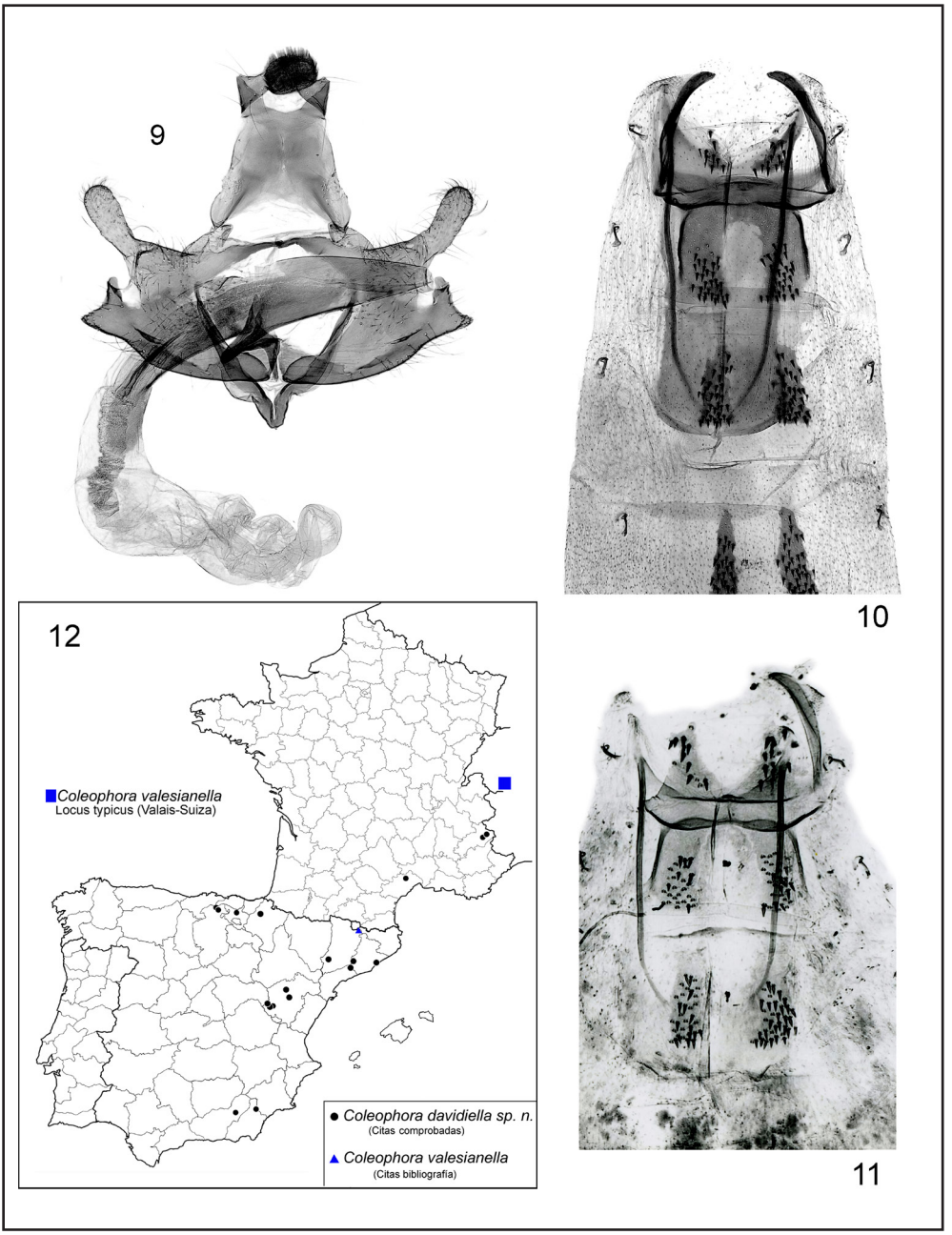
Figuras 1-5. Adultos y genitalia del macho. **1.** *Coleophora davidiella* Gastón, Vives & Ortiz, 2025, Holotipo ♀, Copegi, Álava, España. **2.** *Coleophora davidiella* Gastón, Vives & Ortiz, 2025, Paratipo ♂, El Ribero, Burgos, España. **3.** *Coleophora valesianella* Zeller, 1849, imagen cedida por Lepiforum, Michel Kettener fot., ZSM col. **3a.** Ídem, etiqueta del ejemplar. **4.** *Coleophora davidiella* Gastón, Vives & Ortiz, 2025, saco larvario, imagen cedida por Ignác Richter. **5-5a.** *Coleophora valesianella* Zeller, 1849, Holotipo, prep. gen. PG3216 (F. 457), Senckenberg Museum coll.



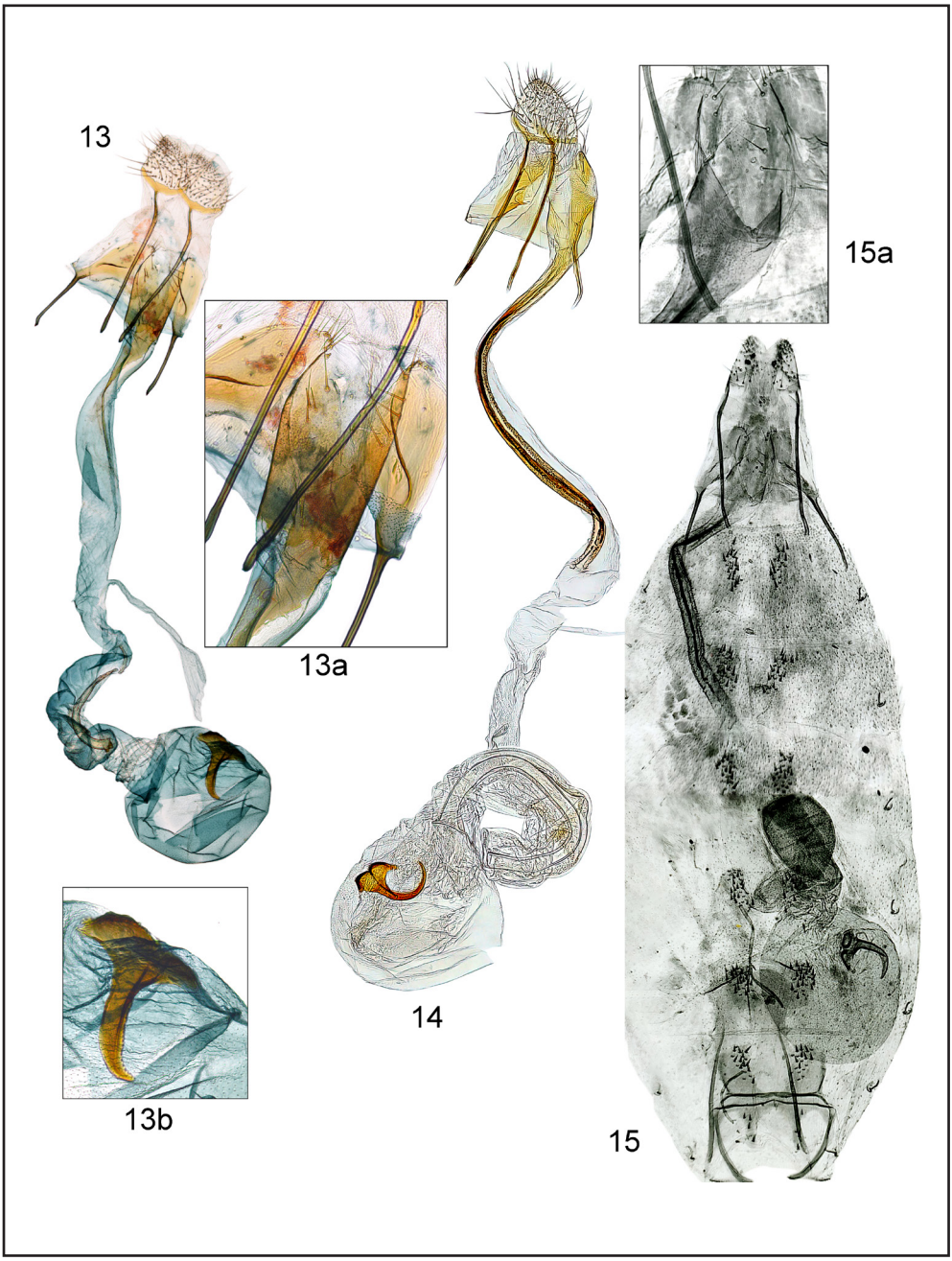
Figuras 6-8. Genitalia del macho. **6.** *Coleophora valesianella* Zeller, 1849, imagen cedida por Lepiforum, Dieter Robrecht fotografía, ejemplar procedente del Cantón de Valais, Suiza. **6a.** Ídem, phalloteca, vesica y cornutus. **7.** *Coleophora davidiella* Gastón, Vives & Ortiz, 2025, Paratipo, prep. gen. 9994JG. **8.** *Coleophora berlandella* Toll, 1956, Holotipo, prep. gen. PG6077, MNHN de Paris coll.



Figuras 9-12. Genitalia del macho, abdomen y mapa. **9.** *Coleophora davidiella* Gastón, Ortiz & Vives, 2025, prep. gen. Bldz. 15640. **10.** Ídem, estructura del abdomen, prep. gen. Bldz 15640. **11.** *Coleophora berlandella* Toll, 1956, Holotipo, detalle del abdomen, prep. gen. PG6077, MNHN de París coll. **12.** Mapa de la distribución; círculos negros, *Coleophora davidiella* Gastón, Ortiz & Vives, 2025, (citas comprobadas); triángulo azul, *C. valesianella* Zeller, 1849 (cita bibliográfica); cuadrado azul, locus typicus de C. valesianella Zeller, 1849, Cantón de Valais (Suiza).



Figuras 13-15. Genitalia de la hembra. **13.** *Coleophora davidiella* Gastón, Vives & Ortiz, 2025, Holotipo, prep. gen. 9996JG. **13a.** Ídem, detalle del antrum. **13b.** Ídem, detalle del signum. **14.** *Coleophora valesianella* Zeller, 1849, Imagen cedida por Lepiforum, Dieter Robrecht fot., ejemplar procedente del Cantón de Valais, Suiza. **15.** *Coleophora berlandella* Toll, 1956, Paratipo, prep. gen. PG6078, MNHN de Paris coll. **15a.** Ídem, detalle del antrum.



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REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

M. Top, D. Frisch & V. Kononenko
Noctuidae Europaeae Essential
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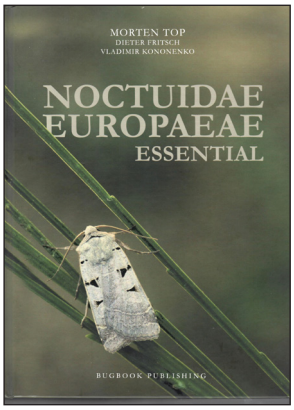

Tenemos en nuestras manos, una obra de extraordinaria importancia de la mano de estos conocidos autores especialistas en Noctuidae, que, a lo largo de más de once años, han conseguido finalizarla y que consideramos como un complemento actualizado de la conocida obra *Noctuidae Europaeae* (NE), donde se apreciaba la mano de nuestro querido amigo y, lamentablemente fallecido, Michael Fibiger.

En esta obra se trata 1.623 especies de Noctuidae conocidas en Europa, de las que se presentan 1.526 fotografías de los estados larvarios a todo color.

Después de una introducción y la biografía de los autores, nos presentan una lista taxonómica de los cambios que han sufrido los volúmenes de NE, con nuevas especies añadidas, especies revisadas y nuevas sinonimias, así como las especies que se han considerado excluir de la fauna europea.

Ya dentro de la propia obra, de todas las especies tratadas, se indica en la plancha donde se encuentran, su referencia para localizarlas en NE, sus datos biológicos, su distribución acompañada de un mapa, seguida con la fotografía del adulto en su medio natural y en muchos casos, también de sus larvas.

La obra termina con una extensa bibliografía, un índice y en las 92 planchas a todo color, podemos ver, en 1.609 fotografías, todas las especies tratadas que se encuentran en Europa y que forman parte de los Noctuoidea, hasta ahora conocidos.

No podemos terminar estas líneas, sin destacar el excelente trabajo realizado por los autores, a los que no podemos por menos que felicitar y a la Editorial, por el buen trabajo realizado y recomendar esta obra, no sólo a los interesados en los Noctuoidea, donde no puede faltar, sino también a todos aquellos que deseen poseer una obra bien realizada. El precio de este libro es de 200 euros y los interesados lo pueden pedir a:

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Antonio Vives Moreno
Sociedad Hispano-Luso-Americana de Lepidopterología
E-mail: avives1954@outlook.es
https://orcid.org/0000-0003-3772-2747

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Phylogeography and genetic relationship within *Erebia neriene* (Böber, 1890) in Eastern Asia inferred from mitochondrial DNA sequences (Lepidoptera: Nymphalidae)

Hisato Nagaoka, Xiaoshuan Bai, Dmitry Goshko, Batzorig Baljinnyam, Toshiaki Yamamoto, Kaneaki Edo & Shigeru Kitanishi

Abstract

Little is known about the genetic relationships within *Erebia neriene* (Böber, 1890) complexes inhabiting areas outside the Japanese Archipelago. In this study, we investigated genetic variations in *E. neriene* individuals collected from eastern Asia using mitochondrial sequences to reveal the phylogeny and genetic relationships among *E. neriene* complexes inhabiting areas outside the Japanese Archipelago. This study revealed greater genetic differentiation and a clear genetic structure among *E. neriene neriene* and *E. neriene scoparia* (Butler, 1882) populations. This is the first population genetics study of these subspecies.
Keywords: Lepidoptera, Nymphalidae, *Erebia*, COI, gene flow, glaciation, long-distance migration, ND5, Asia.

Filogeografía y relación genética dentro de *Erebia neriene* (Böber, 1890) en Asia oriental inferidas a partir de secuencias de ADN mitocondrial (Lepidoptera: Nymphalidae)

Resumen

Se sabe poco sobre las relaciones genéticas dentro de los complejos de *Erebia neriene* (Böber, 1890) que habitan zonas fuera del archipiélago japonés. En este estudio, investigamos las variaciones genéticas en individuos de *E. neriene* recolectados en Asia oriental utilizando secuencias mitocondriales para revelar la filogenia y las relaciones genéticas entre los complejos de *E. neriene* que habitan zonas fuera del archipiélago japonés. Este estudio reveló una mayor diferenciación genética y una clara estructura genética entre las poblaciones de *E. neriene neriene* y *E. neriene scoparia* (Butler, 1882). Se trata del primer estudio de genética de poblaciones de estas subespecies.
Palabras clave: Lepidoptera, Nymphalidae, *Erebia*, COI, flujo genético, glaciación, migración a larga distancia, ND5, Asia.

Introduction

Erebia neriene (Böber, 1809) is distributed in eastern Asia from Mongolia to Japan. Three subspecies have been recognized: *E. neriene neriene* (Böber 1809), which inhabits continental regions; *E. neriene niphonica* (Janson, 1877), which inhabits Honshu, the mainland of Japan; *E. neriene scoparia* (Butler, 1882), whose

distribution areas are Hokkaido, the northernmost island of Japan, and Sakhalin (Inomata et al. 2010-2013). The habitat of *E. neriene* in the northern region is large, and individuals are commonly observed (e.g., Nagaoka & Xiaoshuan, 2017), whereas *E. neriene niphonica* is restricted to high-altitude areas in the southern region, and each habitat is separated from the other.

The phylogenetic relationships of the subspecies have been investigated using mitochondrial (cytochrome *c* oxidase subunit I, COI, and NADH dehydrogenase subunit 5, ND5) and/or nuclear DNA (wingless) sequences (e.g., Nakatani et al. 2007a; Nakatani et al. 2018). Large genetic differentiation was found among the three subspecies and *E. neriene scoparia* was primarily divided from the others, and the remaining lineages were further divided into *E. nerine niphonica* and *E. neriene neriene*. Additionally, Nakatani et al. (2007b) analyzed the phylogeographic history of Japanese *E. neriene* (i.e. *E. neriene scoparia* inhabiting Hokkaido and *E. neriene niphonica*) and suggested that the clear genetic structure observed within *E. neriene niphonica* might have been influenced by fragmentation and secondary contact due to repeated glaciations.

In contrast to Japanese *E. neriene*, the molecular evaluation of *E. neriene neriene* populations has never been conducted. In addition, because previous studies have focused mainly on the phylogeny of Japanese *E. neriene*, the number of continental samples analyzed were insufficient for robust quantitative assessments. A better understanding of the phylogenetic and genetic relationships requires the expansion of sampling to a broader scale. In this study, we investigated the genetic variations in *E. neriene* individuals collected in eastern Asia using mitochondrial COI and ND5 sequences. The aim of this study was to provide the first phylogeny and genetic relationships among *E. neriene* complexes inhabiting areas outside the Japanese Archipelago (i.e., *E. neriene neriene* and *E. neriene scoparia*). Additionally, sequence data were used to confirm the phylogenetic relationships among the three subspecies.

Materials and methods

We collected 111 specimens of adult *E. neriene* individuals from 11 localities (Honshu, Hokkaido, Moneron, Gornyi, Genhe, and Terelj) between 1999 and 2016 using hand nets (Table I). DNA was extracted from two or three legs using a DNeasy Blood & Tissue Kit (QIAGEN, Venlo, Netherlands) according to the manufacturer's instructions. Primers C1-J-1718 (Bromilow & Sperling, 2011) and C1-N-2329 (Simon et al. 1994) for COI, and V1 and C2 (Yagi et al. 1999) for ND5 were used for PCR amplification. PCR was performed using KOD FX Neo (TOYOBO, Osaka, Japan) in accordance with the manufacturer's instructions. The thermal conditions were as follows: initial denaturation at 94 ºC for 2 min, 40 cycles of 98 ºC for 10 s, Tm (COI: 46 ºC, ND5: 45 ºC) for 30 s, and 68 ºC for 30 s, final extension at 68 ºC for 5 min, and hold at 10 ºC. The resulting sequences were deposited in DDBJ/EMBL/GenBank with accession numbers LC616315-616359 for COI and LC735100-LC735112 for ND5 (Table II).

Table I. Sampling information of *Erebia neriene* complexes used in this study.

No.	Sample locality	Abbreviation	Subspecies	Year	Long.	Lat.	*N*
1	Japan, Honshu, Iide Mts.	JHI	*niphonica*	2015	37º50.82´N	139º40.93´E	8
2	Japan, Honshu, Takenokosan Mt.	JHT	*niphonica*	2007-2008	36º47.44´N	138º46.10´E	1
3	Japan, Honshu, Tomi Ridge	JHR	*niphonica*	2010	36º39.20´N	137º47.10´E	2
4	Japan, Honshu, Onyu Pond	JHO	*niphonica*	2010	36º08.17´N	137.32.59´E	1
5	Japan, Honshu, Sanpuku Mountain Pass	JHS	*niphonica*	2007	35º33.14´N	138º08.75´E	3
6	Japan, Hokkaido, Samani	HOS	*scoparia*	2011	45º05.03´N	134º02.59´E	10
7	Japan, Hokkaido, Wakkanai	HOW	*scoparia*	1999	45º31.06´N	141º56.46´E	1
8	Russia, Moneron Is.	RUM	*scoparia*	2010, 2013	46º16.88´N	141º12.46´E	29
9	Russia, Gornyi	RUG	*neriene*	2015	50º46.42´N	136º25.06´E	22
10	Mongolia, Terelj	MOT	*neriene*	2016	47º56.07´N	107º23.50´E	12
11	China, Genhe	CHG	*neriene*	2016	50º49.39´N	121º38.79´E	22

Table II. Haplotype composition and represented samples of each concatenated haplotype. For abbreviations, see Table 1.

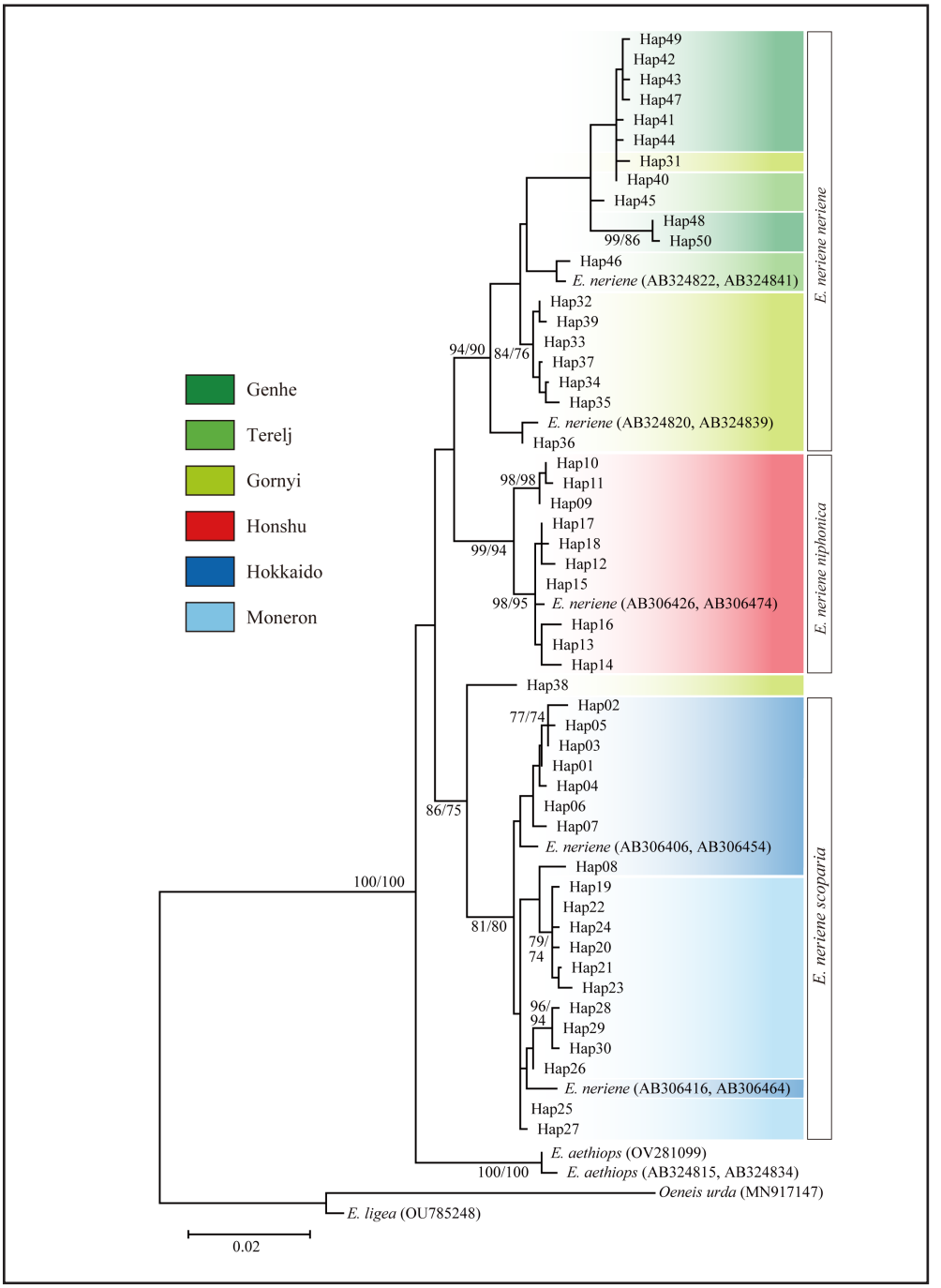
Haplotype name of COI	Accession no. of COI	Haplotype name of ND5	Accession no. of ND5	Haplotype name of total sequence	Haplotype represented (*N*)
COI Hap1	LC616315	ND5 Hap1	LC735100	Hap1	HOS (2) JHI (1)
COI Hap2	LC616316	ND5 Hap1		Hap2	HOS (1)
COI Hap3	LC616317	ND5 Hap1		Hap3	HOS (2)
COI Hap4	LC616318	ND5 Hap1		Hap4	HOS (1)
COI Hap5	LC616319	ND5 Hap1		Hap5	HOS (1)
COI Hap6	LC616320	ND5 Hap1		Hap6	HOS (2)
COI Hap7	LC616321	ND5 Hap1		Hap7	HOS (1)
COI Hap8	LC616322	ND5 Hap2	LC735101	Hap8	HOW (1)
COI Hap9	LC616323	ND5 Hap3	LC735102	Hap9	JHI (4)
COI Hap10	LC616324	ND5 Hap3		Hap10	JHI (2)
COI Hap11	LC616325	ND5 Hap3		Hap11	JHI (1)
COI Hap12	LC616326	ND5 Hap4	LC735103	Hap12	JHT (1)
COI Hap13	LC616327	ND5 Hap5	LC735104	Hap13	JHR (1)
COI Hap14	LC616328	ND5 Hap5		Hap14	JHR (1)
COI Hap15	LC616329	ND5 Hap5		Hap15	JHO (1)
COI Hap16	LC616330	ND5 Hap5		Hap16	JHS (1)
COI Hap17	LC616331	ND5 Hap5		Hap17	JHS (1)
COI Hap18	LC616332	ND5 Hap5		Hap18	JHS (1)
COI Hap19	LC616333	ND5 Hap6	LC735105	Hap19	RUM (12)
COI Hap20	LC616334	ND5 Hap7	LC735106	Hap20	RUM (1)
COI Hap21	LC616335	ND5 Hap6		Hap21	RUM (1)
COI Hap20	LC616334	ND5 Hap6		Hap22	RUM (4)
COI Hap22	LC616336	ND5 Hap6		Hap23	RUM (1)
COI Hap23	LC616337	ND5 Hap6		Hap24	RUM (1)
COI Hap24	LC616338	ND5 Hap6		Hap25	RUM (2)
COI Hap25	LC616339	ND5 Hap6		Hap26	RUM (1)
COI Hap26	LC616340	ND5 Hap6		Hap27	RUM (1)
COI Hap28	LC616342	ND5 Hap6		Hap28	RUM (2)
COI Hap27	LC616341	ND5 Hap6		Hap29	RUM (2)

COI Hap27	LC616341	ND5 Hap7		Hap30	RUM (1)
COI Hap29	LC616343	ND5 Hap8	LC735107	Hap31	RUG (1)
COI Hap30	LC616344	ND5 Hap9	LC735108	Hap32	RUG (7)
COI Hap31	LC616345	ND5 Hap9		Hap33	RUG (5)
COI Hap32	LC616346	ND5 Hap9		Hap34	RUG (1)
COI Hap33	LC616347	ND5 Hap9		Hap35	RUG (1)
COI Hap34	LC616348	ND5 Hap10	LC735109	Hap36	RUG (1)
COI Hap35	LC616349	ND5 Hap9		Hap37	RUG (1)
COI Hap36	LC616350	ND5 Hap10		Hap38	RUG (1)
COI Hap37	LC616351	ND5 Hap9		Hap39	RUG (4)
COI Hap38	LC616352	ND5 Hap8		Hap40	MOT (10) CHG (3)
COI Hap39	LC616353	ND5 Hap8		Hap41	MOT (1)
COI Hap38	LC616352	ND5 Hap11	LC735110	Hap42	CHG (8)
COI Hap38	LC616352	ND5 Hap12	LC735111	Hap43	CHG (1)
COI Hap38	LC616352	ND5 Hap13	LC735112	Hap44	CHG (1)
COI Hap40	LC616354	ND5 Hap9		Hap45	MOT (1)
COI Hap41	LC616355	ND5 Hap11		Hap46	CHG (1)
COI Hap42	LC616356	ND5 Hap11		Hap47	CHG (1)
COI Hap43	LC616357	ND5 Hap10		Hap48	CHG (2)
COI Hap44	LC616358	ND5 Hap11		Hap49	CHG (1)
COI Hap45	LC616359	ND5 Hap10		Hap50	CHG (4)

Neighbor-joining (NJ) and maximum likelihood (ML) trees were constructed with concatenated mtDNA sequences of COI and ND5 using MEGA 11 (Tamura et al. 2021). The p-distance model was used for NJ analysis. Prior to ML phylogenetic estimation, the best nucleotide substitution model was evaluated using MEGA 11, and the HKY + G model was selected based on corrected Akaike information criterion (AICc) scores. The robustness of the nodes in each tree was assessed by generating 1,000 bootstrap replicates. For the phylogenetic analysis, five additional sequences of *E. neriene* (see Figure 1) reported by Nakatani et al. (2007a) were included as references. The following sequences from related species were used as outgroups: *E. aethiops* (Esper, 1777) (accession numbers: OV281099, AB324815 and AB324834), *E. ligea* (Linnaeus, 1758) (OU785248), and *Oeneis urda* (Eversmann, 1847) (MN917147). The lack of nucleotides in some of the cited data was treated as missing.

We calculated the extent of genetic differentiation using Φ_{ST} (Michalakis & Excoffier, 1996) and Nei's average number of differences (D_A; Nei & Li, 1979) to infer genetic relationships among populations. We focused on the genetic differentiation among *E neriene* populations inhabiting areas outside of Japan in this analysis; thus, we pooled samples collected from two localities in Hokkaido and from five in Honshu as Hokkaido and Honshu, respectively. The statistical significance of these tests was obtained using 10,000 permutations in Arlequin 3.5 (Excoffier & Lischer, 2010) and corrected after the false discovery rate (FDR; Benjamini & Yekutieli, 2001).

Figure 1. Maximum likelihood (ML) tree of *Erebia neriene* based on the concatenated sequence of COI (624 bp) and ND5 sequences (386 bp). Numbers on the nodes represent NJ (left) and ML (right) bootstrap values (>70%, n = 1000).



Results

Based on the 624 bp COI (45 haplotypes) and 386 bp ND5 sequences (13 haplotypes), 50 haplotypes were identified among the 111 *E. neriene* individuals (Table II). No insertion/deletion mutations were identified in the sequences. The distribution of haplotypes showed a strong genetic structuring, and only two haplotypes were observed at different localities (Hap1 and Hap40; Table II).

The ML tree revealed three major clades of *E. neriene* inhabiting Eastern Asia, each of which corresponded to the haplotypes *E. neriene neriene*, *E. neriene niphonica*, and *E. neriene scoparia* (Figure 1). The *E. neriene scoparia* clade was primarily divided from the others, and the remaining haplotypes were further separated into *E. neriene niphonica* and *E. neriene neriene.* Except for one haplotype observed in Gornyi (Hap38), the haplotypes observed in each subspecies formed a monophyletic clade. In *E. neriene neriene*, the haplotypes observed in each population did not form a monophyletic clade despite their geographical distance, indicating dispersal and/or gene flow among these continental regions. The topology of the NJ tree was similar to that of the ML trees, except that the *E. aethiops* clade formed a monophyletic clade with *E. neriene neriene* and *E. neriene niphonica* clades.

For pairwise comparison, the Φ_{ST} and D_A values ranged from 0.1376 to 0.9363 and 0.9740 to 31.8788, respectively (Table III). Significant genetic differentiation was observed within all comparisons of *E. neriene* populations except for one comparison (i.e., between Terelj and Genhe).

Table III. Pairwise Φst (below) and D_A (above diagonal) among regional populations of *Erebia neriene* complexes.

-	Honshu	Hokkaido	Moneron	Gornyi	Terelj	Genhe
Honshu		**20.2026**	**22.3967**	**16.9039**	**28.1238**	**24.4675**
Hokkaido	**0.7557**		**5.4259**	**21.5085**	**31.8788**	**28.5608**
Moneron	**0.7832**	**0.5454**		**24.1638**	**30.2890**	**26.9140**
Gornyi	**0.7039**	**0.8074**	**0.8180**		**13.6255**	**12.0527**
Terelj	**0.8373**	**0.9363**	**0.8867**	**0.7575**		0.9740
Genhe	**0.7530**	**0.8225**	**0.8171**	**0.6411**	0.1376	-
bold-p<0.001after FDR (B-Y) method						

Discussion

The populations of *E. neriene* complexes did not share any haplotype except for two (haplotypes 1 and 40), and greater genetic differentiation was observed even among neighboring populations, such as between Moneron and Hokkaido. These results indicate that *E. neriene* inhabiting different regions is independent, and gene flow is rare. These endemic genetic features are attributed to glaciation. Populations inhabiting areas strongly influenced by glaciation are likely to show greater genetic differentiation and uniqueness (Schmitt et al. 2006; Schmitt & Haubrich, 2008). It has been reported that Eastern Asia may be influenced by glacial-interglacial cycles (Frenzel, 1968). During glacial periods, *E. neriene neriene* populations in the continental region may repeatedly undergo depopulation, probably due to low temperatures and subsequent recolonization, resulting in genetic bottlenecks and subsequent large genetic differentiation. However, *E. neriene scoparia* and *E. neriene niphonica* populations may have been separated mainly by transgression or decreasing habitats caused by high temperatures during the interglacial period (Nakatani et al. 2007b). Thus, a strong genetic structure was observed.

Although the genetic uniqueness of each population was observed, Terelj and Genhe did not show significant genetic differentiation despite their geographical distance, and the haplotypes of these populations formed a monophyletic clade. There is a vast habitat area suitable for *E. neriene neriene* in these areas, and *E. neriene neriene* is distributed over a wide range of habitats (e.g., Nagaoka & Xiaoshuan 2017). In addition, there are no obvious barriers to dispersal, such as oceans, mountains, or deserts, between Terelj and Genhe. Therefore, the habitat areas of Terelj and Genhe could have been connected, and these areas might have acted as large populations rather than distinct habitats.

However, the fact that some haplotypes found in Gornyi (i.e., haplotypes 31 and 38) and Hokkaido (haplotype 8) formed the same cluster as those found in different populations may be due to long-distance migration. Gornyi, Moneron, and Hokkaido are separated from other regions by mountains and oceans. Superior migration ability has been reported in some Papilionoidea (e.g., *Parantica sita* (Kollar, 1844)), which can migrate thousands of kilometers (Honda et al. 2016). Therefore, *E. neriene* may conduct long-distance migration, even across the ocean, and has superior migration ability.

The phylogenetic tree observed in this study also showed that the haplotypes of *E. neriene scoparia* were primarily divided from those of the other two subspecies and that *E. neriene scoparia* and *E. neriene niphonica* immigrated separately from the continental region to Japan. This result supports those of previous studies (e.g., Nakatani et al. 2007a; Nakatani et al. 2018; Sekiguchi et al. 2002) and indicates that greater genetic differentiation could be a genetic feature of *E. neriene* complexes.

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Conflict of Interest

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Hisato Nagaoka
Development Bank of Japan
Chiyoda-ku
Tokyo 100-8178
JAPÓN / *JAPAN*
E-mail: beniya583@jcom.zaq.ne.jp
https://orcid.org/0009-0006-4800-4408

y / *and*

Shimorenjyaku
Mitaka
Tokyo 181-0013
JAPÓN / *JAPAN*

Xiaoshuan Bai
Inner Mongolia Normal University
No 81 Zhaoweda Road
Saihan District, Huhhot Inner Mongolia
CHINA / *CHINA*
E-mail: baixs2007@aliyun.com
https://orcid.org/0000-0003-0928-3652

Dmitry Goshko
State Darwin Museum
Vavilova street, 57
117292 Moscow
RUSIA / *RUSSIA*
E-mail: dmitriy.goshko@gmail.com
https://orcid.org/0009-0003-3806-2872

Batzorig Baljinnyam
Mongolia Insect Lover's Society
Bayanzurkh district, 8th khoroo, 51A-1
P.O.B.-51/342
Ulaanbaatar
MONGOLIA / *MONGOLIA*
E-mail: ecotripmongolia@yahoo.co.jp
https://orcid.org/0009-0008-2738-5568

Toshiaki Yamamoto
Department of Veterinary Nursing and Technology
Nippon Veterinary and Life Science University
Kyonancho, Musashino
Tokyo 180-8602
JAPÓN / *JAPAN*
E-mail: tyamamoto@nvlu.ac.jp
https://orcid.org/0000-0002-7770-7886

Kaneaki Edo
Agency for Cultural Affairs
Chiyoda-Ku
Tokyo 100-8959
JAPÓN / *JAPAN*
E-mail: edo@mext.go.jp
https://orcid.org/0009-0008-8168-8738

*Shigeru Kitanishi
Faculty of Science and Technology
Oita Univwersity
700 Dannoharu
Oita 870-1192
JAPÓN / *JAPAN*
E-mail: kitanishi@oita-u.ac.jp
https://orcid.org/0000-0001-8030-4212

*Autor para la correspondencia / *Corresponding author*

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REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

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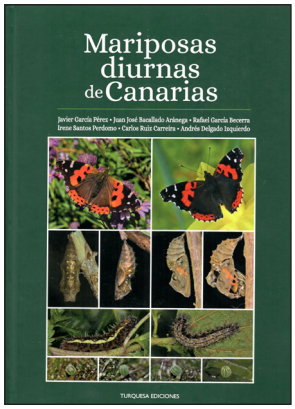

Nos encontramos con una obra, tanto tiempo añorada, realizada por un grupo de entusiastas entomólogos en la que nos presentan, una puesta al día, de la fauna de los Papilionoidea de las mirificas islas canarias, bajo la dirección de nuestro querido amigo y colega el Dr. Juan José Bacallado Aránega (Checho).

Comienza la obra con una introducción, seguida por la morfología, donde es de destacar el capítulo sobre la historia evolutiva con el cladograma de las interesantes especies del género *Hipparchia* Linnaeus, 1767 presentes en la región macaronésica, seguido de otros interesantes capítulos como el ciclo biológico, el vuelo y migración, así como la ecología.

Ya dentro de la parte principal del libro podemos ver las especies que aquí se encuentran, donde podemos verlas en un cuadro al efecto, con todas y cada una de ellas, en que islas se encuentran y si son endémicas o no. Todas las especies están representadas profusamente fotografiadas y en vivo de los adultos y, acompañadas en muchos casos, con sus plantas nutricias y estados larvarios. Nos detallan cada una de las especies consideradas, con su nombre científico y común, su descripción, biología, hábitat y nutrición, seguida de su distribución, lo que queda plasmado en unos dibujos de todas las islas, destacando, en gris, dónde se han encontrado hasta este momento.

Finaliza la obra con un "colofón y reconocimiento, donde podemos ver antiguos colegas que han trabajado, a lo largo de estos años, con "Checho", entre ellos Rudolf Pinker (†), cuya colección tuvimos la suerte de verla en Viena; nuestro querido amigo Josef Klimesch (†); Anthony Valletta (†), H. G. Allcard (†), W. B. L. Manley (†), Edmond de Laever (†); Martin Wiemers, entre otros; seguida de un glosario y detallado índice.

No podemos terminar estas líneas, sin destacar el excelente trabajo fotográfico realizado por los autores, a los que no podemos por menos que felicitar por tan detallada obra y a la Editorial, por el buen trabajo realizado y recomendar esta obra, no sólo a los interesados en la fauna lepidopterológica canaria, donde no puede faltar en cualquier librería que se precie, sino también a todos aquellos que deseen poseer una obra bien realizada. El precio de este libro es de 39,00 euros y los interesados lo pueden pedir a:

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Antonio Vives Moreno
Sociedad Hispano-Luso-Americana de Lepidopterología
E-mail: avives1954@outlook.es
https://orcid.org/0000-0003-3772-2747

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A preliminary checklist of Papilionoidea from Barot valley, district Mandi, Himachal Pradesh, India (Insecta: Lepidoptera)

Gurinder Kaur Walia, Diksha Chopra, Neeraj Neeraj, Jyoti Mahil & Avtar Kaur Sidhu

Abstract

This is a report of the Papilionoidea' species diversity in the Barot valley of Mandi district of Himachal Pradesh (India). The present checklist was made based on a survey tour conducted in the month of May 2024. This study is the preliminary attempt to provide a checklist of the Papilionoidea fauna of a remote valley Barot in district Mandi. This report is a baseline for future studies on Papilionoidea from this area.
Keywords: Insecta, Lepidoptera, Papilionoidea, biodiversity; conservation, checklist, ecosystem, ecology, India.

Lista preliminar de los Papilionoidea del Valle de Barot, distrito de Mandi, Himachal Pradesh, India (Insecta: Lepidoptera)

Resumen

Este es un informe sobre la diversidad de especies de Papilionoidea en el valle Barot del distrito Mandi de Himachal Pradesh (India). La presente lista de comprobación se ha elaborado sobre la base de un estudio realizado en el mes de mayo de 2024. Este estudio es el intento preliminar de proporcionar una lista de control de la fauna Papilionoidea de un remoto valle Barot en el distrito de Mandi. Este informe es una línea de base para futuros estudios sobre Papilionoidea de esta zona.
Palabras clave: Insecta, Lepidoptera, Papilionoidea, biodiversidad; conservación, lista de control, ecosistema, ecología, India.

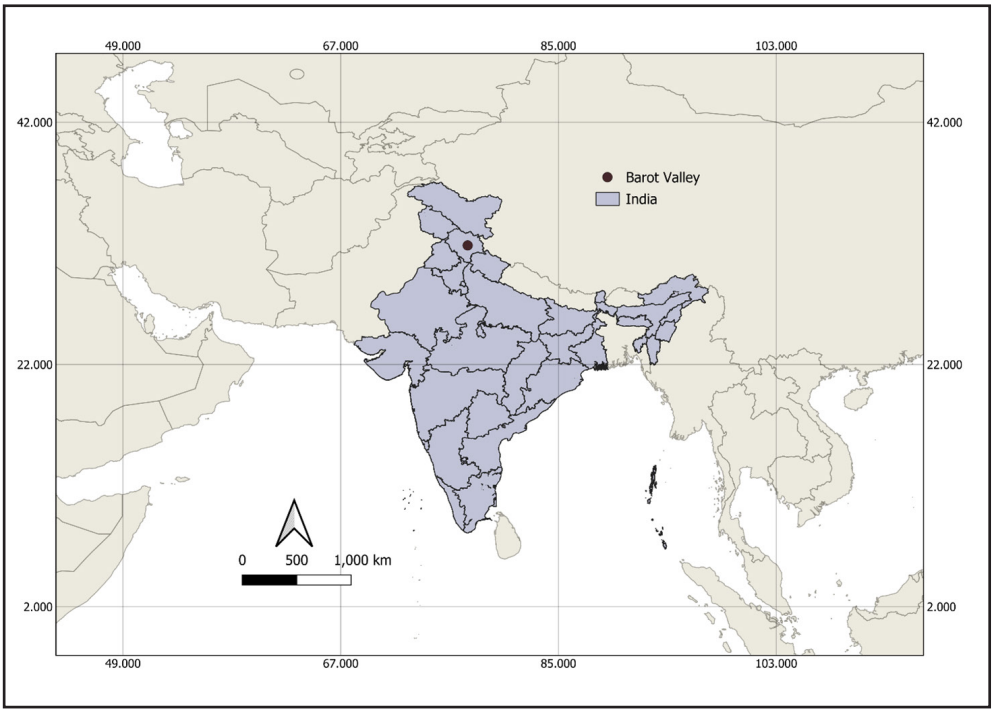
Introduction

Papilionoidea are the paramount flagship invertebrates that plays crucial role in the conservation practices (Barua et al. 2012). Being highly diverse i.e. having around 1,318 species in India, they act as an important bioindicators and occupies vital position in the ecosystem (Kunte 2000; Varshney & Smetacek, 2015). Slightest variations in the environment and forest structures severely affect Papilionoidea's biota (Pollard, 1991). They play a very important role in maintaining the stability of various ecosystems in various ways such as pollination of plants and dispersal of seeds. They also act as an important food source for other groups of organisms (Majer, 1987). Many of the species are strictly seasonal, some show seasonal polymorphism, some are ubiquitous, and some prefer set of habitats (Kunte, 1997). Due to anthropogenic factors such as urbanization, deforestation, biodiversity is being lost at an alarming rate (Achard et al. 2002, Kowarik 1995, McKinney 2002, Miller & Hobbs 2002). In the last few decades, the need to conserve biodiversity has gained prominence in ecological research. The identification and compilation of species in a checklist evinces the biodiversity of that area and is the first step in effectively conserving biodiversity.

Study Area

Barot, located in the Mandi District of Himachal Pradesh, India, is a valley established in the 1920s for the Shanan Hydel Project. It serves as the gateway to the Nargu Wildlife Sanctuary, situated across the Uhl River. Geographically positioned at 32.0372ºN latitude and 76.8439ºE longitude, Barot lies at an elevation of 1,819 meters (6,001 feet) above sea level within a valley formed by the Uhl River, flanked by the Dhauladhar range of the Himalayas. The surrounding forests are abundant with *Cedrus deodara* (Roxb.) G. Don and *Quercus semecarpifolia* Sm. trees, contributing to the rich biodiversity of the region. Barot Valley, nestled within the Dhauladhar range, presents a remarkable landscape, making it a prime destination for wildlife enthusiasts and nature photographers. The region is characterized by a diverse array of flora and fauna, supported by its varied topography and climatic conditions. The area is a microcosm of the larger ecological zone of the western Himalayas, known for its unique biodiversity and endemic species. The climatic conditions of Barot Valley are typical of the subtropical highland climate, with temperature variations ranging from 4ºC in winters to 25ºC in summers. Annual precipitation averages around 1,200 mm, predominantly during the monsoon months of July and August. This climatic regime supports the lush forests and diverse wildlife of the region.

Figure 1. Location of Barot Valley in Himachal Pradesh.



Material and Methods

A survey was made to document Papilionoidea species to Barot valley, district Mandi at 32.0372º N latitude and 76.8439º E longitude. It was a seven-day visit to this area from 16 May 2024 to 22 May 2024. Some species were photographed on camera with the help of Sony DSC-HX60 while some species were collected with the help of net sweeping method. The collected Papilionoidea were killed by following Evans (1932) method by getting the insect into the fold of the net with its wings closed and pinching their thorax gently. We generally visited the field on a sunny day from 8am to 11am and 2pm to 6pm. Existing literature was followed

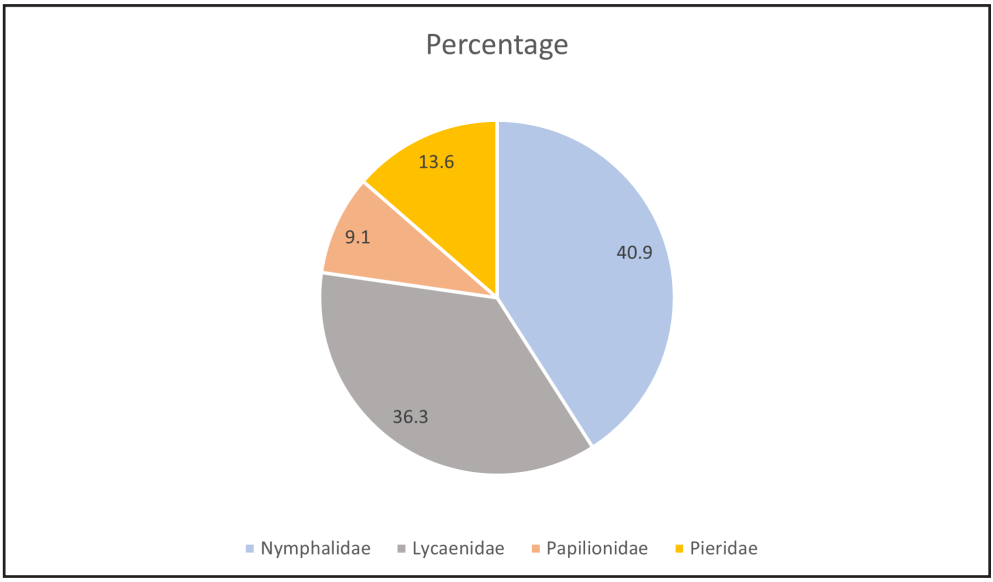
for species identification (Evans, 1932; Kehimkar, 2015; Varshney & Smetacek, 2015). Mapping is done using QGIS software. Online source was also consulted for identification (http://www.ifoundbutterflies.org).

Figure 2. A-C Pictures of landscape of Barot valley.

Results

A seven-day survey resulted in the record of 44 species of Papilionoidea from four families. The highest diversity of family Nymphalidae was observed with 18 species followed by Lycaenidae with 16 species, Pieridae with 6 species and lowest number of Papilionidae was observed with 4 species. Of these, five species are protected under Schedule II of the Indian Wildlife (Protection) Act. 1972. A summary of photographic records is given. A list of all the 44 species is given in the table. This report is a baseline for future studies on Papilionoidea from Barot valley. This area can be explored more as it has high species richness.

Figure 3. Diversity of Papilionoidea in Barot Valley.



Discussion

Barot valley, nestled within the Dhauladhar range, presents a remarkable landscape, making it a prime destination for wildlife enthusiasts and nature photographers. The region is characterized by a diverse array of flora and fauna, supported by its varied topography and climatic conditions. The area is a microcosm of the larger ecological zone of the western Himalayas, known for its unique biodiversity. It was a random sampling of riverside, waterfall, forest, rural and urban areas.

The present study reported 44 species from Barot valley, district Mandi, which comprises four families Nymphalidae, Lycaenidae, Pieridae and Papilionidae. Family Nymphalidae was dominant among other families. Play a very important role in maintaining the stability of various ecosystems in various ways such as pollination of plants and dispersal of seeds. They also act as an important food source for other groups of organisms (Majer, 1987). They act as bioindicators as well and are very important to assess the health and stability of ecosystem. Quantification of diversity and species richness is of importance for evaluating the conservation status.

Conflict of Interest

The authors declare that they have no known financial interest or personal relationship that could have influence the work presented in this article.

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Gurinder Kaur Walia
Department of Zoology and Environmental Sciences
Punjabi University
Patiala, Punjab,147002
INDIA / *INDIA*
E-mail: gurinderkaur_walia@yahoo.co.in
https://orcid.org/0000-0003-1130-3261

*Diksha Chopra
Department of Zoology and Environmental Sciences
Punjabi University
Patiala, Punjab,147002
INDIA / *INDIA*
E-mail: chopradiksha31@gmail.com
https://orcid.org/0009-0005-3102-2880

Neeraj Neeraj
Department of Zoology and Environmental Sciences
Punjabi University
Patiala, Punjab,147002
INDIA / *INDIA*
E-mail: neeraj18697@gmail.com
https://orcid.org/0009-0007-0672-1908

Jyoti Mahil
Department of Zoology and Environmental Sciences
Punjabi University
Patiala, Punjab,147002
INDIA / *INDIA*
E-mail: jmahil1996@gmail.com
https://orcid.org/0009-0002-9440-5705

Avtar Kaur Sidhu
High Altitude Regional Centre
ZSI, Solan, Himachal Pradesh
INDIA / *INDIA*
E-mail: avtarkaur2000@gmail.com
https://orcid.org/0000-0003-0302-4158

*Autor para la correspondencia / *Corresponding author*

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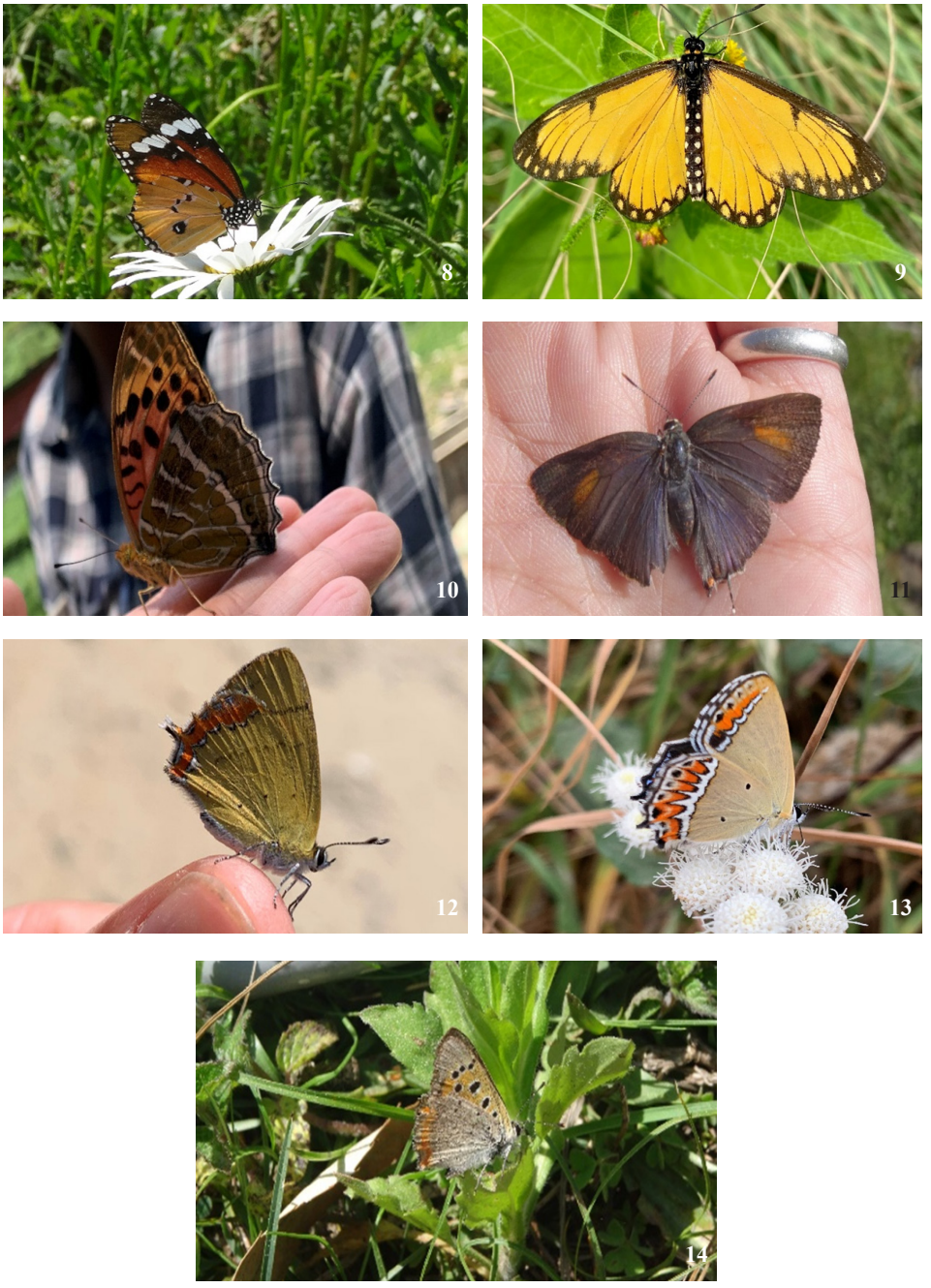
Table 1. List of Papilionoidea of Barot Valley

Family	Subfamily	Scientific name	WPA Status	Observations
Nymphalidae	Nymphalinae	*Aglais caschmirensis* (Kollar, [1844])		Photographed
Nymphalidae	Limentidinae	*Neptis soma* Moore, 1858	Sch-II	Observed
Nymphalidae	Nymphalinae	*Symbrenthia lilaea* (Hewitson, 1864)		Photographed
Nymphalidae	Limentidinae	*Athyma opalina* (Kollar, [1844])		Observed
Nymphalidae	Limentidinae	*Neptis hylas* (Linnaeus, 1758)		Observed
Nymphalidae	Nymphalinae	*Vanessa cardui* (Linnaeus, 1758)		Photographed
Nymphalidae	Nymphalinae	*Vanessa indica* (Herbst, 1794)		Observed
Nymphalidae	Nymphalinae	*Junonia iphita* (Cramer, [1779])		Photographed
Nymphalidae	Nymphalinae	*Kaniska canace* (Linnaeus, 1763)		Photographed
Nymphalidae	Nymphalinae	*Kallima inachus* (Doyère, [1840])		Observed
Nymphalidae	Danainae	*Euploea mulciber* (Cramer, [1777])	Sch-IV	Photographed
Nymphalidae	Danainae	*Danaus chrysippus* (Linnaeus, 1758)		Photographed
Nymphalidae	Satyrinae	*Lethe isana* (Kollar, [1844])		Observed
Nymphalidae	Satyrinae	*Paralasa shallada* Lang, 1880		Observed
Nymphalidae	Heliconiinae	*Acraea issoria* (Hübner, [1819])		Photographed
Nymphalidae	Heliconiinae	*Argynnis children* Gray, 1831		Photographed
Nymphalidae	Libytheinae	*Libythea myrrha* Godart, 1819		Photographed
Nymphalidae	Cyrestinae	*Cyrestis thyodamas* Doyère, [1840]		Observed
Lycaenidae	Theclinae	*Horaga onyx* (Moore, [1858])	Sch-II	Observed
Lycaenidae	Theclinae	*Rapala selira* (Moore, 1874)		Observed
Lycaenidae	Theclinae	*Rapala nissa* (Kollar, [1844])		Photographed
Lycaenidae	Lycaeninae	*Heliophorus moorei* (Hewitson, 1865)	Sch-II	Photographed
Lycaenidae	Lycaeninae	*Heliophorus sena* (Kollar, [1844])		Photographed
Lycaenidae	Lycaeninae	*Lycaena panava* (Westwood, 1852)		Photographed
Lycaenidae	Lycaeninae	*Lycaena phlaeas* (Linnaeus, 1761)		Photographed
Lycaenidae	Polyommatinae	*Lampides boeticus* (Linnaeus, 1767)	Sch-II	Photographed
Lycaenidae	Polyommatinae	*Pseudozizeeria maha* (Kollar, [1844])		Observed
Lycaenidae	Polyommatinae	*Aricia agestis* ([Denis & Schiffermüller], 1775)		Photographed
Lycaenidae	Polyommatinae	*Leptotes plinius* (Fabricius, 1793)		Observed
Lycaenidae	Polyommatinae	*Celastrina huegeli* (Moore, 1882)		Photographed
Lycaenidae	Polyommatinae	*Celastrina argiolus* (Linnaeus, 1758)		Photographed
Lycaenidae	Polyommatinae	*Prosotas nora* (C. Felder, 1860)	Sch-II	Observed
Lycaenidae	Polyommatinae	*Celastrina gigas* (Hemming, 1928)		Observed
Lycaenidae	Polyommatinae	*Jamides bochus* (Stoll, [1782])		Photographed
Pieridae	Pierinae	*Pontia daplidice* (Linnaeus, 1758)		Photographed
Pieridae	Pierinae	*Delias belladonna* (Fabricius, 1793)		Photographed
Pieridae	Pierinae	*Pieris brassicae* (Linnaeus, 1758)		Photographed
Pieridae	Pierinae	*Pieris canidia* (Linnaeus, 1768)		Photographed
Pieridae	Pierinae	*Colias fieldii* Ménétriés, 1855		Photographed
Pieridae	Coliadinae	*Catopsilia pomona* (Fabricius, 1775)		Observed
Papilionidae	Papilioninae	*Graphium cloanthus* (Westwood, 1841)		Photographed
Papilionidae	Papilioninae	*Papilio polytes* Linnaeus, 1758		Observed
Papilionidae	Papilioninae	*Graphium sarpedon* (Linnaeus, 1758)		Photographed
Papilionidae	Papilioninae	*Papilio machaon* Linnaeus, 1758		Observed

Figures 4. 1-7. 1. *Aglais caschmirensis.* **2.** *Libythea myrrha.* **3.** *Symbrenthia lilaea.* **4.** *Vanessa cardui.* **5.** *Junonia iphita.* **6.** *Kaniska canace.* **7.** *Euploea mulciber.*

Figures 5. 8-14. 8. *Danaus chrysippus.* **9.** *Acraea issoria.* **10.** *Argynnis childreni.* **11.** *Rapala nissa.* **12.** *Heliophorus moorei* **13.** *Heliophorus sena.* **14.** *Lycaena phlaeas.*



Figures 6. 15-21. 15. *Aricia agestis*. **16.** *Lycaena panava*. **17.** *Celastrina argiolus*. **18.** *Celastrina huegelii*. **19.** *Jamides bochus*. **20.** *Pontia deplidice*. **21.** *Delias belladonna*.

Figures 7. 22-27. 22. *Pieris canidia.* **23.** *Pieris brassicae.* **24.** *Colias fieldii.* **25.** *Graphium cloanthus.* **26.** *Graphium sarpedon.* **27.** *Lampides boeticus*).

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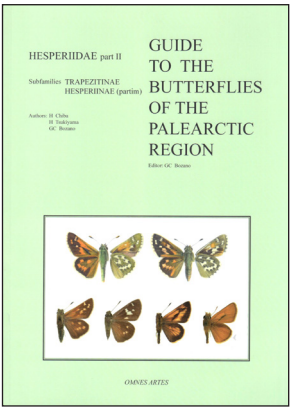
REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

H. Chiba, H. Tsukiyama & G. C. Bozano
Guide to the Butterflies of the Palearctic Region: Hesperiidae part II
82 páginas
Formato 29'5 x 21 cm
Omnes Artes, Milano, 2025
ISBN: 978-88-87989-34-2



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 Hesperiidae Latreille, 1809, estudiándose las subfamilias Trapezitinae Watherhouse & Lyell, 1914 y dentro de ella la tribu Barcini Swinhoe, 1893 (con dos géneros *Barca* de Nicéville, 1902 y *Apostictopterus* Leech, 1891) y Hesperiinae Latreille, 1809 (partim) y dentro de ella la tribu Hesperiini Latreille, 1809 (con tres géneros *Thymelicus* Hübner, [1819], *Hesperia* Fabricius, 1793 y *Ochlodes* Scudder, 1872).

En esta entrega se tratan 32 especies que se encuentran en la Región Paleártica Oriental.

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 y, en varios casos, de la hembra (principalmente del género *Thymelicus*), 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:

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Via Castel Morrone, 19
I-20133 Milano
ITALIA / *ITALY*
E-mail: giancristoforo.bozano@fastwebnet.it

Antonio Vives Moreno
Sociedad Hispano-Luso-Americana de Lepidopterología
E-mail: avives1954@outlook.es
https://orcid.org/0000-0003-3772-2747

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Callima kenyensis Agassiz, sp. nov., description of a new species of Oecophoridae from Africa (Insecta: Lepidoptera)

David Agassiz

Abstract

A new species is described in the genus *Callima* Clemens, 1860 from Kenya, and this is compared with species from the Eastern Mediterranean and Zimbabwe.
Keywords: Insecta, Lepidoptera, Oecophoridae, *Callima*, new species, Kenya.

Callima kenyensis **Agassiz, sp. nov., descripción de una nueva especie de Oecophoridae de África (Insecta: Lepidoptera)**

Resumen

Se describe una nueva especie del género *Callima* Clemens, 1860 para Kenia y se compara con especies del este del Mediterráneo y Zimbabue.
Palabras calve: Insecta, Lepidoptera, Oecophoridae, *Callima*, nueva especie, Kenia.

Introduction

Berggren & Aarvik (2024) published a paper describing six species of the genus *Callima* Clemens, 1860 from the eastern Mediterranean and one from Zimbabwe. On receipt of this paper I looked at my specimens of Oecophoridae from Africa and it was immediately apparent that there was a further species of *Callima* from Kenya.

***Callima kenyensis* Agassiz, sp. nov.**
https://zoobank.org/DDDB960A-A805-4812-A098-6D163B9BD1DA

Type material: Holotype ♀: Kenya, Rift Valley, Turi, 8000ft, 2-III-2000 D. J. L. Agassiz. Paratypes, same locality as holotype, 2 ♂, 5-II-1999; 1 ♀, 12-II-1999; 1 ♀. 8-II-2000; 1 ♀, 6-III-2000. All of the type series were taken at light. Type series in due course to be deposited in the Natural History Museum, London (NHMUK).

Description of species (figure 1): Wingspan 9-12 mm. Head blackish brown, frons grey; labial palpus with basal segment dark brown, segment 2 white at base then dark brown, segment 3 with a white tip; scape dark brown, flagellomeres dark brown weakly annulate paler. Thorax dark brown, tegulae orange. Forewing pattern as for the genus as described by Berggren & Aarvik (2024), costal suffusion dull orange-brown, median yellow blotch absent, terminal dark fascia broad.

Characters and wing pattern are described in the same way as those in Berggren & Aarvik (2024.)

Male genitalia (figure 2): Valva evenly tapered, costa straight juxta lobes shorter than valva, phallus simple towards apex.

Female genitalia (figure 3): Posterior end of segment 8 without lobes, ductus bursae with an enlarged section.

Diagnosis: The wing markings are similar to those of other species in *Callima* but the subterminal yellow blotch is much smaller than in other species and the yellow fringe of the forewing is narrower or lacking. In the male genitalia the costal edge of the valva is straight near the tegumen and the juxta lobes arising from the base are short, as in *C. levantina.*

Derivation. The species is named after the country where it was found.

Discussion: As pointed out by Berggren & Aarvik (2024.) the *Callima icterinella* group of species are from the Eastern Mediterranean with one species, somewhat surprisingly, from Zimbabwe. The new species from high altitude in tropical Africa bridges the gap in the distribution of the genus and it will not be surprising if others occur, perhaps in Ethiopia.

Conflict of Interest

The author declares that he has no financial interest or personal relationship that could influence the work presented in this article.

Reference

Berggren, K., & Aarvik, L. (2024). *Callima icterinella* (Mann, 1867) comb. nov. (Lepidoptera, Oecophoridae), a complex consisting of seven species. *Norwegian journal of Entomology, 71*, 95-108.

David Agassiz
Department of Life Sciences
Insects' division
The Natural History Museum
GB-London SW1A 2BD
REINO UNIDO / *UNITED KINGDOM*
E-mail: david.agassiz@gmail.com
https://orcid.org/orcid.org/0000-0002-4300-8067

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Figures 1-3. 1. *Callima kenyensis* adult. **2.** ♂ genitalia. **3.** ♀ genitalia.

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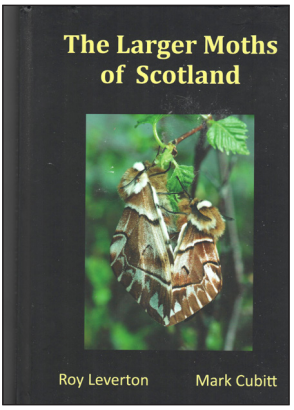
REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

R. Leverton & M. Cubitt
The Larger Moths of Scotland
322 páginas
Formato 30,0 x 21'5 cm
Triphosa Publications, Scotland, 2024
ISBN: 978-1-3999-7626-8



Tenemos en nuestras manos, un interesante libro sobre la fauna de los Macroheterocera presente en Escocia, donde tratan las especies de las familias Hepialidae (cinco especies), Cossidae (una especie), Sesiidae (siete especies), Zygaenidae (siete especies), Drepanidae (doce especies), Lasiocampidae (siete especies), Endromidae (una especie), Saturniidae (una especie), Sphingidae (catorce especies), Geometridae (doscientas veinte especies), Notodontidae (quince especies), Erebidae (cuarenta y seis especies), Noctuidae (ciento veinticinco especies) y Nolidae (cuatro especies).

La finalidad del libro es realizar un estudio sobre la fauna presente en esta zona geográfica analizando las poblaciones pasadas y presentes, realizando estudios analíticos y sobre los factores de influencia de las diversas especies consideradas en Escocia.

Comienza la obra con una serie de interesantes capítulos sobre la influencia de las especies, razas y variaciones, datos sobre la biogeografía de la zona y de la distribución de las especies para cada uno de los condados.

Ya dentro de la obra, es interesante destacar que casi todas las especies están fotografiadas en su entorno natural, que permiten identificarlas sin problemas en la mayoría de los casos. De todas y cada una de las especies consideradas, nos presentan el nombre común y el científico, el rango y distribución en la región considerada, periodos de vuelo y otros datos biológicos de interés y es importante destacar, que se presentan excelentes fotografías de los ejemplares e incluso, en muchos casos, sus estadios larvarios y ejemplares en cópula, que permiten distinguir los machos de las hembras.

La obra finaliza con un apartado sobre las posibles especies que fueron citadas, pero se han considerado introducciones esporádicas, por lo que hay que seguir estudiando si serian parte integrante de la fauna escocesa en el futuro; un mapa de la presencia de las diferentes especies encontradas en cada uno de los condados y una bibliografía muy completa.

No podemos terminar estas líneas, sin felicitar a los autores por este extenso y detallado trabajo realizado a lo largo de tantos años y a la Editorial por la excelente presentación del libro y la labor realizada. El precio de este libro es de 45 libras esterlinas y los interesados lo pueden pedir a:

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Antonio Vives Moreno
Sociedad Hispano-Luso-Americana de Lepidopterología
E-mail: avives1954@outlook.es
https://orcid.org/0000-0003-3772-2747

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Rediscovery of *Vadina hodeei hodeei* (Oberthür, 1881) in Colombia (Lepidoptera: Castniidae)

Robert Worthy & Jorge M. González

Abstract

We report on a specimen of *Vadina hodeei hodeei* (Oberthür, 1881) collected in 2019 and several more collected in 2024. As far as we can ascertain, the previously most recently collected dated specimen was in 1931, so the subspecies hadn't been collected for 88 years.
Keywords: Lepidoptera, Castniidae, *Vadina*, Colombia, Ecuador.

Redescubrimiento de *Vadina hodeei hodeei* (Oberthür, 1881) en Colombia (Lepidoptera: Castniidae)

Resumen

Informamos sobre un ejemplar de *Vadina hodeei hodeei* (Oberthür, 1881) recolectado en 2019, así como varios más en 2024. Basados en información a nuestra disposición, el ejemplar fechado más reciente conocido hasta ahora databa de 1931, por lo que esta subespecie no se había recolectado desde hacía 88 años.
Palabras clave: Lepidoptera, Castniidae, *Vadina*, Colombia, Ecuador.

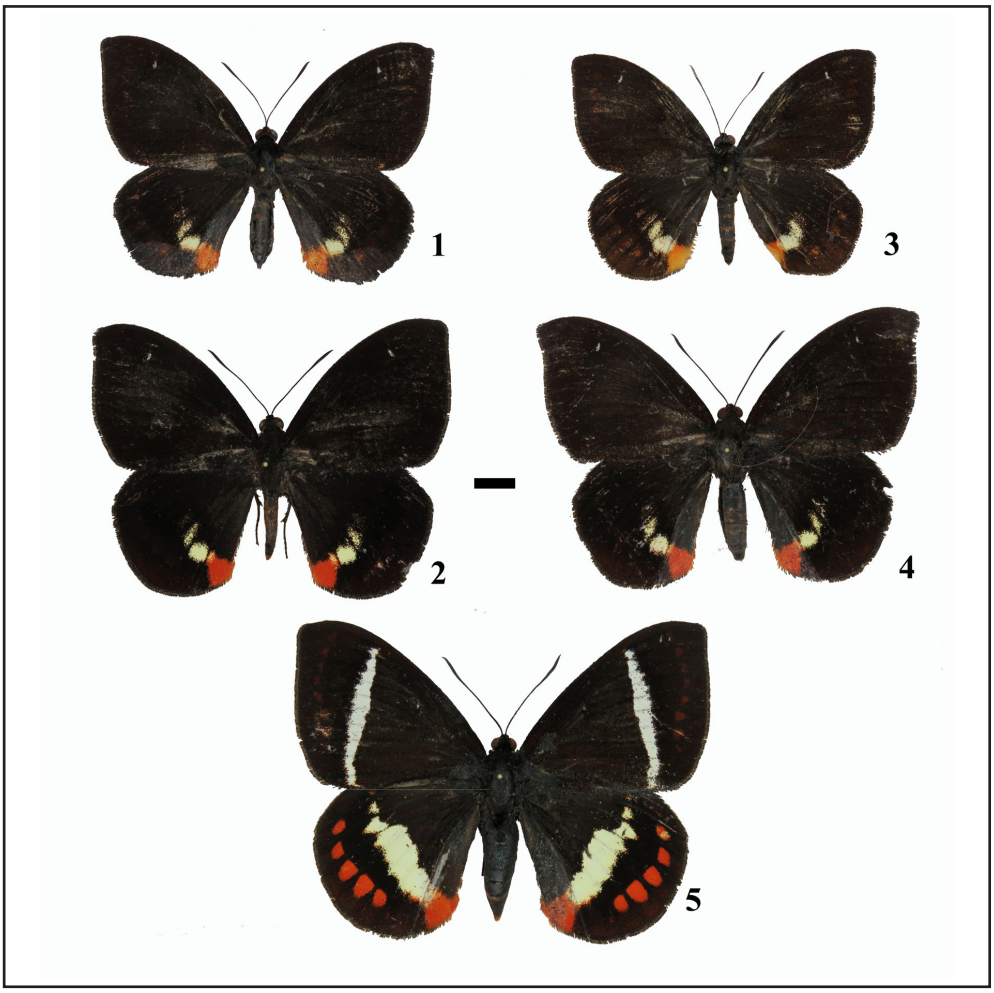
Introduction

In 2022, we published a revision of the Castniidae genera *Amauta* Houlbert, 1918 and *Divana* Miller, 1982 in which we described the new genus *Vadina* Worthy, González & Zilli, 2022 for *Castnia hodeei* Oberthür, 1881. In this paper (Worthy et al. 2022), after examining 33 institutional and private collections worldwide, we listed all known specimens of *V. hodeei*, which amounted to 12 males and 6 females. Apart from one male, the most recent specimen that carried a date was collected in 1931. The other male was collected at Quípama, Boyacá, Colombia in April 2019 by local collectors. Our friend Dirk Casteleyn was contacted by Javier Muñoz and was asked if he could identify the specimen. Dirk immediately recognised it as *V. hodeei*; it is now in his collection and is the first record of *V. hodeei* for 88 years!

After this, no more specimens were found in subsequent years until 2024, when Javier offered us eight males and one female. All of these specimens were collected at Otanche, Boyacá, Colombia in May 2024 by local collectors; Otanche and Quípama are only about 15 km from each other in the Magdalena valley. It is very surprising that after only one specimen was seen in the 93 years since the previous one was collected, so many should have been caught in one year, especially since Otanche is a fairly heavily collected locality, from where a lot of Lepidoptera, including several species of Castniidae, are regularly supplied (Salazar, 1999; Miller, 2008); it is well within the previously published range of the taxon (González et al. 2013; Worthy et al. 2022).

The current depositories of these new specimens are as follows: 4 ♂, 1 ♀ in coll. R. Worthy (Figures 1-5); 1 ♂ in coll. D. Casteleyn; 1 ♂ in coll. R. Hulsbosch; the remaining 2 ♂ are still with J. Muñoz. The full data of all previously collected specimens are listed in Worthy et al. (2022), along with photographs of the types.

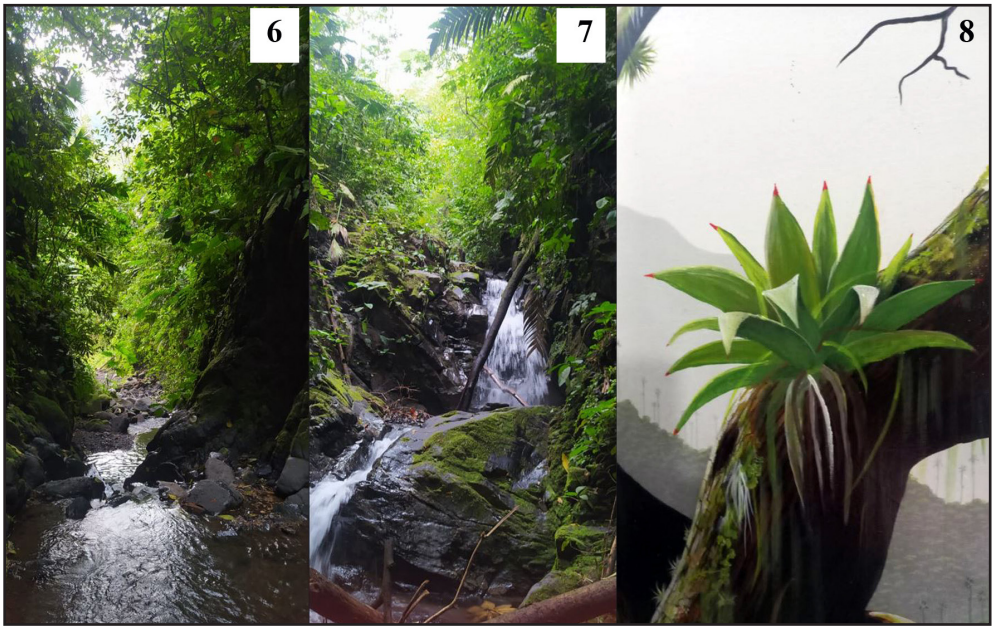
Figures 1-5. *Vadina hodeei hodeei* (Oberthür, 1881) adults. **1-4**. males; **5.** female; all specimens: Otanche, Boyacá, Colombia, May 2024, 500 masl (coll. R. Worthy).



In our previous paper (Worthy et al. 2022), we listed 22 ♂ and 5 ♀ of *V. hodeei kruegeri* (Niepelt, 1927) which we examined, Males of this subspecies are now regularly collected in Esmeraldas department in northwest Ecuador, although we have not been informed that any further females have been collected. We are now aware of 25 more males in the collection of Ramon Hulsbosch with the following data: ECUADOR PROV., Esmeraldas, Alto Tambo ♂, 00º53'N - 78º31'W, 1-30-XI-2016, 780 m, Coll. M. Bolaños, H. Thöny.

All recent specimens of *V. hodeei hodeei* have been found in the Magdalena Valley and we are told that it only flies in April and May at about 6:00 p.m. They fly in stream valleys (Figs. 6-7) and both sexes are regularly seen visiting an unidentified bromeliad (Figure 8).

Figures 6-8. Habitat and host of of *Vadina hodeei hodeei* (Oberthür, 1881) in the Magdalena Valley, Otanche, Boyacá, Colombia. **6-7.** Stream valleys where the subspecies typically flies. **8**. Unidentified bromeliad visited by *Vadina hodeei hodeei* (Oberthür, 1881).



This flight time ties in with what we reported in our previous paper (Worthy et al. 2022) for *V. hodeei kruegeri*, which we stated is crepuscular. More recent information is that subspecieas *kruegeri* flies in Ecuador near a small river in Chuchuví, Esmeraldas from May to November for only about 15 minutes per day between 6:15 and 6:30 p.m. (Ismael Aldas, pers. comm.).

Acknowledgements

We would like to thank Dirk Casteleyn (Belgium), Ramon Hulsbosch (Netherlands), Javier Muñoz M. (Chile) and Ismael Aldas (Ecuador) for supplying us with details of specimens and other useful information.

Conflict of Interest

The authors declare that they have no known financial interest or personal relationship that could have influence the work presented in this article.

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Worthy, R., González, J. M., & Zilli, A. (2022) A review of the genera *Amauta* Houlbert, 1918 and *Divana* J. Y. Miller, 1982 (Lepidoptera: Castniidae) with description of a new genus. *Zootaxa, 5194*(3), 301-342. https://doi.org/10.11646/zootaxa.5194.3.1 PMid:37045328

Robert Worthy
10 The Hill
Church Hill, Caterham
Surrey CR3 6SD
REINO UNIDO / *UNITED KINGDOM*
E-mail: castnia@btopenworld.com
https://orcid.org/0000-0003-0879-6472

y / *and*

*Jorge M. González
Austin Achieve Public Schools
Austin, Texas
(Research Associate, McGuire Center for Lepidoptera and Biodiversity)
EE.UU. / *USA*
E-mail: gonzalez.jorge.m@gmail.com
https://orcid.org/0000-0001-7208-7166

*Autor para la correspondencia / *Corresponding author*

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Hyperlais lutosalis (Mann, 1862) a new record to the Maltese Lepidoptera (Lepidoptera: Pyraloidea, Crambidae, Glaphyriinae)

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

Abstract

Hyperlais lutosalis (Mann, 1862) is reported for the first time from the Maltese Islands. A Maltese name is proposed for this new record.
Keywords: Lepidoptera, Pyraloidea, Crambidae, Glaphyriinae, *Hyperlais lutosalis*, Maltese Islands.

Hyperlais lutosalis **(Mann, 1862) nuevo para los Lepidoptera de Malta (Lepidoptera: Pyraloidea, Crambidae, Glaphyriinae)**

Resumen

Hyperlais lutosalis (Mann, 1862) se menciona por primera vez para Malta. Se propone un nombre maltés para este nuevo registro.
Palabras clave: Lepidoptera, Pyraloidea, Crambidae, Glaphyriinae, *Hyperlais lutosalis*, Malta.

Introduction

The superfamily Pyraloidea, a diverse taxonomic group encompassing approximately 16,000 described species worldwide (Heppner, 1991), showcases a notable regional variation in species distribution. In Europe, around 914 species have been documented (Nuss et al. 2004), reflecting a substantial presence of this superfamily. The Maltese Islands, despite their relatively small size, host a significant portion of Pyraloidea diversity, with 172 recorded species documented (Sammut, 2020), underscoring the importance of these islands as a habitat for a diverse array of moth species within the Pyraloidea. The genus *Hyperlais* Marion, 1959 is represented locally with two other species, *Hyperlais nemausalis* (Duponchel, 1834) and *Hyperlais argillacealis* (Zeller, 1847) (Sammut, 2020). *Hyperlais lutosalis* was originally described from Bursa, Turkey (Kemal et al. 2020). *Hyperlais lutosalis* (Mann, 1862) is being here added to the Maltese Lepidopterofauna.

Material examined

MALTA, 1 ♂, Żebbuġ, 17-II-2024, [35º52’5.86”N,14º26’20.35”E] [at light], A. Catania leg., in coll. A. Catania.

Discussion

According to Varenne & Nel (2011), the first reference to *Hyperlais lutosalis* in Europe was from

Southern France, noted under the synonym *Hyperlais cruzae* Agenjo, 1953. Subsequently, Gastón et al. (2015) recorded *Hyperlais lutosalis* from Spain, France, Sardinia, Croatia, and the European portion of Turkey. Although *Hyperlais lutosalis* typically appears in Europe in limited and scattered occurrences, reports indicate a significantly higher prevalence in North Africa, especially in countries like Morocco, Algeria, and Tunisia (Leraut, 2012). The biology of this species is yet unknown, but records indicate that it is on the wing between the months of February and August, possibly with two generations per year (Leraut, 2012). Honey & Riddiford (2015) extended the flight period to October and Varenne & Nel (2011) prolonged the flight period further to November. It flies in various altitudes between sea level in Almeria and 1400 metres in Espuña (Murcia). It is typical of arid semi-desert biotopes, inhabiting only the south-eastern tip of the Iberian Peninsula (Gastón et al. 2015). The species is new to the Maltese Lepidopterofauna and we propose the Maltese name Ħajperlajs Lewn it-Tafal after a transliteration of the scientific name.

Conclusion

The appearance of *Hyperlais lutosalis* in Malta is interesting, prompting considerations about the changing climate. Species from North Africa are increasingly making their way to southern Europe, seeking similar or even more favourable breeding grounds for their survival and proliferation. Recent records include *Eremopola lenis magnifica* (Rothschild, 1914), possibly driven with the southern wind from the coastal areas of Libya (Catania, et al. 2022). Another notable instance is *Drasteria philippina* (Austaut, 1880), a species typical of the North African semi-arid habitat (Catania, 2019). Other species that regularly visit our 250W Mercury lamp and 18W UV tubes are *Agrotis herzogi* Rebel, 1911, *Agrotis haifae* Staudinger,1897 and *Cerocala algirica* Oberthür,1876 all known to disperse and or migrate. Their records have increased, and this is always possible when they are assisted by currents from North Africa (Agius, 2022).

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Conflict of Interest

The authors declare that they have no known financial interest or personal relationship that could have influence the work presented in this article.

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*Aldo Catania
27, Rama-Rama, Triq Mons, Anton Cilia
MT-Żebbuġ, ŻBĠ3140
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*
E-mail: seguna@onvol.net
https://orcid.org/0000-0002-6264-0690

John J. Borg
National Museum of Natural History
Vilhena Palace, Pjazza San Publju
MT-Imdina, MDN1011
MALTA / *MALTA*
E-mail: john.j.borg@gov.mt
https://orcid.org/0000-0002-0587-3682

Paul Sammut
137/2, Dingli Road
MT-Rabat, RBT9023
MALTA / *MALTA*
E-mail: farfett@onvol.net
http://orcid.org/0000-0002-2019-9577

*Autor para la correspondencia / *Corresponding author*

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REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

J. H. H. Zwier
Aganainae of the World
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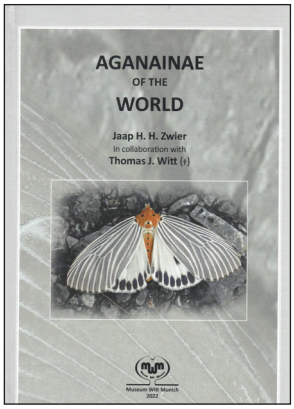

Tenemos en nuestras manos, un interesante libro sobre la fauna de la subfamilia Aganainae Boisduval, 1933, del mundo, de la mano de Jaap H. H. Zwier, que ha contado con la colaboración de Thomas J. Witt (†), Axel Hausmann, Jeremy D. Holloway, Igor Kostjunk, Scott E. Miller, Jerôme Morinière y Wolfgang Speidel, lo que aumente más la calidad de la obra.

Los Aganainae, dentro de los Erebidae Leach, [1815] se distribuyen por el sudeste de Asia, Indonesia y Australia con Papuasia, Micronesia y Melanesia, llegando desde Filipinas por China y llegando hasta Japón y Corea; península arábiga y con las especies incluidas en los géneros *Mecodina* Guenée, 1852 y *Psimada* Walker, 1858, que no se tratan en esta monografía, también hay que incorporar, en su distribución, al continente africano.

Después de una prefacio, agradecimiento y mapa de distribución, el autor nos presenta una lista detallada de las especies que forman parte de los Aganainae y trata los géneros *Agape* Felder, 1874, *Euplocia* Hübner, [1819], *Neochera* Hübner, [1819], *Asota* Hübner, [1819], *Sommeria* Hübner, [1831], *Phaegorista* Boisduval, [1836], *Stemonoceras* Karsch, 1895, *Soloe* Walker, 1854, *Soloella* Gaede, 1926 y *Calpoparia* Watson, 1980. Describiéndose ocho nuevas especies, una nueva subespecie, dos nuevas sinonimias y treinta nuevas combinaciones, lo que aumenta el valor del trabajo realizado.

Ya dentro de la obra, es interesante destacar que todas las especies están tratadas científicamente incluida la descripción original, sus sinonimias, diagnosis, distribución, datos genéticos, con fotografías a todo color de los adultos en veinticuatro planchas y de la genitalia del macho y de la hembra en diecinueve planchas y una más de ejemplares fotografiados en vivo, finalizando con una detallada bibliografía y un índice.

No podemos terminar estas líneas, sin felicitar al autor por este extenso y detallado trabajo realizado a lo largo de tantos años y a la Editorial por la excelente presentación del libro y continua con su excelente calidad, obra que no puede faltar en cualquier biblioteca que se precie. El precio de este libro es de 179 euros y los interesados lo pueden pedir a:

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Antonio Vives Moreno
Sociedad Hispano-Luso-Americana de Lepidopterología
E-mail: avives1954@outlook.es
https://orcid.org/0000-0003-3772-2747