

New data on the distribution of little-known Pyraloidea species from Croatia (Lepidoptera: Pyraloidea)

D. Gumhalter

Abstract

New records and data on distribution concerning 15 Pyraloidea species (Pyralidae, Crambidae) little-known in Croatia are given. The majority of the specimens were collected around the Velebit area, or lesser-studied areas of Continental Croatia, with other material collected in Dalmatia. Three species were reported for the first time from the Mountainous and the Continental geographic area. Within these studied regions, one species was recorded for the first time after more than 150 years, six species after more than 120 years, four species after more than 100 years and five species after almost 70 years. Altogether 13 out of the total of 15 species were recorded for the first time in recent investigations from Croatia: one after an absence of 120 years, three species for the first time in 70 years and nine after almost 20 years.

KEY WORDS: Lepidoptera, Pyraloidea, distribution, faunistic, Dalmatia, Velebit, Croatia.

Nuevos datos sobre la distribución de especies poco conocidas de Pyraloidea de Croacia (Lepidoptera: Pyraloidea)

Resumen

Se dan nuevos registros y datos sobre la distribución concerniente a 15 especies de Pyraloidea (Pyralidae, Crambidae) poco conocidas en Croacia. La mayoría de los especímenes fueron colectados en los alrededores del área de Velebit, o áreas menores premeditadas de Croacia continental, con otro material colectado en Dalmacia. Tres especies fueron registradas, por primera vez, del área geográfica Montañosa y Continental. Dentro de estas regiones premeditadas, una especie fue registrada por primera vez después de más de 150 años, seis especies de más de 120 años, cuatro especies de más de 100 años y cinco especies de más de 70 años. En total 13 de las 15 especies fueron citadas en las recientes investigaciones en Croacia: una después de 120 años, tres especies por primera vez en 70 años y nueve después de casi 20 años.

PALABRAS CLAVE: Lepidoptera, Pyraloidea, distribución, faunística, Dalmacia, Velebit, Croacia.

Introduction

The Pyraloidea, comprising the families Crambidae and Pyralidae, is the third-largest superfamily of the order Lepidoptera. With over 16.300 described species they represent one of the most diverse lineages of Lepidoptera (NUSS *et al.*, 2003-2020). According to LÉGER *et al.* (2021), the family Crambidae currently includes 10.347 described species and the family Pyralidae 6.032 species worldwide. About 850 species of Pyraloidea can be found in Europe (KARSHOLT & RAZOWSKI, 1996) out of which 396 are present in the fauna of Croatia, 218 taxa from the family Crambidae and 178 from the family Pyralidae (GUMHALTER, 2021). This represents about 47% of the overall European Pyraloidea fauna.

According to LÉGER *et al.* (2021), Pyraloidea exhibit an unprecedented spectrum of ecological adaptations in larval life habits, including adaptations to freshwater habitats (Acentropinae) or extreme dry environments such as deserts (some Phycitinae). The larval food spectrum ranges from detritus, lichens and mosses over lycopods and ferns to conifers and mono- and eudicotyledonous plants. Some larvae are scavengers, feeding on stored products and causing economic damage.

Due to its geographic position through three biogeographic zones, Croatia has a great biological diversity (Fig.1). Between the Mediterranean and Eurosibirian-Northamerican biogeographic zone, lies the mountainous karst area of Central Croatia. Some parts of it belong to the Croatian part of the European “Alpine biogeographical region” (EEA, 2012) and present a broad transitional zone of Continental and Mediterranean faunal elements (TVRTKOVIĆ *et al.*, 2015).

Although the Croatian Pyraloidea fauna is very diverse if compared to the neighbouring countries Austria, Hungary, Italy, and Slovenia (GUMHALTER, 2020), not all Croatian regions have been equally studied in the past.

According to GUMHALTER (2019a), the best-studied part of Croatia is the coast (Mediterranean biogeographic region), with 95% of all recorded Pyraloidea species occurring. Altogether 49% of all Pyraloidea species from Croatia have been recorded in the Continental and only 31% in the Mountainous biogeographic region.

In this paper, new data on the distribution of species previously only recorded historically within the specified region of Croatia are presented. Altogether 15 species were recorded for the first time in recent investigations from the specified certain region. Three species were recorded for the first time from the regions of Continental and Mountainous Croatia. Many records represent the first ones after many decades, sometimes after more than 120 or even 150 years from that specific region. Besides, four species were recorded for the first time from Croatia after 120 and 70 years, and nine species after almost two decades.

Material and methods

This study is based completely on the material deposited in the author’s private collection of Lepidoptera. The specimens were collected over a period of six years as adult moths by light trapping or at day with a net. The majority of the specimens were collected around the Velebit area, the largest mountain range in Croatia located in the least-studied region of the country, or lesser-studied areas of Continental Croatia, with other material collected in Dalmatia, the southernmost and best-studied region of Croatia.

Identification of all species based on wing pattern was conducted according to SLAMKA (2006, 2008, 2013, 2019). Dissections of genitalia were performed where necessary, by the standard procedure of maceration of abdomens in potassium hydroxide. The genitalia slides are deposited together with the specimens in the author’s private collection (coll. Gumhalter).

The systematic presentation follows Fauna Europaea (NUSS *et al.*, 2003-2020).

Results and discussion

List of species

PYRALOIDEA
PYRALIDAE
Phycitinae

Genus *Acrobasis* Zeller, 1839

Acrobasis legatea (Haworth, 1811)

Material examined: Dalmatia, island Brač, Nerežišća, 355 m.a.s.l., 43°20'01.1"N 16°34'33.5"E, 1

♀, 31-VIII-2016, D. Gumhalter leg.; Dalmatia, Mount Biokovo, Sveti Jure, 1700 m.a.s.l., 43°20'21.0"N 17°3'14.3"E, 1 ♂, 20-VIII-2019, D. Gumhalter leg.

Distribution: Following KARSHOLT & RAZOWSKI (1996), the species is distributed throughout the Mediterranean and some parts of Europe.

Remarks: The newest records of *A. legatea* from Croatia are from the island Krk (HABELER, 2003). The last records from Dalmatia originate from 1921 (SCHAWERDA, 1921) so these findings are the first ones for that region after 100 years (Fig. 2).

Genus *Ancylosis* Zeller, 1839

Ancylosis cinnamomella (Duponchel, 1836)

Material examined: Dalmatia, Mount Biokovo, 550 m.a.s.l., 43°15'35.8"N 17°05'24.7"E, 1 ♂, 27-VIII-2019, D. Gumhalter leg.

Distribution: According to the Lepiforum website (www.lepiforum.org), the species is distributed in Austria, Bosnia and Herzegovina, Germany, Montenegro, Spain and Ukraine.

Remarks: There are many old records from Croatia, all from the coastal region. The newest records originate from the island of Krk (HABELER, 2003). The last records from the mountains originate from 1896 (ABAFI-AIGNER *et al.*, 1896) and Dalmatia from 1942 (KLIMESCH, 1942). Therefore, this record represents the first one from the Croatian mountains in more than 120 years and Dalmatia in almost 70 years (Fig. 3).

Genus *Selagia* Hübner, [1825]

Selagia argyrella ([Denis & Schiffermüller], 1775)

Material examined: Velebit area, Lika, Grabovača, 670 m.a.s.l., 44°38'33.6"N 15°21'46.6"E, 2 ♂♂, 3 ♀♀, 23-VIII-2016, D. Gumhalter leg.

Distribution: According to SLAMKA (2019), the species is widespread in Europe, excluding Ireland and the majority of the Mediterranean islands. It was recently recorded as a migrant from Sweden. Eastwards it is distributed to Russia and Central Asia.

Remarks: As the last records from the Croatian Mountainous area originate from the end of the 19th century (MANN, 1867; ABAFI-AIGNER *et al.*, 1896), these records represent the first ones after more than 120 years for that geographic region. Since the species was not recorded after that, these findings also represent the first ones from Croatia after more than 120 years (Fig. 4).

CRAMBIDAE

Crambinae

Genus *Agriphila* Hübner, [1825]

Agriphila latistria (Haworth, 1811)

Material examined: Dalmatia, island Brač, Vidova gora, 700 m.a.s.l., 43°17'37.1"N 16°37'26.6"E, 1 ♂, 1 ♀, 27-VIII-2016, D. Gumhalter leg.

Distribution: According to SLAMKA (2008), the species is distributed in West and South Europe, southern Norway, southern Sweden but data from Hungary are doubtful. It is also distributed in Algeria, Asia Minor, and Iraq.

Remarks: The species is mentioned for Croatia only in historical literature: WOCKE (1871), REBEL (1891, 1914), ABAFI-AIGNER (1903) and KLIMESCH (1942). Both SLAMKA (2008) and PLANT & JAKŠIĆ (2018) cite the same sources. As the last record from Croatia originates from Dalmatia 1942 (KLIMESCH, 1942), the present findings represent the first records in almost 70 years for both, Croatia and Dalmatia.

Genus *Chrysocrambus* Bleszyński, 1957*Chrysocrambus cassentiniellus* (Herrich-Schäffer, 1848)

Material examined: Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45°46'38.6"N 15°55'04.5"E, 1 ♂, 30-V-2016, D. Gumhalter leg.; Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45°46'38.6"N 15°55'04.5"E, 1 ♂, 1 ♀, 24-VI-2016, D. Gumhalter leg., gen. prep. 17, 18, 19-2021 D. Gumhalter.

Distribution: According to SLAMKA (2008), the species is distributed in South Europe, the South-Eastern part of Central Europe, Transcaucasia, Asia Minor, Syria, Jordan, Iran and Central Asia.

Remarks: There are several old records of *C. cassentiniellus* from the mountains and the coast, the newest one being from Dalmatia from 1956 (NEUSTETTER, 1956). As there are no records at all from the Continental part, these findings represent the first ones from that geographic region and for Croatia after more than 70 years.

Genus *Chrysoteuchia* Hübner, [1825]*Chrysoteuchia culmella* (Linnaeus, 1758)

Material examined: Velebit area, Bojinac, 663 m.a.s.l., 44°20'57.0"N 15°25'56.1"E, 1 ♂, 28-V-2016, D. Gumhalter leg.

Distribution: According to SLAMKA (2008), the species is widely distributed from Europe to Japan.

Remarks: The species was reported from Croatia many times in historical literature. The newest records originate from the island of Krk (HABELER, 2003) and Continental Croatia (KRČMAR, 2014; KOREN, 2018). The last records from the Mountainous region are from the end of the 19th century (MANN, 1867; ABAFI-AIGNER *et al.*, 1896) so this finding represents the first one after more than 120 years.

Genus *Crambus* Fabricius, 1798*Crambus pascuellus* (Linnaeus, 1758)

Material examined: Dalmatia, island Brač, Nerežišća, 355 m.a.s.l., 43°20'01.1"N 16°34'33.5"E, 1 ♂, 31-VIII-2016, D. Gumhalter leg.; Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45°46'38.6"N 15°55'04.5"E, 1 ♂, 1 ♀, 09-VI-2019, D. Gumhalter leg., gen. prep. 24, 25-2021 D. Gumhalter.

Distribution: The species is widely distributed in Europe, also known from Iceland, as well as from Japan and North America (SLAMKA, 2008).

Remarks: There is only one recent Croatian record of *C. pascuellus*, which originates from the island of Krk (HABELER, 2003). As the last record from Continental Croatia originates from the year 1925 (KOČA, 1925) and Dalmatia from 1942 (KLIMESCH, 1942), these findings represent the first records from Continental Croatia in almost 100 years and Dalmatia in almost 70 years.

Genus *Pediasia* Hübner, [1825]*Pediasia luteella* ([Denis & Schiffermüller], 1775)

Material examined: Velebit area, Lika, Smiljan, 559 m.a.s.l., 44°33'55.1"N 15°18'52.1"E, 1 ♂, 24-VIII-2016, D. Gumhalter leg., gen. prep. 15-2021 D. Gumhalter.

Distribution: SLAMKA (2008) states that the species is distributed in Europe, excluding the northern parts; it is evidently absent from Spain, Great Britain, Ireland, The Netherlands and Denmark. It is also present in Asia Minor, south Kazakhstan, Central Asia, southern Siberia and Mongolia.

Remarks: The last Croatian records of this species are from HABELER (2003) from the island of Krk. Besides these, only historical records exist, mainly from the coast. The only records from the mountainous region are from 1867 (MANN, 1867) and 1896 (ABAFI-AIGNER *et al.*, 1896). This finding is the first one from this geographic region of Croatia in more than 120 years.

Genus *Platytes* Guenée, 1845*Platytes cerussella* ([Denis & Schiffermüller], 1775)

Material examined: Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45°46'38.6"N 15°55'04.5"E, 4 ♂♂, 11-VIII-2016, D. Gumhalter leg.; Continental Croatia, Zagreb, Cmrok, 211 m.a.s.l., 45°50'00.3"N 15°58'29.9"E, 1 ♀, 09-VI-2019, D. Gumhalter leg.

Distribution: SLAMKA (2008) states that the species is distributed in Europe, excluding the northern parts. *P. cerussella* is also present in Turkey, Armenia and south Siberia.

Remarks: The last Croatian records are from HABELER (2003) from the island of Krk. Besides these, only old records persist, the last one being from Dalmatia from 1921 (SCHAWERDA, 1921) and the mountainous region from 1867 (MANN, 1867). Until now, the species was not reported from Continental Croatia.

Evergestinae

Genus *Evergestis* Hübner, [1825]*Evergestis politalis* ([Denis & Schiffermüller], 1775)

Material examined: Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45°46'38.6"N 15°55'04.5"E, 1 ♂, 1 ♀, 30-V-2016, D. Gumhalter leg.

Distribution: Following the Lepiforum website, the species was reported from Austria, Switzerland, Italy, Spain, France and Romania.

Remarks: There are no newer records from Continental Croatia since 1904 (REBEL, 1904), so these findings represent the first ones after almost 120 years. The last record from Croatia is from 1942 (KLIMESCH, 1942) and so these findings also represent the first ones in almost 70 years for that region and Croatia overall.

Pyraustinae

Genus *Anania* Hübner, [1823]*Anania coronata* (Hufnagel, 1767)

Material examined: Velebit area, Lika, Ličko Cerje, 565 m.a.s.l., 44°21'00.2"N 15°41'18.1"E, 1 ♂, 07-IX-2016, D. Gumhalter leg., gen. prep. 26-2021 D. Gumhalter.

Distribution: According to SLAMKA (2013), it is widespread in Europe.

Remarks: Although the species was reported throughout recent surveys from Continental and Mediterranean Croatia (KOREN *et al.*, 2015; KOREN, 2018; GUMHALTER, 2019a), this record from the Velebit area represents the first one from the Croatian Mountainous region since the end of the 19th century (MANN, 1867; REBEL, 1895; ABAFI-AIGNER *et al.*, 1896).

Anania stachydalis (Germar, 1821)

Material examined: Velebit area, Lika, Ličko Cerje, 565 m.a.s.l., 44°21'00.2"N 15°41'18.1"E, 1 ♂, 07-IX-2016, D. Gumhalter leg., gen. prep. 23-2021 D. Gumhalter.

Distribution: According to SLAMKA (2013), it is distributed in Europe, except in the North.

Remarks: Although the species was reported throughout recent surveys from Continental and Mediterranean Croatia (HABELER, 2005; KOREN *et al.*, 2015; KOREN, 2018), this record represents the first one from the Croatian Mountainous region. Following SLAMKA (2013), *A. stachydalis* is a local species (SLAMKA, 2013) so it is possible that it is also local in Croatia. Further reports from Croatia would contribute to the knowledge of its distribution in that country.

Spilomelinae

Genus *Diasemia* Hübner, [1825]

Diasemia reticularis (Linnaeus, 1761)

Material examined: Velebit area, Lika, Grabovača, 670 m.a.s.l., 44°38'33.6"N 15°21'46.6"E, 2 ♂♂, 23-VIII-2016, D. Gumhalter leg.

Distribution: According to SLAMKA (2013), it is distributed in Europe, in Britain it is recorded as a scarce migrant in the South. Elsewhere, it is recorded in Turkey, Georgia, Central Asia, South Siberia, China, India, Amur, Primorye, Kuriles and Japan.

Remarks: Although it is not a rare species, it was not recorded many times in recent investigations. The newest records originate from Continental Croatia (KOREN, 2018) and island Krk (HABELER, 2003), but from the mountains, there are no records after 1867 (Mann). In addition, the last findings from Dalmatia are from the year 1921 (SCHAWERDA, 1921). Therefore, these findings represent the first ones from the mountains in more than 150 years and from Dalmatia after almost 100 years.

Genus *Antigastra* Lederer, 1863

Antigastra catalaunalis (Duponchel, 1833)

Material examined: Dalmatia, island Brač, Sutivan, 10 m.a.s.l., 43°23'11.8"N 16°28'03.7"E, 1 ♂, 01-IX-2018, D. Gumhalter leg.; Dalmatia, Mount Biokovo, Gornja Podgora, 270 m.a.s.l., 43°14'21.4"N 17°05'21.4"E, 1 ♀, 21-VIII-2019, D. Gumhalter leg.

Distribution: According to SLAMKA (2013), the species is distributed in the Tropics and throughout the Mediterranean in dry habitats. It has been recorded as a migrant in England, Ireland, Belgium, Holland and southern Sweden. It also migrates sporadically to southern parts of Central Europe. Besides this, it is distributed in Africa, Turkey, Syria, Iran, India, Hong Kong, Costa Rica, Australia, Japan and South America (Colombia).

Remarks: The species was reported from Croatia several times in historical literature, but the newest record of this species originates from Krk (HABELER, 2003). The last record from Dalmatia is from the year 1942 (KLIMESCH, 1942) so these findings represent the first ones from this region after almost 70 years.

Udea fulvalis (Hübner, [1809])

Material examined: Mount Biokovo, Gornja Podgora, 270 m.a.s.l., 43°14'21.4"N 17°05'21.4"E, 1 ♂, 28-V-2016, D. Gumhalter leg., gen. prep. 35-2021 D. Gumhalter.

Distribution: According to SLAMKA (2013), it is distributed in Europe, except the North. It was mentioned as a scarce migrant to England and Wales. Also reported from Turkey, North Africa, Afghanistan, India, Sri Lanka, South Siberia and Primorye.

Remarks: The newest reports from Croatia are from island Krk (HABELER, 2003). The last time the species was reported from Dalmatia was in 1921 (SCHAWERDA, 1921). Therefore, this record represents the first one for that region after almost 100 years (Fig. 5).

Discussion

Many historical faunistic papers published on Croatian Lepidoptera throughout the last two centuries included Pyraloidea species (GALVAGNI, 1902; MANN, 1857, 1867, 1869; REBEL, 1891, 1895, 1903, 1904, 1917; SCHAWERDA, 1921, etc.). These publications were summarised by PLANT & JAKŠIĆ (2018). However, the majority of historic publications relate to northern parts of the Croatian coast, Istria (e.g. MANN, 1857; REBEL, 1913, 1914; STAUDER, 1914; SCHAWERDA, 1920; PROHASKA, 1922; etc.) or to southern parts of the Croatian coast, Dalmatia (e.g. MANN, 1867;

1869; REBEL, 1891; GALVAGNI, 1902; REBEL, 1917, 1919; SCHAWERDA, 1921; KLIMESCH, 1942; etc.). Mountain ranges and continental areas seem to be poorly represented in the historic literature and little was published that included micromoths from such areas (e.g. MANN, 1867; REBEL, 1895; ABAFI-AIGNER *et al.*, 1896, 1903; etc.).

However, compared to other Microlepidoptera families, the Pyraloidea belong to the better-known families in Croatia. Over the last two decades, many surveys were undertaken to contribute to the knowledge of the Croatian Pyraloidea fauna (KOREN *et al.*, 2015; GUMHALTER *et al.*, 2018; KOREN, 2018; KOREN & ZADRAVEC, 2018; GUMHALTER, 2020; GUMHALTER *et al.*, 2020; GUMHALTER & KUČINIĆ, 2021; GUMHALTER, 2021) and a first checklist was published in 2019a (GUMHALTER, 2019). Because of the continuous faunal additions, the list of species occurring in Croatia was updated twice (GUMHALTER, 2019b, 2021), suggesting that the Pyraloidea fauna of that country is far from sufficiently known. This applies even to the best-studied Mediterranean biogeographic region, since the last additions to the Croatian Pyraloidea fauna originate from the coastal parts of the country (e.g. KOREN & KULIJER, 2020; GUMHALTER, 2021; KOREN, 2021; etc.).

Although recently, a paper was published covering the Croatian Pyraloidea from Continental Croatia (GUMHALTER *et al.*, 2020) and Mount Biokovo (GUMHALTER & KUČINIĆ, 2021), the majority of recent literature continued to deal with the Croatian coast or covered only newly recorded species. Hence, it is no surprise that the distribution and conservation status of Pyraloidea in the Continental and Mountainous region is insufficiently known. The few recent investigations conducted in these two regions resulted in a lack of information on the occurrence of many species, even for widely distributed and very common species. Many have been reported only in old historical publications, which were sometimes even older than 100 years. As these species have not been reconfirmed throughout recent surveys, their current status in a specific region or their distribution in Croatia are unclear.

The majority of the reported species are regarded as being common, cosmopolitan, or widespread. Nonetheless, as there is a lack of recent sufficient investigation, these species have not been recorded in surveys conducted over the last few decades, sometimes even over a period of more than 70, 120 or 150 years. Consequently, their distribution in Croatia or some Croatian regions remained unclear.

CONTINENTAL BIOGEOGRAPHIC REGION

The most interesting records concern the findings of two species that were reported for the first time from that biogeographic region. As the species *C. cassentiniellus* and *P. cerussella* were recorded for the first time from Continental Croatia this new data widens our knowledge of the distribution of these species in that country.

The species *E. politalis* was recorded for the first time after more than 120 years from the Continental part of Croatia. *C. pascuellus* was reported for the first time in 100 years from Continental Croatia. Both species were not recorded for an extended period, so these reports contribute to the knowledge of the recent Pyraloidea fauna of this region.

MOUNTAINOUS BIOGEOGRAPHIC REGION

The species *A. stachydalis* was recorded for the first time from the Mountainous biogeographic region. This new data widens our knowledge of the distribution of this species in Croatia.

The species *D. reticularis* was recorded for the first time in more than 150 years from the Croatian mountains. For five species, these records represent the first ones from the Mountainous part of the country after more than 120 years: *A. cinnamomella*, *S. argyrella*, *C. culmella*, *P. luteella* and *A. coronata*. These recent findings reconfirm that the above-mentioned species are still present in the Mountainous biogeographic region of Croatia.

MEDITERRANEAN BIOGEOGRAPHIC REGION

The species *A. legatea*, *D. reticularis* and *U. fulvalis* were reported for the first time in 100 years from Dalmatia, which is located in the Mediterranean biogeographic region of Croatia. Another five species were recorded for the first time in 70 years from Dalmatia: *A. cinnamomella*, *A. latistria*, *C. pascuellus*, *E. politalis* and *A. catalaunalis*. Although the biogeographic region of Mediterranean Croatia is the best-studied region of the country, many old records were not reconfirmed so these findings contribute to the knowledge of Dalmatian pyraloid moth fauna.

Also interesting are the findings of some species, which have not been reported from Croatia in recent investigations.

The record of the species *S. argyrella* is the first one from Croatia in 120 years and the record of *A. latistria*, *C. cassentiniellus* and *E. politalis* are the first ones from Croatia in almost 70 years. Altogether eight species were reported the last time in 2003 (HABELER, 2003) and these findings represent the first ones in almost two decades: *A. legatea*, *A. cinnamomella*, *C. culmella*, *C. pascuellus*, *P. luteella*, *P. cerusella*, *A. catalaunalis* and *U. fulvalis*.

These findings reconfirm the occurrence of the above-mentioned species in the Croatian Pyraloidea fauna; for some of them were recorded for the last time at the end of the 19th century or in the middle of the 20th century and no recent information on their status in Croatia or that region was available.

One of the consequences of global warming is a change in climate and this is likely to generate changes in habitat structure with a consequential effect on insect biodiversity. Some species may disappear from a region or a whole country. With this in mind, it is important to create species inventories and to reconfirm historical records where possible. The present study updates the databank for some species in some neglected areas, although it is clear that further research is likely to be an ongoing requirement.

Acknowledgements

I am very grateful to Colin W. Plant for linguistic corrections and revision. His helpful comments improved the quality of the manuscript. I would also like to thank František Slamka for confirming the correct determination of the species *A. legatea* and *A. cinnamomella*.

BIBLIOGRAPHY

- ABAFI-AIGNER, L., PAVEL, J. & UHRYK, F., 1896.– *Fauna Regni Hungariae. Lepidoptera*: 82 pp. Regia Societas Scientiarum Naturalium Hungarica, Budapest.
- ABAFI-AIGNER, L., 1903.– Adálek Microlepidopteráink ismeretéhez.– *Rovartani lapok*, **10**(7): 133-137.
- EUROPEAN ENVIRONMENT AGENCY (EEA), 2012.– Biogeographical regions in Europe. Available from: <http://www.eea.europa.eu/data-and-maps/figures> (accessed 6 April 2021).
- GALVAGNI, E., 1902.– Beiträge zur Kenntnis der Fauna einiger dalmatinischer Inseln.– *Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft*, **52**: 362-380.
- GUMHALTER, D., 2019a.– First checklist of pyraloid moths (Lepidoptera: Pyraloidea) in Croatia.– *Zootaxa*, **4604**(1): 059-102. <https://doi.org/10.11646/zootaxa.4604.1.3>.
- GUMHALTER, D., 2019b.– A revised checklist of pyraloid moths (Lepidoptera: Pyraloidea) from Croatia.– *Natura Croatica*, **28**(2): 271-288. <https://doi.org/10.20302/NC.2019.28.20>.
- GUMHALTER, D., 2020.– *Biodiversity, ecological and biogeographical features of Pyralidae and Crambidae (Insecta, Lepidoptera) in three Croatian climate regions*: 369 pp. PhD Dissertation, University of Zagreb, Zagreb. (in Croatian).
- GUMHALTER, D., 2021.– *Psorosa mediterranea* (Amsel, 1954) (Lepidoptera: Pyralidae) - A new species for the Croatian Pyraloid moth fauna, with an updated checklist.– *Natura Croatica*, **30**(1): 37-52. <https://doi.org/10.20302/NC.2021.30.4>.
- GUMHALTER, D., KUČINIĆ, M., VAJDIĆ, M., PEROVIĆ, F., PELIĆ-FIXA, D. & LUKAČ, G., 2018.– New

- records of the crambid moth *Euclasta splendidalis* (Herrich-Schäffer, [1848]) (Lepidoptera: Crambidae) in Croatia with notes on Pyraloidea fauna from the Neretva Valley.– *Natura Croatica*, **27**(1): 225-232. <https://doi.org/10.20302/NC.2018.27.12>.
- GUMHALTER, D., KUČINIĆ, M. & ŠAŠIĆ, M., 2020.– Data on pyraloid moth specimens (Lepidoptera: Pyraloidea) held in the collections of CNHM in Zagreb, Croatia.– *Zootaxa*, **4895**(1): 037-066. <https://doi.org/10.11646/zootaxa.4895.1.2>.
- GUMHALTER, D. & KUČINIĆ, M., 2021.– Contribution to the knowledge of the Croatian Pyraloidea fauna. Species reported from Biokovo Natural Park (Insecta: Lepidoptera).– *SHILAP Revista de lepidopterología*, **49**(193): 65-83.
- HABELER, H., 2003.– *Die Schmetterlinge der Adria-Insel Krk. Eine ökofaunistische Studie*: 221 pp. Buchreihe zur Entomologie Esperiana, Graz.
- KARSHOLT, O. & RAZOWSKI, J., 1996.– *The Lepidoptera of Europe (A Distributional Checklist)*: 280 pp. Apollo Books, Stenstrup.
- KLIMESCH, J., 1942.– Über Microlepidopteren-Ausbeuten aus der Gegend von Zaton bei Gravosa (Süddalmatien).– *Mitteilungen der Münchner Entomologischen Gesellschaft*, **32**(2/3): 347-399.
- KOČA, G. J., 1925.– Drugi prilog fauni leptira (Lepidoptera) Hrvatske i Slavonije.– *Glasnik hrvatskog prirodoslovnog društva*, **36**(1-2): 63-68. (1924).
- KOREN, T., 2018.– Diversity of moths (Lepidoptera: Heterocera) in the surroundings of the Bednja River, Varazdin County, Northern Croatia.– *Natura Croatica*, **27**(1): 111-141. <https://doi.org/10.20302/NC.2018.27.6>.
- KOREN, T., 2021.– *Dioryctria robiniella* (Millière, 1865) (Lepidoptera: Pyralidae) is a member of fauna of Croatia.– *Acta Entomologica Serbica*, **26**(1). <https://10.5281/zenodo.4551159>.
- KOREN, T., VUKOTIĆ, K. & ČRNE, M., 2015.– Diversity of the moth fauna (Lepidoptera: Heterocera) of a wetland forest: A case study from Motovun forest, Istria, Croatia.– *Periodicum Biologorum*, **117**(3): 399-414. <https://doi.org/10.18054/pb.2015.117.3.2945>.
- KOREN, T. & ZADRAVEC, M., 2018.– Three grass moths (Lepidoptera: Crambidae) new to the fauna of Croatia.– *Natura Croatica*, **27**(1): 239-242. <https://doi.org/10.20302/NC.2018.27.14>.
- KOREN, T. & KULJER, D., 2020.– Additions to the Crambidae (Insecta: Lepidoptera) fauna of Croatia and Bosnia & Herzegovina.– *Acta Entomologica Slovenica*, **28**(2): 141-148.
- KRČMAR S., 2014.– List of insect fauna (Insecta) of Kopački rit Nature park (NE Croatia).– *Turkish Bulletin of Entomology*, **4**: 15-39.
- LÉGER, T., MALLY, R., NEINHUIS, C. & NUSS, M., 2021.– Refining the phylogeny of Crambidae with complete sampling of subfamilies (Lepidoptera, Pyraloidea).– *Zoologica Scripta*, **50**: 84-99.
- LEPIFORUM E.V. [ed.], 2021.– *Evergestis politalis* (Denis & Schiffermüller, 1775). LEPIFORUM E.V. [ed.] (2008-2021): Bestimmungshilfe für die in Europa nachgewiesenen Schmetterlingsarten. Accessed on March 3rd, 2021.
- LEPIFORUM E.V. [ed.], 2021.– *Ancylosis cinnamomella* (Duponchel, 1836). LEPIFORUM E.V. [ed.] (2008-2021): Bestimmungshilfe für die in Europa nachgewiesenen Schmetterlingsarten. Accessed on April 7th, 2021.
- MANN, J., 1857.– Verzeichnis der im Jahre 1853 in der Gegend von Fiume gesammelten Schmetterlinge.– *Wiener Entomologische Monatsschrift*, **1**: 161-189.
- MANN, J., 1867.– Schmetterlinge gesammelt im Jahre 1866 um Josefthal in der croat. Militaergrenze.– *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien*, **17**: 63-76.
- MANN, J., 1869.– Lepidopteren gesammelt während dreier Reisen nach Dalmatien in den Jahren 1850, 1862 und 1868.– *Verhandlungen der kaiserlich-königlichen Zoologisch-Botanischen Gesellschaft*, **19**: 371-388.
- NEUSTETTER, H., 1956.– Sammelreisen nach Dalmatien (Jugoslavien).– *Entomologisches Nachrichtenblatt*, **3**(3): 4-8.
- NUSS, M., SPEIDEL, W. & SEGERER, A., 2000-2013.– Pyraloidea. In FAUNA EUROPAEA Web Service. Version 2017.06. Available from: <http://www.faunaeur.org> (accessed 4 March 2021).
- PLANT, C. W. & JAKŠIĆ, P., 2018.– A provisional checklist and bibliography of the Pyraloidea of the Balkan Peninsula (Lepidoptera: Pyralidae & Crambidae).– *Atalanta*, **49**: 219-263.
- PROHASKA, K., 1922.– Kleinschmetterlinge von Pola.– *Zeitschrift des Österreichischen Entomologen Vereines*, **7**: 32-33.
- REBEL, H., 1891.– Beitrag zur Microlepidopteren-Fauna Dalmatiens.– *Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien*, **41**: 610-639.
- REBEL, H., 1895.– Verzeichniss der von Dr. R. Sturany im Jahre 1895 in Croation gesammelten Lepidopteren.– *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien*, **45**: 390-392.

- REBEL, H., 1903.– Studien über die Lepidopterenfauna der Balkanländer. I. Teil. Bulgarien und Ostrumelien.– *Annalen des Naturhistorischen Museums in Wien*, **18**: 123-347.
- REBEL, H., 1904.– Studien über die Lepidopterenfauna der Balkanländer. II. Teil. Bosnien und Herzegowina.– *Annalen des Naturhistorischen Museums in Wien*, **19**: 97-377.
- REBEL, H., 1913.– Lepidopteren aus dem Gebiete des Monte Maggiore in Istrien. II. Nachtrag.– *Jahresbericht des Wiener entomologischen Vereins*, **23**: 177-205.
- REBEL, H., 1914.– Über die Lepidopterenfauna von Brioni grande.– *Jahresbericht des Wiener entomologischen Vereins*, **24**: 181-201.
- REBEL, H., 1917.– Eine neuerliche Lepidopterenausbeute von Zengg.– *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien*, **67**: 141-143.
- REBEL, H., 1919.– Zur Lepidopterenfauna Dalmatiens.– *Verhandlungen zoologisch-botanischen Gesellschaft in Wien*, **69**: 105-110.
- SCHAWERDA, K., 1920.– Lepidopteren-Ausbeute aus der Gegend von Lovrana und vom Monte Maggiore.– *Zeitschrift des Österreichischen Entomologischen Vereins*, **5**(4): 28.
- SCHAWERDA, K., 1921.– Beiträge zur Lepidopterenfauna der kroatischen Küste und Neubeschreibungen.– *Deutsche Entomologische Zeitschrift Iris*, **35**: 111-138.
- SLAMKA, F., 2006.– *Pyraloidea of Europe / Europas (Lepidoptera). Pyralinae, Gracillariinae, Epipaschiinae, Cathariinae & Odontiinae. Identification - Distribution - Habitat - Biologie / Bestimmung - Verbreitung - Habitat - Bionomie*, **1**: 138 pp. František Slamka, Bratislava.
- SLAMKA, F., 2008.– *Pyraloidea of Europe (Lepidoptera). Crambinae & Schoenobiinae. Identification - Distribution - Habitat - Biologie*, **2**: 222 pp. František Slamka, Bratislava.
- SLAMKA, F., 2013.– *Pyraloidea of Europe (Lepidoptera). Pyraustinae & Spilomelinae. Identification - Distribution - Habitat - Biologie*, **3**: 357 pp. František Slamka, Bratislava.
- SLAMKA, F., 2019.– *Pyraloidea of Europe (Lepidoptera). Phycitinae - Part I. Identification - Distribution - Habitat - Biologie*, **4**(1): 432 pp. František Slamka, Bratislava.
- STAUDER, H., 1914.– Mikrolepidopteren des Triester Gebietes und aus Inneristrien.– *Deutsche Entomologische Zeitschrift Iris*, **23**: 4-12.
- TVRTKOVIĆ, N., VEROVNIK, R., LOVRENČIĆ, L., VUKOVIĆ, M. & ŠAŠIĆ, M., 2015.– New contributions to the butterfly fauna of Mt Velebit and the neighbouring area of Lika (Croatia).– *Natura Croatica*, **24**(2): 281-292. <https://doi.org/10.20302/NC.2015.24.18>.
- WOCKE, M. F., 1871.– Microlepidoptera. In O. STAUDINGER & M. F. WOCKE. (Eds.). *Catalog der Lepidopteren des Europaischen Faunengebiets*: 426 pp. Dr. O. Staudinger und Hermann Burdach, Dresden.

D. G.
Azuritweg, 2
D-70619 Stuttgart
ALEMANIA / GERMANY
E-mail: danijela.gumhalter@gmail.com
<https://orcid.org/0000-0002-5174-8145>

(Recibido para publicación / Received for publication 6-VIII-2021)

(Revisado y aceptado / Revised and accepted 30-IX-2021)

(Publicado / Published 30-IX-2022)

Derechos de autor © SHILAP: Este es un artículo de acceso abierto distribuido bajo los términos de la licencia de uso y distribución Creative Commons Reconocimiento 4.0 Internacional (CC BY 4.0). / **Copyright** © SHILAP: This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0) License.

