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Madrid
2023

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The Pterophoridae fauna of Khakassia Republic and south of Krasnoyarsk region (Russia) (Insecta: Lepidoptera)

Petr Ya. Ustjuzhanin & Roman E. Maksimov

Abstract

The article gives a faunal list of Pterophoridae species of Khakassia Republic and the south of Krasnoyarsk region. We have examined 41 localities, as a result of which, 24 species are reported for this region for the first time. In total, 40 Pterophoridae species are currently known for the Republic of Khakassia and for the south of Krasnoyarsk region.
Keywords: Insecta, Lepidoptera, Pterophoridae, biodiversity, fauna, new data, south of the Krasnoyarsk region, Khakassia, Russia.

La fauna de Pterophoridae de la República de Jakasia y el sur de la región de Krasnoyarsk (Rusia) (Insecta: Lepidoptera)

Resumen

El artículo ofrece una lista faunística de las especies de Pterophoridae de la República de Jakasia y el sur de la región de Krasnoyarsk. Hemos examinado 41 localidades, como resultado de lo cual, 24 especies se registran para esta región por primera vez. En total, se conocen actualmente 40 especies de Pterophoridae para la República de Jakasia y para el sur de la región de Krasnoyarsk.
Palabras clave: Insecta, Lepidoptera, Pterophoridae, biodiversidad, fauna, nuevos datos, sur de la región de Krasnoyarsk, Jakasia, Rusia.

Introduction

Khakassia and the south of Krasnoyarsk region are limited from the west by the mountain ranges of the Kuznetsky Alatau and the Abakan Ridge. In the south, the main ridge of the West Sayans is the border line with the Republic of Tuva, and in the north, the East Sayan foothills enter the region from the southeast to the northwest. The height of these mountain ranges reaches 2500-3000 a.s.l. in some parts. The mountain territories of the region are mainly represented by forests, taiga, and high-mountain tundra. The Minusinsk lowland territory is represented by steppe and forest-steppe landscapes. Such a diverse combination of natural zones within the study area allowed us to count on interesting findings of Pterophoridae that met our expectations.

The first data on the Pterophoridae fauna of the Republic of Khakassia were published in 2018 (Ustjuzhanin & Kovtunovich, 2018). Then this list included only 17 species, which was due to the lack of specimens and absence of special studies on the territory of Khakassia. In recent years, the study of species composition of Heterocera in the Khakassia and the south of the Krasnoyarsk region has received a new impetus (Maksimov et al. 2019; Lostchev & Maksimov, 2021; Maksimov et al. 2022).

Due to more extensive and systematic research conducted in the region, the entomological material collected over several years made it possible to identify more than 200 species of Heterocera previously not noted in this region. The current study has significantly enlarged the species composition of Khakassian Pterophoridae due to the special research and collection of Pterophoridae specimens by Roman Maksimov, the second author of this article. Besides that, the research area has been expanded in accordance with its allocation in Catalogue of the Lepidoptera of Russia (Sinev, 2019) (Figures 1, 2). As a result, during the last five years 32 species have been revealed, 24 of which proved to be new for Khakassia and the south of the Krasnoyarsk region. In general, considering the known data (Ustjuzhanin & Kovtunovich, 2018), at present the Pterophoridae fauna of Khakassia counts for 40 species.

Figure 1. The location of Khakassia and South of Krasnoyarsk region in Russian Federation.

Material and methods

All the specimens used in our work were taken from private collections during the period from 2015 to 2022. All the current collection specimens were gathered by us on the territory of Khakassia and south of Krasnoyarsk region in 41 localities with different habitat characteristics, from the steppe zone to the alpine area of the West Sayan, and the Kuznetsky Alatau. Several specimens were caught in the daylight by standard methods, with butterfly net. Most of them were caught at nighttime on the light screen. All the specimens are preserved and stored in private collections of Roman. E. Maksimov in Abakan and Petr Ya. Ustjuzhanin in Novosibirsk.

Collecting localities in Khakassia and South of Krasnoyarsk region

1. Abakan - Russia, Khakassia, Abakan town, 53º43’23”N, 91º26’18”E, a.s.l. 248 m.
2. Ayan -Khakassia, Askyz district, West Sayans, Abakansky ridge, Ayan mount pass, mount taiga, subalpine meadow. 53º21’16”N, 89º36’54”E, a.s.l. 948 m.
3. Bograd - Russia, Khakassia, Bograd district, near Bograd settlement, meadow and forest hills. 54º13’12”N, 90º53’18”E, a.s.l. 493 m.

4. Bolshoe Dikoye - Russia, Khakassia, Bograd district, near Tumannoe station, Bolshoe Dikoye lake. Forest meadow. 54º06'35"N, 90º21'03"E, a.s.l. 828 m.
5. Byrikchul cave - Russia, Khakassia, Askiz district, West Sayans, foothills of Abakansky ridge, forest-steppe hills, near Byrikchul, below the cave. 53º18'41"N, 89º54'58"E, a.s.l. 567m.
6. Efremkino (Ancestor Trail) - Russia, Khakassia, Kuznetsky Alatau mountains, Shira district, near Efremkino village, beginning of "Ancestor Trail", mountain meadows, SW-exposition slope. 54º27'10"N, 89º27'22"E, a.s.l. 531 m.
7. Efremkino (marmoreal career) - Khakassia, Shira district, Kuznetsky Alatau mountains, near Efremkino village, marmoreal career over, forest-steppe meadow. 54º26'21"N, 89º26'07"E, a.s.l. 671 m.
8. Efremkino (Pandora's Box trail) - Khakassia, Shira district, Kuznetsky Alatau mountains, near Efremkino village, the path to the Pandora's Box cave, taiga mountain meadow, rocky slopes, 54º25'51"N, 89º27'34"E, a.s.l. 524 m.
9. Efremkino (Tomichka) - Russia, Khakassia, Kuznetsky Alatau mountains, Shira district, near Efremkino village, meadow on the "Tomichka" camp. 54º27'24"N, 89º26'56"E, a.s.l. 493 m.
10. Ergaky (Gornaya Oya) - South of the Krasnoyarsk region, Ermakovskoe district, West Sayans, Ergaky ridge, "Gornaya Oya" camp, high mountain taiga, subalpine meadow 52º48'11"N, 93º14'54"E, a.s.l. 1418 m.
11. Ergaky (Gornaya Oya) 2 - Russia, South of the Krasnoyarsk region, West Sayans, Ergaky ridge, naer "Gornaya Oya" camp, subalpic meadow. 52º47'51"N, 93º14'01"E, a.s.l. 1539 m.
12. Gladenkaya - Khakassia, Beya district, West Sayans, Gladenkaya mountain, mountain taiga and tundra, kurumniky, (N-exposition slope). 52º56'11"N, 91º22'34"E, a.s.l. 1231 m.
13. Grjady - South of the Krasnoyarsk region, Minusinsk district, near Bystraya village, Funtikov's mountain, steppe hills (S-exposition slope), 53º44'21"N, 91º33'38"E, a.s.l. 358 m. Note: Following W. Kozhantshikov's instructions, we can only approximately guess which point the author called "Grjady" (Koshantshikov, 1923). From several possible and very similar points, we have chosen this one, guided mainly by the least influence of the anthropogenic factor on it.
14. Ivanovskaya mountain - Khakassia, Ordzenikidze district, Kuznetsky Alatau mountains, near Prijiskovoye, Ivanovskaya mountain, alpine meadow, and high mountain tundra, 54º37'32"N, 88º36'01"E, a.s.l. 1315 m.
15. Karasuk - Russia, Khakassia, Bograd district, near Karasuk village, forrest-steppe stone hills. 54º19'37"N, 90º36'51"E, a.s.l. 514 m.
16. Khan-Kul - Russia, Khakassia, Askyz district, near Khan-Kul Lake, steppe rocky hill. 53º22'04"N, 90º52'11"E, a.s.l. 338 m.
17. Lugavskoye - Russia, South of the Krasnoyarsk region, near Lugavskoye lake, forest-steppe tall grass hill meadow. 53º30'18"N, 91º53'27"E, a.s.l. 410 m.
18. Maliy Kyzykul - Russia, South of the Krasnoyarsk region, near Maliy Kyzykul lake, meadow and forest. 53º45'26"N, 92º12'53"E, a.s.l. 342 m.
19. Manysh and Bolshoy On - Russia, Khakassia, West Sayans, Tashtyp district, near Bolshoy on and Manysh rivers merger, high-mountain taiga, meadow, 51052'36"N, 89º48'8"E, a.s.l. 1122 m.
20. Minusinsk pine forest - Russia, South of the Krasnoyarsk region, Minusinsk pine forest, meadov, 53º39'15"N, 91º35'15"E, a.s.l. 308 m.
21. Oglahty - Russia, Khakassia, Bograd district, Khakassky state National Reserve, "Oglahty" area, motley grass steppe, rocky hills. 53º58'59"N, 91º29'43"E, a.s.l. 258 m.
22. Oglahty 2 - Russia, Khakassia, Bograd district, Khakassky state National Reserve, "Oglahty" area, motley grass steppe, rocky hills. 53º59'22"N, 91º30'00"E, a.s.l. 317 m. (Figure 3).
23. Oglahty 3 - Russia, Khakassia, Bograd district, Khakassky state National Reserve, "Oglahty" area, motley grass steppe, rocky hills. 53º59'06.81"N, 91º28'44.47"E, a.s.l. 282 m.
24. Pazykol lake - Russia, Khakassia, Bograd district, 5th km Tumannoe-Sorsk road., Pazykol lake, steppe hill. 54º03'57"N, 90º17'43"E, a.s.l. 754 m.

25. Podlunnaya - Russia, Khakassia, Shira district, Kuznetsky Alatau mountains, close Kommunar mine, Podlunnaya mount top, subalpine meadow, mountain taiga. 54º19'12"N, 89º13'36"E, a.s.l. 1303 m.
26. Podlunnaya 2 - Khakassia, Shira district, Kuznetsky Alatau mountains, close Kommunar mine, Podlunnaya mountain top, subalpine meadow, mount tundra 54º18'47"N, 89º13'32"E, a.s.l. 1344 m.
27. Podlunnaya 3 - Russia, Khakassia, Kuznetsky Alatau mountains, Shira district, close Kommunar mine, Podlunnaya mount top, high-mountain tayga and subalpine meadow, 54º18'36"N, 89º13'39"E, a.s.l. 1322 m.
28. Podlunnaya 4 - Russia, Khakassia, Shira district, Kuznetsky Alatau mountains, close Kommunar mine, Podlunnaya mount top, high-mountain taiga and subalpine meadow, 54º18'35"N, 89º13'41"E, a.s.l. 1316 m.
29. Podlunnaya 5 - Russia, Khakassia, Shira district, Kuznetsky Alatau mountains, close Kommunar mine, Podlunnaya mount top, subalpine meadow, mountain taiga. 54º19'12"N, 89º13'36"E, a.s.l. 1303 m.
30. Podsineye - Russia, Khakassia, Altay district, near Podsineye village, meadow on river the Enissey river. 53º40'21"N, 91º34'02"E, a.s.l. 246 m.
31. Prijiskovoye - Khakassia, Ordzenikidze district, Kuznetsky Alatau mountains, near Prijiskovoye, subalpine meadow and high mountain taiga, 54º39'56"N, 88º40'54"E, a.s.l. 980 m.
32. Saylig-Khem-Taiga - Khakassia, Tashtyp district, West Sayans, Saylig-Khem-Taiga ridge, highmountain tundra, 51º42'55"N, 89º53'09"E, a.s.l. 2140 m. (Figure 4).
33. Snow Leopard - Khakassia, Tashtyp district, West Sayans, near "Snow Leopard" camp, highmountain taiga and high-mountain tundra, 51º49'59"N, 89º46'41"E, a.s.l. 1385 m.
34. Silver Pine forest - Russia, South of the Krasnoyarsk region, Krasnoturansk district, "Silver Pine forest" camp, forest-steppe, 54º15'58"N, 91º31'49"E, a.s.l. 245 m.
35. Sugesh - Russia, Khakassia, Tashtyp district, West Sayans, "Sugesh" camp, mountain taiga. 52º43'03"N, 89º55'19"E, a.s.l. 575 m.
36. Tumannoe - Russia, Khakassia, Bograd district, near Tumannoe station, forest meadow. 54º05'25"N, 90º19'43"E, a.s.l. 801 m.
37. Tyoia - Russia, Khakassia, Askiz district, West Sayans, Abakansky ridge, near Vershina Tyoia, mountain taiga, subalpine meadow. 53º17'29"N, 89º33'50"E, a.s.l. 1024 m.
38. Tyoia 2 - Russia, Khakassia, Askiz district, West Sayans, Abakansky ridge, near Vershina Tyoia, mountain taiga, subalpic meadow. 53º15'29.91"N, 89º33'00.05"E, a.s.l. 963 m.
39. Uytag - Russia, Khakassia, Askiz district, near Uytak station, Sarj hills, the foot of mountain Uytag, steppe rocky hills. W-exposition slope. 53º18'47"N, 90º47'11"E, a.s.l. 350 m.
40. Verh-Bidja - Russia, Khakassia, Ust-Abakan district, near Verh-Bidja village, forest-steppe hills, motley grass meadow, pine forest. 53º58'34"N, 90º44'39"E, a.s.l. 673 m. (Figure 5).
41. Verh-Bidja 2 - Russia, Khakassia, Ust-Abakan district, near Verh-Bidja village, forest-steppe hills. 54º00'36"N, 90º58'38"E, a.s.l. 642 m.

List on the Pterophoridae fauna of the Republic of Khakassia and the South of Krasnoyarsk region (Russia)

Agdistis adactyla (Hübner, [1823])

Material: Grjady, 1 ♀, 11-VIII-2020; Silver Pine Forest, 1 ex., 13-VII-2019.

Distribution: Temperate zone of the Palearctic.

Paraplatyptilia metzneri (Zeller, 1841)

Material: Verh-Bidja, 1 ♀, 17-VI-2020.

Distribution: Europe, Iran, Asia Minor, Armenia, Azerbaijan, Kyrgyzstan, Uzbekistan, Kazakhstan, Tajikistan, NW China, South Siberia, Mongolia (Ustjuzhanin & Kovtunovich, 2018).

Paraplatyptilia sibirica (Zagulajev, 1983)

Material: Saylig-Khem-Taiga, 1 ♂, 08-VII-2020.

Distribution: Subpolar regions of the European part of Russia, Siberia and the Far East, mountains of southern Siberia (Sinev 2019). **New species for the Republic of Khakassia**.

Paraplatyptilia terminalis (Erschoff, 1877)

Material: Efremkino (marmoreal career), 1 ♂, 1 ♀, 16-VI-2018; Ergaky (Gornaya Oya) 2, 1 ♂, 20-VII-2019.

Distribution: Siberia, NE China, Russian Far East (Kamchatka) (Ustjuzhanin, 1996). **New species for the Republic of Khakassia**.

Platyptilia calodactyla ([Denis & Schiffermüller], 1775)

Material: Podlunnaya 2, 1 ♂, 13-VII-2018; Ergaky (Gornaya Oya), 1 ♂, 19-VII-2019; Oglahty, 1 ♀, 28-VIII-2019; Podlunnaya 2, 6 ex, 27-VII-2019; Verh-Bidja, 1 ♂, 17-VI-2020; Snow Leopard, 1 ♂, 10-VII-2020; Efremkino (Ancestor Trail), 3 ex., 07-VIII-2020; Podlunnaya, 5 ex., 04-VII-2020; Podlunnaya 3, 4 ex., 22-VII-2022; Ivanovskaya mountain, 1 ♀, 10-VII-2022; Uytag, 2 ex., 25-VI-2022; Podlunnaya 4, 2 ♂♂, 01-VII-2022.

Distribution: Europe, Kazakhstan, Siberia, Russian Far East, Mongolia, China (Ustjuzhanin 1996). **New species for the Republic of Khakassia**.

Platyptilia farfarella Zeller, 1867

Material: Pazykol lake, 17 ex., 29-30-VII-2022.

Distribution: Europe, Africa, Western Asia, Caucasus, Siberia, Russian Far East, Japan, Taiwan, Mongolia, Kazakhstan (Ustjuzhanin, 1996). **New species for the Republic of Khakassia**.

Platyptilia nemoralis Zeller, 1841

Material: Tyoia 1 ♂, 30-VI-2018; Maliy Kyzykul, 1 ♂, 1 ♀, 21-VII-2018; 1 ♂, 1 ♀, 27-VI-2020.

Distribution: Europe, Siberia, Russian Far East (Primorye, the Kuril Islands), Japan (Ustjuzhanin, 1996), China (Xinjiang) (Li et al. 2002). **New species for the Republic of Khakassia**.

Gillmeria pallidactyla (Haworth, 1811)

Material: Podlunnaya 2, 2 ♂♂, 1 ♀, 13-VII-2018; Verh-Bidja, 2 ♂♂, 17-VI-2020; Ayan, 1 ♂, 1 ♀, 24-VI-2020 Maliy Kyzykul, 1 ♂, 27-VI-2020; Ivanovskaya mountain, 1 ♀, 10-VII-2022; Prijiskovoye, 2 ♂, 11-VII-2022; Tumannoe, 1 ♂, 29-VII-2022.

Distribution: Temperate zone of the Palearctic; North America (Ustjuzhanin et al. 2017).

Gillmeria stenoptiloides (Filipjev, 1927)

Material: Efremkino (Pandora's Box trail), 1 ♂, 14-VII-2018; Uytag, 1 ♂, 25-VI-2022; Pazykol lake, 1 ♂, 1 ♀, 29-30-VII-2022; Byrikchul cave, 1 ♂, 06-VIII-2022.

Distribution: Siberia, Russian Far East, Mongolia, China, Japan (Honshu) (Ustjuzhanin et al. 2017).

Amblyptilia punctidactyla (Haworth, 1811)

Material: Manysh and Bolshoy On, 1 ♀, 29-VI-2019; Maliy Kyzykul, 1 ♂, 12-X-2019; Tyoia 2, 1 ♂, 22-VI-2019; Sugesh, 1 ♂, 16-VIII-2020; 1 ♀, 05-VI-2022; Abakan, 1 ♂, 19-VI-2022; Verh-Bidja 2, 1 ♂, 20-VII-2022.

Distribution: Temperate zone of the Palearctic (Ustjuzhanin et al. 2017). **New species for the Republic of Khakassia**.

Stenoptilia bipunctidactyla (Scopoli, 1763)

Material: Gladenkaya, 1 ♂, 10-VII-2018; Grjady, 1 ♂, 11-VIII-2020.

Distribution: Europe, North Africa, Western Asia, Iran, Polar Ural, southern Siberia, Mongolia, Russian Far East (southern Primorye) (Ustjuzhanin et al. 2017). **New species for the Republic of Khakassia**.

Stenoptilia graphodactyla (Treitschke, 1833)
Material: Lugavskoye, 1 ♂, 07-VII-2019, Karasuk, 1 ♂, 31-VII-2020.
Distribution: Europe, Siberia, China (Shanxi, Xinjiang) (Ustjuzhanin et al. 2017). **New species for the Republic of Khakassia**.

Stenoptilia latistriga Rebel, 1916
Material: Saylig-Khem-Taiga, 1 ♂, 29-VI-2019; 5 ex., 08-VIII-2020.
Distribution: Altai, Tuva, Buryatia, Irkutsk Region (Ustjuzhanin et al. 2017); Khakassia. **New species for the Republic of Khakassia**.

Stenoptilia lasani Ustjuzhanin, Rekelj & Kovtunovich, 2017
Material: Lugavskoye, 1 ♂, 19-VI-2018; Oglahty, 1 ♀, 28-VIII-2019; Pazykol lake, 1 ♂, 30-VII-2022.
Distribution: Tuva, Khakassia. **New species for the Republic of Khakassia**.
Note: Rare local species described from Tuva (Ustjuzhanin et al. 2017)

Stenoptilia nolckeni (Tengstrom, 1869)
Material: Verh-Bidja 2, 1 ♂, 20-VII-2022; Bograd, 6 ex., 27-VII-2022.
Distribution: North Europe, Kazakhstan, Middle Asia, Siberia, Russian Far East, Korea (Ustjuzhanin et al. 2017). **New species for the Republic of Khakassia**.

Stenoptilia pterodactyla (Linnaeus, 1761)
Material: Ergaky (Gornaya Oya), 1 ♀, 19-VII-2019; Grjady, 1 ♀, 19-VI-2020.
Distribution: Europe, Asia Minor, Transcaucasia, Kazakhstan, Kyrgyzstan, southern Siberia, Primorye, North America (Ustjuzhanin, 1996). **New species for the Republic of Khakassia**.

Stenoptilia stigmatodactyla (Zeller, 1852)
Material: Grjady, 1 ♂, 11-VIII-2020.
Distribution: Europe, Transcaucasia, Iran, Kazakhstan, South Siberia, Yakutia, Magadan region (Ustjuzhanin et al. 2017). **New species for the Republic of Khakassia**.

Cnaemidophorus rhododactylus ([Denis & Schiffermüller], 1775)
Material: Pazykol Lake, 1 ♂, 30-VII-2022.
Distribution: Holarctic (Ustjuzhanin et al. 2017).

Procapperia kuldschaensis (Rebel, 1914)
Material: Byrikchul cave, 1 ♂, 1 ♀, 06-VIII-2022.
Distribution: Kazakhstan, Middle Asia, South Siberia (Altai, Kemerovo Region, Tuva, Khakassia), Mongolia, China (Xinjang) (Ustjuzhanin et al. 2017). **New species for the Republic of Khakassia**.

Crombrugghia tristis (Zeller, 1839)
Material: Grjady, 1 ♂, 11-VIII-2020.
Distribution: Europe, Turkey, Syria, Caucasus, Iran, Central Asia, southern Siberia (Ustjuzhanin, 1996), China (Shaanxi) (Li et al. 2002). **New species for the Republic of Khakassia**.

Gypsochares kyraensis (Ustjuzhanin, 1996)
Material: Verh-Bidja 2, 1 ♂, 20-VII-2022

Distribution: Southern Transbaikalia, Khakassia. **New species for the Republic of Khakassia**.

Note: Unique finding! Rare local species described from southern Transbaikalia (Ustjuzhanin, 1996). The habitat of this species has extended more than at two thousand kilometres to West.

Oidaematophorus constanti (Ragonot, 1875)

Material: Verh-Bidja, 1 ♀, 17-VI-2020.

Distribution: Europe, southern Ural, southern Siberia: Altai, Khakassia. **New species for the Republic of Khakassia**.

Note: Rare, local species, found in Russia only recently, first in Altai (Huemer et al. 2016; Ustjuzhanin et al. 2019), then in southern Urals (Nupponen, 2022), now in Khakassia. This finding is the most eastern in its area of habitat.

Oidaematophorus lithodactylus (Treitschke, 1833)

Material: Maliy Kyzykul, 1 ♂, 10-VIII-2019; Sugesh, 1 ♀, 03-VIII-2019.

Distribution: Europe, Asia Minor, Caucasus, Iran, Central Asia, Southern Ural, Siberia, south of Russian Far East, Japan (Ustjuzhanin et al. 2017), China (Xinjiang) (Li et al. 2002). **New species for the Republic of Khakassia**.

Merrifieldia leucodactyla ([Denis & Schiffermüller], 1775)

Material: Karasuk, 4 ex., 31-VII-2020; Bograd, 12 ex., 27-VII-2022; Byrikchul, 3 ex., 06-VIII-2022.

Distribution: North Africa, Europe, Armenia, Kazakhstan, Middle Asia, Siberia, Russian Far East, China (Shanxi), Mongolia (Ustjuzhanin et al. 2017). **New species for the Republic of Khakassia**.

Emmelina monodactyla (Linnaeus, 1758)

Material: Minusinsk pine forest, 2 ex., 10-X-2018; Oglahty 2, 1 ♂, 05-V-2019; Oglahty 3, 2 ex., 28-IV-2019; 2 ex., Maliy Kyzykul, 12-X-2019; Podsineye, 1 ♀, 08-IV-2020; Khan-Kul, 1 ♂, 03-V-2022.

Distribution: North Africa, Europe, the Caucasus, Central Asia, Kazakhstan, southern Siberia east to Tuva, Mongolia, China, India, Philippines, North and South America (Ustjuzhanin et al. 2017).

Hellinsia chrysocomae (Ragonot, 1875)

Material: Verh-Bidja 2, 1 ♂, 20-VII-2022; Bograd, 1 ♂, 27-VII-2022,

Distribution: Europe, Kazakhstan, Middle Asia, China, Mongolia, Siberia, Russian Far East (Ustjuzhanin & Kovtunovich, 2007a). **New species for the Republic of Khakassia**.

Hellinsia didactylites (Strom, 1783)

Material: Podlunnaya, 1 ♂, 04-VII-2020; Oglahty, 1 ♀, 09-VII-2022.

Distribution: Europe, Caucasus, Kazakhstan, Middle Asia, Siberia, Far East of Russia, China (Shaanxi, Jilin) (Ustjuzhanin & Kovtunovich, 2007a). **New species for the Republic of Khakassia**.

Hellinsia innocens (Snellen, 1884)

Material: Verh-Bidja, 1 ♂, 17-VI-2020; Verh-Bidja 2, 1 ♂, 20-VII-2022.

Distribution: Southern Siberia, south of Russian Far East; Mongolia, China (Ustjuzhanin, 1996); Altai (Nupponen, 2022). **New species for the Republic of Khakassia**.

Hellinsia lienigiana (Zeller, 1852)

Material: Verh-Bidja, 1 ♂, 14-VII-2018; Maliy Kyzykul, 1 ♂, 27-VI-2020; Efremkino (Tomichka), 1 ♂, 23-VII-2022.

Distribution: Europe, North Africa, Armenia, Iran, India, south Siberia, south of Russian Far East, Japan, Korea, China (Shaanxi, Zhejiang, Fujian, Jiangxi, Shandong, Hunan, Guizhou), Taiwan, North and Central America, New Guinea (Ustjuzhanin et al. 2015; Li et al. 2002).

Hellinsia osteodactyla (Zeller, 1841)

Material: Podlunnaya 2, 1 ♂, 13-VII-2018; Podlunnaya, 1 ♂, 04-VII-2020.

Distribution: Europe, Caucasus, Central Asia, Kazakhstan, Siberia, the Far East, Mongolia, Japan (Ustjuzhanin et al. 2015), China (Heilongjiang, Shandong, Shanxi, Xinjiang, Yunnan, Ningxia) (Li et al. 2002). **New species for the Republic of Khakassia**.

Calyciphora albodactyla (Fabricius, 1794)

Material: Verh-Bidja 2, 1 ♂, 20-VII-2022; Bolshoe Dikoye, 1 ♂, 29-VII-2022.

Distribution. Europe, Southern Siberia: Irkutsk, Kemerovo regions, Khakassia. **New species for the Republic of Khakassia**.

Note: The first indication for Siberia (Irkutsk) was published (Arenberger, 1995) as a synonym of *Calyciphora xerodactyla* (Zeller, 1841). Later (Ustjuzhanin, 1996) mistakenly identified as *Calyciphora nephelodactyla* (Eversmann, 1844), indicated for Taishet (Irkutsk Region). In another paper by the author (Ustjuzhanin, 2001), this species as *Calyciphora xerodactyla* is recorded for the vicinity of Kuzedeevo village, Kemerovo Region, found in a relict linden grove.

Conclusion

The southern Siberia is rich in the diversity of natural landscapes and abundance of flora and fauna. Concerning the Pterophoridae fauna, the most studied is Altai, from where 54 species are known (Ustjuzhanin & Kovtunovich, 2007; Huemer et al. 2016; Nupponen, 2022), 37 species are known from Tyva (Ustjuzhanin et al. 2017) and 45 from Buryatia (Ustjuzhanin & Kovtunovich, 2007b). The territory of Khakassia and south of Krasnoyarsk region are profitably located between the western and eastern portions of southern Siberia. From one hand, the west-Palaearctic species penetrate there: *Paraplatyptilia metzneri*, *Oidaematophorus constanti, Calyciphora albodactyla*, from the other hand - east-Palaearctic species: *Paraplatyptilia terminalis, Gillmeria stenoptiloides, Gypsochares kyraensis, Hellinsia innocens.* At the same time, in Khakasia there are its own typical central-Asian species: *Procapperia kuldschaensis, Stenoptilia lasani, Stenoptilia latistriga.* All this determines the picture of biodiversity of the Lepidoptera fauna, in particular, Pterophoridae, of Khakassia and south of Krasnoyarsk region, which allows to suggest a further increase in the plume moths species composition during the next study for at least 10 species.

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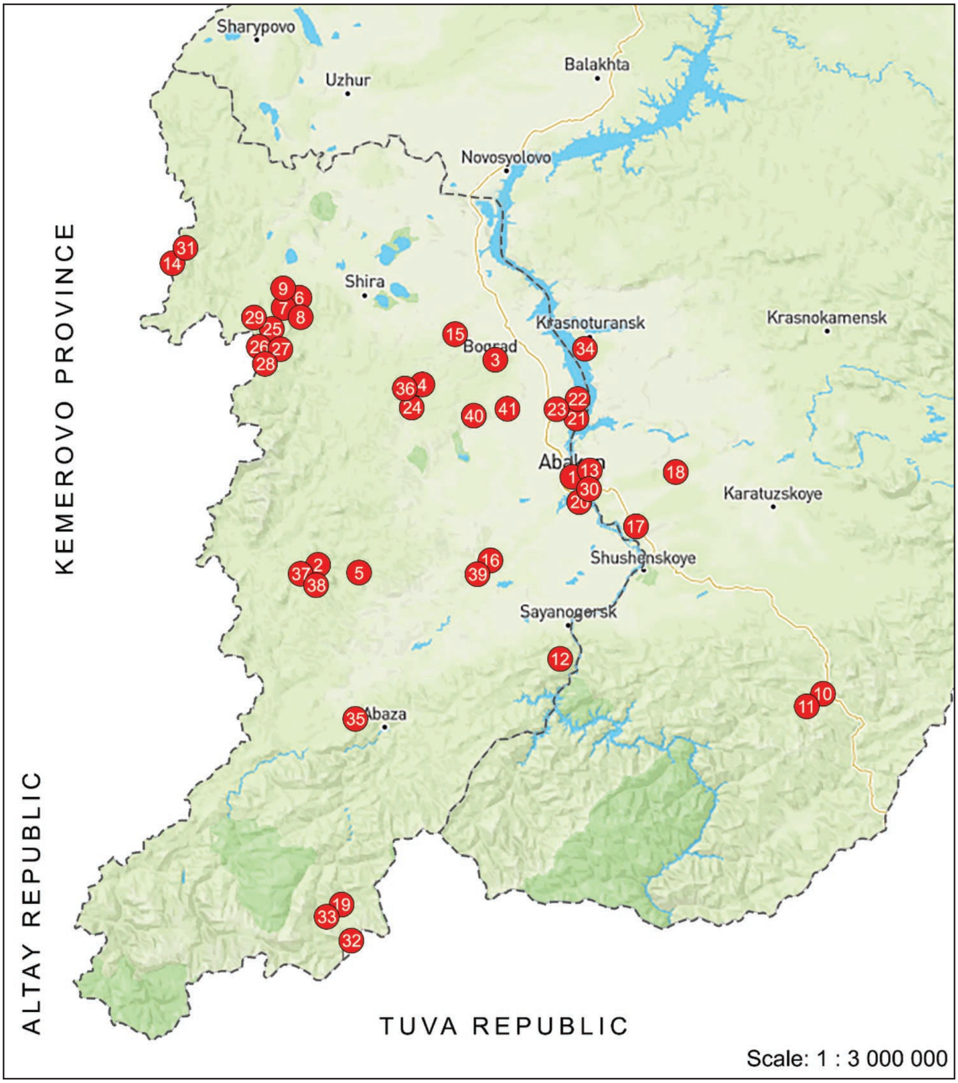
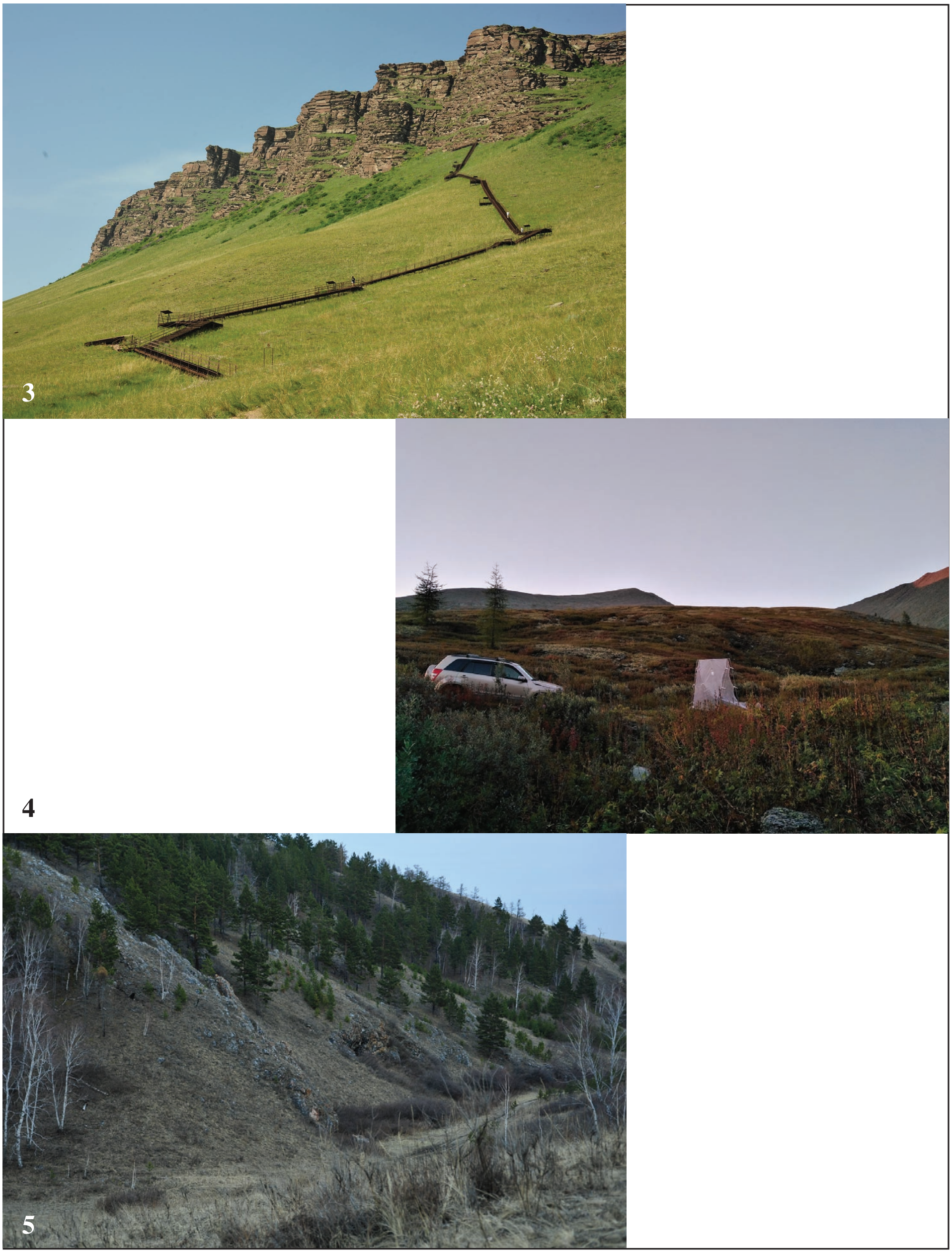


Figure 2. Collecting localities in Khakassia and South of Krasnoyarsk region. The numbers inside the red circles given in accordance with the numbers of collecting localities in the text.



Figures 3-5. Biotopes. **3**. Russia, Khakassia, Bograd district, Khakassky state National Reserve, "Oglahty" area, motley grass steppe, rocky hills, a.s.l. 317 m. **4**. Russia, Khakassia, Tashtyp district, West Sayans, Saylig-Khem-Taiga ridge, highmountain tundra, a.s.l 2140 m. **5**. Russia, Khakassia, Ust-Abakan district, near Verh-Bidja village, forest-steppe hills, motley grass meadow, pine forest, a.s.l 673 m.

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

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

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

D. Máximo Rodríguez Alcaraz (España / *Spain*)
Mr. Wolfang Losert (Alemania / *Germany*)
Mrs Stella Beavan (Reino Unido / *United Kingdom*)
Mr. Soeren Peter Glintborg (Dinamarca / *Denmark*)
Mr. François Michel (Francia / *France*)
Mr. Werner Bögl (Alemania / *Germany*)
Dr. Wolgang Vorbrüggen (Alemania / *Germany*)
D. Federico Palou Ponte (España / *Spain*) (Reingreso / *Rejoin*)
Mr. Klaus Metz (Alemania / *Germany*) (Reingreso / *Rejoin*)
Mr. Gwenfrewi Cardon (Bélgica / *Belgium*) (Reingreso / *Rejoin*)
Mr. Morten Molgaard (Dinamarca / *Denmark*) (Reingreso / *Rejoin*)
D. Ginés Gomariz Cerezo (España / *Spain*) (Reingreso / *Rejoin*)

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

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

Dr. José Amador Calle Pascual (España / *Spain*)
D. Nicolau Ejarque Montesano (España / *Spain*)
D. Enric Argelagués Vidal (España / *Spain*)
Dr. Juan Manuel Lantero Navarro (España / *Spain*)
Mr. Karl-Erik Lundsten (Finlandia / *Finland*)
D. Francisco Truyols Henares (España / *Spain*)
Dr. Julio Cifuentes Colmenero (España / *Spain*)

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

The Society ceases the following members, due to unpaid subscription in the time allocated by the Governing Body:

Mr. Hermann Falkenhahn (Alemania / *Germany*)
Dr. Jacques Hutsebaut (Bélgica / *Belgium*)
Mr. Sas Lasan (Eslovenia / *Slovenia*)
Dr. Luc Manil (Francia / *France*)
Mr. Steffen Schelhorn (Alemania / *Germany*)
Mr. Bo Wikström (Finlandia / *Finland*)
D. Javier Álvarez Sancho (España / *Spain*)
D. Ernestino Maravalhas (Portugal / *Portugal*)
Mr. Timo Nupponen (Finlandia / *Finland*)
Dr. Gernald Schmidberger (Austria / *Austria*)

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

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

Prof. Dr. Tosio Kumata (Japón / *Japan*)
Mr. Matti Ahola (Finlandia / *Finland*)

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Notocelia mediterranea (Obraztsov, 1952) - a widespread cryptic species in Europe (Lepidoptera: Tortricidae)

Jan Šumpich, Peter Huemer, Jacques Nel & Thierry Varenne

Abstract

Notocelia mediterranea (Obraztsov, 1952) was until recently widely overlooked and combined with its sister species, *Notocelia incarnatana* (Hübner, [1800]). However, detailed evaluation of forewing pattern and genitalia of both sexes, as well as DNA barcode divergence clearly support the existence of two separate species. A brief comparison of the habitus of both species, as well as photographs of adults and genitalia of both sexes are given. Female genitalia of *Notocelia mediterranea* are detailed here for the first time. First records for Spain, France, Austria, Slovenia, Bulgaria, Greece, Croatia, and Montenegro are also given.
Keywords: Lepidoptera, Tortricidae, *Notocelia mediterranea, Notocelia incarnatana*, new records, barcoding, habitus, female genitalia, Europe.

Notocelia mediterranea **(Obraztsov, 1952) - una especie críptica muy extendida en Europa (Lepidoptera: Tortricidae)**

Resumen

Notocelia mediterranea (Obraztsov, 1952) ha sido, hasta hace poco, ampliamente pasada por alto y combinada con su especie hermana, *Notocelia incarnatana* (Hübner, [1800]). Sin embargo, la evaluación detallada de las características de las alas anteriores y la genitalia de ambos sexos, así como la divergencia del código de barras de ADN, apoyan claramente la existencia de dos especies separadas. Se ofrece una breve comparación del hábitus de ambas especies, así como fotografías de adultos y genitalia de ambos sexos. La genitalia de la hembra de *Notocelia mediterranea* se detalla aquí por primera vez. También se dan los primeros registros de España, Francia, Austria, Eslovenia, Bulgaria, Grecia, Croacia y Montenegro.
Palabras clave: Lepidoptera, Tortricidae, *Notocelia mediterranea*, *Notocelia incarnatana*, nuevos registros, código de barras, hábitus, genitalia de la hembra, Europa.

Notocelia mediterranea **(Obraztsov, 1952) - une espèce cryptique largement répandue en Europe (Lepidoptera: Tortricidae)**

Résumé

Notocelia mediterranea (Obraztsov, 1952) était jusqu'à récemment largement négligée et associée à son espèce sœur, *Notocelia incarnatana* (Hübner, [1800]). Cependant, l'évaluation détaillée du dessin des ailes antérieures et des organes génitaux des deux sexes, ainsi que la divergence des codes-barres de l'ADN soutiennent clairement l'existence de deux espèces distinctes. Une brève comparaison de l'habitus des deux espèces, ainsi que des photographies d'adultes et de genitalia des deux sexes sont donnés. Les genitalia femelles de *Notocelia mediterranea* sont détaillés ici pour la première fois. Les premiers signalements pour l'Espagne, la France, l'Autriche, la Slovénie, la Bulgarie, la Grèce, la Croatie et le Monténégro sont également donnés.

Mots clés: Lepidoptera, Tortricidae, *Notocelia mediterranea, Notocelia incarnatana*, répartition, barcoding, habitus, genitalia femelles, Europe.

Introduction

The genus *Notocelia* Hübner, [1825] is represented by eight species in Europe. Close to the genus *Epiblema* Hübner, [1825] among the *Eucosmini*, it is distinguished in males by the presence of a pair of non-deciduous cornuti at the apex of the vesica; in females by the distinct anterior part of the sterigma and semi membranous hairy lobes attached to its posterior corners (Razowski, 2003). The known host plants are Rosaceae.

Among these species, *Notocelia mediterranea* (Obraztsov, 1952) has remained particularly poorly known since its original description, based on two specimens from Italy. Razowski (2003) did not examine the habitus of the female or female genitalia and considered the species a probable synonym of *Notocelia incarnatana* (Hübner, [1800]). However, the validity of *N. mediterranea* as a separate species was recently confirmed by Šumpich et al. (2022), who also illustrated the adults of both sexes. Based on this work, *N. mediterranea* was published as a new species for Slovakia (Tokár et al. 2021) and Hungary (Fazekas et al. 2023). None of these works gave distinguishing features. We here for the first time provide a detailed diagnostic comparison of *N. incarnatana* and *N. mediterranea* based on differences of external morphology, male and female genitalia, barcoding data and publish reliable faunistic records.

Material and methods

The present study is based on material from the following collections:

INRA	Institut National de la Recherche Agronomique, Versailles, France
NMPC	National Museum of the Czech Republic, Prague, Czech Republic
RCJN	Research Collection Jacques Nel, La Ciotat, France
RCJS	Research Collection Jan Skyva, Prague, Czech Republic
RCTV	Research Collection Thierry Varenne, Nice, France
TLMF	Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria

Study specimens collected by the authors were attracted to ultraviolet light (8W/12V tubes), mostly installed in portable light traps or other devices. Other examined material was borrowed from museums or private collections.

Pinned specimens were photographed using a Canon 750D camera in combination with a Canon MP-E-65 mm lens. Slide-mounted genitalia were photographed using a Canon EOS 200D DSLR camera mounted on an Olympus CX-31 stereomicroscope. For each photograph, sets of 10-20 images were taken at different focal planes and focus-stacked using Helicon Focus 6. The final images were edited in Adobe Photoshop.

Tissue samples (dry legs) from *Notocelia* specimens were successfully processed at the Canadian Centre for DNA Barcoding (CBG, Biodiversity Institute of Ontario, University of Guelph) (deWaard et al. 2008), resulting in 520-658 base-pair DNA barcode segments of the mitochondrial COI gene (cytochrome c oxidase 1). The sequences, together with details of the sequenced specimens, were uploaded to the Barcode of Life Data Systems (BOLD; Ratnasingham & Hebert, 2007). Degrees of intra- and interspecific variation of DNA barcode fragments were calculated under the Kimura 2-parameter model of nucleotide substitution using the analytical tools of BOLD. A neighbor-joining tree of DNA barcode data of selected taxa (Figure 1) was constructed using MEGA11 (Tamura et al., 2013) under the Kimura 2 parameter model for nucleotide substitutions.

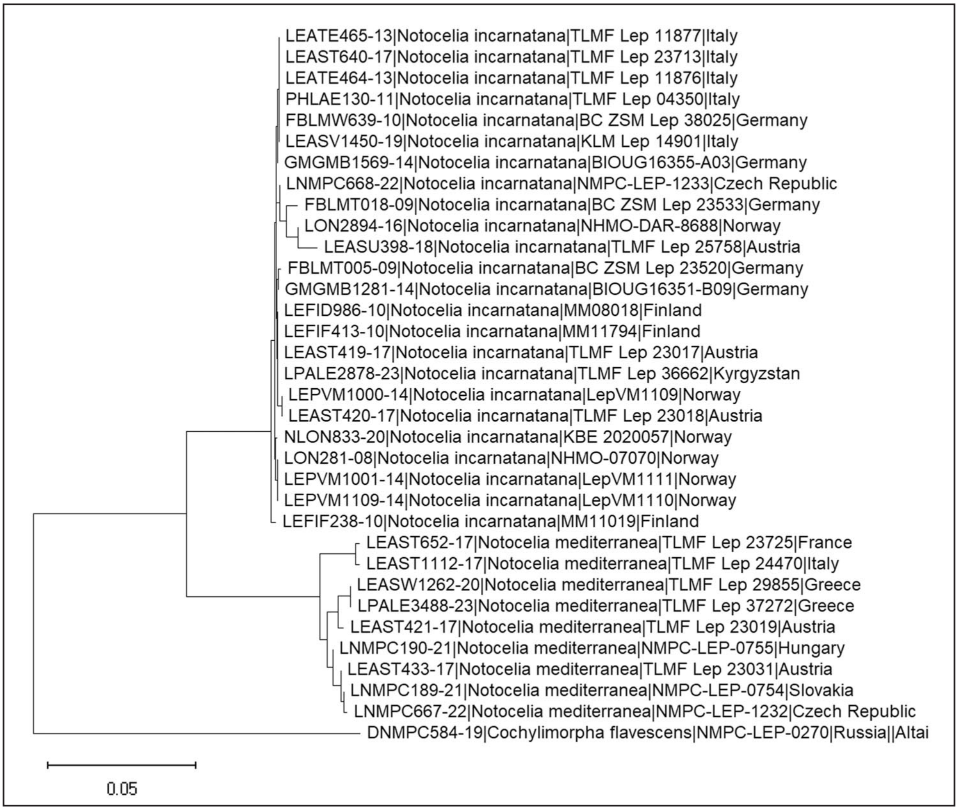

Figure 1. Neighbor-joining tree of *Notocelia* species created from public records in BOLD, with *Cochylimorpha flavescens* Šumpich & Budashkin, 2021 as outgroup. Source: Barcode of Life Database, cf. Ratnasingham and Hebert 2007).

Results

Notocelia incarnatana (Hübner, [1800])
Tortrix incarnatana Hübner, [1800]. *Europ. Schmett. Tor.*, pl. 30

Material examined: Austria, Burgenland, Illmitz, NP Neusiedler See, Biol. Station, 118 m, 17-VIII-2017, 1 ♂, 2 ♀♀, P. Huemer leg. (DNA Barcode IDs TLMF Lep 23017, TLMF Lep 23018) (TLMF); Burgenland, Jois SW, Hackelsberg, 190 m, 1 ♂, 2 ♀♀, 07-IX-2016, P. Huemer leg. (TLMF); Nordtirol, Fliess, 1 ♂, 02-VIII-1972, A. Hernegger leg. (gen. prep. TOR 378 P. Huemer) (TLMF); Nordtirol, Innsbruck, 1 ♀, 27-VII-1968 e. l., K. Burmann leg. (TLMF); Osttirol, Virgen-Obermauern, 1400 m, 1 ♂, 18-VIII-1993, P. Huemer leg. (TLMF). Italy, Südtirol, Laatsch, 1000 m, 2 ♂♂, 1 ♀, 23-VII-1977, K. Burmann leg (TLMF); Südtirol, Matschertal, Waalweg, 1750 m, 1 ♂, 24-VIII-2017, P. Huemer leg. (DNA Barcode ID TLMF Lep 23713) (TLMF). Czechia, Bohemia, Ošelín, Mže env., 1 ♀, 24-VIII-1991, J. Liška leg. (gen. prep. J. Liška) (NMPC); Česk kras (karst), Karlické údolí (valley), 2 ♂♂, 19-VIII-2002, J. Liška leg. (gen. prep. 23053 J. Šumpich) (NMPC); Český kras (karst), Radotín-Cikánka, 1 ♂, 18-VIII-2012, J. Liška leg. (gen. prep. 23058 J. Šumpich) (NMPC); Louny, Raná, 1 ♂, J. Liška leg. (NMPC); Moravia, Kobylí, Kuntínov, 1 ♀, 24-VIII-1994, J. Liška leg. (gen. prep. 23060 J.

Šumpich) (NMPC); Podyjí National Park, Havraníky, 2 ♂♂, 2 ♀♀, 15-IX-2021, J. Liška leg. (DNA Barcode NMPC-Lep-1233) (NMPC). France, Montagne de l'Alpe, Col de la Bonette, 1800 m, 1 ♂, 29-VII-2003, J. Skyva leg. (gen. prep. 23051 J. Šumpich) (RCJS); Var, Puits-de-Rians, la Planée, 1 ♂, 29-VIII-2004, J. Nel leg. (RCJN); Jura, Bonnefontaine, RD260, 1 ♀, 31-VII-2003, J. Nel leg. (gen. prep. 15953 J. Nel) (TLMF); Haut-Rhin, Gaeschney, 1 ♂, 01-IX-1984, J.-P. Chambon leg. (gen. prep. INRA nº 376) (INRA), (Chambon, 1999, fig. 2255); Alpes-de-Haute-Provence, Meyronnes, 1 ♀, 13-VIII-2016, Th. Varenne leg. (gen. prep. 6018 Th. Varenne) (RCTV); Saône-et-Loire, Préty, 1 ♀, 22-VIII-1995, Th. Varenne leg. (gen. prep. 1251 Th. Varenne) (RCTV); Côte-D'or, Gevrey-Chambertin, 1 spec., 30-VII-1997, Th. Varenne leg. (RCTV); Alpes-Maritimes, Mouans-Sartoux, 1 ♂, 1 ♀, 10-IX-1983, F. Dujardin leg. (TLMF); Hautes-Alpes, Les Vigneaux, 1200 m, 1 ♂, 25-VII-1990, P. Huemer & G. Tarmann leg. (TLMF); Hautes-Alpes, Prelles, 3 ♂♂, VIII-1973, F. Zürnbauer leg. (TLMF); Hautes-Alpes, Prelles, 2 ♂♂, 1 ♀, VIII-1974, F. Zürnbauer leg. (TLMF); Hautes-Alpes, Pelvoux, 2 ♂♂, VIII-1973, F. Zürnbauer leg. (TLMF). Germany, Baden-Württemberg, Hoheneuffen, 700 m, 2 ♂♂, 03-VIII-1958, L. Süssner leg. (TLMF); Baden-Württemberg, Markgörningen, Rotenacker, 1 ♀, 14-VIII-1971, L. Süssner leg. (TLMF). Sweden, Gotland, Vänge, Gurfiles, 2 ♂♂, 6-VIII-2007, P. Bína leg. (gen. prep. 23059 J. Šumpich) (NMPC). Switzerland, Graubünden, Umbrail, 2200 m, 1 ♂, 3-9-VIII-1975, K. Burmann leg. (TLMF).

Diagnosis: see under *N. mediterranea*.

Redescription: Adult (Figures 2-9). Wingspan 17.0-18.5 mm (males), 12.0-17.0 (females). This species was described in detail by several authors, e. g. Razowski (2003) and Fazekas et al. (2023). Compared to other species of the genus with a grey-brown basal area quite distinct from the rest of the forewing, *N. incarnatana* has relatively slender wings. The subtornal blotch suffused with ochreous (in fresh specimens) is characteristic. Females are usually smaller than males, in some specimens with a slight tendency towards wing reduction. Forewings of both sexes are mostly dusted pinkish.

Variation: The grey coloration can be more or less pronounced, and the median fascia may be interrupted.

Male genitalia (Figures 18-20): The uncus is broadly rounded and well separated from the tegumen, the socii are strongly elongated and reach the inner distal edge of the tegumen (Figures 18-19), the valve horn is slender and well developed, and the cucullus is slender and relatively narrow (Figure 18b). For other figures see Obraztsov (1952), Chambon (1999), Razowski (2003) and Fazekas et al. (2023).

Female genitalia (Figure 24): The outer distal edge of the sterigma is broadly rounded, very slightly convex, the inner distal edge of the sterigma is broadly arched, the distal side angles of the sterigma are relatively short and triangular, the subgenital sternite is wide, the proximal part of the ductus bursae is narrow and the bulla seminalis is small. For other figures see Razowski (2003), Nel (2005) and Fazekas et al. (2023).

Molecular data: BIN: BOLD:AAE5506. The intraspecific average distance of the barcode region is 0.33% (n=29) (maximum 1.77%). The distance to the nearest neighbour, *Notocelia culminana* (Walsingham, 1879) (BIN: BOLD:AAC7221), is 6.17% (p-dist) (Figure 1).

Biology: The larvae can be found in spring living in spun leaves of *Rosa* spp. Moths fly from June to September.

Distribution: Palaearctic Region, however distribution needs to be reassessed for Mediterranean and sub-Mediterranean countries.

Notocelia mediterranea (Obraztsov, 1952)

Epiblema mediterranea Obraztsov, 1952. *Z. Wien. Ent. Ges., 37*, 125

Material examined: Austria, Burgenland, Illmitz, NP Neusiedler See, Biol. Station, 118 m, 3 ♂♂, 17-VIII-2017, P. Huemer leg. (DNA Barcode ID TLMF Lep 23019) (TLMF); Burgenland, Jois SW, Hackelsberg, 190 m, 1 ♂, 18-VIII-2016, P. Huemer leg. (DNA Barcode ID TLMF Lep 23031) (TLMF); Burgenland, Jois SW, Hackelsberg, 190 m, 3 ♂♂, 07-IX-2016, P. Huemer leg. (TLMF). Bulgaria, Belogradcik, 1 ♂, 26-VIII-1978, J. Skyva leg. (gen. prep. 202434 J. Šumpich) (RCJS).

CROATIA, Krk island, Punat, 3 ♂♂, 1 ♀, 10-16-IX-2000, J. Šumpich leg. (NMPC); same locality but 3 ♂♂, 1 ♀, 20-30-IX-2003, S. Gomboc leg. (NMPC, TLMF); Krk island, Risika, 10-50 m, 2 ♂♂, 2-8-IX-2021, J. Liška leg. (gen. prep. J. Liška) (NMPC); same locality but 1 ♀, 8-13-IX-2002, J. Liška leg. (NMPC); Pag island, Novalja-Potoènica, 5 ♂♂, 2-6-IX-2001, J. Šumpich leg. (NMPC); Rovinj, Kokuletovica, 50 m, 3 ♂♂, 10-IX-2002, H. Deutsch leg. (TLMF). CZECHIA, Moravia, Znojmo, Podyjí National Park, Podmolí-Šobes, 3 ♂♂, 3 ♀♀, 12-IX-2021, J. Liška leg. (DNA Barcode NMPC-Lep-1232; gen. prep. J. Liška) (NMPC); Kobylí, Zázmoníky Nature Reserve, 1 ♂, 18-VIII-2016, J. Liška leg. (gen. prep. 23048 J. Šumpich) (NMPC); same locality but 1 ♂, 27-VIII-2003, J. Liška leg. (NMPC). FRANCE, Montagne du Lubéron, Cavaillon-Oppède, 2 ♂♂, 6-9-IX-2004, J. Procházka leg. (gen. prep. 23054, 202432 J. Šumpich) (RCJS); Bouches-du-Rhône, Ceyreste, la Colle-Noire, 1 ♂, 18-IX-2021, J. Nel leg. (gen. prep. 35415 J. Nel) (RCJN); Fos-sur-Mer, 1 ♂, 13-IX-2007, Th. Varenne leg. (gen. prep. 4197 Th. Varenne) (RCTV); Hautes-Alpes, Saint-Crépin, 1 ♂, 12-VIII-2016, Th. Varenne leg. (gen. prep. 5939 Th. Varenne) (RCTV); Saint-Crépin, la Bourgea, 1 ♂, 28-VIII-2019, J. Nel leg. (gen. prep. 37447 J. Nel) (RCJN); Parc national des Ecrins, Réotier, Saint-Thomas, 1 ♂, 08-IX-2014, J. Nel leg. (gen. prep. 37439 J. Nel) (RCJN); same locality but 1 ♂, 05-IX-2021, J. Nel leg. (RCJN); Alpes-Maritimes, Courségoules, 1 ♀, 14-VIII-2017, Th. Varenne leg. (gen. prep. 170814) (RCTV); Isola-sur-Tinée, 1 ♀, 20-VIII-2018, Th. Varenne leg. (gen. prep.180820) (RCTV); Pyrénées-Orientales, Villefranche-de-Conflent, 1 ♂, 28-VIII-2019, Th. Varenne leg. (gen. prep.190828) (RCTV); Alpes-Maritimes, N Maurion, Fontan, 710 m, 1 ♂, 1 ♀, 11-IX-2017, P. Huemer leg. (DNA Barcode ID TLMF Lep 23725) (TLMF); Alpes-Maritimes, Saint-Barnabé, 1000 m, 10 ♂♂, 1 ♀, 04-IX-1983, F. Dujardin leg. (TLMF); Alpes-Maritimes, St. Vallier, 650 m, 1 ♂, 08-VIII-1978, F. Dujardin leg. (TLMF); Alpes-Maritimes, Vegautier, 1100 m, 09-IX-1967, F. Dujardin leg. (TLMF); Alpes-Maritimes, Col de Braus, St. Laurent, 600 m, 1 ♂, 19-IX-1965, F. Dujardin leg. (TLMF); Alpes-Maritimes, Col de Braus, 1000 m, 2 ♂♂, 28-VIII-1971, F. Dujardin leg. (TLMF); Alpes-Maritimes, Mouans-Sartoux, 1 ♀, 10-IX-1983, F. Dujardin leg. (TLMF); Alpes-Maritimes, St. Blaise, 1 ♀, 06-IX-1981, F. Dujardin leg. (TLMF). GREECE, Piéria, Leptokaria, 1 ♂, 17-22-VIII-1996, J. Skyva leg. (gen. prep. 23057 J. Šumpich) (RCJS); Peloponnes, Exochori, Viros Gorge, 470 m, 2 ♂♂, 2 ♀♀, 12-13-IX-2020, P. Huemer leg. (DNA Barcode IDs TLMF Lep 29855, TLMF_Lep_37272) (TLMF). HUNGARY, Balaton, Balatonakoli, 1 ♂, 28-VIII-1998, J. Ortner leg. (TLMF). Csákberény, 1 ♂, 18-VIII-2000, J. Skyva leg. (RCJS); Bajna, Epöl, 1 ♀, 17-VI-2006, J. Skyva leg. (DNA Barcode NMPC-Lep-0755) (RCJS); Ajka, Pula, Ocs, 1 ♀, 9-IX-2005, J. Liška leg. (gen. prep. 23052 J. Šumpich) (NMPC). ITALY, Gorizia, Duino, S. Giovanni, 70-80 m, 2 ♂♂, 28-IX-2014, H. Deutsch leg. (DNA Barcode ID TLMF Lep 24470) (TLMF); Trento, Pietramurata, 04-IX-1971, 1 ♂, K. Burmann leg. (gen. prep. 85/256 P. Huemer) (TLMF); Verona, Monte, 300 m, 3 ♂♂, 24-VII-1984, K. Burmann leg. (TLMF); Verona, Monte, 300 m, 1 ♂, 13-IX-1984, K. Burmann leg. (gen. prep. 84/245 P. Huemer) (TLMF); Verona, Monte, 300 m, 2 ♂♂, 20-IX-1984, K. Burmann leg. (TLMF); Verona, Monte, 300 m, 2 ♀♀, 03-IX-1986, K. Burmann leg. (TLMF); Verona, Monte, 300 m, 3 ♂♂, 22-X-1994, K. Burmann leg. (TLMF). MONTENEGRO, Tivat, 4 ♂♂, 16-29-IX-1981, J. Skyva leg. (RCJS); same locality but 1 ♂, 20-IX-4-X-1990, J. Skyva leg. (RCJS). SLOVAKIA, Slovenský keas (karst), Plešivec-Ďulová, 2 ♂♂, 3-IX-2016, J. Liška leg. DNA Barcode NMPC-Lep-0754; gen. prep. 202711, 202423 J. Šumpich) (NMPC). SLOVENIA, Karst, Presnica, 3 ♂♂, 09-09-2002, H. Deutsch leg. (TLMF). SPAIN, Teruel, Albarracín, Valdovecar, 2 ♂♂, 3-IX-2002, J. Procházka leg. (RCJS); same locality but 1 ♂, 6-IX-2002, J. Procházka leg. (gen. prep. 23055 J. Šumpich) (RCJS); Teruel, Sierra de Beceite, Beceite, 1 ♂, 9-IX-2002, J. Procházka leg. (gen. prep. 23056 J. Šumpich) (RCJS).

Diagnosis: Compared with *N. incarnatana*, *N. mediterranea* is characterized by a less contrasting forewing pattern, with the pink tinge either completely absent or inconspicuous. The apex of the forewing is usually rounded. Females are usually about the size of, often larger than males. In male genitalia, the protuberance of the valve (valve horn) is slender, comparatively long and rounded at its apex in *N. incarnatana*, whereas in *N. mediterranea* it is smaller, broader at the base and has a sharp tip. The cucullus is slender and longer in *N. incarnatana*, but stouter in *N. mediterranea.* On the lower edge of the valva there is often a distinct bulge in *N. incarnatana*, while in *N. mediterranea* it is weakly developed or non-existent. In most specimens of *N. mediterranea*, the apex of the uncus is prominently convex, whereas in *N. incarnatana* it is lentil shaped. In female genitalia, ductus bursae is more slender in *N. incarnatana*, there are also minor differences in the area of the sterigma and in the shape of the ostium. Dissection of genitalia is necessary to distinguish this species from worn *N. incarnatana* specimens, however, females can usually be identified reliably from external appearance.

Redescription: Adult (Figures 10-17). Wingspan 13.0-17.0 mm (males), 15.5-19.0 mm (females). Slender wings like *N. incarnatana*, but distinguished by a lighter gray, less contrasting appearance, and an absence of pink diffusion. The apex of the forewing is usually more rounded.

Variation low.

Male genitalia (Figures 21-23): The uncus is narrow, rounded in continuity with the tegumen, the socii are markedly shorter and usually do not reach the inner distal edge of the tegumen, the valve horn is generally blunt, and the cucullus is generally more slender and wider. Male genitalia have been pictured by Obraztsov (1952), Razowski (2003) and Fazekas et al. (2023).

Female genitalia (Figures 25-26). Similar to those of *N. incarnatana*, but the outer distal edge of the sterigma is strongly convex, the inner distal edge deeply excavated, and the distal lateral angles broadly triangular at their base but prolonged, with a relatively long digitiform process. The subgenital sternite is narrow (variability figs 25a, 26a), the proximal part of the ductus bursae wide, and the bulla seminalis large. Female genitalia are detailed here for the first time.

Molecular data: BIN: BOLD:AAY8762. The intraspecific average distance of the barcode region is 1.52% (n=18) % (maximum 2.69%). The distance to the nearest neighbour, *Notocelia incarnatana* (BIN: BOLD:AAE5506), is 6.87% (p-dist) (Figure 1).

Biology: early stages unknown, larva likely on Rosaceae; moths fly from mid-June to late October.

Distribution: Southern parts of Central Europe: Italy (locus typicus), Slovakia (Tokár et al. 2021), Hungary (Fazekas et al. 2023), Czechia (Šumpich et al. 2023), Austria and southern Europe: Spain, France, Slovenia, Croatia, Montenegro, Bulgaria and Greece (first records provided in this paper).

Remarks: probably a much more widespread species but has been overlooked due to its similarity with *N. incarnatana*. Specimens of *N. incarnatana* will need to be re-assessed in collections. Both species have been collected syntopically and synchronically near Saint-Crépin (France, Hautes-Alpes), in southern Moravia (Czechia) and in eastern Austria.

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The authors thank Kristina Lexová for English language corrections and Antonio Vives for preparing the Spanish text. J. Šumpich carried out his part of the work on this article with support from the Ministry of Culture Czech Republic (DKRVO 2019-2023 / 5.I.e, National Museum, 00023272).

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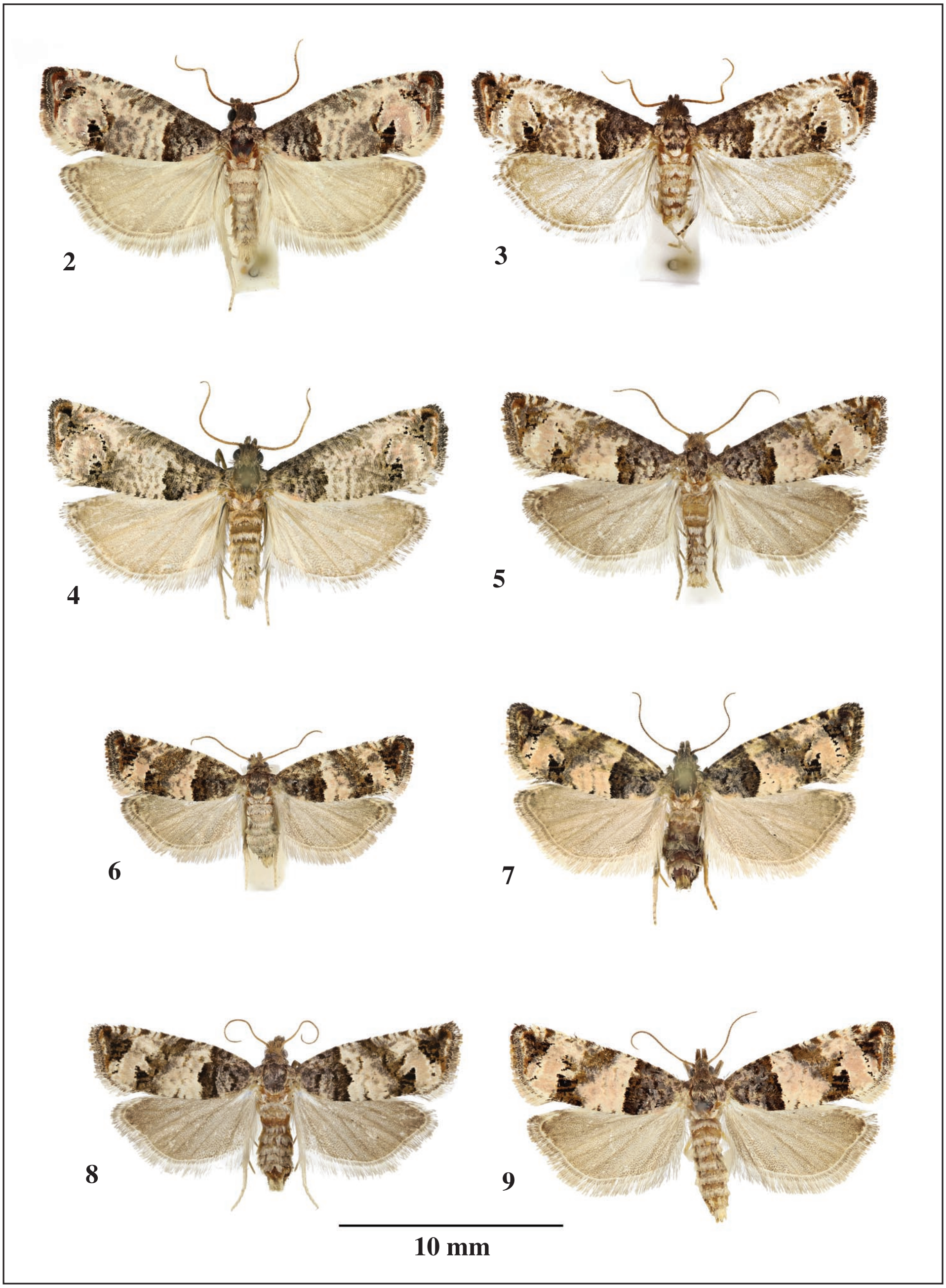
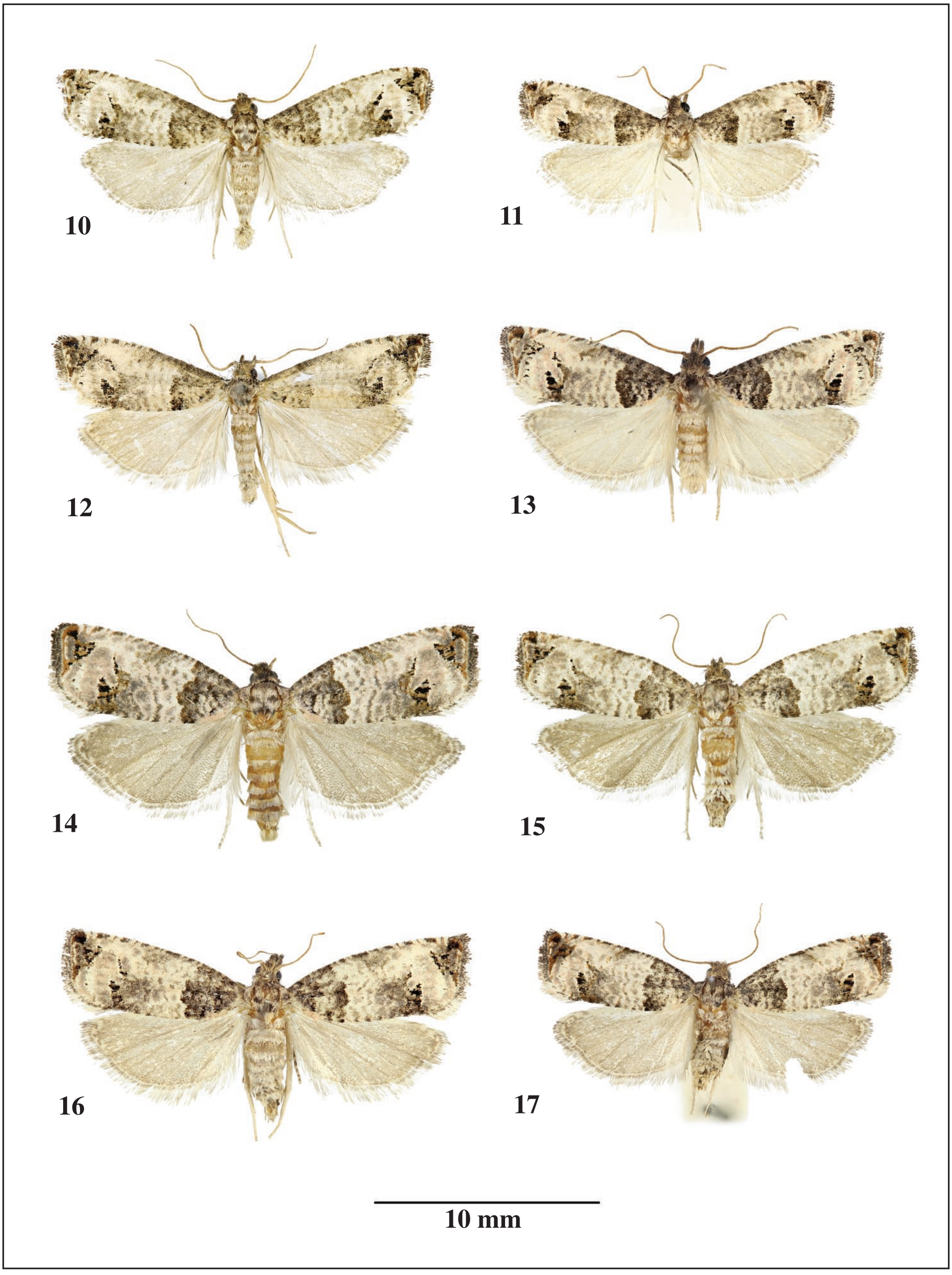
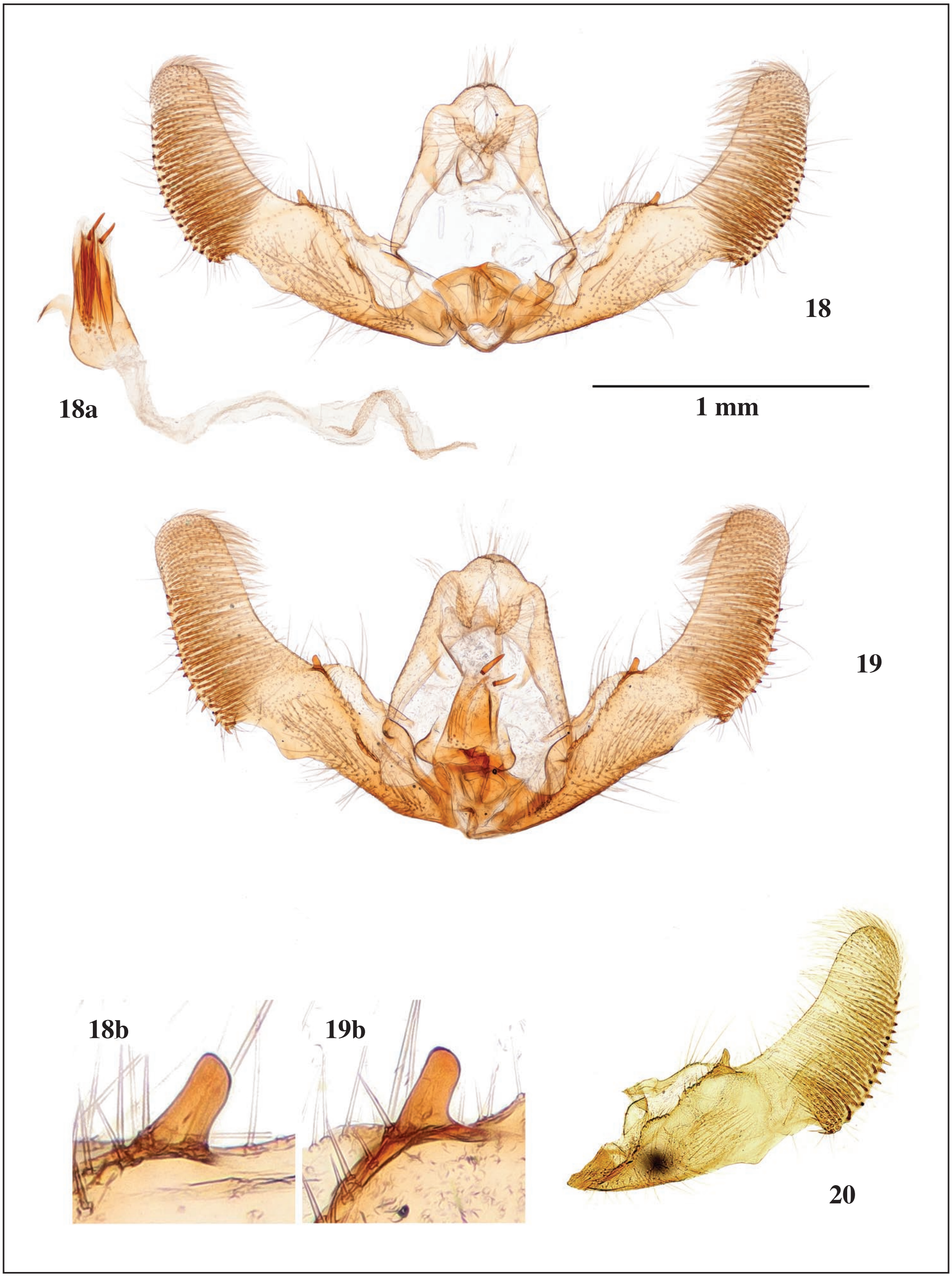


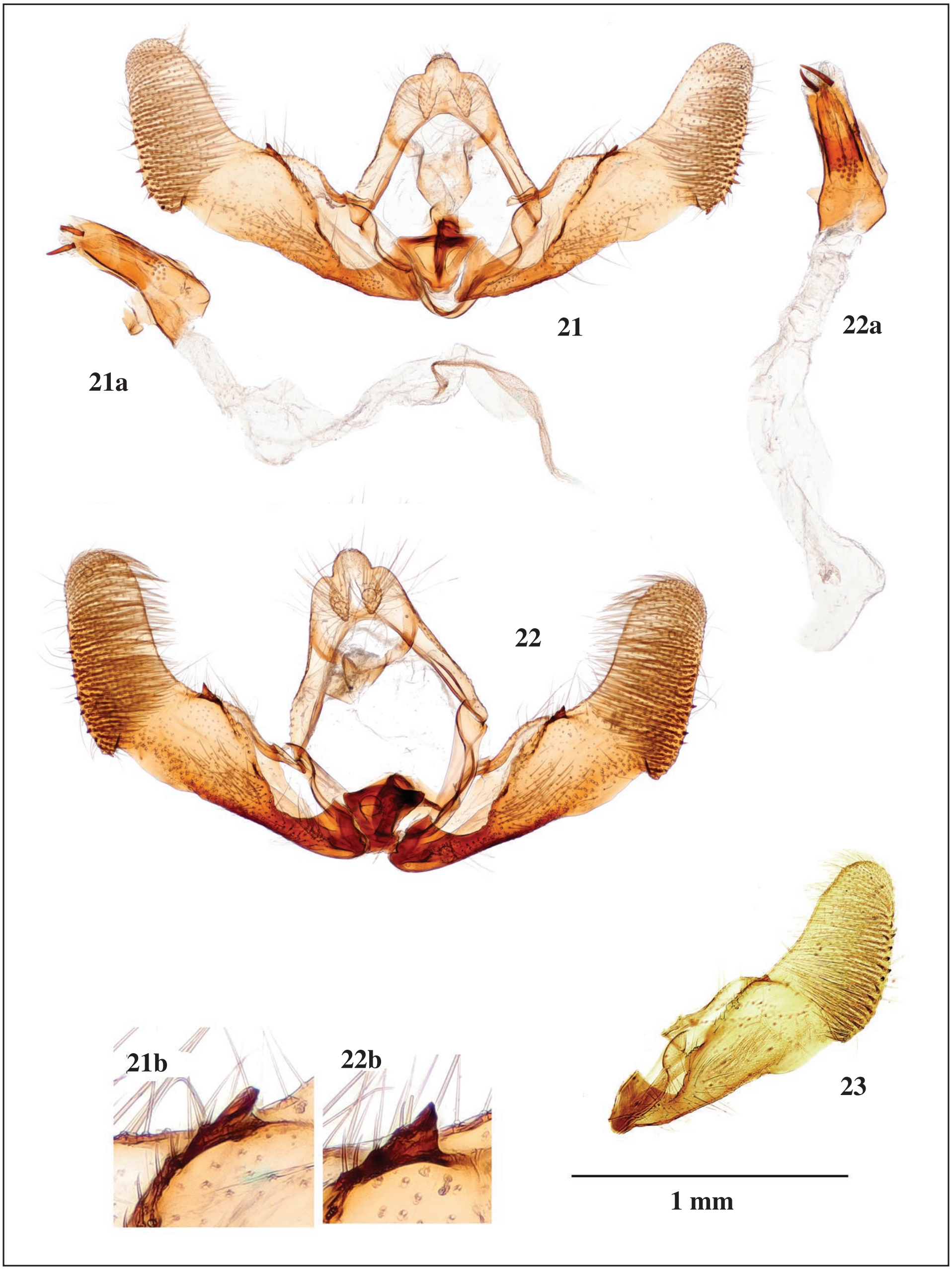
Figures 2-9. *Notocelia incarnatana* (Hübner, [1800]), adults. **2-5.** Males. **2.** Slovakia. **3-5.** Czech Republic. **6-9.** Females, Czech Republic. (4 barcoded).



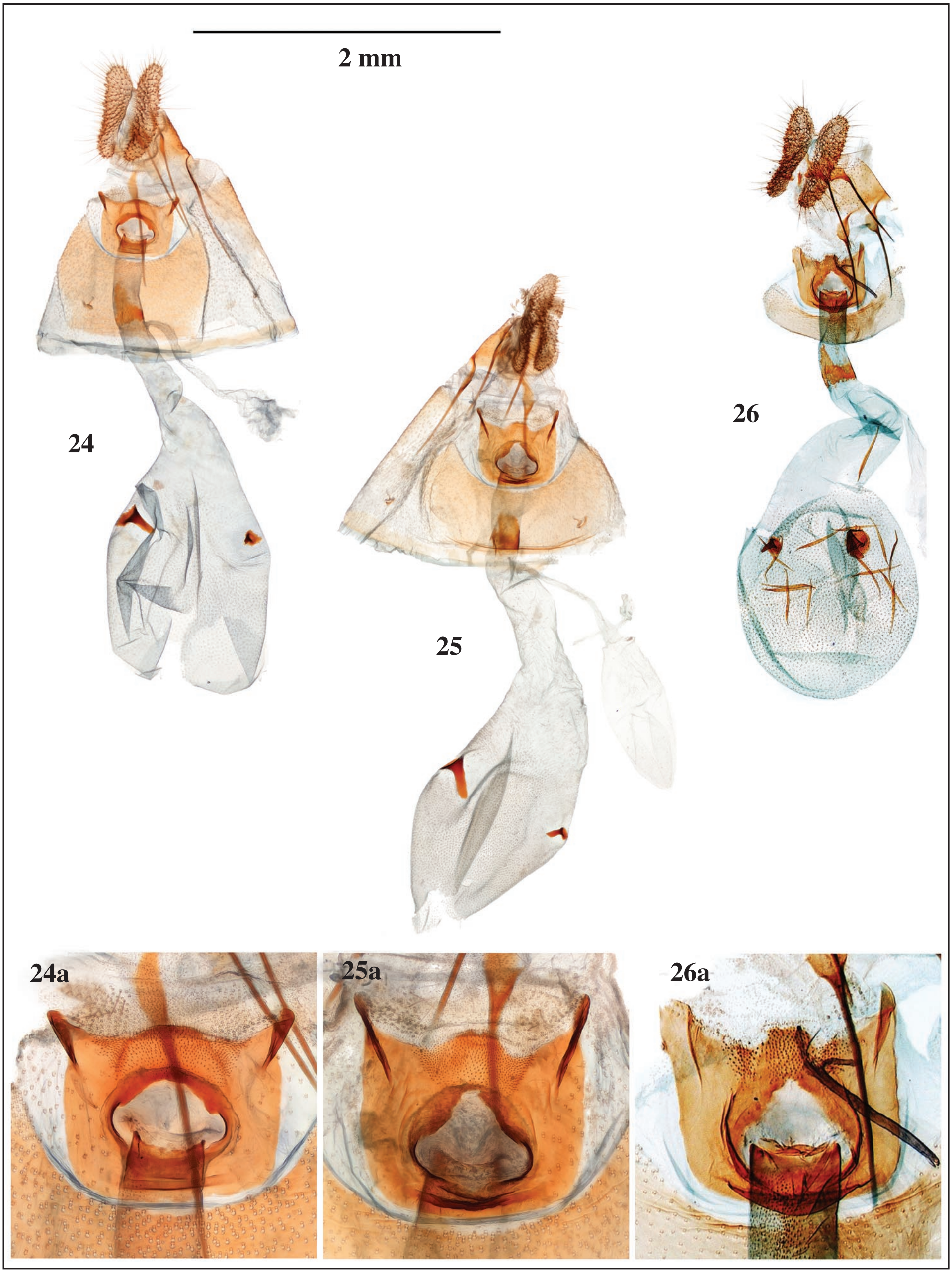
Figures 10-17. *Notocelia mediterranea* (Obraztsov, 1952), adults. **10-13.** Males. **10.** Czech Republic. **11.** Slovakia. **12.** Spain. **13.** Croatia. **14-17.** Females. **14-15.** Czech Republic. **16.** Hungary. **17.** Croatia. (9, 10 barcoded).



Figures 18-20. Male genitalia of *Notocelia incarnatana* (Hübner, [1800]). **18.** Sweeden, gen. prep. 23059 JŠ. **19.** Czech Republic, gen. prep. 23060 JŠ. **20.** France, gen. prep. 37414 JN. (**a** - aedeagus; **b** - detail of valvae protuberance).



Figures 21-23. Male genitalia of *Notocelia mediterranea* (Obraztsov, 1952). **21.** Slovakia, gen. prep. 202711 JŠ. **22.** Czech Republic, gen. prep. 20031 JŠ. **23.** France, gen. prep. 37439 JN. (**a.** aedeagus; **b.** detail of valvae protuberance).



Figures 24-26. Female genitalia. **24.** *Notocelia incarnatana* (Hübner, [1800]), Czech Republic (gen. prep. 23053 JŠ). **25-26.** *Notocelia mediterranea* (Obraztsov, 1952). **25.** Hungary (gen. prep. 23052 JŠ). **26.** France (gen. prep. GF140817 TV). (**a.** detail of sterigma and ostium).

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The larva and the food plant of *Dirphia sombrero* Le Cerf, 1934 (Lepidoptera: Saturnidae, Hemileucinae)

Vitor O. Becker & Almir C. Almeida

Abstract

The last instar larva of *Diphia sombrero* Le Cerf, 1934, an endemic species to the southern Brazil Atlantic Forest, is described and illustrated, and its food plant is recorded.
Keyword: Lepidoptera, Saturniidae, Hemileucinae, *Dirphia,* caterpillar, food plant, Neotropical.

A lagarta e a planta hospedeira de *Dirphia sombrero* Le Cerf, 1934 (Lepidoptera: Saturniidae, Hemileucinae)

Resumo

O último instar da lagarta de *Diphia sombrero* Le Cerf, 1934, uma espécie endêmica da Mata Atlântica do sudeste do Brasil, é descrita e ilustrada, e sua planta hospedeira é registrada.
Palavras-chave: Lepidoptera, Saturniidae, Hemileucinae, *Dirphia,* lagarta, planta hospedeira, Neotropical.

La larva y la planta alimentaria de *Dirphia sombrero* Le Cerf, 1934 (Lepidoptera: Saturniidae, Hemileucinae)

Resumen

Se registra e ilustra el último estado de la larva de *Diphia sombrero* Le Cerf, 1934, una especie endémica de los bosques atlánticos de sudeste de Brasil y su planta nutricia.
Palabras clave: Lepidoptera, Saturniidae, Hemileucinae, *Dirphia,* oruga, planta alimentaria, Neotropical.

Introduction

Dirphia Hübner, [1819] is a Neotropical genus of Saturniidae which includes 40 species (Lemaire, 2002, p. 784), of which the caterpillars of nine species were figured by Lemaire (2002, plates ES 11, 12). *Dirphia sombrero* Le Cerf, 1934 is endemic to southeastern Brazil, at high elevations (800-2000 m), in the States of São Paulo and Rio de Janeiro. Its larva and food plant have been unknown until now. A group of larvae were collected, one of them pupated and one male emerged. This note brings, for the first time, the description of the last instar larva and the record of its food plant.

Material and methods

This note is based on caterpillars collected at the Intervales Biological Station, 800 m, 24º27’S, 44º41’W, Ribeirão Grande, São Paulo State, and reared on the food plant, on the single male that emerged, and on the pertinent literature. Eight caterpillars were collected, on 7 November 2021. However, due to unfavorable conditions during transportation, only one caterpillar survived the trip and pupated. The container with the pupa was checked for several months. As no adult emerged, it was assumed to be dead. However, after nine months, while cleaning the container, a dead, badly descaled male was found on the bottom of the container. Examination of its genitalia confirmed the identification. For this reason, the male illustrated here is a specimen collected at light at São José do Barreiro, also in São Paulo State, not far from Intervales.

Results and discussion

The male specimen that emerged revealed that it belongs to *Dirphia sombrero* Le Cerf, 1934.

Dirphia sombrero Le Cerf, 1934 (Figures 1, 2)
Dirphia sombrero Le Cerf, 1934. *Revue suisse de Zoologie, 41*, 263

Diagnosis: Adult male (Figure 1) FW length 43-45 mm (92-98 mm wingspan) dark fuscous, irrorated with pale yellow scales, antemedial and postmedial bands dentate, with a pale fuscous band along termen. HW dark fuscous. Abdomen black, banded with long, pale yellow scales. Last instar larva bright red, crossed with irregular black lines, and with the scoli and spiraculum white.

Description: Last instar larva (Figure 2) circa 7 cm long. Head and thoracic legs bright red. Prolegs and anal plate vinaceous. Body orange red, crossed with irregular, sinuous black lines. Scoli white. Spiraculum white, ringed black. An irregular, subventral, black band along the body.

Food plants and behavior: The larvae were collected on young trees of *Myrsine coriacea* (Sw.) R. Br. (Primulaceae) and fed in the laboratory. Both species, are common trees in secondary growth forests along the Atlantic Forest of southeastern Brazil, at high elevations. Their fruits are very important to frugivorous birds, which are the most important dispersal agents of these plants.

Remarks: Undoubtedly the most showy and beautiful caterpillar of the genus. It is strongly distinct from all the nine caterpillar species illustrated by Lemaire (2002, plates ES 11, 12). Species of *Myrsine* have been recorded as food plants of *Dirphia monticola* Zerny, 1924 and *Callodirphia arpi* (Schaus, 1908), two sympatric, also high elevation species (Zikán, 1927).

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Robiara S. Becker and Diego R. Dolibaina (Reserva Serra Bonita) prepared the illustrations. Dr. Scott E. Miller (USNM) reviewed the manuscript and made corrections and suggestions that improved it. Dr. Antonio Vives, the editor of *SHILAP Revta. lepid*. did an excellent job to keep the high quality of the publication.

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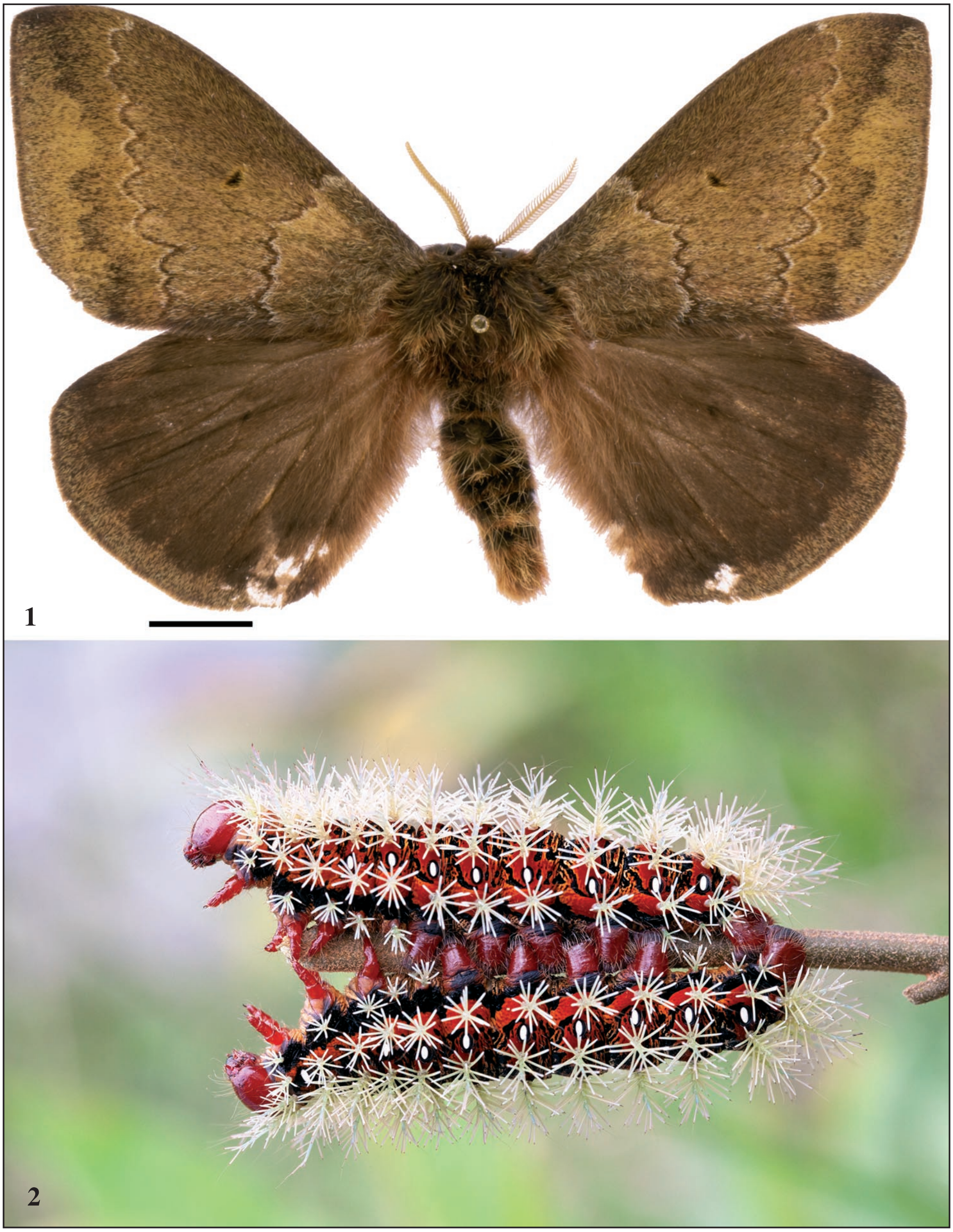

Figures 1-2. *Dirphia sombrero.* **1.** Adult male, São José do Barreiro, São Paulo, Brazil. **2.** Last instar larvae, Intervales Biological Station, Ribeiro Grande, São Paulo, Brazil.

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New and interesting Portuguese Lepidoptera records from 2022 (Insecta: Lepidoptera)

Martin F. V. Corley, João Nunes, Jorge Rosete, Joaquim Teixeira & Ana Valadares

Abstract

Eight species are added to the Portuguese Lepidoptera fauna, of which two are new for the Iberian Peninsula, and one species deleted, mainly as a result of fieldwork undertaken by the authors and others in 2022. In addition, second and third records for the country, new province records and new host-plant data for a number of species are included. A summary of recent papers affecting the Portuguese fauna is included.
Keywords: Insecta, Lepidoptera, distribution, Portugal.

Novos e interessantes registos portugueses de Lepidoptera em 2022 (Insecta: Lepidoptera)

Resumo

Oito espécies são adicionadas à fauna portuguesa de Lepidoptera, das quais duas são novas para a Península Ibérica, e uma espécie é eliminada, principalmente como resultado do trabalho de campo realizado pelos autores e outros em 2022. Além disso, são incluídos segundos e terceiros registos para o país, novos registos de províncias e novos dados de plantas hospedeiras para várias espécies. Inclui-se um resumo de trabalhos recentes que afetam a fauna portuguesa.
Palavras-chave: Insecta, Lepidoptera, distribuição geográfica, Portugal.

Nuevas e interesantes citas portuguesas de Lepidoptera en 2022 (Insecta: Lepidoptera)

Resumen

Se añaden ocho especies a la fauna portuguesa de lepidópteros, de las cuales dos son nuevas para la Península Ibérica, y se suprime una especie, principalmente como resultado del trabajo de campo realizado por los autores y otras personas en 2022. Además, se incluyen segundos y terceros registros para el país, nuevos registros de provincias y nuevos datos de plantas hospedadoras para varias especies. Se incluye un resumen de trabajos recientes que afectan a la fauna portuguesa.
Palabras clave: Insecta, Lepidoptera, distribución geográfica, Portugal.

Introduction

This paper is the seventeenth in the series of annual summaries of new knowledge of Portuguese

Lepidoptera. It gives records of species of Lepidoptera added to the Portuguese fauna in 2022 and some unpublished earlier records, together with new province records not included in the checklist (Corley, 2015). Additional data include new data on larval host-plants within the country and second and third records of species for the country. Papers published in 2022 and part of 2023 that relate to the Portuguese Lepidoptera fauna are listed and briefly summarised. Finally, an Appendix lists the new species for Portugal separately, with numbers indicating their position in the checklist; new genera for Portugal have author and year of publication given.

The Portuguese moth recording scheme "Rede de Estações de Borboletas Nocturnas" which started in 2021 has made a significant contribution to knowledge of the distribution of moths in Portugal. New province records from this source are included in this paper.

Eight species new for Portugal are listed below, of which two are new for the Iberian Peninsula. One species is removed from the Portuguese list.

In Corley et al. (2022) the number of Lepidoptera species recognised from Portugal was 2754. With the current paper and other papers mentioned herein this total has risen to 2775.

Material and Methods

Most species were captured at light. For specimens not taken at light, the means of capture is given. Specimens are retained in the collections of the original recorders, unless otherwise stated. However, many records are based only on photographic evidence. Original photos (figures 1-8) of all species new for Portugal including those without a voucher specimen (figures 7, 8) are provided in this paper.

The order and nomenclature of families and species follows the Portuguese list (Corley, 2015) and subsequent updates in this series (Corley et al. 2016, 2018a, 2018b, 2019, 2020, 2021, 2022). The nomenclature of plant names follows the Euro+Med Plant-Base (2006).

The entry for species new for Portugal concludes with a summary of the known European distribution taken from Karsholt & van Nieukerken (2013) and available information on the larval host-plant, given in square brackets if the information comes from outside Portugal.

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

Aboim, 1.5 km S. of, (Fafe)	NF7698	680 m
Alfambras (Aljezur)	NB1724	75 m
Alpiarça	ND3645	30 m
Ansião, 2 km E. of,	NE5019	250 m
Areia, Mindelo (Vila do Conde)	NF2273	15 m
Avintes (Vila Nova de Gaia)	NF3749	80 m
Bairro, 2 km W. of Ota (Alenquer)	MD9829	180 m
Batocas, 1 km S. of, (Sabugal)	PE8282	825 m
Barragem da Meimoa (Penamacor)	PE5858	570 m
Bertiandos, 1 km W. of, (Ponte de Lima)	NG2923	6 m
Campolide (Lisboa)	MC8587	100 m
Casais do Porto, Louriçal (Pombal)	NE2229	20 m
Casais da Cruz da Areia (Leiria)	ND1698	100 m
Castelo do Germanelo, Rabaçal (Penela)	NE4830	250 m
Cesaredas, Reguengo Grande (Lourinhã)	MD7950	155 m
Colinas Verdes, Bensafrim (Lagos)	NB2512	80 m
Concavada (Abrantes)	ND8067	105 m
Cortes do Meio, Penhas da Saúde (Covilhã)	PE2462	1.300 m
Costa da Caparica (Almada)	MC7978	3 m

Couce (Valongo)	NF4356	50 m
Fontainhas (Cascais)	MC6384	50 m
Freixial, Bucelas (Loures)	MD8606	150 m
Gondesende (Bragança)	PG7735	800 m
Grada, Barcouço (Mealhada)	NE4461	60 m
Lagoa de São José, Mata do Urso, Carriço (Pombal)	NE1128	45 m
Lama Grande, Serra de Montesinho (Bragança)	PG8346	1.390 m
Larça, 1 km S. of, (Coimbra)	NE5062	100 m
Louriçal (Pombal)	NE2228	30 m
Marvão	PD3962	830 m
Mindelo (Vila do Conde)	NF2174	5 m
Miradouro da Senhora do Almurtão (Idanha-a-Nova)	PE5619	330 m
Mirandela	PF5295	220 m
Monsanto (Idanha-a-Nova)	PE6235	460 m
Monsaraz, 1 km E. of, (Reguengos de Monsaraz)	PC4256	200 m
Monte da Saravisca (Vila Viçosa)	PC4194	250 m
Mosteiro de Santa Maria de Aguiar (Figueira de Castelo Rodrigo)	PF7327	660 m
Palácio de Sintra (Sintra)	MC6694	240 m
Paraíso, Bensafrim (Lagos)	NB2512	20 m
Parque Biológico de Gaia (Vila Nova de Gaia)	NF3650	110 m
Perna Negra (Monchique)	NB4945	180 m
Pó (Bombarral)	MD8151	50 m
Poço (Condeixa-a-Nova)	NE4406	220m
Ponte de Carvalhal, Vale de Nogueiras (Vila Real)	PF1371	620 m
Portela de Famalicão (Guarda)	PE3879	890 m
Porto Cerdeira, 3 km S.W. of Sistelo (Arcos de Valdevez)	NG4945	210 m
Praia das Bicas (Sesimbra)	MC8357	60 m
Praia de Mira (Mira)	NE1678	5 m
Praia do Areão, Gafanha da Boa Hora (Vagos)	NE1885	5 m
Praia do Samouco (Marinha Grande)	NE0007	6 m
Quinta de Marim (Olhão)	PA0599	13 m
Quinta do Chegão, Rio Águeda (Figueira de Castelo Rodrigo)	PF7541	180 m
Quintarrei (Valongo)	NF4167	166 m
Ramila (Marvão)	PD4261	500 m
Reguengo do Fetal (Batalha)	ND2088	170 m
Reveladas (Marvão)	PD3955	650 m
Ribeiro de Guilharde, 2 km S.E. of Meixedo (Bragança)	PG8634	605 m
Rio Azibo at Banreses (Macedo de Cavaleiros)	PF7698	515 m
Rio Ovelha, 1 km N.W. of Folhada (Marco de Canaveses)	NF7664	130 m
Salselas (Macedo de Cavaleiros)	PG7702	550 m
Samodães (Lamego)	NF9855	350 m
São Vicente de Penso, Carcavelos (Braga)	NF4793	195 m
Sargaçal (Lagos)	NB2711	30 m
Segura, Praia Fluvial (Idanha-a-Nova)	PE7310	180 m
Serra do Socorro, Turcifal (Torres Vedras)	MD8019	380 m
Sítio da Maceira, 3 km W. of Santo António das Areias (Marvão)	PD3963	500 m
Susão (Valongo)	NF4261	162 m
Trafaria (Almada)	MC7979	90 m
Vale da Porca (Macedo de Cavaleiros)	PF7799	580 m
Vale de Amoreira (Guarda)	PE3275	540 m

Recorders and determiners

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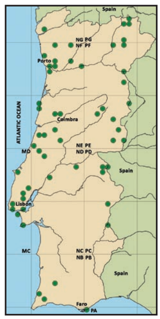
Ana Valadares
Thijs Valkenburg
José Luis Yela Garcia

Abbreviations and symbols

conf.	confirmed by
det.	determined by
gen. det.	determined by analysis of genitalia dissection by
gen. prep.	genitalia preparation by
REBN	Record obtained through the Portuguese moth recording scheme “Rede de Estações de Borboletas Nocturnas”.
*	New for Portugal.
**	New for the Iberian Peninsula.

Provinces:

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



List of families and species

NEPTICULIDAE

Ectoedemia phaeolepis Van Nieukerken, A. Laštůvka & Z. Laštůvka, 2010
BL: Ansião, 25-VI-2021, Rosete, gen. prep. Dale.

ADELIDAE

Adela collicolella Walsingham, 1904
BB: Monsanto, by day, 17-IV-2022, Rosete.

INCURVARIIDAE

Crinopteryx familiella Peyerimhoff, 1871
DL: Quintarrei, leafmines on *Halimium ocymoides* (Lam.) Willk., 4-II-2021, Nunes.

TINEIDAE

Nemapogon variatella (Clemens, 1859)
E: Praia do Samouco, 16-VII-2021, Rosete, gen. prep. Dale.

Trichophaga tapetzella (Linnaeus, 1758)
BL: Louriçal, 11-X-2021, Rosete.

BUCCULATRICIDAE

Bucculatrix diffusella Menhofer, 1943
Third Portuguese record. BL: Praia do Areão, reared from pupa on *Artemisia campestris* subsp. *maritima* (DC.) Arcang., 25-VIII-2022, Rosete.

GRACILLARIIDAE

Phyllonorycter lautella (Zeller, 1846)
Second Portuguese record. DL: Avintes, 20-II-2022, Teixeira, det. Nunes.

Triberta helianthemella (Herrich-Schäffer, 1860)
TM: Vale da Porca, larvae on *Halimium umbellatum* (L.) Spach, 24-IV-2022, Nunes.

Cameraria ohridella Deschka & Dimić, 1986
BL: Castelo do Germanelo, 10-VI-2022, Rosete.

YPONOMEUTIDAE

Pseudoswammerdamia combinella (Hübner, 1786)
TM: Rio Azibo at Banreses, by day, 24-IV-2022, Nunes, C. Silva and Teixeira.

GLYPHIPTERIGIDAE

Glyphipterix simpliciella (Stephens, 1834)
BB: Miradouro da Senhora do Almurtão, by day, 17-IV-2022, Rosete, gen. det. Rosete.

PRAYDIDAE

Prays peregrina Agassiz, 2007
Fifth and sixth records. DL: Susão, by day, 13-III-2022, Nunes; Areia, Mindelo, 09-VII-2022, L. Silva, det. Nunes. The increasing frequency of records of this species suggests that it is a recent arrival and not an overlooked native.

AUTOSTICHIDAE

Symmocoides don (Gozmány, 1963)
BA: Batocas, 15-VI-2015, Corley and Romão.

LECITHOCERIDAE

Eurodachtha siculella (Wocke, 1889)
E: Serra do Socorro, 18-VI-2022, Cardoso, conf. Corley.

OECOPHORIDAE

Denisia piresi Corley, 2014
Third locality for this endemic species. BL: Louriçal, 5-V-2022, Rosete, gen. det. Dale.

Goidanichiana jourdheuillella (Ragonot, 1875)
E: Bairro, 2 km W of Ota, 1-VII-2022, Cardoso.

Dasycera oliviella (Fabricius, 1794)
E: Pó, 4-VII-2022, Cardoso.

DEPRESSARIIDAE

Agonopterix ciliella (Stainton, 1849)
BL: Grada, Barcouço, 4-I-2022, L. Silva, det. Corley.

GELECHIIDAE

Teleiodes italica Huemer, 1992
BA: Portela de Famalicão, 1-VIII-2021, Rosete, gen. prep. Dale.

** *Carpatolechia notatella* (Hübner, 1813)
TM: Lama Grande, 16-VI-2022, Nunes, C. Silva and Jesus, gen. det. Nunes (figure 1). Widespread in Europe, not recorded from Spain, most Balkan countries and Mediterranean islands. [*Salix* L.].

Delete *Istrianis myricariella* (Frey, 1970)
The specimen on which the record (Corley et al. 2000) was based has been re-examined and belongs to the next species,

* *Istrianis arenicolella* (Caradja, 1920)
ALG: Colinas Verdes, Bensafrim, 26-IX-1995, Corley (as *I. myricariella* in Corley et al. 2000); Quinta de Marim, 12-IV-2022, Valkenburg, reared on *Tamarix* L. by Nunes, gen. det. Nunes (figure 2). Algeria, France, Spain.

COLEOPHORIDAE

Coleophora calycotomella Stainton, 1869
E: Praia do Samouco, 16-VII-2021, Rosete, gen. prep. Dale.

Coleophora genistae Stainton, 1857
DL: Susão, larvae on *Genista triacanthos* Brot., 16-IV-2022, Nunes.

Coleophora albicosta (Haworth, 1828)
BB: Barragem da Meimoa, by day, 17-IV-2022, Rosete.

Coleophora ribasella Baldizzone, 1982

Third and fourth Portuguese records. BL: Praia de Mira, empty cases on *Artemisia campestris* subsp. *maritima* (DC.) Arcang., 24-VIII-2022, Rosete; Praia do Areão, 25-VIII-2022, Rosete.

Coleophora nutantella Mühlig & Frey, 1857

BL: Castelo do Germanelo, 10-VI-2022, Rosete, gen. det. Rosete.

Coleophora crepidinella Zeller, 1847

E: Costa da Caparica, larvae on *Beta maritima* L., 31-V-2022, Nunes.

LYPUSIDAE

Agnoea filiella (Staudinger, 1859)

BL: Ansião, 25-VI-2021, Rosete, gen. prep. Dale.

PTEROPHORIDAE

Delete *Agdistis glaseri* Arenberger, 1978. Records belong to *A. bifurcatus* Agenjo, 1952.

Reinstate *Agdistis bifurcatus* Agenjo, 1952. In Corley et al. (2018b) all records were erroneously transferred to *A. glaseri* as a result of confusion over the numbering of species on the plates in Arenberger (1995).

Stenoptilia gallobritannidactyla Gibeaux, 1985

BL: Lagoa de São José, by day, 3-VII-2022, Rosete, gen. det. The genus *Stenoptilia* is exceptionally problematic, with many taxa affected by wide divergence of opinion between different authorities. Gielis (1996) adopted a very broad species concept within the genus (22 species in Europe), while some French authors went to the other extreme: Leraut's 1997 checklist has 36 species in France alone. Arenberger (2005) occupied the middle ground, accepting 46 species in Europe of which two were described in 2002, after Gielis (1996). He accepted *S. inopinata* Bigot & Picard, 2002 as a good species but we have examined a number of Portuguese specimens and can find no significant difference between *S. inopinata* and *S. gallobritannidactyla* and therefore consider them to be synonymous. As this is based on Arenberger's illustrations, which are not from type specimens except for the male of *gallobritannidactyla*, we prefer not to make a formal synonymisation.

Adaina microdactyla (Hübner, 1813)

BL: Castelo do Germanelo, 30-IV-2022, Rosete, gen. det. Rosete, conf. Corley.

EPERMENIIDAE

* *Epermenia pontificella* (Hübner, 1796)

BB: Segura, Praia Fluvial, 7-V-2022, Teixeira, det. Nunes (figure 3). Spain eastwards, extending north to Lithuania but absent from north-west Europe and most Mediterranean islands. [*Thesium* L.].

CHOREUTIDAE

Choreutis pariana (Clerck, 1759)

ALG: Alfambras, 6-IX-2021, Valadares.

TORTRICIDAE

Archips rosana (Linnaeus, 1758)

AAL: Sítio da Maceira, V-2022, reared from larva on *Arbutus unedo* L., Valadares, det. Nunes.

Clepsis coriacanus (Rebel, 1894)
E: Palácio de Sintra, 1-V-2022, reared from *Polypodium* L., Fraser-Jenkins, det. Corley.

Acleris literana (Linnaeus, 1758)
AAL: Sítio da Maceira, 26-III-2022, Valadares.

Phtheochroa duponchelana (Duponchel, 1843)
E: Campolide, 10-V-2022, by day, Ramos, det. Corley.

Cochylimorpha punctiferana (Ragonot, 1881)
Fourth Portuguese record. TM: Samodães, 20-V-2022, Nunes.

Lobesia botrana (Denis & Schiffermüller, 1775)
The record from BA given in Corley et al. (2018) belongs to *L. virulenta* Bae & Komai, 1991. There is a BA record of *L. botrana* from Quinta do Chegão, 16-V-2018, Corley.

Rhyacionia duplana (Hübner, 1813)
ALG: Sargaçal, 18-I-2022, Valadares; E: Pó, 2-I-2022, Cardoso.

** *Dichrorampha aeratana* (Pierce & Metcalfe, 1915)
DL: Rio Ovelha, Folhada, by day, 29-IV-2022, Teixeira, gen. det. Nunes (fig. 4). Widespread in Europe but not recorded from Spain or the Balkan countries and some Mediterranean islands. [*Leucanthemum vulgare* Lam,].

* *Dichrorampha baixerasana* Trematerra, 1991
TM: Salselas, by day, 17-VI-2022, Teixeira, gen. det. Nunes (fig. 5). Spain, Switzerland, Italy, Croatia, Albania. Host-plant unknown.

LIMACODIDAE

Hoyosia codeti (Oberthür, 1883)
R: Concavada, 1-VII-2022, Alves (REBN).

PYRALIDAE

Asalebria florella (Mann, 1862)
DL: Susão, larva on *Genista triacanthos* Brot., 22-V-2022, Nunes.

Elegia fallax (Staudinger, 1881)
The record from Bertiandos (as *E. fallaximima* Nel & Mazel, 2011) (Corley et al. 2015) belongs to *E. atrifasciella*.

Elegia atrifasciella Ragonot, 1887
M: Bertiandos, 8-VII-2014, Corley.

Ephestia elutella (Hübner, 1796)
BL: Casais do Porto, 29-V-2016, Rosete, gen. det. Rosete.

Cadra cautella (Walker, 1863)
BL: Louriçal, 6-VII-2022, Rosete, gen. det. Rosete.

CRAMBIDAE

Hodebertia testalis (Fabricius, 1794)
AAL: Sítio da Maceira, 30-X-2022, Valadares.

Evergestis isatidalis (Duponchel, 1833)
TM: Mirandela, 1-V-2022, Gonzalez.

Anarpia incertalis (Duponchel, 1832)
E: Fontainhas, 11-V-2022, Fraser-Jenkins, det. Corley.

DREPANIDAE

Polyploca ridens (Fabricius, 1787)
AAL: Sítio da Maceira, 26-III-2022, Valadares.

LASIOCAMPIDAE

Trichiura castiliana Spuler, 1908
AAL: Sítio da Maceira, 29-X-2022, Valadares.

Trichiura ilicis (Rambur, 1866)
AAL: Sítio da Maceira, 26-III-2022, Valadares.

Malacosoma neustria (Linnaeus, 1758)
AAL: Sítio da Maceira, 27-V-2022, Valadares.

Phyllodesma suberifolia (Duponchel, 1842)
E: Pó, 24-VIII-2022, Cardoso.

SPHINGIDAE

Acherontia atropos (Linnaeus, 1758)
AAL: Sítio da Maceira, 30-X-2022, Valadares.

GEOMETRIDAE

Idaea barbuti Tautel & Lévèque, 2013
DL: Couce, 14-VIII-2022, Nunes, gen. det. Nunes; TM: Lama Grande, 16-VIII-2022, Nunes, gen. det. Nunes.

Idaea obsoletaria (Rambur, 1833)
E: Pó, 10-VII-2022, Cardoso (REBN).

Idaea blaesii Lenz & Hausmann, 1992
E: Trafaria, 2-VII-2022, Fabião, gen. det. Cardoso (REBN); BL: Poço, 23-VII-2020, Rosete, gen. det. Rosete.

Idaea rubraria Staudinger, 1901
BL: Larça, 20-VIII-2022, L. Silva (REBN).

Scopula ornata (Scopoli, 1763)
DL: Couce, 4-IX-2022, Nunes (REBN).

Scopula submutata (Treitschke, 1828)
TM: Vale da Porca, larva on *Thymus mastichina* L., 24-IV-2022, Nunes.

Xanthorhoe fluctuata (Linnaeus, 1758)
DL: Quintarrei, larva on *Teesdalia nudicaulis* (L.) R. Br., 30-I-2021, Nunes.

Larentia malvata (Rambur, 1833)
R: Alpiarça, 23-X-2022, Nascimento, conf. Nunes (REBN); AAL: Monsaraz, 12-XI-2022, Guégués, det. Nunes (REBN).

Eupithecia massiliata Millière, 1865
E: Trafaria, 26-III-2022, Fabião (REBN).

Eupithecia oxycedrata (Rambur, 1833)
E: Praia das Bicas, 1-I-2022, Almeida, det. Valadares (REBN).

Eupithecia innotata (Hufnagel, 1767)
M: Mindelo, larva on *Artemisia campestris* subsp. *maritima* (DC.) Arcang., 9-X-2021, Nunes.

Chiasmia clathrata (Linnaeus, 1758)
AAL: Sítio da Maceira, 28-III-2022, Valadares.

Digrammia rippertaria (Duponchel, 1830)
Second Portuguese record. BB: Segura, Praia Fluvial, 11-VI-2021, Teixeira.

Acanthovalva inconspicuaria (Hübner, 1819)
AAL: Sítio da Maceira, 30-X-2022, Valadares.

Colotois pennaria (Linnaeus, 1761)
AAL: Sítio da Maceira, 27-X-2022, Valadares.

Phigalia pilosaria (Denis & Schiffermüller, 1775)
M: São Vicente de Penso, 28-I-2022, Gomes (REBN).

Biston strataria (Hufnagel, 1767)
AAL: Sítio da Maceira, 26-III-2022, Valadares.

Aleucis distinctata (Herrich-Schäffer, 1839)
AAL: Marvão, 27-III-2022, Valadares.

Compsoptera jourdanaria (Serres, 1826)
AAL: Sítio da Maceira, 28-X-2022, Valadares.

Phaiogramma etruscaria (Zeller, 1849)
AAL: Sítio da Maceira, 29-V-2022, Valadares.

NOTODONTIDAE

Cerura iberica (Templado & Ortiz, 1966)
AAL: Sítio da Maceira, 26-III-2022, Valadares.

Drymonia ruficornis (Hufnagel, 1766)
AAL: Sítio da Maceira, 26-III-2022, Valadares.

Pheosia tremula (Clerck, 1759)
M: São Vicente de Penso, 26-IV-2022, Gomes (REBN).

EREBIDAE

Lymantria dispar (Linnaeus, 1758)
R: Concavada, 1-VII-2022, Alves (REBN).

Coscinia cribraria (Linnaeus, 1758)
ALG: Perna Negra, 11-X-2020, Valadares.

Coscinia chrysocephala (Hübner, 1904)
AAL: Sítio da Maceira, 27-V-2022, Valadares.

Eilema uniola (Rambur, 1866)
E: Freixial, Bucelas, 11-VIII-2022, Godinho (REBN).

Nodaria nodosalis (Herrich-Schäffer, 1851)
E: Trafaria, 14-IV-2022, Fabião (REBN).

Lygephila craccae (Denis & Schiffermüller, 1775)
M: Porto Cerdeira, Sistelo, 9-IX-2022, Valadares.

Pandesma robusta (Walker, 1958)
AAL: Sítio da Maceira, 28-X-2022, Valadares.

NOCTUIDAE

Thysanoplusia daubei (Boisduval, 1840)
E: Trafaria, 24-X-2022, Fabião (REBN).

Pseudozarba bipartita (Herrich-Schäffer, 1850)
AAL: Monsaraz, 8-VII-2022, Guégués, det. Nunes (REBN).

Aedia leucomelas (Linnaeus, 1758)
R: Alpiarça, 9-X-2022, Nascimento, conf. Nunes (REBN).

Acronicta cuspis (Hübner, 1813)
Second Portuguese record. M: Bertiandos, larva on *Salix* L., X-2022, Gonçalves; DL: Parque Biológico de Gaia, larva on *Alnus glutinosa* L., 20-IX-2022, adult emerged 18-V-2023, Teixeira.

Cucullia erythrocephala Wagner, 1914
AAL: Sítio da Maceira, 26-III-2022, Valadares, gen. prep. Cardoso, det. Nunes, conf. Yela.

Bryonycta pineti (Staudinger, 1859)
BL: Poço, 4-VII-2022, Rosete.

Heliothis nubigera Herrich-Schäffer, 1851

R: Alpiarça, 30-V-2022, Nascimento, conf. Nunes (REBN); AAL: Sítio da Maceira, 28-V-2022, Valadares.

Callopistria juventina (Stoll, 1782)

E: Cesaredas, Reguengo Grande, 12-VI-2022, Cardoso (REBN).

Cryphia lusitanica (Draudt, 1931)

AAL: Monsaraz, 9-IX-2022, Guégués, det. Nunes (REBN).

Bryophila ravula (Hübner, 1813)

R: Alpiarça, 25-IX-2022, Nascimento, det. Corley (REBN).

Spodoptera littoralis (Boisduval, 1838)

AAL: Monsaraz, 14-X-2022, Guégués (REBN); E: Praia do Samouco, 1-IX-2014, Rosete.

Caradrina aspersa Rambur, 1834

M: Aboim, 25-VII-2019, Nunes.

* *Caradrina flava* Oberthür, 1876

E: Trafaria, 28-X-2022, Fabião, gen. det. Nunes (fig. 6). Spain, Malta, Greece, including Crete. Host-plant unknown.

Nonagria typhae (Thunberg, 1784)

E: Pó, 16-VI-2022, Cardoso (REBN).

Apamea arabs (Oberthür, 1881)

R: Concavada, 5-V-2022, Alves (REBN).

Episema grueneri Boisduval, 1837

AAL: Monte da Saravisca, 14-X-2017, Valadares.

Agrochola lunosa (Haworth, 1809)

AAL: Monte da Saravisca, 2-XI-2019, Valadares.

* *Agrochola litura* (Linnaeus, 1758)

TM: Ribeiro de Guilharde, Meixedo, 15-X-2022, C. Silva, Jesus and Fernandes, det. Yela (figure 7). Almost all Europe. [Polyphagous on herbaceous and woody plants].

Agrochola lota (Clerck, 1759)

ALG: Alfambras, 5-I-2022, Valadares (REBN).

Agrochola circellaris (Hufnagel, 1766)

ALG: Alfambras, 5-I-2022, Valadares (REBN).

Lithophane ornitopus (Hufnagel, 1766)

AAL: Sítio da Maceira, 27-III-2022, Valadares

Lithophane furcifera (Hufnagel, 1766)

Third Portuguese record. TM: Ponte de Carvalhal, 5-III-2021, Fernandes.

Lithophane leautieri (Boisduval, 1829)
BL: Larça, 11-XI-2022, L. Silva (REBN).

Cosmia diffinis (Linnaeus, 1767)
Second Portuguese record. BA: Mosteiro de Santa Maria de Aguiar, 27-VII-2019, Romão and Pires.

Dicycla oo (Linnaeus, 1758)
AAL: Sítio da Maceira, 27-V-2022, Valadares.

Dryobotodes roboris (Geyer, 1835)
AAL: Monte da Saravisca, 1-XI-2019, Valadares.

* *Ammoconia caecimacula* (Denis & Schiffermüller, 1775)
TM: Gondesende, 30-X-2022, Valkenburg, conf. Nunes (figure 8). Nearly all Europe, absent from British Isles, Albania and some Mediterranean islands. [Polyphagous on herbaceous plants].

Trigonophora jodea (Herrich-Schäffer, 1850)
AAL: Sítio da Maceira, 27-X-2022, Valadares.

Aporophyla lueneburgensis (Freyer, 1848)
AAL: Sítio da Maceira, 30-X-2022, Valadares.

Aporophyla canescens (Duponchel, 1826)
AAL: Sítio da Maceira, 27-X-2022, Valadares.

Polymixis dubia (Duponchel, 1836)
R: Concavada, 4-X-2022, Alves (REBN).

Orthosia incerta (Hufnagel, 1766)
AAL: Reveladas, 4-III-2019, Valadares.

Orthosia miniosa (Denis & Schifermüller, 1775)
AAL: Sítio da Maceira, 27-III-2022, Valadares.

Orthosia cerasi (Fabricius, 1775)
AAL: Sítio da Maceira, 27-III-2022, Valadares.

Anorthoa munda (Denis & Schifermüller, 1775)
AAL: Sítio da Maceira, 27-III-2022, Valadares.

Anarta gredosi (de Laever, 1977)
AAL: Sítio da Maceira, 29-III-2022, Valadares, conf. Corley.

Hecatera dysodea (Denis & Schiffermüller, 1775)
BL: Reguengo do Fetal, 27-VIII-2022, Mourão, det. Nunes (REBN).

Hadena magnolii (Boisduval, 1829)
AAL: Sítio da Maceira, 29-V-2022, Valadares.

Hadena albimacula (Borkhausen, 1792)
BL: Casais da Cruz da Areia, 13-VII-2022, Soares (REBN).

Leucania obsoleta (Hübner, 1803)
R: Alpiarça, 9-IV-2022, Nascimento, det. Nunes (REBN); E: Trafaria, 1-IX-2022, Fabião (REBN).

Leucania zeae (Duponchel, 1827)
E: Trafaria, 8-IX-2022, Fabião (REBN).

Dichagyris nigrescens (Höfner, 1888)
Third Portuguese record. BB: Cortes do Meio, 26-VI-2014, Romão, det. Corley.

Agrotis catalaunensis (Millière, 1873)
R: Alpiarça, 9-III-2022, Nascimento, det. Cardoso (REBN).

Agrotis spinifera (Hübner, 1808)
AAL: Monsaraz, 8-IV-2022, Guégués, det. Nunes (REBN).

Cerastis rubricosa (Denis & Schifermüller, 1775)
AAL: Ramila, 4-III-2019, Valadares.

Noctua interjecta Hübner, 1803
ALG: Alfambras, 4-VIII-2022, Valadares (REBN).

NOLIDAE

Earias albovenosana Oberthür, 1917
ALG: Paraíso, Bensafrim, larva on *Salix* L., 21-V-2022, emerged 4-VI-2022, Valadares; E: Freixial, Bucelas, 11-VIII-2022, Godinho (REBN).

Earias clorana (Linnaeus, 1761)
The record from Beira Alta in Corley (2015) based on Vale de Amoreira, 13-VII-2013, Romão, belongs to *E. albovenosana*.

Recent literature

Bartsch et al. (2021) have revised the genus *Pyropteron*. They conclude that *P. muscaeformis* subspecies *lusohispanica* is synonymous with *P. koschwitzi*. There is no evidence that typical *P. muscaeformis* occurs in Portugal, so it must be deleted from the list.

They distinguished a new subspecies of *P. leucomelaena* occurring in south Spain and Morocco, while the typical subspecies is present in central and northern Spain. No Portuguese material of this species was examined, so which subspecies occurs there remains to be established.

Corley et al. (2022) add 13 species to the Portuguese list and delete two.

Gaedike (2022) describes a new species, *Epermenia lusitanica* from Ericeira on the Portuguese coast.

Macià et al. (2022) have revised the genus *Eilema* Hübner, 1819 based on morphological and genetic study of European species. The 11 Portuguese species are placed in seven different genera:

Katha Moore, 1878
depressa (Esper, 1787)

Indalia Macià, Ylla, Gastón, Huertas & Bau, 2022
uniola (Rambur, 1866)
marcida (Mann, 1859)

pygmaeola pallifrons (Zeller, 1847)
predotae (Schawerda, 1927)

Nyea Agenjo, 1982
lurideola (Zincken, 1817)

Eilema Hübner, 1819
caniola (Hübner, 1808)

Manulea Wallengren, 1863
palliatella (Scopoli, 1763)
iberica (von Mentzer, 1980) (*complana iberica* von Mentzer, 1980)

Pseudokatha Macià, Ylla, Gastón, Huertas & Bau, 2022
rungsi (Toulgoët, 1960)

Wittia de Freina, 1980
sororcula (Hufnagel, 1766)

While we accept the results of the scientific work performed, we do not agree with the authors' conclusion that *Eilema* needs to be split. In our view, this fragmentation of the large genus *Eilema* is unnecessary and premature as such work should be based on a global revision of the group. The genera recognised here could equally well be treated as subgenera. This would result in minimal disturbance of current nomenclature but would still leave the phylogenetic conclusions as valid. However, it is irrational to retain *Zobida* as a distinct genus if we are not recognising the other splits from *Eilema*, so we return *Z. bipuncta* to *Eilema*.

Marabuto (2022) adds the recently described Hesperiidae *Spialia rosae* Hernández-Roldán, Dapporto, Dincă, Vicente & Vila, 2016 to the Portuguese list along with the following Heterocera: *Ptilocephala moncaunella* (Chapman, 1903), *Prays peregrina* Agassiz, 2007, *Digitivalva occidentella* (Klimesch, 1956), *Epicallima mikkolai* (Lvovsky, 1995), *Eretmocera medinella* (Staudinger, 1859), *Epiphyas postvittana* (Walker, 1863), *Lobesia limoniana* (Millière, 1860), *Titanio tarraconensis* Leraut & Luquet, 1982, *Apochima flabellaria* (Heeger, 1848), *Apamea epomidion* (Haworth, 1809) and *Nola cucullatella* (Linnaeus, 1758). In addition, full collection data are given for *Xanthorhoe designata* (Hufnagel, 1767) and *Triphosa tauteli* Leraut, 2008 which had been mentioned as present in Portugal without data in Hausmann & Viidalepp (2012) and consequently listed for Portugal in Corley (2015). Finally records of *Pseudoswammerdamia combinella* (Hübner, 1796), *Eublemma amoena* (Hübner, 1803) and *Xestia sexstrigata* (Haworth, 1809) are given which predate those already published as new for Portugal (Nunes et al. 2021; Corley et al. 2022).

Nunes & Gil (2023) add 43 species to the fauna of Douro Litoral including *Dialectica imperialella* (Zeller, 1847), new to Portugal and second Portuguese records of *Coleophora hackmani* (Toll, 1953), *Lobesia virulenta* Bae & Komai, 1991 and *Hoplodrina blanda* (Denis & Schiffermüller, 1775).

Prozorov et al. (2022) treat Iberian and North African *Lemonia philopalus* as separate species. The Iberian species is *L. vazquezi* Oberthür, 1916. However, they admit that the two species cannot be distinguished morphologically due to variation, which leaves as distinguishing characters only geographical provenance and the barcode distance of 2.13%, which in our view are insufficient to justify separation into two species. We therefore consider *vazquezi* to be a junior synonym of *philopalus*.

Zhang et al. (2020) concluded that *Carcharodus baeticus* should be placed in *Muschampia*.

Appendix: Changes to the Portuguese fauna list

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

Name changes resulting from changes at genus level or to new synonymy are given, with each species retaining its list number. In a case where a new name is provided for a previously misidentified species, the new species retains the number of the misidentified species. Thus, *Istrianis arenicolella* (Caradja, 1920) replaces *Istrianis myricariella (*Frey, 1870) which was previously misidentified, but the species retains the number 0706 in the checklist.

0139.1 *Ptilocephala moncaunella* (Chapman, 1903)
0239.1 *Dialectica imperialella* (Zeller, 1847)
0336.1 *Digitivalva occidentella* (Klimesch, 1956)
0363.1 *Prays peregrina* D. Agassiz, 2007
0417.1 *Epicallima mikkolai* (Lvovsky, 1995)
0702.2 *Carpatolechia notatella* (Hübner, 1813)
0706 *Istrianis arenicolella* (Caradja, 1920) (*Istrianis myricariella* sensu Corley, 2000 non Frey, 1870)
Eretmocera Zeller, 1852
0892.1 *Eretmocera medinella* (Staudinger, 1859)
0931 *Agdistis bifurcatus* Agenjo, 1952
0936 *Stenoptilia gallobritannidactyla* Gibeaux, 1985 (*Stenoptilia inopinata* Bigot & Picard, 2002)
0969.2 *Epermenia pontificella* (Hübner, 1796)
0969.3 *Epermenia lusitanica* Gaedike, 2022
Epiphyas Turner, 1927
1007.1 *Epiphyas postvittana* (Walker, 1863)
1112.1 *Lobesia limoniana* (Millière, 1860)
1174.1 *Dichrorampha aeratana* (Pierce & Metcalfe, 1915)
1178.1 *Dichrorampha baixerasana* Trematerra, 1991
1240 *Pyropteron koschwitzi* (Špatenka, 1992) (*Pyropteron muscaeformis lusohispanica* Laštůvka & Laštůvka, 2007)
1277 *Muschampia baeticus* (Rambur, 1839) (*Carcharodus baeticus* (Rambur, 1839))
1278.1 *Spialia rosae* Hernández-Roldán, Dapporto, Dincă, Vicente & Vila, 2016
Titanio Hübner, 1825
1609.1 *Titanio tarraconensis* Leraut & Luquet, 1982
1720 *Lemonia philopalus* (*L. vazquezi* Oberthür, 1916)
Apochima Agassiz, 1847
1989.1 *Apochima flabellaria* (Heeger, 1848)
2150 *Eilema bipuncta* (Hübner, 1824) (*Zobida bipuncta* (Hübner, 1824))
2311.1 *Caradrina flava* Oberthür, 1876
2355.1 *Apamea epomidion* (Haworth, 1809)
2386.1 *Agrochola litura* (Linnaeus, 1758)
Ammoconia Lederer, 1857
2426.1 *Ammoconia caecimacula* (Denis & Schiffermüller, 1775)
2579.1 *Nola cucullatella* (Linnaeus, 1758)

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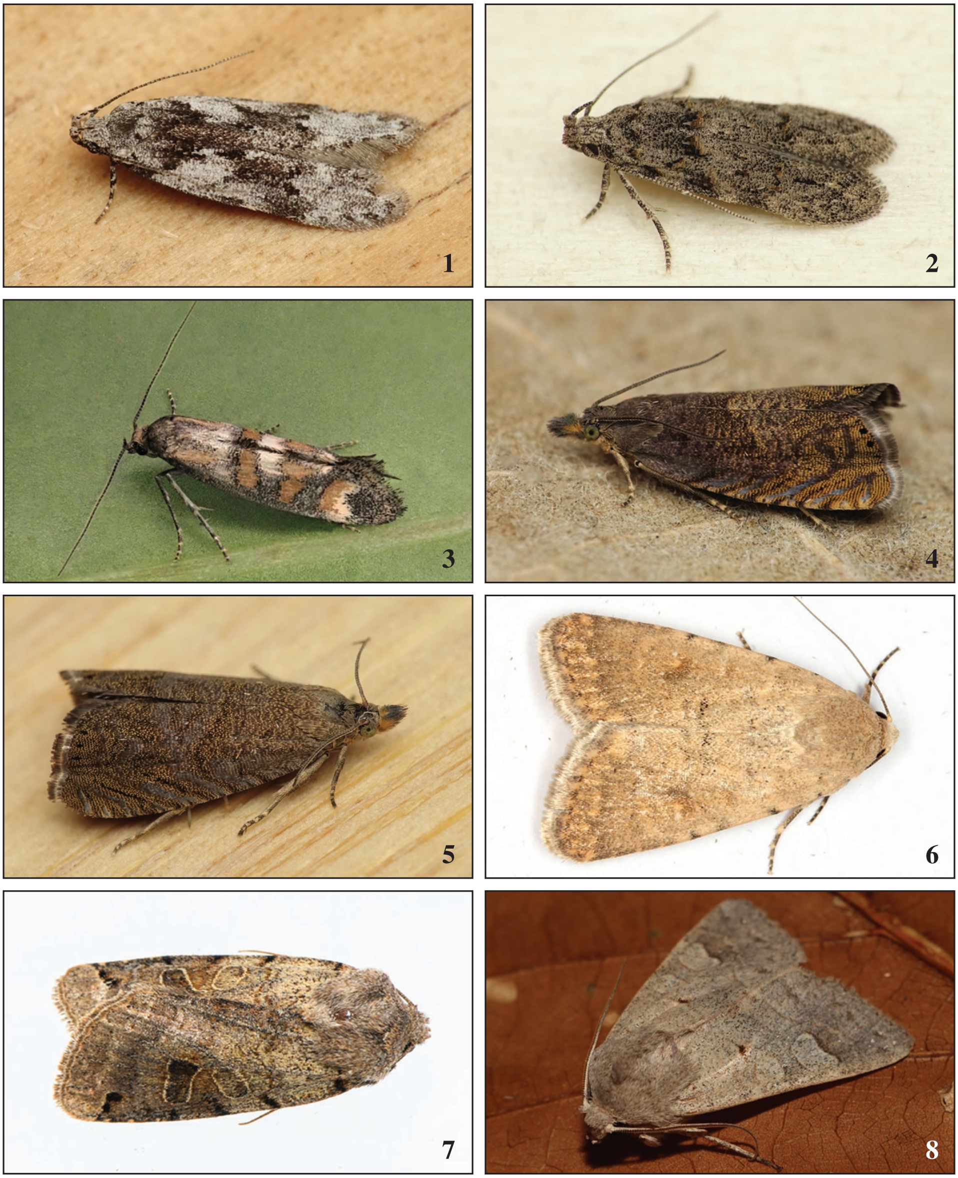

Figures 1-8. 1. *Carpatolechia notatella* (Hübner, 1813), Lama Grande, Bragança (J. Nunes). **2.** *Istrianis arenicolella* (Caradja, 1920), Quinta do Marim, Olhão (J. Nunes). **3.** *Epermenia pontificella* (Hübner, 1796), Segura, Idanha-a-Nova (J. Teixeira). **4.** *Dichrorampha aeratana* (Pierce & Metcalfe, 1915), Folhada, Marco do Canaveses (J. Nunes). **5.** *Dichrorampha baixerasana* Trematerra, 1991, Salselas, Macedo de Cavaleiros (J. Nunes). **6.** *Caradrina flava* Oberthür, 1876, Trafaria, Almada (J. Fabião). **7.** *Agrochola litura* (Linnaeus, 1758, Meixedo, Bragança (A. Fernandes). **8.** *Ammoconia caecimacula* (Denis & Schiffermüller, 1775), Gondesende, Bragança (T. Valkenburg).

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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Las solicitudes cumplirán las siguientes condiciones:

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

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

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

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

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Application for permits to collect Lepidoptera in Spain for scientific purposes

Applications must abide by the following conditions:

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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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First record of *Pyralis farinalis* Linnaeus, 1758 from India (Pyralidae: Pyralinae)

Muzafar Riyaz & Savarimuthu Ignacimuthu

Abstract

In the present report, we highlight the first occurrence of *Pyralis farinalis* Linnaeus, 1758 (Pyraloidea: Pyralidae) from India. The specimen was collected from Tehsil Herman, district of Shopian in Kashmir valley, which is situated at the foothills of Pir Panjal Mountain range-Northwestern Himalayas, India; it is 50 km away from Srinagar, Kashmir.
Keyword: Lepidoptera, Pyralidae, *Pyralis farnalis*, new record, India.

Primer registro de *Pyralis farinalis* Linnaeus, 1758 de la India (Pyralidae: Pyralinae)

Resumen

En el presente informe, destacamos la primera aparición de *Pyralis farinalis* Linnaeus, 1758 (Pyraloidea: Pyralidae) de la India. El espécimen se capturó en Tehsil Herman, distrito de Shopian en el valle de Cachemira, que está situado en las estribaciones de la cordillera de Pir Panjal, Himalaya noroccidental, India; está a 50 km de Srinagar, Cachemira.
Palabra clave: Lepidoptera, Pyralidae, *Pyralis farnalis*, nuevo registro, India.

Introduction

In India, the work on superfamily Pyraloidea was initiated by Hampson (1896) that included the distribution and taxonomy of 1,136 species. Up to date, a number of authors from India and across the globe have occasionally reported and described many new species and new records from the superfamily Pyraloidea (Rao & Sivaperuman, 2021; Singh et al. 2020; Mathew, 2006; Raha et al. 2017; Murthy et al. 2015). A catalogue of Indian Pyraloidea was published recently, and it included 1,695 described species of Pyraloidea moths distributed among 509 genera (Singh et al. 2022). The family Pyralidae has a total of 518 species distributed over 182 genera; of these, 171 species spread across 47 genera are assigned to the subfamily Pyralinae in India. There are more than ten species that belong to each of the five genera *Endotricha* Zeller, 1847, *Hypsopygia* Hübner, [1825], *Pyralis* Linnaeus, 1758, *Sacada* Walker, 1852, and *Stemmatophora* Guenée, 1845, with *Hypsopygia* (24 species) being the most diverse in the Pyralinae family. In addition, the genus *Pyralis* comprises of 17 species reported across the country with no species records from Jammu and Kashmir. In the Indian subcontinent, the region of Northeast India is home to the greatest variety of Pyralinae, followed by the West and Northwest Himalayas, and then the Central Himalayas (Singh et al. 2022).

Pyralis farinalis Linnaeus, 1758 (Pyralidae: Pyralinae) is a genus that belongs to superfamily

Pyraloidea. The species was first scientifically described by Linneaus in 1758 as type species of the genus *Pyralis* Linnaeus, 1758 (Linnaeus, 1758). The species was synonymized by Zeller, 1847 as *Asopia domesticalis*. The species was further synonymized by several authors (Nuss et al. 2003–2018). Based on Munroe & Solis in Kristensen (1999), the genus *Pyralis* is classified within the family Pyralidae and subfamily Pyralinae.

Materials and Methods

The single adult male *Pyralis farinalis* (Figures 2-3) was photographed and collected inside the household on 20-VI-2022 at an elevation of 1,596m in Tehsil Herman (33º42’18”’N, 74º56’23”’E), district Shopian, Kashmir Division (Jammu & Kashmir Union Territory), India (Figure 1). The sample was collected during night hours with the use of a headlamp (ProTac HL Headlamp) and cotton-wrapped ethyl acetate vials. Photographs of the species were obtained with a smart phone (Xiaomi Redmi Note 8 Pro) equipped with a 20 mm macro lens. The specimen was acquired by the author in the course of his exploration on the unique insect life in the Kashmir Valley of India, and further taxonomic studies, such as the removal and preparation of the genitalia, were accompanied. For several minutes, the specimen’s abdomen was cleaned after treated with KOH at 135ºC, and the genitalia was then prepared. After being rinsed with distilled water, the genatilia was placed in glycerin and preserved for further analysis. With a total annual precipitation of 660 mm and an average temperature of 25 degrees Celsius, the region is primarily rural and has an extensive range of agricultural areas (Riyaz et al. 2021; 2022; Riyaz & Reshi, 2021; Shiekh & Mishra, 2023). The specimen and its genitalia have been deposited in the insect museum of Xavier Research Foundation, St. Xavier’s College, Palayamkottai, India, with voucher numbers XRF-KMR-253 and XRF-KMR-GS-276.

The species was properly identified by examining the morphological features of the male specimen as well as the genitalia of the animal using a number of online platforms, such as; (https://www.gbif.org/species/1872901, https://www.nhm.ac.uk/our-science/data/butmoth/search/GenusDetails.dsml?NUMBER=25251.0, https://britishlepidoptera.weebly.com/072-pyralis-farinalis-meal-moth.html) and relevant literature (Solis & Shaffer, 1999; Katoi, 1977; Payne, 1925).

Results and Discussion

Wingspan 22 mm. Forewings are elongate triangular, dividing into two sections by a pair of white lines, the distal line of which is wavy and the basal line of which curves in an arc; the area between the lines is light yellowish-brown; areas outside the distal line and inside the basal line are dark brown. Hind wing is broad, rounded, and pale brown, with two undulating white lines crossing it; the distal half of the wing has several dark spots. Adults frequently rest with the uppermost point of their abdomen at a right angle to their bodies (Figures 2-3).

After examining the genitalia, we observed Uncus equal width throughout or less narrow than the base; flat or spatulate, ventrally with spine clusters absent; tegumen highly sclerotized; vinculum well developed; juxta simple, seldo extensively sclerotized; Uncus short and broad; Valvae simple; ventral surface of valva bearing hairlike setae not arranged in radiating rows, costal setae absent; vesica of aedeagus with clusters of spinelike cornuti, vesica spined, reflexed with heavy sclerotization (Figure 4).

The species is cosmopolitan in distribution (Poltavsky et al. 2018) and largely distributed in Europe and North America (https://www.gbif.org/species/1872901) (Figure 5). Moreover, the species is a pest of stored food plants, especially milled plant products (Curtis & Landolt, 1992). The authors speculate that the northern parts of the Jammu division (J&K UT, India) are where this species is most likely to be found. This is based on prior observations with comparable habitats, and it is proposed that this area includes all of Kashmir. The authors of the investigation believe that there is a good chance that the species might be found in the northern regions of Pakistan, Afghanistan, Turkmenistan, and Iran since these countries link to the current site. Based on current monitoring and prior locations, the IUCN Red List review of this species on the GeoCAT website determined that the species was of Least

Concern (LC), and its area of occurrence was assessed to be 166,367,999.798 km^2. This evidence is remarkable and significant since it gives the first reliable proof of *Pyralis farinalis* Linnaeus, 1758 inhabiting the Indian subcontinent. With respect to the political confines of India, this culminates in a notable range extension for the species.

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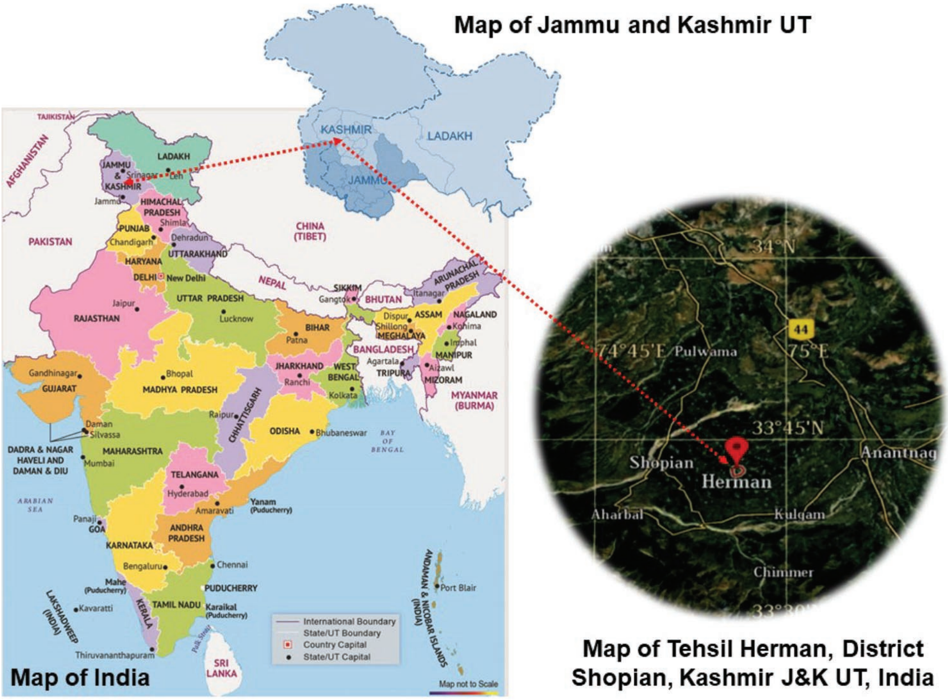

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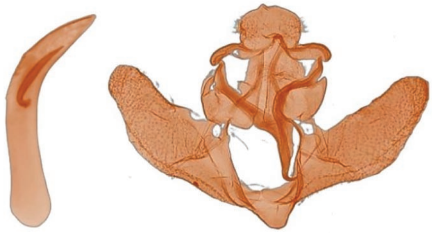
Figures 1-3. 1. Map of Shopian District showing location of collection site. (Source: Google maps). **2-3.** *Pyralis farinalis* L. **2.** Mounted adult male. **3.** Adult male in the field. **4.** Male genitalia including whole body and phallus in ventral and lateral views, respectively. **5.** Distribution of *Pyralis farinalis* L. and present study marked red (Source: GeoCAT/GBIF).



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Figures 4-5. 4. Male genitalia including whole body and phallus in ventral and lateral views, respectively. **5.** Distribution of *Pyralis farinalis* L. and present study marked red (Source: GeoCAT/GBIF).

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The taxonomic position of the Neotropical genus *Macrocirca* Meyrick, 1931 with new synonymy and description of one new species (Lepidoptera: Depressariidae, Depressariinae)

Vitor O. Becker

Abstract

Macrocirca strabo Meyrick, 1931, described in the Hyponomeutidae, is transferred to the Depressariidae, Depressariinae. A new species, *Macrocirca moseri* Becker, sp. nov., from Brazil, is described. *Odonna* Clarke, 1982, syn. nov. is a junior synonym of *Macrocirca* Meyrick, 1931; *M. passiflorae* (Clarke, 1982), comb. nov. and *M. xenodora* (Clarke, 1982), comb. nov. are included in *Macrocirca.*
Keywords: Lepidoptera, Depressariidae, Yponomeutidae, *Macrocirca, Odonna,* new species, new synonyms, distribution, Neotropical.

La posición taxonómica del género Neotropical *Macrocirca* Meyrick, 1931 con nuevas sinonimias y descripción de una nueva especie (Lepidoptera: Depressariidae, Depressariinae)

Resumen

Macrocirca strabo Meyrick, 1931, descrita en los Hyponomeutidae, es transferida hacia los Depressariidae, Depressariinae. Se describe una nueva especie: *M. moseri* Becker, sp. nov., de Brasil. *Odonna* Clarke, 1982, syn. nov. es una junior sinonimia de *Macrocirca* Meyrick, 1931; *M. passiflorae* (Clarke, 1982), comb. nov. y *M. xenodora* (Clarke, 1982), comb. nov. son incluidas en *Macrocirca.*
Palabras clave: Lepidoptera, Depressariidae, Yponomeutidae, *Macrocirca, Odonna,* especie nueva, nuevas sinonimias, distribución, Neotropical.

Introduction

Macrocirca strabo Meyrick, 1931 was described in the Hyponomeutidae [Yponomeutidae]. Meyrick (1931, p. 38) provided only this statement on its relationships, “Allied to *Ethmia*, from which it is distinguished by the palpi,” and it has remained an enigmatic genus until now. Becker (1984, p. 145), based on Meyrick’s assumptions, transferred it to the Ethmiinae (Oecophoridae). Lewis & Sohn (2015, p. 177) followed Becker, retaining the genus in Ethmiinae. Examination of material available revealed that it belongs to the Depressariinae (Depressariidae), becoming a senior synonym of *Odonna* Clarke, 1982, and includes a further, undescribed species from Brazil.

Material and methods

This work is based on the literature, on the type specimens, and on specimens in the author’s collection (VOB), the IMLT, and the MNHUK. The holotype of the new species is provisionally deposited in VOB, and will be transferred, together with the collection, to a Brazilian institution in the future. Genitalia were prepared following the methods described by Robinson (1976). Terms for morphological characters follow Hodges (1971).

Abbreviations

The following abbreviations are used in the text:

IMLT	Instituto Miguel Lillo, Tucumán, Argentina
FW	forewing
g. s.	genitalia slide
HW	hind wing
NHMUK	Natural History Museum, London, United Kingdom
PR	Paraná State, Brazil
SP	São Paulo State, Brazil
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA
VOB	Vitor O. Becker Collection, Serra Bonita Reserve, Camacan, Bahia, Brazil
ZSBS	Zoologische Sammlung des Bayerischen Staates, Munich, Germany

Results

Examination of the material and the pertinent literature revealed that *Macrocirca* is represented by four species, one of them undescribed.

Macrocirca Meyrick, 1931
Macrocirca Meyrick, 1931. *Mitt. Münch. Ent. Ges., 21*, 38
Type-species: *Macrocirca strabo* Meyrick, 1931. *Mitt. Münch. Ent. Ges., 21*, 38, by monotypy.
=*Odonna* Clarke, 1982. *J. Res. Lepid., 20*(1), 46, **syn. nov.**
Type-species: *Odonna passiflorae* Clarke, 1982. *J. Res. Lepid., 20*(1), 47, by original designation.

Diagnosis: FW length 18-22 mm (38-48 mm wingspan), long, narrow (nearly 3x longer than broad), costa and dorsum nearly parallel, termen round to sub-acute, angled inwards toward tornus; dark grey, vein interspaces marked as thin dark lines, reniform small, blackish, ringed whitish. Accessory cell present, R4 + R5 stalked from middle, the former to costa before apex, the second to apex; M3 and CuA1 connected at lower angle of cell, CuA2 near end of cell. HW whitish, slightly greyish towards margins; M1 halfway between Rs and M2; M3 + CuA1 connected at lower angle of cell. Mid and hind tibia covered with long, whitish scales. Male genitalia (Figures 3-6): Uncus a short triangle, densely covered with setae dorsally; tegumen narrow, elongated distad; gnathos a pair of slender, spined knobs; valva broad at basal half, distal half a narrow, spatulate projection; vinculum round; juxta a sclerotized ring around aedeagus, whit two lateral, short projection; aedeagus as long as valva, thick, curved at base, covered or not with long setae distally.

Distribution: Colombia, Argentina, and southeastern Brazil, at high elevations.

Food-plant: *Passiflora* sp. (Passifloraceae) (Chacón & Hernandes, 1982; Clarke, 1982).

Remarks: In general appearance, especially the narrow, elongate FW, the adults show similarities to some species of *Ethmia* Hübner, [1819] especially those in the *semilugens*-group (Powell, 1973), which led Meyrick (1931, p. 38) to associate it with this genus. According to Clarke (1982, p. 46) the genus keys in Clarke (1978) near to *Talitha* Clarke, 1978, a monotypic genus described from a single female from Chile. However, as pointed out by Clarke, the shape of their female genitalia indicates that this relationship is doubtful. The shape of the male genitalia is unique and totally distinct among the New World Depressariinae. Nothing that resemble them was found either in the published literature or among the hundreds of genitalia preparations examined by the author. Despite this unique situation, the presence of a double, spined gnathos, places it in this subfamily.

Key to males

1. Male genitalia with distal digit of valva as long as sacculus (Southern South America) 2
   Male genitalia with distal digit of valva much longer than sacculus (Colombia) 3

2. Digital branches of gnathos longer than uncus (Argentina) .... *strabo*
   Digital branches of gnathos as long as uncus (Brazil) .... *moseri*

3. FW length less than 30 mm .... *passiflorae*
   FW length longer than 30 mm .... *xenodora*

Macrocirca strabo Meyrick, 1931 (Figures 1, 3)
Macrocirca strabo Meyrick, 1931, in Rosen. *Mitt. Münch. Ent. Ges., 21*, 38
Syntypes ♂, ♀, ARGENTINA: Cordoba, Capilla del Monte (Hosseus) (NHMUK, ZSBS) [syntype male examined].

Material examined: Syntype ♂, labelled as above (NHMUK); 1 ♂, ARGENTINA: Catamarca, Belén, Barranca Larga, II-1937 (IMLT).

Diagnosis: Grey; abdomen cream basally; FW stroked dark grey between veins; reniform ringed light grey. HW grey, gradually dark grey towards apex and termen.

Description: As the specimen belonging to the IMLT (Figure 1), available for study, is badly faded, the original description, presumably based on better specimens, sensu Meyrick (1931): "♂, ♀, 38-48 mm. Head, palpi, thorax whitish mixed dark grey. Forewings very elongate, costa gently arched, ♀ more arched, apex obtuse, termen rounded, rather strongly oblique; whitish irregularly irrorated dark grey, veins appearing as darker streaks; a fine black dash in cell before middle (probably representing first discal stigma), surrounded by a pale area, and a transverse blackish line on end of cell (indicating second discal), also surrounded by whitish, before, between, and beyond these undefined patches of dark suffusion; cilia greyish. Hindwings pale grey, darker towards apex and termen; cilia grey-whitish, greyer round apex" (p. 38).

Male genitalia (Figure 3): Uncus a broad, elongate triangle; gnathos arms thin, slightly longer than uncus; valva with a narrow, curved projection at mid costa, sacculus smooth, distal, spatulate projection twice as long as wide, round distally; aedeagus strongly curved at base, without spines at apex; vesica without spines; juxta a thin ring around the aedeagus with a pair of lateral, blunt knobs.

Distribution: Argentina, on the West, dry side of the Andes, at high elevations.

Remarks: Described from an unspecified number of males and females, at least one of each. According to Meyrick (1931) the material he studied belonged to the ZSBS. Dr. W. Speidel, curator of Lepidoptera of this institution, pers. comm., informed the author that no specimens were found in this collection. However, as Meyrick often did when he studied material from other collections represented by more than one specimen, he kept at least one for his collection. In the NHMUK there is one male, labeled as above, and bearing an identification label in his handwriting, examined by the author, which certainly belongs to the type-series. This specimen is not designated as lectotype for two reasons: the specimens at the ZSBS might be found in the future, and the identity of the species is well documented by this syntype. The specimen belonging to the IMLT, whose adult and genitalia are illustrated here, is a perfect match to this syntype, except for being badly faded, being collected in the same Argentinian Andean region. The darker streaks on FW, mentioned by Meyrick, are not located on the veins, but are between the veins.

***Macrocirca moseri* Becker, sp. nov.** (Figures 2, 4)

Holotype ♂, BRAZIL: PR, Lapa, 900 m, 1-2-I-2003, g. s. (Moser) (VOB); Paratypes: 2 ♂ ♂, PR, Castro, 1895 (Jones) (NHMUK); 1 ♂, SP, São Paulo, 1895 (Jones) (NHMUK).

Diagnosis: Head and thorax metallic black, abdomen cream, FW below cell shiny dark grey, whitish, stroked black between veins above cell; reniform ringed whitish; HW whitish.

Description (Figure 2): FW length 17 mm (38 mm wingspan). Head and thorax metallic black; 2nd segment of labial palpi whitish below; basal third of antenna black, gradually grey towards tip. Legs black, mid, and hind tibia mixed with whitish scales.

Male genitalia (Figure 4): Uncus a short triangle, densely covered with setae dorsally; gnathos as long as uncus; valva with a pair of projections at middle: a dorsal, curved, sharp-pointed one at mid costa, the other, shorter, at the ventral end of sacculus; distal, spatulate projection slightly curved and constricted basally; juxta with the lateral projection asymmetrical: right one broad, left one sharp-pointed; aedeagus slightly curved at middle, expanded based, apex with long setae.

Distribution: Southern Brazil, at high elevation, from the type locality, from Castro, not far away, and from São Paulo.

Remarks: Similar to *M. strabo*, but smaller. Apparently this species is not readily attracted to mercury vapour light. The author has collected intensively in the biome in which it occurs for more than 50 years, focused on Microlepidoptera, but never collected a single specimen.

Macrocirca passiflorae (Clarke, 1982) **comb. nov.**
Odonna passiflorae Clarke, 1982. *J. Res. Lepid., 20*(1), 47
Holotype ♀, COLOMBIA: Valle, Tenerife, 2600 m (Chacón & Hernandes) (USNM, 100175) [examined].

Food-plant: *Passiflora mollissima* Bailey (Passifloraceae) (Chacón & Hernandes, 1982, p. 43).

Distribution: Colombia, from the type-locality only, at high elevations in the Andes.

Remarks: Like the sympatric *M. xenodora*, the distal digit of valva is longer than the sacculus. The size, and the shape of genitalia are the only safe ways to distinguish both.

Macrocirca xenodora (Clarke, 1982) **comb. nov.**
Odonna xenodora Clarke, 1982. *J. Res. Lepid., 20*(1), 49
Holotype ♂, COLOMBIA: Cauca, Paramo de Purace, Lake San Rafael, 3570 m (Clarke) (USNM, 100176) [examined].

Distribution: Colombia, at high elevation in the Andes.

Remarks: Similar to *M. passiflorae* but larger.

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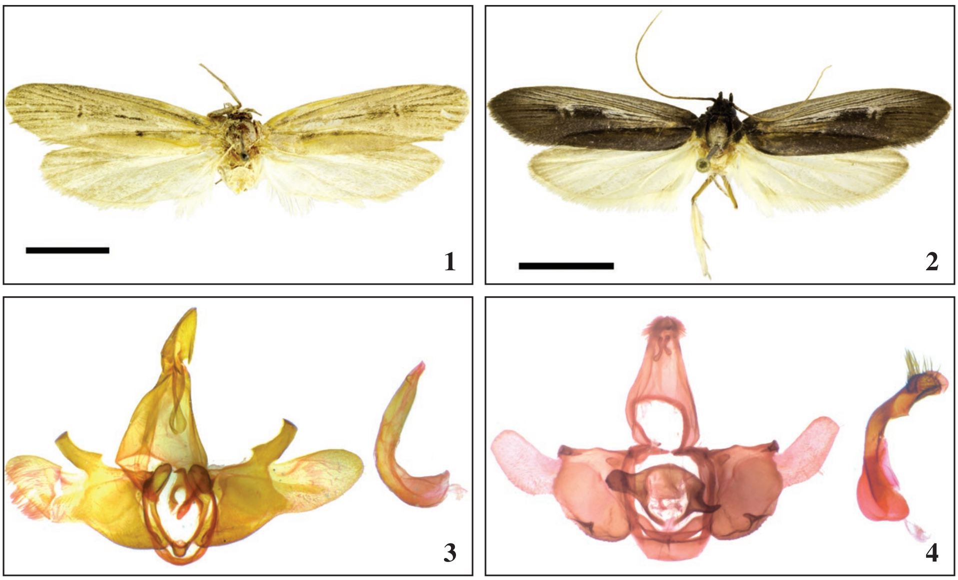

Figures 1-4. *Macrocirca.* **1-2.** Adult males. **3-4.** Male genitalia. **1.** *M. strabo,* Argentina. **2.** *M. moseri,* holotype, Brazil. **3.** *M. strabo,* ventral view; aedeagus, lateral view. **4.** *M. moseri,* holotype, ventral view; aedeagus lateral view.

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Molecular identification of some immature Lepidoptera causing *Quercus* L., defoliation in Lorestan province, western Iran (Insecta: Lepidoptera)

Asadollah Hosseini-Chegeni & Majid Tavakoli

Abstract

Quercus L., dominate almost 40% of Iran's forest area. The second destructive group of insects is defoliator Lepidoptera distributed in the Zagros forests of Iran. We assessed Lepidoptera communities in Zagros forests ecosystems in Lorestan province, western Iran during a ca. 2-yr period that coincided with defoliation outbreaks experienced by this area. A number of 500 lepidopteran larva feeding *Quercus* leaves handy were collected. The phylogenetic relationship of Lepidoptera was analysed using BEAST software based on the Bayesian Inference method. In total, 14 lepidopteran taxa were identified based on DNA sequences of their immature stages. Six genera and eight species were identified using BLASTn. Here we developed a COI barcoding-based approach to Lepidoptera species delimitation.
Keywords: Insecta, Lepidoptera, Damage, *Quercus brantii*, sequencing, COI barcoding, Phylogenetic tree, Iran.

Identificación molecular de algunos Lepidoptera inmaduros causantes de la defoliación de *Quercus* L., en la provincia de Lorestán, oeste de Irán (Insecta: Lepidoptera)

Resumen

Quercus L., dominan casi el 40% de la superficie forestal de Irán. El segundo grupo destructivo de insectos son los Lepidoptera defoliadores distribuidos en los bosques de Zagros de Irán. Hemos evaluado las comunidades de lepidópteros en los ecosistemas de los bosques de Zagros en la provincia de Lorestan, al oeste de Irán, durante un periodo de unos 2 años que coincidió con los brotes de defoliación experimentados en esta zona. Se recogieron 500 larvas de lepidópteros que se alimentaban de hojas de *Quercus*. La relación filogenética de los Lepidoptera se analizó mediante el programa informático BEAST, basado en el método de la inferencia bayesiana. En total, se identificaron 14 taxones de Lepidoptera a partir de las secuencias de ADN de sus estadios inmaduros. Mediante BLASTn se identificaron seis géneros y ocho especies. Aquí desarrollamos un enfoque basado en el código de barras COI para la delimitación de especies de Lepidoptera.
Palabras clave: Insecta, Lepidoptera, Daño, *Quercus brantii*, secuenciación, código de barras COI, árbol filogenético, Irán.

Introduction

Zagros forests in the Irano-Turanian region with an area of six million hectares occupy almost 40% of the total forests of Iran. These forests in western Iran contain 170 tree and shrub species (Sagheb-Talebi et al. 2014). The genus *Quercus* L. comprises more than 400 species found throughout the Northern hemisphere (Gil-Pelegrín et al. 2017). *Quercus* forests dominate almost 40% of Iran's forest area between 1,000 and 2,000 m elevation. These forests belong to two phytogeographical regions including Caspian-Arasbaran and Irano-Turanian (Sagheb-Talebi et al., 2014). *Quercus brantii* Lindl., occurs on south-western slopes of central Zagros between altitude 1,800 and 2,000 m.a.s.l. (Jazirehi & Ebrahimi Rostaghi, 2003). These dominant trees play a fundamental role in the Zagros ecological nature, principally through serving as food plants for numerous herbivores in the food chain, which are important resources and shelter refugees for thousands of species of animals (Jafarzadeh et al. 2020). The arthropod herbivore fauna of *Quercus* trees is usually richer than other tree species, and hence the insect groups are a crucial element of biodiversity in their ecological communities (Marquis et al. 2019; Tavakoli, Khaghaninia, et al. 2019).

Insect leaf feeders or defoliators are the largest groups of forest pests (Ciesla, 2011). Insect feeding on foliage can take a variety of forms such as; whole external feeding (all leaf tissue fed except the veins and midribs), external partial feeding (only tender tissue of leaves are eaten), and internal feeding with symptoms such as dead spots and discoloration (Ciesla, 2011). An outbreak of phytophagous insects usually causes a temporary shift from wood to leaf production, large changes in the stream-water chemistry (biogeochemical effects), rapid decrease of the growth and the productivity of the forest (short-term), nitrogen leakage from the forest ecosystem and influence ecosystem-level processes such as nutrient cycling, increase in the death or decline of trees, change in the species composition (long-term) (Eshleman et al. 1998; Reynolds et al. 2000; Swank et al. 1981; Webb et al. 1995). The second group of destructive insects is the *Quercus* defoliator Lepidoptera in the Zagros forests (Abai, 2009). One of the most important challenges facing all those involved in plant protection management of the forest is the lack of accurate knowledge of the defoliator insect species occurring in these areas. In the defoliation process of *Quercus* trees, a complex of different species are involved; the identity of many of which is unknown, and there is always a request from us to identify and naming of these pests (commonly named "a leaf / bud eating worm", "a white-spotted leaf-eater", "a biting leaf-eater", "an awkward silk weaver" and etc. (Rahmani et al. 2022). In most cases, these pests are univoltine (in some cases multivoltine), start herbivory simultaneously and their population size decrease in a short period of time, so it returns to their original state before an outbreak. But in general, they have a negative effect on the annual growth of infested trees and seed production. Many of these pests are native to the region and can be found every year according to climatic conditions (Rahmani et al. 2022). Elevation and tree density, soil variables such as pH, and litter properties were responsible for the insect herbivory in forests of northern Iran (Hajizadeh et al. 2016). Various outbreaks of herbivorous insects were recorded in forests of Iran; *Hyphantria cunea* (Drury, 1773), *Altica viridula* Weise, 1889, the geometrid moths such as *Ennomos quercinaria* (Hufnagel, 1767) and *Erannis defoliaria* (Clerck, 1759) in Caspian regions (Barimani Varandi et al. 2006; Kavosi, 2007; Kavosi & Gninenko, 2007; Kiadaliri et al. 2005), *Lymantria dispar* (Linnaeus, 1758) in northern Zagros (Tavakoli et al. 2018), *Leucoma wiltshirei* Collenette, 1938, in southern Zagros (Jalili, 2022).

The main aim of the present work was to identify the caterpillars (immature / larval stages) causing losses due to defoliation in forest-steppe *Quercus* stands for two years period (2018-2020) using COI barcoding and to reconstruct phylogenetic relationships of lepidopterans. In this paper, we showed that *Quercus* leaf defoliating is a phenomenon that does not belong only to one species and several species of lepidopteran larvae are responsible for this event.

Methods

Study area and sample collection

This investigation was conducted from March 2018 to June 2020 in the Zagros forests of Lorestan province, western Iran. The forests of Lorestan province cover one million two hundred thousand hectares and about 44% of the total area of the province in the west, south, southwest of the centre and east of the province. There are about 90 species of trees and shrubs (woody plants) in this province. In

Lorestan, there are two species of *Quercus* including *Quercus brantii* and *Q. infectoria* Oliv. with several growing hybrids to be recognized. A number of 500 lepidopteran larva feeding *Quercus* leaves handy were collected. Caterpillars were cached using a white canvas curtain fabric measuring 2 x 2 meters cover the ground under the tree. Sixteen to 51 trees were analyzed in each station. The specimens were photographed under a stereomicroscope (Wild-Heerbrugg M8Model) equipped with a digital camera (Nikon® Coolpix S7000) (Figure 1).

DNA extraction and PCR

The genomic DNA of a representative specimen was extracted using CTAB according to Doyle & Doyle (1987). A fragment of the cytochrome oxidase subunit I (*COI*) was amplified by polymerase chain reaction (PCR) using the primers designed by various authors (Table 1). PCR reactions were carried out in a thermocycler (Corbett®, Australia) based on a touchdown temperature profile: 3 minutes at 94ºC, 11x [45 s at 94ºC, 50 s at 60-50ºC, 60 s at 72ºC], followed by 24x [45 s at 94ºC, 50 s at 50ºC, 60 s at 72ºC], 3 minutes at 72ºC). PCR for each 25 l final volume reaction was performed using 12.5 l RedMaster PCR 2X (Sinaclon®, Iran), 1 l of each primer (10 pM), 4 l gDNA template (100 ng/l), and 6.5 l ddH_2O. The PCR products were visualized with 1% agarose gel electrophoresis and finally submitted to a third-party service provider (Codon Genetic Group®, Iran) for sequencing using Applied bioSyestems-ABI, 3130XL.

Table 1. PCR primers (matching result according to primer BLAST) used in molecular analysis and the size of expected *COI* gene fragment targeting different butterflies

Primer name (direction)	Sequence (5'→3')	**Taxa** (GB acc. no.) / **Gene target size** (bp)													
		Amphipyra effuse (MW352787)	Catocala fraxini (OV884055)	Eriogaster sp. (Lasiocampidae) (NC_062175)	Pammene albuginana (GQ149501)	Apocheima cinerarius (KR478686)	Quercusia quercus (KM592971)	Erannis defoliaria (FR990095)	Euproctis cryptosticta (KY996558)	Satyrium behrii (OP431069)	Dicycla oo (Noctuidae) (MZ297463)	Tortrix viridana (AY883092)	Bena Bicolorana (Nolidae) (NC_062184)	Aporophyla lueneburgensis (OW028764)	Orthosia cruda (MZ297463)
C1-J-1718*	GGA GGA TTT GGA AAT TGA TTA G	524													
C1-N-2191*	CCC GGT AAA ATT AAA ATA TAA ACT TC														
LCO1490**	GGT CAA CAA ATC ATA AAG ATA TTG G											701	702		
HC02198***	CAG GGT GMC CAA AAA ATC														

*From Simon et al. (1994) with minor modification in C1-J-1718 as follows: deletion of –TTCC... from the 5' end; **From Folmer et al. (1994); ***Modified after Folmer et al. (1994) with major modification in HC02198 as follows: deletion of – TAAACTT... from the 5' end along with some minor changes.

BLASTn AND PHYLOGENETIC ANALYSIS

The DNA sequence was manually checked using FinchTV® software to correct any sources of error or ambiguities if present. Homologies with the available sequence data in GenBank were checked using BLASTn analysis and the phylogenetic closeness. The criteria for the identification via BLASTn analysis were 99% - 100% sequence identity with comparable COI sequences of each taxa deposited in

GenBank and an acceptable query cover (more than 90%). In many cases, we used from Bold Systems website (https://boldsystems.org/index.php/) as a complementary data bank in order to improve the identification of Lepidoptera taxa. Finally, the sequence was submitted to GenBank, and the accession numbers were achieved. The nucleotide sequence was then used to build a phylogenetic tree supporting the identification. To construct the COI phylogenetic tree, various alignment datasets (according to different families or superfamily) were analysed using BEAST (Ver. 2.6.0) (Bouckaert et al. 2014) based on the Bayesian Inference (BI) method. The phylogenetic trees were summarized and visualized using Tree Annotator and then FigTree (Ver. 1.4.4.), respectively. For this purpose, COI sequences including sequences of the present study, as well as the comparable data sequences of GenBank submitted from various parts of the world including the species of a genus were used. Sequences were selected according to the identity revealed by the BLAST algorithm. Then, the sequences were aligned using SeaView4 software (Gouy et al. 2010). The genetic distances among and between sequences were calculated using Maximum Composite Likelihood (MCL) modelled in MEGA7 (Kumar et al. 2016). The out-groups were chosen from the sister groups as well as successively more distant lineages including some taxa of this study and other taxa. Thus, the genera *Euproctis*, *Erannis*, *Lasiocampa*, *Satyrium* and *Tortrix* were examined as out-groups.

Results

Caterpillar identification via BLASTn analysis

In total, 14 Lepidoptera taxa were identified based on DNA sequences of their immature stages. Six genera and eight species were identified using BLASTn. The genera including *Apocheima* Hübner, [1825], *Catocala* Schrank, 1802, *Eriogaster* Germar, 1810, *Euproctis* Hübner, [1819], *Pammene* Hübner, [1825], *Satyrium* Scudder, 1876 and species *Amphipyra pyramidea* (Linnaeus, 1758), *Aporophyla nigra* (Haworth 1809), *Bena bicolorana* (Fuessly 1775), *Dicycla oo* (Linnaeus 1758), *Erannis ankeraria* (Staudinger 1861), *Orthosia cruda* ([Denis & Schiffermüller], 1775), *Quercusia quercus* (Linnaeus 1758), *Tortrix viridana* Linnaeus 1758 were found (Table 2). The most identified taxa (5 taxa) were related to the noctuid family and the least taxa were related to Erebidae, Lasiocampidae, Nolidae, each one species (Figure 2). COI sequences were registered in GenBank under the accession numbers MT832310, MT832359, MT833841-2, MT835252-4, MT844020, MT844050-5, MT881717, MT947393, MT948195. After immature rearing and adult emergence of some Lepidoptera such as *Catocala* and *Satyrium* in laboratory conditions (data not shown), the specimens need to be morphologically identified at the level of species for further investigations.

Phylogenetic analysis

Phylogenetic trees were constructed based on partial COI sequence data and several clades were formed according to genetic distances and out-group relationships (Figure 3). The genetic distances between clades are as follows: 9% to 21% (Noctuoidea, seven clades), 14% (Geometridae, two clades), 11% (Lasiocampidae, two clades), 10% (Lycaenidae, two clades), 17% (Tortricidae, two clades). The COI phylogeny of the various lepidopteran genera is rooted in clades of selected out-group genera. The COI phylogenetic tree shows in Noctuoidea (Figure 3A), the clade *Euproctis* is a more distinct evolutionary lineage as ancestral, basal, or a sister group with 19% to 21%, genetic distance compared with other clades.

Discussion

This study as a faunal work

In this survey, out of 14 collected taxa (eight species and six genera with unidentified species), seven taxa including four species and three genera (unknown species) are reported for the first time in Lorestan province. Two species are identified as *Quercus* tree defoliator for the first time from Iran. According to the literatures review, the taxa *Apocheima*, *Aporophyla nigra*, *Bena bicolorana*, *Orthosia cruda*, *Pammene*, *Quercusia quercus* and *Satyrium* have not been reported from Lorestan province, and two species *Aporophyla nigra* and *Orthosia cruda* have not been mentioned as *Quercus* tree defoliator in Iran (Abai, 2009; Mirzayans & Abai, 1974; Mohammadian, 2005; Shahreyari-Nejad et al. 2018). Other taxa which are previously reported in Iran including *Amphipyra pyramidea*, *Orthosia cruda*, *Ap. nigra*, *Dicycla oo*, *Euproctis*, *Catocala*, *Tortrix viridana*, *Erannis*, *Eriogaster*, *Quercusia quercus* and *B. bicolorana*. *Am. pyramidea* distributed in Palearctic from Southern Europe to Turkey, Levant, Iran, and temperate regions of Asia collected on *Quercus* species, polyphagous on various deciduous trees and bushes (Kravchenko et al. 2007). *O. cruda* distributed in West-Palearctic including Morocco, Algeria, Tunisia, Europe, Turkey, Levant, Caucasus, Transcaucasia and Kazakhstan collected on deciduous trees, mainly on *Quercus*, *Salix* and *Populus* L. (Kravchenko et al. 2007). *Aporophyla nigra* distributed in West-Palearctic. Morocco, Tunisia, Libya, Southern and Central Europe, Turkey, Levant, Iran, Iraq and Caucasian region collected on *Astragalus* L., *Crataegus monogyna* Jacq., *Rosa canina* L., *Calluna* Salisb., *Rumex* L., *Plantago* L., *Stellaria* L., *Deschampsia* P. Beauv., *Epilobium* L., *Genista* L. and *Oxalis* L. (Kravchenko et al. 2007). *D. oo* distributed in European-West Asiatic, Southern, Central and Eastern Europe, Turkey, Levant, Iran, Iraq, and Transcaucasia. Over the past few decades extinct from many parts of Europe, drastically decreased in most of the other regions. This species invades *Q. calliprinos* Webb and *Q. ithaburensis* Decne also other *Quercus* spp. (Kravchenko et al. 2007). The new data of the present study indicate the need for further faunistic studies in different regions of Zagros provinces. Another aspect of the importance of this type of studies is that during the last two decades, due to climate changes, we have witnessed several outbreaks of *Quercus* leaf-eating pests in the forest areas of Iran, and therefore, identifying them seems necessary to control them in the future. The following taxa reported by Mirzayans and Abai (1974) and Abai (2009) on *Quercus* tree in Iran; various *Euproctis* and *Catocala* from Zagros mountains and northern provinces, *D. oo* from Zagros mountains, *Am. pyramidea* from northern and south western provinces, *Tortrix viridana* from different parts, and also, two species of the genus *Erannis* and *Eriogaster*. The following lepidopterans taxa were reported by Mohammadian (2005) in various parts of Iran; thirteen *Catocala*, five *Eriogaster*, five *Euproctis*, seven *Satyrium*, four *Amphipyra* (such as *Am. pyramidea* from Zagros & Elburz Mountains), three *Erannis* (such as *Er. ankeraria* from Northern half of Iran Plateau), *Aporophyla australis* (Boisduval 1829), *Q. quercus* and *T. viridana* from Zagros Mountains, *B. bicolorana* from Caspian Eastern shore, *D. oo* from West & North of Iran, *O. incerta* (Hufnagel, 1766) from Northern half of Iran. Ravan et al. (2016) reported some Noctuinae species on the *Quercus* tree bionomically and morphologically; Some Ravan's reported species such as *Ap. nigra* and *D. oo* are distributed in Khuzestan and Fars provinces located in southwest Iran. Due to the importance of the *Quercus* tree in forest ecology, many studies have been conducted on its *Quercus* defoliator pests in the surrounding countries; the Geometridae family was indicated as the most representative Lepidoptera family feeding on *Quercus* trees in Turkey (Torun & Çalişkan, 2016). Larvae of 54 Lepidoptera species were collected from eight species of *Quercus* in Greece (Kalapanida & Petrakis, 2012). In another study, in addition to the Geometridae family, the highest number of *Quercus* foliage defoliators was reported among Noctuidae (Kalapanida & Petrakis, 2012). Torun and Çalişkan (2016) reported Lepidoptera larval communities feeding on *Q. pubescens* in Turkey including seven Geometridae, four Noctuidae, two Tortricidae, two Thyatiridae and one species for each of the families Gelechiidae, Arctiidae, Gracillariidae, Lasiocampidae, Lymantriidae, Oecophoridae, Pyralidae, Yponomeutidae, Pterophoridae and Lycaenidae. In the present study, the greatest richness of *Quercus* defoliating caterpillars belonged to the Noctuidae family (five taxa) and Noctuoidea superfamily (seven taxa) followed by Geometridae, Lycaenidae, Tortricidae (each family with two taxa) and finally Lasiocampidae (one taxon).

Table 2. Caterpillars collected in this study and their GenBank data

No. of station	Collection site (county)	GCS	Altitude m.a.s.l.	Taxa identified (GB acc. no.)						
				Noctuoidea			Geometroidea	Bombycoidea	Papilionoidea	Tortricoidea
				Noctuidae	Erebidae	Nolidae	Geometridae	Lasiocampidae	Lycaenidae	Tortricidae
1	Meleh-ye Shabanan (Khorramabad)	48°09'40"E 33°32'07"N	1250	*Am. pyramidea* (MT832310) *Catocala* sp. (MT881717) *D. oo* (MT835254) *O. cruda* (MT833841)			*Apocheima* sp. (MT844054) *Er. ankeraria* (MT844050)		*Qi. quercus* (MT844051)	*Pammene* sp. (MT844055)
2	Eyvandar (Aleshtar)	48°15'54"E 33°40'27"N	1525	*Ap. nigra* (MT832359) *O. cruda* (MT833842)	*Euproctis* sp. (MT835252)				*Satyrium* sp. (MT844052)	
3	Nozhian (Khorramabad)	48°34'35"E 33°13'45"N	1345	*Catocala* sp. (MT835253)	*Euproctis* sp. (MT844020)			*Eriogaster* sp. (MT844053)		
4	Sarkanah (Sepiddasht)	48°43'16"E 33°15'45"N	1327			*B. bicolorana* (MT947393)				*T. viridana* (MT948195)

GCS: geographical coordinates system, m.a.s.l.: meters above sea level, GB acc. no.: GenBank accession number, Am.: *Amphipyra*, Ap.: *Aporophyla*, B.: *Bena*, D.: *Dicycla*, Er.: *Erannis*, O.: *Orthosia*, Qi.: *Quercusia*, T.: *Tortrix*

The context and importance of study

The most important aspect of this study was the attendance of researcher at the time and place of which the defoliation by caterpillars was occurred. As in the authors' previous studies (Tavakoli et al. 2017, 2018; Tavakoli, Hosseini-Chegeni et al. 2019), trees damaged by pest insects were significantly more defoliated and the affected trees exhibited heavily aggregated caterpillars feeding on the foliage. The sampling technique consists of shaking the tree twigs to fall various larvae on a white cloth spread under the tree over the ground and then the direct manual collection of larval samples. Furthermore, the larva that feed on the *Quercus* trees (particularly *Quercus brantii* in this study), showing a richer species diversity, with high level of homochromy and homomorphy among the larva with tree parts (trunk, branches, and foliage) that live on it. They cannot be easily seen and collected by amateurs and even some insect collectors, so this method was used. A constraint of our study is that most of the present defoliator pests are univoltine species, i.e., their damaging and larval stages appear at certain times (Glavendekiæ & Medareviæ, 2010; Kalapanida & Petrakis, 2012). Then, researchers can monitor and study them at certain times. Following the defoliator there has been an ecological succession of wood boring beetles and the *Quercus* decline (dieback) occurrence in the areas where we have had the outbreak of insect defoliators (Csóka & Kovács, 1999; Domingue et al. 2011; Netherer & Schopf, 2010; Rouault et al. 2006). Rearing caterpillars to adult stage in several forestry lepidopteran species are more difficult at laboratory conditions, and usually due to the poor data related to behaviour, biology and ecology, the breeding and hatching of larva is very difficult (laboratory observations). Inevitably, we had to use molecular methods for diagnosis. Unlike some polyphagous pests such as *Lymantria dispar* which is previously reported in Zagros forests of Iran (Tavakoli et al. 2018), the larvae of the present study are monophagous and feed exclusively on *Q. brantii*. The authors could not find them on other hosts. Due to the lack of basic knowledge on the emergence time of adult insects and rich species diversity of leaf-feeder Lepidoptera of *Quercus* trees, shrubs, and pastures, it was impossible for us to use light traps and obtain adult Lepidoptera that are feeding on leaves. When using light traps and collecting Lepidoptera, its host is not known. A set of these pests are native to Zagros forests of Iran and so are not invasive, while in the climate change context, the concern is more about invasive than native pests (Simmons et al. 2014). The Zagros forests of Lorestan province are highly damaged i.e., under the severe pressure due to the agricultural and animal husbandry activities, as well as successive droughts, the leaf feeders and wood borings were dominated (Attarod et al. 2016; Beiranvand et al. 2015; Jazirei & Ebrahimi Rostaghi). As a global perspective human and none human factors may be the most destructive agents in the forestry ecosystems (Kulman, 1971; McCullough et al. 1998). Here we developed a COI barcoding-based approach to lepidopteran species delimitation.

This study built a basic framework to identify and thus the application of suitable control measures for each Lepidoptera species causing *Quercus* defoliation in Lorestan province, western Iran.

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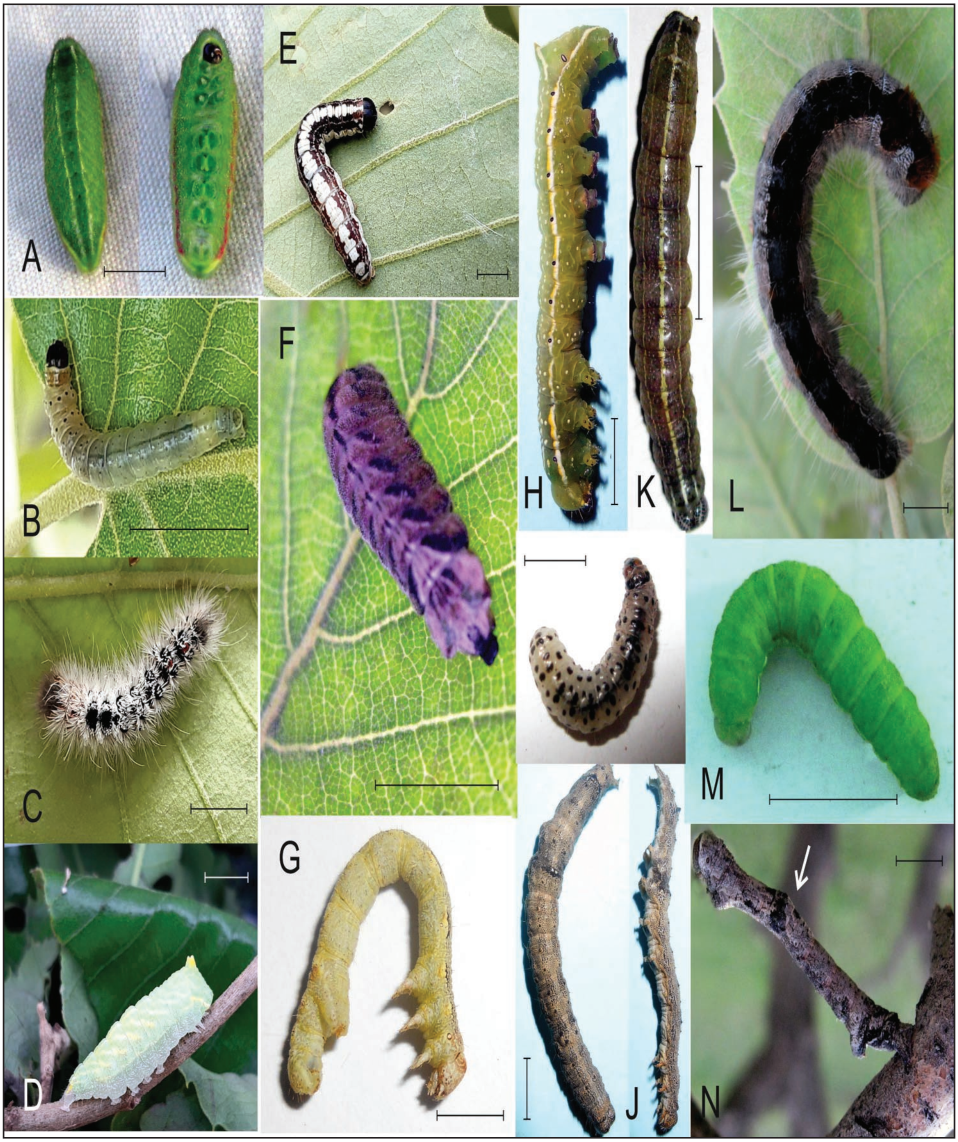

Figure 1. Larval stages of the various Lepidoptera (A-N) collected in this study (naming after BLASTn analysis and phylogenetic closeness). A. *Satyrium* sp. B. *Tortrix viridana.* C. *Euproctis* sp. D. *Bena bicolorana.* E. *Dicycla oo.* F. *Quercusia quercus.* G. *Erannis ankeraria.* H. *Amphipyra pyramidea.* I. *Pammene* sp. J. *Catocala* sp. K. *Orthosia cruda.* L. *Eriogaster* sp. M. *Aporophyla nigra.* N. *Apocheima* sp. Size bar is equal to 1 cm.

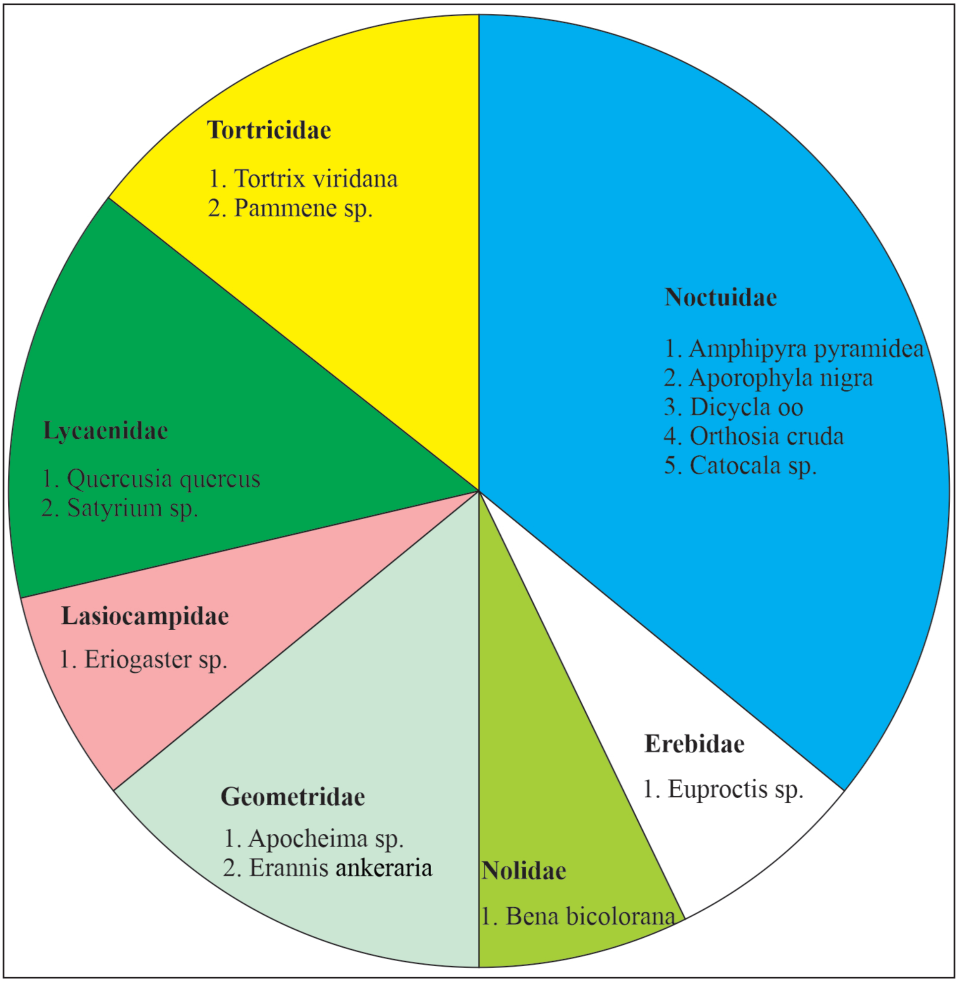

Figure 2. Relative proportions of the Lepidopteran taxa (superfamily, family, genera, and species) identified in caterpillar communities feeding on *Quercus brantii*, in western Iran.

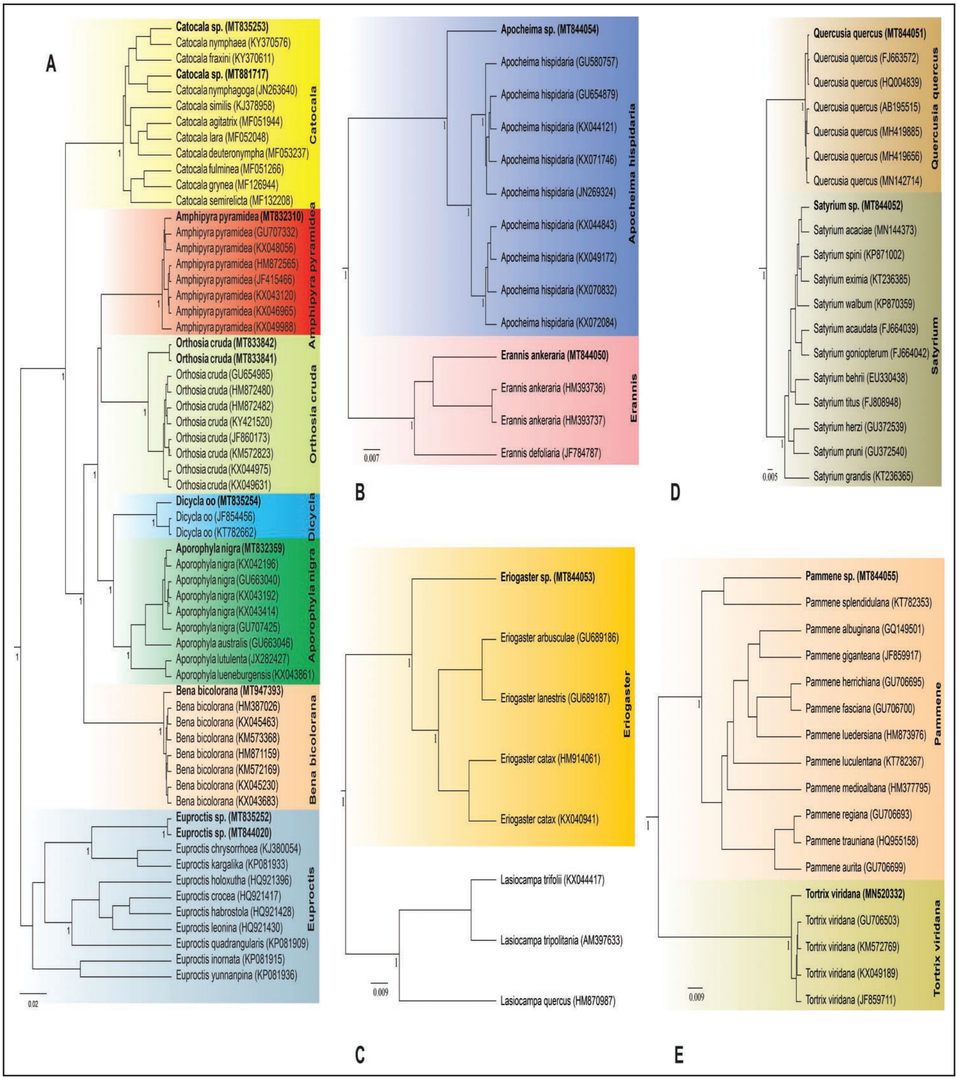

Figure 3. Phylogenetic relationships among Lepidoptera in the Zagros forests of Lorestan province derived from the Bayesian inference (BI) generated based on analysis of partial COI sequences; Numbers below each node show posterior probability value (10 million reiterations). Taxon labels give the species name followed by GenBank accession numbers in parentheses. The taxon sequenced in the present study is highlighted in bold. The clades are well marked with color boxes according to superfamily or families including Noctuoidea containing Erebidae, Noctuidae, Nolidae (A), Geometridae (B), Lasiocampidae (C), Lycaenidae (D), Tortricidae (E).

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New data on the genus *Scythris* Hübner, [1825] from the Canary Islands (Spain), with description of six new species (Lepidoptera: Scythrididae)

Per Falck

Abstract

The *Scythris petrella* species-group in the Canary Islands is revised based on external morphology, genitalia and DNA barcodes. Eleven species are recognized. Six species are described as new: *Scythris aronaella* Falck, sp. nov. (Spain: Tenerife), *Scythris moyaella* Falck, sp. nov. (Spain: Gran Canaria), *Scythris rupemella* Falck, sp. nov. (Spain: Gran Canaria), *Scythris linealbella* Falck, sp. nov. (Spain: Tenerife), *Scythris solisella* Falck, sp. nov. (Spain: El Hierro and Tenerife) and *Scythris ochrelinella* Falck, sp. nov. (Spain: Tenerife). *Scythris hierroella* Klimesch, 1986, syn. nov. is treated as a synonym of *Scythris petrella* Walsingham, 1908. Photographs of adults and genitalia of all species are provided. All species are DNA barcoded. Analyses of the DNA barcodes support the identifications and distinctiveness of each species as they all appear well-supported and genetically isolated.
Keywords: Lepidoptera, Scythrididae, DNA barcodes, new records, new species, Canary Islands, Spain.

Nuevos datos sobre el género *Scythris* Hübner, [1825] de las Islas Canarias (España), con descripción de seis nuevas especies (Lepidoptera: Scythrididae)

Resumen

Se revisa el grupo de especies de *Scythris petrella* en las Islas Canarias basándose en la morfología externa, la genitalia y los códigos de barras de ADN. Se reconocen once especies. Seis especies se describen como nuevas: *Scythris aronaella* Falck, sp. nov. (España: Tenerife), *Scythris moyaella* Falck, sp. nov. (España: Gran Canaria), *Scythris rupemella* Falck, sp. nov. (España: Gran Canaria), *Scythris linealbella* Falck, sp. nov. (España: Tenerife), *Scythris solisella* Falck, sp. nov. (España: El Hierro y Tenerife) y *Scythris ochrelinella* Falck, sp. nov. (España: Tenerife). *Scythris hierroella* Klimesch, 1986, syn. nov. se trata como sinónimo de *Scythris petrella* Walsingham, 1908. Se facilitan fotografías de adultos y genitalia de todas las especies. Todas las especies tienen códigos de barras de ADN. Los análisis de los códigos de barras de ADN apoyan la identificación y el carácter distintivo de cada especie, ya que todas parecen estar bien sustentadas y aisladas genéticamente.
Palabras clave: Lepidoptera, Scythrididae, código de barras de ADN, nuevos registros, nuevas especies, Islas Canarias, España.

Introduction

Scythrididae are a medium sized family of Gelechioidea with approximately 669 species worldwide (Nieukerken et al. 2011). Since then, a number of species have been described and actually there are 923 species. The male genitalia are characterised by their extraordinary morphological diversification, including asymmetry and the female genitalia in having a very narrow ductus bursae (Heikkilä et al. 2014, p. 583; Bengtsson, 1997). The Scythrididae fauna of the Canary Islands have been treated in several publications (Walsingham, 1908; Klimesch, 1986; Bengtsson, 1997; Falck & Karsholt, 2019) and until now twenty-one species are known of which eleven are considered to be endemic.

In an attempt to arrange the species in a logical order, Bengtsson (1997) proposed a classification based on male genital morphology, female genital morphology and other characters when known. One of the species groups, the *petrella* species-group, includes *S. arachnodes* Walsingham, 1908, *S. petrella* Walsingham, 1908, *S. hierroella* Klimesch, 1986, *S. pseudoarachnodes* Bengtsson, 1997, *S. brithae* Falck & Karsholt, 2019 and *S. grancanariella* Falck & Karsholt, 2019 all endemic to the Canary Islands. In the male genitalia the group is characterised by a sigmoid or meandering phallus, lateral, rounded protrusion of tegumen, small valvae and asymmetrical segment VIII. In the female genitalia the median fissure of sternum VII is characteristic. Their larva feeds on lichens, another characteristic, and this has not been observed in any other species-groups.

In the present paper the *petrella* species-group is revised, and adults, male- and female genitalia are figured of all known species. One additional species is described, which is impossible to arrange in the classification made by Bengtsson (1997). All the species are barcoded.

Material and methods

Almost 700 specimens from Gran Canaria, El Hierro and Tenerife were examined. Most of the specimens were netted during the daytime and only a few specimens attracted to an 8 watt super actinic light. 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 slide were photographed using a Soptop CX40T Trinocular microscope in conjunction with a Toup Tek P10500A-E3 / E3ISPM05000KPA-E3 / 5.0MP USB3 camera.

DNA samples were prepared from dried legs according to the prescribed standards and processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) to obtain the 658 base-pair long barcode fragment of the mitochondrial COI gene (cytochrome c oxidase I). Intra- and interspecific distances of DNA barcode fragments were calculated using analytic tools of BOLD with the Kimura 2-parameter model of nucleotide substitution. Genetic clusters are presented with their barcode index number (BIN; cf. Ratnasingham & Hebert, 2013). A neighbour-joining tree (Figure 54) was constructed using analytic tools of BOLD with the Kimura 2-parameter model and COI-5P Cytochrome Oxidase Subunit 1-5' Region (15) as marker. Details of successfully sequenced voucher specimens are publicly available through the dataset DS-SCYCA at www.boldsystems.org and at dx.doi.org/10.5883/DS-SCYCA.

The morphology and the DNA Barcodes of all the species are examined.

Abbreviations used

GP Genitalia preparation
PF Collection of Per Falck, Neksø, Denmark
MNCN Collection of Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain

Checklist of Scythrididae know from the Canary Islands

Enolmis acanthella (Godart, 1824)
Scythris pinkeri Klimesch, 1986
Scythris polycarpaeae Klimesch, 1986
Scythris biacutella Bengtsson, 2002
Scythris arachnodes Walsingham, 1908

Scythris petrella Walsingham, 1908
= *Scythris hierroella* Klimesch, 1986, **syn. nov.**
Scythris pseudoarachnodes Bengtsson, 1997
Scythris brithae Falck & Karsholt, 2019
***Scythris aronaella* Falck, sp. nov.**
Scythris grancanariella Falck & Karsholt, 2019
***Scythris moyaella* Falck, sp. nov.**
***Scythris rupemella* Falck, sp. nov.**
Scythris guimarensis Bengtsson, 1997
***Scythris linealbella* Falck, sp. nov.**
***Scythris solisella* Falck, sp. nov.**
***Scythris ochrelinella* Falck, sp. nov.**
Scythris klimeschi Bengtsson, 1997
Scythris fasciatella (Ragonot, 1880)
Scythris boseanella Klimesch, 1986
Scythris nipholecta Meyrick, 1924
Scythris eucharis Walsingham, 1907
Scythris amplexella Bengtsson, 2002
Scythris camelella Walsingham, 1907
Scythris albidella (Stainton, 1867)
Scythris mus Walsingham, 1898
Eretmocera medinella (Staudinger, 1859)

Results

Scythris arachnodes Walsingham, 1908 (Figures 1-2, 31, 31a, 44)
Scythris arachnodes Walsingham, 1908, *Proc. zool. Soc. Lond., 1907*, 972
Type locality: SPAIN, Tenerife.

Material examined: SPAIN, Arona, 670 m, 10 ♂♂, 3 ♀♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3011PF, 3012PF, 3009PF, 3010PF, DNA samples Lepid Phyl 0385PF/CILEP384-20, 0386PF/CILEP385-20, 0387PF/CILEP386-20; Las Manchas, 1050 m, 1 ♂, 5 ♀♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3013PF (PF, MNCN).

DNA barcodes (Figure 54): Three specimens were sequenced, resulting in 658 bp, full length DNA barcode fragments for one specimen, and fragments of 634 bp for two specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEC6071. The intraspecific distance is 0%. The minimum p-distance to nearest neighbour *S. aronaella* is 1.82 %.

Diagnosis: Wingspan 8.5-10 mm. *S. arachnodes* is characterized by the blackish brown colour and two whitish zigzagging fasciae at 1/3 and 2/3. It resembles *S. pseudoarachnodes*, *S. grancanariella*, and especially dark specimens of *S. petrella*. *S. arachnodes* can be distinguished from *S. pseudoarachnodes* by the larger size, from *S. grancanariella* by the much darker ground-colour and from *S. petrella* by the darker ground-colour and by that the inner fascia is not outwardly angulated, however, it is not always possible to identify without genitalia dissection or barcoding. In the male genitalia (Figures 31, 31a) the almost symmetrical valvae each with one long slightly tapering process and two smaller protrusions and the shape of phallus with a straight middle part are characteristic. In the female genitalia (Figure 44) the posterior margin of sternum VII with a median fissure with a weakly sclerotized edge, and the anterior margin with a small, heavily sclerotized V-shaped structure, laterally with a corrugated area are characteristic.

Biology: The larva lives in a silken tube under a rather opaque web, in appearance of a spider´s web, on rocks and rough stones in walls, probably feeding on small lichens (Walsingham, 1908, p. 972). The specimens were flying actively or disturbed from rocks in sunny days.

Distribution: Known only from the island of Tenerife, Spain.

Scythris petrella Walsingham, 1908 (Figures 3-8, 32, 32a, 33, 33a, 45-46)
Scythris petrella Walsingham, 1908, *Proc. zool. Soc. Lond., 1907*, 972-973
Type locality: SPAIN, Tenerife.
= *Scythris hierroella* Klimesch, 1986, *Vieraea 16*, 328, **syn. nov.**

Material examined: SPAIN, Gran Canaria, Los Tilos de Moya, 550 m, 1 ♂, 17-30-IX-2018, leg. P. Falck, genitalia slide 2839PF, DNA sample Lepid Phyl 0712PF/CILEP711-20, same data but, 12 ♂♂, 4 ♀♀, 8-20-VIII-2020, leg. P. Falck, genitalia slide 3409PF, 3410PF, DNA samples Lepid Phyl 0705PF/CILEP704-20, 0706PF/CILEP705-20, 0713PF/CILEP712-20, 0714PF/CILEP713-20, same data but, 1 ♂, 2 ♀♀, 9-22-VI-2021, leg. P. Falck, genitalia slide 3505PF, 3506PF; Carreteria, 455 m, 14 ♂♂, 6 ♀♀, 8-20-VIII-2020, leg. P. Falck, genitalia slide 3411PF, 3417PF, DNA samples Lepid Phyl 0703PF/CILEP702-20, 0704PF/CILEP703-20, 0707PF/CILEP706-20, 0711PF/CILEP710-20, same data but, 1 ♂, 1 ♀, 9-22-VI-2021, leg. P. Falck, genitalia slide 3503PF, 3504PF; Teror, 500 m, 3 ♂♂, 1-13-IV-2022, leg. P. Falck, genitalia slide 3677PF; El Hierro, Erese, 700 m, 31 ♂♂, 29 ♀♀, 22-VII-3-VIII-2022, leg. P. Falck, genitalia slide 3748PF, 3759PF, 3765PF, 3767PF, 3778PF, DNA samples Lepid Phyl 1102PF/CILEP1101-22, 1104PF/CILEP1103-22; Frontera, 280 m, 6 ♂♂, 8 ♀♀, 22-VII-3-VIII-2022, leg. P. Falck; Cruz de Las Reyes, 1360 m, 9 ♂♂, 7 ♀♀, 22-VII-3-VIII-2022, leg. P. Falck, genitalia slide 3749PF, 3760PF, 3763PF, DNA samples Lepid Phyl 1105PF/CILEP1104-22, 1106PF/CILEP1105-22; Tenerife, Arona, 670 m, 9 ♂♂, 1 ♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3002PF, 3006PF, 3008PF, 3015PF, same data but, 2 ♂♂, 4 ♀♀, 3-16-VIII-2021, leg. P. Falck, genitalia slide 3509PF, 3512PF; Las Mercedes, 750 m, 1 ♂, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3021PF; Aguamansa, 1050 m, 40 ♂♂, 61 ♀♀, 13-26-VIII-2019, leg. P. Falck, genitalia slide 3081PF, 3088PF, 089PF, 3093PF, 3094PF, DNA samples Lepid Phyl 0399PF/CILEP398-20, 0400PF/CILEP399-20¸ La Guancha, 930 m, 3 ♂♂, 2 ♀♀, 13-26-VIII-2019, leg. P. Falck, genitalia slide 3082PF, 3092PF, DNA sample Lepid Phyl 0398PF/CILEP397-20; Las Manchas, 1050 m, 1 ♂, 3-16-VIII-2021, leg. P. Falck; Near Chirche, 1100 m, 2 ♂♂, 1 ♀, 3-16-VIII-2021, leg. P. Falck, genitalia slide 3507PF; Güímar, 500 m, 11 ♂♂, 1 ♀, 3-16-VIII-2021, leg. P. Falck, genitalia slide 3508PF, 3516PF (all PF).

DNA barcodes (Figure 54): Sixteen specimens were sequenced, resulting in 658 bp, full length DNA barcode fragments for five specimens, fragments of 648 bp for eight specimens, and fragments of 632 bp, 603 bp and 573 bp for three specimens. The intraspecific divergence is high, and *S. petrella* is divided into three well-separated sub-groups comprised by nine specimens from Gran Canaria (maximum intraspecific distance 0.16%), four specimens from El Hierro (maximum intraspecific distance 0.52%) and three specimens from Tenerife (maximum intraspecific distance 0.32%). The maximum intraspecific distance between the sub-groups is 1.90% between Gran Canaria and El Hierro, 1.86% between Gran Canaria and Tenerife and 2.70% between El Hierro and Tenerife. The minimum p-distance to nearest neighbour *S. aronaella* is 1.12%. The barcodes fall within Barcode Index Numbers (BIN) BOLD: AEG7684 (Gran Canaria), AEW1054 (El Hierro) and AEC3981 (Tenerife).

Diagnosis: Wingspan 7.5-11 mm. *S. petrella* is characterized by the blackish brown colour of the forewing, mottled with white, sometimes forming one or two spots near the apex, an outwardly angulate, indistinct whitish fascia at 1/3 and an outer whitish fascia at 2/3. It exhibits considerable variation both in size and mottling with white scales. It resembles *S. arachnodes* q. v. and especially *S. grancanariella*, which usually is more greyish-white in appearance, but it is often impossible to separate adults of the two species without dissection of the genitalia or barcoding. In the male genitalia (Figures 32, 32a, 33, 33a) the almost symmetrical valvae each with one rather broad, tapering process and one small hook-shaped process laterally, and the long, rather thin phallus with two deep bows near the apex are characteristic. In the female genitalia (Figures 45-46) the posterior margin of sternum VII with a median fissure with sclerotized edge, the anterior margin of sternum VII with a heavily sclerotized V-shaped structure, laterally and posteriorly surrounded by a U-shaped sclerotization and a small beak-shaped extension antero-laterally are characteristic.

Biology: Klimesch (1986, p. 327) mentions that the larva lives under a web on lichen overgrown rocks, but it is unclear if he reared the species himself. The specimens were flying actively in warm and sunny days or disturbed from rocks or stone walls. In hot nights a few specimens were attracted to light. The adults were observed over a long period of time from the beginning of April until the end of September.

Distribution: *S. petrella* is one of the most widely distributed species of the genus in the Canary Islands, and it is known from the islands of El Hierro, Gran Canaria, La Palma (Baez, 2010) and Tenerife, Spain.

Remarks: Klimesch (1986) treated the Scythrididae fauna of the Canary Islands and described three new species. He also figured the adults and genitalia of two further species, one without naming it (p. 326) and a second with the preliminary name *Scythris* sp. (*hierroella* Jäckh, in litt.). He did not intend to describe *S. hierroella*, probably because the lack of males. Bengtsson (1997, p.139) raised *S. hierroella* to species rank based on this description. However, he apparently had his doubts whether it was a distinct species, as he stated, "Males of *hierroella* caught or reared together with females might definitely solve the taxonomy of these two [*S. hierroella* and *S. petrella*, author´s comment] species". Examination of the male and female genitalia clearly shows that *S. hierroella* is conspecific with *S. petrella*. However, there is a divergence in the DNA between the populations from Gran Canaria, El Hierro and Tenerife, see the discussion below.

In some populations of *S. petrella* (e. g. Aguamansa, Tenerife and Cruz de las Reyes, El Hierro) almost all the specimens are very dark with diffuse fasciae and with very little white mottling.

Scythris pseudoarachnodes Bengtsson, 1997 (Figures 9-10, 34, 34a, 47)
Scythris pseudoarachnodes Bengtsson, 1997, *Microlepid. Eur., 2,* 140
Type locality: SPAIN, Tenerife, Icod.
= *Scythris pseudarachnodes* Bengtsson, 1997, *Microlepid. Eur., 2,* 22, 140, 247, 273, *lapsus calami*

Material examined: Spain, Tenerife, Arona, 670 m, 14 ♂♂, 1 ♀, 13-26-VIII-2019, leg. P. Falck, genitalia slide 3083PF, 3084PF, 3513PF, 3514PF, 3515PF, DNA samples Lepid Phyl 0389PF/CILEP388-20, 0390PF/CILEP389-20, same data but, 1 ♂, 3-16-VIII-2021, leg. P. Falck; La Guancha, 930 m, 1 ♂, 13-26-VIII-2019, leg. P. Falck, genitalia slide 3095PF, DNA sample Lepid Phyl 0388PF/CILEP387-20; Güímar, 500 m, 32 ♂♂, 2 ♀♀, 3-16-VIII-2021, leg. P. Falck, genitalia slide 3511PF; Las Manchas, 1050 m, 1 ♂, 3-16-VIII-2021, leg. P. Falck (PF, MNCN).

DNA barcodes (Figure 54): Three specimens were sequenced, resulting in 658 bp, full length DNA barcode fragments for two specimens, and fragments of 633 bp for one specimen. The barcodes fall within Barcode Index Number (BIN) BOLD: AEC2342. The maximum intraspecific distance is 0.32%. The minimum p-distance to nearest neighbour *S. aronaella* is 1.78 %.

Diagnosis: Wingspan 7-7.5 mm. *S. pseudoarachnodes* is characterized by the blackish brown colour of the forewing, mottled with white, sometimes forming one or two indistinct spots near the apex, a zigzagging white fascia at 1/3 and an indistinct white fascia at 2/3. It resembles *S. arachnodes* q.v., *S. petrella* and *S. grancanariella* q.v., in most cases it can be separated from similar species by the smaller wingspan, but it is sometimes impossible to identify without genitalia dissection or barcoding. In the male genitalia (Figures 34, 34a) the asymmetrical valvae, right one with one large slightly tapering process and one small hook-shaped process, left one with one large parallel sided process and one small pointed process, and the rather robust weakly meandering phallus with a slightly bifid apex (almost looks like it is broken) are characteristic. In the female genitalia (Figure 47) the posterior margin of sternum VII with a deep median fissure with the edge sclerotised anteriorly and the sub-trapezoid, laterally incurved profile of segment VII is characteristic.

Biology: The type specimens were reared in August from larvae found on rocks with lichens (Klimesch, 1986, p. 328). The adults were flying actively in the afternoon sunshine in August at altitudes from 500 to 1050 m above sea level.

Distribution: Known only from a few localities on the island of Tenerife, Spain.

Scythris brithae Falck & Karsholt, 2019 (Figures 11-12, 35, 35a, 48)
Scythris brithae Falck & Karsholt, 2019, *SHILAP Revta. lepid., 47*(186), 329
Type locality: SPAIN, Gran Canaria, Los Tilos de Moya.

Material examined: SPAIN, Los Tilos de Moya, 500 m, 9 ♂♂, 2 ♀♀, 11-24-VI-2018, P. Falck, genitalia slide 2730PF, 2731PF, 2860PF, 2860PF, DNA samples Lepid Phyl 0393PF/CILEP392-20, 0394PF/CILEP393-20, same data but, 20 ♂♂, 3 ♀♀, 8-22-VIII-2020, leg. P. Falck, genitalia slide 3416PF, DNA samples Lepid Phyl 0701PF/CILEP700-20, 0702PF/CILEP701-20, same data but, 5 ♂♂, 1 ♀, 9-22-VI-2021, leg. P. Falck; Carreteria, 455 m, 15 ♂♂, 6 ♀♀, 8-20-VIII-2020, leg. P. Falck, genitalia slide 3420PF, 3797PF (PF, MNCN).

DNA barcodes (Figure 54): Four specimens were sequenced, resulting in DNA barcode fragments of 648 bp, 632 bp, 628 bp and 622 bp. The barcodes fall within Barcode Index Number (BIN) BOLD: AEC2413. The maximum intraspecific distance is high 1.18%. The minimum p-distance to nearest neighbour *S. pseudoarachnodes* is 3.69 %.

Diagnosis: Wingspan 7-10 mm. *S. brithae* is characterized by an outwardly oblique stripe at 1/3 from dorsum to the middle of the forewing. It is very similar to *S. aronaella* and it is impossible to separate the two species without dissection of the genitalia or barcoding. In the male genitalia (Figs 35, 35a) the almost symmetrical valvae each with one long slightly tapering process and the two curved bends of the phallus are characteristic. In the female genitalia (Figure 48) the funnel-shaped antrum and the almost invisible median fissure of sternum VII are characteristic.

Biology: Early stages unknown. The adults were flying actively in the afternoon sunshine in June and August.

Distribution: Known only from two localities in the northern part of the island Gran Canaria, Spain.

***Scythris aronaella* Falck, sp. nov.** (Figures 13-14, 36, 36a, 49)

Holotype ♂: SPAIN, Tenerife, Arona, 670 m, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3001PF (MNCN). Paratypes: SPAIN, Tenerife, Arona, 670 m, 10 ♂♂, 7 ♀♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3004PF, 3005PF, 3007PF, 3014PF, 3016PF, 3017PF, 3087PF, DNA sample Lepid Phyl 0383PF/CILEP382-20; Las Manchas, 1050 m, 2 ♂♂, 2 ♀♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3022PF, 3023PF, DNA sample Lepid Phyl 0384PF/CILEP383-20; Aguamansa, 1050 m, 4 ♂♂, 2 ♀♀, 13-26-VIII-2019, genitalia slide 3080PF, 3085PF, 3090PF, 3091PF, DNA sample Lepid Phyl 0382PF/CILEP381-20; Güímar, 500 m, 19 ♂♂, 4 ♀♀, 1-13-VI-2022, leg. P. Falck, genitalia slide 3736PF, 3737PF, 3738PF, 3739PF, 3740PF (PF, MNCN).

Description: Wingspan 8-10.5 mm. Labial palp slightly upturned, dark brown, whitish medially and dorsally, segment 3 slightly shorter than segment 2. Antenna blackish brown about 2/3 the length of the forewing, in the male with short ciliae about 0.7 of antenna diameter. Vertex, neck tuft, collar, tegula and thorax dark brown, mottled with pale ochreous scales, especially around the neck and thorax. Forewing dark brown mottled with white especially near the base and in apical half, sometimes forming one or two indistinct blotches near apex; at 1/3 from dorsum an outwardly oblique, whitish stripe sometimes forming an angulated incomplete fascia, at 2/3 an indistinct zigzagging white fascia; fringe dark grey. Hindwing width about 1/2 of the forewing, dark grey; fringe dark grey. Abdomen greyish, in the females segment VII-VIII are clearly more brownish.

Variation: Often there is a rather distinct white stripe in the median part of the forewing from near the base to beyond the inner fascia.

Male genitalia (Figure 36): Valvae asymmetrical. Uncus anvil-shaped posteriorly with a median V-shaped indentation; gnathos small, distal arm with pointed apex; tegumen sub-triangular with lateral, rounded protrusions; valvae sub-rectangular with lateral processes, right one with two long and one short slightly tapering processes, left one with one long tapering process and one smaller slightly bent process; phallus rather robust, almost straight in anterior half, then meandering with two small and one larger bends. Segment VIII (Fig. 36a) almost symmetrical; tergum VIII sub-triangular with two small lateral protrusions; sternum VIII sub-rectangular, posteriorly with two digitate rounded processes.

Female genitalia (Figure 49): Papilla analis elongate, distally rounded; posterior apophysis slender, three times as long as papilla analis; anterior apophysis slightly shorter than half the length of posterior apophysis; sternum VIII sub-rectangular, posterior margin with a hardly visible median fissure, anterior margin with an irregular U-shaped indentation; sternum VII sub-rectangular, posterior margin with deep median fissure with heavily sclerotized edge, anterior margin with sclerotized V-shaped median structure; tergum VII sub-rectangular, anterior margin with lateral concavity.

DNA barcodes (Figure 54): Four specimens were sequenced, resulting in 658 bp, full length DNA barcode fragments for two specimens, and fragments of 637 bp and 621 bp for two specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEC3980. The maximum intraspecific distance is 0.83%. The minimum p-distance to nearest neighbour *S. petrella* is 1.12%.

Diagnosis: The incomplete outwardly oblique inner fascia is characteristic and separates *S. aronaella* from most other members of the *petrella*-group, with the exception of *S. brithae*, where examination of the genitalia or barcoding is necessary to make a safe determination.

In the male genitalia the asymmetrical valvae, the numbers and shapes of the lateral processes on the valvae and the shape of the robust phallus are characteristic. In the female genitalia the weak median fissure of the posterior margin of sternum VIII, the deep sclerotised median fissure of the posterior margin of sternum VII and the shape of tergum VII are characteristic.

Biology: The early stages are unknown, but the larva probably feeds on lichens. The adults were flying actively or disturbed from rock walls with abundant growth of lichens in warm and sunny days from late May to the end of August at altitudes from 500 to 1050 m above sea level.

Distribution: Known only from scattered localities on the island of Tenerife, Spain.

Etymology: The species is named after the small town Arona situated near the type-locality.

Scythris grancanariella Falck & Karsholt, 2019 (Figures 15-16, 37, 37a, 50)
Scythris grancanariella Falck & Karsholt, 2019, *SHILAP Revta. lepid., 47*(186), 330
Type locality: SPAIN, Gran Canaria, Los Tilos de Moya.

Material examined: SPAIN, Gran Canaria, Los Tilos de Moya, 500 m, 1 ♂, 1 ♀, 11-24-VI-2018, leg. P. Falck, genitalia slide 2732PF, DNA sample Lepid Phyl 0391PF/CILEP390-20; Carreteria, 455 m, 2 ♂♂, 1 ♀, 9-22-VI-2021, leg. P. Falck, genitalia slide 3501PF, 3502PF, same data but, 4 ♂♂, 3 ♀♀, 1-13-IV-2022, leg. P. Falck, genitalia slide 3678PF; Teror, 550 m, 2 ♀♀, 1-13-IV-2022, leg. P. Falck, genitalia slide 3680PF (PF, MNCN).

DNA barcodes (Figure 54): One specimen was sequenced, resulting in 613 bp DNA barcode fragments. The barcode falls within Barcode Index Number (BIN) BOLD: AEC5321. The minimum p-distance to nearest neighbour *S. petrella* is 3.61 %.

Diagnosis: Wingspan 9.5-11 mm. *S. grancanariella* is characterized by the brown colour of the forewing, heavily mottled with greyish white and an outwards angulated white fascia at 1/3. It resembles *S. arachnodes* q.v., *S. pseudoarachnodes* and *S. petrella* q.v. It can be distinguished from *S. pseudoarachnodes* by the larger wingspan and the greyish white colour of the forewing, but it is sometimes impossible to identify it without genitalia dissection or barcoding. In the male genitalia (Figures 37, 37a) the asymmetrical valvae, each with a large semi-oval process, left one with a long narrow curved tapering process and the long slender weakly meandering phallus are characteristic. In the female genitalia (Figure 50) the funnel-shaped antrum and the sclerotised circular dilatation of ductus bursae are characteristic.

Biology: Early stages unknown. The adults were flying actively in the afternoon sunshine from the beginning of April until the end of June.

Distribution: Known only from a few localities in the northern part of the island Gran Canaria, Spain.

***Scythris moyaella* Falck, sp. nov.** (Figures 17-18, 38, 38a)

Holotype ♂: SPAIN, Gran Canaria, Carreteria, 455 m, 4-20-VIII-2020, leg. P. Falck, genitalia slide 3418PF (PF). Paratypes: SPAIN, Gran Canaria, Carreteria, 455 m, 5 ♂♂, 4-20-VIII-2020, leg. P. Falck, genitalia slide 3795PF, DNA sample Lepid Phyl 0699PF/CILEP698-20; Los Tilos de Moya, 500 m, 3 ♂♂, 4-20-VIII-2020, leg. P. Falck, genitalia slide 3419PF, DNA sample Lepid Phyl 0715PF/CILEP714-20, 0716PF/CILEP715-20 (PF, MNCN).

Description: Wingspan 8-9 mm. Labial palp slightly upturned, segment 2 yellowish white mottled with brown apically, segment 3 brownish grey, slightly shorter than segment 2. Antenna about 3/4 the length of the forewing, fuscous, in the male with short ciliae about the length of the antenna diameter. Vertex brownish. Collar yellowish brown. Tegula and thorax brown. Forewing dark brown; a median, quite distinct, irregular yellowish white stripe from near the base to about fi, from dorsum at 1/3 an oblique elongate yellowish white spot reaching median stripe, two irregular yellowish white spots, one above tornus and one near apex sometime confluent, the stripe and spots are irregularly bordered by darker brown scales; fringe dark grey. Hindwing width about 1/2 of the forewing, dark grey; fringe dark grey. Abdomen greyish brown.

Male genitalia (Figure 38): Valvae almost symmetrical. Uncus bilobed, indented posteriorly; gnathos small, distal arm broad tapering towards pointed apex; tegumen sub-triangular with small, rounded lateral protrusions; valvae very short, sub-rectangular with a small rounded lateral protrusion; phallus rather robust, bent before 1/2, tapering towards blunt apex. Segment VIII (Figure 38a) symmetrical. Tergum VIII with two sclerotized, small posterolateral protrusions; sternum VIII X-shaped.

Female genitalia: Unknown.

DNA barcodes (Figure 54): Three specimens were sequenced, resulting in DNA barcode fragments of 648 bp for all three specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEG7006. The maximum intraspecific distance is 0.16%. The minimum p-distance to nearest neighbour *S. petrella* is 3.84%.

Diagnosis: *S. moyaella* resembles *S. solisella*, *S. guimarensis* and *S. linealbella*. It can be distinguished from *S. guimarensis* and *S. linealbella* by the brown ground-colour and the yellowish white wing pattern. It is not possible to separate *S. moyaella* and *S. solisella* without genitalia dissection or barcoding. In the male genitalia the bilobed uncus, the very short valva and the large robust phallus are characteristic.

Biology: Early stages unknown. The adults were flying actively in the afternoon sunshine.

Distribution: Known only from the northern part of the island of Gran Canaria, Spain.

Etymology: The species is named after the small-town Moya situated near the type-locality.

***Scythris rupemella* Falck, sp. nov.** (Figures 19-20, 39, 39a, 51)

Holotype ♂: SPAIN, Gran Canaria, Pie de la Cuesta, 500 m, 21-VIII-4-IX-2020, leg. P. Falck, genitalia slide 3412PF (PF). Paratypes: SPAIN, Gran Canaria, Pie de la Cuesta, 500 m, 18 ♂♂, 3 ♀♀, 21-VIII-4-IX-2020, leg. P. Falck, genitalia slide 3413PF, 3414PF, 3415PF, DNA samples Lepid Phyl 0708PF/CILEP707-20, 0709PF/CILEP708-20, 0710PF/CILEP709-20 (PF, MNCN).

Description: Wingspan 7-7.5 mm. Labial palp slightly upturned, greyish brown, whitish medially and dorsally, segment 3 slightly shorter than segment 2. Antenna about 3/4 the length of the forewing, blackish brown, in the male with short ciliae about the length of the antenna diameter. Vertex, collar, tegula and thorax brown. Forewing brown mottled with beige in apical area; at 1/3 an irregular diffuse beige fascia, at 2/3 an irregular diffuse beige fascia not reaching costa; fringe dark grey. Hindwing width about 1/2 of the forewing, dark grey; fringe dark grey. Abdomen dark grey mottled with beige scales.

Male genitalia (Figure 39): Valvae asymmetrical. Uncus sub-rectangular bilobed, postero-laterally pointed, posterior margin with V-shaped indentation; gnathos small, distal arm tapering towards pointed apex; tegumen sub-triangular with rounded lateral protrusions; right valva short, sub-rectangular, postero-laterally one long process with rounded apex, antero-laterally a small triangular tip, left valva short, sub-rectangular, postero-laterally a long slightly broadening process with rounded apex, antero-laterally a long tapering process slightly curved near pointed apex; phallus long and narrow, weakly meandering in posterior half with three bends. Segment VIII (Figure 39a) symmetrical.

Tergum VIII X-shaped with small lateral protrusion; sternum VIII sub-triangular, posteriorly with a rather pointed, sclerotized process.

Female genitalia (Figure 51): Papilla analis elongate, distally rounded; posterior apophysis slender, slightly longer than twice the length of papilla analis; anterior apophysis approximately 0.8 the length of posterior apophysis; sternum VIII sub-rectangular with two sclerotized crescent structures, anteriorly wrinkled, posterior margin with a small V-shaped median fissure; antrum triangular; ductus bursae membranous, narrow; sternum VII sub-rectangular, posteriorly with deep median fissure edge weakly sclerotised, anteriorly with sclerotised V-shaped median structure, anterior margin rounded and sclerotised, laterally with small indentation; tergum VIII sub-rectangular.

DNA barcodes (Figure 54): Three specimens were sequenced resulting in DNA barcode fragments of 648 bp for all three specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEG6553. The maximum intraspecific distance is 0.65%. The minimum p-distance to nearest neighbour *S. guimarensis* is 4.30%.

Diagnosis: *S. rupemella* resembles *S. petrella*, *S. arachnodes* and *S. pseudoarachnodes.* It can be distinguished by the brown ground-colour and the beige diffuse fasciae. In the male genitalia the bilobed uncus, the long-pointed process on the left valvae and sternum VIII with a pointed sclerotised process are characteristic. In the female genitalia the crescent structures in sternum VIII, the posteriorly deep median fissure and rounded sclerotised margin of segment VII are characteristic.

Biology: Early stages unknown. The adults were disturbed from a vertical rock surface with abundant lichen growth during warm and sunny days from the end of August until the beginning of September.

Distribution: Known only from the type-locality nearby the small village Pie de la Cuesta situated in the southern part of the island of Gran Canaria, Spain.

Etymology: The species is named after the Latin word: *rupem* (= rock). The name alludes to the vertical rock surface at the type-locality.

Scythris guimarensis Bengtsson, 1997 (Figures 21-22, 40, 40a)
Scythris guimarensis Bengtsson, 1997, *Microlepid. Eur., 2,* 47
Type locality: SPAIN, Tenerife, Güímar.

Material examined: SPAIN, Tenerife, Güímar, 500 m, 3 ♂♂, 1-13-VI-2022, leg. P. Falck, genitalia slide 3744PF, 3798PF, DNA samples Lepid Phyl 1096PF/CILEP1095-22, 1097PF/CILEP1096-22, 1098PF/CILEP1097-22 (PF).

DNA barcodes (Figure 54): Three specimens were sequenced, resulting in 658 bp, full length DNA barcode fragments for one specimen, and fragments of 614 bp and 587 bp for two specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEU7743. The intraspecific distance is 0%. The minimum p-distance to nearest neighbour *S. petrella* is 2.75%.

Diagnosis: Wingspan 7.5 mm. *S. guimarensis* is characterized by the blackish brown colour of the forewing, three white spots, one near the base bordered by black scales, an outwardly oblique streak at 1/3 bordered by black scales and one spot above tornus. It resembles *S. moyaella* q.v., *S. solisella* q.v. and certain forms of *S. linealbella* q.v. In the male genitalia (Figures 40, 40a) the symmetrical valvae, the sub-quadrate, postero-laterally pointed uncus, the simple elongate apically rounded valvae and the near base curved and tapering phallus are characteristic. Female genitalia unknown.

Biology: Hostplant lichens on stones (Bengtsson, 1997). The adults were flying actively in the afternoon sunshine in June.

Distribution: Known only from the type-locality situated nearby the small town Güímar, Tenerife, Spain.

***Scythris linealbella* Falck, sp. nov.** (Figures 23-25, 41, 41a, 52)

Holotype ♂: SPAIN, Tenerife, Las Manchas, 1050 m, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3018PF (MNCN). Paratypes: SPAIN, Tenerife, Arona, 670 m, 6 ♂♂, 1 ♀, 21-V-3-VI-2019, leg. P.

Falck¸ Las Manchas, 1050 m, 14 ♂♂, 10 ♀♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 30198PF, 3020PF, DNA sample Lepid Phyl 0407PF/CILEP406-20; Las Mercedes, 750 m, 1 ♂, 21-V-3-VI-2019, leg. P. Falck; Aguamansa, 1050 m, 11 ♂♂, 7 ♀♀, 13-26-VIII-2019, leg. P. Falck, genitalia slide 3078PF, 3079PF, DNA samples Lepid Phyl 0404PF/CILEP403-20, 0405PF/CILEP404-22, 0406PF/CILEP404-22, same data but, 2 ♀♀, 1-13-VI-2022, leg. P. Falck; Güímar, 500 m, 5 ♂♂, 1 ♀, 1-13-VI-2022, leg. P. Falck (PF, MNCN).

Description: Wingspan 7-8 mm. Labial palp slightly upturned, dark brown, paler dorsally, segment 3 slightly shorter than segment 2. Antenna about 2/3 the length of the forewing, fuscous, in the male with short ciliae about 0.5 width of the antenna diameter. Vertex dark brown. Collar dark beige. Tegula whitish, brown basally. Thorax dark brown. Forewing dark brown; a median distinct, off-white stripe from the base to the fringe-line; fringe dark grey. Hindwing width about 1/2 of the forewing, dark grey; fringe dark grey. Abdomen dark greyish brown. Variation: The median stripe is sometimes broken and bordered by blackish brown scales (Figure 25).

Male genitalia (Figure 41): Valvae symmetrical. Uncus sub-trapezoid, posterior margin weakly rounded; gnathos robust, corrugated, distal arm sickle-shaped; tegumen sub-triangular; valvae simple, approximately twice as long as broad, apex rounded; phallus longer than valvae, S-shaped and tapering towards apex. Segment VIII (Figure 41a) symmetrical. Tergum VIII sub-trapezoid; sternum VIII sub-trapezoid, anteriorly and posteriorly with deep U-shaped indentations.

Female genitalia (Figure 52): Papilla analis elongate, distally rather pointed; posterior apophysis slender, slightly more than twice the length of papilla analis; anterior apophysis approximately 0.8 the length of posterior apophysis; sternum VIII sub-rectangular, posteriorly a median sub-trapezoid sclerotisation, posterior margin with small V-shaped indentation; sternum VII sub-rectangular, posteriorly with a small median fissure with postero-medial edge slightly concave, sclerotised; tergum VII sub-rectangular.

DNA barcodes (Figure 54): Four specimens were sequenced, resulting in 658 bp, full length DNA barcode fragments for one specimen, fragments of 634 bp for two specimens and 631 bp for one specimen. The barcodes fall within Barcode Index Number (BIN) BOLD: AEC1613. The maximum intraspecific distance is 0.67%. The minimum p-distance to nearest neighbour *S. petrella* is 3.49%.

Diagnosis: *S. linealbella* can be distinguished from all other *Scythris* species known from the Canary Islands by the distinct white stripe, however, the white stripe is rarely broken, and such specimens resembles *S. moyaella* q.v., *S. solisella* q.v. and *S. guimarensis.* It can be distinguished by the small white stripe above tornus, in *S. guimarensis* the white spot above tornus is rounded. In the male genitalia the posteriorly rounded uncus, the wrinkled part of gnathos and the S-shaped phallus are characteristic. In the female genitalia the sclerotised median part of sternum VIII and the slightly concave, sclerotised median fissure of segment VII are characteristic.

Biology: Early stages unknown. Adults were flying actively in warm and sunny days in rocky areas.

Distribution: Known only from scattered localities on the island of Tenerife, Spain.

Etymology: The species is named after the white stripe on the forewing, in Latin *linea alba* (= white stripe).

Remarks: Klimesch (1986, p. 326) described the above mentioned species, but without naming it.

***Scythris solisella* Falck, sp. nov.** (Figures 26-29, 42, 42a, 53)

Holotype ♂: SPAIN, Tenerife, Aguamansa, 1050 m, 13-26-VIII-2019, leg. P. Falck, genitalia slide 3801PF (MNCN). Paratypes: SPAIN, El Hierro, Frontera, 280 m, 3 ♀♀, 22-VII-3-VIII-2022, leg. P. Falck, genitalia slide 3757PF, 3769PF; Cruz de Las Reyes, 1360 m, 11 ♂♂, 46 ♀♀, 22-VII-3-VIII-2022, leg. P. Falck, genitalia slide 3758PF, 3761PF, 3764PF, 3766PF, 3768PF, 3770PF, 3771PF, 3776PF, 3777PF, DNA samples Lepid Phyl 1099PF/CILEP1098-22, 1100PF/CILEP1099-22, 1101PF/CILEP1100-22; Tenerife, Aguamansa, 1050 m, 19 ♂♂, 27 ♀♀, 13-26-VIII-2019, leg. P. Falck, genitalia slide 3796PF, 3076PF, DNA samples Lepid Phyl 0401PF/CILEP400-20, 0402PF/CILEP401-20, 0403PF/CILEP402-20 (PF, MNCN).

Description: Wingspan 7.5-9 mm. Labial palp slightly upturned, segment 2 greyish brown paler dorsally, segment 3 greyish brown, slightly shorter than segment 2. Antenna about 2/3 the length of the forewing, fuscous, in the male with short ciliae about 0.7 of the antenna diameter. Vertex brownish. Collar yellowish brown. Tegula and thorax brown. Forewing brown; a median quite distinct yellowish stripe from the base to about 1/2, from dorsum at about 1/3 an outwardly oblique elongate yellowish spot confluent with median stripe, above tornus an irregular yellowish spot, sometimes a small yellowish dot near apex; fringe dark grey. Hindwing width about 1/2 of the forewing, dark grey; fringe dark grey. Abdomen greyish brown. Fresh specimens have a bluish tinge. Variation: Specimens from El Hierro differ consistently from specimens from Tenerife by the almost black ground-colour, the white spots and the lack of a median stripe.

Male genitalia (Figure 42): Valvae symmetrical. Uncus sub-rectangular, posterior edge with median concavity; gnathos small, distal arm thorn-shaped; tegumen sub-triangular; valvae sub-rectangular, approximately twice as long as broad, slightly tapering distally, apex rounded, medially with a small setosed flap; phallus clearly shorter than valvae, curved and tapering towards apex. Segment VIII (Figure 42a) symmetrical. Tergum VIII sub-trapezoid posteriorly rounded; sternum VIII sub-triangular posteriorly forked, antero-medially a small spike.

Female genitalia (Figure 53): Papilla analis elongate, distally pointed; posterior apophysis slender, twice as long as papilla analis; anterior apophysis half the length of posterior apophysis; sternum VIII sub-rectangular, anterior half wrinkled in median third; antrum funnel-shaped; sternum VII sub-rectangular, posteriorly a small median fissure, edge slightly sclerotized; tergum VII sub-rectangular.

DNA barcodes (Figure 54): Six specimens were sequenced, resulting in 658 bp, full length DNA barcode fragments for two specimens, and fragments of 637 bp, 634 bp, 632 bp and 588 bp for four specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEC2342. The maximum intraspecific distance is 0.51% (El Hierro population) and 0.16% (Tenerife population), the maximum intraspecific distance between the populations is 0.99%. The minimum p-distance between the populations is 0.65%. The minimum p-distance to nearest neighbour *S. aronaella* is 2.60%.

Diagnosis: *S. solisella* resembles *S. moyaella* q.v., *S. guimarensis* and *S. linealbella.* It can be distinguished from *S. guimarensis* and *S. linealbella* by the distinct outward oblique spot at 1/3 and the distinct tornal spot. In the male genitalia the sub-rectangular valvae with medial flap, the curved phallus and the triangular sternum VIII forked posteriorly are characteristic. In the female genitalia the very long posterior apophysis, the wrinkled median part of sternum VIII and the posterior margin with a small median fissure of segment VII are characteristic.

Biology: Early stages unknown. Adults were flying actively in warm and sunny days in rocky areas often together with *S. petrella.*

Distribution: Known only from a few localities on the islands of El Hierro and Tenerife, Spain.

Etymology: The species is named after the Latin word *solem* (= the sun) referring to the species flying actively in sunny weather.

Remarks: The difference in the colouration between populations of *S. solisella* from El Hierro and Tenerife is not unique. Several species from El Hierro generally have a darker grey or blackish colouration than from other of the Canary Islands, e. g. *Chersogenes klimeschi* (Gozmány, 1975) (Autostichidae), *Agdistis bifurcatus* Agenjo, 1952 (Pterophoridae), *Pempeliella canariella* Asselbergs, 2016 (Pyralidae).

Scythris ochrelinella Falck, sp. nov. (Figures 30, 43, 43a, 43b)

Holotype ♂: SPAIN, Tenerife, Arona, 21-V-3-VI-2019, leg. P: Falck, genitalia slide 3003PF, DNA sample Lepid Phyl 0397PF/CILEP396-20 (PF later MNCN).

Description: Male. Wingspan 11.5 mm. Labial palp slightly upturned, segment 2 dark brown, whitish dorsally, segment 3 dark brown slightly shorter than segment 2. Antenna slightly more than 1/2 the length of the forewing, fuscous, with short ciliae about 0.5 of the antenna diameter. Vertex dark brown. Collar and tegula brown mottled with beige. Thorax blackish brown. Forewing blackish brown, lighter brown along dorsum, mottled with few white scales, especially near dorsum and in apical area; from near the base to about 1/2 an ochre-coloured distinct median stripe, upwards bordered by white, just below the stripe a small white spot and another white spot at the end of the cell; fringe dark grey. Hindwing width about 1/2 of the forewing, dark grey; fringe dark grey.

Male genitalia (Figure 43): Valvae symmetrical. Uncus sub-rectangular, posterior margin with broad U-shaped indentation, lateral lobes shortly setosed; gnathos triangular, distal arm short, pointed; tegumen sub-triangular, postero-laterally with two large, triangular pointed projections; valvae narrow, distally forked, each arm with a longitudinal flap; phallus slightly shorter than half the length of valvae, curved. Segment VIII symmetrical. Tergum VIII (Figure 43b) sub-trapezoid; sternum VIII (Figure 43a) sub-trapezoid, posteriorly with deep U-shaped indentation.

Female genitalia: Unknown.

DNA barcodes (Figure 54): The specimen was sequenced, resulting in DNA barcode fragments of 638 bp. The barcode falls within Barcode Index Number (BIN) BOLD: AEC1614. The minimum p-distance to nearest neighbour an undescribed *Scythris*-species is 6.94%.

Diagnose: *S. ochrelinella* resembles superficially *S. rondaensis* Bengtsson, 1997. It can be distinguished by the distinct ochre stripe bordered by black and white and the dark grey hindwing, in *S. rondaensis* the forewing is black with two indistinct, smaller ochre dots, the hindwing is brownish and more pointed. In the male genitalia the tegumen with lateral, triangular projections and the forked valvae with longitudinal flaps on each arm are characteristic.

Biology: Early stages unknown. The specimen was flying actively in a warm and sunny day.

Distribution: Known only from the type-locality nearby the small town Arona, Tenerife, Spain.

Etymology: The species is named after the characteristic ochre-coloured stripe on the forewing.

Remarks: It is not possible to place *S. ochrelinella* into one of the *Scythris* species-groups erected by Bengtsson (1997). *S. rondaensis* belongs to the *cistorum* species-group, which in the male genitalia is characterized by strongly sclerotized, more or less asymmetrical parts in the male genitalia; valvae with small lobes (Bengtsson, 1997, p. 124).

Discussion

The taxonomy of *Scythris petrella* is not entirely unproblematic, as it exhibits high variability in the adult appearance and high intraspecific values in COI between populations from separate islands of the Canary Islands. However, no differences were observed in the genitalia neither in males nor females between the populations and there is no correlation between divergence in COI and populations with entirely dark- (Aguamansa, Tenerife) nor entirely whitish speckled specimens (Arona, Tenerife). A high intraspecific variation in COI between species from separate islands of the Canary Islands is commonly observed (Falck et al. 2021, p. 298; Falck et al. 2022, p. 108; Falck & Karsholt, 2023). It can be interpreted as a snapshot of the evolutionary process.

All the known *Scythris*-species from the Canary Islands are easily recognizable by the genitalia, with only minor internal variation.

The molecular analyses support the taxonomic arrangement. All identified species are genetically distinct from other species with p-distance values between species ranging from 1.12% (between *S. aronaella* and *S. petrella*) to 6.94% (between *S. ochrelinella* and *Scythris sp.*). Although the minimum divergence between *S. aronaella* and *S. petrella*, *S. pseudoarachnodes* and *S. arachnodes* (1.12%, 1.78% and 1.82% respectively) are below the 2% threshold suggested as a putative guideline for species delimitation by Hebert et al. (2003), *S. aronaella* is described as a new species, because of the distinct and constant differences in the morphology in the male- and female genitalia and in the appearance of adults.

S. guimarensis Bengtsson, 1997 is transferred from the *klimeschi* species-group to the *petrella* species-group based on the close genetically relationship in the group and because it is also a lichen-feeding species, however, there is a large diversity in the male genital morphology in the group.

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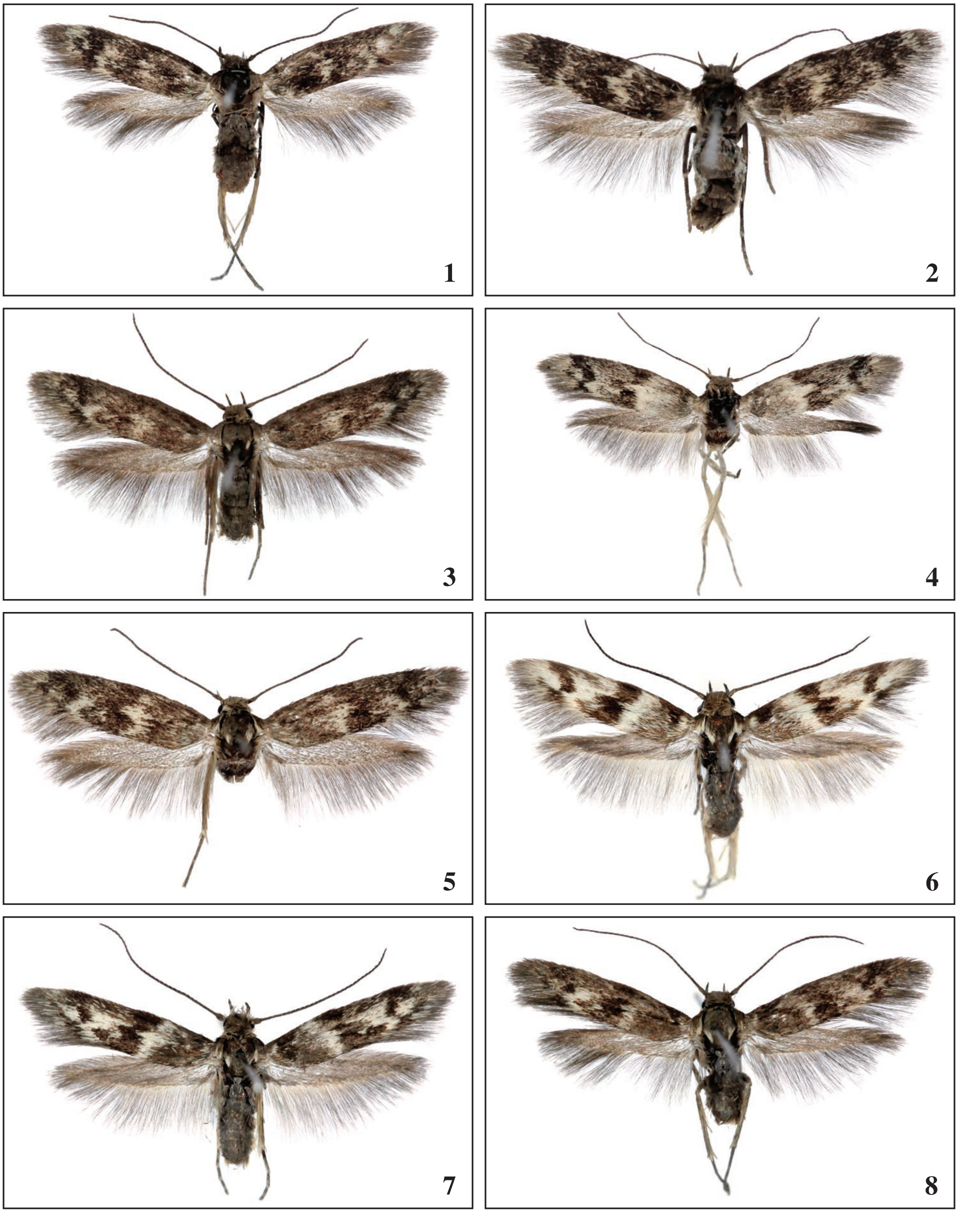
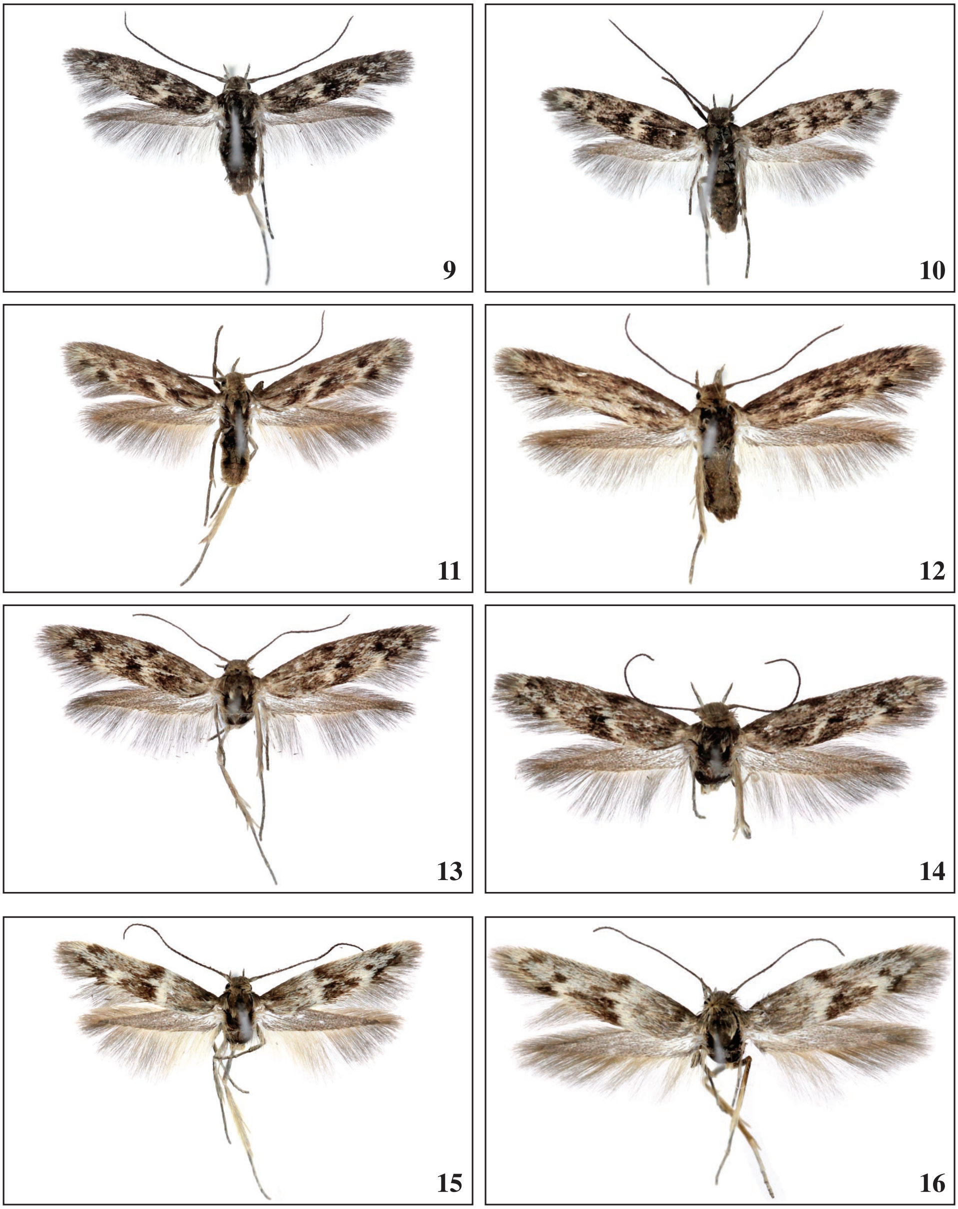
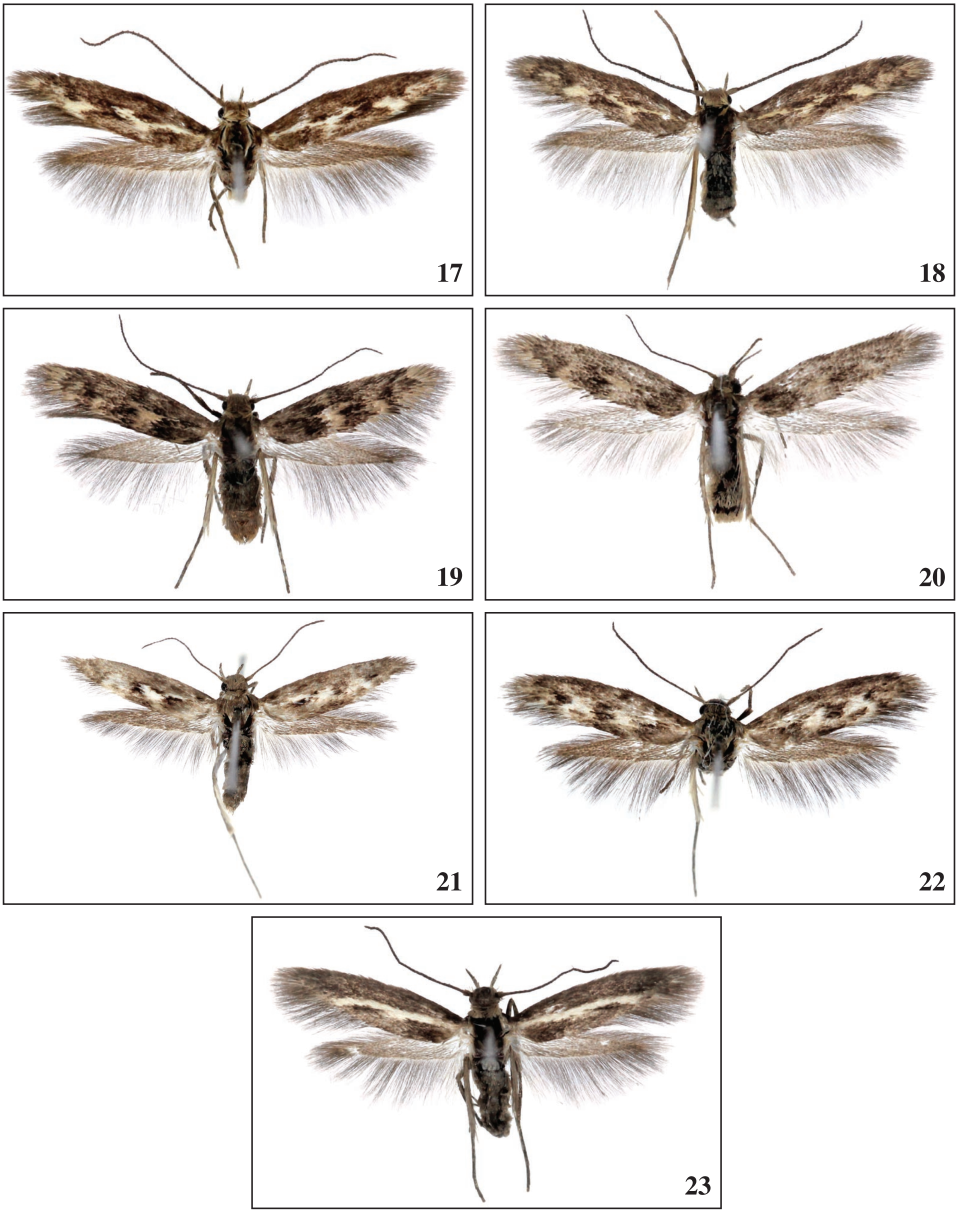


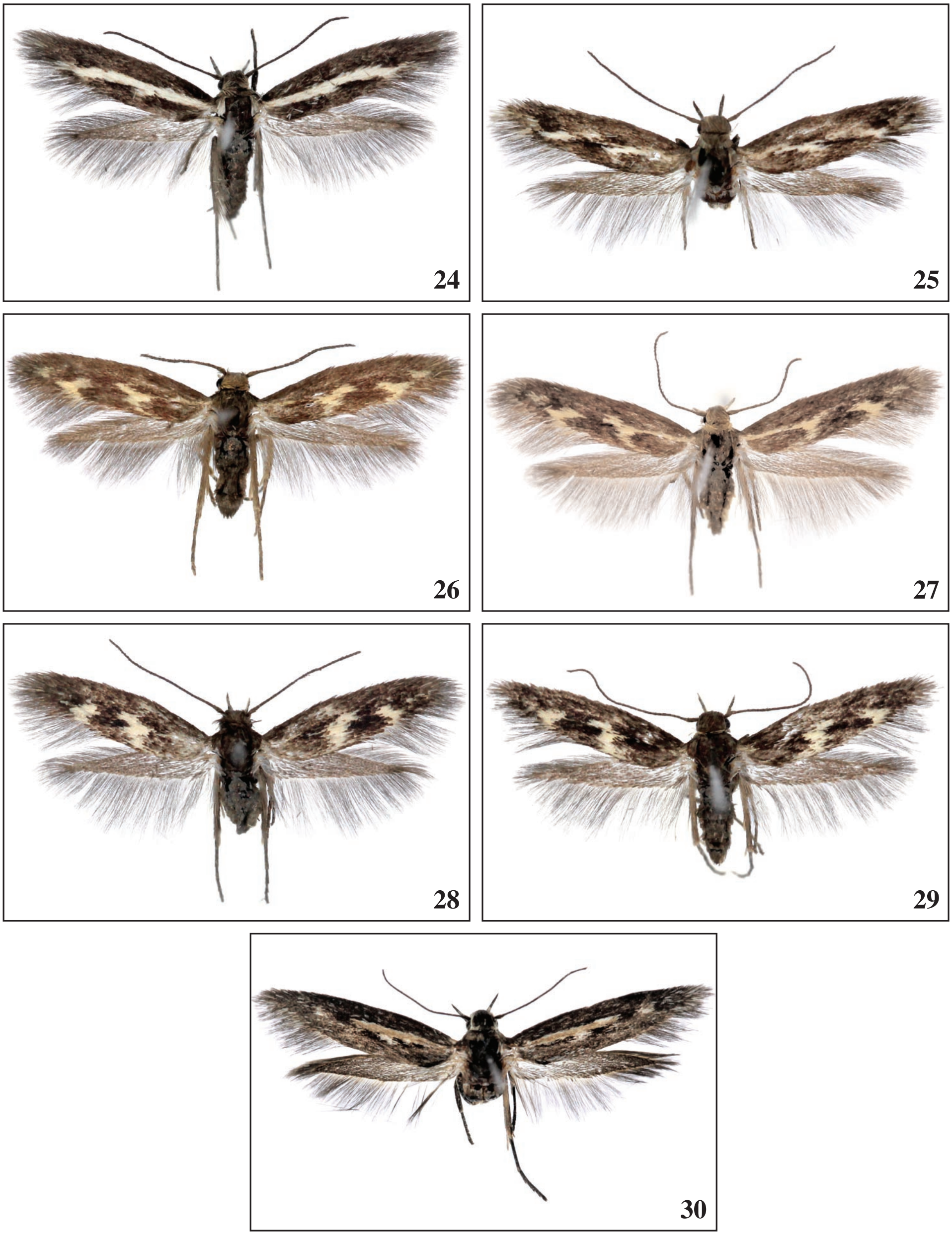
Figures 1-8. 1. *Scythris arachnodes* Walsingham, 1908, ♂, Tenerife, 9 mm. **2.** *Scythris arachnodes* Walsingham, 1908, ♀, Tenerife, 9 mm. **3.** *Scythris petrella* Walsingham, 1908, ♂, Tenerife, 11 mm. **4.** *Scythris petrella* Walsingham, 1908, ♀, Gran Canaria, 10.5 mm. **5.** *Scythris petrella* Walsingham, 1908, ♀, Tenerife, 11 mm. **6.** *Scythris petrella* Walsingham, 1908, ♂, El Hierro, 9.5 mm. **7.** *Scythris petrella* Walsingham, 1908, ♂, El Hierro, 10 mm. **8.** *Scythris petrella* Walsingham, 1908, ♀, El Hierro, 10 mm.



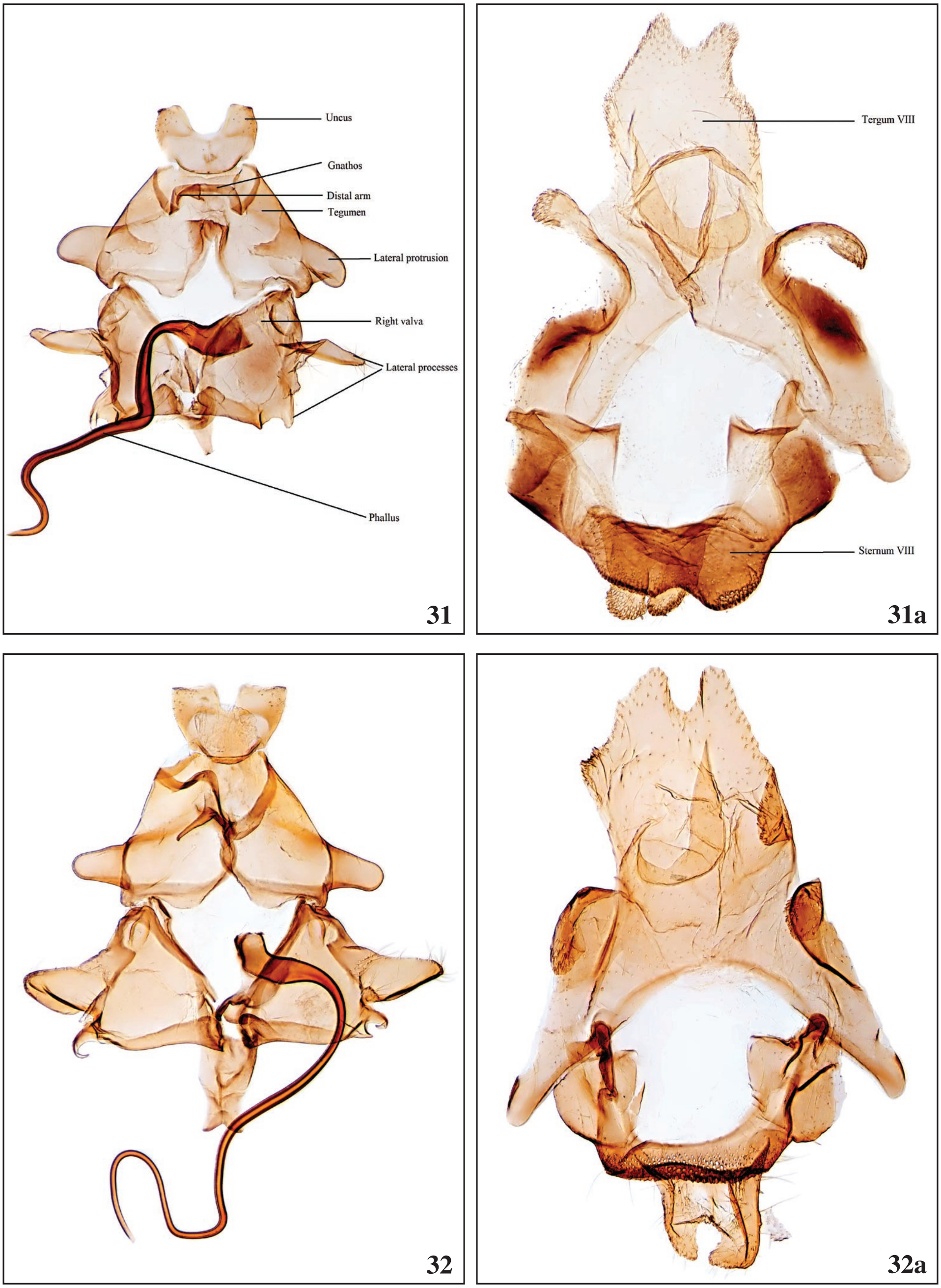
Figures 9-16. 9. *Scythris pseudoarachnodes* Bengtsson, 1997, ♂, Tenerife, 7.5 mm. **10.** *Scythris pseudoarachnodes* Bengtsson, 1997, ♀, Tenerife, 7.5 mm. **11.** *Scythris brithae* Falck & Karsholt, 2019, ♂, Gran Canaria, 9.5 mm. **12.** *Scythris brithae* Falck & Karsholt, 2019, ♀, Gran Canaria, 9.5 mm. **13.** *Scythris aronaella* Falck, sp. nov., ♂, Tenerife, 10 mm. **14.** *Scythris aronaella* Falck, sp. nov., ♀, Tenerife, 9 mm. **15.** *Scythris grancanariella* Falck & Karsholt, 2019, ♂, Gran Canaria, 9.5 mm. **16.** *Scythris grancanariella* Falck & Karsholt, 2019, ♀, Gran Canaria, 11.5 mm.



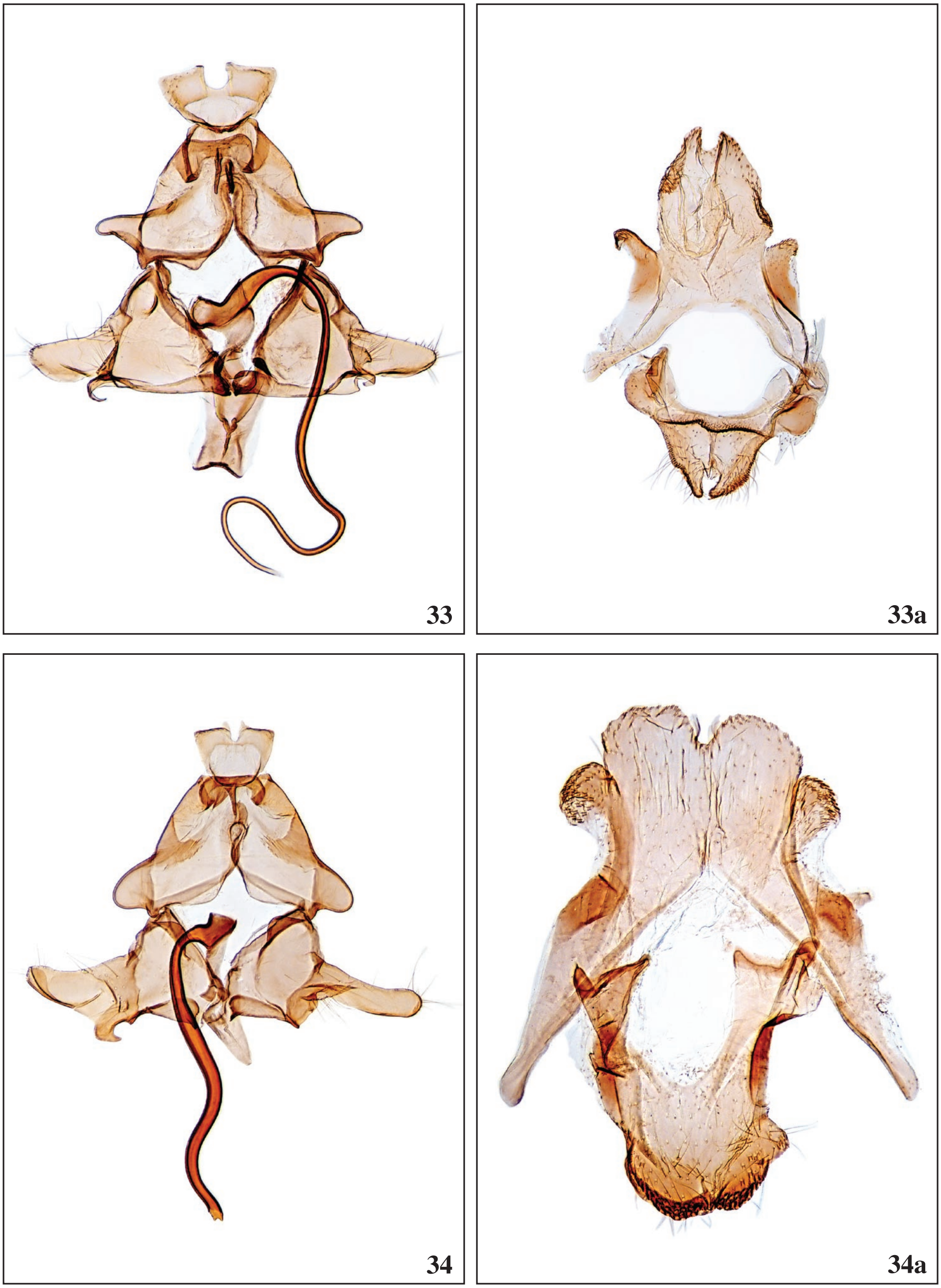
Figures 17-23. 17. *Scythris moyaella* Falck, sp. nov., ♂, Gran Canaria, 9 mm. **18.** *Scythris moyaella* Falck, sp. nov., ♂, Gran Canaria, 8 mm. **19.** *Scythris rupemella* Falck, sp. nov., ♂, Gran Canaria, 7 mm. **20.** *Scythris rupemella* Falck, sp. nov., ♀, Gran Canaria, 7 mm. **21.** *Scythris guimarensis* Bengtsson, 1997, ♂, Tenerife, 7.5 mm. **22.** *Scythris guimarensis* Bengtsson, 1997, ♂, Tenerife, 7.5 mm. **23.** *Scythris linealbella* Falck, sp. nov., ♂, Tenerife, 8 mm.



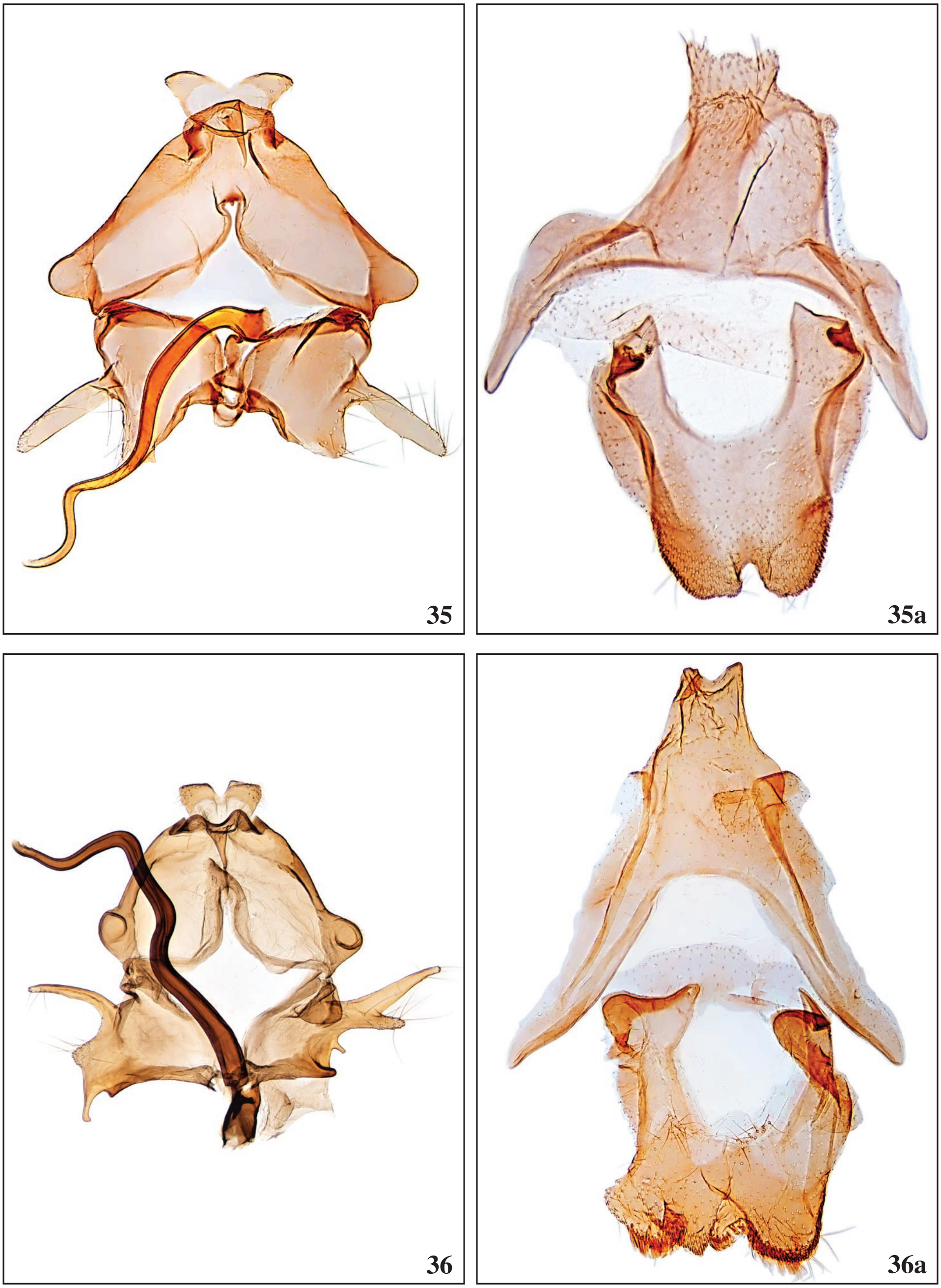
Figures 24-30. 24. *Scythris linealbella* Falck, sp. nov., ♀, Tenerife, 8 mm. **25.** *Scythris linealbella* Falck, sp. nov., ♀, Tenerife, 7.5 mm. **26.** *Scythris solisella* Falck, sp. nov., ♂, Tenerife, 8 mm. **27.** *Scythris solisella* Falck, sp. nov., ♀, Tenerife, 9 mm. **28.** *Scythris solisella* Falck, sp. nov., ♂, El Hierro, 8 mm. **29.** *Scythris solisella* Falck, sp. nov., ♀, El Hierro, 8.5 mm. **30.** *Scythris ochrelinella* Falck, sp. nov., ♂, Tenerife, 11.5 mm.



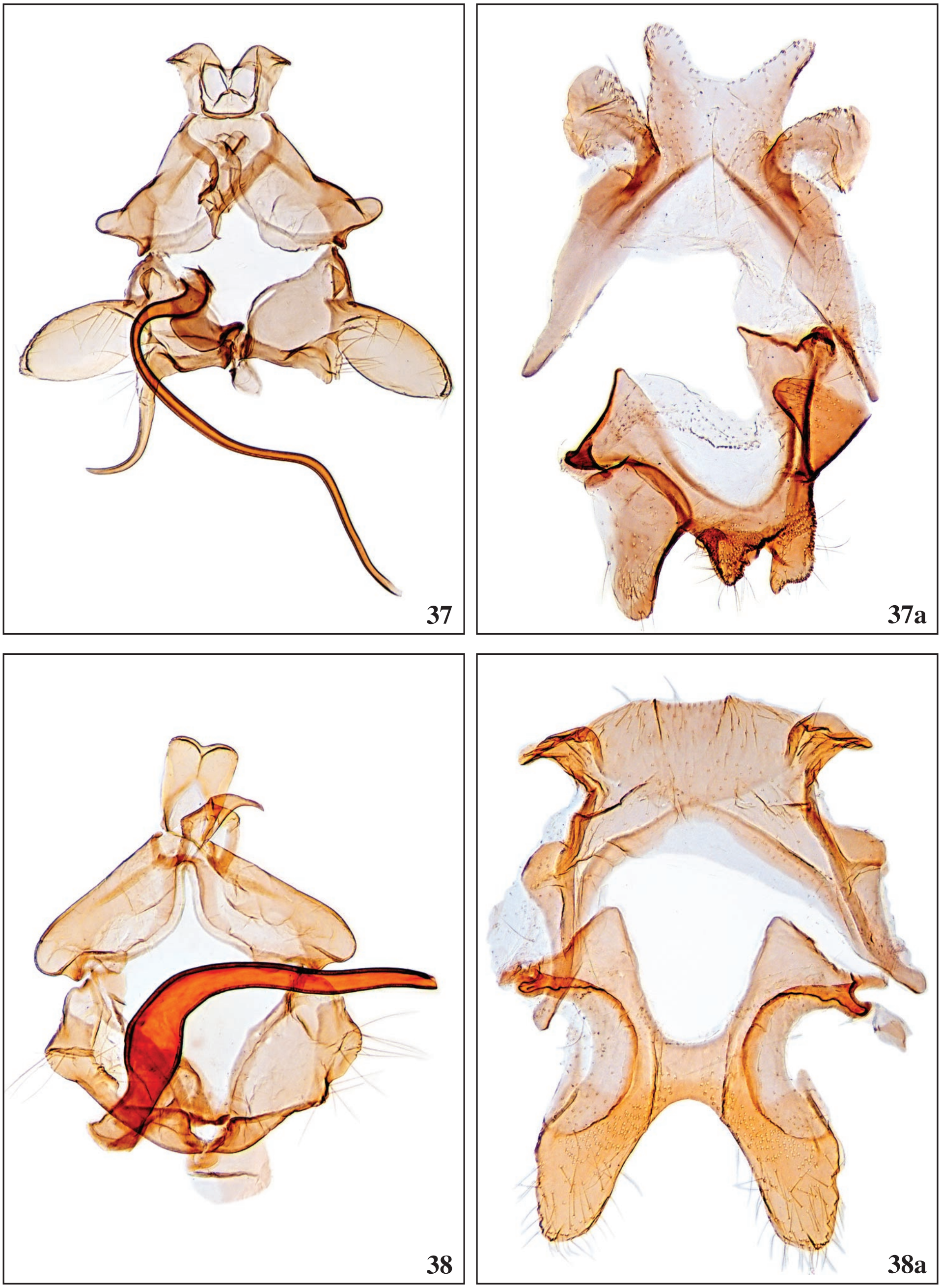
Figures 31-32. 31. *Scythris arachnodes* Walsingham, 1908, ♂, GP3011PF. **31a.** Segment VIII, GP3012PF. **32.** *Scythris petrella* Walsingham, 1908, ♂ (Tenerife), GP3082PF. **32a.** Segment VIII, GP3082PF.



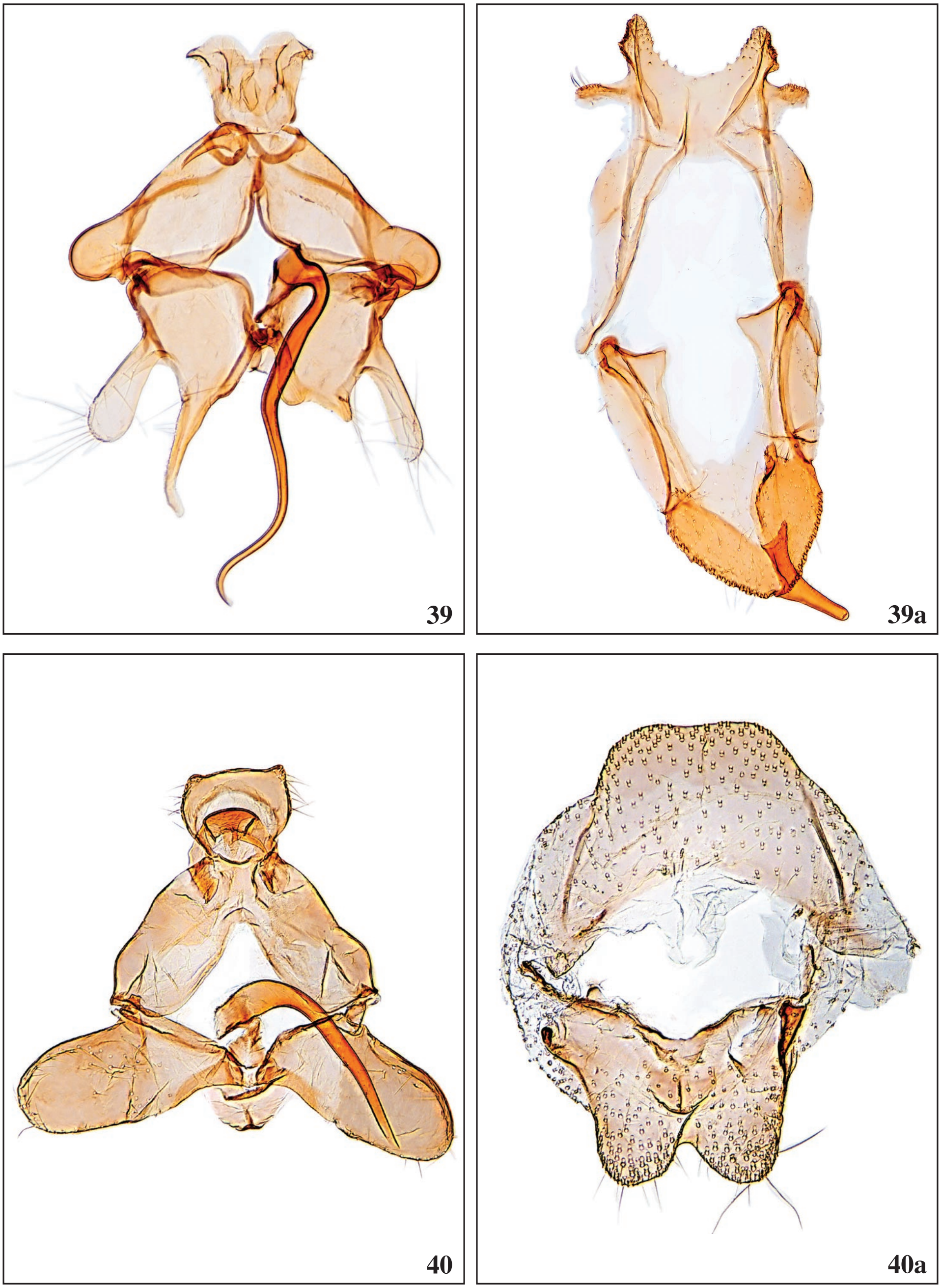
Figures 33-34. 33. *Scythris petrella* Walsingham, 1908, ♂ (El Hierro), GP3778PF. **33a.** Segment VIII, GP3759PF. **34.** *Scythris pseudoarachnodes* Bengtsson, 1997, ♂, GP3580PF. **34a.** Segment VIII, GP3583PF.



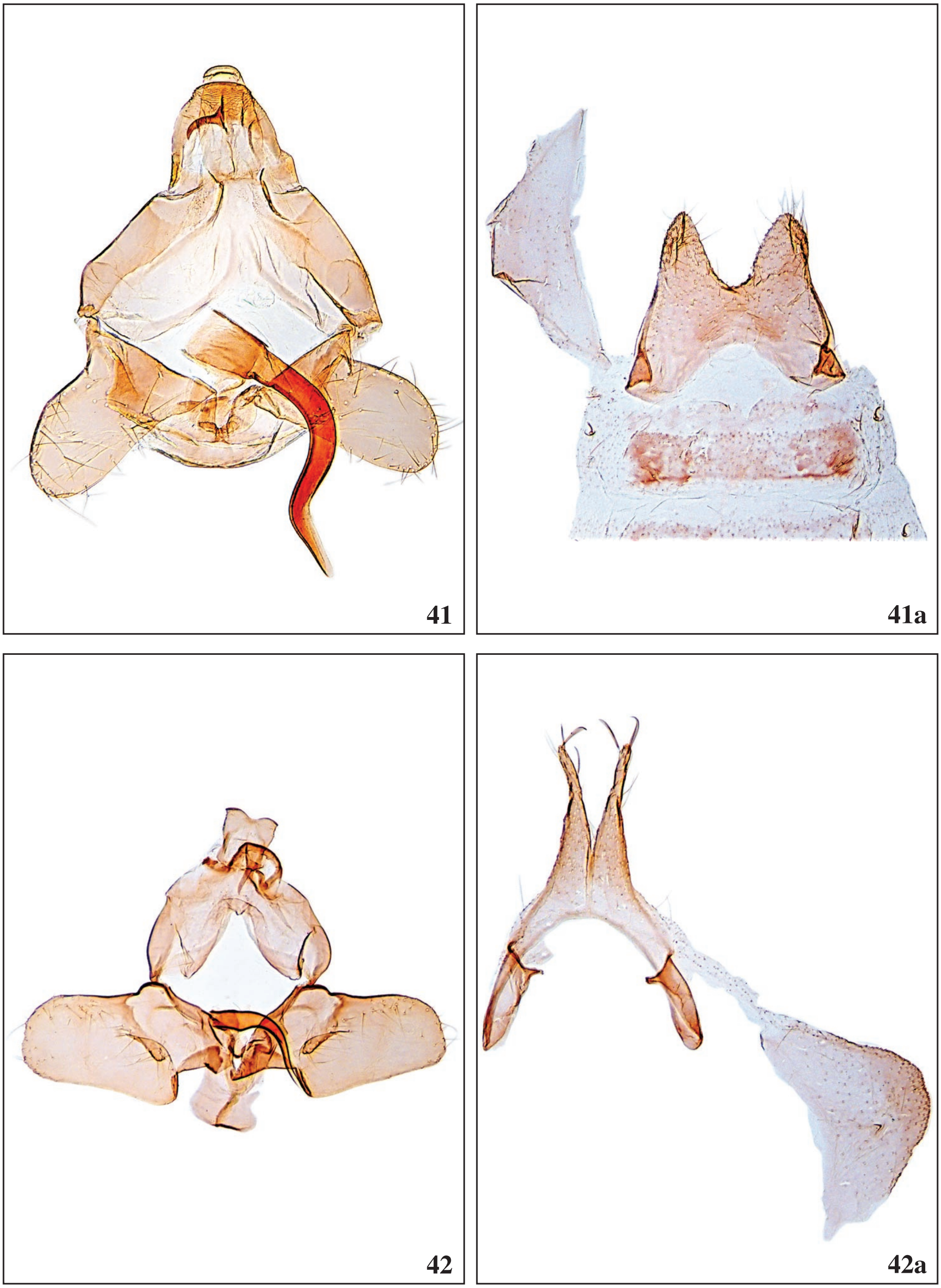
Figures 35-36. 35. *Scythris brithae* Falck & Karsholt, 2019, ♂, GP2860PF. **35a.** Segment VIII, GP2860PF. **36.** *Scythris aronaella* Falck, sp. nov., ♂, GP3005PF. **36a.** Segment VIII, GP3005PF.



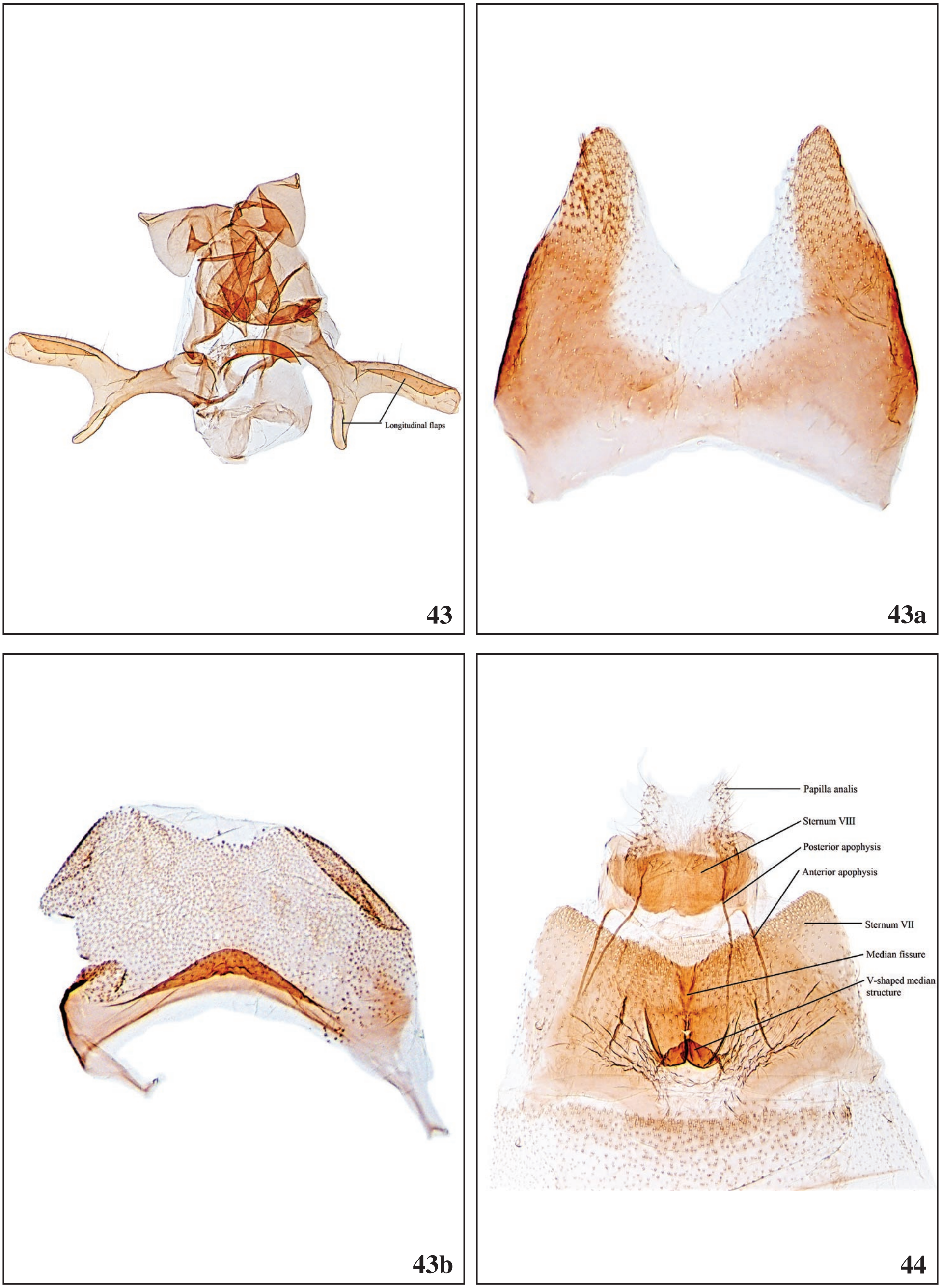
Figures 37-38. 37. *Scythris grancanariella* Falck & Karsholt, 2019, ♂, GP3502PF. **37a.** Segment VIII, GP3501PF. **38.** *Scythris moyaella* Falck, sp. nov., ♂, GP3419PF. **38a.** Segment VIII, GP3419PF.



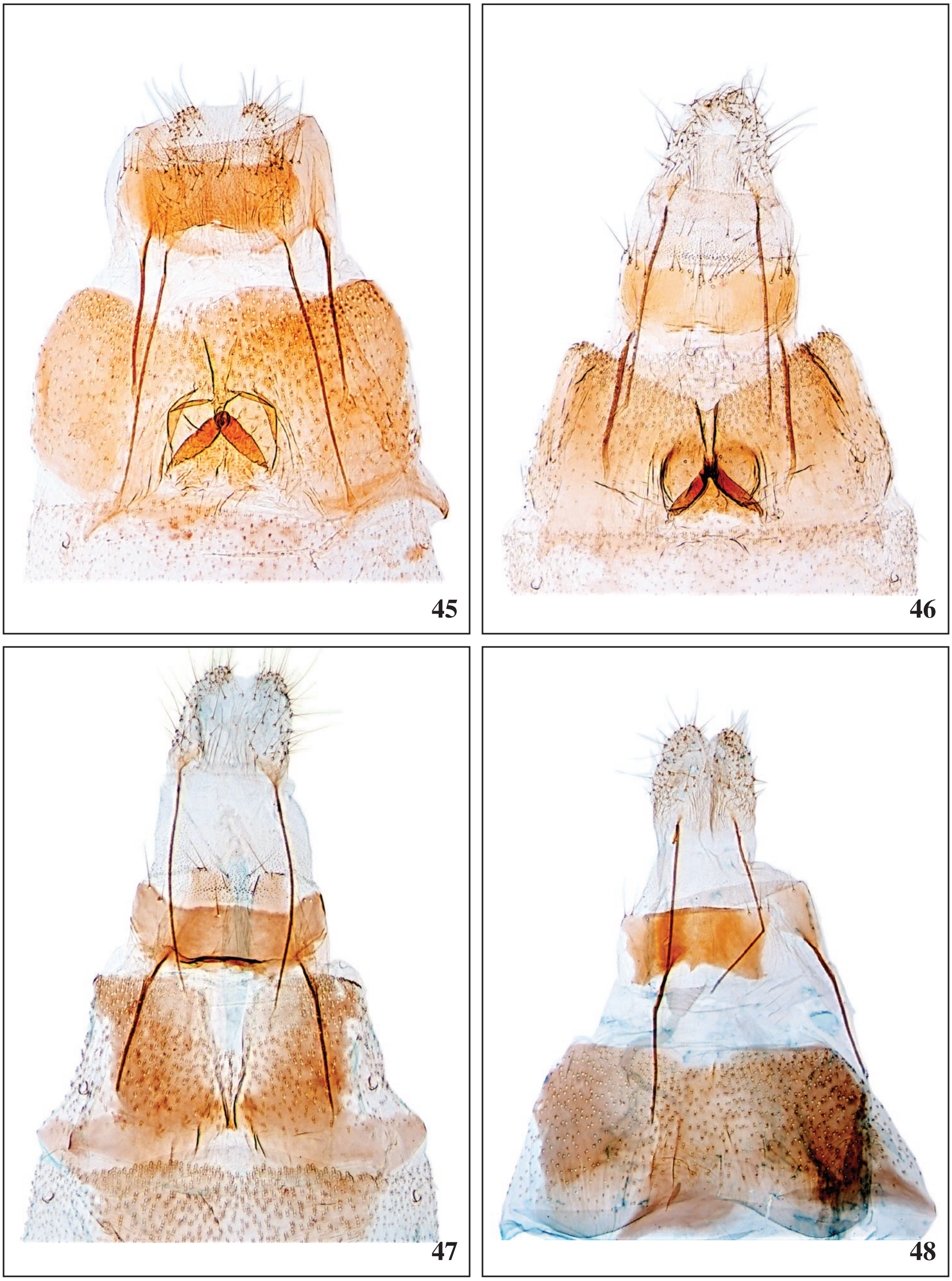
Figures 39-40. 39. *Scythris rupemella* Falck, sp. nov., ♂, GP3419PF. **39a.** Segment VIII, GP3413PF. **40.** *Scythris guimarensis* Bengtsson, 1997, ♂, GP3744PF. **40a.** Segment VIII, GP3798PF.



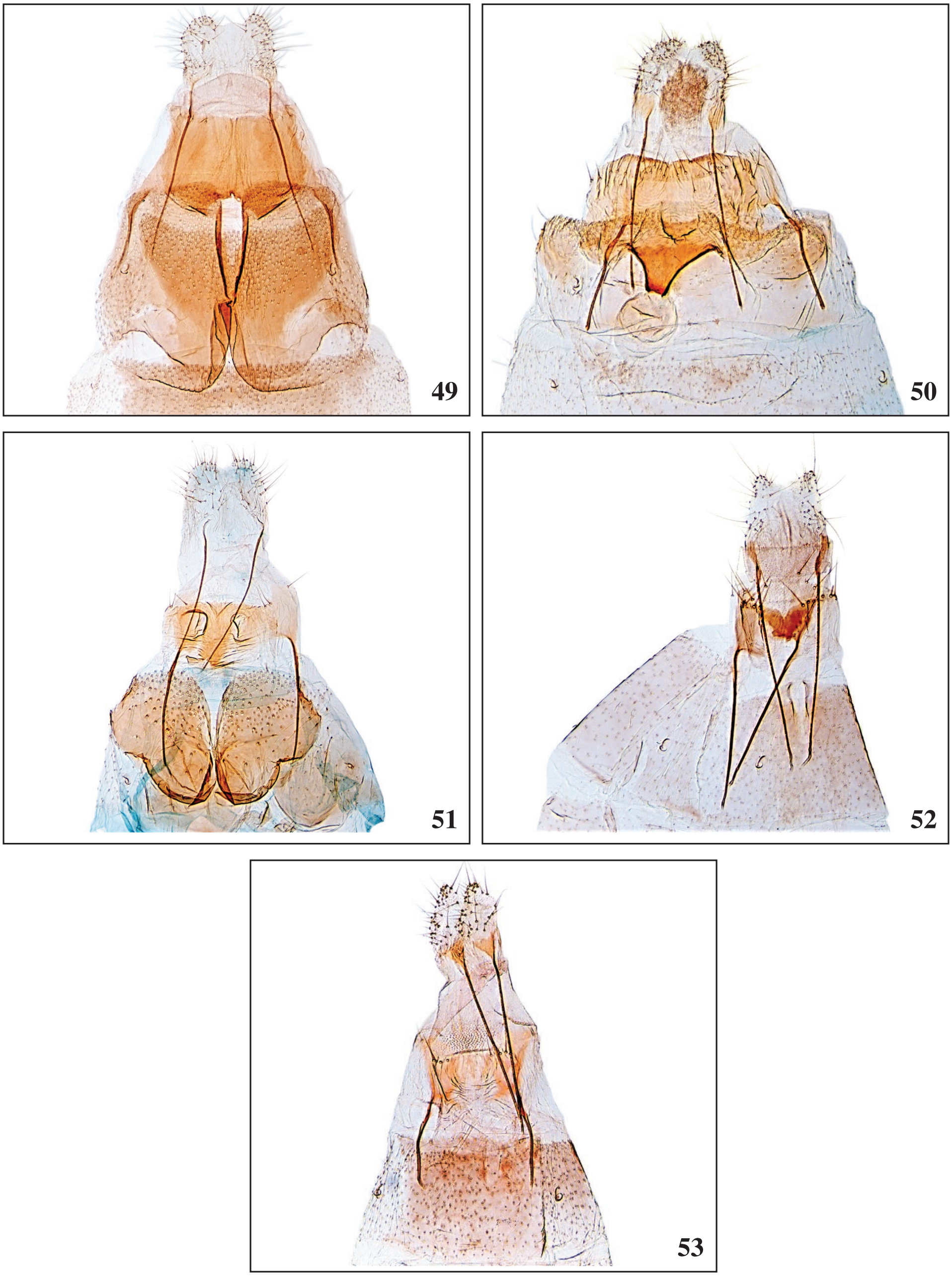
Figures 41-42. 41. *Scythris linealbella* Falck, sp. nov., ♂, GP3019PF. **41a.** Segment VIII, GP3019PF. **42.** *Scythris solisella* Falck, sp. nov., ♂, GP3076PF. **42a.** Segment VIII, GP3076PF.



Figures 43-44. 43. *Scythris ochrelinella* Falck, sp. nov., ♂, GP3003PF. **43a.** Sternum VIII, GP3003PF. **43b.** Tergit VIII, GP3003PF. **44.** *Scythris arachnodes* Walsingham, 1908, ♀, GP3013PF.



Figures 45-48. 45. *Scythris petrella* Walsingham, 1908, ♀ (Tenerife), GP3002PF. **46.** *Scythris petrella* Walsingham, 1908, ♀ (El Hierro), 3767PF. **47.** *Scythris pseudoarachnodes* Bengtsson, 1997, ♀, GP3084PF. **48.** *Scythris brithae* Falck & Karsholt, 2019, ♀, GP2733PF.



Figures 49-53. 49. *Scythris aronaella* Falck, sp. nov., ♀, GP3085PF. **50.** *Scythris grancanariella* Falck & Karsholt, 2019, ♀, GP3678PF. **51.** *Scythris rupemella* Falck, sp. nov., ♀, GP3415PF. **52.** *Scythris linealbella* Falck, sp. nov., ♀, GP3020PF. **53.** *Scythris solisella* Falck, sp. nov., ♀, GP3766PF.

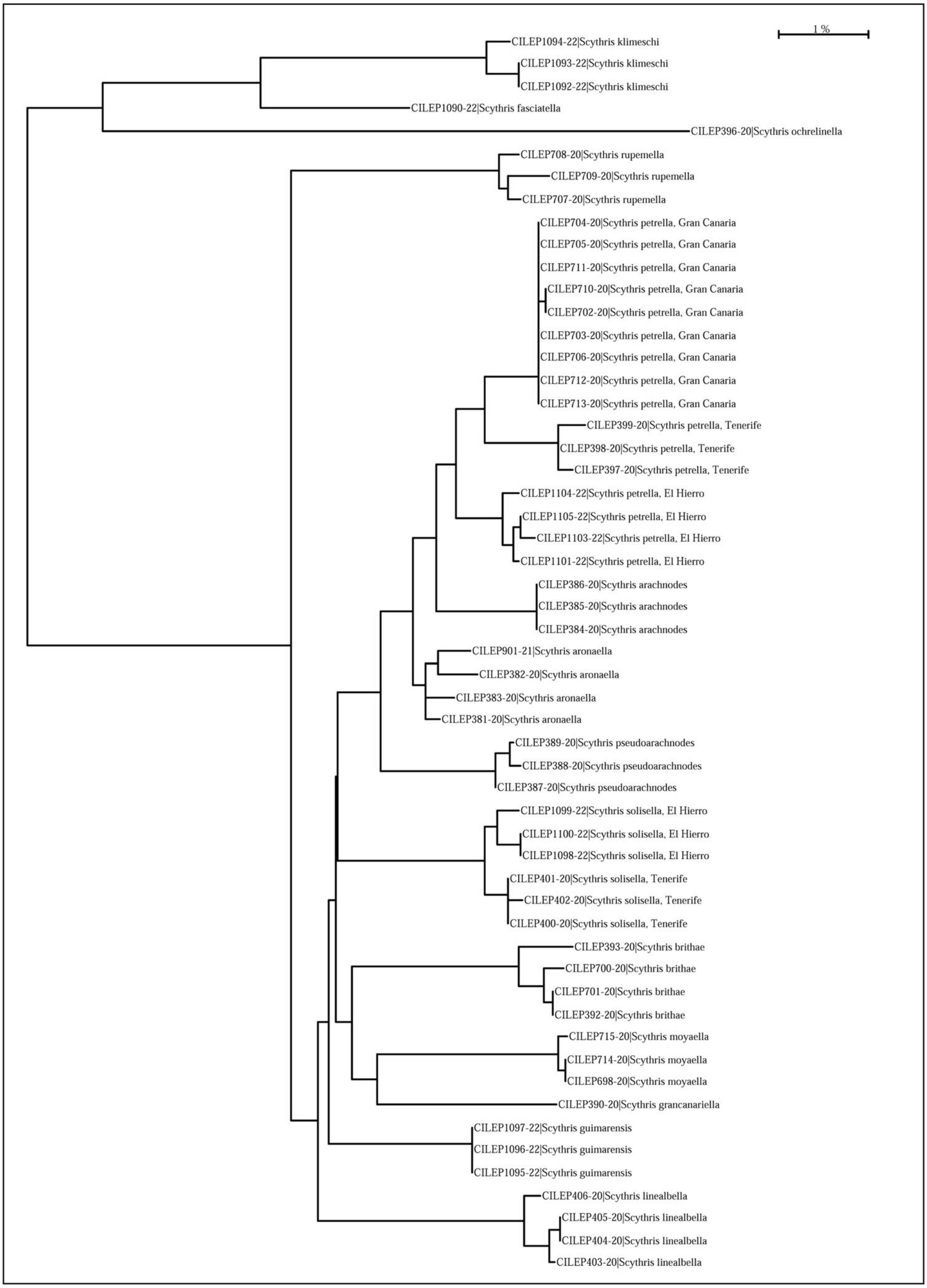


Figure 54. Neighbour-joining tree of DNA barcodes of fourteen species of *Scythris*.

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Lepidoptera collected in S. W. Mongolia during expedition in Mongolian Altai in 2022 (Lepidoptera: Geometridae)

Ilya A. Makhov, Vladimir A. Lukhtanov & Maria S. Vishnevskaya

Abstract

An annotated checklist of Geometridae collected in Southwest Mongolia is presented. In total 51 species are recorded. Eight species are recorded as new for the fauna of Mongolia, *Alcis depravata* (Staudinger, 1892), *Holoterpna diagrapharia* Püngeler, 1900, *Scotopteryx supproximaria* (Staudinger, 1892), *Cataclysme riguata* (Hübner, [1813]), *Rhodostrophia crypta* Viidalepp & Kostkuk, 2020, *Idaea ossiculata* (Lederer, 1870), *Scopula divisaria* (Christoph, 1893), and *Casilda consecraria* (Staudinger, 1871). Habitus and genitalia are illustrated for these species. Four of them were DNA-barcoded, as well as three other species. Results of DNA barcoding are discussed.
Kewwords: Lepidoptera, Geometridae, new records, Mongolian Altai, DNA barcoding, Mongolia.

Lepidoptera recolectados en el S. O. de Mongolia durante la expedición en el Altai Mongol en 2022 (Lepidoptera: Geometridae)

Resumen

Se presenta una lista anotada de los Geometridae recolectados en el suroeste de Mongolia. En total se registran 51 especies. Ocho especies son nuevas para la fauna de Mongolia, *Alcis depravata* (Staudinger, 1892), *Holoterpna diagrapharia* Püngeler, 1900, *Scotopteryx supproximaria* (Staudinger, 1892), *Cataclysme riguata* (Hübner, [1813]), *Rhodostrophia crypta* Viidalepp & Kostkuk, 2020, *Idaea ossiculata* (Lederer, 1870), *Scopula divisaria* (Christoph, 1893) y *Casilda consecraria* (Staudinger, 1871). Se ilustran el hábitat y la genitalia de estas especies. Cuatro de ellas han sido codificadas por ADN, al igual que otras tres especies. Se discuten los resultados de la codificación del ADN.
Palabras clave: Lepidoptera, Geometridae, nuevos registros, Altai mongol, código de barras de ADN, Mongolia.

Introduction

The Lepidoptera fauna of Mongolia is of considerable interest to zoologists. Entomologists from different countries (former Soviet Union, Hungary, Russia etc.) have been studying the insect fauna (including Lepidoptera) of Mongolia for many years. Some groups of Mongolian lepidopterans were studied relatively well, namely Papilionoidea (Tshikolovets et al. 2009; Yakovlev, 2012), Sphingidae (Derzhavets, 1977; Yakovlev et al. 2015), Zygaenidae (Efetov et al. 2012), Cossidae (Yakovlev, 2004, 2015), Notodontidae (Morozov et al. 2016; Schintlmeister, 2008) and Pterophoridae (Ustjuzhanin & Kovtunovich, 2008). Nevertheless, the knowledge about other taxonomic groups (e. g. Geometridae, Noctuidae, Alucitidae) remains insufficient. The recent publications illustrate this well (Knyazev et al. 2020; Ustjuzhanin et al. 2016).

Our research considers the west part of Mongolia, Mongolian Altai in particular, which is still poorly known. The Mongolian Altai is a mountain system in Mongolia and China which stretches approximately 1000 km from the northwest to the southeast. The mountain system of the Mongolian Altai reaches uplands of the Altai Republic (Russia) in the north, borders with deserts and semi-deserts of Dzhungaria and Gobi towards the south and west, and semi-deserts of the Great Lakes Depression in the northeastern area of the system. Mongolian Altai reaches an altitude of 4362 m (Mountain Munkh-Khajrkhan-Ula) and consists of several parallel ridges. Southwestern slopes receive more precipitation than northeastern ones, and they consist of richer forest-meadow landscapes (with spruce and larch prevailing in forests), changing into steppes in lowlands and alpine meadows. Steppes and semi-deserts dominate on northeastern slopes, while semi-deserts prevail between the mountains (Kamelin, 2005; Yakovlev et al. 2015).

The Mongolian Altai is a significant frontier in the distribution of insects: a number of studies have shown that insect fauna of the southwestern (Dzhungarian) slopes of Mongolian Altai differs markedly from those of the northeastern slopes. This conclusion is based on the distribution of Orthoptera (Sergeev, 1986), Coleoptera (Kryzhanovskij, 2002), Lepidoptera (Yakovlev, 2011, 2012, 2015). The main ridge of the Mongolian Altai divides the biota of the Altai Mountain region into two biological provinces: Altai-Dzhungarian (western) and Western Mongolian (eastern) (Yakovlev, 2012).

In June 2022 the authors of this article made a trip to the south of Mongolian Altai (Figure 1). The main goals of this expedition were to study the Lepidoptera fauna in south-western (Dzhungarian) macroslope of Mongolian Altai and Dzhungarian Gobi, the less studied and rather rich in biodiversity southern parts of Khovd and Gov'-Altai Aimags (Yakovlev, 2012; Yakovlev & Dubatolov 2013a, b).

The present paper is devoted to Geometridae recorded by us during this travel. Although Mongolia is one of the largest countries, little is known about its moth fauna, and there is no comprehensive review of species richness, diversity, and distribution patterns of geometrid moths in the country. A fairly complete historical review of the study of geometrid moths in Mongolia was given by Enkhtur and co-authors (2020). Only a few works deal with the geometrid moths of the Mongolian Altai (Vasilenko, 2004, 2006).

Here we provide the list of Geometridae recorded in 11 localities of W Mongolia (Table 1), including the species new for Mongolia.

Table 1. List of collection sites (in alphabetical order).

Abbreviation	Locality	Coordinates	Date	Figure
G-AT	Gov'-Altai Aimag, Tonkhil Sum, 11 km W of Tonkhil village	46.2979918N, 93.7575660E	15-VI	2A, 2B
G-AS	Gov'-Altai Aimag, Sharga Sum, Sharga village vicinity, wet meadow	46.265184N, 95.275054E	17-VI	2C
KA	Khovd Aimag, Altai Sum, 22 km NNW of Altai, 1552 m.a.s.l.	46.006623N, 92.356425E	6-VI	3A
KB1	Khovd Aimag, Bulgan Sum, 19 km NE of Bulgan, dry steppe	46.2548970N, 91.2569036E	12-VI	3B, 3C
KB2	Khovd Aimag, Bulgan Sum, 27 km NNW of Burenkhairkhan	46.3372557N, 91.4698368E	10-VI	4A
KB3	Khovd Aimag, Bulgan Sum, 30 km NNE of Bulgan	46.4021527N, 91.1830443E	11-VI	4B
KB4	Khovd Aimag, Bulgan Sum, 36 km S of Bulgan, desert	45.7812698N, 91.1355541E	7-VI	4C
KD	Khovd Aimag, Darvi Sum, 14 km NWW of Darvi vill., dry hills	46.958009N, 93.435621E	17-VI	5A, 5B
KM1	Khovd Aimag, Must Sum, 16 km NWW of Must, 2280 m.a.s.l.	46.7274700N, 92.5920415E	13-VI	6A, 6B
KM2	Khovd Aimag, Must Sum, 16 km NWW of Must, dry hills	46.7274700N, 92.5920415E	5-VI	6C
KU	Khovd Aimag, Uyench Sum, 10 km NNE of Burenkhairkhan	46.1866290N, 91.6003534E	9-VI	5C

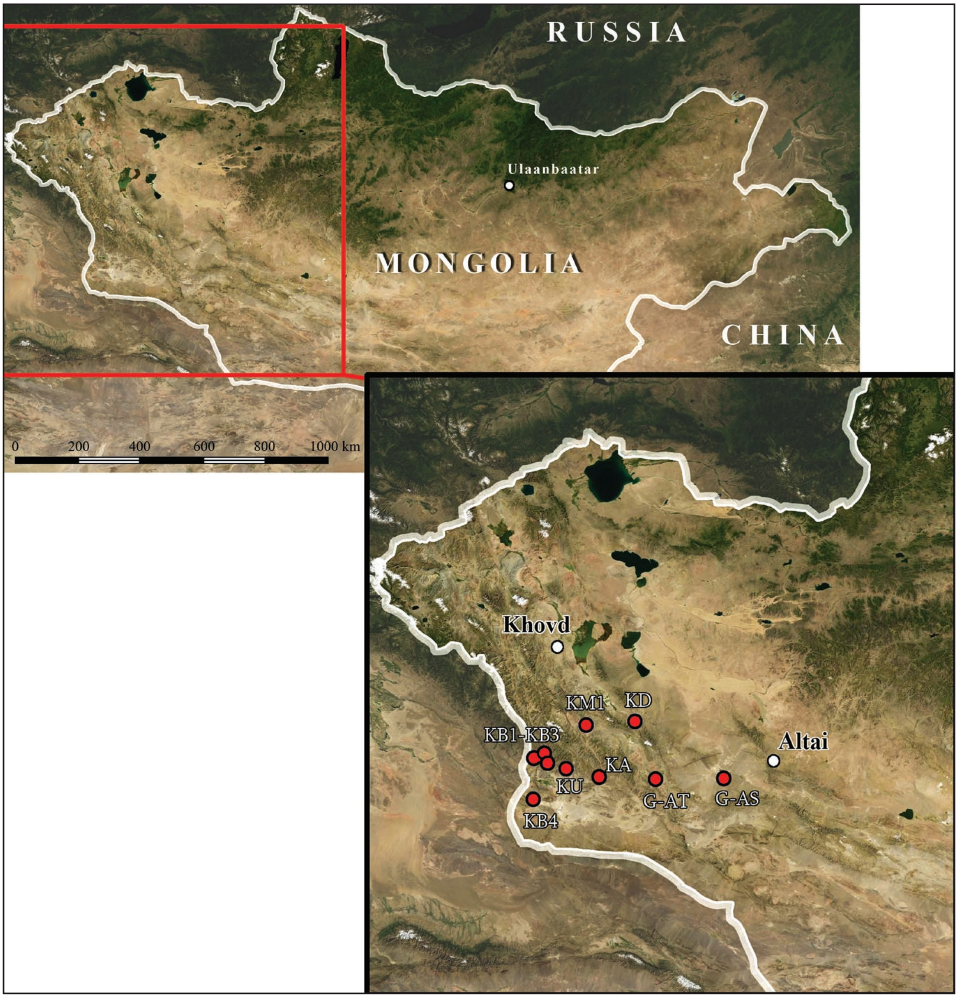

Figure 1. Map of collecting localities.

Material and methods

Material sampling

The moths were sampled with standard methods. Most geometrids were captured at night (usually since twilight coming to 4-5 am) using a Sylvania HSL-BW 250W E40 mercury vapor lamp powered from a FUBAG TI 1000 petrol generator, and a portable screen made of white cotton canvas. The small part of lepidopterans was caught at daytime by an entomological net. All collected Lepidoptera are deposited in the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, Russia).

Morphological analysis

Genitalia preparations were made using a standard technique; maceration was performed with a 15% solution of potassium hydroxide. Glycerol was used for temporary preparations. The photos of temporary genitalia preparations were performed using a Nikon SMZ25 stereoscopic microscope, Nikon DS-Ri2 camera and NIS-Elements BR software.

DNA barcoding and data analysis

For some moths we obtained DNA barcodes to verify our identifications. For DNA extraction we used the dry specimens; one to three legs of each specimen were used. The legs were crushed before lysis, and the lysis reaction proceeded overnight. DNA extraction was carried out using the DNeasy Blood & Tissue Kit (QIAGEN, Germany), according to the manufacturer's protocol. DNA elution was performed with 150 μL elution buffer. Amplification of a 658-bp-long COI fragment was performed using the primers HCO2198 (5'-TAAACTTCAGGGTGACCAAAAAATCA-3') (Folmer et al. 1994) and LCO1490 (5'-GGTCAACAAATCATAAAGATATTGG-3') (Folmer et al. 1994). The polymerase chain reaction (PCR) profile used for this marker was as follows: 95 ºC for 3 min, 95 ºC for 30 s, 50 ºC for 45 s, 72 ºC for 1 min (steps 2-4 cycled 34 times) and 72 ºC for 10 min. The samples were sequenced at Evrogen JSC (Moscow).

Obtained COI sequences were blasted against the complete sequence database of the Barcode of Life Data systems (BOLD) in order to infer the closest matches using the BOLD Identification Engine (http://www.boldsystems.org/index.php/IDS_OpenIdEngine). Moreover, a cross-check control of external morphology was also performed. Genetic distances were calculated using the Kimura 2-parameter (K2P) distance model (Kimura, 1980), using the analytical tools provided by the BOLD Systems v4 platform (Ratnasingham & Hebert, 2007). Genetic distances are given in % minimum pairwise distance. All sequences obtained were uploaded to GenBank; their accession numbers are provided in the annotated checklist (in the parentheses next to the corresponding specimens).

Results and discussion

In the species list below, we provide the data on the findings of Geometridae made in 2022. All moths were collected by the first author. The taxonomic order follows the one presented in Beljaev & Mironov (2019). Literature references are given for each species with the corresponding combination. In the section "Material" the data on the location (see Table 1 for details), the number of collected moths and their sex are given. In the section "Distribution" the countries in which this species occur are listed. The following sources were used to characterize the distribution (Beljaev & Mironov, 2019; Beljaev, 2016; Gorbunov, 2011; Hausmann, 1993, 2001; Mironov & Galsworthy, 2014; Mironov & Ratzel, 2012; Mironov, 2013; Mironov, 2017; Rajaei et al. 2023; Vasilenko & Belousov, 2021; Vasilenko & Mironov, 2021; Vasilenko, 2006; Vasilenko, 2019; Viidalepp, 1975-1979, 1988, 1996).The species new for Mongolia are marked with asterisk. Some notes on distribution, results of DNA-barcoding and additional information are given in the separate section.

Annotated checklist of species

GEOMETRIDAE

ENNOMINAE

Perconia strigillaria (Hübner, [1787])
Perconia strigillaria: Viidalepp, 1975, 488; 1979, 783; 1996, 78; Enkhtur et al. 2017, 672; 2020, 15
Perconai [sic!] *strigillaria*: Enkhtur et al. 2021b, 370

Material: KB3 - 3 ♂♂, 2 ♀♀, G-AT - 2 ♀♀, KB1 - 1 ♀.

Distribution: Europe, Balkans, Ireland, Turkey, Transcaucasia, Russia (European part to S. Yakutia), Mongolia.

Charissa difficilis (Alphéraky, 1883)
Gnophos difficilis: Staudinger, 1896, 275; Alberti, 1971, 374; Viidalepp, 1975, 485; 1979, 786
Dysgnophos difficilis: Vojnits, 1975, 194
Charissa difficilis: Enkhtur et al. 2020, 13; Knyazev et al. 2020, 193

Material: KA - 3 ♂♂, 6 ♀♀, KB4 - 1 ♂, 4 ♀♀, KB1 - 1♀, KB3 - 3 ♀♀, KB2 - 2 ♂♂, 10 ♀♀, KU - 1♂, 2 ♀♀, KM1 - 2 ♂♂, 1 ♀, G-AT - 2 ♂♂.

Distribution: Russia (Caucasus, S. Ural), Armenia, Kazakhstan, Kyrgyzstan, Mongolia, N. W. China.

Charissa turfosaria (Wehrli, 1922)
?Gnophos exilis Wehrli, 1922, 15: Viidalepp, 1975, 486; 1979, 786; 1996, 82
?Gnophos benepunctaria, nec Wehrli, 1922, 16: Viidalepp, 1975, 486
?Gnophos glaciata Wehrli, 1922, 14: Viidalepp, 1975, 485
?Gnophos glaciatus: Viidalepp, 1979, 786
?Dysgnophos benepunctarius (Wehrli, 1922): Vojnits, 1975, 193; 1977, 174
?Dysgnophos glaciatus: Vojnits, 1975, 194; Viidalepp, 1996, 82
Gnophos turfosaria: Smiles, 1979: 117
?Dysgnophos subsplendidaria: Smiles, 1979, 118; Enkhtur et al. 2021b, 370
?Charissa subsplendidaria (Wehrli, 1922): Enkhtur et al. 2020, 13
Charissa turfosaria: Enkhtur et al. 2020, 13

Material: KM1 - 1 ♂; KM2 - 1 ♂; G-AT - 1 ♂; KB3 - 1 ♀.

Distribution: Russia (N. and central Ural, Altai, mountains of S. Siberia, E. and S. Yakutia, northern part, and mountains of the Far East), Kazakhstan, Mongolia, Alaska, Canada.

Synopsia strictaria Lederer, 1853
Synopsia strictaria: Staudinger, 1892, 366; 1896, 273; Staudinger & Rebel, 1901, 339; Vojnits, 1975, 189; 1977, 173; Viidalepp, 1979, 784; 1996, 79; Mühlenberg et al. 2011, 202; Enkhtur et al. 2021b, 370
Megalycinia strictaria: Viidalepp, 1975, 482; Enkhtur et al. 2020, 14; 2021a, Supplementary material (Table S2)

Material: KB3 - 1 ♀.

Distribution: Russia (S. Ural, Altai, S. Siberia, Dauria, southern part of the Far East), Kazakhstan, Mongolia, N. and S. W. China, N Korea.

Dyscia fagaria (Thunberg, 1784)
Dyscia fagaria: Beljaev, 2016, 544

Material: KB4 - 1 ♂.

Distribution: N. W. and Central Europe, W. Ukraine, Russia (S. European part, Caucasus, S. Ural, Transbaikalia), Transcaucasia, Central Asia, Kazakhstan, Mongolia, China (N. and N. W.).

Jankowskia bituminaria (Lederer, 1853)
Boarmia bituminaria: Staudinger, 1896, 274; Staudinger & Rebel, 1901, 339
Cleora bituminaria: Viidalepp, 1975, 483
Pleogynopteryx bituminaria: Vojnits, 1975, 190; 1977, 173; Enkhtur et al. 2020, 15
Jankowskia bituminaria: Vasilenko, 2004, 68; Enkhtur et al. 2020, 14; Knyazev et al. 2020, 192
Jankowskia bituminaria raddensis Wehrli, 1941: Jiang et al. 2010, 10; Enkhtur et al. 2020, 14

Material: KA - 2 ♂♂, KB4 - 3 ♀♀, KU - 1 ♂.

Distribution: Russia (S. Siberia, Dauria, southern part of Far East), Mongolia, N. China, N. Korea.

Spartopteryx kindermannaria (Staudinger, 1871)
Synopsia kindermannaria: Staudinger, 1896, 274; Staudinger & Rebel, 1901, 338
Spartopteryx kindermannaria: Viidalepp, 1975, 482; Vojnits, 1975, 189; 1977, 173; Viidalepp, Solyanikov, 1977, 637; Mühlenberg et al. 2011, 202; Enkhtur et al. 2020, 15
Spartopteryx kindermanniaria [sic!]: Viidalepp, 1979, 789; 1996, 86

Material: KB3 - 1 ♂.

Distribution: Russia (S. Ural, Altai, S. Siberia, Dauria, southern part of the Far East), S. Kazakhstan (Tien Shan), Mongolia, China (N. and N. W.).

Hypomecis atomaria (Linnaeus, 1758)
Ematurga atomaria: Staudinger, 1892, 379; Staudinger & Rebel, 1901, 350; Alberti, 1957, 6; Viidalepp, 1975, 486; Viidalepp, Solyanikov, 1977, 639; Enkhtur et al. 2020, 13
Ematurga atomaria krassnojarscensis Fuchs, 1901: Vojnits, 1975, 197; 1977, 174; Viidalepp, 1979, 787; 1996, 85; Enkhtur et al. 2020, 13

Material: KB2 - 1 ♂.

Distribution: Europe, Turkey, Transcaucasia, Russia, Kyrgyzstan, E. and S. Kazakhstan, Mongolia, China.

* *Alcis depravata* (Staudinger, 1892)

Material: KB2 - 1 ♀ (GenBank ID: OQ720933).

Distribution: E. and S. Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Mongolia, N. W. China.

Note: The only collected female was a mosaic gynandromorphy (Figure 7A). However, its appearance corresponds to the features of *A. depravata*, previously unknown from Mongolia.

Phaselia serrularia (Eversmann,1847).
Phaselia serrularia: Enkhtur et al. 2020, 15

Material: KA - 1 ♂ (GenBank ID: OQ720935).

Distribution: Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, W. Mongolia, and Southern Fderal District of Russia.

Note: The DNA barcode obtained from our sample was found to be identical with several *COI* of *Phaselia* collected in Khovd Aimag (Mongolia) by Roman Yakovlev in 2005 and 2016. Four of them are identified as *Phaselia serrularia* (Eversmann, 1847) and only one as *P. narynaria*. Analysis of genitalia of our specimen (Figures 10A, 10B) shows that it is conspecific with *P. serrularia*.

Chiasmia saburraria (Eversmann, 1851)
Macaria intermaculata var. *kenteata* Staudinger, 1892, 375: Staudinger, 1896, 273
Phasiane zimmermanni Graeser, 1888 var. *kenteata*: Staudinger & Rebel, 1901, 353
Phasiane biparata Lederer, 1853: Staudinger & Rebel 1901, 353
Semiothisa saburraria kenteata Staudinger, 1892: Vojnits, 1974, 283; 1977, 172
Semiothisa saburraria: Viidalepp, 1975, 478; 1978, 760; 1996, 75
Chiasma [sic!] *saburraria*: Vasilenko, 2004, 68
Chiasmia saburraria: Enkhtur et al. 2020, 13; Knyazev et al. 2020, 193
Chiasmia saburraria kenteata: Enkhtur et al. 2020, 13

Material: KB4 -1 ♂.

Distribution: Russia (S. Ural to the southern part of the Far East), Mongolia, N. China.

GEOMETRINAE

* *Holoterpna diagrapharia* Püngeler, 1900

Material: KB2 - 4 ♂♂, 2 ♀♀ (Figures 7C, 7D).

Distribution: Iran, Turkmenistan, Uzbekistan, Kyrgyzstan, Kazakhstan, W. Mongolia.

Note: Rare turanian desert species (Gorbunov, 2011; Viidalepp, 1988), **new for Mongolia**. Apparently, the easternmost limits of the *H. diagrapharia* range lies in S. W. Mongolia.

Thetidia smaragdaria (Fabricius, 1787)
Phorodesma smaragdaria var. *prasinaria* (Eversamann, 1837): Staudinger, 1896, 271
Euchloris smaragdaria v. *mongolica*: Staudinger & Rebel 1901, 262
Euchloris anomica Prout, 1935: Vojnits, 1976, 169; 1977, 167
Euchloris volgaria mongolica: Vojnits, 1977, 168
Thetidia volgaria (Guenée, 1858): Viidalepp, 1975, 442; Enkhtur et al. 2020, 15
Thetidia smaragdaria mongolica: Viidalepp, 1976, 845; 1996, 63; Mühlenberg et al. 2011, 202
Thetidia volgaria mongolica: Enkhtur et al. 2020, 15
Thetidia smaragdaria: Knyazev et al. 2020, 192; Enkhtur et al. 2021, Supplementary material (Table S2)

Material: KB2 - 1 ♂, KB3 - 1 ♂.

Distribution: Europe, Russia, W. Turkey, ?Transcaucasia, ?N. Iran, Kyrgyzstan, Turkmenistan, Uzbekistan, Kazakhstan, Mongolia, China, Korea, Japan.

Dyschloropsis impararia (Guenée, 1858)
Eucrostis impararia: Staudinger, 1896, 272
Geometra impararia: Staudinger & Rebel 1901, 261
Holoterpna impararia: Vojnits, 1976, 170; 1977, 167
Dyschloropsis impararia: Alberti, 1971, 373; Viidalepp, 1975, 442; 1976, 845; 1996, 61; Vasilenko, 2004, 68; Knyazev et al. 2020, 192; Enkhtur et al. 2020, 15

Material: KA - 1 ♂; KD - 2 ♂♂; KU - 1 ♀; KB1 - 1 ♀.

Distribution: Russia (southern Ural to Dauria), Mongolia, Kazakhstan, Central Asia, N. China.

Phaiogramma etruscaria (Zeller, 1849)
Fhaiogramma [sic!] *etruscaria*: Vasilenko, 2006, 346

Material: KU - 2 ♂♂, 2 ♀♀; KB1 - 1 ♂.

Distribution: S. Europe, Morocco, Tunisia, Turkey, Levant, S. W. Russia, Caucasus, Transcaucasia, N. Iraq, Iran, Afghanistan, Turkmenistan, Tajikistan, Uzbekistan, Kyrgyzstan, Kazakhstan, W. Mongolia.

Microloxia herbaria (Hübner, [1813])
Microloxia herbaria advolata Eversmann, 1837: Vojnits, 1977, 168; Enkhtur et al. 2020, 15
Microloxia herbaria: Viidalepp, 1975, 443; 1976, 846; 1996, 62; Knyazev et al. 2020, 192; Enkhtur et al. 2020, 15

Material: KB1 - 12 ♂♂, 2 ♀♀, KU - 1 ♂.

Distribution: Europe, Russia (S. European part, S. Ural), Turkey, Levant, Caucasus, Transcaucasia, N. Iran, Afghanistan, N. Pakistan, Kazakhstan, Turkmenistan, Uzbekistan, Kyrgyzstan, Tajikistan, W. Mongolia.

LARENTIINAE

Aplocera plagiata (Linnaeus, 1758)
Aplocera plagiata roddi Vasilenko, 1995: Enkhtur et al. 2020, 16

Material: KB3 -1 ♀.

Distribution: Europe, European Russia, Turkey, Transcaucasia, Levant, N. Iran, Afghanistan, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan, Mongolia, N. America.

* *Scotopteryx supproximaria* (Staudinger, 1892)

Material: KB3 - 2 ♂♂, 7 ♀♀ (Figures 7E, 7F; genitalia: Figures 10C, 10D, 11I; GenBank ID: OQ720938).

Distribution: Kazakhstan, Uzbekistan, Kyrgyzstan, W. Mongolia.

Note: A **new species for the fauna of Mongolia**. Genetically *S. supproximaria* is close to *S. burgaria* (Eversmann, 1843): at minimum distances of 1.2%.

Euphyia unangulata (Haworth, 1809)
Euphyia unangulata: Viidalepp, 1975, 459; 1996, 17; Mühlenberg et al. 2011, 201; Enkhtur et al. 2020, 17; 2021a, Supplementary material (Table S2); 2021b, 371

Material: KA - 2 ♂♂.

Distribution: Europe, Russia, Mongolia, Central China, Korea, Japan, N. America.

Euphyia coangulata (Prout, 1914)
Cid[aria] unangulata var. *subangulata* Staudinger, 1896, 279
Larentia unangulata var. *subangulata*: Staudinger & Rebel, 1901, 303
Cidaria coangulata: Alberti, 1971, 373
Euphyia coangulata: Viidalepp, 1975, 459; 1977, 571; 1996, 17; Vojnits, 1979, 209; Knyazev et al. 2020, 193; Enkhtur et al. 2020, 17

Material: KB2 - 2 ♂♂; KB4 - 2 ♀♀.

Distribution: Russia (Altai, S. Siberia, Transbaikalia), Mongolia, W. China.

* *Cataclysme riguata* (Hübner, [1813])

Material: KB3 - 5 ♂♂ (Figure 7B).

Distribution: S. Europe, S. W. Russia (S. European part, Caucasus, S. Ural, Altai), Turkey, Transcaucasia (Georgia, Armenia, Azerbaijan), N. Iran, Afghanistan, Kazakhstan, S. Turkmenistan, Tajikistan, Kyrgyzstan.

Note: Not previously recorded from Mongolia. Earlier Viidalepp (1975, 462) noted that occurrence of this species in Mongolia is probable.

Catarhoe cuculata (Hufnagel, 1767)
Catarhoe cuculata undulosa (Warnecke, 1934): Viidalepp, 1996, 14
Catarhoe cuculata: Mühlenberg et al., 2011, 200; Enkhtur et al. 2020, 16; 2021b, 371

Material: KB3 - 1 ♀.

Distribution: Algeria, Europe, Russia, Turkey, Caucasus, Transcaucasia, Iran, Kazakhstan, Uzbekistan, Kyrgyzstan, Mongolia, Northeast China.

Kyrtolitha obstinata (Staudinger, 1892)
Kyrtolitha obstinata: Viidalepp, 1975, 451; 1977, 566; Enkhtur et al. 2020, 19

Material: KA - 2 ♂♂ (Figures 8A, 8B).

Distribution: E. and S. Kazakhstan (Dzhungarian (?) and Transili Alatau), Kyrgyzstan, Uzbekistan, Tajikistan, W. Mongolia, N. W. China.

Nebula mongoliata (Staudinger, 1896)
Cid[aria] ibericata ?var. *mongoliata* Staudinger, 1896, 278
Larentia mongoliata: Staudinger & Rebel, 1901, 300
Coenotephria mongoliata: Viidalepp, 1975, 458; Vojnits, 1979, 209
Nebula mongoliata: Viidalepp, 1996, 27; Vasilenko, 2004, 66; Enkhtur et al. 2020, 19

Material: KB2 - 1 ♂ (GenBank ID: OQ720940), KB3 - 2 ♂♂ (GenBank ID: OQ720939), KB4 - 5 ♂♂ (GenBank ID: OQ720941, OQ720942, OQ720943, OQ720944)

Distribution: Russia (S. E. Altai, Tyva, Irkutskaya Oblast, Buryatia, Zabaikalsky Kray), Mongolia.

Note: The studied specimens are genetically homogeneous, and their barcodes differ from ones of S. Siberian *N. mongoliata* (Irkutskaya Oblast, Buryatia) by 4 substitutions.

Eupithecia centaureata ([Denis & Schiffermüller], 1775)
Eupithecia centaureata: Viidalepp, 1975, 463; Vasilenko, 2004, 67; Mironov, Galsworthy, 2014, 114; Enkhtur et al. 2020, 17; 2021a, Supplementary material (Table S2); 2021b, 371; Knyazev et al. 2020, 193
Eupithecia centaureata centralisata Staudinger, 1892: Viidalepp, 1978, 753; 1996, 41

Material: KB4 - 1 ♂, KB2 - 1 ♂, KB3 - 1 ♂, 2 ♀♀, KU - 1 ♂, 1 ♀.

Distribution: Europe, Russia (European part to Amur region), N. Africa (Morocco, Algeria, Tunisia); Turkey, Transcaucasia, Lebanon, Israel, Jordan, Syria, Iran, Afghanistan, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, Mongolia, China, Taiwan, Korea, India.

Eupithecia vulgata (Haworth, 1809)
Tephroclystia vulgata: Staudinger & Rebel, 1901, 312
Eupithecia vulgata: Staudinger, 1896, 283; Viidalepp, 1975, 463; Mironov & Galsworthy, 2014, 118; Enkhtur et al. 2020, 18
Eupithecia vulgata lepsaria Staudinger, 1882: Viidalepp, 1996: 42; Enkhtur et al. 2020, 18.

Material: KA - 2 ♂♂.

Distribution: N. Africa, Europe, Russia (European part to Amur region), Morocco, Lebanon, Turkey, Transcaucasia, N. Iran, Tajikistan, Afghanistan, Kazakhstan, Uzbekistan, Kyrgyzstan, Mongolia, N. W. China, Korea.

Eupithecia holti Viidalepp, 1973
Eupithecia holti Viidalepp, 1973, 397; 1975, 468; 1996, 36; Mironovm & Galsworthy, 2014, 105; Enkhtur et al. 2020, 17; Knyazev et al. 2020, 193

Material: KA - 1 ♂, 1♀, KB4 - 1 ♂.

Distribution: Russia (Altai Mountains, Tyva, S. Buryatia), Mongolia.

Eupithecia vicariata Dietze, 1904
Eupithecia vicariata: Mironov, Galsworthy, 2014, 113; Knyazev et al. 2020, 193

Material: KB3 - 2 ♀♀, KU - 1 ♂.

Distribution: Turkmenistan, Kyrgyzstan, Tajikistan, S. W. Kazakhstan, Mongolia, W. China.

Eupithecia exactata Staudinger, 1882
Eupithecia exactata: Viidalepp, 1978, 752; Mironov & Galsworthy, 2014, 120; Knyazev et al. 2020, 193.

Material: KD - 2 ♂♂, G-AT - 1 ♂, 1 ♀.

Distribution: N. Iran, S. E. Kazakhstan, Kyrgyzstan, Tajikistan, N. E. Afghanistan, Russia (Altai Mountains), Kyrgyzstan, Mongolia, China, India, Pakistan.

Eupithecia innotata (Hufnagel, 1767)
Eupithecia innotata: Enkhtur et al. 2020, 17

Material: KB3 - 2 ♂♂.

Distribution: Europe (except Iceland, Scandinavia and the south of the Balkans), W. Russia, Morocco, Algeria, Tunisia, Turkey, Transcaucasia, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Afghanistan, Pakistan, Mongolia, China (Xinjiang Uygur Autonomous Region, Qinghai).

Eupithecia lariciata (Freyer, 1842)
Eupithecia lariciata: Viidalepp, 1975, 468; Viidalepp & Solyanikov, 1977, 634; Viidalepp, 1996, 37; Mironov & Galsworthy, 2014, 108; Enkhtur et al. 2020, 17; 2021, Supplementary material (Table S2)

Material: KD - 1 ♂.

Distribution: Europe, Russia, Mongolia, Central China, N. Korea, Japan (Hokkaido, Honshu), N. America.

Eupithecia subbrunneata Dietze, 1904
Catarina carissima (Vojnits & de Laever, 1973): Viidalepp, 1978, 756
Eupithecia carissima: Viidalepp, 1996, 40; Vasilenko, 2004, 66
Eupithecia subbrunneata: Mironov & Galsworthy, 2014, 110; Enkhtur et al. 2020, 18

Material: KU - 3 ♂♂.

Distribution: Russia (S. Ural to Primorye), S. E. Kazakhstan, Mongolia, China, Korea.

Eupithecia dissertata (Püngeler, 1905)
Eupithecia dissertata: Viidalepp, 1975. 462; Viidalepp & Solyanikov, 1977, 631; Viidalepp, 1978, 753; Viidalepp, 1996, 36; Mironov & Galsworthy, 2014, 107; Enkhtur et al. 2020, 17

Material: KU - 2 ♂♂.

Distribution: Central and E. Europe (in mountains), Russia (Altai Mountains, Sayan, Baikal region, Amur region, Magadanskaya Oblast), S. E. Kazakhstan, N. and W. Mongolia, China.

Eupithecia illaborata Dietze, 1904
Eupithecia illaborata: Mironov & Galsworthy, 2014, 102; Enkhtur et al. 2020, 17

Material: KB3 - 1 ♀.

Distribution: S. E. Kazakhstan, Tajikistan, Kyrgyzstan (Tien Shan Mountains), Mongolia, N. China (Xinjiang and Inner Mongolia).

Eupithecia kozlovi Viidalepp, 1973
Eupithecia kozlovi Viidalepp, 1973, 398; 1975, 470; 1996, 37; Mironov & Galsworthy, 2014, 108; Enkhtur et al. 2020, 17; Knyazev et al. 2020, 193.

Material: KU - 1 ♂, 2 ♀♀, KB1 - 1 ♂, KB2 - 1 ♂, 1 ♀, KB4 - 1 ♂.

Distribution: China (Inner Mongolia, Qinghai, Gansu), Tajikistan, Kyrgyzstan, S. E. Kazakhstan, Russia (Altai Mountains), Mongolia.

Eupithecia despectaria Lederer, 1853
Eupithecia despectaria: Viidalepp, 1975, 462; 1978, 752; Vasilenko, 2004, 67; Mironov & Galsworthy, 2014, 115; Enkhtur et al. 2020, 17

Material: KU - 5 ♂♂, KB3 - 1 ♂.

Distribution: Turkey, Russia (Altai Mountains, Sayan, Tyva), S. and E. Kazakhstan, Mongolia, N. W. China (Kuldja), Kirghizstan, Tajikistan, Uzbekistan, N. W. Pakistan.

Eupithecia parallelaria Bohatsch, 1893
Eupithecia parallelaria: Viidalepp, 1975, 466; 1978, 755; 1996, 39; Mironov & Galsworthy, 2014, 112

Material: KU - 5 ♂♂, 2 ♀♀, KA - 2 ♂♂, 4 ♀♀, KB2 - 2 ♀♀, KB3 - 1 ♂, 2 ♀♀, KM2 - 1 ♀, KB1 - 2 ♀♀.

Distribution: Iran, Turkmenistan, Uzbekistan, Tajikistan, S. E Kazakhstan, Kyrgyzstan, Afghanistan, Pakistan, N. W. China, Mongolia.

Horisme intersecta (Staudinger, 1882)
Cid[aria] intersecta: Staudinger, 1896, 280
Larentia intersecta: Staudinger & Rebel, 1901, 301
Horisme intersecta: Viidalepp, 1975, 474
Euphyia intersecta: Enkhtur et al. 2020, 17

Material: KA - 1 ♂, 1 ♀, KB2 - 2 ♂♂, KB3 -5 ♂♂, 2 ♀♀.

Distribution: N. Iran, Kazakhstan, Kyrgyzstan, ?N. W. China, Mongolia.

STERRHINAE

Rhodostrophia vibicaria (Clerck, 1759)
Rhodostrophia vibicaria: Viidalepp, 1975, 450; 1976, 850; 1996, 57; Mühlenberg et al. 2011, 201; Enkhtur et al. 2020, 21; 2021a, Supplementary material (Table S2); 2021b, 371

Material: KB3 - 2 ♂♂, KB1 - 1 ♂.

Distribution: Europe, Morocco, Algeria, Turkey, Transcaucasia, N. Iran, W. Russia, Kazakhstan, Central Asia, Central Mongolia.

Rhodostrophia jacularia (Hübner, [1813])
Eusarca jacularia: Staudinger, 1896, 276
Rhodostrophia jacularia: Viidalepp, 1975, 450; 1976, 850; Viidalepp & Solyanikov, 1977, 626; Viidalepp, 1996, 57; Vojnits, 1976, 171; 1977, 169; Vasilenko, 2004, 67; Enkhtur et al. 2020, 21; 2021a, Supplementary material (Table S2); 2021b, 371; Knyazev et al. 2020, 193
Rhodostrophia tyugui Vasilenko, 1998, 1138; Vasilenko, 2004, 67; Enkhtur et al. 2020, 21
Rhodostrophia ustyuzhanini Vasilenko, 2006, 345; Enkhtur et al. 2020, 21

Material: KB4 - 1 ♂, KD - 3 ♂♂, KM1 - 10 ♂♂, G-AT - 2 ♂♂.

Distribution: Turkey, Russia (Volga region, Altai, S. Siberia, Dauria), N. Kazakhstan, Mongolia, N. W. China.

* *Rhodostrophia crypta* Viidalepp & Kostjuk, 2020

Material: KA - 1 ♂ (Figure 8D).

Distribution: E. Kazakhstan, W. Mongolia.

Note: *R. crypta* was described only 3 years ago. The authors of this taxon showed that it reliably differs from its closely related *R. vastaria* Christoph, 1877 described from Turkmenistan. According to the Viidalepp and Kostjuk (2020), *R. vastaria* inhabits the Turkmen shore of the Caspian Sea (Turkmenbashi), the Ustjurt plateau (W. Kazakhstan) and the southern Urals. The genitalia structure of our specimen (Figures 10E-10G) corresponds precisely to those in *R. crypta* which is **new for Mongolia**.

Idaea straminata (Borkhausen, 1794)
Sterrha sibirica: Djakonov, 1926; Vojnits, 1976, 174
Sterrha inornata (Haworth, 1809): Viidalepp, 1975, 444
Idaea straminata: Korsun et al. 2012, 22; Enkhtur et al. 2020, 21; 2021a, Supplementary material (Table S2); Knyazev et al. 2020, 193
Idaea straminata sibirica: Viidalepp, 1996, 52; Enkhtur et al. 2020, 21

Material: KB4 - 1 ♂.

Distribution: N. Africa, Europe, Lebanon, Turkey, Caucasus, Transcaucasia, Russia, N. Iran, Afghanistan, W. Tajikistan, Turkmenistan, Kyrgyzstan, Kazakhstan, Uzbekistan, Mongolia, N. E. China, N. Korea.

* *Idaea ossiculata* (Lederer, 1870)

Material: KB3 - 1 ♂ (Figure 8E; genitalia: Figures 10H, 10I).

Distribution: Europe, Russia (S. European part, Caucasus, S. Ural), Transcaucasia (Armenia, Azerbaijan), Turkey, Iran, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, W. Mongolia.

Note: This species is easily confused with *I. sylvestraria* (Hübner, [1799]). *I. ossiculata* is a **new representative of the genus for the Mongolian fauna**.

Idaea descitaria (Christoph, 1893)

Material: KB2 - 2 ♂♂, KB1 - 1 ♂ (Figure 8F), KB3 - 1 ♂.

Distribution: E. Europe, Russia (S. European part, S. Ural, S. Siberia, Altai, Transbaikalia), Caucasus, Turkey, Iran, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, N. W. China, Mongolia.

Note: In the studied publications on Mongolian geometrids this species is absent. Mongolia is listed for the range of *I. descitaria* in Vasilenko (2019, p. 352). According to the author (personal communication) the specimens of *I. descitaria* from Mongolia are kept in collection of Institute of Systematics and Ecology of Animals of Siberian Branch of Russian Academy of Sciences (Novosibirsk).

Scopula cumulata (Alphéraky, 1883)

Scopula cumulata: Vasilenko, 2006, 344; Enkhtur et al. 2020, 21

Material: KA – 1♂, KB3 – 2♂ 2♀.

Distribution: Russia (S. E. Altai), S. Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, N. W. China, W. Mongolia.

Scopula beckeraria (Lederer, 1853)

Scopula beckeraria: Vojnits, 1976, 172; 1977, 170; Viidalepp, 1975, 449; Vasilenko, 2004, 67; Enkhtur et al. 2020, 21; Knyazev et al. 2020, 194

Scopula beckeraria amataria Wehrli, 1926: Viidalepp & Solyanikov, 1977, 625; Viidalepp, 1976, 849; 1996, 56; Enkhtur et al. 2020, 21

Material: KD - 1 ♀, KB4 - 6 ♂♂, 1 ♀, KA - 1 ♂, KB2 - 2 ♂♂, 1 ♀, KB1 - 3 ♀♀, KB3 - 2 ♀♀.

Distribution: S. E. Europe (Macedonia, N. Greece, Bulgaria, W. Romania), Caucasus, Transcaucasia, Central Asia, E. Mediterranean, Turkey, Levant, Russia (southern part: Volga region to Transbaikalia), Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, Mongolia, N. India, N. Iran, N. Afghanistan, N. China.

Scopula marginepunctata (Goeze, 1781)

Acidalia marginepunctata: Staudinger & Rebel, 1901, 273

Scopula marginepunctata: Viidalepp, 1975, 448; Enkhtur et al. 2020, 21; 2021b, 371

Material: KB4 - 1 ♂, KB2 - 5 ♂♂, 1 ♀, KB3 - 2 ♂♂, 9 ♀♀, KB1 - 1 ♀.

Distribution: Europe, S. W. Russia, Morocco, Tunisia, Levant, Caucasus, Turkey, Iran, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, Afghanistan, N. W. China, Mongolia.

Scopula rufotinctata (Prout, 1913)

Glossotrophia rufotinctata: Vasilenko, 2006, 345; Enkhtur et al., 2020, 20

Material: KA - 2 ♂♂ (GenBank ID: OQ720937) 1 ♀ (Figures 9A, 9B; genitalia: Figures 11A-11C).

Distribution: Turkmenistan, Tajikistan, Uzbekistan, Kyrgyzstan, Mongolia, N. W. China, India.

Note: The barcode obtained by us significantly differs from COI sequences of *S. rufotinctata* available in BOLD (minimum distance 4.3%); however, it is almost conspecific to several *Scopula sp.* (‘*sacrariaNP01Ir*’) from N. Iran (Golestan). Perhaps there is misidentification and / or several differentiated haplogroups occur in populations of *S. rufotinctata*.

* *Scopula divisaria* (Christoph, 1893)

? *Scopula latelineata* (Graeser, 1892): Vasilenko, 2006, 345; Enkhtur et al. 2020, 21

Material: KA - 1 ♂ (GenBank ID: OQ720936).

Distribution: Russia (S. Ural), Kazakhstan, W. Mongolia.

Note: Some authors (Enkhtur et al. 2020; Vasilenko, 2006) recorded a sister species *Scopula latelineata* (Graeser, 1892) for Mongolia. We studied the original description of *S. latelineata*, and also a photo of syntype of *Acidalia latelineata* in Hausmann (2004, Pl. 19, Fig. 155f). The appearance (Figure 9E) and genitalia structure (Figure 11D-11F) of the male collected in our trip correspond to that in *S. divisaria*. It has not hitherto been recorded from Mongolia.

Lythria purpuraria (Linnaeus, 1758)

Material: G-AS - 1 ♂.

Distribution: Europe, Transcaucasia, Russia (from the western borders to Transbaikalia), Turkey, Iran, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan, Afghanistan, W. Mongolia, N. W. China.

Note: In the studied publications on Mongolian geometrids this species is absent. Mongolia is listed for the range of *L. purpuraria* in Vasilenko (2019, p. 353). According to the author (personal communication) the specimens of *L. purpuraria* from Mongolia are kept in collection of Institute of Systematics and Ecology of Animals of Siberian Branch of Russian Academy of Sciences (Novosibirsk).

* *Casilda consecraria* (Staudinger, 1871)

Material: KB4 - 2 ♂♂ (Figure 9C; genitalia: Figures 11G, 11H; GenBank ID: OQ720934) 1 ♀ (Figure 9D).

Distribution: S. Europe (S. France, Spain, Corsica, Sardinia, S. Sicily), Morocco, Israel, Egypt, S. Cyprus, Levant, Arabian Peninsula, Iran, Turkmenistan, S. W. Kazakhstan, Uzbekistan.

Note: Not hitherto **recorded from Mongolia**.

Thus, we collected 51 species of moths, of which 8 were new to Mongolia. This ratio suggests that the inventory of the Geometridae fauna of the Mongolian Altai, as well as Mongolia as a whole, is still far from completion.

Some species new for Mongolia have turanian and central Asian ranges (4 species), and one - Tien Shan range. Presumably, in S. W. Mongolia they are located on the eastern border of their areas being elements of the Dzhungarian fauna.

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Figure 2. Habitats of the travel. Gov'-Altai Aimag. **A, B.** Tonkhil Sum, 11 km W of Tonkhil vill. **C.** Sharga Sum, Sharga village vicinity.

Figure 3. Habitats of the travel. Khovd Aimag. **A.** Altai Sum, 22 km NNW of Altai. **B, C.** Bulgan Sum, 19 km NE of Bulgan.

Figure 4. Habitats of the travel. Khovd Aimag. **A.** Bulgan Sum, 27 km NNW of Burenkhairkhan. **B.** Bulgan Sum, 30 km NNE of Bulgan; C. Bulgan Sum, 36 km S of Bulgan.

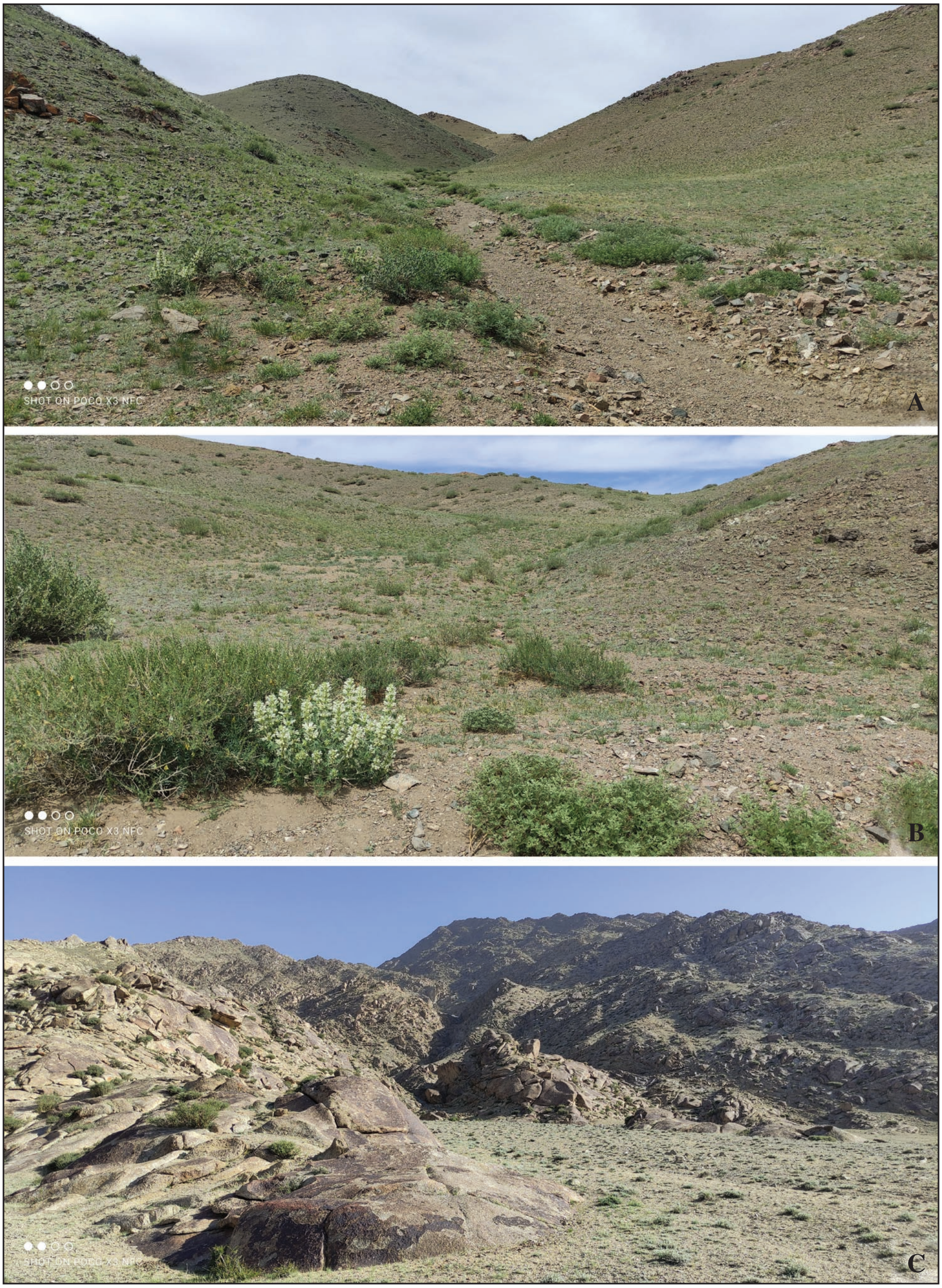

Figure 5. Habitats of the travel, Khovd Aimag. **A, B.** Darvi Sum, 14 km NWW of Darvi vill. **C.** Uyench Sum, 10 km NNE of Burenkhairkhan.

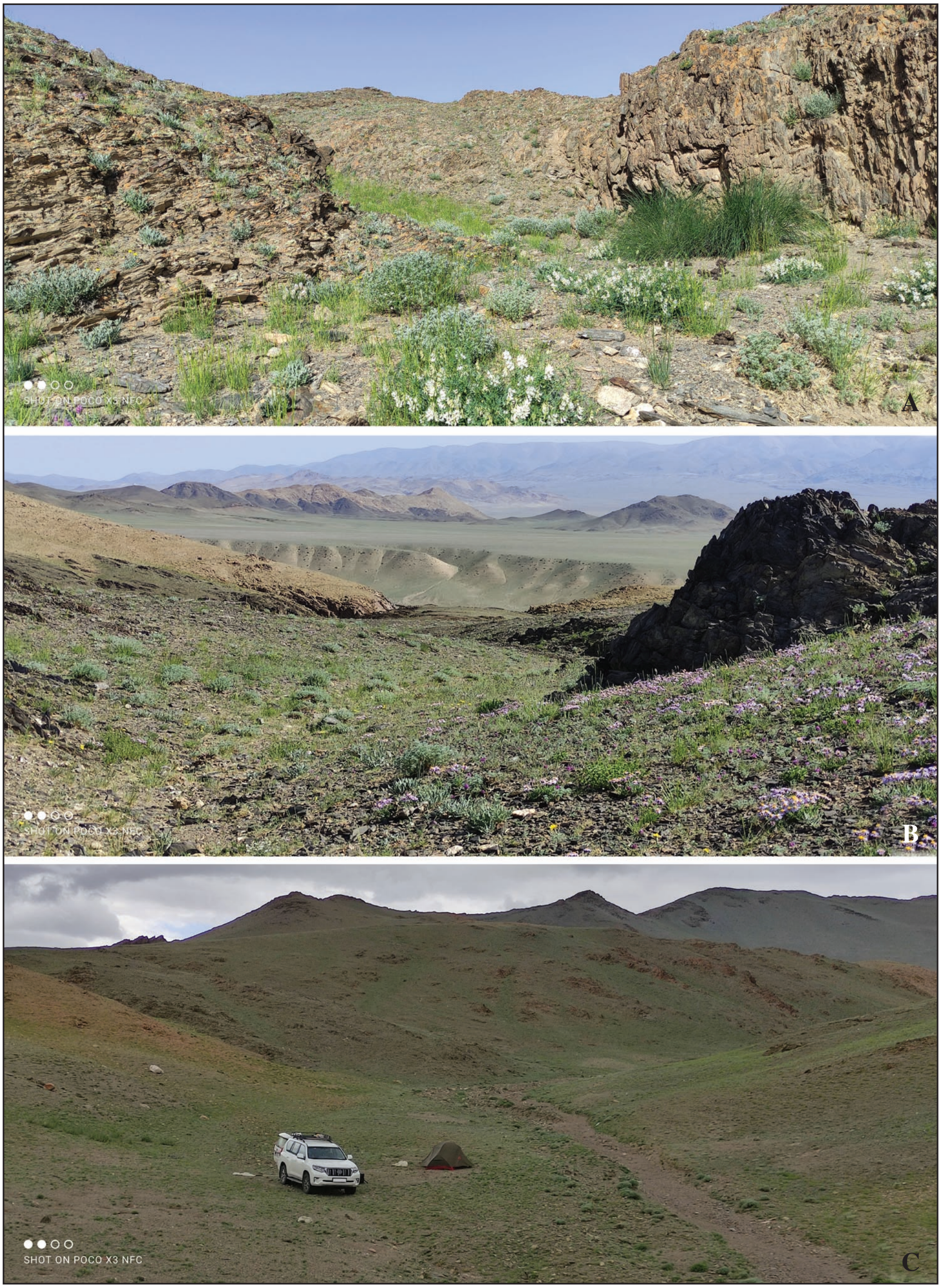

Figure 6. Habitats of the travel. Khovd Aimag. **A, B.** Must Sum, 16 km NWW of Must. **C.** Must Sum, 16 km NWW of Must.

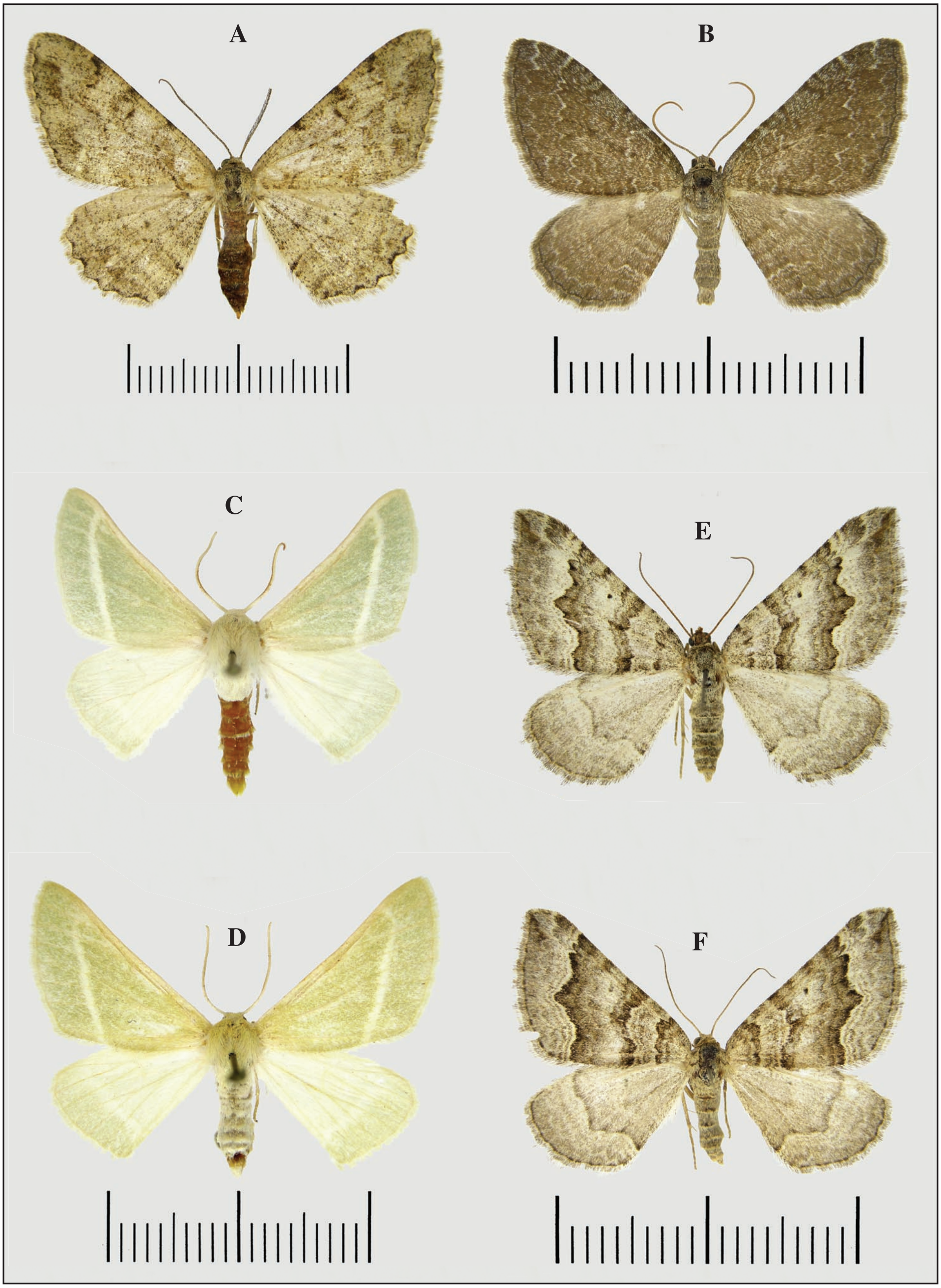

Figure 7. Adults of Mongolian Geometridae. **A.** *Alcis depravata*, female. **B.** *Cataclysme riguata*. **C.** *Holoterpna diagrapharia*, male. **D.** ditto, female. **E, F.** *Scotopteryx supproximaria*, females.

Figure 8. Adults of Mongolian Geometridae. **A, B.** *Kyrtolitha obstinata*, males. **C.** *Nebula mongoliata*, male. **D.** *Rhodostrophia crypta*, male. **E.** *Idaea ossiculata*, male. **F.** *Idaea descitaria*, male.

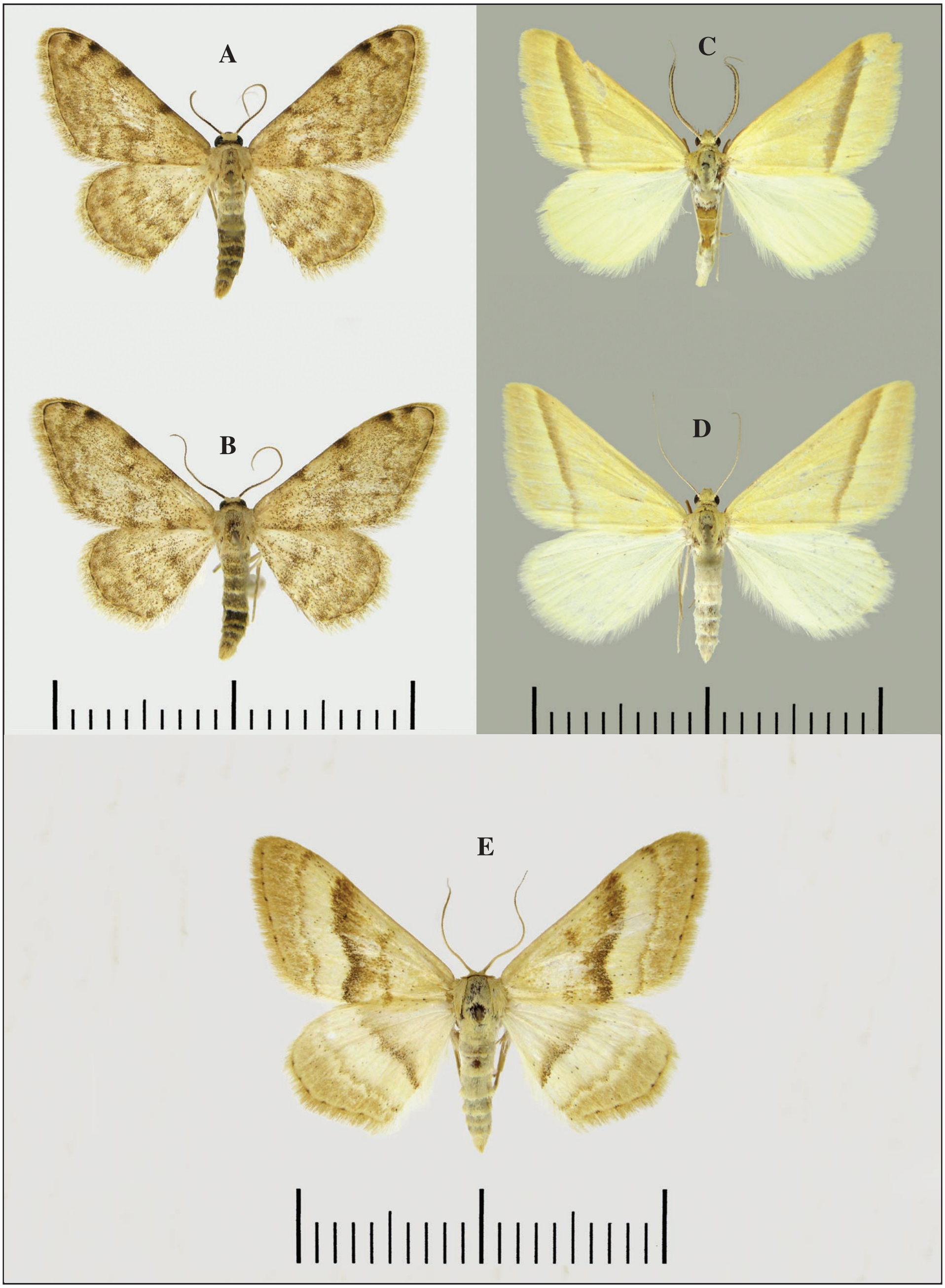

Figure 9. Adults of Mongolian Geometridae. **A, B.** *Scopula rufotinctata*, males. **C.** *Casilda consecraria*, male. **D.** ditto, female. **E.** *Scopula divisaria*, male.

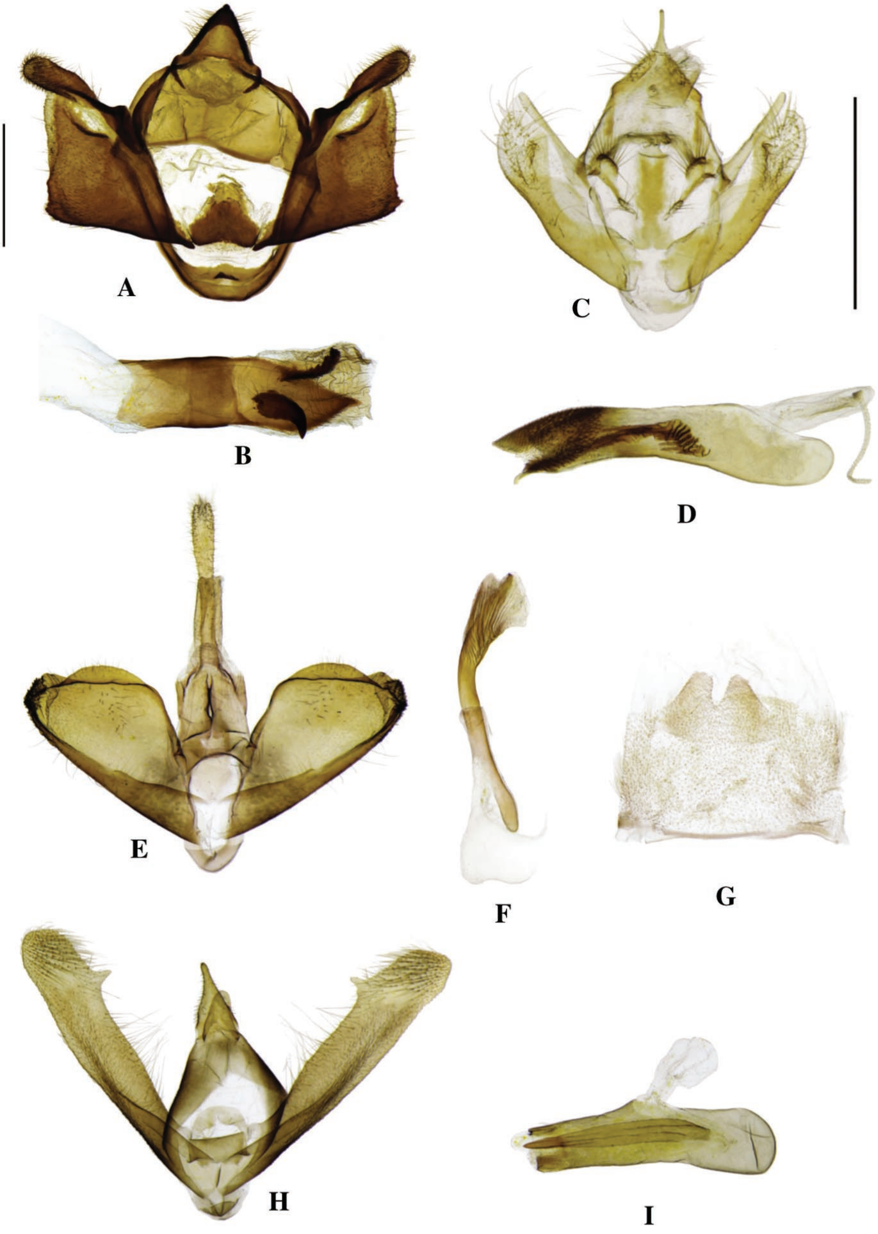

Figure 10. Male genitalia of Mongolian Geometridae. **A, B.** *Phaselia serrularia.* **C, D.** *Scotopteryx supproximaria.* **E-G.** *Rhodostrophia crypta.* **H, I.** *Idaea ossiculata*. **A, C, E, H.** genital segment. **B, D, F, I.** phallos. **G.** abdominal sternite VIII.

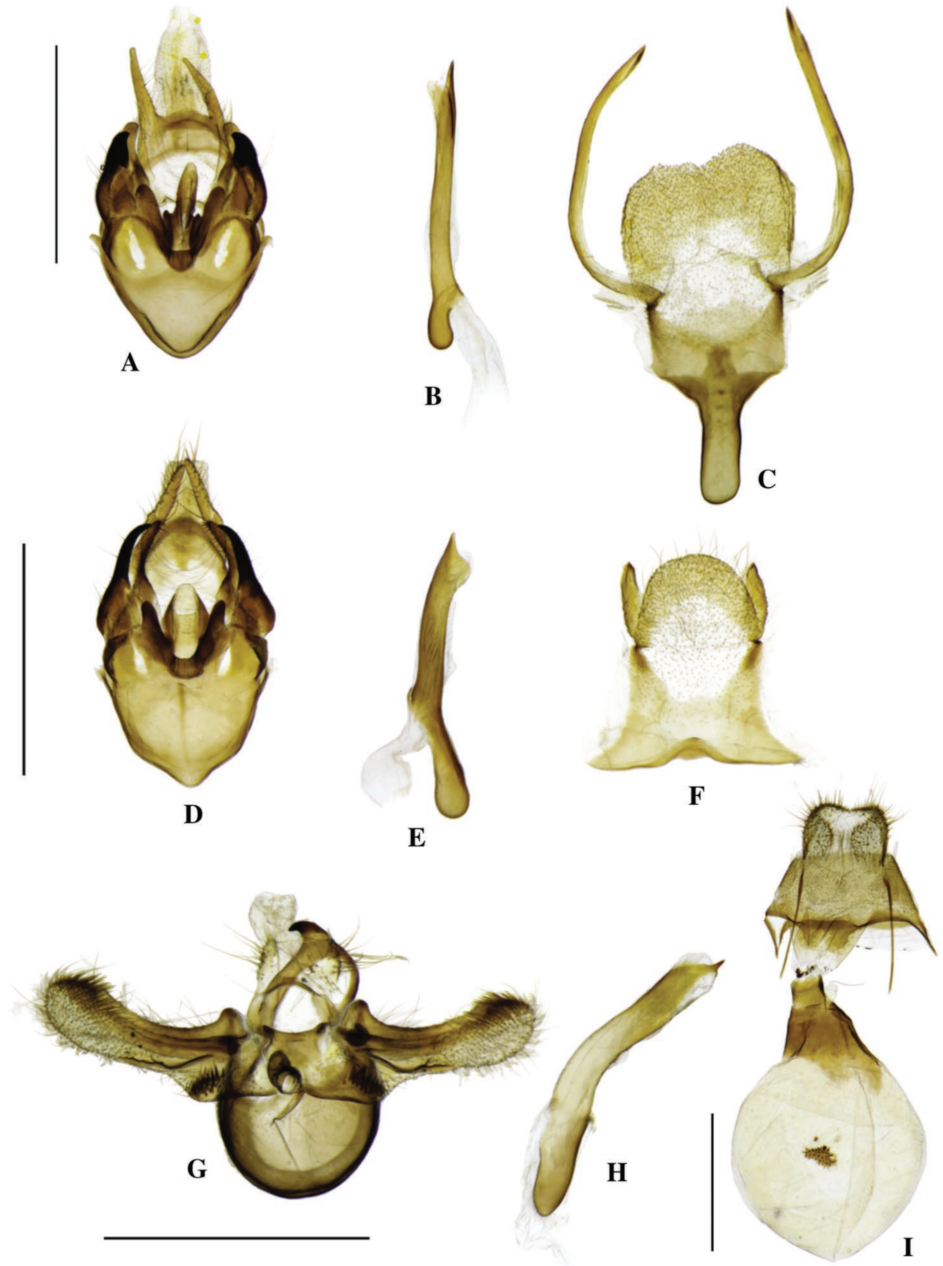

Figure 11. Male and female genitalia of Mongolian Geometridae. **A-C.** *Scopula rufotinctata*. **D-F.** *Scopula divisaria.* **G, H.** *Casilda consecraria.* **I.** *Scotopteryx supproximaria*. **A, D, G.** genital segment. **B, E, H.** phallos. **C, F.** abdominal sternite VIII. **I.** bursa copulatrix.

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The protected species *Pseudophilotes bavius hungarica* (Diószeghy, 1913): oviposition strategy, new records and conservation (Lepidoptera: Lycaenidae)

Andrei Crişan, Tibor-Csaba Vizauer & László Rákosy

Abstract

Pseudophilotes bavius hungarica (Diószeghy, 1913) is a Transylvanian endemic of conservation interest. We made observations regarding its oviposition strategy, and established its preference for floral stems of *Salvia nutans* L. taller than five centimeters. *Salvia transsilvanica* Schur was also confirmed as a host plant for *P. bavius hungarica.* The distribution map of this subspecies was completed in two localities from the south of the Transylvanian Plain, Râpa Lechinţa and Râpa Dătăşeni. We reported presence of *P. bavius* in Tulcea County for the first time, thus supporting the hypothesis that it colonised Dobrogea via Ukraine alongside *P. bavius bavius* (Eversmann, 1832) and it did not spread from Turkey and Bulgaria alongside *P. bavius egea*. Many conservation threats that may lead to population fragmentation and extinction have been identified.
Keywords: Lepidoptera, Lycaenidae, *Pseudophilotes bavius hungarica*, *Salvia transsilvanica*, oviposition, new records, conservation, Romania.

La especie protegida *Pseudophilotes bavius hungarica* **(Diószeghy, 1913): estrategia de oviposición, nuevos registros y conservación**
(Lepidoptera: Lycaenidae)

Resumen

Pseudophilotes bavius hungarica (Diószeghy, 1913) es un endemismo transilvano de interés para la conservación. Realizamos observaciones sobre su estrategia de oviposición y establecimos su preferencia por tallos florales de *Salvia nutans* L. de más de cinco centímetros de altura. También se confirmó que *Salvia transsilvanica* Schur es una planta nutricia de *P. bavius hungarica*. El mapa de distribución de esta subespecie se completó en dos localidades del sur de la llanura transilvana, Râpa Lechinţa and Râpa Dătăşeni. Informamos de la presencia de *P. bavius* en el condado de Tulcea por primera vez, apoyando así la hipótesis de que colonizó Dobrogea a través de Ucrania junto con *P. bavius bavius* (Eversmann, 1832) y no se propagó desde Turquía y Bulgaria junto con *P. bavius egea*. Se han identificado muchas amenazas para la conservación que pueden conducir a la fragmentación y extinción de la población.
Palabras clave: Lepidoptera, Lycaenidae, *Pseudophilotes bavius hungarica*, *Salvia transsilvanica*, oviposición, nuevos registros, conservación, Rumanía.

Introduction

Pseudophilotes bavius (Eversmann, 1832) is a xerothermophilous species associated with steppe meadows on loamy or calcareous soils where *Salvia nutans* L. is present (Rákosy et al. 2021). Due to the vulnerability of the species it has been of interest to lepidopterists for over 35 years and a large number of scientific articles have been published examining not only its biology and ecology (Crişan et al. 2011; Dincă et al. 2011a; Jutzeler et al. 1997; Kolev, 2017; König, 1992; Német et al. 2016; Rákosy & Weidlich, 2017), but also its more complex population dynamics (Crişan et al. 2014), and molecular characterisation (Bartoňová et al. 2020; Dincă et al. 2011b).

P. bavius is included in the annexes of the Council Directive 93/43/EEC1 on the conservation of natural habitats and wild fauna and flora (Annex II. and IV.). However, in the European Red List of Butterflies (Van Sway et al. 2010), *P. bavius* is considered only Least Concern. Maes et al. (2019) raise the degree of endangerment / threat to Vulnerable.

P. bavius is also protected by Romanian legislation (OUG no. 57/2007, approved with amendments by Law 49/2011), in seven Natura 2000 sites. Conservation efforts are specifically targeted towards the *hungarica* subspecies (a Transylvanian endemic), because changing land use practices in the region mean that most of its natural habitats have disappeared and it is therefore considered endangered in Romania (Rákosy et al. 2021). The abandonment of traditional haymaking causes the accumulation of decayed plant material and litter, which is a major threat to the survival of the butterfly's host plant *Salvia nutans* (Jakab & Kapocsi, 2005; Német et al. 2016) and other valuable steppic plant species (*Astragalus peterfii* Jáv., *Salvia transsilvanica* Schur, *Nepeta ucranica* L. etc.). Through this study we aim to bring new information regarding the oviposition, distribution and host plant of this endemic subspecies of conservation concern. We would also like to draw the attention of the authorities to the need for additional, active measures to protect this taxon.

Study sites

The study sites are in Transylvania, Romania. In Suatu, the study areas were chosen on the north side of the road DN16 Cluj-Napoca – Reghin, on a slope with a southern exposure, clay-sandy soil, partially denuded and steppe vegetation, with a high abundance of *S. nutans.* The coordinates of the centers of the polygons from Suatu are: N 46.798780, E 23.950030, respectively N 46.798705, E 23.950418. In Bărăi, the study areas were designated on a slope with a south-western exposure, steppe vegetation and rich in *S. nutans*. The coordinates of the polygon centers in Bărăi are: N 46.860940, E 23.901262, respectively N 46.861363, E 23.900479. All four study areas have a steep slope of about 25 degrees, and are located at altitudes between 350 and 475 m. The climate of the region is temperate continental with an average annual precipitation of 550-600 mm and a mean annual temperature of 8.5º C (Kun et al. 2007). Suatu plots are located near "Suatu - Cojocna - Crairât" Natura 2000 Site (ROSCI0238) and Bărăi plots are part of "Lacul Ştiucilor - Sic - Puini - Bonţida" Natura 2000 Site (ROSCI0099). Both study areas are part of a mosaic landscape comprising permanent meadows, abandoned farmland and extensively grazed pasture. Due to the abandonment of traditional haymaking and extensive grazing, shrubs are increasing (Crişan et al. 2014).

Materials and methods

The villages of Suatu and Bărăi (Cluj county), have stable populations of *P. bavius hungarica*. In each of these sampling locations, we identified the areas with the highest concentration of the host plant, *S. nutans* and outlined two survey sites of approximately 100 m^2.

On 18-IV-2020, the beginning of *P. bavius hungarica* flight period, we quantified the number of eggs laid on *S. nutans* inflorescences in Suatu (Figure 1). When eggs were found the following data were recorded: 1. the height of the stem, and 2. the number of eggs laid in the inflorescences of the plant. We categorised stem height into set four ranges: 0.1-2.0 cm, 2.1-5.0 cm, 5.1-9.0 cm, >9.0 cm. Four days after the initial assessment, (22-IV-2020), the quantification was repeated on the plots from Suatu, and a comparative count was performed in Bărăi. On this occasion, all the plants were counted, regardless of whether or not they had a developed flower stem.

A measuring tape was used to determine floral stems heights, and all measurements were recorded by the same person to avoid inter-observer bias.

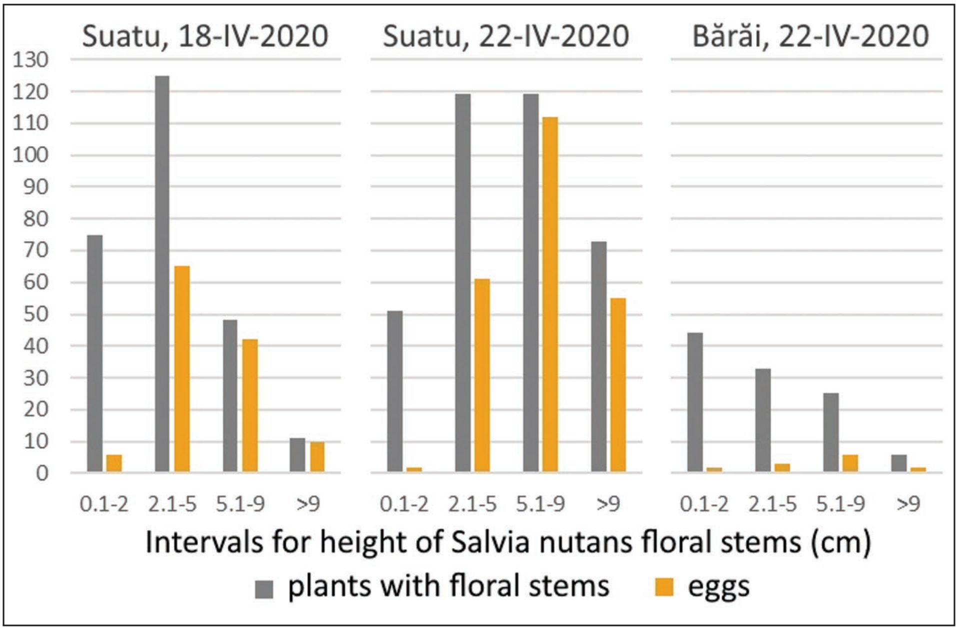

Figure 1. Histograms representing the number of *S. nutans* plants stratified into four categories according to their floral stems height (0-2 cm; 2.1-5.0 cm; 5.1-9.0 cm; >9.0 cm), and the number of *P. bavius hungarica* eggs found on plants in each height range. Data were recorded in study plots of about 100m^2 from Suatu and Bărăi.

On 25-IV-2019, a transect was used to try and identify new populations of *P. bavius hungarica* in the “Râpa Lechinţa” region of Mureş Valley, Natura 2000 Site ROSCI0210 (N 46.463368, E 24.243547). Mapping/inventoring of *P. bavius hungarica* was also conducted in the “Râpa de la Dătăşeni” (N 46.487270, E 24.150318), and ROSCI0040 Coasta Lunii (N 46.530037, E 23.939893) areas of Mureş and Arieş Valleys on 23-IV-2020, 5-V-2021, 10-V-2021, 8-VI-2021, and 11-V-2022.

Results

A total of 1387 *S. nutans* plants were examined (Table 1). In Suatu, over 900 plants were checked for the presence/absence of *P. bavius hungarica* eggs. On 18-IV-2020, 69 and 54 eggs were recorded in the first plot (S1), second plot (S2), respectively. After just four days (on 22-IV-2020), the number of eggs almost doubled, reaching 127 in S1, and 103 in S2. In Bărăi (22-IV-2020) only six eggs were found in the first plot (B1), and seven in the second (B2).

When the egg counts were conducted, we occassional observed ants belonging to the species *Lasius paralienus* Seifert, 1992 and *Camponotus aethiops* (Latreille, 1798) on the flower buds of the stems, but never aphids.

As part of our effort to identify new *P. bavius hungarica* populations in Transylvania from April 2019 to April 2020, we discovered two small populations in the “Râpa Lechinţa” (four adult females) and “Râpa de la Dătăşeni” (four adult females and two adult males) regions of the Mureş Valley.

Since *S. nutans* is very rare in the southern Transylvanian Plain (near the Mureş Valley; Prodan, 1931), the identification of another plant that could be exploited by female *P. bavius hungarica* for oviposition was attempted. After examining over 200 plants (most of them without flowers), we found a hatched egg on a leaf of *S. transsilvanica*.

Table 1. Number of *Salvia nutans* plants, the number and height of the floral stems and the number of *Pseudophilotes bavius hungarica* eggs identified in the study areas of Suatu and Bărăi.

Parcel	**S1**		**S2**		**B1**	**B2**
Data	18-IV-2020	22-IV-2020	18-IV-2020	22-IV-2020	22-IV-2020	22-IV-2020
Total number of examined *Salvia nutans* plants	429		538		146	274
The number of *S. nutans* plants with inflorescences	123	173	136	189	109	203
Number of *S. nutans* plants with at least one egg of *Pseudophilotes bavius hungarica*	37	58	34	56	4	4
The average height of the floral stems of *S. nutans* (cm) with at least one egg *P. bavius hungarica*	3.8	5.6	4.2	7.5	3.9	4.4
Number of identified *P. bavius hungarica* eggs	69	127	54	103	6	7
The maximum number of *P. bavius hungarica* eggs identified on a inflorescence	9	10	4	5	2	3

On 5-V-2021, 10 individuals of *P. bavius hungarica* (8 males, 2 females) were observed at Dătăşeni. The observed male-to-female ratio indicated that the flight had only recently begun, presumably because of the unusually cool spring temperatures recorded in 2021. On 10-V-2021, 11 individuals of *P. bavius hungarica* (6 males, 5 females) were observed at Dătăşeni, and >200 plants (most of them without flowers) were examined. Overall, 30 eggs of *P. bavius hungarica* deposited on *S. transsilvanica* plants, 28 of which were deposited on inflorescences (with a maximum number of 9 eggs per inflorescence). The remaining two eggs were deposited on the leaves of the plants that have not yet developed floral buds. Inside an inflorescence were observed 2 larvae in the first instar.

In Râpa Dătăşeni on 8-VI-2021, we recorded the presence of six *P. bavius hungarica* larvae; each of which was found on a different *S. transsilvanica* plant. During the same survey effort we examined 100 *S. nutans* plants in the Râpa Lechinţa and did not find a single *P. bavius hungarica* larva. Similarly, no larvae were found on any of the >200 *S. nemorosa* plants that were examined at Râpa Dătăşeni and Râpa Lechinţa.

On 11-V-2022, at Coasta Lunii we observed the largest number of *P. bavius hungarica* eggs laid on *S. transsilvanica.*

Our field observations confirmed the following plants to be nectar sources for the adults: *Cytisus nigricans* (L.), *Euphorbia cyparissias* L.*, E. seguieriana* Neck.*, Fragaria vesca* L., *F. viridis* Duchesne*, Ornithogalum umbellatum* L., *Salvia nutans, S. transsilvanica, Thymus marschallianus* Willd., *T. vulgaris* L.*, Veronica prostrata* L., *Vinca minor* L.

Discussion

It is already known that the phenology of the host plant as well as the flight period of the butterfly differs from one year to another due to the weathering peculiarities of each year (Crişan et al. 2011; König, 1992). Although the flight period does not exceed 15-17 days, the start of the flight has been observed to vary between 2nd April and 18th April and the exact timing is dictated by the prevailing weather conditions in any given year (Crişan et al. 2011; Crişan et al. 2014; pers. comm. L. Rákosy).

Within 4 days of the first count in Suatu, the number of stems in *S. nutans* plants increased by approximately 40%, and the number of eggs laid increased by almost 100% in both S1 and S2. It is interesting to note that most eggs were laid on flower stalks in the height category 5.1-9.0 cm, both in S1 and S2. Even when the number of plants with stems larger than 9.0 cm increased, the highest concentration of eggs was in the category 5.1-9.0 cm. This highlights, the preference of females to lay their eggs on flower stalks with heights of 5-9 cm or higher.

The *P. bavius hungarica* population of Bărăi is much smaller than the population of Suatu, however, the abundance of the host plant is comparable in both areas. In Bărăi the vegetation is thicker meaning there is a lack of exposed topsoil that which can slow the plant's development, and cause an associated phenological delay in *P. bavius hungarica* (Jakab & Kapocsi, 2005) (Figure 2). Additionally, the high density vegetation in Bărăi hinders the growth of ant populations (specifically *L. paralienus* and *C. aethiops*) which are involved in a commensal myrmecophilous relationship with *P. bavius hungarica*, whereby they provide protection to larvae and facilitate increased survival rates (Német et al. 2016).

Figure 2. The difference between the vegetation structure from Suatu, set on fire in autumn / winter 2020 (a) compared to the one from Bărăi, unharmed, not set on fire (b).

The vegetation structure in Suatu differs from Bărăi which could account for the observed differences in butterfly population dynamics. In Suatu, there are many patches of bare soil which were created by the burning of dry vegetation in the autumn of 2019. It seems that the burning of dry vegetation at this time of year did not adversely affect *P. bavius hungarica*, and it favoured the expansion of *S. nutans* population. Ants are present in this area but visit flower buds or inflorescences after the appearance of *P. bavius hungarica* larvae and the installation of aphids.

Captive *P. bavius hungarica* larvae readily accept *Salvia nemorosa* (König, 1992) and *Salvia pratensis* (Jutzeler et al. 1997) in addition to *S. nutans*. However, despite the fact that Leraut (2016) and Tshikolovets (2011) list *S. transsilvanica* among *P. bavius* host plants this is the first time the *S. transsilvanica* has been confirmed as a host plant for the *P. bavius hungarica* subspecies in the wild. The discovery of two small populations of *P. bavius hungarica* in areas without *S. nutans*, coupled with the observation of active ovipositioning and larval feeding, confirm *S. transsilvanica* as a host plant, and extends this butterfly species' oligophagous range (Figures 3-4). Confirmation of the new host-plant makes it possible to conceive of the existence of populations of *P. bavius hungarica* in areas without *S. nutans*, provided *S. transsilvanica* is present. Considering the many flowers that adults visit for feeding, *P. bavius hungarica* is also a successful pollinator. Similarly to other lycaenid species, *P. bavius hungarica* show no egg avoidance behavior (Árnyas et al. 2009; Dinesh & Venkatesha, 2013; Jansson, 2013; Van Dyck & Regniers, 2010) (Figure 3). The maximum number of eggs observed at Coasta Lunii on a single plant (*S. transsilvanica*) was 34.

Figure 3. Eggs of *P. bavius hungarica* laid on the inflorescence of *Salvia nutans* (a), respectively on the flower bud of *S. transsilvanica* (b, c).

Protection and conservation

Pseudophilotes bavius hungarica is a protected endemic Lepidoptera subspecies threatened by changing agricultural practices leading to overgrazing and abandonment of traditional hay making followed by afforestation (e.g. Crişan et al. 2011, 2014). Both of these threats reduce the quality and size of *P. bavius hungarica* habitats. Populations are generally well protected in areas that have a steep gradient comprised of sage, which prevents them from being converted to arable land. *P. bavius hungarica* is also common in landscapes with steep slopes and clay-sandy soils because regular landslides create large areas of bare soil that are immediately colonised by *Salvia* spp. (including *S. nutans*). In recent years it has been observed that *S. nutans* in these optimal habitats being replaced by invading *S. nemorosa,* a ruderal relative of *S. nutans* (Bădărău & Maloş, 2019) that is not able to support *P. bavius hungarica* populations.

Figure 4. Larvae of *P. bavius hungarica* feeding on the inflorescence of *Salvia nutans* (a), and on the flower of *S. transsilvanica* (b).

In Transylvania, most steppe habitat has already been converted into arable land, intensive pasture, vineyards, orchards, or pine and acacia plantations, all of which lead to high levels of habitat fragmentation and subsequent isolation of existing populations of *P. bavius hungarica*. When this habitat loss is considered alongside its low-mobility (30 m per day; Crişan et al. 2014), *P. bavius hungarica* must be considered especially vulnerable to rapid, landscape scale land-use change.

Until now, conservation efforts have focussed solely on managing host plant populations. However, given that the larvae are facultatively myrmecophilic, conservation managers must also consider the need to preserve areas with large patches of bare soil and low vegetation density that sustain the ant populations (e.g. *Camponotus* spp.) which aid *P. bavius hungarica* larval survival (Német et al. 2016).

Contrary to expectation, it has been found that the burning of dry vegetation in late autumn or very early spring does not negatively affect the pupae of *P. bavius hungarica*; at least in areas where the uneven microtopography does not allow fire to completely destroy the habitat. In fact, fire may have a beneficial impact on *P. bavius hungarica* by reducing the dry plant mass and creating patches of bare soil that support *Lasius* spp. and *Camponotus* spp. ant colonies (Német et al. 2016).

The poor management of the Suatu I scientific reserve, which was home to the largest known population of *P. bavius hungarica* until 1990-93, led to a rapid and sharp decline in the population. The main cause of the population decline in this 4.28 ha area is the loss of traditional farming practices. Abandonment of mowing and grazing has caused an undesirable thick vegetal layer, with damaging impacts not only for *P. bavius hungarica* but also for the many rare plant species protected in the reserve (Enyedi et al. 2008).

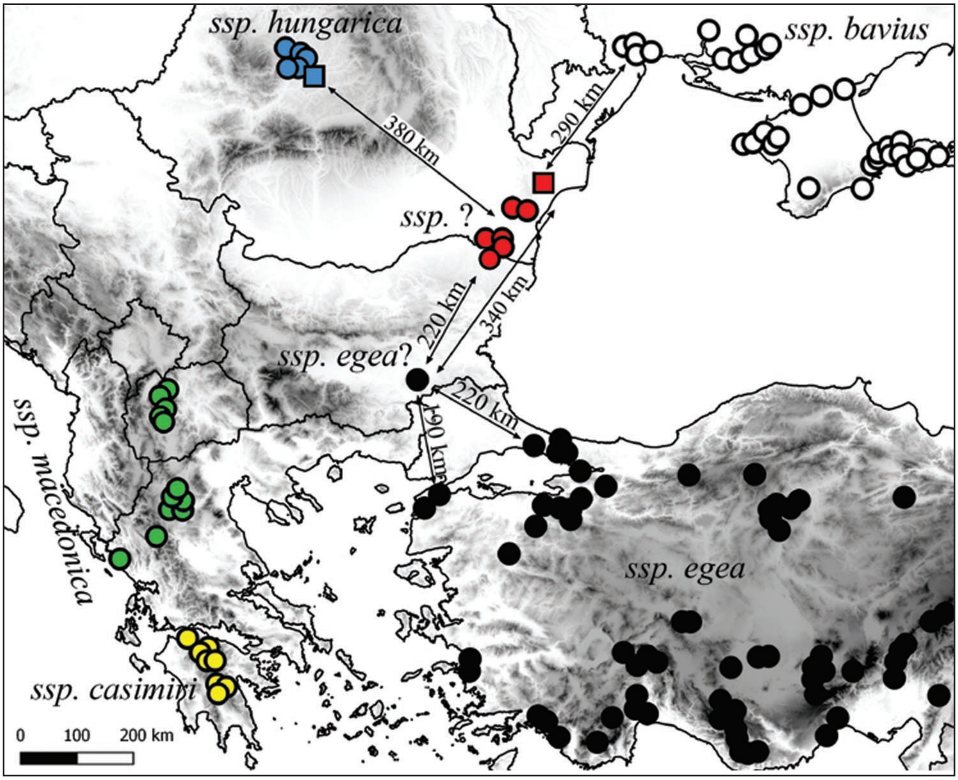

Figure 5. Western distribution of *Pseudophilotes bavius*. Blue square - new records from Transylvania (Râpa Dătăşeni and Râpa Lechinţa), Red square - a new record from Tulcea county (northern Dobrogea, Babadag area). General distribution after Rákosy & Widlich (2017).

Unfortunately, local authorities appear to be entirely disinterested in the protection of the local endemics *P. bavius hungarica* and *Astragalus peterfii* Javorka despite the fact they provide the area with a unique feature on a European, if not global, scale. After 1960 and as a result of land-use changes within the reserve, including abandonment of mowing and grazing alongside the formation of bush barriers, the two endemic taxa settled on abandoned terraces located east and west of the reservation. The population of *P. bavius hungarica* has developed so well in these areas that the population in 2010 was estimated to be over 1000 individuals (Crişan et al. 2014). In 2016, the small 2 ha area in which the *P. bavius hungarica* population was concentrated began to be intensely grazed (overgrazed) by a flock of sheep. In the spring of 2017, all the *S. nutans* plants were grazed at the same time of year at which the larvae of *P. bavius hungarica* are found in the inflorescences. So far the situation is unchanged, the same flock of sheep consumes all *S. nutans* plants in early May, so the population has been eradicated. Since this increase in grazing intensity, no *P. bavius hungarica* have been observed in the area meaning that the largest population of an endemic taxon has been destroyed because of irrational decision-making, indifference and ignorance. Our efforts to highlight the plight of *P. bavius hungarica*, including the media coverage of the situation, have not been successful, and immediate material interests are, unfortunately, still prioritised over biodiversity preservation.

The protection of *P. bavius hungarica* in the Mureş Valley is an important objective for the ROSCI0210 Râpa Lechinţa site because it is Transylvanian endemic at its most southeastern distributional limit (Figure 5). It is therefore imperative that this taxon is included on lists of protected taxa. Populations identified outside the site should be included in the site by extending its boundaries.

The species *P. bavius* was first reported from Dobrogea near the Romanian-Bulgarian border based on individuals collected in 1988. These populations were assumed to belong to the subspecies *P. bavius egea* (Herrich-Schäffer, 1852) (Rákosy & Székely, 1996; Székely, 1994). Later, the species was reported from several sites in Dobrogea, including in the central area of the region (Dincă at al. 2011, Székely 2012, 2013), but all these reports were from Constanţa county (southern Dobrogea). The idea of the presence of the *P. bavius egea* subspecies in Romania was later maintained (Rákosy et al. 2003; Rákosy, 2013; Székely, 2008; Székely, 2016). On 13-V-2021, the presence of the species *P. bavius* was also reported in Tulcea County (northern Dobrogea), in the Babadag region (pers. obs. L. Rákosy) (Figure 5). The taxonomic classification of *P. bavius* populations in Dobrogea was discussed by Rákosy & Weidlich (2017), with the hypothesis being formulated that the populations of Dobrogea probably belong to the nominative species *P. bavius bavius*, which came here from the Crimean Peninsula and southeastern Ukraine (*P. bavius bavius*), and not from Turkey (*P. bavius egea*). The discovery of this species in Tulcea County also makes the hypothesis of colonisation from Ukraine with the nominotypic subspecies much more plausible. The latest publications (Rákosy & Goia 2021; Rákosy et al. 2021) no longer include *P. bavius egea* on the list of taxa that can be found in Romania.

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Una nueva especie del género *Orthotmeta* Warren, 1896 del Oeste de Papúa, Indonesia (Lepidoptera: Geometridae, Ennominae, Eutoeini)

Andrés Expósito-Hermosa

Resumen

Se describe *Orthotmeta robdevosi* Expósito, sp. n. del oeste de Papúa, Indonesia. Se ilustra el adulto, así como la genitalia del holotipo macho.
Palabras clave: Lepidoptera, Geometridae, Ennominae, Eutoeini, *Orthotmeta,* nueva especie, O. Papúa, Indonesia.

A new species of the genus *Orthotmeta* Warren, 1896 from west Papua, Indonesia (Lepidoptera: Geometridae, Ennominae, Eutoeini)

Abstract

Orthotmeta robdevosi Expósito, sp. n. from west Papua, Indonesia. The adult is illustrated, as well as the genitalia of the male holotype.
Keywords: Lepidoptera, Geometridae, Ennominae, Eutoeini, *Orthotmeta,* new species, W. Papua, Indonesia.

Introducción

Al proceder al estudio de algunos ejemplares de la tribu Eutoeini Holloway, 1993 [1994], con etiqueta del Oeste de Papúa depositado en la colección AEH, se ha localizado material que no se puede asociar a ninguna de las especies conocidas, hasta ahora, de la citada tribu tribu (Holloway 1993 [1994], Scoble in Parsons et al. 1999). Analizado dicho material, se ha comprobado que la morfología externa, del mismo, puede asociarse a las especies de *Orthotmeta* Warren, 1896 y la morfología interna recuerda también a las especies de los géneros: *Probithia* Warren, 1894 y *Calletaera* Warren, 1895.

Así, pues, se procede seguidamente a describir, el citado material, como especie nueva.

Abreviaturas utilizadas

AEH Colección Andrés Expósito-Hermosa, Móstoles (Madrid), ESPAÑA
sp. n. species nova

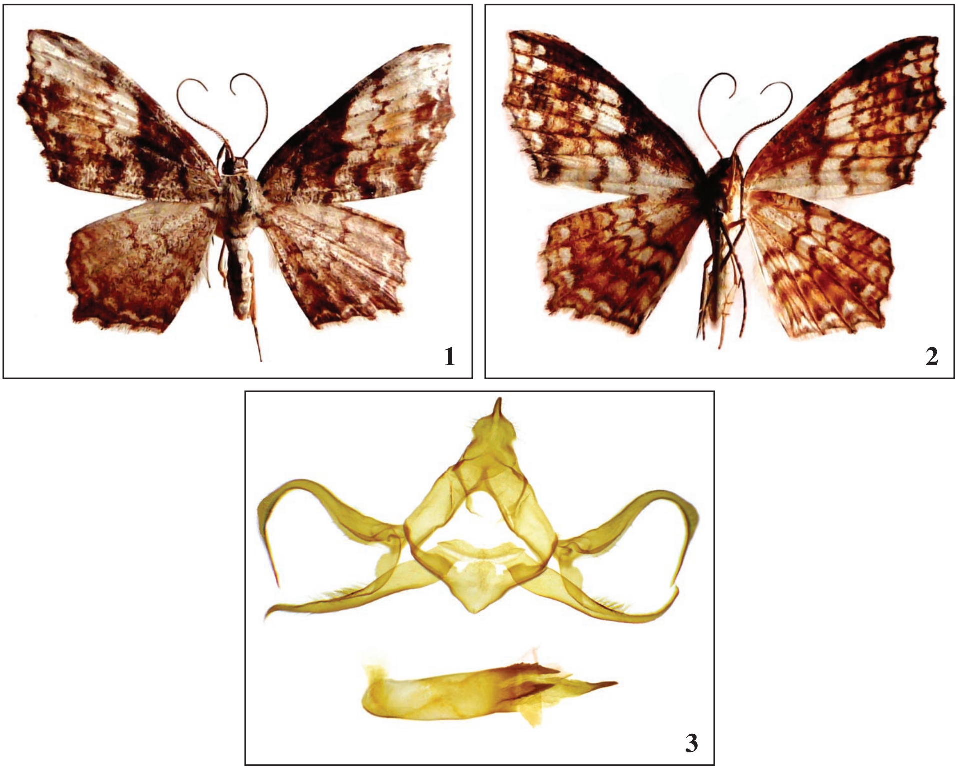
Sistemática

***Orthotmeta robdevosi* Expósito, sp. nov.** (Figuras 1-3)

Holotipo ♂: INDONESIA, Tembagapura, a 3.500 m, O. Papúa, X-XI-2018 (colector local). Genitalia macho preparación AEH 3463. El holotipo, se encuentran depositado en la colección del autor en Móstoles, Madrid (España). Así mismo, se ha legado al SNSB-Zoologische Staatssammlung München patas del holotipo, para efectuar el correspondiente análisis del ADN código de barras genético e incluirlo en la correspondiente base de datos.

El macho (Figuras 1-2) muestra una expansión alar de 28 mm. Las antenas son bipectinadas. Chaetosema presente. Tórax con apreciable línea longitudinal oscura. El modelo de las alas encaja bastante bien con algunas especies del género *Orthotmeta* Warren, 1896. Fondo de las alas, así como el resto del cuerpo, blanco lácteo, con espolvoreado de escamas de diversas tonalidades, desde el rojo-violáceo oscuro al claro y otras con tono leonado. Alas anteriores con la costa convexa hacia su zona basal; ápex falcatado con un prominente diente en el termen a la altura de M_3=4, que tambien es perceptible en las alas posteriores. Visible mancha oscura en la zona postdiscal que se amortigua al llegar al dorsum; línea postmediana del mismo color con marcadas ondas; además, de otra banda paralela a la anterior línea y de tonalidad leonada. En las alas posteriores destaca la falta de la irregular mancha oscura de la zona basal del anverso y la presencia de varias bandas paralelas con abundantes ondas que oscilan desde el blanco hasta el rojo-violáceo. Reverso semejante, pero más claro, y la mancha oscura de la costa se extiende hasta el ápice, y las demás líneas considerablemente más marcadas.

Hembra ♀ desconocida.



Figuras 1-3. 1-2. *Orthotmeta robdevosi* Expósito, sp. nov., Holotipo ♂. **1.** Anverso. **2.** Reverso. **3.** Genitalia ♂ preparación AEH 3349.

Genitalia ♂ (Figura 3): El uncus es cilíndrico con forma de dedo, dos procesos laterales cuadrangulares con algunos pelos en su base. El gnathus es estrecho y con forma de cinta fina. Las valvas se hallan casi divididas en dos delgadas partes que se van estrechando hacia su porción terminal; presencia de un proceso interno (propio de Eutoeini) que une a ambos brazos a modo de charnela; el brazo superior (costa), con ligero vello, que se va curvando y estrechando, con una perceptible prominencia, que termina en un proceso muy delgado; los asimétricos brazos ventrales (sacculus), con vello más acentuado, son más cortos que los brazos superiores y concluyen en un pequeño gancho. La juxta tiene forma de porción de corona circular. El aedeagus es grueso, contiene dos grandes cornuti y otro muy agudo en la vesica.

Distribución: Endemismo de Tembagapura al Oeste de Papúa, Indonesia.

Etimología: Se dedica esta especie nueva a Rob de Vos The chairman of The Papua Insect Foundation y se la denomina *robdevosi*.

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    Article in collective volume:

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

    Book:

    Vives Moreno, A. (2014). *Catálogo sistemático y sinonímico de los Lepidoptera de la Península Ibérica, de Ceuta, de Melilla y de las Islas Azores, Baleares, Canarias, Madeira y Salvajes (Insecta: Lepidoptera)*. Improitalia.

    Internet:

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

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Marialma Becker, a new genus of Neotropical Larentiinae (Lepidoptera: Geometridae)

Vitor O. Becker

Abstract

Marialma Becker, gen. nov., is proposed to accommodate *Sabulodes? magicaria* Felder & Rogenhofer (1875) [*Marialma magicaria* (Felder & Rogenhofer, 1875)] comb. nov.
Keywords: Lepidoptera, Geometridae, Larentiinae, *Sabulodes,* description, new combination, new genus, Neotropical.

Marialma Becker, un nuevo género de Larentiinae Neotropical (Lepidoptera: Geometridae)

Resumen

Se propone *Marialma* Becker, gen. nov., para acomodar *Sabulodes? magicaria* Felder & Rogenhofer (1875) [*Marialma magicaria* (Felder & Rogenhofer, 1875)] comb. nov.
Palabras clave: Lepidoptera, Geometridae, Larentiinae, *Sabulodes,* descripción, combinación nueva, género nuevo, Neotropical.

Marialma **Becker, um novo gênero de Larentiinae Neotropical (Lepidoptera: Geometridae)**

Resumo

Marialma Becker, gen. nov., é proposto para acomodar *Sabulodes? magicaria* Felder & Rogenhofer (1875) [*Marialma magicaria* (Felder & Rogenhofer, 1875)] comb. nov.
Palavras-chave: Lepidoptera, Geometridae, Larentiinae, *Sabulodes,* descrição, combinação nova, gênero novo, Neotropical.

Introduction

The elegantly patterned species *"Sabulodes*" *magicaria* has been without an appropriate generic placement since it was described by Felder & Rogenhofer (1875, pl. 122, fig. 10), who described the species in *Sabulodes* Guenée, [1858] with a question mark. *Sabulodes* is a New World genus of Ennominae (Rindge, 1978), whereas *S. magicaria* is in the subfamily Larentiinae. Fletcher (1979, p. 132) and Scoble (1999, p. 614) listed the species in *"Monarcha"* Warren, a preoccupied, manuscript name. As the species is not related to any of the described Neotropical Larentiinae genera, a new genus is proposed here to accommodate it.

Material and methods

This work is based on the type-specimen, and on the material belonging to this species in the author's collection (VOB), the collections of other major museums (NHMUK, USNM, CMNH), and on the pertinent literature. Genitalia were prepared following the methods described by Robinson (1976). Terms for morphological characters follow Hodges (1971).

Marialma Becker, gen. nov.

Type-species: *Sabulodes? magicaria* Felder & Rogenhofer, 1875. *Reise Fregatte Novara, 2(Abth.2)*, pl. 122, fig. 10, by monotypy and present designation.

Monarcha Warren, manuscript, preoccupied name (Vigors & Horsfield, 1826, p. 254) [Aves].

Diagnosis: Large, reddish brown with white lines and brown patches; wings with the ornate pattern along termen imitating feathers. Sexes similar.

Description: Labial palpi porrect, 2nd segment triangular, slightly longer than eye diameter; antenna filiform. Forewing with costa straight, curved before apex; apex acute; termen oblique, excurved at middle, dentate (indentations in the vein interspaces), R4+R5 stalked from middle, R5 following costa to apex; M1+Rs connected at upper angle of cell; M2 from mid cell, equidistant to M1 and M3; M3 and Cu1 connected at lower angle of cell; Cu2 from distal third of cell. Hind wing also with dentate termen, indentations between vein interspaces; Sc and Rs+M1 connected at upper angle of cell; Rs+M1 stalked at 1/3 beyond cell, M2 equidistant to M1 and M3, M3 from lower angle of cell, Cu1 from before angle, Cu2 from mid cell.

Male genitalia (Figure 2): Uncus a short, curved ventrad knob, densely covered with minute setae. Gnathos divided into a pair of short, thick, rough arms. Valva longer than tegumen, four times as long as wide, slightly bent dorsal at distal third, margins nearly parallel, saccular margin not differentiated. Vinculum a shallow, broad triangle. Juxta a short, wide plate. Aedeagus (Figure 3) shorter than valva, slightly curved ventrad; vesica without cornuti or scobination.

Female genitalia (Figure 4): Small in relation to the size of the abdomen, not extending beyond basal margin of 8th sternite; apophysis posterioris 1/3 as long as anterioris; ostium bursae narrow, same diameter as ductus bursae; ductus bursae membranous, as long as corpus bursae diameter; corpus bursae sclerotized and wrinkled before ductus bursae.

Remarks: This beautiful species is unique among the Neotropical Larentiinae, and its relationship with other taxa cannot be established with certainty. Brehm at al. (2019, p. 464) suggested that it might be a member of the Psaliodini, but further study must be carried out in order to establish its relationship.

Etymology: After Dr. Maria Alma Solis, Curator, USNM, for all her long, generous, collaboration.

Marialma magicaria (Felder & Rogenhofer, 1875), **comb. nov. (**Figures 1-4)
Sabulodes? magicaria Felder & Rogenhofer, 1875. *Reise Fregatte Novara, 2(Abth.2)*, pl. 122, fig. 10.
Syntypes (&), [COLOMBIA]: Bogotá (Lindig) (NHMUK).

Diagnosis: Large, reddish brown with white lines and brown patches; wings with the ornate pattern along termen imitating feathers.

Description: Male (Figure 1) Forewing length 28-30 mm 60-65 mm wingspan; female 35 mm (75 mm wingspan). Reddish-brown. Head and thorax golden ochreous; labial palpus brown, golden ochreous dorsally; antenna dark fuscous. Abdomen brown, with thin row of white scales at the posterior margin of tergites. Fore and mid coxae golden ochreous, tarsi brown. Forewing reddish-brown; costa, an oblique fascia from before mid costa to before mid-dorsum, and patches beyond postmedial band, golden ochreous; crossed with four white lines: first [antemedial band] straight, from basal fourth of costa to dorsum; second [median line], from mid costa to mid dorsum; third from distal fourth of cost, curved towards termen, to M3, than curved inwards, forming lunules between vein interspaces, to Cu2, then curved outwards to before tornus; termen with feather-like, brown patches on veins fourth short, from before apex to R5. Hind wings dark fuscous; antemedial and postmedial bands diffuse, ill-defined; termen with the same feather-like patches as in the Forewings.

Male and female genitalia (Figures 2-4): as described for the genus (see above).

Distribution: Colombia to Bolivia, in the Andes, at high elevations.

Remarks: *Marialma magicaria* was proposed from an unknown number of females, presumably a single one. This is one the most beautiful Larentiinae species in the Neotropical region.

Acknowledgements

Diego R. Dolibaina, Serra Bonita Reserve, prepared the illustrations. Dr. Scott E. Miller (USNM) reviewed the manuscript, made several corrections, and suggested some changes that improved the article. Dr. Antonio Vives, the editor, carried out the usual, competent editorial task.

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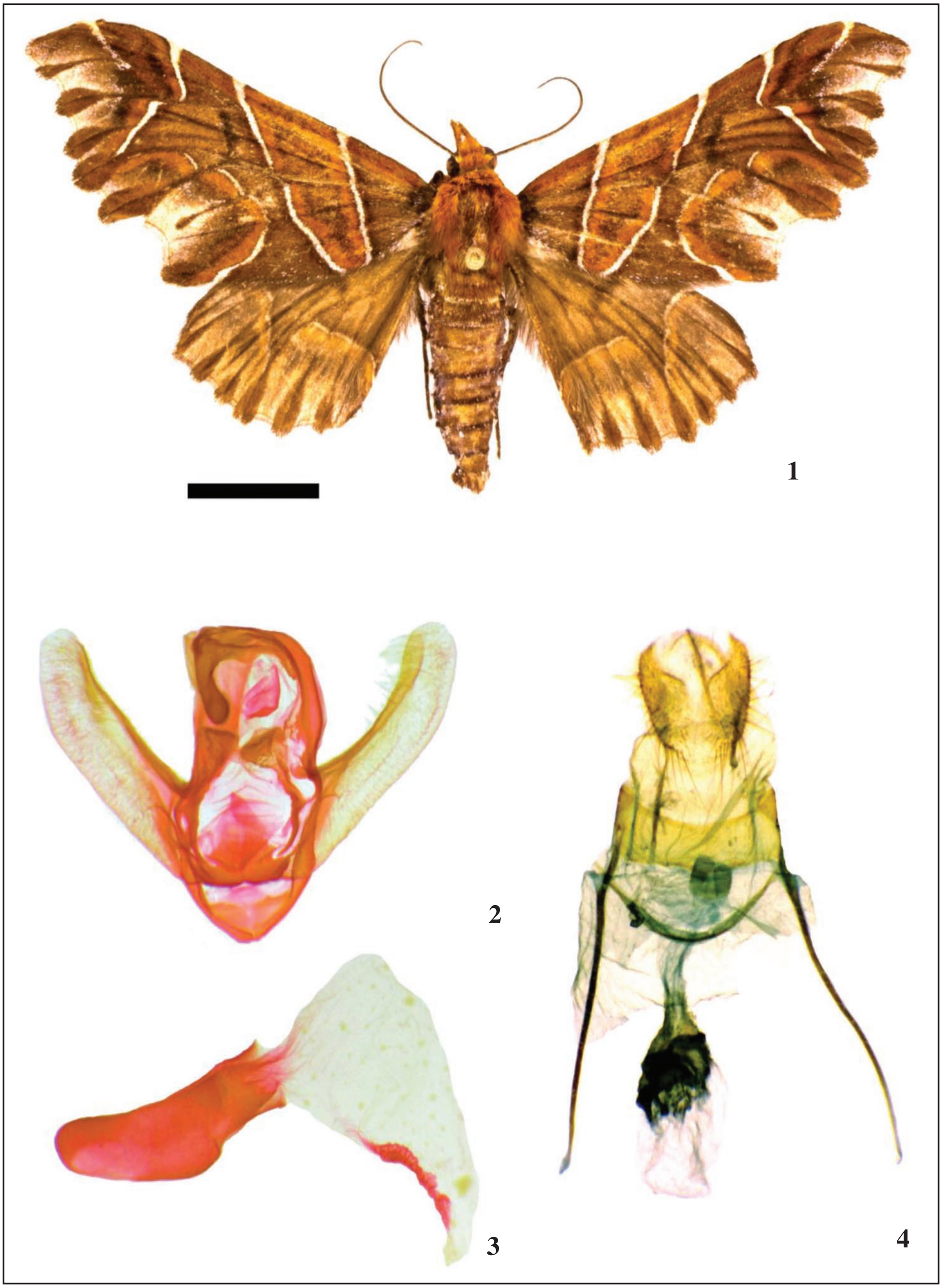

Figures 1-4. *Marialma magicaria.* **1.** Adult male, dorsal view, Ecuador. **2.** Male, genitalia, ventral view, Colombia. **3.** Aedeagus, view, Colombia; **4.** Female genitalia, ventral view, Colombia.

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First record of the genus *Haritalopha* Hampson, 1895 from India (Noctuoidea, Erebidae, Hypeninae)

Rahul Joshi, Jalil Ahmad & Navneet Singh

Abstract

In this manuscript, *Haritalopha biparticolor* Hampson, 1895 is reported for the first time from India, that represents the first record of genus *Haritalopha* Hampson, 1895 from India. The genus is recharacterised with male genitalia for the first time. Diagnosis and illustrations of adults and genitalia are also provided.
Keywords: Lepidoptera, *Haritalopha,* new record, recharacterisation, India.

Primer registro del género *Haritalopha* Hampson, 1895 de la India (Lepidoptera: Noctuoidea, Erebidae, Hypeninae)

Resumen

En este manuscrito se cita por primera vez *Haritalopha bipaticolor* Hampson, 1895 de la India, lo que también representa el primer registro del género *Haritalopha* Hampson, 1895 de la India. Se vuelve a caracterizar el género incorporando por primera vez los genitales masculinos. También se proporcionan imágenes de los adultos y de la genitalia.
Palabras clave: Lepidoptera, Noctuoidea, Erebidae, Hypeninae, nuevo registro, *Haritalopha*, recaracterización, India.

Introduction

Genus *Haritalopha* was erected by Hampson, 1895 as a monotypic genus for placement of new species, *H. bipaticolor* Hampson, 1895 (type species) from Bhutan. The genus was treated under subfamily Deltoidinae, family Noctuidae by Hampson (1895). Though, Nye (1975) treated it under Ophiderinae and Poole (1989) catalogued another species *H. indentalis* (Wileman, 1915) from Taiwan under *Haritalopha*. Yoshimoto, 1995 extended the range of genus upto Nepal. Kononenko & Pinratana, 2005 treated the genus under Hypeninae and is known only from Bhutan, Nepal, Taiwan, and Thailand.

In this manuscript, reporting of *H. bipaticolor* Hampson, 1895 from Himachal Pradesh is its first record from India. This also represents the first record of genus *Haritalopha* from India. The male genitalia is studied for the first time and thus, the genus is recharacterised. Images of *H. bipaticolor* and *H. indentalis,* along with male genitalia of *H. bipaticolor* are given.

Haritalopha Hampson, 1895
Trans. ent. Soc. Lond., 1895(2), 309
Type species: *Haritalopha biparticolor* Hampson, 1895

Diagnosis: Adult: Labial palpi oblique, covered with hairs, 2nd joint reaching upto the frontal tuft and the 3rd joint is long; antennae ciliated; thorax with triangular tuft. Forewings have outer margin excised from apex to vein M1, apex acute and produced; vein R3 from the areole. Hindwing with vein M2 from middle of disco-cellulars. Abdomen with conical tufts. Male genitalia, with uncus long and narrow, that tapers towards apex; valva undivided, membraneous, slightly narrowing towards apex; basal saccular process broad, thumb like, sclerotized, slightly curved; harpe mushroom shaped, not much sclerotized; juxta bipartite; transtilla sclerotized; tegumen longer as compared to vinculum; vinculum narrowing into small saccus. Aedeagus long, curved medially, vesica without cornutus. Female unknown

Distribution: India (present study), Nepal, Bhutan, Taiwan, Thailand.

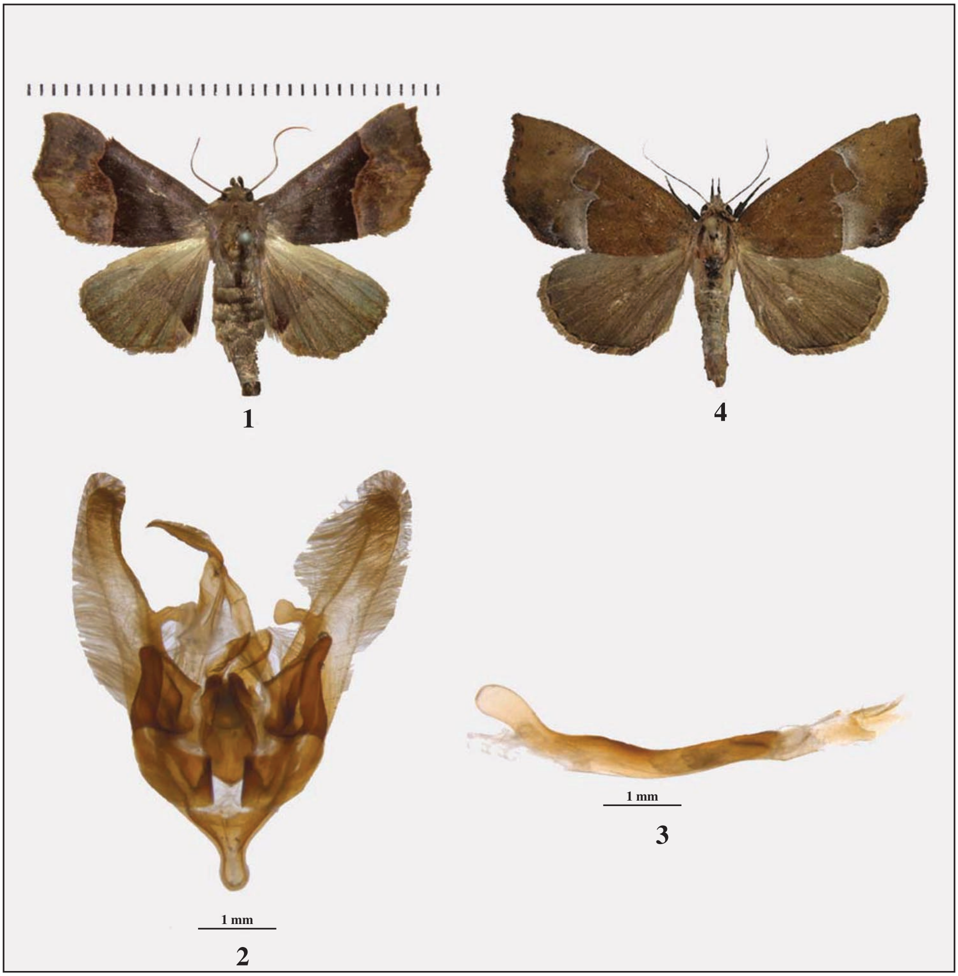

Figure 1-4. *Haritalopha biparticolor* (1-3). **1.** Adult. **2.** male genitalia. **3.** Aedeagus. **4.** *H. identalis* adult (© Taiwan Moth Information Center).

Haritalopha biparticolor Hampson, 1895 (Figures 1, 2, 3)
Trans. ent. Soc. Lond., 1895(2), 309
Type Locality: Bhutan

Material examined: INDIA, Himachal Pradesh, Barog, 1680 m, 1 ♂, 29-VI-2009, Coll. R. Joshi. (NZCZSI)

Diagnosis: Wingspan 34 mm. Adult with head red-brown, labial palpi oblique and hairy, 2nd joint reaches frons, 3rd joint long upturned; antennae ciliated. Forewing purplish red brown; indistinct curved antemedial line; a rufous post-medial line, angled outwards below costa and then sharply incurved reaching the dorsum; area beyond line is greyish fuscous, a brown blotch is present in the middle, some traces of waved post-medial line; cilia brown. Hindwing fuscous, basal area paler, fuscous blotch near anal angle narrowing towards middle, not reaching beyond discal cell. Underside greyish, both wings with a faint post-medial line, that is incurved below costa on forewing and is uniformly curved on hindwing. Abdomen fuscous with a dark tinge at tip, crossing the margin of hindwings. Male genitalia as described under genus.

H. biparticolor resembles another known member of the genus *H. indentalis* (Wileman, 1915) (Figure 4). However, in *H. indentalis*, the anterior of the forewing is less brown, a discal spot is present in the cell, post medial line with whitish area towards outer margin, black buff more dominating at termen than apex, hindwing is without dark patch at anal angle.

Distribution: India: Himachal Pradesh (present study), Bhutan, Nepal, Thailand.

Remark: This seems to be the small form as the type is having a wingspan of 46 mm.

Acknowledgement

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Primer registro de *Hypsopygia* (*Ocrasa*) *fulvocilialis* (Duponchel, [1834] 1831, in Godart & Duponchel) para León, España (Lepidoptera: Pyralidae, Pyralinae, Pyralini)

Jesús Gómez-Fernández

Resumen

Se presenta el primer registro conocido del Pyralidae *Hypsopygia* (*Ocrasa*) *fulvocilialis* (Duponchel, [1834] 1831, in Godart & Duponchel) para la provincia de León, España.
Palabras clave: Lepidoptera, Pyralidae, Pyralinae, Pyralini, *Hypsopygia*, *Ocrasa*, León, Castilla y León, España.

First record of *Hypsopygia* (*Ocrasa*) *fulvocilialis* (Duponchel, [1834] 1831, in Godart & Duponchel) from León, España (Lepidoptera: Pyralidae, Pyralinae, Pyralini)

Abstract

The first known record of the Pyralidae *Hypsopygia* (*Ocrasa*) *fulvocilialis* (Duponchel, [1834] 1831, in Godart & Duponchel) from the León province, Spain, is presented.
Keywords: Lepidoptera, Pyralidae, Pyralinae, Pyralini, *Hypsopygia*, *Ocrasa*, León, Castilla y León, Spain.

Introducción

La superfamilia Pyraloidea es la tercera más grande del orden Lepidoptera, después de Noctuoidea y Geometroidea, comprendiendo más de 16.000 especies descritas en todo el mundo (Solis, 2007), de las que 9.655 especies pertenecientes a la familia Crambidae y alrededor de 5.921 especies a la familia Pyralidae (Van Nieukerken et al. 2011). En Europa se pueden encontrar 850 especies de Pyraloidea (Karsholt & Razowski, 1996).

El género *Hypsopygia* fue descrito por Jacob Hübner en [1825] y en Europa está representado por las siguientes especies (Leraut, 2006; Slamka, 2006):

Hypsopygia (*Hypsopygia*) *costalis* (Fabricius, 1775)
Hypsopygia (*Ocrasa*) *glaucinalis* (Linnaeus, 1758)
Hypsopygia (*Ocrasa*) *fulvocilialis* (Duponchel, [1834] 1831, in Godart & Duponchel)
Hypsopygia (*Ocrasa*) *almanalis* (Rebel, 1917)
Hypsopygia (*Ocrasa*) *incarnatalis* (Zeller, 1847)
Hypsopygia (*Ocrasa*) *rubidalis* ([Denis & Schiffermüller], 1775)

H. almanalis es la única especie de este género que no vuela en la Península Ibérica (Vives Moreno, 2014), ya que está registrada en Turquía y Chipre (Leraut, 2014).

Hypsopygia (*Ocrasa*) *fulvocilialis* es una especie predominantemente del sur de Europa, estando presente en: Albania, Bosnia Herzegovina, Grecia, Macedonia, Serbia (Plant & Jakšić, 2018), Armenia (Slamka, 2006), Bulgaria (Ganev, 1986; Plant & Jakšić, 2018), Chipre (Atay, 2011; Leraut, 2014), Croacia (Rebel, 1914; Plant & Jakšić, 2018; Gumhalter & Kučinić, 2021), España (Slamka, 2006; Vives Moreno, 2014; Revilla, 2015), Francia (Slamka, 2006), Hungría (Fazekas, 2001; Slamka, 2006; Pastorális, 2012), Italia (Isla de Sicilia en Bassi et al. 1995; Speidel, 1996; Slamka, 2006 y Península Itálica en Zahm, 2012), Palestina (Slamka, 2006; Leraut, 2014), Portugal (Mendes, 1904; Slamka, 2006; Corley et al. 2012; Corley et al. 2014), Rumania (Slamka, 2006; Plant & Jakšić, 2018), Rusia (Slamka, 2006; Proklov & Karayeva, 2013), Siria (Slamka, 2006) y Turquía (Kemal & Koçak, 2015).

En España, *H. fulvocilialis* ha sido citada de la provincia de Málaga (Revilla, 2015).

Esta especie tiene una envergadura alar de 20-32 mm, no apreciándose dimorfismo sexual a simple vista, aunque presenta unas antenas ciliadas en el macho y simplemente filiformes en la hembra (Slamka, 2006). La cabeza y el tórax son de color marrón claro, posee grandes palpos labiales, visibles y del mismo color, el abdomen ligeramente oscurecido en los laterales. Los ojos de color oscuro resaltan a ambos lados de la cabeza. Las alas anteriores son de un color marrón claro en la zona postdiscal, ligeramente más oscuro en la zona discal y basal, con dos líneas más claras que la cruzan. Las alas posteriores son del mismo color y tono que la zona postdiscal de las alas anteriores, también atravesadas por dos líneas sinuosas pero muy claras y sutiles. Las tégulas son del mismo color que tórax y abdomen, no resaltando, de manera uniforme. Posee largas fimbrias en los márgenes externos alares, delimitados por una delgada línea continua más oscura. Como especie perteneciente a la familia Pyralidae posee un característico órgano timpánico (Nuss et al. 2003-2017).

H. fulvocilialis es monovoltina, abarcando su periodo de vuelo desde mayo hasta agosto y encontrándose, principalmente, en zonas abiertas y secas (Slamka, 2006), en llano y hasta niveles de media montaña (Leraut, 2014).

Las larvas de esta especie no se han descrito todavía ni se sabe nada acerca de su alimentación (Leraut, 2014), aunque muy probablemente sean detritófagas, como lo es *Hypsopygia* (*Ocrasa*) *glaucinalis* (Linnaeus, 1758) (Slamka, 2006) y su capullo se desconoce también, al igual que los huevos no han sido todavía descritos ni fotografiados hasta la fecha.

Material y métodos

Para la determinación y clasificación, se ha seguido en la nomenclatura a Vives Moreno (2014) y se ha consultado la web: www.pyraloidea.org. (Nuss et al. 2003-2017).

Para su identificación nos hemos basado en el examen comparativo de los caracteres morfológicos externos, ya que es una especie fácilmente reconocible por fotografía o de visu. La especie con la que se podría confundir es *Hypsopygia glaucinalis* (Linnaeus, 1758), pero en las alas anteriores las dos líneas cruzadas se ensanchan y agrandan en la costa, siendo la línea posmediana claramente curvada hacia el exterior (en *H. glaucinalis* lo hace ligeramente) (Slamka, 2006). Adicionalmente mediante análisis genital hay una clara diferenciación entre ambas especies, como puede observarse en Leraut (2006).

La trampa de luz utilizada estaba compuesta por una bombilla mezcla de vapor de mercurio de 400 W, conectada directamente a red doméstica 220 v, un trípode y una sábana blanca como base de todo el conjunto.

Las fotografías del ejemplar capturado ya preparado se han realizado con una cámara Canon EOS 1300D con objetivo Canon EFS 18-135 mm, lente de cuatro aumentos, tiempo de exposición 1/250s, velocidad ISO-100 y una resolución de 5184 X 3456 píxeles.

Resultados

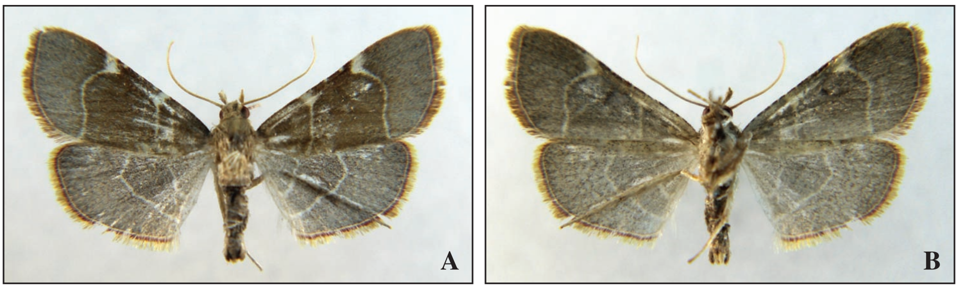
El ejemplar, un macho en buen estado, fue avistado y capturado por el autor en las cercanías de la Torre en la localidad de Villarrodrígo de Ordás, perteneciente al municipio de Santa María de Ordás, al norte de la provincia de León, el 7 de agosto de 2020, a las 22:30 h., revoloteando en la trampa de luz que habíamos colocado para la ocasión, registrándose los siguientes datos:

Coordenadas GPS: 42º43'06.58" N, 5º49'15.39" W, a 1.001 m. de altitud. Sistema MGRS y Datum ETRS89: 30TTN6933 (correspondiente a esa cuadrícula de 1 x 1 km. de lado).

El lugar de captura está situado en una zona de media montaña perteneciente al Valle del río Luna, donde abunda *Alnus glutinosa* (L.) Gaertn. y sobre todo *Quercus pirenaica* Willd. como vegetación predominante, además de vegetación ribereña como *Populus nigra* L., con pequeñas áreas de *Pinus sylvestris* L. repoblado hace varias décadas.

Distribución en España conocida *Hypsopygia fulvocilialis* (Dup.). El círculo negro representa la primera cita y el círculo rojo la cita actual.

El ejemplar es un macho de *Hypsopygia* (*Ocrasa*) *fulvocilialis* (Duponchel, [1834] 1831, in Godart & Duponchel), siendo el único observado en la trampa de luz. Es posible que este ejemplar pertenezca a una población establecida en el valle, habrá que confirmarlo en futuras investigaciones y muestreos. De momento, este ejemplar que ha quedado depositado en la colección del autor es el registrado más al norte de España y probablemente esta especie puede haber colonizado otras áreas con hábitats similares en el Sistema Central, Sistema Ibérico y Pirineos, ampliando su corología.



Hypsopygia fulvocilialis (Dup.). **A.** Visión dorsal. **B.** Visión ventral.

Los casos más septentrionales se han registrado hasta ahora en Hungría y Rusia (Chechenia), pero es de suponer que siguiendo la estela del calentamiento global cada vez se vayan encontrando ejemplares todavía más al norte. En lo referente a España es probable que algunos ejemplares sean confundidos con *H. glaucinalis* y no se estén identificando correctamente, pasando desapercibida y camuflada entre los listados de los trabajos de campo que se realizan.

En el Museo Civico di Terrasini, en Sicilia, Italia, se conserva el "holotipo" de la subespecie que supuestamente había descubierto nueva para la ciencia Mario Mariani en 1937, con los siguientes datos escritos en dos etiquetas: Sicilia, Zappulla [ME, Italia] 16-VIII-[19]33, M. Mariani y *Herculia fulvocilialis hartigialis* Mar. (Arnone, 1990). Actualmente se considera como una sinonimia y así consta en Leraut (2006) y Vives Moreno (2014).

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NOTICIAS GENERALES / *GENERAL NEWS*

SHILAP REVISTA DE LEPIDOPTEROLOGÍA, AHORA DISPONIBLE EN VERSIÓN ELECTRÓNICA / *SHILAP REVISTA DE LEPIDOPTEROLOGÍA, NOW AVAILABLE IN ELECTRONIC VERSION*.– *SHILAP Revista de lepidopterología*, desde 1973 solo estaba publicándose en versión impresa (ISSN: 0300-5267) y desde el año 2022, ya dispone de la versión electrónica (eISSN: 2340-4078) en la siguiente dirección **https://shilap.org**, consideramos que es un paso muy importante al superar los 50 años de existencia. / *SHILAP Revista de lepidopterología, since 1973 was only published in printed version (ISSN: 0300-5267) and from this year 2022, already has an electronic version (eISSN: 2340-4078) in the following address* ***https://shilap.org****, we consider it a very important step over the age of 50 years of existence*.– **DETALLE /DETAILS**: SHILAP, Apartado de correos, 331; E-28080 Madrid, ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

SHILAP REVISTA DE LEPIDOPTEROLOGÍA **EN LOS ÍNDICES DE IMPACTO INTERNACIONALES 2022 / SHILAP REVISTA DE LEPIDOPTEROLOGIA** ***IN THE INTERNATIONAL IMPACT INDEXES 2022*.–** Según SCOPUS en su Índice SJR 2021 de *SCImago Journal Rank*, aparecemos con un **Indicador SJR: 0,243** FI, **Índice H: 13**, **Categoría: Ciencia Animal y Zoología: 318/469 (Q3), Ecología, Evolución, Comportamiento y Sistemática: 537/706 (Q4), Ciencia de los Insectos: 129/177 (Q3)**. Según CLARIVATE ANALYTICS en su Índice JCR 2022 de *Journal Citation Indicator*, aparecemos con un **Índice de Impacto: 0,3, Categoría: 96/100 (Q4, Entomología)**, el **Influencia del artículo: 0,068**, el **Índice de inmediatez: 0,1**, el **Eigenfactor: 0,00019** y la **Categoría Eigenfactor: Ecología y Evolución.** / *According to SCOPUS in their Index SJR 2022 of* SCImago Journal Rank*, we appear with a* ***SJR Indicator: 0,243 FI, H Index: 13, Rank: Animal Science and Zoology 318/469 (Q3), Ecology, Evolution, Behavior and Systematic: 537/706 (Q4), Insect Science*****:** ***129/177 (Q3)****. According to CLARIVATE ANALYTICS in their Index JCR 2022 of* Journal Citation Reports, *we appear with an* ***Impact Index: 0,3, Rank: 96/100 (Q4, Entomology)****,the* ***Article influence: 0,068****, the* ***Inmediacy Index: 0,3****, the* ***Eigenfactor: 0,00019****, and the* ***Eigenfactor Category: Ecology and Evolution*****.– DETALLES /** ***DETAILS*****:** SHILAP; Apartado de correos, 331; E-28010 Madrid; ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

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Lourdesiella Bernabé, Huertas & Vives, nuevo género de la familia Stathmopodidae y descripción de la especie *Lourdesiella falcatum* Bernabé, Huertas & Vives, sp. nov. en la Península Ibérica (Lepidoptera: Gelechioidea)

Pedro M. Bernabé-Ruiz, Manuel Huertas-Dionisio & Antonio Vives Moreno

Resumen

Se describen el género monoespecífico *Lourdesiella* Bernabé, Huertas & Vives, gen. nov. (Stathmopodidae) y la especie *Lourdesiella falcatum* Bernabé, Huertas & Vives, sp. nov. (Stathmopodidae). Se realiza el análisis del gen mitocondrial citocromo oxidasa I (COI), AND código de barras para la nueva especie. Se ofrecen datos sobre su biología.
Palabras clave: Lepidoptera, Gelechioidea, Stathmopodidae, *Lourdesiella*, *Lourdesiella falcatum*, nuevo género, nueva especie, ADN código de barras, Península Ibérica.

***Lourdesiella* Bernabé, Huertas & Vives, new genus of the family Stathmopodidae and description of the species *Lourdesiella falcatum* Bernabé, Huertas & Vives, sp. nov. in the Iberian Peninsula (Lepidoptera: Gelechioidea)**

Abstract

The monospecific genus *Lourdesiella* Bernabé, Huertas & Vives, gen. nov. (Stathmopodidae), and the species *Lourdesiella falcatum* Bernabé, Huertas & Vives, sp. nov. (Stathmopodidae) are described. Analysis of the mitochondrial cytochrome oxidase I (COI) gene, DNA barcode for the new species, is performed. Data on its biology are given.
Keywords: Lepidoptera, Gelechioidea, Stathmopodidae, *Lourdesiella*, *Lourdesiella falcatum*, new genus, new species, DNA barcoding, Iberian Peninsula.

Introducción

La familia Stathmopodidae fue citada por primera vez por Meyrick (1913), aunque se limitó a describir algunas especies sin ofrecer los caracteres diagnósticos de la familia. Posteriormente, Janse (1917) también cita la familia Stathmopodidae en una lista de especies, de tres géneros diferentes, de Sudáfrica. La primera revisión de la familia, a partir de especies encontradas en la región Paleártica y de ejemplares de especies de otras regiones faunísticas depositados en el NHMUK, la llevó a cabo Kasy (1973). En este trabajo, además de caracterizarse la familia Stathmopodidae, se describen las genitalias y las venas alares de cuarenta y cinco especies, repartidas en diez géneros. Más tarde, Falkovich

(1989), basándose principalmente en Kasy (1973), también describe la familia y la especie *Stathmopoda pedella* (Linnaeus, 1761). Posteriormente, Kostner & Sinev (2003) describen siete especies de dos géneros (*Stathmopoda* Herrich-Schäffer, 1853 y *Tortilia* Chrétien, 1908) al referirse a los Stathmopodidae europeos. En ninguno de los trabajos anteriores se detallan con precisión los estados inmaduros y, sólo recientemente, se han conocido algunos casos gracias al estudio de las asociaciones de las orugas con sus plantas hospedadoras (Shen et al. 2022; Terada, 2016). Aunque la clasificación de las especies de esta familia suele ser difícil, debido a la ausencia de caracteres morfológicos diagnósticos fiables (Shen et al. 2022), el que principalmente distingue a estos Microlepidoptera es la presencia de escamas piliformes en la parte superior de las tibias y tarsos de las patas traseras, así como la existencia de grupos de cerdas en la unión de sus articulaciones (Kasy, 1973; Koster & Sinev, 2003; Sinev, 2015).

En todo el mundo, según GBIF (Global Biodiversity Information Facility) (http://www.gbif.org/), servidor mundial que recoge información sobre biodiversidad y su geolocalización, la familia Stathmopodidae se compone de 423 especies descritas y repartidas en 26 géneros, en su mayoría de distribución tropical, principalmente indo-australiana. En España, actualmente, sólo se encuentra representada por seis especies: *Stathmopoda pedella* (Linnaeus [1760] 1761), *Stathmopoda auriferella* (Walker, 1864), *Tortilia flavella* Chrétien, 1908, *Tortilia flavescens* Falck & Karsholt, 2019, *Neomariania partinicensis* (Rebel, 1937) y *Neomariania rebeli* (Walsingham, 1984) (Falck & Karsholt, 2019; Vives Moreno, 2014). El número de registros de todas ellas en España es muy reducido. Según GBIF, de *S. pedella* únicamente aparece un registro en el País Vasco y otro de *N. partinicensis* en la provincia de Alicante; *S. auriferella*, *T. flavescens* y *N. rebeli*, solo se citan de las Islas Canarias (Falck & Karsholt, 2019); *T. flavella* se cita de la provincia de Granada (Koster & Sinev, 2003).

Además de comparar los elementos morfológicos de los ejemplares capturados, en todas las fases de desarrollo, también se ha empleado la herramienta propuesta para la identificación molecular de especies de Lepidoptera, o marcador del código de barras de ADN, que utiliza las secuencias nucleotídicas del marcador molecular mitocondrial Citocromo oxidasa I (COI) (Hebert et al. 2003).

Los objetivos del presente trabajo consisten en realizar la descripción de una nueva especie de Stathmopodidae, así como en aportar detalles sobre su biología. Por otra parte, las diferencias morfológicas y genéticas obtenidas nos llevan a proponer también la creación de un nuevo género.

Material y métodos

Los ejemplares descritos se han capturado en el Parque Natural de la Sierra de Aracena y Picos de Aroche, en el norte de la provincia de Huelva, España (Hoja 10x10 km 29SPB99). Los transectos diurnos de los muestreos sistemáticos efectuados durante las campañas 2020 y 2021, en el Barranco de Carabaña (Bernabé-Ruiz et al. 2020), permitieron localizar unas crisálidas singulares, protegidas por una sutil red blanca, sobre las hojas de un ejemplar de madreselva (*Lonicera periclymenum* subsp. *hispanica* (Boiss. & Reut.) Nyman) (figura 1). Para la identificación de la especie botánica se ha seguido a Ruiz-Téllez & Devesa (2007). Se recolectó material vegetal de ese ejemplar de madreselva en el que se encontraron otras crisálidas, además de orugas y huevos. Las hojas con presencia de crisálidas se introdujeron en pequeños botes de polietileno transparente de 30 mililitros de capacidad a los que se le perforó la tapadera superior. Tras localizar algunas larvas vivas, también se introdujeron en botes idénticos junto con hojas frescas de la misma planta que permitieron seguir su ciclo biológico hasta obtener las crisálidas y, posteriormente, los adultos.

La terminología utilizada para describir el imago y la genitalia se sigue a Kasy (1973) y Koster & Sinev (2003).

Para obtener secuencias nucleotídicas del marcador molecular mitocondrial Citocromo oxidasa I (COI), se ha extraído ADN a partir de patas secas. Las muestras se han procesado en el Laboratorio de Análisis Molecular AndDNA, de Villaviciosa de Córdoba (Córdoba, España). La extracción del ADN se realizó mediante digestión proteolítica de la muestra, seguida de su concentración y purificación, mediante columnas de intercambio iónico. Para ello, se depositó la muestra en un tubo eppendorf de 0,2 ml y se añadieron 135 µl de tampón de lisis (0,3 g Tris, 0,93 g de KCl, 1,25 ml Tween 20, 250 ml de agua destilada) y 15 µl de solución de Proteinasa K (50 % glicerol, 50 % tampón de lisis, 5 mM de $CaCl_2$, 20 mg/ml Proteinasa K). La mezcla se incubó durante doce horas a 37º C y el sobrenadante se purificó mediante el kit Genomic DNA clean-up (Macherey-Nagel). El ADN purificado se eluyó en 25 µl de agua para biología molecular. Una vez extraído el ADN, se realizaron reacciones de PCR (reacción en cadena de la polimerasa), mediante el siguiente programa: 94º C, 3 minutos; 40 ciclos de 94º C, 20 segundos; 54º C, 25 segundos; 72º C, 45 segundos; un ciclo de extensión final de 72º C, 5 minutos, empleando una combinación de primers específicos para la región COI ($LEPFw_{1:}$ TTTATTCAACCAATCATAAAGATAT, $LEPRv_1$: TAAACTTCTGGATGTCCAAAAA). Por último, se obtuvo un fragmento de PCR que se purificó y se secuenció mediante tecnología Sanger en un analizador genético ABI3130. La longitud de la secuencia se ajustó a 614 bp mediante el uso del programa SeqMan, perteneciente al paquete de programas DNASTAR Lasergene (https://dnastar.com). Para alinear las secuencias y comparar su divergencia o similitud se ha empleado el programa MegAlign, del paquete de programas DNASTAR Lasergene. Se empleó el algoritmo Clustal W Method, con los parámetros por defecto. Finalmente, la secuencia obtenida se ha depositado en GenBank. Se ha comparado la divergencia genética de la secuencia obtenida para la región COI con otras similares depositadas en la base de datos de Boldsystems (https://www.boldsystems.org/index.php/IDS_OpenIdEngine) y de GenBank (https://www.ncbi.nlm.nih.gov/genbank).

Los ejemplares capturados se han depositado en el Museo Nacional de Ciencias Naturales de Madrid, España (MNCN), holotipo ♂ y dos paratipos, 1 ♂ y 1 ♀ y en la Facultad de Ciencias Experimentales de la Universidad de Huelva, España (FCCEE), dos paratipos, 1 ♂ y 1 ♀.

Las preparaciones genitales se han basado en Robinson (1976), empleando resina soluble al agua DMHF. El material utilizado incluye, entre otros, un binocular Leica MZ6 y un Microscopio Leica ATC 2000. Las fotografías de los imagos se han obtenido con cámara réflex Nikon D-500 y objetivo Nikkor 60 mm, después, se han procesado con los programas Adobe Photoshop © y Helicon Focus ©.

Abreviaturas

ANIC: Australian National Insect Collection (CSIRO), Canberra, Australia
BMNH: The Natural History Museum, Londres, Reino Unido
c.d.n.g.: carácter diagnóstico del nuevo género
FCCEE: Facultad de Ciencias Experimentales de la Universidad de Huelva, Huelva, España
GBIF: Global Biodiversity Information Facility
MNCN: Museo Nacional de Ciencias Naturales, Madrid, España
PNSAPA: Parque Natural de la Sierra de Aracena y Picos de Aroche, Huelva, España
prep. gen.: preparación de genitalia

Resultados

Los caracteres morfológicos observados en los ejemplares capturados que permiten establecer la adscripción a Stathmopodidae, se detallan a continuación:

***Lourdesiella* Bernabé, Huertas & Vives, gen. nov.**

Especie tipo: *Lourdesiella falcatum* Bernabé, Huertas & Vives, sp. nov.

Diagnosis (figuras 2-6): Especie de pequeño tamaño. Cabeza bien desarrollada, sin ocelos; vértex con pelos escamiformes enfrentados (c.d.n.g.). Palpos labiales bien desarrollados, ligeramente curvados en el tercer segmento hacia la parte superior. Antenas cortas y densamente ciliadas; no alcanzan la mitad del ala delantera (c.d.n.g.); pecten con numerosas cerdas lineales en el escapo; presencia de escamas grandes en la parte superior de los primeros artejos del flagelo, que decrecen de tamaño progresivamente (c.d.n.g.). Alas anteriores apuntadas, con facies oblicuas de color marrón y fimbrias largas; también se aprecian dos pequeñas plúmulas en el margen dorsal (c.d.n.g.); las escamas de la cara inferior son más oscuras en ambas alas; en reposo, las alas anteriores se mantienen semiabiertas, permitiendo observar el abdomen a través de las fimbrias (c.d.n.g.); las venas del ala anterior no presenta celdilla radial adicional en la parte anterior de la celda media; las venas r4 y r5 parten de un tronco común, delimitando al ápice del ala (c.d.n.g.) (figura 7). Tercer par de patas con algunos pelos pardo-oscuros en las articulaciones finales de la tibia y del tarso; otros pelos puntiagudos recubren la tibia y el primer segmento del tarso; los grupos de pelos presentes en las patas traseras no provocan que éstas deban estar extendidas hacia fuera o elevadas cuando el adulto se encuentra en reposo (c.d.n.g.). Abdomen sin espinas aparentes en los márgenes de los terguitos o en otras disposiciones (c.d.n.g.).

Genitalia del macho (figuras 8-11): Uncus ancho. Tegumen amplio. Gnatos muy poco desarrollado (c.d.n.g.). Valvas con la base ancha y ápice redondeado, cubiertas de numerosas cerdas en la cara interior. Anellus alargado (c.d.n.g.). Saccus de base triangular y extremo alargado (c.d.n.g.). Aedeagus largo, delgado y ligeramente curvado; sin proceso distal aparente, con un cornuti en la mitad de su longitud (c.d.n.g.).

Genitalia de la hembra (figuras 11a, 11b): Papilas anales desarrolladas, poco quitinizadas. Apófisis posteriores cortas; las anteriores bifurcadas (c.d.n.g.), de tamaño similar a las posteriores. Ductus seminalis muy cercano al ostium bursae (c.d.n.g.). Ductus bursae largo, membranoso y con numerosos pliegues en casi toda su longitud, con un engrosamiento singular en la mitad de su longitud (c.d.n.g.). Corpus bursae casi esférico, pequeño; no presenta signum (c.d.n.g.) (figura 1).

Estados inmaduros: oruga alargada sin patas ventrales (c.d.n.g.). La crisálida presenta setas que se destacan del cuerpo y el último urito con varias setas largas (c.d.n.g.). El capullo está hecho con hilo blanco en forma de red poco tupida muy característica, con hilos cortos en forma de espinas, que sobresalen de los bordes y permite ver la oruga o la crisálida en su interior (c.d.n.g.).

Detalles: Siguiendo a Vives Moreno (2014), tanto el género como la nueva especie, deberían colocarse detrás del género *Stathmopoda* Herrich-Schäffer, 1853.

Etimología: Este nuevo género se dedica a María Lourdes Morera Gálvez, esposa del primer autor, por su constante apoyo y estímulo.

Lourdesiella falcatum Bernabé, Huertas & Vives, sp. nov

Material estudiado: Holotipo, 1 ♂, España, Huelva, Cortegana (P.N.S.A.P.A.), 600 m, 13-VII-2020 ex. larva, P. Bernabé leg., prep. gen. 20-180pb, depositado en el MNCN.

Paratipos 2 ♂ y 2 ♀: 1 ♂, ídem, ex. larva, 24-VI-2021, P. Bernabé leg., prep. gen. 21-211pb, MNCN; 1 ♀, ídem, 28-VI-2020 ex. larva, P. Bernabé leg., prep. gen. 20-177pb, MNCN; 1 ♂, ídem, ex. larva, 10-VII-2020, P. Bernabé leg., prep. gen. 20-215pb, FCCEE; 1 ♀, ídem, 13-VII-2020 ex. larva 24-VI-2021, P. Bernabé leg., prep. gen. 20-176pb, FCCEE.

Descripción del macho (figuras 2-5): Envergadura, 8,9 mm de promedio (8-10,5 mm, n=9). Cabeza bien desarrollada, vértex con pelos escamiformes grandes, erguidos y enfrentados, de color blanco; frente con pelos más pequeños también blancos. Palpos labiales de 0,6 mm, bien desarrollados, curvados hacia arriba, formado por tres segmentos de longitud similar y cubiertos de pelos blancos; del extremo superior del segundo segmento parten numerosos pelos negros que rodean al tercer segmento, salvo en su cara interna. Palpo maxilar poco aparente. Labro desarrollado, no enrollado en espiral, más corto que el palpo labial. Antenas blancas y cortas, que no superan la mitad del ala anterior, más anchas en su base; escapo con pecten de numerosas cerdas delgadas; flagelo filiforme, cubierto de numerosas setas; sus primeros segmentos presentan, en su cara superior, escamas grandes que decrecen de tamaño progresivamente. Tórax y tégulas recubiertos de escamas blanquecinas, salvo dos grupos de escamas pardo-oscuras a ambos lados de la zona posterior del tórax. Abdomen recubierto principalmente de escamas blanquecinas, salvo en el dorso de los segmentos 3º y 6º, que aparecen recubiertos de escamas pardo-oscuras; los segmentos 2º, 7º y 8º también presentan algunas escamas pardo-oscuras dispersas. Primer par de patas de 2,5 mm de longitud, con epífisis; recubiertas de escamas blanquecinas, con pelos pardo-oscuros en tibia y tarso. Segundo par de patas de 2,8 mm, blanquecinas con pelos pardo-oscuros en las articulaciones y dos espolones apicales en la tibia de longitud desigual, de 0,5 mm el mayor y de

0,25 mm el menor. Tercer par de patas de 4,3 mm, blanquecinas, con algunos pelos pardo-oscuros en las articulaciones finales de la tibia y del tarso; pelos blanquecinos puntiagudos recubren la tibia y el primer segmento del tarso; la tibia presenta un par de espolones medios de longitud desigual, de 0,8 y 0,4 mm, y otro par de espolones apicales también de longitud desigual, de 0,4 y 0,3 mm. Alas anteriores apuntadas, de entre 4,1 y 4,4 mm de longitud; fimbrias largas, con franjas de color blanquecino y otras marrón claras que se alternan; la cara superior presenta, en general, escamas blanquecinas; manchas de escamas marrón claras difusas, forman un triángulo en el extremo; manchas pequeñas de escamas pardo-oscuras se observan en la mitad del margen costal, en los bordes del triángulo del ápice y cercanas a la base del margen dorsal; también se aprecian dos pequeñas plúmulas de escamas pardo oscuras en el margen dorsal; las escamas de la cara inferior, marrón oscuras; en actitud de reposo, las alas anteriores se mantienen semiabiertas, permitiendo observar el abdomen a través de las fimbrias. Alas posteriores de 3,2-3,6 mm de longitud, de color gris en su cara superior, también de color gris más oscuro en la inferior; frénulo formado por una sola cerda en ambos sexos. El diseño de las venas alares se muestra en la figura 7. En el abdomen no se aprecian espinas dispuestas perpendicularmente o en otras disposiciones, en los márgenes de los terguitos. La descripción de la hembra (figura 6) no difiere de la del macho salvo en su mayor envergadura (9,6 mm de promedio (9-10,5 mm, n=8)) y en la forma del abdomen, más abultado en los primeros segmentos de éstas. Además, cuando emergen de la crisálida, el abdomen de las hembras presenta un tenue tono verdoso que se disipa a las pocas horas.

Genitalia del macho (figuras 9-10): Uncus ancho con el extremo redondeado y ligeramente arqueado; su forma recuerda a una pequeña pala, con dos cerdas conspicuas en la base. Tegumen amplio, trapezoidal. Gnatos muy poco desarrollado. Valvas con la base ancha y ápice redondeado, cubiertas de numerosas cerdas en la cara interior de los dos tercios apicales. Anellus alargado, ligeramente curvado. Saccus de base triangular y extremo alargado que se prolonga hasta alcanzar al aedeagus. Éste es largo, delgado y ligeramente curvado, presenta un cornuti muy característico con forma de falcata, en la mitad de su longitud.

Genitalia de la hembra (figuras 11a, 11b): Papilas anales poco desarrolladas y poco quitinizadas. Antrum con forma de copa. Placa postvaginal con forma de octógono. Apófisis posteriores cortas y las anteriores bifurcadas, de tamaño similar a las posteriores. Ductus bursae largo, membranoso al principio, con numerosas espinas justo después del punto de unión con el ductus seminalis; presenta numerosos pliegues en casi toda su longitud, y un engrosamiento singular en la mitad, aproximadamente, formado por dos cuerpos arriñonados unidos. Corpus bursae casi esférico, membranoso, pequeño si se compara con la longitud del ductus bursae; no presenta signum.

Estados inmaduros. El huevo (figura 12) es muy característico, tiene forma de tonel, estriado, con varias extensiones curvas en el micrópilo, mide 0,40 mm de alto y 0,30 mm de ancho. La oruga (figuras 13-14) mide 4,50 mm de longitud, verde claro. Setas curvadas translúcidas, las D1 y D2 (dorsales) en un solo pináculo, la D1 más corta que la D2. En la zona central de cada segmento hasta la mitad del cuerpo, tiene manchas blancas. No tiene patas ventrales. Las patas torácicas gruesas y translúcidas. En el 9º urito, las setas son más largas que las del resto del cuerpo. La cápsula cefálica (figura 15) mide 0,30 mm, verde claro, los ocelos negros y las antenas translúcidas. El escudo protorácico de forma irregular, verde claro con manchas blancas (figura 16). El escudo anal (figura 17) pequeño, verde claro con tres manchas oscuras, las setas son cortas. La crisálida (figura 18) mide de 3,50 a 4,00 mm de longitud, verde claro al principio y más blanca al final, con setas que se destacan del cuerpo; cabeza redondeada y el último urito (figura 19) con ocho setas largas rubias. El capullo (figuras 1, 20) de 5 a 6 mm de longitud y de 2 a 3 mm de ancho, está hecho con hilo blanco en forma de red muy característica, con hilos cortos en forma de espinas, que sobresalen de los bordes. Lo realizan en una hoja, preferentemente en el envés, paralelo al nervio central o en el margen del limbo, de forma que permite ver la oruga o la crisálida en su interior.

Diagnosis molecular: Se intentó secuenciar los cinco ejemplares capturados aunque sólo se pudo conseguir en un ejemplar. Por razones desconocidas, el laboratorio sólo pudo aislar una secuencia obtenida de la región COI de uno de los ejemplares de *L. falcatum* sp. nov. (Paratipo ♀, ex. larva 28-VI-2020, prep. gen. 20-177pb), la cual se muestra a continuación (614 pares de bases, código de acceso a GenBank OQ873518):

Nº Orden	Código Acceso Secuencias GenBank-BoldSystem/Especie/Id-Secuencia
1	**OQ873518 *Lourdesiella falcatum* sp.n. 38360**
2	FJ376649.1 *Thylacosceles* sp. 3 ex *Cyrtomium fortunei* isolate S8AK
3	FJ376650.1 *Thylacosceles* sp. 3 ex *Cyrtomium fortunei* var. *Clivicola* isolate S10AK
4	FJ376651.1 *Stathmopodinae* sp. ex *Dryopteris* sp. isolate S59AK
5	HM422448.1 *Stathmopodinae* sp. voucher USMET00662096
6	KF311868.1 *Atrijuglans hetaohei*
7	KF396228.1 *Calicotis crucifera* voucher 11ANIC-15764
8	KF396494.1 *Pseudaegeria* sp. AIC3 voucher 11ANIC-15722
9	KF397077.1 *Pseudaegeria polytita* voucher 11ANIC-15725
10	KF397126.1 *Mylocera* sp. ANIC3 voucher 11ANIC-15740
11	KF398186.1 *Pseudaegeria* sp. AIC3 voucher 11ANIC-15720
12	KF398891.1 *Pseudaegeria* sp. AIC1 voucher 11ANIC-15724
13	KF399233.1 *Dolophrosynella* sp. ANIC1 voucher 11ANIC-15745
14	KF400990.1 *Pseudaegeria* sp. AIC7 voucher 11ANIC-15729
15	KF402133.1 *Mylocera* sp. AIC2 voucher 11ANIC-15739
16	KF402179.1 *Pseudaegeria hyalia* voucher 11ANIC-15731
17	KF402625.1 *Dolophrosynella* sp. ANIC1 voucher 11ANIC-15747
18	KF402741.1 *Coracistis erythrocosma* voucher 11ANIC-15733
19	KF402842.1 *Pseudaegeria polytita* voucher 11ANIC-15718
20	KF403634.1 *Coracistis erythrocosma* voucher 11ANIC-15735
21	KF404836.1 *Snellenia capnora* voucher 11ANIC-15712
22	KF405381.1 *Mylocera* sp. ANIC3 voucher 11ANIC-15742
23	KF406198.1 *Dolophrosynella* sp. ANIC1 voucher 11ANIC-15748
24	KY323269.1 *Stathmopodidae* sp. AAG3468 voucher USM:ET:00720213
25	KY323304.1 *Stathmopodidae* sp. AAG3468 voucher USM:ET:00720171
26	LC717499.1 *Calicotis crucifera* ZYS093
27	MH415535.1 *Stathmopodidae* sp. CLV5454
28	MH415645.1 *Stathmopodidae* sp. BKR0258
29	MH416473.1 *Stathmopodidae* sp. DL14Z1-0021
30	MH417175.1 *Stathmopodidae* sp. BKR0099
31	MH417544.1 *Stathmopodidae* sp. KLM Lep 02254
32	MH417833.1 *Stathmopodidae* sp. BKR0088
33	MN852875.1 *Atkinsonia* sp. NKU WQY0095
34	MPGO4833-19 *Schreckensteinia felicella*. BIOUG50291-C06
35	HM873075.1 *Schreckensteinia festaliella* voucher MM06151
36	HM875873.1 *Schreckensteinia festaliella* voucher MM14070
37	KT148468.1 *Schreckensteinia erythriella* voucher BIOUG01521-C09
38	LEPNF028-14 *Schreckensteinia felicella*. CCDB-23267-A12
39	LOCBB521-06 *Schreckensteinia erythriella*. 06-BLLOC-1461
40	MG357653.1 *Schreckensteinia* sp. BIOUG26572-A06
41	MG360530.1 *Schreckensteinia* sp. BIOUG26572-A07
42	MG361014.1 *Schreckensteinia* sp. BIOUG26216-C10
43	MG361624.1 *Schreckensteinia* sp. BIOUG25482-A02
44	MG466515.1 *Schreckensteinia* sp. BIOUG21222-C04
45	MG467539.1 *Schreckensteinia* sp. BIOUG21222-D11
46	MG469083.1 *Schreckensteinia* sp. BIOUG21222-E02
47	MNAD037-07 *Schreckensteinia erythriella*. CNCLEP00027697
48	MNAD228-07 *Schreckensteinia* sp. CNCLEP00028667
49	MNAE087-07 *Schreckensteinia erythriella*. CNCLEP00031125

Tabla 1a.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	
1		81.8	81.8	81.8	85.1	86.1	83.9	83.4	84.3	87.8	83.4	84.9	87.6	83.7	84.3	84.7	87.4	85.9	84.3	85.9	83.4	87.6	87.8	84.7	84.9	84.1	84.3	84.3	84.5	85.1	85.7	86.4	85.3	84.7	86.8	86.6	87.0	84.7	87.0	86.8	86.8	86.8	87.0	86.8	86.6	87.0	86.8	84.7	87.0	**1**
2	20.9		100.0	94.9	85.2	86.0	86.3	85.8	85.5	86.9	86.0	86.0	85.8	84.5	85.5	84.6	85.5	84.6	85.5	84.9	86.3	86.6	85.8	84.6	84.9	84.9	82.3	85.5	85.2	84.6	85.2	85.5	84.9	82.1	81.5	81.5	85.2	82.1	85.2	84.9	85.5	84.9	85.2	84.9	84.9	85.2	84.9	82.1	85.2	**2**
3	20.9	0.0		94.9	85.2	86.0	86.3	85.8	85.5	86.9	86.0	86.0	85.8	84.5	85.5	84.6	85.5	84.6	85.5	84.9	86.3	86.6	85.8	84.6	84.9	84.9	82.3	85.5	85.2	84.6	85.2	85.5	84.9	82.1	81.5	81.5	85.2	82.1	85.2	84.9	85.5	84.9	85.2	84.9	84.9	85.2	84.9	82.1	85.2	**3**
4	20.9	5.3	5.3		86.3	86.3	86.9	85.2	84.9	86.3	85.2	85.5	85.8	84.2	84.0	84.0	85.5	84.6	84.9	84.9	85.5	86.6	85.8	85.8	86.0	85.5	84.0	85.2	85.5	84.9	85.5	86.0	85.5	83.2	81.8	81.8	85.5	83.2	85.5	85.2	85.8	85.2	85.5	85.5	85.5	85.5	85.5	83.2	85.5	**4**
5	16.7	16.5	16.5	15.1		86.7	86.2	86.2	88.5	87.6	86.4	88.3	87.2	88.8	87.6	89.3	87.4	85.7	88.5	86.0	85.9	87.6	87.6	99.4	99.6	85.9	86.8	86.6	87.6	87.2	88.1	89.3	88.9	83.4	83.7	83.6	84.9	83.4	84.9	84.7	84.7	84.9	84.9	85.1	84.9	84.9	85.1	83.4	84.9	**5**
6	15.4	15.4	15.4	15.1	14.7		86.9	87.9	88.7	89.5	88.1	90.9	89.3	89.6	87.5	90.1	89.1	87.9	88.7	87.9	87.9	89.5	89.3	86.3	86.3	87.1	88.1	86.7	87.3	87.9	87.5	89.1	87.7	84.6	83.8	83.6	86.7	84.6	86.7	86.7	86.5	86.5	86.7	86.7	86.5	86.7	86.7	84.6	86.7	**6**
7	18.1	15.1	15.1	14.4	15.2	14.5		86.2	85.5	88.0	86.4	86.2	87.2	86.8	86.2	86.8	87.0	85.9	85.5	86.2	85.5	88.0	87.2	85.9	86.0	97.5	84.7	85.7	87.4	85.9	89.5	87.8	86.4	82.0	81.1	80.9	83.2	82.0	83.2	83.0	83.0	83.0	83.2	82.8	82.6	83.2	82.8	82.0	83.2	**7**
8	18.8	15.8	15.8	16.5	15.2	13.2	15.2		89.7	87.8	99.8	88.9	87.8	88.6	89.3	91.0	87.6	86.4	89.7	86.4	85.9	87.8	87.8	86.0	86.0	86.4	84.7	85.7	86.0	87.4	88.0	88.3	89.3	85.1	85.3	85.1	85.7	85.1	85.7	85.5	85.5	85.7	85.7	85.7	85.5	85.7	85.7	85.1	85.7	**8**
9	17.6	16.2	16.2	16.9	12.5	12.3	16.2	11.1		89.1	89.9	91.8	88.7	91.5	92.2	95.0	88.5	86.8	100.0	87.2	86.6	89.1	88.7	88.1	88.1	85.9	86.6	84.9	87.0	85.9	86.2	87.6	86.8	83.6	85.3	85.1	84.1	83.6	84.1	83.9	84.3	84.1	84.1	84.1	83.9	84.1	84.1	83.6	84.1	**9**
10	13.4	14.4	14.4	15.1	13.6	11.3	13.1	13.4	11.8		88.0	89.1	98.5	89.2	88.3	88.7	98.3	88.7	89.1	89.1	88.7	99.8	98.7	87.4	87.4	87.8	88.1	87.4	87.0	87.2	88.5	89.7	88.9	85.9	83.7	83.6	87.6	85.9	87.6	87.4	87.4	87.4	87.6	87.6	87.4	87.6	87.4	85.9	87.6	**10**
11	18.8	15.5	15.5	16.5	15.0	13.0	15.0	0.2	10.9	13.1		89.1	88.0	88.8	89.5	90.8	87.8	86.6	89.9	86.6	86.0	88.0	88.0	86.2	86.2	86.6	84.9	85.9	86.2	87.6	88.1	88.5	89.5	85.1	85.3	85.1	85.7	85.1	85.7	85.5	85.5	85.7	85.7	85.7	85.5	85.7	85.7	85.1	85.7	**11**
12	16.9	15.5	15.5	16.2	12.7	9.7	15.2	12.0	8.7	11.8	11.8		88.7	94.5	92.2	91.4	88.5	87.2	91.8	87.6	88.0	89.1	88.7	88.0	88.0	86.2	87.6	85.9	87.2	88.7	87.4	88.9	86.6	83.9	85.1	84.9	85.3	83.9	85.3	85.1	85.1	85.1	85.3	85.3	85.1	85.3	85.3	83.9	85.3	**12**
13	13.6	15.8	15.8	15.8	14.0	11.6	14.0	13.4	12.2	1.6	13.1	12.2		88.8	88.0	88.7	99.4	88.7	88.7	88.7	88.7	98.7	99.4	87.0	87.0	87.4	88.0	86.6	86.6	87.0	88.5	89.7	88.9	86.4	84.1	83.9	87.8	86.4	87.8	87.6	87.6	87.6	87.8	87.8	87.6	87.8	87.6	86.4	87.8	**13**
14	18.2	17.4	17.4	17.7	12.0	11.0	14.3	12.2	8.8	11.5	12.0	5.6	12.0		92.7	92.1	89.4	88.4	91.5	88.8	86.4	89.2	89.2	88.4	88.4	86.6	86.4	85.4	86.4	87.0	86.8	89.2	87.2	84.8	85.0	84.8	84.4	84.8	84.4	84.3	84.3	84.4	84.4	84.4	84.3	84.4	84.4	84.8	84.4	**14**
15	17.6	16.2	16.2	17.9	13.6	13.7	15.2	11.6	8.3	12.7	11.3	8.3	13.1	7.5		92.9	87.8	85.7	92.2	86.0	86.4	88.3	88.0	87.4	87.6	85.9	86.6	87.0	87.4	87.0	87.6	89.1	86.4	84.9	85.3	85.1	84.9	84.9	84.9	84.7	84.7	84.9	84.9	84.9	84.7	84.9	84.9	84.9	84.9	**15**
16	17.1	17.2	17.2	17.9	11.6	10.6	14.5	9.6	5.2	12.2	9.8	9.2	12.2	8.1	7.5		88.5	88.1	95.0	88.1	86.6	88.7	88.7	89.1	88.9	87.4	87.2	85.3	86.8	87.0	88.0	88.3	88.0	85.7	85.3	85.1	85.9	85.7	85.9	85.7	85.7	85.9	85.9	85.9	85.7	85.9	85.9	85.7	85.9	**16**
17	13.8	16.2	16.2	16.2	13.8	11.8	14.3	13.6	12.5	1.7	13.4	12.5	0.6	11.3	13.4	12.5		88.5	88.5	88.5	88.1	98.5	99.6	87.2	87.2	87.2	87.8	86.8	86.4	86.8	88.3	89.5	88.7	87.0	83.9	83.7	87.6	87.0	87.6	87.4	87.4	87.4	87.6	87.6	87.4	87.6	87.4	87.0	87.6	**17**
18	15.7	17.2	17.2	17.2	15.9	13.2	15.7	15.0	14.5	12.2	14.7	14.1	12.2	12.4	15.9	12.9	12.5		86.8	99.2	84.7	88.9	88.7	85.3	85.3	86.0	86.4	85.7	85.9	86.0	86.4	87.4	87.0	83.6	82.0	81.8	84.1	83.6	84.1	83.9	83.9	83.9	84.1	84.1	83.9	84.1	84.1	83.6	84.1	**18**
19	17.6	16.2	16.2	16.9	12.5	12.3	16.2	11.1	0.0	11.8	10.9	8.7	12.2	8.8	8.3	5.2	12.5	14.5		87.2	86.6	89.1	88.7	88.1	88.1	85.9	86.6	84.9	87.0	85.9	86.2	87.6	86.8	83.6	85.3	85.1	84.1	83.6	84.1	83.9	84.3	84.1	84.1	84.1	83.9	84.1	84.1	83.6	84.1	**19**
20	15.7	16.9	16.9	16.9	15.4	13.2	15.2	15.0	14.0	11.8	14.7	13.6	12.2	12.0	15.4	12.9	12.5	0.8	14.0		85.5	89.3	88.7	86.0	86.0	86.4	86.8	85.9	86.0	86.2	86.8	87.6	87.0	83.6	82.0	82.2	84.1	83.6	84.1	83.9	83.9	83.9	84.1	84.1	83.9	84.1	84.1	83.6	84.1	**20**
21	18.9	15.2	15.2	16.2	15.7	13.2	16.2	15.7	14.8	12.2	15.4	13.1	12.2	14.8	15.0	14.8	12.9	17.1	14.8	16.2		88.9	88.3	85.7	85.9	85.1	86.2	85.5	84.7	84.3	86.4	86.2	85.5	84.3	81.1	81.3	84.7	84.3	84.7	84.5	84.5	84.5	84.7	84.5	84.3	84.7	84.3	84.3	84.7	**21**
22	13.6	14.8	14.8	14.8	13.6	11.3	13.1	13.4	11.8	0.2	13.1	11.8	1.4	11.5	12.7	12.2	1.6	12.0	11.8	11.6	12.0		98.9	87.4	87.4	87.8	88.1	87.4	87.0	87.2	88.5	89.7	88.9	86.0	83.7	83.6	87.8	86.0	87.8	87.6	87.6	87.6	87.8	87.8	87.6	87.8	87.6	86.0	87.8	**22**
23	13.4	15.8	15.8	15.8	13.6	11.6	14.0	13.4	12.2	1.4	13.1	12.2	0.6	11.5	13.1	12.2	0.4	12.2	12.2	12.2	12.7	1.2		87.4	87.4	87.4	88.0	87.2	86.6	87.0	88.5	89.7	88.9	86.8	84.1	83.9	87.8	86.8	87.8	87.6	87.6	87.6	87.8	87.8	87.6	87.8	87.6	86.8	87.8	**23**
24	17.2	17.3	17.3	15.8	0.6	15.2	15.7	15.4	12.9	13.8	15.2	13.1	14.3	12.4	13.8	11.8	14.0	16.4	12.9	15.4	15.9	13.8	13.8		99.8	85.9	86.4	86.0	87.2	86.6	87.8	88.9	88.7	83.0	83.9	84.1	84.5	83.0	84.5	84.3	84.3	84.5	84.5	84.7	84.5	84.5	84.7	83.0	84.5	**24**
25	16.9	16.9	16.9	15.5	0.4	15.2	15.5	15.4	12.9	13.8	15.2	13.1	14.3	12.4	13.6	12.0	14.0	16.4	12.9	15.4	15.7	13.8	13.8	0.2		85.7	86.4	86.2	87.2	86.8	87.8	88.9	88.7	83.0	83.7	83.9	84.5	83.0	84.5	84.3	84.3	84.5	84.5	84.7	84.5	84.5	84.7	83.0	84.5	**25**
26	17.8	16.9	16.9	16.2	15.7	14.2	2.5	15.0	15.7	13.4	14.7	15.2	13.8	14.5	15.7	13.8	14.0	15.5	15.7	15.0	16.6	13.4	13.8	15.7	15.9		85.1	85.7	86.8	85.9	89.3	87.4	86.0	82.6	81.1	80.9	83.7	82.6	83.7	83.6	83.6	83.6	83.7	83.4	83.2	83.7	83.4	82.6	83.7	**26**
27	17.6	20.1	20.1	17.9	14.5	13.0	17.1	17.1	14.7	12.9	16.9	13.6	13.1	14.8	14.7	14.0	13.4	15.0	14.7	14.5	15.2	12.9	13.1	15.0	15.0	16.6		88.3	91.2	91.0	92.0	92.9	86.4	82.8	80.9	80.7	83.6	82.8	83.6	83.4	83.4	83.4	83.6	83.9	83.7	83.6	83.7	82.8	83.6	**27**
28	17.6	16.2	16.2	16.5	14.7	14.7	15.9	15.9	16.9	13.8	15.7	15.7	14.7	16.0	14.3	16.4	14.5	15.9	16.9	15.7	16.2	13.8	14.1	15.5	15.2	15.9	12.7		89.3	90.8	91.2	91.0	84.5	82.2	81.5	81.3	82.4	82.2	82.4	82.2	82.2	82.2	82.4	82.4	82.2	82.4	82.4	82.2	82.4	**28**
29	17.3	16.5	16.5	16.2	13.6	14.0	13.8	15.4	14.3	14.3	15.2	14.0	14.7	14.8	13.8	14.5	15.0	15.7	14.3	15.5	17.1	14.3	14.7	14.1	14.1	14.5	9.4	11.6		91.8	92.4	96.0	86.8	80.3	81.6	81.5	82.4	80.3	82.4	82.2	82.2	82.4	82.4	82.2	82.0	82.4	82.2	80.3	82.4	**29**
30	16.6	17.2	17.2	16.9	14.1	13.2	15.7	13.8	15.7	14.1	13.6	12.2	14.3	14.1	14.3	14.3	14.5	15.5	15.7	15.2	17.6	14.1	14.3	14.8	14.5	15.7	9.6	9.8	8.8		90.8	93.1	87.2	81.6	82.0	81.8	82.8	81.6	82.8	82.6	82.6	82.6	82.8	82.8	82.6	82.8	82.6	81.6	82.8	**30**
31	15.9	16.5	16.5	16.2	12.9	13.7	11.3	13.1	15.2	12.5	12.9	13.8	12.5	14.3	13.6	13.1	12.7	15.0	15.2	14.5	15.0	12.5	12.5	13.4	13.4	11.6	8.5	9.4	8.1	9.8		93.9	87.4	83.2	82.4	82.2	84.5	83.2	84.5	84.3	84.3	84.3	84.5	84.3	84.1	84.5	84.3	83.2	84.5	**31**
32	15.0	16.2	16.2	15.5	11.6	11.8	13.4	12.7	13.6	11.1	12.5	12.0	11.1	11.5	11.8	12.7	11.3	13.8	13.6	13.6	15.2	11.1	11.1	12.0	12.0	13.8	7.4	9.6	4.1	7.2	6.4		87.6	82.2	83.9	83.7	83.7	82.2	83.7	83.6	83.6	83.7	83.7	83.6	83.4	83.7	83.6	82.2	83.7	**32**
33	16.4	16.9	16.9	16.2	12.0	13.5	15.0	11.6	14.5	12.0	11.3	14.7	12.0	13.8	15.0	13.1	12.2	14.3	14.5	14.3	16.2	12.0	12.0	12.2	12.2	15.5	15.0	17.3	14.5	14.1	13.8	13.6		84.5	84.5	84.3	85.1	84.5	85.1	84.9	84.9	85.1	85.1	85.1	84.9	85.1	85.1	84.5	85.1	**33**
34	17.1	20.5	20.5	19.0	18.8	17.2	20.6	16.6	18.6	15.7	16.6	18.1	15.0	16.7	16.9	15.9	14.3	18.6	18.6	18.6	17.6	15.4	14.5	19.3	19.3	19.8	19.6	20.3	22.8	21.1	19.1	20.3	17.3		87.2	87.0	92.7	100.0	92.7	92.7	92.5	92.5	92.7	92.7	92.5	92.7	92.7	100.0	92.7	**34**
35	14.5	21.3	21.3	20.9	18.3	18.2	21.8	16.4	16.4	18.3	16.4	16.6	17.8	16.5	16.4	16.4	18.1	20.6	16.4	20.6	21.9	18.3	17.8	18.1	18.3	21.8	22.1	21.3	21.1	20.6	20.0	18.1	17.4	14.1		99.8	88.7	87.2	88.7	88.5	88.5	88.5	88.7	88.5	88.3	88.7	88.5	87.2	88.7	**35**
36	14.8	21.3	21.3	20.9	18.6	18.5	22.1	16.6	16.7	18.6	16.6	16.9	18.1	16.8	16.7	16.7	18.3	20.8	16.7	20.3	21.6	18.6	18.1	17.8	18.1	22.1	22.4	21.6	21.3	20.8	20.3	18.3	17.6	14.3	0.2		88.5	87.0	88.5	88.3	88.3	88.3	88.5	88.3	88.1	88.5	88.3	87.0	88.5	**36**
37	14.3	16.5	16.5	16.2	16.9	14.7	19.1	15.9	17.8	13.6	15.9	16.4	13.4	17.2	16.9	15.7	13.6	17.8	17.8	17.8	17.1	13.4	13.4	17.4	17.4	18.3	18.6	20.1	20.0	19.5	17.4	18.3	16.6	7.6	12.2	12.5		92.7	100.0	99.8	99.8	99.8	100.0	99.6	99.4	100.0	99.4	92.7	100.0	**37**
38	17.1	20.5	20.5	19.0	18.8	17.2	20.6	16.6	18.6	15.7	16.6	18.1	15.0	16.7	16.9	15.9	14.3	18.6	18.6	18.6	17.6	15.4	14.5	19.3	19.3	19.8	19.6	20.3	22.8	21.1	19.1	20.3	17.3	0.0	14.1	14.3	7.6		92.7	92.7	92.5	92.5	92.7	92.7	92.5	92.7	92.7	100.0	92.7	**38**
39	14.3	16.5	16.5	16.2	16.9	14.7	19.1	15.9	17.8	13.6	15.9	16.4	13.4	17.2	16.9	15.7	13.6	17.8	17.8	17.8	17.1	13.4	13.4	17.4	17.4	18.3	18.6	20.1	20.0	19.5	17.4	18.3	16.6	7.6	12.2	12.5	0.0	7.6		99.8	99.8	99.8	100.0	99.6	99.4	100.0	99.4	92.7	100.0	**39**
40	14.5	16.9	16.9	16.5	17.1	14.7	19.3	16.2	18.1	13.8	16.2	16.6	13.6	17.5	17.1	15.9	13.8	18.1	18.1	18.1	17.4	13.6	13.6	17.6	17.6	18.6	18.8	20.3	20.3	19.8	17.6	18.6	16.9	7.6	12.5	12.7	0.2	7.6	0.2		99.6	99.6	99.8	99.4	99.2	99.8	99.2	92.7	99.8	**40**
41	14.5	16.2	16.2	15.8	17.1	14.9	19.3	16.2	17.6	13.8	16.2	16.6	13.6	17.5	17.1	15.9	13.8	18.1	17.6	18.1	17.4	13.6	13.6	17.6	17.6	18.6	18.8	20.3	20.3	19.8	17.6	18.6	16.9	7.9	12.5	12.7	0.2	7.9	0.2	0.4		99.6	99.8	99.4	99.2	99.8	99.2	92.5	99.8	**41**
42	14.5	16.9	16.9	16.5	16.9	14.9	19.3	15.9	17.8	13.8	15.9	16.6	13.6	17.2	16.9	15.7	13.8	18.1	17.8	18.1	17.4	13.6	13.6	17.4	17.4	18.6	18.8	20.3	20.0	19.8	17.6	18.3	16.6	7.9	12.5	12.7	0.2	7.9	0.2	0.4	0.4		99.8	99.4	99.2	99.8	99.2	92.5	99.8	**42**
43	14.3	16.5	16.5	16.2	16.9	14.7	19.1	15.9	17.8	13.6	15.9	16.4	13.4	17.2	16.9	15.7	13.6	17.8	17.8	17.8	17.1	13.4	13.4	17.4	17.4	18.3	18.6	20.1	20.0	19.5	17.4	18.3	16.6	7.6	12.2	12.5	0.0	7.6	0.0	0.2	0.2	0.2		99.6	99.4	100.0	99.4	92.7	100.0	**43**
44	14.5	16.9	16.9	16.2	16.6	14.7	19.6	15.9	17.8	13.6	15.9	16.4	13.4	17.2	16.9	15.7	13.6	17.8	17.8	17.8	17.4	13.4	13.4	17.1	17.1	18.8	18.1	20.1	20.3	19.5	17.6	18.6	16.6	7.6	12.5	12.7	0.4	7.6	0.4	0.6	0.6	0.6	0.4		99.8	99.6	99.8	92.7	99.6	**44**
45	14.6	16.9	16.9	16.2	16.7	14.7	19.6	16.0	17.9	13.6	16.0	16.4	13.4	17.3	16.9	15.7	13.6	17.9	17.9	17.9	17.4	13.4	13.4	17.1	17.1	18.9	18.1	20.1	20.3	19.6	17.6	18.6	16.7	7.7	12.5	12.7	0.4	7.7	0.4	0.6	0.6	0.6	0.4	0.0		99.4	99.6	92.5	99.4	**45**
46	14.3	16.5	16.5	16.2	16.9	14.7	19.1	15.9	17.8	13.6	15.9	16.4	13.4	17.2	16.9	15.7	13.6	17.8	17.8	17.8	17.1	13.4	13.4	17.4	17.4	18.3	18.6	20.1	20.0	19.5	17.4	18.3	16.6	7.6	12.2	12.5	0.0	7.6	0.0	0.2	0.2	0.2	0.0	0.4	0.4		99.4	92.7	100.0	**46**
47	14.3	16.9	16.9	16.2	16.4	14.7	19.3	15.7	17.6	13.6	15.7	16.2	13.4	17.0	16.7	15.5	13.6	17.6	17.6	17.6	17.4	13.4	13.4	16.9	16.9	18.6	18.1	19.9	20.1	19.6	17.4	18.4	16.4	7.5	12.3	12.5	0.4	7.5	0.4	0.6	0.6	0.6	0.4	0.0	0.0	0.4		92.7	99.4	**47**
48	17.1	20.5	20.5	19.0	18.8	17.2	20.6	16.6	18.6	15.7	16.6	18.1	15.0	16.7	16.9	15.9	14.3	18.6	18.6	18.6	17.6	15.4	14.5	19.3	19.3	19.8	19.6	20.3	22.8	21.1	19.1	20.3	17.3	0.0	14.1	14.3	7.6	0.0	7.6	7.6	7.9	7.9	7.6	7.6	7.7	7.6	7.5		92.7	**48**
49	14.3	16.5	16.5	16.2	16.9	14.7	19.1	15.9	17.8	13.6	15.9	16.4	13.4	17.2	16.9	15.7	13.6	17.8	17.8	17.8	17.1	13.4	13.4	17.4	17.4	18.3	18.6	20.1	20.0	19.5	17.4	18.3	16.6	7.6	12.2	12.5	0.0	7.6	0.0	0.2	0.2	0.2	0.0	0.4	0.4	0.0	0.4	7.6		**49**

Tabla 1b.

CACTTCACTAAGAATTATTATTCGAGCCGAATTAGGAAATCCAGGATCTTTAATTGGAGATGA
TCAAATTTATAATTCAATTGTTACAGCTCATGCATTTATTATAATTTTTTTTATAGTTATACCAAT
TATAATTGGCGGATTTGGAAATTGATTAGTTCCATTAATATTAGGAGCTCCAGATATGGCTTTT
CCTCGAATAAATAATATAAGATTTTGATTACTCCCCCCTTCTTTAATGTTATTAATTTCTAGAG
GAATTGTAGAAAATGGGGCAGGAACTGGATGAACAGTTTACCCCCCACTTTCATCAAATATT
GCTCATAGAGGTAGTTCTGTTGATTTAGCAATTTTTTCATTACATTTAGCAGGAATTTCTTCA
ATTTTAGGGGCTATTAACTTTATTACAACAATTATTAATATAAAACCTAACGGAATAAATTTTG
ATCAATTAACATTATTTATTTGAGCTGTAGGAATTACAGCCCTTTTATTACTATTATCTCTTCCA
GTATTAGCTGGTGCTATTACTATATTATTGACAGATCGAAATTTAAATACATCATTTTTTGATCC
TGCTGGAGGAGGGGATCCTATTCTTTATCAACATTTAT

El estudio realizado, mediante el uso del programa SeqMan, para alinear esta secuencia y comparar su divergencia/similitud con las depositadas en GenBank y Boldsystems se representa en las tablas 1a, 1b y 2. Se ha comparado con las secuencias públicas de las familias Stathmopodidae (de esta familia existen 151 BINs -Barcode Index Number- y 1.595 secuencias en Boldsystems), de forma que en la tabla 2 se muestran únicamente algunas de las secuencias más próximas, para demostrar que se supera el 2 % de divergencia, criterio seguido para separar especies dentro de la misma familia (Hausmann et al. 2011). También se han incluido dos secuencias de Schreckensteiniidae (de esta familia se conservan 10 BINs y 187 secuencias en Boldsystems) por la similitud de los estados inmaduros (huevo, oruga y capullo de la crisálida) de *L. falcatum* con los de *Schreckensteinia festaliella* (Hübner, [1819] 1796) (Buszko & Skalski, 1980; Ramadan, 2014). Según la tabla 1, la menor divergencia genética (13,4 y 13,6 %) se obtiene con las secuencias de Stathmopodidae de *Mylocera sp*. (KF397126.1 y KF405381.1, respectivamente) y *Dolophrosynella sp*. (KF406198.1 y KF399233.1, respectivamente). Ambos géneros son monoespecíficos (*Mylocera tenebrifera* Turner, 1898 y *Dolophrosynella balteata* Durrant, 1919) de individuos citados únicamente de Australia, según GBIF. Ambas especies fueron descritas por Turner (1897) y Durrant (1919), respectivamente. Las cuatro secuencias anteriores se han depositado en GenBank por Hebert et al. (2013), sobre ejemplares existentes en la sede de la ANIC, lo que garantiza la correcta adscripción de los ejemplares a los géneros citados y, por tanto, a la familia Stathmopodidae. En la tabla 1 también se comprueba una divergencia con las secuencias de *Schreckensteinia erythriella* Clemens, 1860 de un 14,3 %. Entre ellas, se encuentra la que se ha depositado en GenBank con código KT148468.1, por Hebert et al. (2016), que garantiza la correcta identificación de la especie.

% Homología

% Divergencia	1	2	3	4	5	6	7	8	9	10	11		
1		87,8	87,8	87,6	87,6	87,4	87,0	86,8	86,1	85,9	84,7	**1**	**OQ873518 *Lourdesiella falcatum* sp.nov. 38360**
2	13,4		98,7	99,4	98,9	99,6	87,8	84,1	89,3	88,7	88,7	**2**	KF406198.1 *Dolophrosynella* sp. ANIC1 voucher 11ANIC-15748
3	13.4	1,4		98,5	99,8	98,3	87,6	83,7	89,5	88,7	88,7	**3**	KF397126.1 *Mylocera* sp. ANIC3 voucher 11ANIC-15740
4	13,6	0,6	1,6		98,7	99,4	87,8	84,1	89,3	88,7	88,7	**4**	KF399233.1 *Dolophrosynella* sp. ANIC1 voucher 11ANIC-15745
5	13,6	1,2	0,2	1,4		98,5	87,8	83,7	89,5	88,9	88,7	**5**	KF405381.1 *Mylocera* sp. ANIC3 voucher 11ANIC-15742
6	13,8	0,4	1,7	0,6	1,6		87,6	83,9	89,1	88,5	88,5	**6**	KF402625.1 *Dolophrosynella* sp. ANIC1 voucher 11ANIC-15747
7	14,3	13,4	13,6	13,4	13,4	13,6		88,7	86,7	84,1	85,9	**7**	KT148468.1 *Schreckensteinia erythriella* voucher BIOUG01521-C09
8	14,5	17,8	18,3	17,8	18,3	18,1	12,2		83,8	82,0	85,3	**8**	HM873075.1 *Schreckensteinia festaliella* voucher MM06151
9	15,4	11,6	11,3	11,6	11,3	11,8	14,7	18,2		87,9	90,1	**9**	KF311868.1 *Atrijuglans hetaohei*
10	15,7	12,2	12,2	12,2	12,0	12,5	17,8	20,6	13,2		88,1	**10**	KF402741.1 *Coracistis erythrocosma* voucher 11ANIC-15733
11	17,1	12,2	12,2	12,2	12,2	13,4	15,7	16,4	10,6	12,9		**11**	KF402179.1 *Pseudaegeria hyalia* voucher 11ANIC-15731

Tabla 2. Divergencia / Homología genética.

El cladograma (figura 21) muestra el código de acceso a GenBank o Boldsystems, seguido de la especie y del código privado de cada aislado. Se muestran las diferencias obtenidas entre la única secuencia aislada de *L. falcatum* y las secuencias de las especies de Stathmopodidae (y Schreckensteiniidae) más próximas existentes en las bases de datos consultadas.

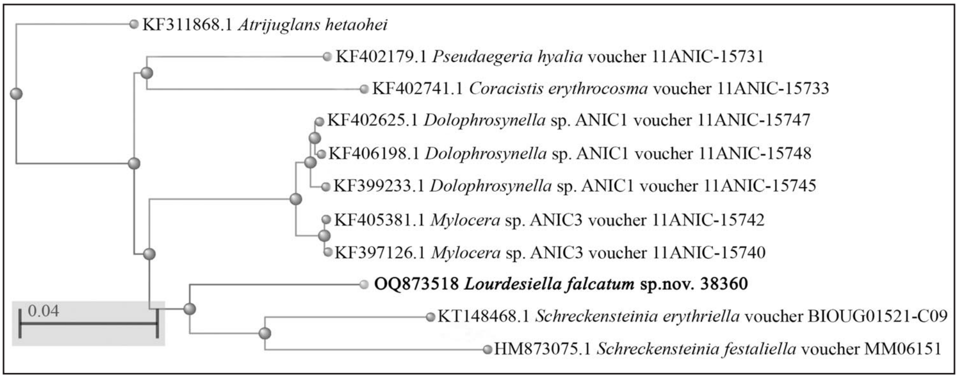

Figura 21. Cladograma.

Biología y distribución: Se han observado a las orugas mientras se alimentaban sobre su huésped, *L. periclymenum* subsp. *hispanica*. Se desplazan por las hojas y tallos alimentándose de los numerosos pelillos glandulares tan abundantes en esta especie botánica. Si no se mueven, son difíciles de ver porque el color verde claro y sus numerosas setas las camufla entre el abundante indumento de la planta. Su presencia no ha provocado daños externos apreciables ni síntomas de estrés en el huésped.

Se ha seguido en cautividad el ciclo biológico de 9 ♂ y 8 ♀, aunque sólo se han conservado los cinco ejemplares depositados, el resto se han liberado en el mismo lugar de su recolección, para cumplir con las condiciones de la autorización concedida. Ello ha permitido conocer que la fase de crisálida dura entre 11-14 días. Durante 2020, los adultos han volado entre el 21 de junio y el 13 de julio. Y en 2021, entre el 24 y el 27 de junio, sin apreciarse diferencias significativas entre sexos. No se han observado inmaduros ni adultos fuera del periodo primavera-verano, por tanto, se trata de una especie univoltina. La observación de ejemplares, vivos y aletargados, en fases larvarias L1-L2, a la salida del invierno de 2022, sugiere que esa es la fase en la que esta especie pasa el invierno.

Todos los individuos, en todas sus fases, de la nueva especie *L. falcatum* se han localizado sobre un único ejemplar de *L. periclymenum* subsp. *hispanica.* Se ha intentado localizar otros huéspedes de la misma especie botánica también parasitados, próximos al anterior, sin éxito.

Etimología: La nueva especie se refiere a la forma del cornuti del aedeagus, en el andropigio, por su similitud con el arma ibérica prerromana denominada *falcata*.

Discusión

Puede parecer sorprendente que aparezcan nuevas especies de Lepidoptera en un área tan prospectada como Europa. Sin embargo, los procedimientos de muestreos generalizados, basados en capturas mediante trampas de luz y transectos más o menos rápidos, no son suficientes para conocer en profundidad la comunidad de Lepidoptera de un lugar concreto (Bernabé-Ruiz, 2023; Huertas-Dionisio & Bernabé-Ruiz, 2020). Es probable que *L. falcatum* pasara inadvertida por no acudir a fuentes de luz y por no provocar daños apreciables en su huésped. Este trabajo es un nuevo ejemplo de que una observación minuciosa del entorno puede ofrecer resultados inesperados.

Kasy (1973), al referirse al género *Stathmopoda* Herrich-Schäffer, 1853, recoge que la delimitación de los géneros de Stathmopodidae es problemática y tiene la impresión de que se trata de una familia filogenéticamente joven y en pleno desarrollo. Aun así, en este trabajo, los caracteres morfológicos de los imagos (fundamentalmente, por sus patas traseras) y genitalia (sobre todo, por el andropigio) de los ejemplares estudiados permite, por un lado, su correcta adscripción a la familia Sathmopodidae y por otro, varios caracteres los distinguen del resto de géneros de esta familia (fundamentalmente, las características antenas, la ausencia de espinas en los terguitos, la presencia de plúmulas y las venas de las alas), la forma de varios elementos del andropigio (gnatos, anellus, saccus y aedeagus) y, sobre todo, elementos del ginopigio (papilas anales; ductus seminalis, ductus bursae y corpus bursae). Por otra parte, el estudio genético realizado a partir de la única secuencia obtenida permite establecer una divergencia muy alta sobre el resto de las especies de Stathmopodidae de las que se conservan secuencias que permitan establecer comparaciones fiables. Los géneros monoespecíficos de Stathmopodidae más próximos, *Mylocera* y *Dolophrosynella*, se diferencian claramente del nuevo género *Lourdesiella* (Durrant, 1919; Turner, 1897).

En este estudio, la descripción de los estados inmaduros refuerza las diferencias observadas con otras especies de Stathmopodidae (Kasy, 1973; Koster & Sinev, 2003; Shen & Hsu, 2020, 2023; Shen et al. 2022; Sinev, 2015; Terada, 2016). Esa diferencia se observa tanto en su morfología como en su biología. Sin embargo, los estados inmaduros de *L. falcatum* comparten características comunes con los de *S. festaliella*. La única similitud apreciable, a simple vista, entre los imagos de ambas especies es la posición de las alas en reposo (semiabiertas) y la longitud de las antenas, que apenas llegan a la mitad del margen costal. Sin embargo, la morfología de huevos, orugas y crisálidas (en esta última fase, concretamente, por la presencia de una red protectora) han permitido establecer cierto parentesco. Sin embargo, *S. festaliella* (así como *S. erythriella* y *S. felicella*) también difiere claramente en sus caracteres morfológicos y genitalia de *L. falcatum* (Buszko & Skalski, 1980; Powell & Opler, 2009; VanDyk, 2023). Puede resultar de interés, en futuros estudios sobre la familia Stathmopodidae, que las tres especies del género *Schreckensteinia* anteriores, compartan con *L. falcatum* que son ectoparásitos especializados, aunque ésta última, en sentido estricto, no pueda considerarse como tal debido a que no ha provocado daños. Concretamente, *S. festaliella* de *Rubus* spp. (Rosaceae), *S. erythriella* de *Castilleja* spp. (Lamiaceae) y *S. felicella* de *Rhus* spp. (Anacardiaceae) (Powell & Opler, 2009; VanDyk, 2023). Ambos aspectos ecológicos (ectoparásitismo y mono-oligofagia) parecen aproximar filogenéticamente a las tres especies citadas con *L. falcatum*. De hecho, las divergencias genéticas observadas con la nueva especie (14,3 %) se diferencian muy poco de las obtenidas con los géneros más próximos de Stathmopodidae, *Dolophrosynella* y *Mylocera* (13,4 %).

Se desconoce la distribución real de la nueva especie. La hipótesis de que coincida con la de su único huésped conocido hasta ahora, *L. periclymenum* subsp. *hispánica*, resulta poco consistente Ésta abarca gran parte del centro y del sur de la Península Ibérica y el norte de África (Ruiz-Téllez & Devesa, 2007; Ruiz-Torre, 2006). También es posible que se subestime la capacidad de dispersión por el viento de estos pequeños insectos; sus alas estrechas, dotadas de largas fimbrias, les podrían permitir colonizar nuevos territorios, aunque se encuentren a gran distancia. Así mismo, tampoco se puede descartar que su presencia tenga un origen antrópico, debido a que actualmente se producen movimientos migratorios a grandes distancias que podrían facilitar la dispersión de ésta y otras especies. Por cualquiera de los dos últimos motivos expuestos (Shen et al. 2022) su distribución podría ser mucho mayor e incluso tener su origen en la región indo-australiana, zona geográfica que alberga la mayoría de las especies de Stathmopodidae.

El estudio genético determina una divergencia con el resto de las especies de Stathmopodidae superior al 13%. Por tanto, muy superior al umbral del 2%, aceptado actualmente para separar especies próximas dentro de la misma familia (Hausmann et al. 2011). Esa diferencia genética tan elevada, superior al 10% entre especies de la misma familia, se ha observado también en otros trabajos que se refieren a taxones recientemente descubiertos, dentro del ámbito mediterráneo (Sterling et al. 2023). Además, se comprueba que las secuencias genéticas (COI) en Lepidoptera, necesarias para separar taxones próximos, deben ser respaldadas por otros datos morfológicos (preferiblemente, de todas las fases de desarrollo), genitales y ecológicos. Las diferencias morfológicas descritas de todas las fases estudiadas, el estudio genital y genético permiten separar a la nueva especie de las otras pertenecientes a la familia Stathmopodidae y describir el nuevo género *Lourdesiella*.

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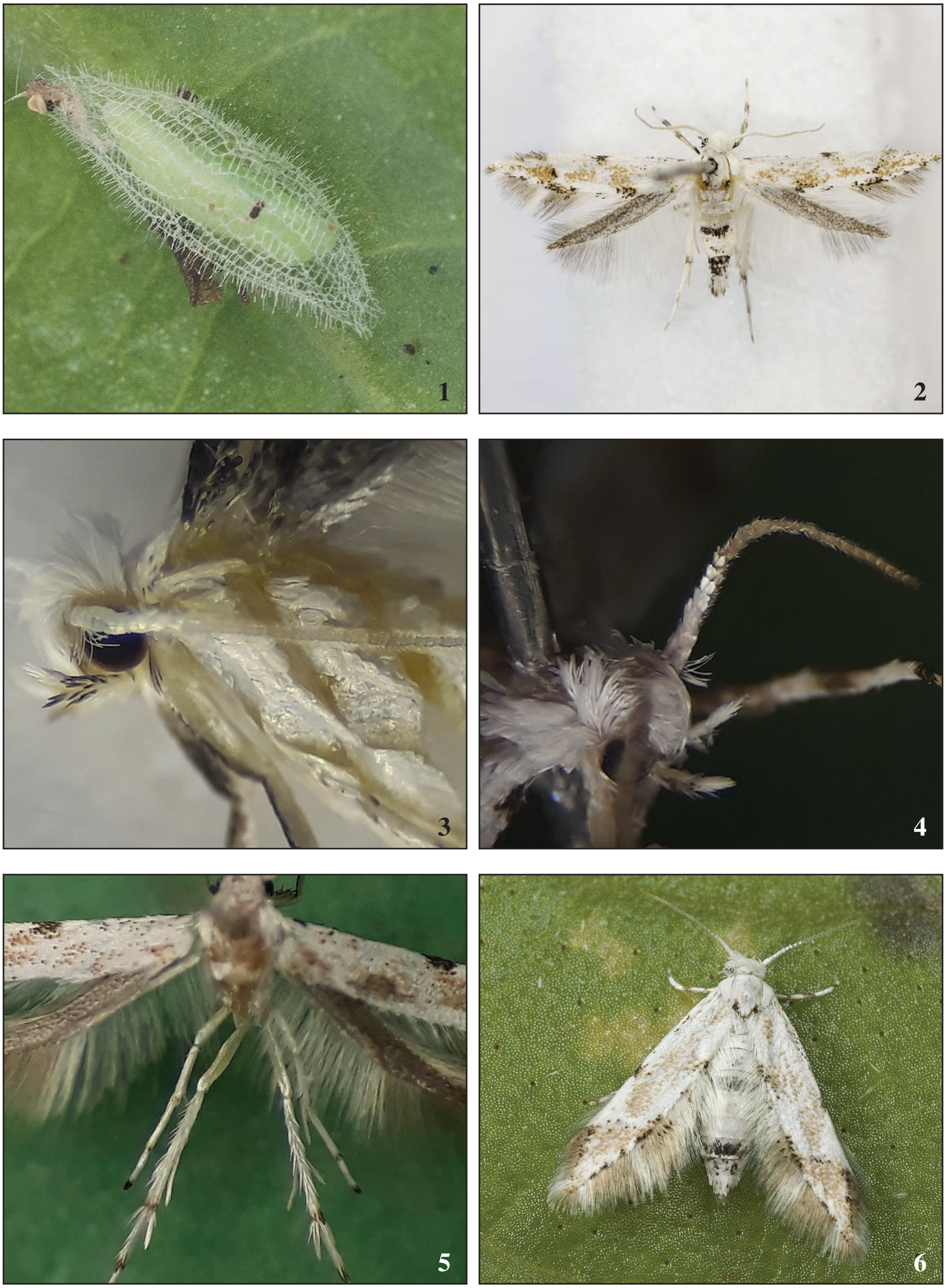
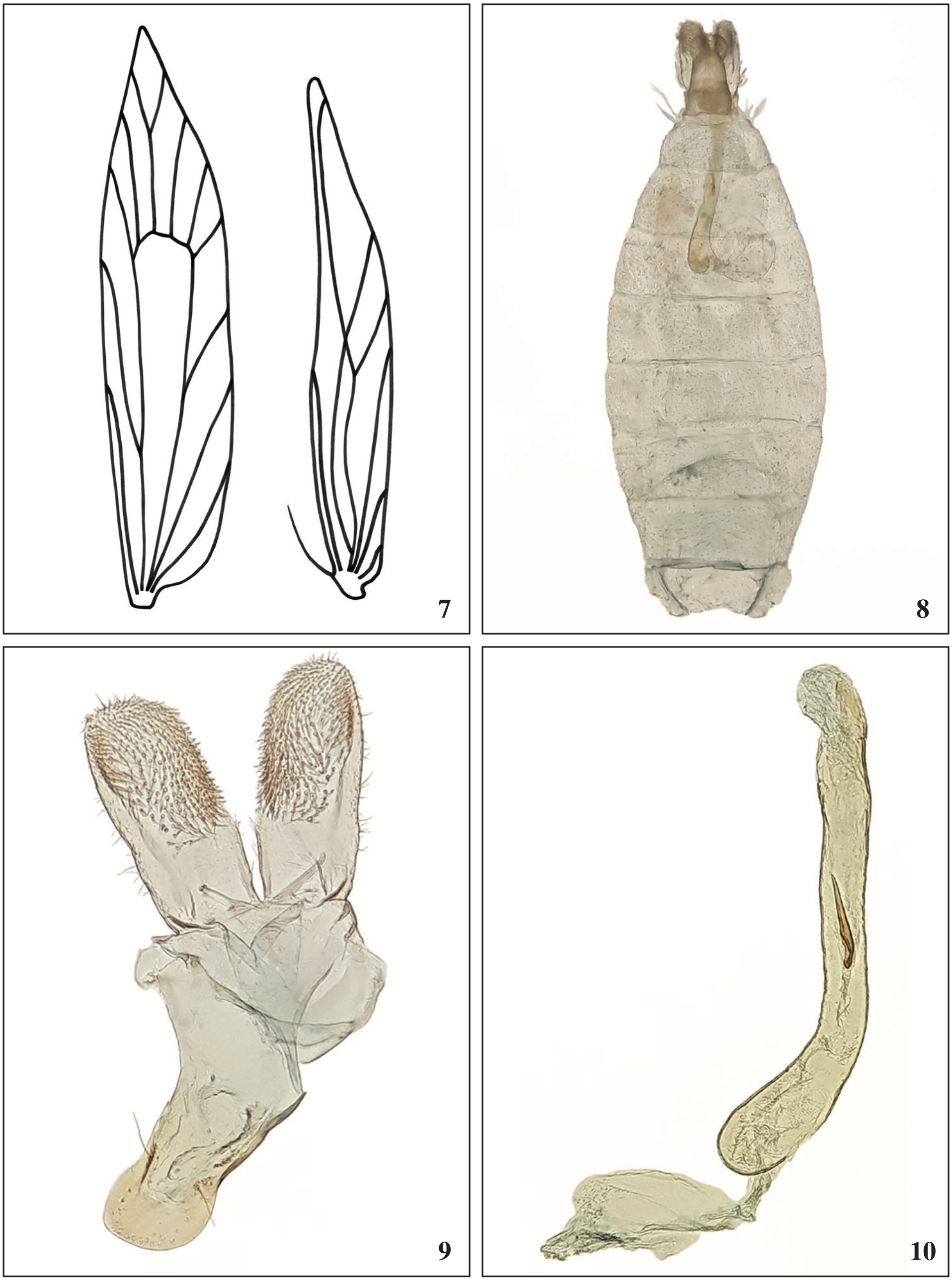
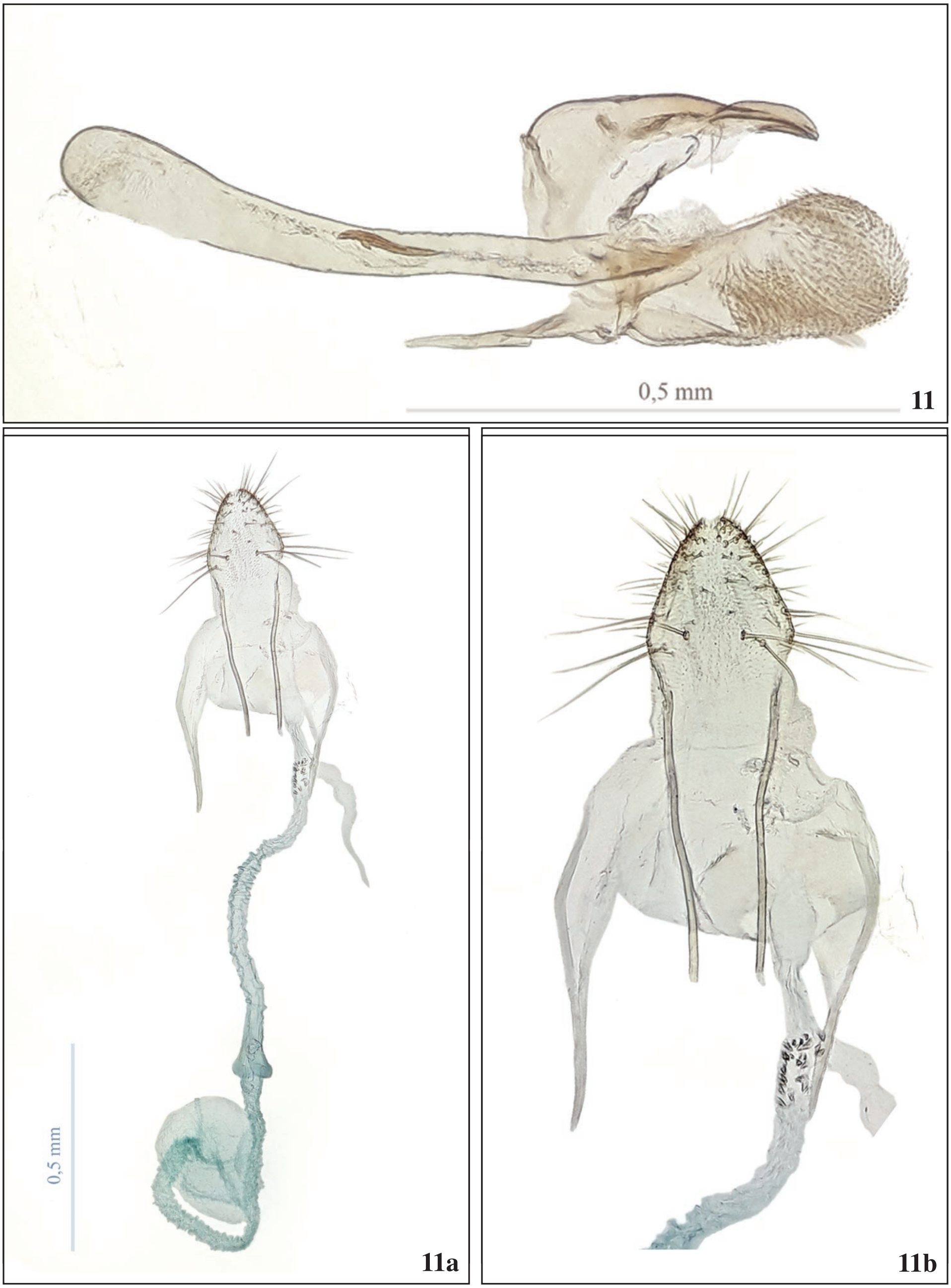


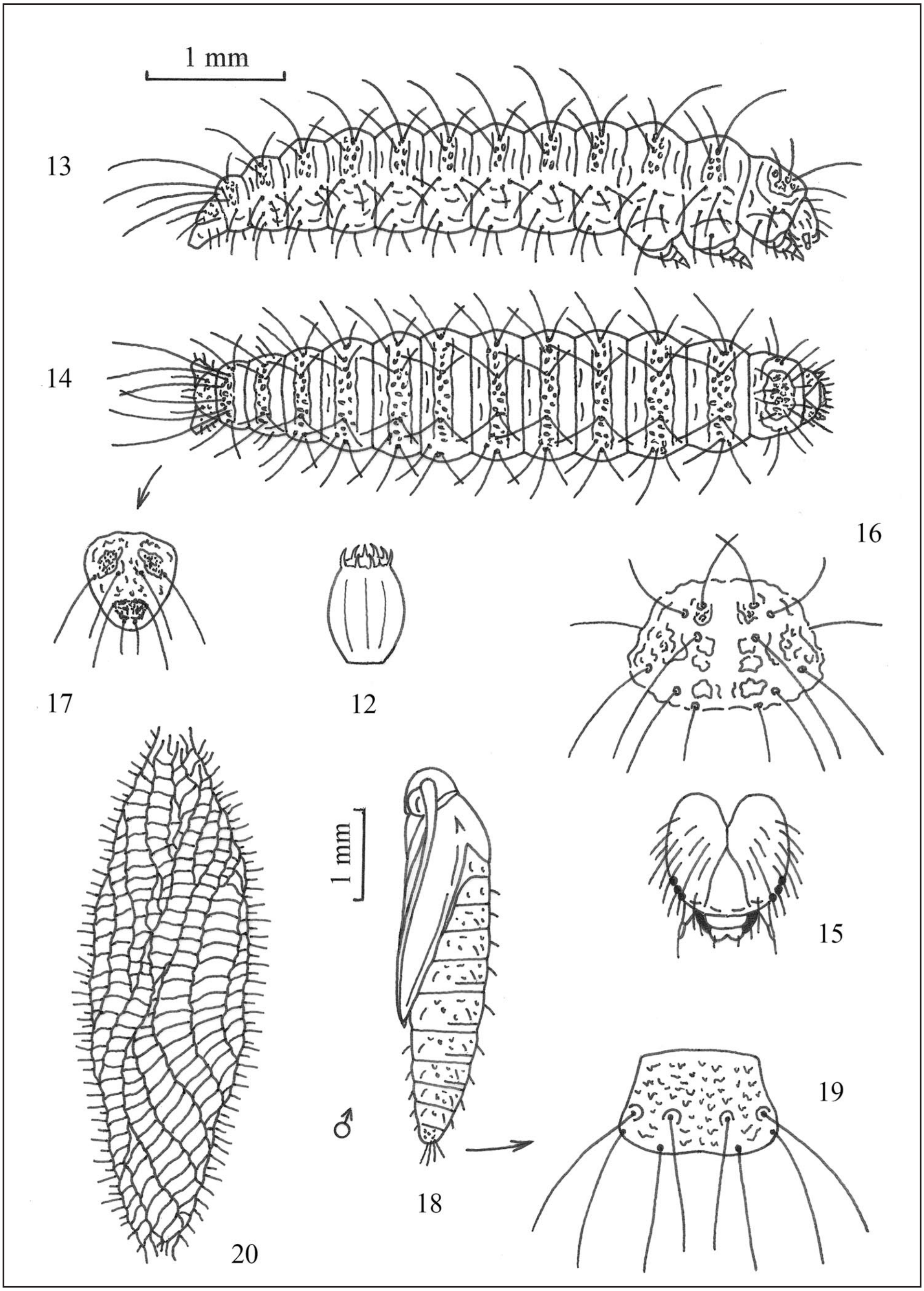
Figuras 1-6. *Lourdesiella* Bernabé, Huertas & Vives, sp. nov. **1.** Crisálida. **2.** Holotipo, Cortegana, Huelva, España. **3.** Paratipo palpos y escapo pectinado. **4.** Paratipo antena. **5.** Paratipo patas traseras. **6.** Paratipo.



Figuras 7-10. *Lourdesiella* Bernabé, Huertas & Vives, sp. nov. **7.** Venas alares. **8.** Paratipo abdomen. **9.** Holotipo andropigio. **10.** Aedeagus.



Figuras 11. *Lourdesiella* Bernabé, Huertas & Vives, sp. nov. **11.** Paratipo andropigio **11a.** Paratipo ginopigio. **11b.** Paratipo ginopigio detalle papilas anales.



Figuras 12-20. *Lourdesiella* Bernabé, Huertas & Vives, sp. nov. Estados inmaturos.

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Two new additions to the Lycaenidae of Uttar Pradesh, India (Insecta: Lepidoptera)

Ratindra Pandey, Taslima Sheikh & Rupak De

Abstract

The present study added two new records of Lycaenidae for the State of Uttar Pradesh, India. Both species, *Rapala pheretima petosiris* (Hewitson, [1863]) and *Flos adriana* (de Nicéville, [1884]) are new for the Uttar Pradesh.
Keywords: Insecta, Lepidoptera, Lycaenidae, *Flos, Rapala,* Dudhwa National Park, Uttar Pradesh, India.

Dos nuevas incorporaciones a los Lycaenidae de Uttar Pradesh, India (Insecta: Lepidoptera)

Resumen

El presente estudio añade dos nuevos registros de Lycaenidae para el Estado de Uttar Pradesh, India. Ambas especies, *Rapala pheretima petosiris* (Hewitson, [1863]) y *Flos adriana* (de Nicéville, [1884]), son nuevas para Uttar Pradesh.
Palabras clave: Insecta, Lepidoptera, Lycaenidae, *Flos*, *Rapala*, Dudhwa Parque Nacional, Uttar Pradesh, India.

Introduction

Rapala pheretima (Hewitson, [1863]) has only one subspecies found in India i.e., *Rapala pheretima petosiris* (Hewitson, [1863]). According to Gasse (2018), This subspecies is only seen in the Satpura Range in Southeast of Madhya Pradesh and Northern part of Chhattisgarh on rare occasions. it is found in the N Eastern Ghats in Orissa and S West Bengal. It is fairly widespread in the Himalayas up to 1500 m elevation, extending from the western limit of eastern Uttarakhand i.e., in Kumaon and all the way to Arunachal Pradesh in the east and entire Northeastern part of India excluding Mizoram; it is also reported from central, Northeastern, and Southeast part of Bangladesh. This subspecies is mentioned as *R. pheritimus,* in Evans (1932), and as *R. pheritima* in Cantlie (1962).

According to Varshney & Smetacek (2015), this subspecies is distributed from Uttarakhand to N. E. India. This species is historically known to occur from Odisha and Nepal eastward into the eastern Himalaya, NE India, Myanmar, Indochina, and Malay Peninsula (Cantlie 1962; Evans 1932; Wynter-Blyth, 1957).

According to Gasse (2018)*, Flos adriana* (de Nicéville, [1884]) is scarce in the Himalayas, reaching up to 1100 m in elevation from Eastern part of Uttarakhand towards Nepal, also seen in Sikkim, can be seen in Northern West Bengal, and also found in Bhutan up to Arunachal Pradesh State and Northeast India to south of the Brahmaputra i.e., is in eastern Assam as well as in Manipur. Evans (1932) names this species as *Amblypodia adriana,* o subspecies is listed under this species.

According to Varshney & Smetacek (2015), *Flos adriana* (de Nicéville, [1884]) is seen from Uttarakhand to Northeast region of India.

Materials and methods

On 15-VII-2023 authors surveyed the openly accessible portions of the Dudhwa National Park (28º29'24.7"N 80º38'44.5"E) in district Lakhimpur-Kheri, Uttar Pradesh which is at an altitude of around 150 m. During the Rhopalocera survey, two Rhopalocera species were seen and photographed i.e., *Flos adriana* (de Nicéville, [1884]) and *Rapala pheretima petosiris* (Hewitson, [1863]). Later on, again the area was explored on 16-VII-2023 and the two species were again spotted and photographed. The identification was done with the help of available literature like (Kehimkar, 2016; Evans, 1932). Were photographed with the help of DSLR Nikon D750 / Nikon D3100. No collection or killing was done. Distribution map has been prepared with ArcGIS 10.5 software by using original base map of India (Figure 5).

Study area

Dudhwa National Park (latitude 28º29'24.7"N and longitude 80º38'44.5"E) lies in district Lakhimpur-Kheri, Uttar Pradesh. It has an area of 490.29 square kilometers. The Dudhwa National Park is remnant of the formerly huge Terai forests of Uttar Pradesh's plains, and it runs parallel to the Himalayan foothills. It is distinguished by a complex of Sal forests, tall grasses, and marshes that are subject to annual flooding. It is one of India's most endangered ecosystems.

The National Park is a component of India's main Terai Protected Area Complex, the Dudhwa Tiger Reserve. The Terai-Bhabhar Biogeographic Subdivision of the Upper Gangetic Plains (7a) Biogeographic Province is represented only by the Dudhwa National Park and Tiger Reserve. According to Champion & Seth (1968), the region's vegetation is of the North Indian Moist Deciduous type. Some of the best Sal forests in the nation can be found there. There are many different types of plants and plant communities, according to current documentation. Many of these have conservation-related importance.

It is the only location in the nation where the nominate subspecies of the *Rucervus duvaucelii duvaucelii*, has a population that is capable of sustaining itself. The Reserve is home to five different deer species. There is a sizable *Pantera tigris* Linnaeus, 1758 population. There are some severely endangered species, like the *Caprolagus hispidus* (Pearson, 1839) and *Hubaropsis bengalensis* (Gmelin, 1789). The *Rhinoceros unicornis* (Linnaeus, 1758) population has been successfully introduced back into the wild in Dudhwa. The Wildlife (Protection) Act of 1972's Schedule-1 lists eleven reptile and amphibian species, nine bird species, and thirteen mammal species that are all thought to be endangered (Anonymous, 2006).

Results

Systematic position
Class Insecta Linnaeus, 1758
Order Lepidoptera Linnaeus, 1758
Family Lyacenidae Leach, 1815

Rapala pheretima petosiris (Hewitson, [1863]). (Figures 1-3)

Description male: Upper side brown with a rufous center, rear wings are tailed. The underwing side is a rufous-brown color. The anterior wing features two large spots before to the middle, while the posterior wing has two or three spots. Both wings are spanned beyond the center by a brown band that is slightly undulated on the anterior wing and bordered with white on both sides and is broken into spots on the posterior wing. A silver spot above the lobe, a large silvery blue spot between them, and the caudal mark on the posterior wing.

Female: The only difference between the female and the male on the underside is that the female's markings on the posterior wing are smaller and have a slightly different shape. The female is rufous brown above and blue-glossed.

Flos adriana (de Nicéville, [1884]) (Figure 4)

Description male: Upper side is a deep, glossy purple-blue with a 2 mm black border that widens to around 3 mm near the apex.

Female: It is with lighter purple on the topside and a wider border. Short tail on the hindwing.

Discussion: Two Lycaenidae species, *Flos adriana* (de Nicéville, [1884]) and *Rapala pheretima petosiris* (Hewitson, [1863]) are being reported along with photographs for the first time from the state of Uttar Pradesh. There is no previous record or sighting of these species from Uttar Pradesh State. The available literature, articles, papers, books were consulted to cross check the distribution of these species from this region of India and after checking the literature and current checklist on Butterflies of India by Paul Van Gasse (2018), an updated version, these two species are claimed as the first sightings and thus new addition to the Rhopalocera fauna of Uttar Pradesh. The current study coincides with the previous articles written on the same State, the previous articles (Behera, 2016; Bura et al. 2016; de Rye Phillipe, 1902; Director, 2015; (Kanaujia et al. 2015; Kumar, 2012, 2014, 2017, 2020; Kumar & Rana, 2018; (Kumar et al. 2016, 2020; Sarkar & Mandal, 2018; Sharma, 2007; Champion & Seth, 1968; Kumari & Sheikh, 2021; Sheikh et al. 2023; De et al. 2023). The current study is also correlated with the other studies which were done in other states and based on the format of those articles, the current article is prepared. The articles with similar work based on new records from other states (Sheikh & Parey, 2019a, 2019b; Sheikh & Malik, 2020; Parey & Sheikh, 2021; Riyaz et al. 2021; Sheikh, 2022; Sheikh & Parey, 2022; Gupta & Sheikh, 2021; Khan & Sheikh, 2022; Sheikh & Mishra, 2022; Dar et al. 2022a, 2022b; Sheikh & Hassan, 2023. Of the two, none is listed in the Wildlife (Protection) Act, 1972 (Anonymous, 2006) and the Wildlife (Protection) Amendment Act, 2022 (Anonymous, 2022).

Conclusion

From the point of view of a survey of Rhopalocera, the state of Uttar Pradesh is largely uncharted territory; more research could lead to a large number of new records and rediscoveries in the future. Since this is the first time the species have been reported from the State, they add to the State's known biodiversity.

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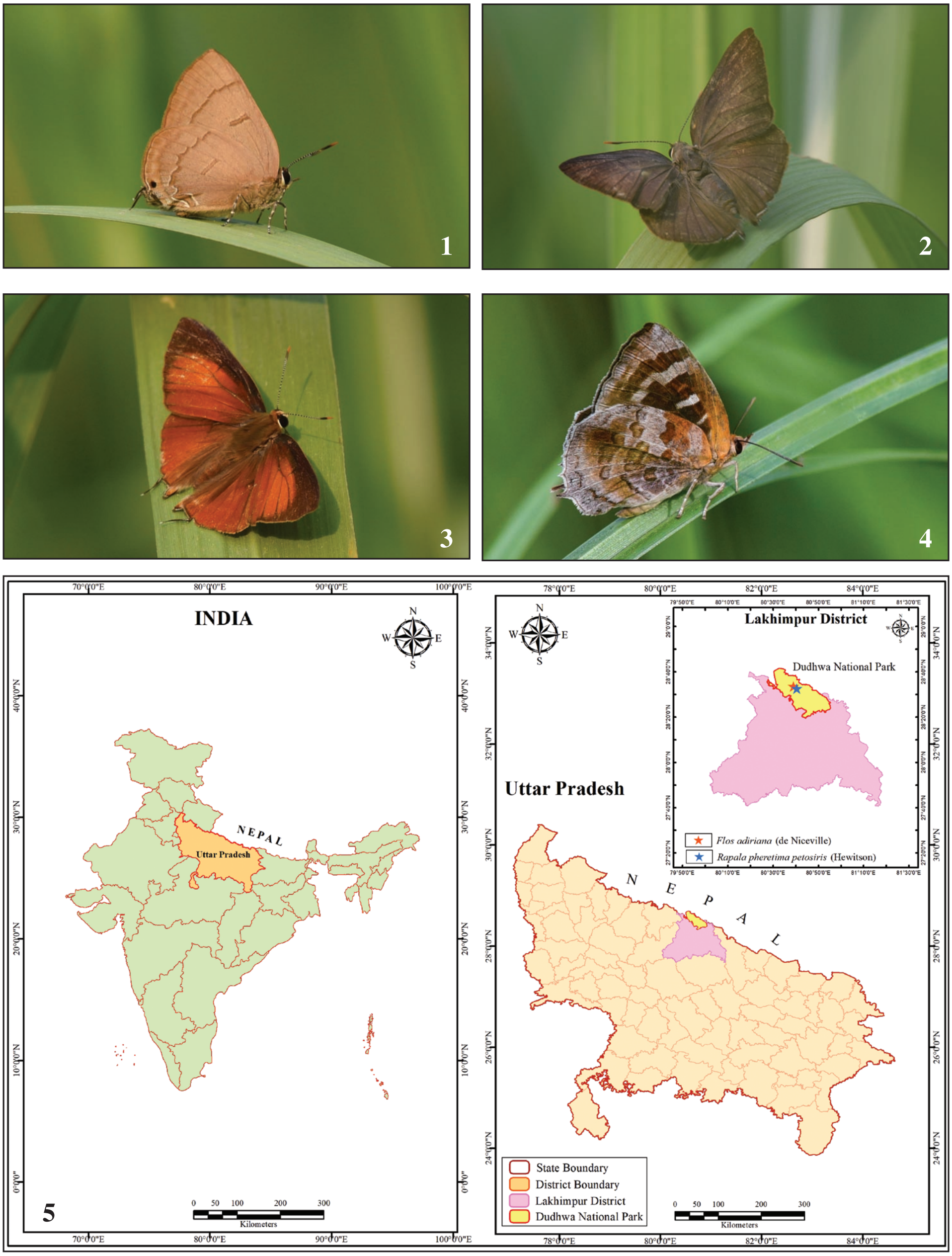

Figures 1-5. 1. *Rapala pheretima petosiris* (Hewitson, [1863]) (Underwing). **2.** *Rapala pheretima petosiris* (Hewitson, [1863]) (Upperwing Female). **3.** *Rapala pheretima petosiris* (Hewitson, [1863]) (Upperwing Male). **4.** *Flos adriana* (de Nicéville, [1884]) (Underwing). **5.** Map shows the location of *Rapala pheretima petosiris* Hewitson and *Flos adriana* de Nicéville.

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