A neotype designation for the *Whittleia undulella* (Fischer von Röslerstamm, 1837) with review of the distribution (Lepidoptera: Psychidae)

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Abstract: *Whittleia undulella* (Fischer von Röslerstamm, 1837) is a very rare psychid species in the Carpathian Basin and Palaearctic. The original description was based on specimens from Hungary. It is one of the characteristic species of the "puszta" grassland vegetation on sand. The westernmost occurrence is in Hungary, the range in Europe and Central Asia is still incompletely known. The distribution of this species in western Palaearctic is reviewed here, based on data from collections and literature. A neotype for *Whittleia undulella* (Fischer von Röslerstamm, 1837) designated from material collected by A. Friedrich in the 1930's is in the Hungarian Natural History Museum collection. A neotype and lectotype of *Whittleia undulella* and *Whittleia* [*Epicnopteryx*] *undulella* ab. *paveli* Uhryk is designated. The adults and genitalia of *W. undulella* are described and illustrated. A distribution map is illustrated for the first time. With 14 figures.

Keywords: Lepidoptera, Psychidae, *Whittleia undulella*, neotype and lectotype designation, diagnosis, biology, distribution, Palaearctic.

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Introduction

It is undeniable that some micro-moths are able to provoke great curiosity, which may last through generations of students. There are several, often interrelated reasons for this, including the real or apparent rarity in a biogeographical region, and species with an unusual life history. Such problems have contributed to the long-term popularity of Psychidae species, particularly with regard to the European species.

All available information on the distribution of *Whittleia undulella* in Pannonian region and Palaearctic in general is presented here. The data are based on faunistic publications and Lepidoptera collections.

Whittleia undulella was described from Hungary (Ofen= Buda[pest]) (Fischer von Röslerstamm, 1837). So far, this species has been hardly studied. Its distribution is very disjunct; it is relatively well-known in central Hungary since the 1800's, but is always locally and rare in the Palaearctic as a whole. It seems to occur at altitudes from about 100 m up to 350 m in lowland and hilly areas.

Uhryk (1898) described an infrasubspecific form: "*Epicnopteryx undulella* ab. *paveli*". According to Gozmány (1965) "ab. *paveli*" is a valid species, but genitalia investigations have failed to confirm this. There are no differences in genitalia,

and many specimens can be confidently recognized from external features. The wing pattern and ground colour are variable. The "*paveli*" specimens are unambiguously a form of *W. undulella*.

Critical overview of the literature and museum material of *Whittleia undulella* in Carpathian Basin

Research on Hungarian *W. undulella* has been rather neglected in the last few decades. It is due to the growing distance between the level of the Hungarian processing and the elaboration determined by the international publications, which had caused a hardly negotiable inconvenience in the judgement of the state of the Hungarian species. The clarification of the species in questionable position could be the starting point of all the further inland research. During our work, the species with Hungarian distribution were assigned based on the literary data, and were evaluated with the consideration of the taxonomic and geopolitical changes which have occurred since the mention in literature.

W. undulella is not mentioned for Serbia or Romania in Karsholt & Razowski (1996). However, there is information in lepidopterological papers that may be of real significance.

An old record of *W. undulella* was made by Rothschild (1912, p. 27) in April, 1911 in Serbia (Deliblato sands, Flamunda). We have no information about its presence since then, though it is likely that it still occurs there. The Deliblat is largest European continental sandy terrain, and is located in the south-east part of the Pannonian region, i.e. in Banat, covering the area of nearly 35000 ha. The moderate continental climate, absence of surface water courses and sandy soil resulted in unique biocoenoses, located in a special vegetation-geographical area called Deliblaticum.

Another specimen was found in the Hungarian Natural History Museum collection from Romania (Retezat Mountains): ♂ |Retyezát | 1925. IV. 28. | Velez |. The data labels of Mr Zsigmond Velez (1885–1954) are unreliable, and the one-under this specimen is thought to be false. The Retezat Mts is a protected area (National Park Category II IUCN) located in Hunedoara County (SW Romania). *W. undulella* is not known to occur in mountainous regions.

A very old record of *W. undulella* was made by Husz (1881) in Slovakia (Eperjes= Prešov). Unfortunately, there is no voucher specimen, and therefore the site is very questionable.

In addition, a very dubious female specimen from Slovakia was located in the museum (HNHM): "Trencsén, 1909. V. 25. | Pazsiczky |". The identification of the dried specimen is very uncertain, and it is possible that is could be *W. schwingenschussi* Rebel, 1910.

The available evidence fails to demonstrate the presence of *W. undulella* in Slovakia (c.f.: Sauter & Hättenschwiler 1991; Sobczyk, 2011).

Material and methods

Comparative material of all named specimens and one undetermined specimen from the Carpathian Basin were examined are listed amongst the other material examined. The external morphology of the Hungarian specimens was studied and genitalia of many were dissected. The checked specimens and microscopic slides are deposited in the Collections of the Hungarian Natural History Museum (Budapest), Mátra Museum (H-Gyöngyös), Ripl-Rónai Museum (H-Kaposvár) and in the Regiograf Institute (H-Komló). Photographs of adults were taken with Zeiss stereomicroscope using the ScopePhoto 3.0.12 computer software with BMS tCam 3.0 MP digital camera connected to a computer. As a light source, we used two LED panels, each containing 100 separate LED diodes and two filtering membranes, after which the light spectrum was optimized close to the spectrum of natural daylight. Photos of genitalia slides were taken through a Scopium XSP-151-T-Led biological microscope using a MicroQ 3.0 MP digital camera. The digital images were manipulated with CorelDraw X6 and Adobe Photoshop CS. All illustrations and genital preparations were made by the author.

Only data from the specimens with rather precise indications of the locality were included in an Excel spreadsheet with coordinates in decimal degrees that were defined with Google Earth and an Excel spreadsheet with coordinates in decimal degrees that were defined with Google Earth Pro, an online coordinate conversion tool. All data from our personal observations were included in this database.

Collection acronyms: HNHM= Hungarian Natural History Museum, Budapest; RRM= Ripl-Rónai Museum, H-Kaposvár; ZMHB= Museum für Naturkunde der Humbolt-Universität zu Berlin.

Whittleia undulella undulella (Fischer von Röslerstamm, 1837) [Figs 1–8.]

Solenobia undulella Fischer von Röslerstamm, 1837: 86, figs 39 a, b, c. Type locality: Hungary, Ofen (= Buda[pest]).

The original type specimens were lost or severely damaged (see in Treitschke Collection in HNHM, Budapest; Fig. 1). A neotype is designated from near the original locality (see Csepel). Neotype, designated below; slide-mounted (Fig. 1), deposited at HNHM: adult male; Hungary | Csepel (Ung.) | 7. IV. 1933 | A. Friedrich |coll. Gergely |

Synonym: *Epicnopterix undulella* ab. *paveli* Uhryk, 1898, **syn. nov.** The original type series deposited in HNHM, Budapest; Fig. 2). The lectotype designated: "Lectotypus, ♂ | Csepel | Pavel |IV. 1894 | ab. *Paveli* |Whitlea (!sic) *paveli* Uhry (!sic) | Det. Sieder 1954 |". More error writing in the label. "Cotype" | ab. Paveli Uhrik (!sic) |Hungaria | (Csepel) | 5. 4. 1894 | ex coll. PÜNGELER |in coll. ZMHB, Berlin.

References: Gozmány 1965; Husz 1881; Husz 1881; Karsholt & Razowski 1996; Sobczyk 2011; Solyanikov 2001; Sauter & Hättenschwiler 1991; Szőcs 1969; Uhryk 1898.

Designation of neotype: A neotype fixation for *Whittleia undulella* (Fischer von Röslerstamm, 1837) is necessary to define objectively not only this species name but also the genus-group name *Whittleia*, for which *undulella* serves as the type species. Therefore a neotype is designated here, with the following particulars (as required in ICZN 1999: Article 75.3). The neotype is designated to permanently clarify the taxonomic status of the nominal taxon *Whittleia undulella.* The neotype study area on the Danube river valley lies a little under 8 km southeast from the original type locality (Buda[pest] = Ofen]. No source of extant specimens of *W. undulella* is known that would be closer to the original type locality. The neotype is the property of HNHM, a recognized scientific institution that houses and permanently preserves numerous name-bearing types and other zoological voucher specimens.

Fig. 1. Neotype of *Whittleia undulella,* ♂

Fig. 2. Lectotype of *Whittleia undulella* ab. *paveli,* ♂

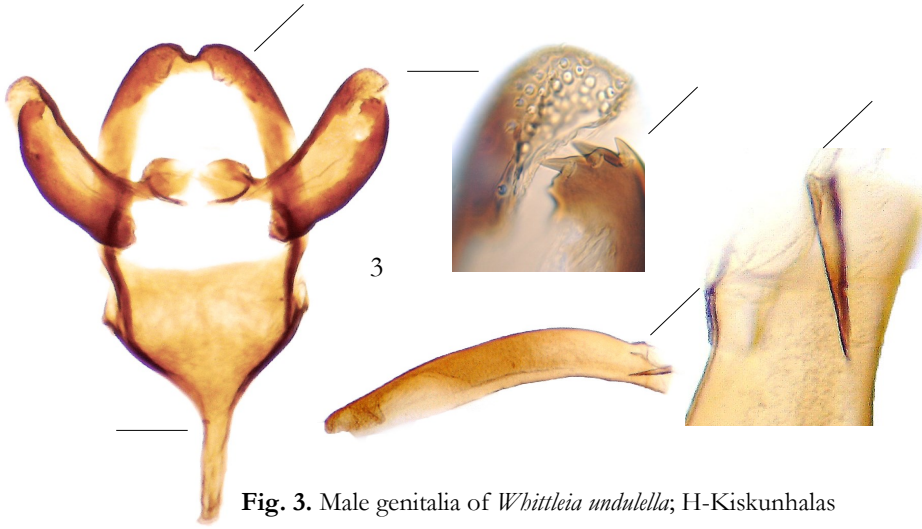

Fig. 3. Male genitalia of *Whittleia undulella*; H-Kiskunhalas

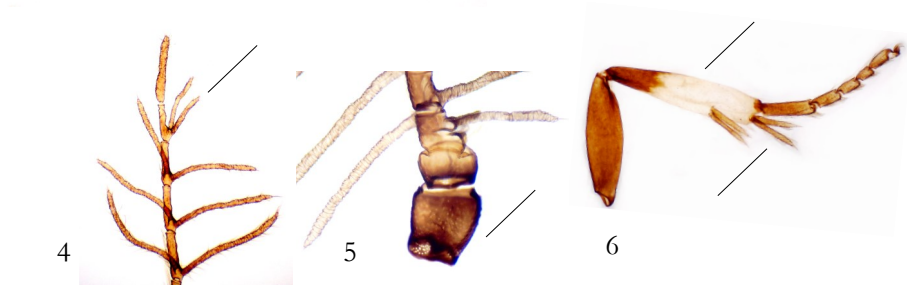

Fig. 4–8.
Diagnostic characters (indicated) of *Whittleia undulella*, ♂:
4. antenna (apical)
5. antenna (basal)
6. hind leg (lateral view)
7. tergit VIII
8. sternit VIII

Other material examined: 2♂, [Ofen], [1838.], [Kindermann], Coll. Treitschke; TREITS 1089; 2♂, [Peszér], [1864.], Frivaldszky, Coll. Frivaldszky; Friv. Coll. 860;1♀, [Rákospalota], [1876.], [Langerth]; 409/25; 1♂ Rákospalota, 1878., [Langerth]; 2♂, Palota, 1878., [Pável]; 3♂, [Budapest vidéke], [1886.], [Pável]; 778a/11; 1♂, Budapest, 1885., Pável; 1♂, 1♀, Budapest, 1891. V. 14., [Abafi-Aigner]; 1♂, Csepel, 1894. IV., Pável; 1♂, Budapest, 1897. IV. 9., Dr. Uhrik Nándor, Coll. Ulbrich; 1♂, Gyón, 1906. IV. 15., Kertész;1 sack, Peszér, 1909. IV. 25., Schmidt; 1♂, Káposztásmegyer, 1909. IV. 26., Gabrielli; 3♂, Káposztásmegyer, 1909. IV. 29., Gabrielli; 1 sack, Trencsén, 1909. V. 25., Pazsiczky; 2 sack, Peszér, 1909. VI. 25., Kertész; 1♂, Csepel-sziget, 1910. IV. 16., Uhryk; 1♂, Budapest, Mátyáshegy, 1916. IV. 9., Haimbach, Coll. Jablonkay; 1♂, Retyezát, 1925. IV. 28., Coll. Velez; 1♂, Szigetszentmiklós, 1931. IV. 18., Uhrik; 2♂, Csepel, 1931. IV. 25., Uhrik; 5♂, Csepel, 1934. IV. 12., Friedrich; 3♂, Csepel, 1934. IV. 14., Uhrik, Coll. Ilosvai Varga; 2♂, Csepel, 1934. IV. 14., Uhrik, Coll. Dr. Kovács L; 1♂, Kiskunhalas, 1934. IV. 6., Dr. Kuthy, Coll. Dr. J. Erdős; 1♂, Csepel, 1935. IV. 7., Friedrich, Coll. Gergely; 1♂, Csepel, 1939. IV. 14., Friedrich, Coll. Dr. Kovács L.; 1♂, Csepel, 1939. IV. 20., Szurdoky, Coll. Dr. Kovács L.; 1♂, Fót, 1941. IV. 20., Jablonkay, Coll. Jablonkay; 1♂, Fót, 1941. IV. 20., Stahulják, Coll. Gergely; 1♂, Fót, 1941. IV. 21., Majthényi, Coll. Jablonkay; 1♂, Szigetszentmiklós, 1943. IV. 20., Uhrik, Coll. Dr. Kovács L; 1 sack, Peszérpuszta, 1949. IV. 2-4., Dr. Issekutz, Coll. Issekutz; 1♂, Fót, Somlyóhegy, 1953. IV. 10., Jablonkay, Coll. Jablonkay; 1♂, Csomád, 1953. IV. 10., Jablonkay, Coll. Kovács I.; 1♂, Csomád, 1953. IV. 10., Jablonkay, Coll. Kovács I.; 2♂, Fót, Csomád, 1953. IV. 10., Jablonkai, Coll. Lengyel; 7♂, Szigetcsép, tangazdaság [= demonstration farm], 1962. IV. 30., Dr. Gozmány; 1 sack, Szigetcsép, tangazdaság, 1963. IV. 17., Szőcs, Coll. Éhik; 20♂, Szigetcsép, tangazdaság, 1963. IV. 23., Szőcs, Coll. Éhik; 1♂ and 1♀ (copula), Szigetcsép, tangazdaság, 1963. IV. 23., Szőcs; 3♀ sack, Szigetcsép, tangazdaság, 1963. IV. 23–30., Szőcs (all specimens in coll. HNHM); 1♂, Kiskunhalas, 1934. IV. 4., Kuthy Béla; 1♂, Kiskunhalas, 1934. IV. 6., Kuthy Béla; 1♂, Kiskunhalas, 1934. IV. 11., Kuthy Béla; 1♂, Kiskunhalas, 1934. IV. 16., Kuthy Béla; 2♂, Kiskunhalas, 1935. IV. 12., Kuthy Béla; 1♂, Kiskunhalas, 1935. IV. 12., Kuthy Béla; 1♂, Kiskunhalas, 1936. IV. 3., Kuthy Béla; 1♂, Kiskunhalas, 1937. IV. 16., Kuthy Béla. (all specimens in coll.RRM).

New data: 2♂, Paks, 09. IV. 2015. foto: Wilfried Voigt & Márta Mária Szalai-Dobosné.

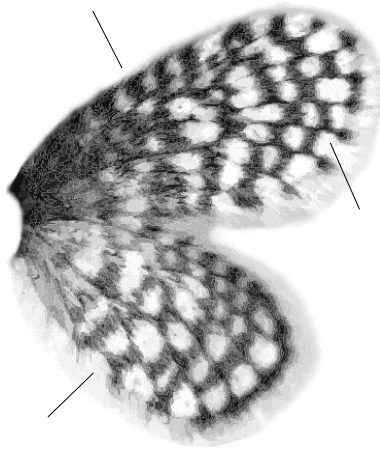

Fig. 9. Wing pattern of *Whittleia undulella*

Diagnosis: Variable species. Wingspan of male 9–12.5 mm. Head and thorax with whitish hair; vertex whitish or light greyish hairy, antenna with 15–20 segments. Wings distinctly roundish, covered with dense hair-like scales; whitish grey with dark greyish brown pattern forming irregular undulated transverse stripes. Fringe scales long and white. Female apterous, length 6 mm, antenna and legs reduced to stumps, obsolescent.

Similar species: Specimens of *Whittleia retiella* Newman, 1847 are smaller than those of *W. undulella*; *W. schwingenschussi* Rebel, 1910 differs in having blackish transverse stripes. *Epichnopterix* (? or *Whittleia*) *moskvensis* Solyanikov 2001, forewing venation with 7 veins from discal cell (see Solyanikov 2001). The type series of "*moskvensis*" it should be reviewed.

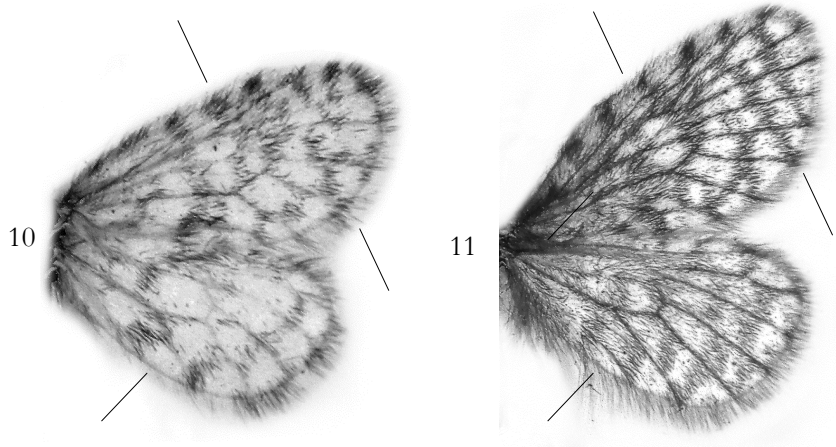

Fig. 10–11. Similar species to *Whittleia undulella*: 10. *W. retiella;* 11. *W. schwingenschussi*

Male genitalia: The general appearance is short and stout. The modified sternum and tergum are usually regarded as belonging to the genitalia. Sternite VIII posterior and anterior margin is concave. Tergite VIII with median lobe and anterior margin concave. Tegumen strong, with two apical lobes. Valva short, sclerotized; cucullus roundish. Clasper of sacculus broad, with 2–4 cornuti; saccus long. Aedeagus long and curved, cornuti absent (Fig. 3).

Female genitalia: not examined.

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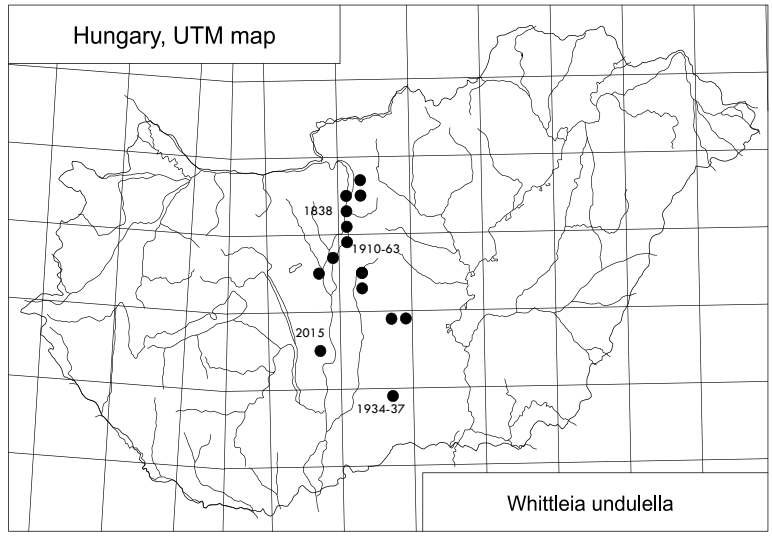

Fig. 12. Confirmed localities of *Whittleia undulella* in Hungary between 1838 and 2015 (see in text)

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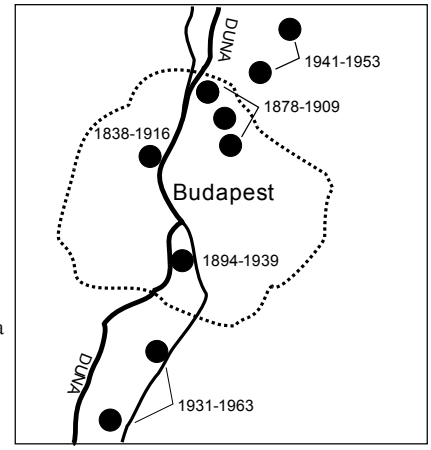

Fig. 13. Localities of *Whittleia undulella* in Budapest area between 1838 and 1963. No new record from 1963 year.

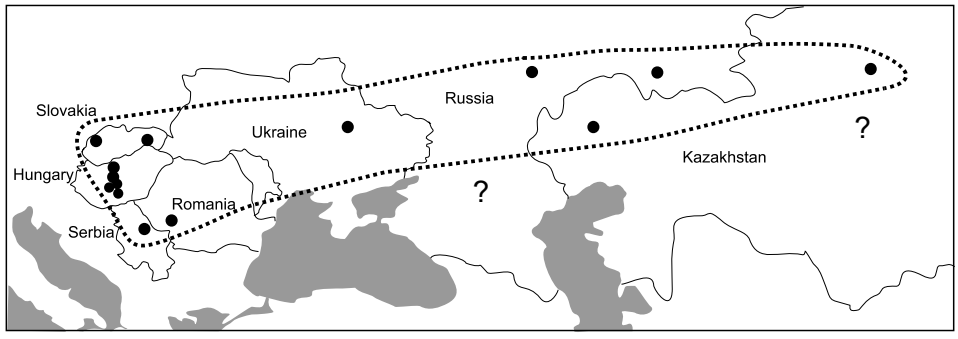

Fig. 14. Distribution of *Whittleia undulella* in Palaearctic (provisional map)

Biology: Hostplant is unknown, possibly *Potentilla arenaria* Borkh., *P. thyrsiflora* Hülsen in Zimm. or *P. leucopolitana* Müll. (Rosaceae). Larvae hibernate. Adults have been collected from early-April to end-June during daylight hours, especially in the afternoon at altitudes from 80 m to about 230–300 m. The preferred habitats are pannonic sand steppes and dune areas in the Danube–Tisza Interfluve. Pannonic sand steppes are endemic habitats of the Pannonian biogeographical region, located in Hungary, but extending into Lower Austria, Slovakia, Romania and Bulgaria. In terms of non-EU countries, the habitat also extends into Serbia. Pannonian sand steppes are characterised by open sand grassland communities usually dominated by tussock-forming, narrow leaved grass *Festuca vaginata* and *Stipa borysthenica*. The species occurs particularly on limestone mountain habitats at low altitudes to about 250–300 m; very local and rare in Somlyó Hills at Fót or Mátyás Hills at Budapest.

Distribution: *W. undulella* has a peculiar disjunct distribution in the Palaearctic, but outside the Carpathian Basin it appears only locally and its habitats are totally isolated. In Hungary, it is found in the Fót Hills and Budai Mountains. It has been observed outside the Carpathian Basin in Ukraine, Russia and Kazakhstan (see in Fig. 14.) and there is an uncertain specimen from Romania (Retyezat Mountains).

The Hungarian localities for *W. undulella* are in two areas: there is a big data group from the Danube–Tisza Interfluve and there are 4 two records from Transdanubia (Mezőföld and Budai Mountains [Ofen = type locality]. The Danube–Tisza Interfluve sand region contains the traditional Hungarian habitats of the species. These sites are usually protected areas (National Park). Unfortunately, the official Hungarian nature conservation has not yet noticed the species. Because it was described from Hungary, and is home to the largest population in Europe, it deserves much more attention. Fig. 12–13.

There is only one reliable reference from the area of Slovakia from May 1909 when Pazsiczky caught a specimen of *W. undulella* near Trenčin. The voucher specimen is in the collection of the Hungarian Natural History Museum Budapest. Gábor Pastoralis (pers. comm. in May 2015) informed me that there is no other record of *W. undulella* from Slovakia.

[There is earlier information about the occurrence of the moth in Slovakia in 1881 from the city of Prešov (Husz 1881), but there is no voucher specimen].

Conservation: *W. undulella* shows a very sporadic distribution throughout its known range. It has apparently declined, at least in the Hungarian part of its range. Based especially on the negative trends in various habitat characteristics, e.g. decreasing amount and quality and high degree of fragmentation, the species has been rated as threatened in Hungary. The major threats to the Pannonic sand steppes are changes in traditional land use, especially the decrease in the number of grazing sheep and goats. The intensification of certain agricultural and forestry practices has also contributed to large-scale losses.

Remarks: *W. undulella* exists only in isolated colonies as relict populations, separated from others by different climatic or ecological features. The unique populations in Hungarian middle hills (Budai Hills, Fóti Hills) and in the Great Hungarian Plain (Danube-Tisza Interfluve, Mezőföld) are typically placed on sand-hill and limestone or dolomite hills areas. The species disappeared from the vicinity of Budapest (Buda, Csepel-sziget, Mátyás-hegy, etc.) and is likely to have become extinct there because the old habitats have been permanently destroyed.

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