

THE SPECIES *Pyrgus malvae* Linnaeus, 1758 (LEPIDOPTERA, HESPERIIDAE) IN THE LEPIDOPTERA COLLECTIONS WITHIN THE MUSEUM OF NATURAL HISTORY OF SIBIU, ROMANIA

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Abstract. The paper presents the research results on the species *Pyrgus malvae* Linnaeus, 1758 (Lepidoptera, HesperIIDae), known as the grizzled skipper, existing within the Lepidoptera collections of the Museum of Natural History of Sibiu, Romania. Following the analysis of the six collections of Lepidoptera: Daniel Czekelius, Daniel Czekelius (Palearctic), Eugen Worell, Viktor Weindel, Rolf Weirauch and Eckbert Schneider, a number of 66 specimens belonging to this taxon were reported. This species is of special interest, from a geographical and faunal point of view for Romania but also for Europe, the oldest specimen being collected 106 years ago. The collection data of the presented species come from the period between the years 1904 and 1984; the collection places are from Sibiu, the surroundings of Sibiu, other locations in Transylvania and other areas of Romania. There are also some specimens that come from outside Romania: certain specimens in Eugen Worell's Collection from Chișinău in the Republic of Moldova and a specimen from Viktor Weidel's Collection from Salzburg, Austria.

Keywords: *Pyrgus malvae*, collections of Lepidoptera, Museum of Natural History Sibiu, Romania.

Rezumat. Specia *Pyrgus malvae* Linnaeus, 1758 (Lepidoptera, HesperIIDae) în colecțiile de lepidoptere din cadrul Muzeului de Istorie Naturală Sibiu, România. În prezentul articol sunt citate rezultatele cercetărilor referitoare la specia *Pyrgus malvae* Linnaeus, 1758 (Lepidoptera, HesperIIDae), existență în cadrul colecțiilor de lepidoptere din Muzeul de Istorie Naturală Sibiu, România. În urma analizei celor șase colecții de lepidoptere: Daniel Czekelius, Daniel Czekelius (Palearctica), Eugen Worell, Viktor Weindel, Rolf Weirauch și Eckbert Schneider, au fost semnalate un număr de 66 exemplare aparținând acestui taxon. Aceste specii prezintă un interes deosebit, din punct de vedere geografic și faunistic pentru România dar și pentru Europa, cel mai vechi exemplar fiind colectat în urmă cu 106 ani. Datele de colectare ale speciei prezentate provin din intervalul de timp cuprins între anii 1904-1984, iar locurile de colectare sunt din Sibiu, împrejurimile Sibiului, alte localități din Transilvania și alte zone ale României. Există și câteva exemplare care provin din afara României, exemplare existente în Colecția lui Eugen Worell și colectate de la Chișinău, din Republica Moldova și un exemplar din Colecția lui Viktor Weidel ce provine din Salzburg, Austria.

Cuvinte cheie: *Pyrgus malvae*, colecții de lepidoptere, Muzeul de Istorie Naturală Sibiu, România.

INTRODUCTION

The examination of the Lepidoptera collections within the Museum of Natural History of Sibiu, Romania (STANCĂ-MOISE, 2002; 2015; 2017; 2018; 2019; 2020; 2021; MOISE CRISTINA 2011a, b, c, d) has determined the authors to continue their study because it is a rich entomological material, with unpublished data, which can be considered as biodiversity heritage in Romania. At local, regional and national level, the importance of this Museum, one of the oldest in Romania, is given by its collections, an important biodiversity repository. Data from the museum's Lepidoptera collections have been published over time in various specialized articles (CZEKELIUS, 1897, 1898, 1917, 1922; POPESCU-GORJ, 1960; SCHNEIDER, 1984, 1996; SZÉKELY, 2003; TÖRÖK & CUZEPAN 2012; WORELL, 1951). These collection data inscribed on the labels of lepidopteran species within the collections of the Museum of Natural History of Sibiu can provide valuable information on the evolution of butterfly species and on their adaptation to the current environment, that is constantly changing as a result of anthropogenic factors (COSTACHE et al., 2019).

The adaptation of Lepidoptera to climate change, inter- and intraspecific relationships and even historical events must be constantly studied to take protection and conservation actions. At European level there are permanent concerns regarding the monitoring and adaptation of butterfly species to climate change (BRERETON et al., 2011; ȘTEFĂNESCU et al., 2013).

In Romania, natural science museums are valuable sources through the entomological material, collected over time from all regions of the country and kept in collections, as the studied species has been reported in other natural history museums such as: Bucharest, Brasov, Covasna, Craiova and Galați (CĂPUȘE & KOVÁCS 1987; CHIMIȘLIU, 1989, 2006; CIOCHIA & BARBU, 1980; MARCU & RÁKOSY, 2002; POPESCU-GORJ, 1964; STĂNESCU, 2005)

The Museum of Natural History of Sibiu opened its doors to visitors in 1895 and is currently an archive of natural conditions in Transylvania, with an invaluable heritage that has played and still plays an important role in entomological research in Transylvania and Romania. Founded by Saxon naturalists who collected entomological material over 100 years ago from the city of Sibiu, the surroundings of Sibiu, neighbouring regions and other localities in Transylvania (SZÉKELY, 1996), while valorizing the existing data in collections, it was and is the work of many generations of naturalists (CARADJA, 1931; SCHNEIDER, 1984, 1996; TÖRÖK & CUZEPAN, 2012, 2014; WORELL, 1951).

In Transylvania, the richness of faunal elements and especially the numerous existing species of Lepidoptera have been of interest for several researchers since the end of the 19th century. The oldest catalogues of Lepidoptera originate from 1897 and 1917 and belong to Daniel Czekelius (1857-1937), a tireless Transylvanian researcher, who

reports 1095 species from Transylvania out of the 2116 species known at that time and who, throughout his activity, published 18 papers on Lepidoptera, most of them in the Journal of the Transylvanian Society of Natural Sciences in Sibiu known as *Verhandlungen und Mitteilungen des Siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt* (CZEKELIUS, 1897, 1898, 1917, 1922). Currently, the collection of Lepidoptera from Transylvania of Dr. D. Czekelius includes 7162 specimens and about 2100 species, while the collection of Palearctic Lepidoptera of Daniel Czekelius has 6929 specimens from Transylvania or other European countries, as a result of exchange relationships (SCHNEIDER, 1996).

Some families and numerous species have been verified by specialists but relatively few faunal and taxonomic data have been published in papers (NICULESCU & KÖNIG, 1970; SCHNEIDER, 1984; CĂPUȘE & KOVACS, 1987; BURNAZ, 1993).

The Lepidoptera collection of Eugen Worell (1884-1961) comprises a number of 896 species and 6646 specimens, whose collection data contribute to the knowledge of the distribution of a large number of species, and includes rare, less known or new species. The species come from all areas of Romania, but the collected material is mostly from Sibiu and the surroundings of Sibiu (STANCĂ-MOISE, 2012).

The Viktor Weindel (1887-1966) Transylvanian Lepidoptera Collection consists of 573 species and 3490 specimens with a collection activity of over 60 years (1900-1959). The existing species in the collection come from Sibiu and the surroundings of Sibiu (Viile Sibiului, Gușterița, Cîsnadioara, Cîsnădie, Măgura Cîsnădiei, Dumbrava Sibiului Forest, Sadu, Paltiniș) from Southern and Eastern Transylvania, from the Turnu Roșu Pass – the border of Sibiu and Vâlcea counties, and from other geographical regions of Romania, too (SCHNEIDER, 1984).

The Rolf Weirauch (1906-1984) Lepidoptera collection includes 888 species and 6043 specimens from Sibiu and the surroundings of Sibiu (Gusterita Hill, Slimnic Hill, Măgura Cîsnădiei, Cîsnadioara, Dumbrava Sibiului Forest, Turnu Roșu Pass and Cozia Mountain), the Metalliferous Mountains of Transylvania, different areas of the Southern and Eastern Carpathians, Herculane, Dobrogea and the Danube Delta. Even though the collection contains extremely valuable material from a faunal point of view, many of his discoveries and collection sites are still unpublished. The catalogue of his collection of butterflies was published in 1982 by his former student Ekbert Scheider (SCHNEIDER, 1996).

The Eckbert Schneider Lepidoptera Collection (1927) contains over 20000 specimens collected from Sibiu, the surroundings of Sibiu and Southern Transylvania, but also from other regions of Romania: Banat, Crișana, Dobrogea, the Danube Delta, Oltenia, Moldova.

However, there are many unpublished data on these Lepidoptera collections, of scientific and historical importance. The aim of this paper is to bring new data regarding the past collection period of the species *Pyrgus malvae*, which span from 1904 to 1984, from localities near Sibiu, other places in Transylvania or Romania.

MATERIALS AND METHODS

The Genus *Pyrgus* from the collections of Lepidoptera in the Museum of Natural History in Sibiu, Romania was studied during this year. The specimens belonging to the species *Pyrgus malvae* come from the following collections: Daniel Czekelius, Eugen Worell, Viktor Weindel, Heinrich Hann von Hanneheim, Rolf Weirauch and Eckbert Schneider, collected from Romania or on the occasion of trips abroad. Systematic framing was done after the reference monograph (RÁKOSY et al., 2003).

Each presented specimen is accompanied by the collection data: day, month, year, and place of collection, but also the name of the collector, all this information being reproduced exactly as on the label. There are also specimens where the information is incomplete or writing is indecipherable, thus being accompanied by a question mark.

RESULTS AND DISCUSSIONS

Following the centralization of the collection data, the species was identified in 6 collections: the Collection of Lepidoptera from Transylvania (Daniel Czekelius), the Collection of Palearctic Lepidoptera (Daniel Czekelius), the Lepidoptera Collection of Eugen Worell, the Lepidoptera Collection of Viktor Weindel, the Lepidoptera Collection of Rolf Weirauch and the Lepidoptera Collection of Eckbert Schneider.

Based on the analysis of the collection places from Transylvanian localities and inscribed on labels, we can say that this species has been reported in various habitats: forest edges, forested meadows, natural meadows, hills, valleys and rarely in forests.

In Romania, the species *Pyrgus malvae* is widespread in all provinces, being reported in the period 1901-2001, in all regions: Banat, Crișana, Transylvania, Maramureș, Muntenia, Moldova, Dobrogea (POPESCU-GORJ & DRĂHIA, 1964; RÁKOSY & SZÉKELY, 1996; SZÉKELY, 2008; RÁKOSY, 2013), while in Oltenia it was reported between 1901-1980 (RÁKOSY, 2013).

According to the distribution map in Romania (Fig. 1), the species was reported between 1850-1950 in Transylvania, Dobrogea, Oltenia, Muntenia, Banat, Crișana and Maramureș, i.e. in almost all regions of Romania, between 1951-1990, in all regions of Romania, but less frequently in Oltenia, and in the period between 1991-2018 it was reported in all regions of the country. At present, in Romania its conservation status is of least concern (COSTACHE et al., 2019).

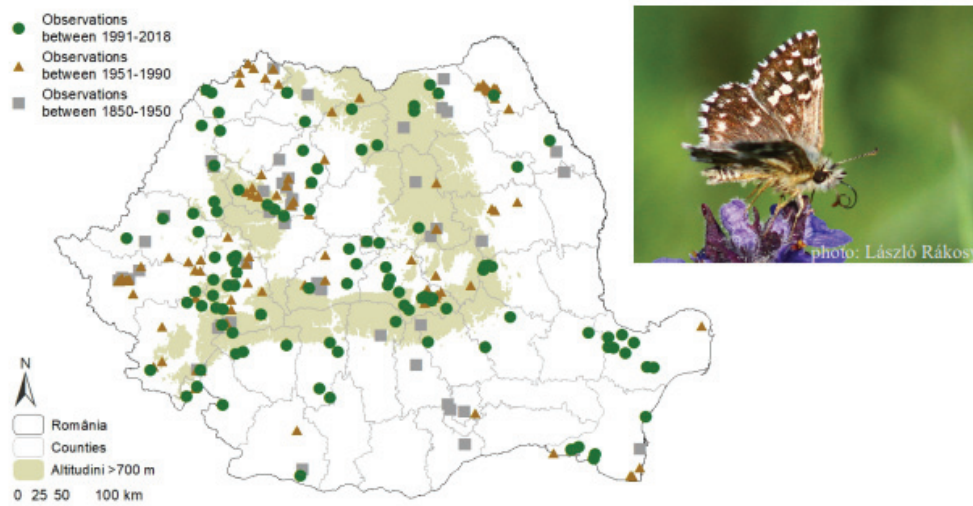


Figure 1. Distribution map of *Pyrgus malvae* in Romania (COSTACHE et al., 2019).

In Romania it is spread in all ecosystem types, except for subalpine and alpine regions. The frequency is common and very common (SZÉKELY, 2004). The altitude at which it was captured in Romania is between 0-1800 m. It has two generations per years, the flight period for the first generation is from mid-April to the end of June, and the second-generation flies from mid-July until mid-September (RÁKOSY, 2013). It overwinters in the larval stage (SZÉKELY, 2008). The host plants for larvae are: *Potentilla erecta*, *P. tabernaemontani*, *P. pedate*, *P. palustris*, *P. argentea*, *Fragaria vesca* (STREITBERGER & FARTMANN, 2013).

Pyrgus malvae Linnaeus, 1758 (Hesperiidae, Pyrgus)

1. From Daniel Czekelius (Fig. 2).

Examined material: June 14, 1908, Schnhs (?) Mountains, leg. Czekelius; June 6, 1910, Păltiniș-Sibiu, leg. Czekelius; July 28, 1911, Borsec, leg. Czekelius; May 20, (without year) Schnisburg (?), leg. Czekelius; April 21, (without year), Sibiu, (two specimens), leg. Czekelius; May 3, (without year), Sibiu, leg. Czekelius; May 10, (without year), Sibiu, leg. Czekelius; May 14, (without year) Schnisburg (?), leg. Czekelius; May 15, (without year), Sibiu, leg. Czekelius; one specimen, (no data), Hodad, leg. Dr. Kiss.

2. From Daniel Czekelius (Palearctic region) (Fig. 3).

Examined material: April 19, 1915, Sibiu, leg. Czekelius; June, 1918, (without collection day), Romania, leg. Czekelius; May 15, 1921, Sibiu, leg. Czekelius; May 26, 1921, 1000 m, (the name of the locality indecipherable), leg. Hannein; June, 1921, (without collection day), Romania, leg. Czekelius.

3. From Eugen Worell's collection (Fig. 4).

Examined material: one specimen (Without a label); May 17, 1916, Chișinău (Durlești)/Republic of Moldova, leg. Worell; April 4, 1934, Sibiu, (four specimens), leg. Worell; April 26, 1936, Chișinău/Republic of Moldova, leg. Worell; 1937, (without the day and month of collection), Chișinău/Republic of Moldova, (two specimens), leg. Worell; May 4, 1938, Sibiu, (two specimens), leg. Worell; April 12, 1952, Sibiu, leg. Worell; April 28, 1952, Sibiu (five specimens), leg. Worell; April 10, 1954, Sibiu, leg. Worell; April 10, 1957, Sibiu, leg. Worell.

4. From Viktor Weindel's collection (Fig. 5).

Examined material: May 3, 1904 (without the place of collection), leg. Weindel; April 30, 1922, Cîsnădie/Heltau (two specimens), leg. Weindel; April 16, 1932 (without the place of collection), leg. Weindel; May 29, 1934, Sibiu (Zidu Cetatii), leg. Weindel; May 15 (without the year of collection), Salzburg, leg. Weindel, *Hespezia* (?) (no data collection), leg. Weindel.

5. From Rolf Weyrauch's collection (Fig. 6).

Examined material: April 6, 1954, Băile Herculane, leg. Weyrauch; April 17, 1954, Băile Herculane, leg. Weyrauch; August 8, 1967, Băile Herculane, leg. Weyrauch; September 6, 1974, Găneasca (Dobrujja), leg. Weyrauch; June 10-18, 1975, Băile Herculane, leg. Weyrauch; May 15-18, 1975, Dobrujja, leg. Weyrauch; May 12, 1976, Slimnic (Zakel Hill), leg. Weyrauch; June 20, 1976, Hagieni Forest (Dobrujja), leg. Weyrauch; August 11-12, 1977, Băile Herculane, leg. Weyrauch.

6. From Eckbert Schneider's collection (Fig. 7).

Examined material: 1955 (without the day and month of collection), NBg (?), leg. Schneider, July 28, 1957, Copșa Mică, leg. Schneider, May 1, 1960, Șiria-Arad, leg. Schneider, April 23, 1970, Sibiu, leg. Schneider, May 23, 1962, Cincu, leg. Schneider, August 7, 1970, Orlat, leg. Schneider, April 12, 1972, Șura Mare, (two specimens), leg. Schneider, May 14, 1974, Slimnic (Zakel Hill), leg. Schneider, May 8, 1975, Șura Mare, meridional Transylvania, leg. Schneider, May 1, 1976, Văsăud, (two specimens), leg. Schneider, July 24, 1978, Turmu Severin (Valea Judoștită), leg. Schneider, June 2, 1982, Șercaia, leg. Schneider, May 12, 1984, Mălâncrav, leg. Schneider.

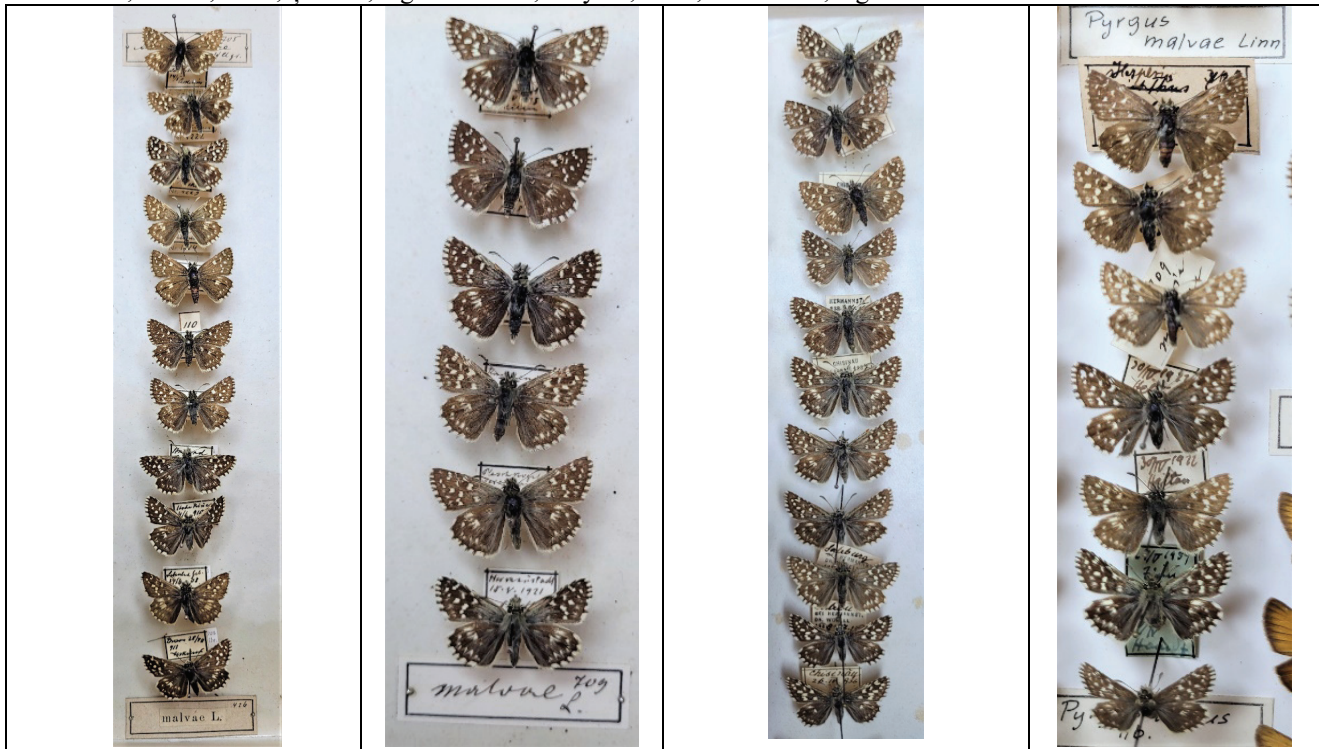


Figure 2. *Pyrgus malvae* in Daniel Czekelius' collection (Photo taken by C. Stancă-Moise).

Figure 3. *Pyrgus malvae* in Daniel Czekelius' Palaeartic region (Photo taken by C. Stancă-Moise).

Figure 4. *Pyrgus malvae* in Eugen Worell's collection (Photo taken by C. Stancă-Moise).

Figure 5. *Pyrgus malvae* in Viktor Weindel's collection (Photo taken by C. Stancă-Moise).



Figure 6. *Pyrgus malvae* in Rolf Weyrauch's collection (Photo taken by C. Stancă-Moise).

Figure 7. *Pyrgus malvae* in Eckbert Schneider's collection (Photo taken by C. Stancă-Moise).

Table 1. The Lepidoptera collections where the species *Pyrgus malvae* Linnaeus, 1758 (Hesperiidae, Pyrgus) was identified.

Crt. No.	Collection	Specimens	Period of collection	The area of collection
1	Daniel Czekelius	11	1908-1911	Transylvania
2	Daniel Czekelius Palearctic	5	1918-1921	Romania
3	Eugen Worell	19	1916-1957	Transylvania, Republic of Moldova
4	Viktor Weindel	7	1904-1934	Transylvania, Austria
5	Rolf Weyrauch	9	1954-1976	Dobruđa, Transylvania
6	Eckbert Schneider	15	1955-1984	Crișana, Oltenia, Transylvania
Total		66	1904-1984	

CONCLUSIONS

The analysed material consists of 66 specimens of the species *Pyrgus malvae*. There are two high points of sampling, one in 1921 and another in 1930, both with 13 specimens. A large number of specimens were collected in the years 1909, 1910 (7-8 specimens) and 1974 (8 specimens).

As it may be seen, the collection period was 80 years, i.e. between 1904 and 1984. If we divide this into two periods, we can conclude that the most numerous specimens were collected after 1950, when the concerns of Saxon naturalists in Sibiu were much greater for studying the biodiversity of Lepidoptera populations.

Most specimens of *Pyrgus malvae* (Table 1) were collected from Transylvania, especially from the Sibiu county, but also from the Banat, Caras-Severin and Dobrogea counties, Cosntanța County and Ilfov counties, near Bucharest.

In the Collection of Lepidoptera of Daniel Czekelius most specimens do not have the year of collection, some labels are indecipherable; the oldest specimens date from 1910: one from Transylvania, Sibiu county, Paltiniș/Hohe Rinne (45°39'10"N 23°55'55"E) and another also from Transylvania-Borsec 46°58'0"N25°34'12"E), a place located in the mountain range of the Eastern Carpathians to the NE of Harghita county, at the crossing of Giurgeului Mts., Bistrita Mts. and Calimani Mts., at an altitude between 850-950 m.

In the Collection of Palearctic Lepidoptera of Daniel Czekelius the specimens do not have collection dates (day, month and place of collection), the label only mentioning the country of origin as Romania and the collection years, i.e. 1918 and 1921.

The existing specimens in the Lepidoptera collection of Eugen Worell, come mostly from Sibiu/Hermannstadt (45°47'45"N24°9'8"E) and are collected between 1934-1957; one specimen has no collection data and four specimens are from Chisinau (47°01'0"N 28°52'0"E), Republic of Moldova.

In the Viktor Weindel Lepidoptera Collection, most of the captured specimens did not have complete data on the labels; most of them come from Sibiu, being collected between 1922 and 1934, and one specimen without the year of collection originates from Salzburg, Austria.

Rolf Weyrauch's Lepidoptera collection includes specimens captured after 1950 and until 1975. They originate from Herculane Spa/Herkulesbad (44°52'43"N 22°24'51"E) located on the Cerna Valley and part of Caras-Severin county, Banat region. Several specimens also come from Dobrogea, one from Hagieni Forest (43.800°N 28.433°E) in which the dominant species is oak. This forest has an area of approximately 432 ha and is a nature protected area with a zoo-botanical profile, on the Negru Vodă Plateau, Constanta county. The most recent specimen dates from 1976 and was collected on the Slimnic Hill/Zackel Hill (45.89806°N 24.17000°E) located in southern Transylvania, Sibiu county. This is a protected area of national interest (mixed natural reserve), which corresponds to the IUCN category IV (RÁKOSY, 2013).

The most recent specimens are from the Eckbert Schneider Lepidoptera collection, in the period between 1955-1984, collected from several localities in Sibiu County, but there are also specimens that come from Șiria (46°16'2"N 21°38'18"E), Arad county, from the Crișana region, but also a specimen from Turnu-Severin (44°37'24"N 22°40'04"E), Mehedinți county, Oltenia region.

The *P. malvae* has been reported in all regions of Romania (RÁKOSY, 2013), being a quite common butterfly; for this reason, no conservation measures are proposed. But at the level of our country, measures for habitat protection and conservation are recommended (COSTACHE et al., 2019).

In the Catalogue of the Lepidoptera Collection of dr. Vladimir Olaru, within the Museum Complex of Natural Sciences Galați, six specimens were reported (2♂♂ and 4♀♀), collected from Gârboavele Forest (45.57667°N 27.99889°E), which is a protected area (site of community importance – SCI). located in SE Moldova, Galați county. The specimens were collected in 1965, on August 25 (2♂♂) and September 4 (4♀♀) (MARCUS & RÁKOSY, 2002).

In the Catalogue of the Lepidoptera Collection of N. Delvig, from the Brașov county Museum, eight specimens are preserved (5♂♂ and 3♀♀) that come from the surroundings of the Brașov city, namely: Săcele/Gîrcin Valley (45°37'12"N 25°42'35"E), 5♂♂, April 28, 1957, May 28, 1965, Tâmpa/Brașov (45°38'N 25°35'E), May 7, 1961 (two samples), Lempeș Hill, April 22, 1971 and Săcele/Gîrcin Valley (3♀♀), April 28, 1957, May 25, 1958, May 28, 1965 (CIOCHIA & BARBU, 1980).

The "Ioan Lăzărescu" collection of Lepidoptera, curated at the "Grigore Antipa" National Museum of Natural History from Bucharest, has 11 specimens, collected respectively in: Bistra Forest, May 3, 1964; May 9, 1965, Căpâlna (320 m altitude), August 16, 1971; Nadăș June 6, 1968 (two specimens); Green Forest April 14, 1973 (two specimens), April 14, 1973 (three specimens); and Pogăniș Lake April 25, 1971 (STĂNESCU, 2005).

The most recent collection data of this species come from the Plopiș-Iaz Mountains, the Iaz 2 Swamp, ponds, pastures, May 19, 2014; Meseș-Huta Mountains, wet meadows with alder, May 21, 2014; Meseș-Poic Mountains, alder and wet meadows, May 22, 2014; Crasna-Aghireș hills, dry pasture on loess walls and in abandoned orchards, 330 m alt., July 15, 2015; Plopiș-Tusa Mountains, Barcău springs, wet pasture, 644 m alt., July 16, 2015; Crasna-Vârșoț Hills, L. Vârșoț, in a meadow, July 17, 2015 (BÁLINT et al., 2017); Almaș-Agrij-Ugruțiu depression, closed steppe, oak forest edge, pasture at the bottom of the valley, May 25, 2016 (KATONA et al., 2016).

At European level this species is in decline and is therefore considered a priority species, conservation measures being needed (FOX et al., 2019). Therefore, many protection measures have been implemented such as: monitoring, ecological studies of species requirements (STREITBERGER & FARTMANN, 2013), restricting recreational activities in habitats where it is present, limiting overgrazing, limiting natural deforestation, improving habitat management (ȘTEFĂNESCU et al., 2021).

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