

The globally rare *Argyresthia impura* (Staudinger, 1879) adventive in the Netherlands and Belgium, with notes on synonymy, biology, and distribution (Lepidoptera: Argyresthiidae)

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Abstract

The rare Western European *Argyresthia buvati* (Gibeaux, 1993) is synonymised with *A. impura* (Staudinger, 1879) from Turkey. Single stray records of the species in the Netherlands and Belgium prompted this study. We describe and illustrate the genitalia and provide information on distribution and biology. The species is believed to feed on *Juniperus* species.

Keywords: Lepidoptera, Argyresthiidae, *Argyresthia impura*, *Argyresthia buvati*, new synonymy, distribution, The Netherlands, Belgium.

La mundialmente rara *Argyresthia impura* (Staudinger, 1879) adventicia en los Países Bajos y Bélgica, con notas sobre sinonimia, biología y distribución (Lepidoptera: Argyresthiidae)

Resumen

La rara *Argyresthia buvati* (Gibeaux, 1993) de Europa occidental se sinonimiza con *A. impura* (Staudinger, 1879) de Turquía. Los registros aislados de la especie en los Países Bajos y Bélgica motivaron este estudio. Describimos e ilustramos la genitalia y proporcionamos información sobre su distribución y biología. Se cree que la especie se alimenta de especies de *Juniperus*.

Palabras clave: Lepidoptera, Argyresthiidae, *Argyresthia impura*, *Argyresthia buvati*, nueva sinonimia, distribución, Países Bajos, Bélgica.

Introduction

The last decades exotic conifers have become popular plants in gardens and for hedges, leading to an influx of associated herbivore insect species in cities, far away from their native habitat. The micro moth genus *Argyresthia* has many species feeding on conifers, during the last decades several of these have started using planted conifers in Europe, especially Cupressaceae. The American species *Argyresthia thuiella* (Packard, 1871) was recorded for the first time in the Netherlands in 1972 and has spread since over much of Europe (van Frankenhuyzen, 1974; Konečná & Šefrová, 2014), feeding on various species of *Thuja* and *Chamaecyparis*. The European *A. trifasciata* Staudinger, 1871, feeding mostly on *Juniperus*, spread from its native area in the Alps, and reached the Netherlands and the British Isles in the early 1980's (Konečná & Šefrová, 2014; Stigter & van Frankenhuyzen, 1992), and is now distributed and common over much of Europe. Another North American species entered the British Isles in or before the 1990's: *A. cupresella* Walsingham, 1890 (Agassiz & Tuck, 1999). Identification of such newcomers is not always easy, and misidentifications occur. We report here another unexpected newcomer in the Netherlands and Belgium.

In the evening of 11 January 2018, a small unknown micro-moth was found indoors in the home of the second author in IJmuiden, Noord-Holland, the Netherlands (Figure 3). The identification was troublesome, and sending photographs to different Dutch lepidopterologists, did not give any clues either. The moth was collected and dissected by Koen van Dijken, which showed that it was a male of an *Argyresthia* species. However, identifying the specimen to species level still remained a puzzle. Clearly, the species was not one of the known North-Western European species (Agassiz 1996; Bengtsson & Johansson 2011; Gibeaux 1983; Sterling & Parsons 2012), as it showed unknown external characters. Some photographs of the genitalia (Figure 7) were sent to European experts. Rachel Terry finally identified the specimen as *Argyresthia buvati* (Gibeaux, 1993), which was confirmed by David Agassiz of the Natural History Museum in London.

While studying the literature on this species, we learned that according to Laštůvka & Laštůvka (2019), *A. impura* (Staudinger, 1879) is closely related to *A. buvati*, or maybe even conspecific. Study of the Lectotype of *A. impura* confirmed this, and we therefore synonymise *A. buvati* here with *A. impura*. Meanwhile, a second specimen of this species had been observed in Belgium, Oost-Vlaanderen, Ruien-Dorp on 13 March 2023, also indoors. We summarise the scarce knowledge of this species and discuss how it could reach the homes in the Netherlands and Belgium.

Material and methods

The material we studied ourselves are the Dutch specimen and three genitalia slides from Lecto- and Paralectotype (Table 1). Other specimens were studied from photographs and literature data. The wingspan data are obtained from the type series of *A. impura* (6 specimens, courtesy Théo Léger, Berlin) plus literature data (Gibeaux, 1993; Lepiforum E.V., 2025).

Geographical coordinates for localities were obtained (estimated) from Google Earth, as accurate as possible. For recent localities GPS data were available.

For the morphological terminology we follow Liu et al. (2017). Photographs of genitalia were prepared with a manually operated Zeiss Axioskop H and a MRc5 camera, using Zeiss AxioVision software version 4.8. Photographs were edited with Adobe Photoshop, avoiding changes to the real object. Measurements of genitalia were taken on micrographs with AxioVision measurement tools.

The DNA barcode of the Dutch specimen was obtained from a leg of the specimen, following the procedures as described by Doorenweerd et al. (2015). The DNA barcodes of the specimens from Munich were generated in the framework of the EU-HORIZON project Biodiversity Genomics Europe (BGE). All DNA barcodes are in BOLD Dataset DS-ARGIMP (<https://dx.doi.org/10.5883/DS-ARGIMP>). Genbank accession numbers are given in Table 1 and in Dataset DS-ARGIMP.

Taxonomy

Argyresthia (Blastotere) impura (Staudinger, 1879)

Zelleria impura Staudinger, 1879, 280

Lectotype (designated by Friese, 1963, p. 407), Türkiye, Amasia [Jenikeui-Hochebene bei Amasia, 7-VI-1875, Staudinger, Genitalpräparat Friese Nr. 277 (Museum für Naturkunde Berlin)]

Hofmannia impura (Staudinger, 1879). Rebel, 1901, 34. Recombination.

Argyresthia impura (Staudinger, 1879). Friese, 1963, 407. Recombination, record North Macedonia.

Blastotere buvati Gibeaux, 1993, 189. Holotype. 1 ♂, France, Hautes-Alpes, Saint-Crépin, junipéraie, 7-V-1959 (R. Buvat). (Coll. Gibeaux) **syn. nov.**

Argyresthia (Blastotere) impura; Agassiz & Friese 1996, 57

Argyresthia (Blastotere) buvati; Agassiz & Friese, 1996, 57

Argyresthia buvati; Laštůvka & Laštůvka, 2019, 239. New record Spain, suggested possible synonymy with *impura*.

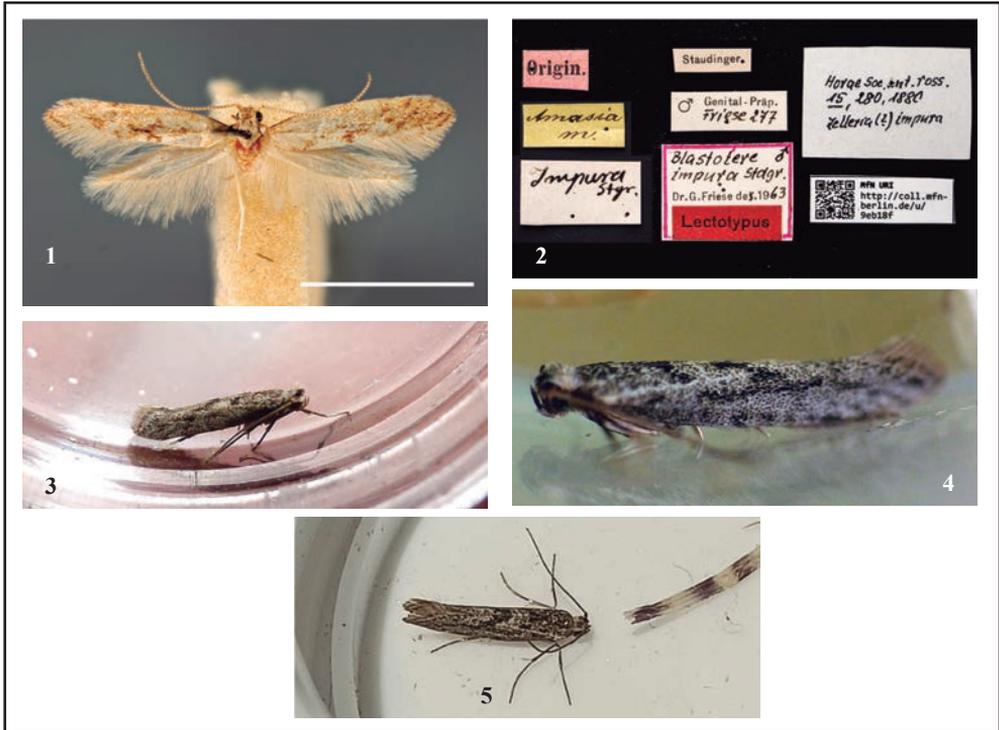
Recognition

Externally *A. impura*, with its grey flecked appearance (Figures 1-5, see also water colour by Laštůvka & Laštůvka (2019) and photos on BOLD) does not resemble other European *Argyresthia* species. The whole moth

is grey, with indistinct black spots, usually two on dorsum. Head with black tuft, ringed antennae. The lectotype is faded and now looks more ochreous. Wingspan 12-14.5 mm.

Male genitalia (n=3) (Figures 6-9). Tuba analis about as long as width of valva, tapering. Socius covered with ca 24 scale-like setae, with a 1-3 setae posteriorly. Valva broadly rounded, with almost parallel margins, length 570-580 µm. Vinculum (saccus) broad, truncate anteriorly. Phallus slightly curved, 965-1055 µm long; cornutus with probably four strong denticles (difficult to see, Figure 9). Eighth sternite Y-shaped (Figure 8).

Figures 1-5. *Argyresthia impura*, adults. **1.** Lectotype male, photo Eran Wolff. **2.** Labels of lectotype. **3.** Live specimen, the Netherlands, photo Dick Groenendijk. **4-5.** Live specimen Belgium, photos Cedric de Noyette. Scale bar 5 mm.



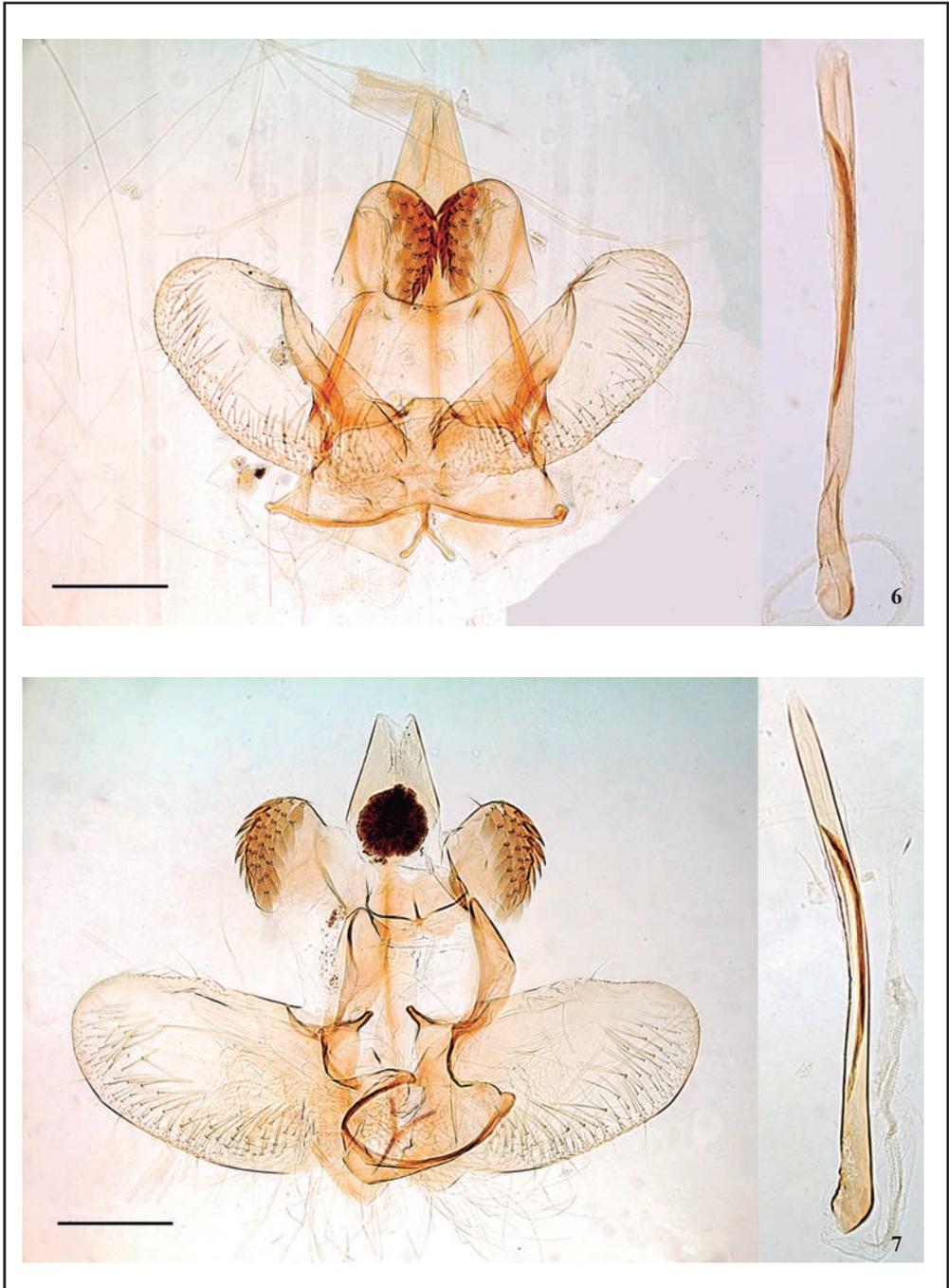
Female genitalia (n=1) (Figures 10-12). Posterior apophyses ca 1125 µm long, anterior apophyses 775 µm long, bifurcate at distal 43%; ventral branches joined and forming ventral margin of ostium bursae. Lamella postvaginalis ca. triangular. Antrum not well visible in slide. Signum (Figure 12) with straight horns, 230 µm.

Comments

Argyresthia impura was described as *Zelleria impura* from seven males and three females from Turkey (Amasia), and Staudinger further included two Iranian specimens (“Schliesslich finde ich noch zwei am 26 Mai bei Tasch in Nord-Persien von Christoph gefundene Stücke, die sicher auch zu dieser Art gehören”). Some authors give the year of description as 1880, but the issue in which the species was described was published on 1 November 1879 (<https://www.biodiversitylibrary.org/page/41262088>).

Friese (1963), who found the species in North Macedonia, was the first to recognise that *impura* belongs to *Argyresthia* and selected a Lectotype. Unfortunately, he did not publish any illustrations.

Figures 6-7. *Argyresthia impura*, male genitalia, phallus at right. 6. Lectotype male, slide Friese 277. 7. Male from the Netherlands, slide GKVD02022018, RMNH.INS. 15582. Scale bars 200 μ m.



Figures 8-9. *Argyresthia impura*, details of genitalia. **8.** Eighth segment male, slide GKVD02022018. **9.** Detail cornuti in phallus, slide Friese 277. **10-12.** Female genitalia, paralectotype, slide Friese 278, **10.** ovipositor and apophyses. **11.** detail lamella postvaginalis and antrum. **12.** signum. Scale bars 200 μ m (10) 100 μ m (other figures).



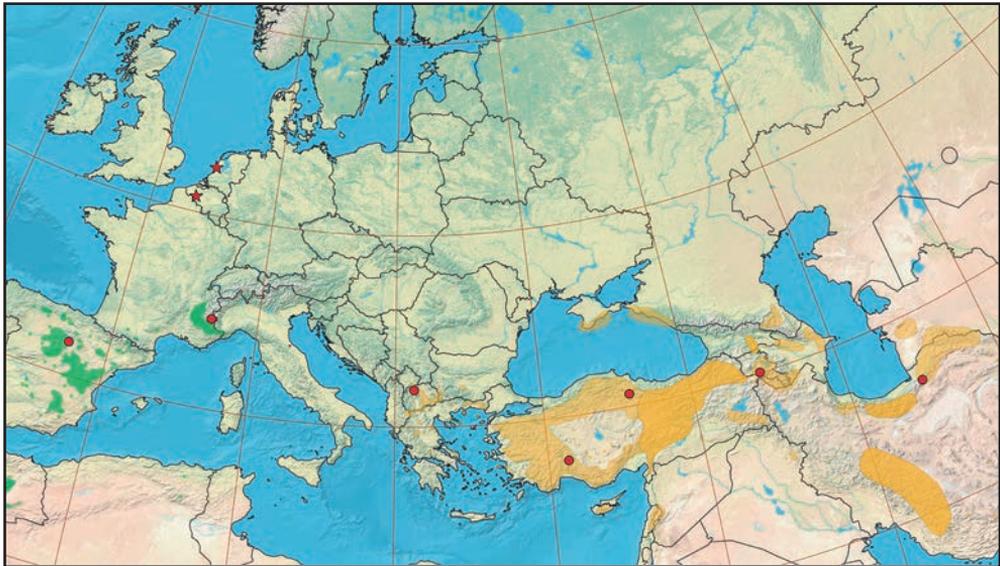
Argyresthia buvati was described from France, Hautes Alpes, Saint-Crépin, where it was found in the vegetation of *Juniperus thurifera* L., also known as the Spanish juniper. It was found together with *A. reticulata* Staudinger, 1877 and *A. thuriferana* (Gibeaux, 1993), described at the same time as *A. buvati* and occurring on the same host. The original records were from 1959 to 1989, but the species was still present in 2013 and 2014 (Christian Gibeaux, personal communication). The only other record is from northern Spain, Soria, Aldehuela de Calatañazor, where it was taken in June 2018 in *J. thurifera* vegetation, in company with the same two species as in France (Laštůvka & Laštůvka, 2019). The description year of *A. buvati* is often erroneously cited as 1992; however, according to the cover page of vol. 3, fasc. 4 was published in March 1993 (Huemer, 2010).

The male and female genitalia as described and illustrated in detail here, match the original photos and description of *A. buvati* well (Gibeaux 1993), confirming the synonymy of the species.

Distribution (Figure 13)

France, Spain, North Macedonia, Turkey, Armenia (new record), North Iran. The single records from Belgium and the Netherlands are most likely from accidental imports. Lewis & Sohn (2015) also list Uzbekistan, but according to Jay Sohn (e-mail 2025), this may have been a misinterpretation of Friese's record from Tasch (in Iran) as Tashkent (in Uzbekistan). Everywhere a very scarcely recorded species, see Table 1 for all records and Figure 13 for a map. Apart from the Macedonian one, all native records are from higher mountains, above 1000 m at least. Based on the distribution of the *Juniperus* species that may be the hosts, the species could be expected to occur also in Morocco, Greece, Georgia, Azerbaijan, Turkmenistan and maybe further east.

Figure 13. Distribution records of *Argyresthia impura*, mapped on distribution area of *Juniperus thurifera* (solid green) and *J. excelsa* (solid ochreous). The adventive records are presented with a star.



Biology

Juniperus thurifera is most likely the native hostplant in France (Gibeaux, 1993) and Spain (Laštůvka & Laštůvka, 2019), although there is no positive proof of feeding. The Spanish juniper has a restricted distribution, mainly in Spain, with some small occurrences in the French and Italian Alps, the Pyrenees and Corsica, and occurs in Algeria and Morocco (San-Miguel-Ayanz et al. 2015). This means that the Turkish and Macedonian populations must have other hosts. Several species of *Juniperus* occur in that area, but only the closely related *J. excelsa* Bieb. (Mao et al. 2010) occurs in all localities of *A. impura*, with a distribution spanning from North Macedonia through

Greece and Turkey to the western Himalaya. The distribution of both species is mapped in Figure 13, green for *J. thurifera*, and ochreous for *J. excelsa*, including its several subspecies (map source: Caudullo et al. 2017; 2024). Although there is a striking match in distribution, this is of course no proof that *J. excelsa* is the hostplant.

It is remarkable that the Belgium specimen was found in a house, where at that moment the Serbian spruce (*Picea omorika* (Pančić) Purk.) was present as Christmas tree as the only plant. This tree has a limited native distribution in Bosnia-Herzegovina and Serbia (San-Miguel-Ayanz et al. 2015) but is commonly grown as ornamental and Christmas tree. Several species of *Argyresthia* that are known to feed on Cupressaceae are known to be able to use several species in that family (e.g. *A. cupressella*, *A. thujella*, *A. trifasciata*), but none of these also uses conifers in the Pinaceae. On the other hand, the *Argyresthia* species known to feed on Pinaceae are usually strictly monophagous on either *Abies*, *Picea* or *Larix* (Bengtsson & Johansson, 2012). As the records of “*A. buvati*” in France and Spain strongly suggest that they are associated with *Juniperus thuriferana*, the hostplant *Picea* seems rather unlikely, and we must consider the possibility that the Belgian specimen might not have fed on *Picea*. It could still be possible that it was brought indoors as pupa on this tree, as this might have come from a place where also material of Cupressaceae was kept or was growing.

DNA barcodes

Five specimens are barcoded in total, the Dutch specimen, the one from Armenia and three specimens from the Klimesch collection in the Munich Museum. The DNA barcodes are almost identical, the maximum distance between these is 0.46%, with the Armenian one most distant from the others. All belong to the Barcode Index Number BOLD:ADR8059. see Table 1. The nearest neighbour is an unidentified *Argyresthia* from Kyrgyzstan with BIN BOLD:AEI2999 at a distance of 5.05%.

Discussion

The morphological examination of the types and published photos clearly showed that *Argyresthia buvati* and *A. impura* are one species, with a disjunct distribution: western populations in Spanish and French mountains, and eastern populations reaching from the Balkans, through Turkey to the Alborz mountains in Iran. Whereas the western population are clearly associated with the local tree *Juniperus thurifera*, there are no records of host or associated trees for the eastern populations, but the distribution match with the species *Juniperus excelsa*, related to *J. thuriferana* is remarkable, and requires further study. DNA barcodes are only available for the eastern populations and show hardly variation. We expect that the DNA barcode of western populations will be rather different due to geographic isolation.

The two specimens found in the Netherlands and Belgium should be regarded as adventive. The barcode of the Dutch specimen is identical to Turkish and Macedonian specimens, suggesting an eastern origin. As both specimens were found in house in winter, far too early for the normal flying time, it is most likely that the specimens emerged indoors from pupae that were brought indoors. As both Belgium and the Netherlands have many inhabitants with close ties to Turkey, a possible scenario could be that cocoons of the species were brought in with objects or artefacts originating from Turkey, allowing the moths to emerge due to the higher temperatures. An origin from cultivated *Juniperus* seems less likely but cannot be completely excluded. In both houses there were no *Juniperus* or related plants present at the time of discovery of the moth, only in Belgium a Christmas tree of the genus *Picea* was reported. The combination of *Juniperus* and *Picea* as hosts for the same species, both belonging to a different family, would be rather unlikely, but also this scenario cannot be excluded altogether.

The rareness of *A. impura* suggests a rather specialised life history, and we urge lepidopterists to search for the species in stands of *Juniperus* species and pay attention to the presence of leafmines or spinning’s in wintertime.

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Conflict of Interest

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

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Table 1. Records of *Argyresthia impura*, locality details, sources and Genbank accession numbers.

Country	Locality	Date	Collector	Coordinates	Specimens	Sources, material details	GenBank #
Western populations							
France	Hautes-Alpes, Saint-Crépin	07-V-1959	R. Buvat	44.71, 6.61	1 ♂ HT buvati	Gibeaux, 1993	
	Hautes-Alpes, Saint-Crépin	29-31-V-1981	Chr. Gibeaux	44.71, 6.61	1 ♀ PT buvati	Gibeaux, 1993	
	Hautes-Alpes, Saint-Crépin	17-18-V-1989	R. Buvat	44.71, 6.61	adults PT buvati	Gibeaux, 1993	
Spain	Soria, Aldehuela de Calatañazor	15-19-VI-2018	A. & Z. Laštůvka	41.71, 2.793	2 ♀	Laštůvka & Laštůvka, 2019	
Eastern Populations							
North Macedonia	W. of Skopje, Treschkaschlucht [Matka Canyon]	1-10-V-1956	F. Kasy	41.935, 21.3	1 ♂, 1 ♀	Friese, 1963	
	Skopje, Matka, Treska Canyon	20-V-1956	F. Kasy	41.935, 21.3	1 ♂	BOLD: BGE_ZSM_LEP_2223	PV217822
Turkey	Amasya Province, Jenikeui [Yeniköy]-Hochebene [plateau E of Vermis]	7-VI-1875	O. Staudinger	40.65, 35.88	1 ♂ LT, 2 ♂, 2 ♀ PLT	Staudinger 1879. slides: LT Friese 277, PLT ♀ Friese 278, PLT ♂ Friese 279	
	Isparta, Anamas Dag	17-VI-1966	J. Klimesch	37.705, 31.283	1 ♂	Lepiforum E.V., 2025	
	Isparta, Anamas Dag	17-VI-1966	J. Klimesch	37.705, 31.283	1 ♂	BOLD: BGE_ZSM_LEP_2221	PV217819
	Isparta, Anamas Dag	17-VI-1966	J. Klimesch	37.705, 31.283	1 ♂	BOLD: BGE_ZSM_LEP_2222	PV217820
Armenia	Ararat, Khosrov forest state reserve	26.IV-9-V-2022	U. Jurivete & P. Ivinskis	40.037, 44.777	1 ♀	BOLD: MM28032	PV217818
Iran	Semnan Province, Tasch [Tāsh-e-olyā]	26-V-1875	Christoph	36.57, 54.68	1 ♂	Staudinger, 1879	
Adventive records							
Netherlands	Noord-Holland, IJmuiden-Zeewijk	11-I-2018	D. Groenendijk	52.448, 4.596	1 ♂	https://waarneming.nl/observation/150499804/RMNH.INS.15582 (also BOLD), slide GKVD02022018	PV217821
Belgium	Oost-Vlaanderen, Ruien-Dorp	13-III-2023	C. De Noyette	50.7733, 3.4868	1 adult	https://waarnemingen.be/observation/265135149/	