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# Nota lepidopterologica

A journal devoted to the study of Lepidoptera
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# Type specimens of 'Cossidae' described by W. Koshantschikov

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**Abstract.** The type material of *Duomitella relicta* Koshantschikov, 1923 and *Stygia gerassimovii* Koshantschikov, 1923 is revised, and lectotypes for both taxa are designated. One new synonym *Brachodes appendiculata* (Esper, 1783) = *Stygia gerassimovii* Koshantschikov, 1923, **syn. n.** is established and the synonymization of *Duomitella relicta* Koshantschikov, 1923 with *Scardia polypori* (Esper, 1786) (Tineidae) is confirmed.

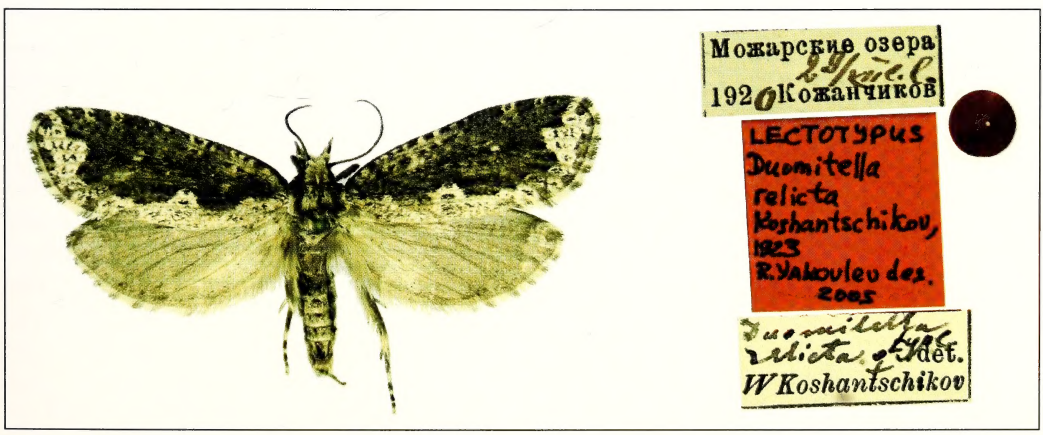
K e y w o r d s . Cossidae, Tineidae, Brachodidae, lectotypus, synonymy, Siberia, Minusinsk.

In his paper "Materialen zur Macrolepidoptera Fauna des Minussinsk [sic] Bezirkes (Siberien Ienisey Gouv.)" Koshantschikov (1923) described two new species of Cossidae (Lepidoptera), *Duomitella relicta* and *Stygia gerassimovii*. For the first species, a new monotypic genus *Duomitella* was also erected. The descriptions were rather detailed, but no figures were given. During work at the Zoological Institute of Russian Academy of Sciences (St. Petersburg) I found the type material of these two species. Hereby I designate lectotypes and discuss the systematic position of these taxa. My designations of these lectotypes arc mach within the framework of my preparation of a catalogue of the Cossidae of the Old World.

## *Duomitella relicta* Koshantschikov, 1923: 22–25 (Figs. 1–2)

References: Zagulyaev 1973: 89 (= *Scardia polypori* (Esper, 1786)); Schoorl 1990: 242; Yakovlev 2004: 155 (= *Scardia polypori* (Esper, 1786)).

M a t e r i a l . Lectotype (**here designated**): ♀ in perfect condition with labels: 1- (rectangular yellowish paper typed label) "Можарские озёра [Mozharskie lakes] | 29.07. e.[x] l.[arva] | 1920, Кожанчиков [Koshantschikov]"; 2- (red circle); 3- (rectangular yellowish paper label with inscription made by Koshantschikov in black Indian ink) "*Duomitella* | *relicta* ♂ type" (and typed inscription) "Koshantschikov det.",; 4- (rectangular red author's label) "Lectotypus | *Duomitella* | *relicta* | Koshantschikov, | 1923 | R. Yakovlev des. | 2005". 1♂, 1♀ are designated paralectotypes.



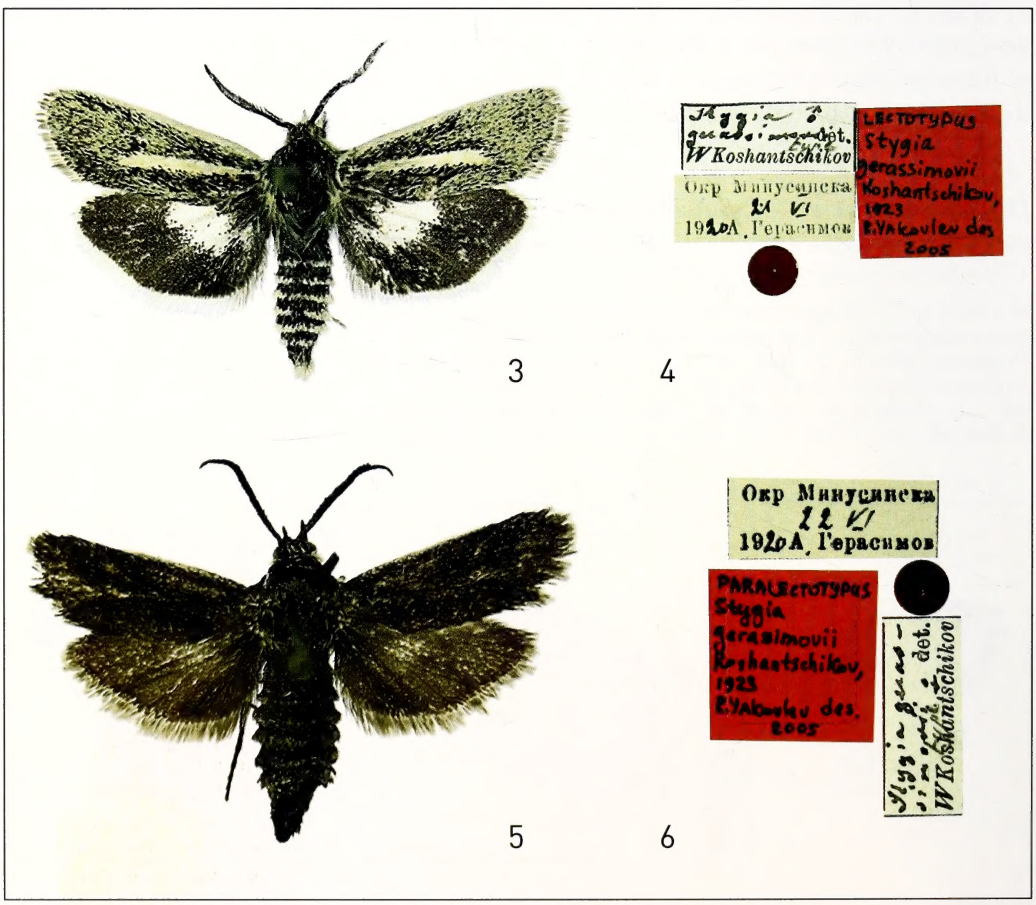

**Figs. 1–2.** *Duomitella relicta* Koshantschikov, 1923. **1.** Lectotype. **2.** Labels of lectotype.

The species was described from 1♂ and 2♀ collected in "Mozharskie" marshes [E part of Minusinsk district, Tiberkul' (Itkul') lake]. It was later synonymized with *Scardia polypori* (Esper, 1786) (Tineidae) by Zagulyaev (1973). Schoorl (1990: 242) was not aware of Zagulyaev's work, but, having analysed the original description, he also came to the conclusion that the taxon did not belong to Cossidae. My critical study of the type material of *Duomitella relicta* Koshantschikov, 1923 totally confirms Zagulyaev's point of view.

### *Stygia gerassimovii* Koshantschikov, 1923: 25–27, Syn. n. (Figs. 3–6)

References: Daniel 1954: 174; Schoorl 1990: 79; Yakovlev 2004: 161–162.

Material. Lectotype (**here designated**): ♀ in perfect condition with labels: 1- (rectangular yellowish paper typed label) "окр. Минусинска [near Minusink] | 21.06.1920 | Кожанчиков [Koshantschikov]"; 2- (red circle); 3- (rectangular yellowish paper label with inscription made by Koshantschikov in black Indian ink) "*Stygia* | *gerassimovii* ♂ type" (and typed inscription) "Koshantschikov det."; 4- (rectangular red author's label) "Lectotypus | *Stygia* | *gerassimovii* | Koshantschikov, | 1923 | R. Yakovlev des. | 2005 ". 23♂, 2♀ are designated as paralectotypes.




**Figs. 3–6.** *Stygia gerassimovii* Koshantschikov, 1923. **3.** Lectotype. **4.** Labels of lectotype. **5.** Paralectotype, ♀. **6.** Labels of this paralectotype.

The species was described from 24♂ and 2♀ collected on Tagarsky island (river Yenisey, near Minusinsk). Afterwards, it was only mentioned as a member of Cossidae (Daniel 1955; Schoorl 1990; Yakovlev 2004), and only on the basis of the detailed original description. After a thorough analysis of Koshantschikov's description, Vladimir V. Dubatolov (Novosibirsk, Russia) assumed that the taxon could belong to Brachodidae. The same assumption was admitted by Axel Kallies (Australia).
My study of the type material shows that the taxon does in fact belong to Brachodidae and that it is conspecific with *Brachodes appendiculata* (Esper, 1783), a species known from South and Central Europe, southern Urals, northern Kazakhstan, and southern Siberia (Zagulyaev 1978).

**Acknowledgements**

I am grateful to S. Yu. Sinev (St. Petersburg) for his help during my work with the type material of the Zoological Institute, Russian Academy of Sciences, to V. V. Dubatolov (Novosibirsk) and Axel Kallies (Australia) for their fruitful comments on the analysis of the *Stygia gerassimovii* description, to J. W. Schoorl jr. (Holland) for his help in my search for rare publications, to Thomas Witt (Germany) for his all-round support of this investigation, and to V. V. Zolotuhin (Ulyanovsk) for his helpful comments during my work.

**References**

Daniel, F. 1955. Monographie der Cossidae. I. Kritishe Beurteilung der bisher dem Genus *Stygia* Latr. zugeteilten Arten. – Mitteilungen der Münchner Entomologischen Gesellschaft E.V., 45: 159–181, pl. 1.

Koshantschikov, W. 1923. Materialen zur Macrolepidoptera Fauna des Minussinsk Bezirkes (Siberien Ienisey Gouv.). – Ezhegodnik gosudarstvennogo museja N.M. Mart'yanova **1** (1–6): 25–27.

Schoorl, J. W. 1990. A phylogenetic study on Cossidae (Lepidoptera: Ditrysia) based on external adult morphology. – Zoologische Verhandelingen. **263**: 295 pp.

Yakovlev, R. V. 2004. Carpenter-moths (Lepidoptera, Cossidae) of Siberia. – Euroasian Entomological Journal **3** (2): 155–163, pl. 1. (in Russian)

Zagulyaev, A. K. 1973. Nasekomye Cheshuekrylye, Fauna USSR **4** (4): 89 (in Russian)

Zagulyaev, A. K. 1978. Cossidae – Drevotochzy. P. 184. – *In*: G. S. Medvedev (ed.), Opredelitel' nasekomykh evropeiskoi chasti SSSR **5** (4) Cheshuekrylye 1. – Leningrad, Nauka. (in Russian)

Book Review

**Barry Goater, Matthias Nuss & Wolfgang Speidel. Pyraloidea I (Crambidae: Acentropinae, Evergestinae, Heliothelinae, Schoenobiinae, Scopariinae). – *In*: Peter Huemer & Ole Karsholt (eds.), Microlepidoptera of Europe, Volume 4.** – Apollo Books, Stenstrup. 304 pp. Hardcover (ISBN 87-88757-33-1). DKK 580.00.

This book's publication is welcomed after some delay, which allowed Volume 5 to be published ahead of volume 4. The size and binding is similar to earlier volumes in this series. It begins with an abstract detailing taxonomic changes, there is then an introductory chapter on the Pyraloidea describing the morphology of adults, their head, wings, tympanal organs and male and female genitalia. The classification of Pyraloidea at family level has long been a matter of debate, this book departs from the practice embodied e.g. in Karsholt & Razowski (1996) by using two families: Pyralidae and Crambidae to separate the superfamily. The differences are well known to taxonomists, Munroe (1972) and most authors following him retained the well known name Pyralidae for the benefit of non specialists and used the terms Crambiform and Pyraliform

to separate the two categories. Others have argued that the superfamily name is sufficient to encompass the two groups and this position is accepted here. It means that non specialists who recognised Pyralinae and Pyraustinae *s.l.* as the broad winged mesolepidoptera will have to remember to call them Pyraloids rather than Pyralids. The differences between these groups are clearly set out in a table and the subfamilies belonging to each are listed in alphabetical order, without any attempt to show their familial relationships. There follow some brief notes about collecting and the preparation of moths and their genitalia. No reason is given for the arbitrary selection of five Crambid subfamilies, but it is assumed that this is made necessary by the state of knowledge and availability of specialists in those groups. A checklist of species is given with a number assigned to each, the same number being used consistently for the species descriptions and genitalia illustrations. Sensibly, introduced species are assigned letters, rather than numbers, which would interrupt the sequence of European species. There then follows the treatment of the respective subfamilies and their species. For the Acentropinae the introduction is longer and includes a cladogram of the genera and additional morphological details. The species accounts follow including a full synonymy, brief diagnosis, description of male and female genitalia, distribution and biology. The Evergestinae have a shorter introduction, the species accounts generally contain a longer diagnosis. Species from north Africa are also included; the final two species are headed "Taxa incertae sedis" and left in their original genus. The Heliothinae contains but one species in Europe and so this subfamily does not take many pages, Schoenobiinae are treated in a similar manner to Acentropinae, with a few keys included. The Scopariinae, on account of their greater numbers, occupy about half of the book. The species accounts are concise but appear accurate. There follows a Distribution table for all species, where the occurrence in each country is tabulated. This follows the pattern of Karsholt & Razowski with some refinements, but different symbols described in the introduction are used by some authors and not others. Scopariinae species have the country's letters in upper case only if they have been verified by the author. Parentheses for introductions are used without explanation, and brackets for extinct species are used, but not consistently. The colour plates showing the adults are made from photographs and are very clear. The Scopariinae are featured on one plate natural size, but also on subsequent plates at 1.75 × natural size. Each specimen figured has the data for that specimen detailed on the opposite page. Next the male genitalia are illustrated, the Acentropinae, Evergestinae and Schoenobiinae by fine line drawings, the remainder by photographs. Finally are the references and index. In any multi-author work of this size there are likely to be errors and inconsistencies; for example the original spelling of *andalusicum* is given in the checklist and species description, but is changed to *andalusica* in the index and illustrations, *Parapoynx stagnalis* is stated as being introduced to England, even though the author himself pointed out that this was a misidentification and gives the reference to the correction! The distribution of *Scoparia ancipitella* is stated to be Lowland to montane without it saying exactly where. Despite these minor shortcomings this volume must be warmly welcomed, and the treatment of the Scopariinae is sure to remain a masterpiece for a difficult group.

David Agassiz

**References**

Karsholt, O. & Razowski, J. 1996. The lepidoptera of Europe, a distributional checklist. 380 pp. Stenstrup.

Munroe, E. 1972. Pyraloidea, Pyralidae comprising subfamilies Scopariinae, Nymphulinae. – *In*: R. B. Dominick et al. (eds), The Moths of America north of Mexico. **13.1A**: 1–134. London.

# *Perizoma onurcani* sp. n. from Turkey (Geometridae: Larentiinae)

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**Abstract.** The description of a new geometrid moth, *Perizoma onurcani* **sp. n.**, from northern Turkey (Trabzon Province) is given. The holotype and two paratypes (all females) of the new taxon are kept in the collection of the University of Mustafa Kemal, Hatay, Turkey (UMKH).

**Zusammenfassung.** *Perizoma onurcani* **sp. n.** wird aus der nördlichen Türkei (Provinz Trabzon) beschrieben. Der Holotypus und zwei Paratypen (alles Weibchen) der neuen Art werden in der Sammlung der Mustafa Kemal Universität, Hatay, Türkei (UMKH) aufbewahrt.

Key words. Lepidoptera, Geometridae, *Perizoma onurcani*, new species, Turkey.

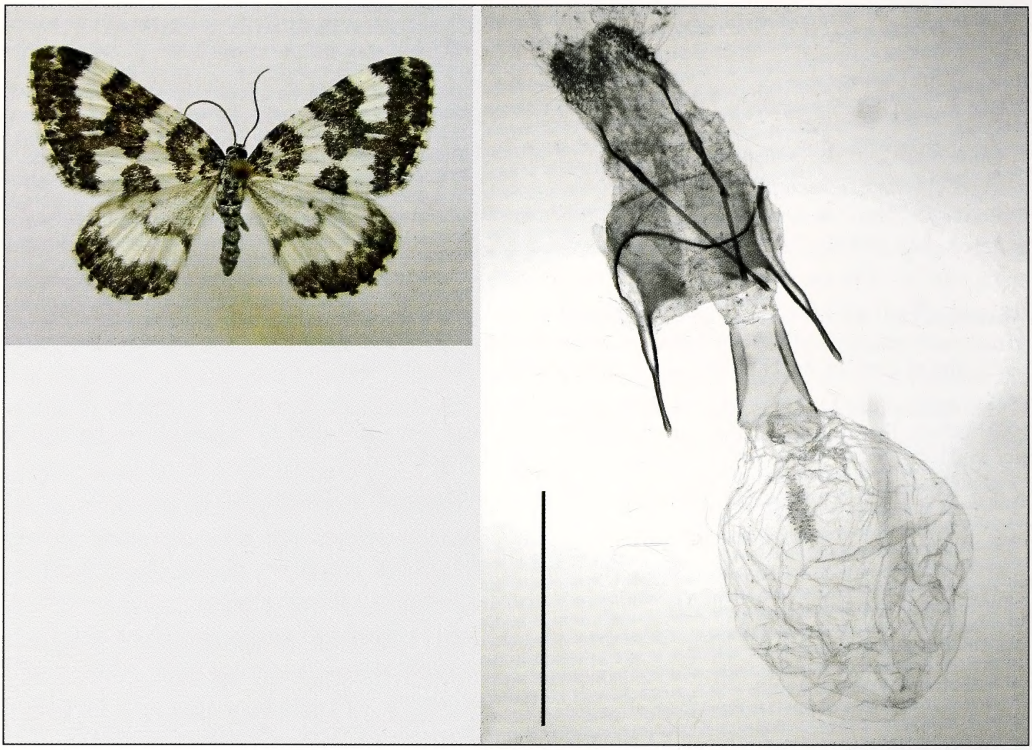
## Introduction

After the publications of Riemis (1994), Viidalepp (1996) and Mironov (2000, 2003) on the geometrid moths of Turkey, Transcaucasus (which belonged to the former U.S.S.R.), and Europe, the species of the genus *Perizoma* Hübner, 1825 of the fauna of Asia Minor were thought to be well known. Up until now, eight species of this genus have been recorded from the territory of Turkey, i.e. *P. alchemillata* (Linnaeus, 1758), *P. hydrata* (Treitschke, 1829), *P. parahydrata* Alberti, 1969, *P. gigas* Wiltshire, 1976, *P. bifaciata* (Haworth, 1809), *P. blandiata* ([Denis & Schiffermüller], 1775), *P. albulata* ([Denis & Schiffermüller], 1775), and *P. flavofasciata* (Thunberg, 1792). Recently, however, a new geometrid species was found near Trabzon, in the northern part of Turkey. This species is externally reminiscent of representatives of the genera *Pseudobaptria* Inoue, 1982 (Inoue 1982; Sato 2002; Mironov 2003) and *Epirrhoe* Hübner, 1825 (Pierce 1914; Prout 1912-1916; Błeszynski 1965; Urbahn 1968) rather than to any other species of *Perizoma*. Nevertheless, the venation and the female genitalia of this species are typical of representatives of the genus *Perizoma* (Pierce 1914; Prout 1912-1916; Błeszynski 1965; Mironov 2000, 2003).

### *Perizoma onurcani* sp. n.

Material. Holotype ♀. **Turkey**, Trabzon Province, Macka, Camlıduz, 40°45'N; 39°28'E, 1516 m, 30.vi.2005, at light, leg. F. Can (UMKH). Paratypes: 2♀, same data, but 1470 m, 16.vi.2003, at light, leg. O. Doganlar (slide no. 58) (UMKH).

**Description** (Fig. 1)**.** Wingspan 26.5–28.0 mm; fore wing 14.5–15.0 mm. Labial palpi about 1.2 times diameter of eye. Frons and vertex covered with black and white scales. Antennae filiform, brown. Thorax dorsally covered with mixture of black and white scales. Fore wing broad with slightly arched costal and terminal margins and rounded



**Figs. 1–2. 1.** *Perizoma onurcani* sp. n., holotype ♀. **2.** Female genitalia of *Perizoma onurcani* sp. n. (slide no. 58).

apex; ground colour rich black and white; basal area broad, black, irrorate with white scales, with broken broad white transverse band in middle; outer border of black basal area evenly curved; medial area black, irrorate with white scales, broadened to costa, divided by narrow, longitudinal white band along Cu2 and connected with terminal area by two short, longitudinal black bands between M2-M3 and M3-Cu1; outer border of medial area strongly curved twice towards termen of fore wing; terminal area broad, black, with narrow, wavy white subterminal line forming small whitish spot at termen between M2 and M3. Fringe clearly chequered black and white. Hind wing rounded, broad; basal half covered with mixture of black and white scales; outer border of basal area sinuate, darker, blackish; transverse band between basal and terminal areas very broad and clearly white; terminal area broad, black, slightly irrorate with white scales, especially along inner border, with whitish wavy subterminal line; discal dot small, rounded or ovoid, black, placed in basal area closer to costal margin of hind wing; fringes as on fore wing. Abdomen pale grey, irrorate with black scales, with narrow black transverse bands along posterior margin of each segment.

Female genitalia (Fig. 2). Bursa copulatrix large, ovate, membranous, with one narrow, elongate scobinate signum. Ductus seminalis attached to posterior part of corpus bursae near base of colliculum. Colliculum collar-like, rather flat, large, elongate and broad, slightly tapered posteriorly. Antrum membranous. Tergite A8 rather broad

with rounded posterior corners and broad, slightly sclerotized medial area. Anterior and posterior apophyses thin, elongate, slightly expanded at apices; posterior apophyses dilated at their bases. Basal arms of anterior apophyses connected with each other by a long and narrow, heavily sclerotized band encircling antrum. Papillae anales large, rather broad and elongate, covered with numerous medium-sized setae.

**Habitat.** The type series was collected at light at altitudes of 1,470 to 1,516 m above sea level. The natural vegetation in this area is 'plateau dominated' by forest roses, blackberry, privet, firebush, fern, wild strawberry, as well as forest trees such as spruce, fir, and beech.

**Life history.** The moths were collected while flying to the light of mercury vapor lamps (160 W). The immature stages are unknown.

**Distribution.** The species is known only from its type locality – the northern part of Asian Turkey (Trabzon Province).

**Derivatio nominis.** This species is dedicated to Onurcan - the son of Dr. Feza Can (Doganlar).

**Remarks.** This species is, externally, reminiscent of representatives of the genera *Pseudobaptria* and *Epirrhoe* rather than of any other species of the genus *Perizoma*. *Perizoma onurcani* sp. n. can be recognized readily and distinguished easily from any other Larentiinae species by the distinctive black and white maculation. The female genitalia are more similar to those of *Perizoma flavofasciata* (Thunberg, 1792), but clearly distinguishable by the shorter scobinate signum in the bursa copulatrix and the presence of a slightly longitudinally sclerotized, medial area on the eighth tergite. The relationship of *Perizoma onurcani* sp.n. with any other species of this genus is not known.

**Acknowledgements**

We wish to express our thanks to the following colleagues who helped during fieldwork: Dr. Oguzhan Doganlar (UMKH, Faculty of Agriculture, Department of Entomology), Dr. Cigdem Ulubas Serce (UMKH, Faculty of Agriculture, Department of Phytopathology), Dr. Sedat Serce (UMKH, Faculty of Agriculture, Department of Horticultural Crops), and Dr. Murat Kütük (University of Inonu, Faculty of Science and Letters , Department of Biology, Malatya, Turkey). Bernard Landry kindly improved the English text.

**References**

Błeszynski, S. 1965. Klucze do Oznaczania Owadow Polski, Czesc 27. Motyle – Lepidoptera, Zeszyt 46 b, Miernikowce – Geometridae, Podrodzina Hydriomeninae, Warszawa, 305 pp.

Inoue, H. 1982. Geometridae. – *In*: H. Inoue et al., Moths of Japan, vol. **1**: 425–573, vol. **2**: 263–310. – Kodansha, Tokyo.

Mironov, V. G. 2000. Sistematika pjadenitz triby Perizomini (Lepidoptera, Geometridae, Larentiinae). [Systematics of the Geometrid Moth tribe Perizomini (Lepidoptera, Geometridae, Larentiinae)]. – Entomologicheskoe Obozrenie **79** (1): 112–122.

Mironov, V. 2003. Larentiinae II (Perizomini and Eupitheciini). – *In*: A. Hausmann, The Geometrid Moths of Europe **4**. – Apollo Books, Stenstrup. 463 pp.

Pierce, F. N. 1914. The genitalia of the group Geometridae of the Lepidoptera of the British Islands. – Liverpool, XXIX + 88 pp., 48 pls.

Prout, L. B. 1912–1916. Die spannerartigen Nachtfalter. – *In*: A. Seitz, Die Gross-Schmetterlinge des Palaarktischen Faunengebietes **4**. Stuttgart, 479 pp., 25 pls.

Riemis, A. 1994. Geometridae of Turkey **3**. A provisional list of the Geometridae of Turkey (Lepidoptera). – Phegea **22** (1): 15–22.

Sato, R. 2002. Taxonomic notes on *Pseudobaptria corydalaria* (Graeser) (Geometridae, Larentiinae) and its allies from Russia, Japan, China and Europe, with description of one new species from China. – Tinea **17** (1): 33–41.

Urbahn, E. 1968. Was ist *Epirrhoë tartuensis* Möls 1965? – Nachrichtenblatt der Bayerischen Entomologen **17** (2): 17–25.

Viidalepp, J. 1996. Checklist of the Geometridae (Lepidoptera) of the former U.S.S.R. – Apollo Books, Stenstrup. 111 pp.

# *Chesias angeri* Schawerda, 1919 stat. rev., a long neglected species from northern Italy (Geometridae)

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**Abstract.** *Chesias angeri* Schawerda, 1919, has been discovered in north-eastern Italy (Friuli Venezia Giulia) for the first time since its description. The hitherto disputed species is characterized by an invariable unique pattern of the forewing and other external characters that differ from those of the related *C. rufata* (Fabricius, 1775). The male genitalia are very similar to those of *C. rufata*. However, the female genitalia exhibit significant differences and support separate specific status. Morphological characters of both species are figured.

**Zusammenfassung.** *Chesias angeri* Schawerda, 1919, wurde erstmals seit ihrer Beschreibung in Nordostitalien (Friuli Venezia Giulia) wiederentdeckt. Die bisher umstrittene Art zeichnet sich gegenüber der nahe Verwandten *C. rufata* (Fabricius, 1775) durch konstante Zeichnungsunterschiede im Vorderflügel sowie weitere habituelle Merkmale aus. Die männlichen Genitalien sind jenen von *C. rufata* sehr ähnlich, jedoch finden sich in den Weibchen signifikante Differenzen, die einen separaten Artstatus belegen. Morphologische Merkmale beider Arten werden dargestellt.

Key words. Lepidoptera, Geometridae, *Chesias angeri*, Italy.

## Introduction

The genus *Chesias* Treitschke, 1825 is restricted to the western Palaearctic region where it comprises ten species (Scoble 1999). However, the taxonomy at the specific and subspecific levels is highly disputed even for the European fauna. Müller (1996) accepted five European species including *C. legatella* (Denis & Schiffermüller, 1775), *C. rufata* (Fabricius, 1775), *C. isabella* Schawerda, 1915, *C. pinkeri* Schawerda, 1939, and *C. zuellichi* Schawerda, 1939. However, according to Hausmann et al. (2005), *C. linogrisearia* Constant, 1888 is accepted as a valid species and *C. zuellichi* is regarded as a synonym of *C. pinkeri*, the latter, at the same time, being downgraded to a subspecies of *C. rufata*. Furthermore, *C. capriata* Prout, 1904 is considered a valid species, and not a subspecies of *C. legatella*.

The regional checklist of the Italian fauna (Raineri & Zangheri 1995) included two species only, viz. *C. legatella* and *C. rufata*. However, according to the above mentioned studies *C. capriata* and *C. linogrisearia* have to be added.

Despite all efforts the identity of another species from Italy remained obscure till now. The taxon described as *Chesias angeri* Schawerda, 1919, was either ignored by authors (Forster & Wohlfahrt 1981; Müller 1996; Raineri & Zangheri 1995), treated as a valid species (Scoble 1999) or considered as a synonym of *C. rufata* (Hausmann et al. 2005), based on the examination of a single male syntype without abdomen (Hausmann *in litt.*, referring to the examination of Viidalepp, the author of the forthcoming volume 3 of Geometrid Moths of Europe). However, the well known Austrian lepidopterist Karl Schawerda described *C. angeri* as a good species, based on three male specimens that

were collected by A. Buchtik on 18th April 1918 at San Quirino, by Prof. F. Anger on 5th May 1918 at Muscoli near Cervignano, and by F. Wagner in May 1918 at Magredis (Schawerda 1919), all localities situated in the north-eastern corner of Italy (provinces of Udine and Pordenone). Additional material collected by Wagner from 10th to 18th April 1918 was not included in the original description (Wagner 1923). The very distinct external appearance left no doubt that it was a new species and Schawerda (1919) figured it in black and white.

For decades no further specimens of *C. angeri* were collected, despite some specific search by Pinker at the type locality Magredis (Kusdas & Thurner 1955). Consequently the latter authors regarded the species to be, possibly, a rare form of *C. rufata*. The lack of material probably contributed significantly to the ignorance and omission of the species in standard European literature. In recent years the second author was able to collect a series of *Chesias* that were tentatively identified as *C. rufata*. Discussions with the first author and examination of several specimens showed the rediscovery of *C. angeri*. Morphological characters such as wing markings and female genitalia leave no doubt as to specific status. Therefore, the species rank is re-established, the taxon is re-described, and the male and female genitalia are figured for the first time.

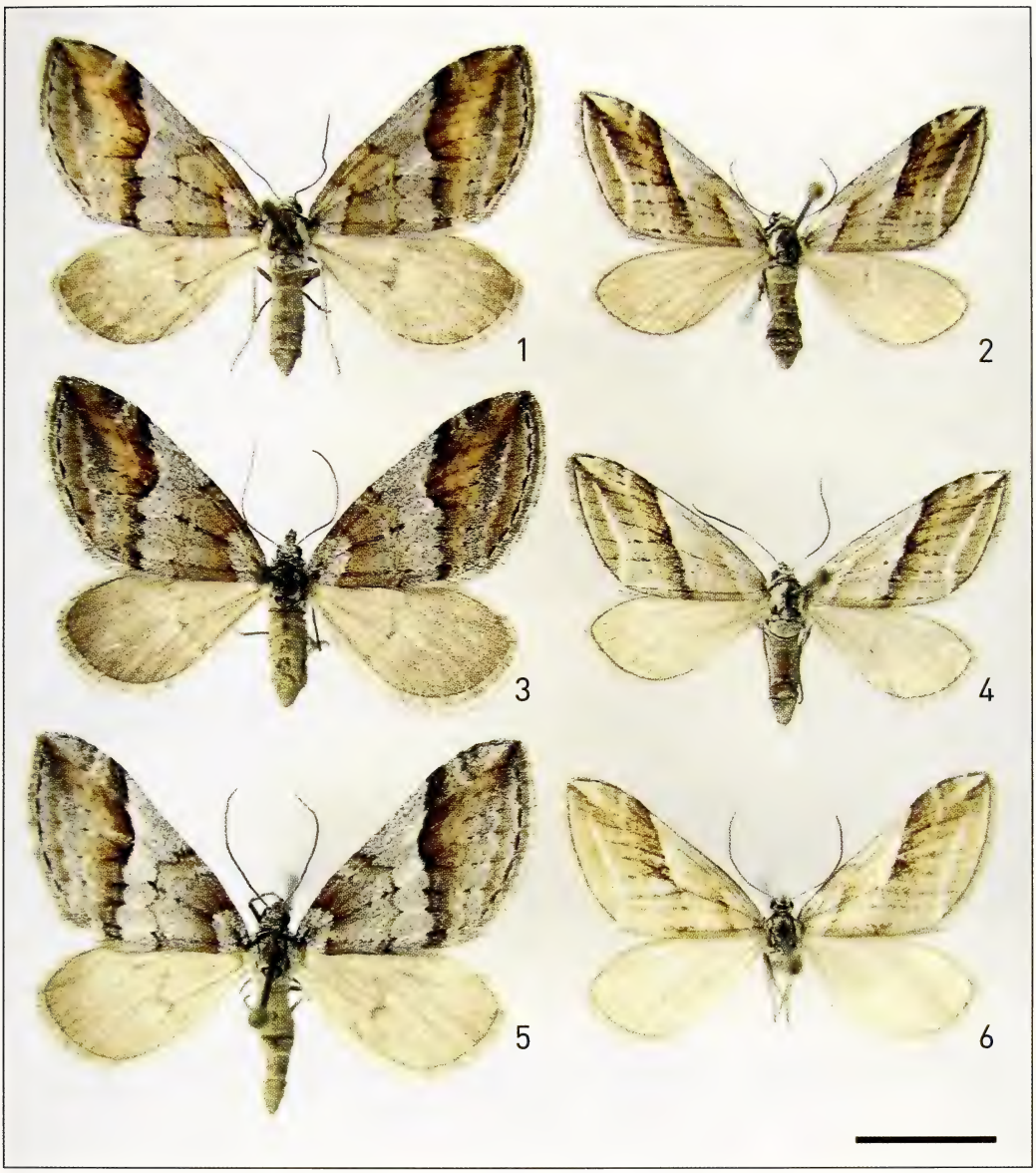
### *Chesias angeri* Schawerda, 1919 stat. rev.

Material. 3♂, 5♀, Italy, prov. Udine, Campoformido, 80 m, 16.iv.2000, leg. Morandini; 2♂, 3♀, same data, but 21.iv.2000, 3♂, 3♀, same data, but 23.iv.2000; 2♂, same data, but 9.v.2003 (colls. Museo Friulano di Storia Naturale, Udine; Tiroler Landesmuseum Ferdinandeum, Innsbruck; Zoologische Staatssammlung, München; Morin, Monfalcone). The exact locality is not stated for conservation purposes.

**Redescription.** Adult (Figs. 2, 4, 6). Wingspan: ♂, 27 mm (n=1); ♀, 25–27 mm (n=5). Labial palpus porrect, brown, ventral and inner surface lighter, greyish brown. Frons, vertex, tegula and thorax greyish brown, mixed with some brown. Abdomen greyish brown, margins of segments lighter. Forewing rather narrow, pointed, termen oblique; ground colour light greyish brown with two darker lines almost parallel to termen; brown, narrow, oblique basal line at one fifth abruptly turned costad near subcosta; medial line almost absent, occasionally indistinctly developed with weakly light rust-brown area towards basal line; dark rust-brown, moderately broad, straight and oblique postmedial fascia from middle of inner margin towards two-thirds of costa; subterminal area with whitish line, slightly curved towards termen at tornus; area between termen and fascia suffused with dark brown scales; dark brown apical streak and dark brown, persistent terminal line present; hindwing light greyish-brown, without distinct markings.

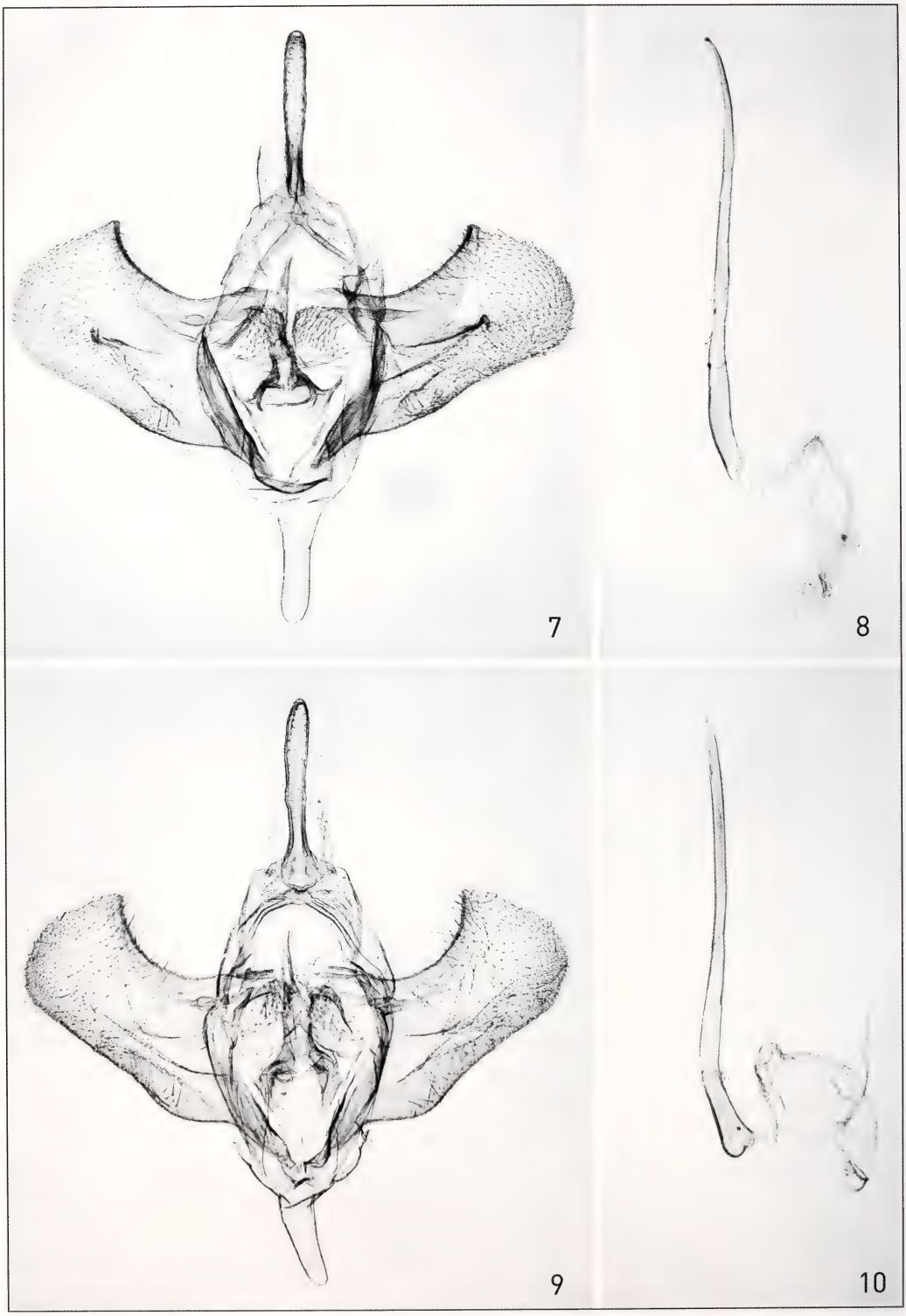
Genitalia ♂ (Figs. 9–10). Uncus long, almost clavate; tegumen narrow; valva broad, with sclerotized rod along ventromedial surface, saccular margin basally rounded, distal part slightly emarginated, apex of valva broadly rounded with pointed costal part; transtilla consisting of pair of broad and setose papillae; juxta with prominent, spine-like caudal process, lateral processes absent; vinculum with long, rod-like saccus, slightly shorter than uncus; phallus long and very slender, slightly curved near base.

Genitalia ♀ (Fig. 12). Papillae anales small; apophyses posteriores rather long, about two times length of tergum A8; apophyses anteriores short, about half length of




**Figs. 1–6.** Adults of *Chesias* species. **1, 3, 5.** *Chesias rufata* (Fabricius, 1775). **2, 4, 6.** *Chesias angeri* Schawerda, 1919. (scale bar = 1 cm)

tergum A8; tergum A8 sub-rectangular, with convex posterior and concave anterior margin; sternum A7 with broad and convex anterior margin, inserted by slightly sclerotized antrum; ductus bursae short, about length of segment A8, well sclerotized and slightly curved anteriorly, abruptly joining pear-shaped entrance of corpus bursae; corpus bursae large, main part almost globular, densely covered with star-shaped signa, less spinose posteriorly.




**Figs. 7–10.** Male genitalia of *Chesias* species. **7–8.** *Chesias rufata* (Fabricius, 1775). **9–10.** *Chesias angeri* Schawerda, 1919.

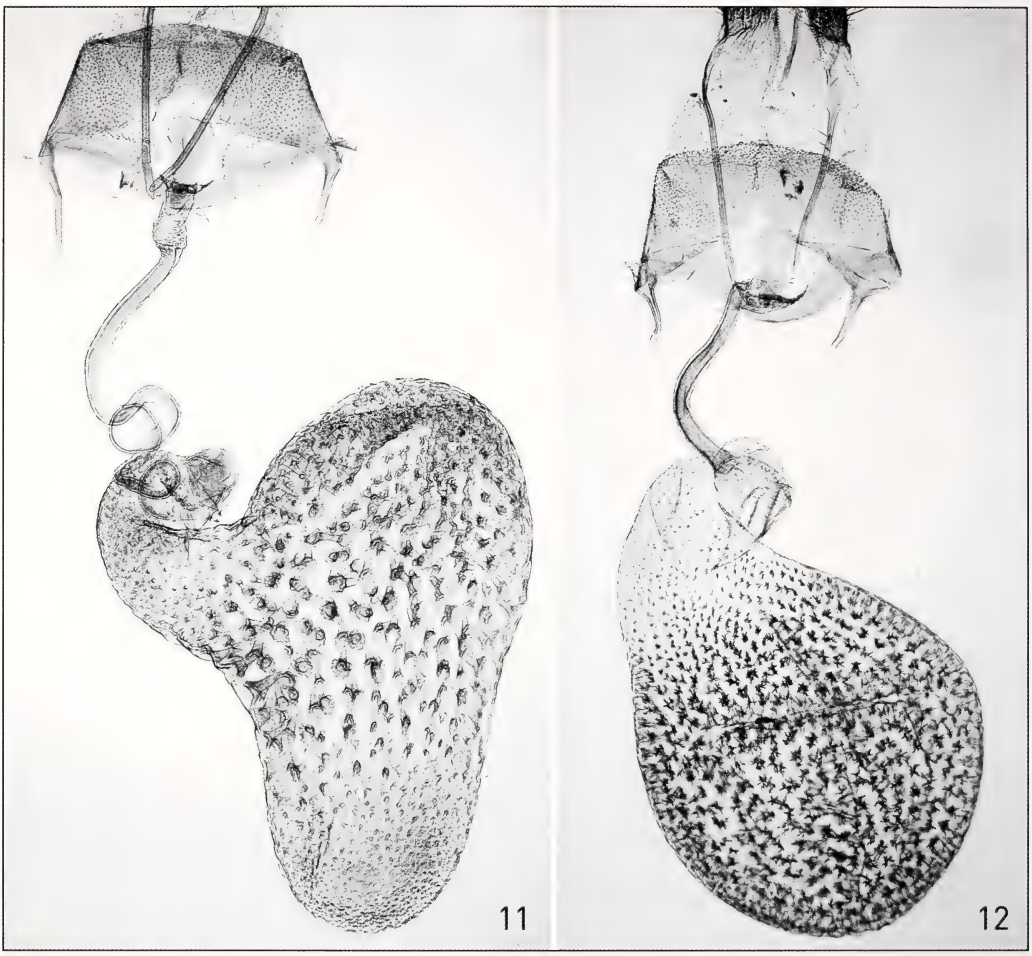
**Differential diagnosis.** *C. angeri* differs from *C. rufata* in numerous external characters (Figs. 1–6) that have all been described in details already by Schawerda (1919). Particularly the dark forewing markings of both species are completely different: the basal line and the post-medial fascia are almost parallel to the termen in *C. angeri* and the ante-medial line of *C. rufata* is completely absent. Furthermore, the distinct postmedial fascia of *C. rufata* is slightly angulate towards the cell and turns straight from about two-thirds of the costa to three-quarters of the inner margin where it ends right-angled. Instead of a slightly curved subterminal line *C. rufata* exhibits a straight whitish wavy line and the dark brown terminal line is interrupted in the latter species whereas it is persistent in *C. angeri*. Finally, *C. angeri* is smaller and more narrow-winged than *C. rufata* and the colour of its hindwings is lighter.

The genitalia are particularly distinct in the females (Figs. 11–12) throughout the genus. *C. angeri* is characterized by a comparatively short ductus bursae meeting the globular corpus bursae in the posterior section. In *C. rufata* the ductus bursae is much longer and caudally coiled, meeting the reniform corpus bursae laterally. The male genitalia of both species are very similar and alleged differences such as in the shape of the valva seem to underplay intraspecific variation (Figs. 7–10). However, only two males of *C. angeri* could be examined so far. The genitalia are also particularly similar to those of *C. rhegmatica* Prout, 1937, from Cyprus, which, however, is completely different externally.

**Distribution.** North-eastern Italy (Fig. 13). Only known from a few closely situated localities: Campoformido (prov. Udine, UTM UL 59); Cervignano del Friuli, Muscoli (prov. Udine, UTM UL 77); Povoletto, Magredis (prov. Udine, UTM UM61); San Quirino (prov. Pordenone, UTM UM 20). Reputedly occurring in Bosnia-Herzegovina (Scoble 1999), but this reference is based on a misinterpretation of the original description. Schawerda (1919) only mentioned that one of his collectors, A. Buchtik, who found the new species in San Quirino, had collected for him in the Herzegovina for several years in earlier times.

**Life history.** The habitat (Fig. 14) of *C. angeri* is permanent xerophilous meadows with a continuous sward and a rich flora of up to 60 species within 100 square meters. This vegetation grows on an alluvial gravel substrate, has never been fertilized, and is mown once or twice a year. Phyto-sociologically it belongs to the Onobrychio arenariae-Brometum erecti association with numerous xerophilous species such as *Onobrychis arenaria* (Kit.) DC., *Ononis spinosa* L., *Anthyllis vulneraria* ssp. *polyphylla* (DC.) Nyman (Fabaceae), *Thymus pulegioides* L. (Lamiaceae), *Knautia illyrica* Beck (Dipsacaceae), *Dianthus carthusianorum* ssp. *sanguineus* Vis. (Caryophyllaceae), *Filipendula vulgaris* Moench. (Rosaceae), *Bromus erectus* L. (Poaceae) and to signify acidification of the soil also *Genista tinctoria* L. (Fabaceae).

As far as known the larvae of the species of *Chesias* feed on *Cytisus* L. and *Genista* L. (Fabaceae) and those of *C. rufata* have been recorded from *Cytisus scoparius* (L.) Link. (= *Sarothamnus scoparius*) (Wall 1975). The yet undescribed mature caterpillar of *C. angeri* has been found by the second author from late May to mid-June, feeding on the flowers of *Genista tinctoria* L. It is 3 cm long, olive green with a lateral white line, and it has been observed several times and collected with a net on flowers of the




**Figs. 11–12.** Female genitalia of *Chesias* species. **11.** *Chesias rufata* (Fabricius, 1775). **12.** *Chesias angeri* Schawerda, 1919.

host-plant. Pupation took place in the ground and the adults emerged from the end of March to the end of April after the hibernation of the pupae. Wagner (1923) observed a number of specimens flying for short distances when disturbed, or flushed up from vegetation and resting on stalks of *Genista* sp. and other plants. The type locality at Magredis was dominated by *Calluna* Salisb. (Ericaceae) and *Genista* L. according to this author. Similarly, the second author observed the species during daytime. However, considering nocturnal activity patterns in related taxa, it is very likely that the adults are also attracted to light during the night. In the field the adults have been observed from mid-April to the first decade of May, indicating one generation.

**Remarks.** The type material of *C. angeri* could not be found in the collections of the Naturhistorisches Museum, Vienna. One syntype was borrowed for a plate of habitus photographs for the third volume of the book series 'Geometrid Moths of Europe.' The photograph was examined and conspecificity with our new material was confirmed (Hausmann pers. comm.).

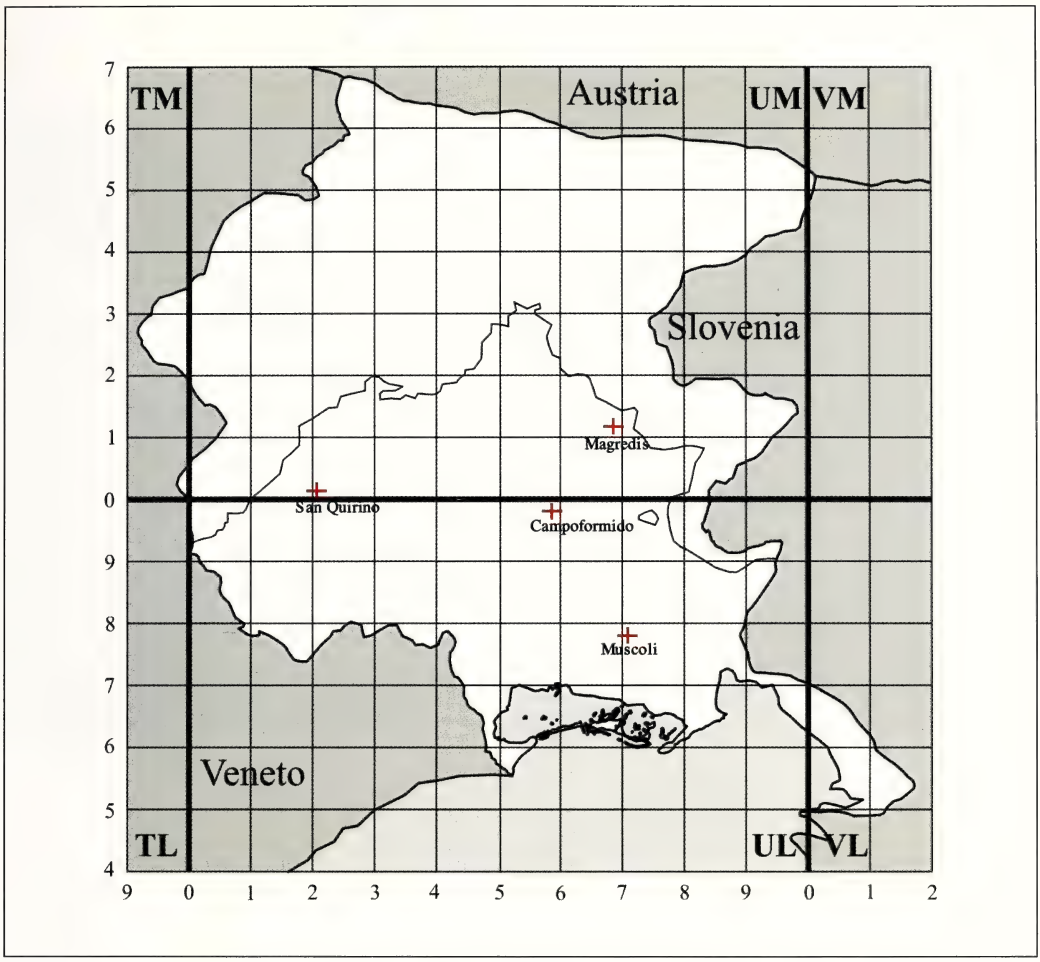



**Fig. 13.** Collecting localities of *Chesias angeri* Schawerda, 1919 (white area: Friuli Venezia Giulia, the northeastern region of Italy).

## Discussion

The rediscovery of a striking species such as *C. angeri* is surprising, particularly within the well explored central European region. However, the faunistic composition of Lepidoptera in the north-easternmost part of Italy is still insufficiently known and numerous remarkable new records and even new species have been found in this area in recent years (Mikkola 1998; Huemer 2002a; 2002b; Huemer & Kaila, 2003; Huemer et al. 2005). Despite a strong human impact and the destruction of large parts of the Friulian plane by intensive agriculture some most remarkable relict habitats that are unique within Europe are restricted to this area. Beside the last large and natural alpine river systems with tremendous gravel shores e.g. along the rivers Tagliamento, Meduna and Cellina, a specialised type of xerophilous meadow (the so-called "magredi") growing on alluvial gravely substrate is typical for the central parts of the plane. It varies from discontinuous vegetation to continuous herbaceous covering and is inhabited by a

**Fig. 14.** Habitat of *Chesias angeri* Schawerda, 1919.

remarkable flora and fauna which even includes some discontinuously distributed local endemic plants, e.g. *Brassica glabrescens* Poldini (Brassicaceae), *Knautia ressmannii* (Pacher) Briq. (Dipsacaceae), *Centaurea dichroantha* A. Kern. and *Leontodon berinii* (Bartl.) Roth. (Asteraceae). However, the lepidopterous community of this habitat type is explored insufficiently though some interesting species have been found recently, e.g. undescribed species of *Apatetris* sp. and *Megacraspedus* sp. (Gelechiidae), *Trifurcula trasaghica* Lastuvka & Lastuvka, 2005 (Nepticulidae), or the first Italian records of *Scrobipalpa halonella* (Herrich-Schäffer, 1854), *Stenoptilia mariaeluisae* Bigot & Picard, 2002 (Pterophoridae) and *Asartodes monspesulalis* (Duponchel, 1833) (Pyralidae). The habitat of *C. angeri* cannot be considered as typical "magredi" but instead an advanced succession stage of xerophilous meadows with continuous vegetation. This kind of habitat is particularly endangered and highly fragmented and even the extent of formerly widely distributed "magredi" in a wider sense has been reduced to less than 1000 ha during the last century.

**Acknowledgements**

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**References**

Forster, W. & Th. A. Wohlfahrt 1981. Die Schmetterlinge Mitteleuropas **5**. Spanner (Geometridae). – Franckh´sche Verlagsbuchhandlung, Stuttgart, 312 pp., 26 pls. [reprint of fascicles].

Hausmann A., V. Mironov & J. Viidalepp 2005. Geometridae. – *In*: O. Karsholt & E. van Nieukerken, Lepidoptera. – Fauna Europaea, Version 1.2. – http://www.faunaeur.org [visited at March 7, 2005].

Huemer, P. 2002a. *Agdistis morini* sp. n., a new plume moth from Friuli-Venezia Giulia (Italy) (Lepidoptera, Pterophoridae). – Gortania, Atti del Museo Friulano di Storia Naturale **23**: 187–196.

Huemer, P. 2002b. New records of Lepidoptera for the fauna of Italy from the collections of the Museo Friulano di Storia Naturale, Udine (Lepidoptera). – Gortania, Atti del Museo Friulano di Storia Naturale **23**: 197–205.

Huemer P. & L. Kaila 2003. *Elachista* (*Elachista*) *morandinii* sp.n., a new species from Central Europe (Lepidoptera, Elachistidae). – Gortania, Atti del Museo Friulano di Storia Naturale **24**: 211–220.

Huemer, P., C. Morandini & L. Morin. 2005. New records of Lepidoptera for the Italian fauna (Lepidoptera). – Gortania, Atti del Museo Friulano di Storia Naturale **26**: 261–274.

Kusdas, K. & J. Thurner 1955. Beitrag zur Insektenfauna der Provinz Udine (Oberitalien). – Atti del 1° Convegno Friulano di Scienze Naturali Udine, 4 – 5 settembre 1955: 273–334.

Mikkola, K. 1998. Revision of the genus *Xylomoia* Staudinger (Lepidoptera: Noctuidae), with descriptions of two new species. – Systematic Entomology **23** (2): 173–186.

Müller, B. 1996. Geometridae. Pp. 218–249. – *In*: Karsholt, O. & J. Razowski (eds.), The Lepidoptera of Europe. – Apollo Books, Stenstrup.

Raineri, V. & S. Zangheri 1995. Lepidoptera Drepanoidea, Axioidea, Geometroidea. 23 pp. – *In*: A. Minelli, S. Ruffo & S. La Posta (eds.), Checklist delle specie della fauna italiana **91**. – Calderini, Bologna.

Schawerda, K. 1919. Eine neue Makrolepidopterenart. *Chesias angeri* Schawerda. – Zeitschrift des österreichischen Entomologen-Vereines **4**: 24–25.

Scoble, M. J. (ed.) 1999. Geometrid moths of the world: a catalogue (Lepidoptera, Geometridae). – CSIRO Publishing, Collingwood, 482 + 129 pp. (index).

Wagner, F. 1923. Beiträge zur Lepidopteren-Fauna der Provinz Udine (Ital. sept. or.) nebst kritischen Bemerkungen und Beschreibung einiger neuen Formen. – Zeitschrift des österreichischen Entomologen-Vereines **8**: 14–26, 34–44, 51–54.

Wall, C. 1975. The biology of the British species of *Chesias* (Lepidoptera: Geometridae). – Entomologist´s Gazette **26**: 89–106.

# A new species of *Agonopterix* feeding on giant hogweed (*Heracleum mantegazzianum*) in the Caucasus, with a discussion of the nomenclature of *A. heracliana* (Linnaeus) (Depressariidae)

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**Abstract.** *Agonopterix caucasiella* sp. n. is described and compared with its closest relatives, *A. ciliella* (Stainton, 1849) and *A. heracliana* (Linnaeus, 1758). Adults and genitalia of these species are figured. The life history of *A. caucasiella* sp. n. in the Caucasus is described. Its larva feeds in the umbels of *Heracleum mantegazzianum* Sommier & Lévier (Apiaceae) (giant hogweed), an invasive weed in Europe, which is moreover toxic to human skin. The complicated and controversial nomenclature of the related *A. heracliana* (Linnaeus) (*Phalaena* (*Tortrix*)) is discussed, as is that of *Depressaria heracliana* (Linnaeus) sensu auctt. For the latter the name *D. radiella* (Goeze, 1783) is valid, whereas *D. heraclei* (Retzius, 1783) is shown to be invalid. A lectotype is designated for *Pyralis applana* Fabricius, 1777. *Phalaena radiella* Goeze, 1783 is fixed as the type-species of *Depressaria* Haworth, 1811.

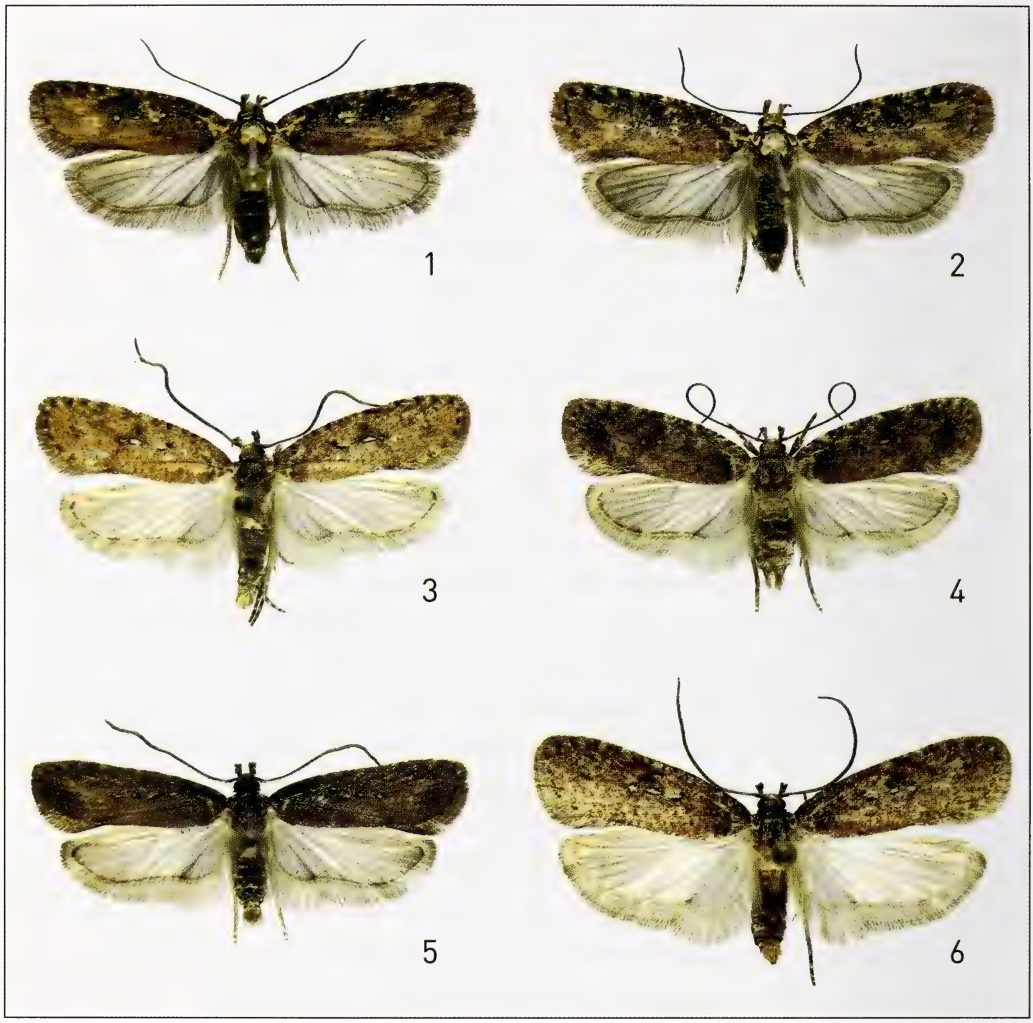
**Zusammenfassung.** *Agonopterix caucasiella* sp. n. wird beschrieben und mit ihren nächsten Verwandten *A. ciliella* (Stainton, 1849) und *A. heracliana* (Linnaeus, 1758) verglichen. Die Falter und die Genitalien dieser Arten werden abgebildet. Die Lebensweise von *A. caucasiella* sp. n. im Kauskaus wird beschrieben. Ihre Larven fressen an den Dolden von *Heracleum mantegazzianum* Sommier & Lévier (Apiaceae) (Riesenbärenklau), ein Neophyt in Europa, welcher für die menschliche Haut giftig ist. Die komplizierte und widersprüchliche Nomenklatur der verwandten *A. heracliana* (Linnaeus) (*Phalaena* (*Tortrix*)) wird diskutiert, genauso wie *Depressaria heracliana* (Linnaeus) sensu auctt. Für letztere ist der Name *D. radiella* (Goeze, 1783) verfügbar, während *D. heraclei* (Retzius, 1783) nicht verfügbar ist. Ein Lectotypus wird für *Pyralis applana* Fabricius, 1777 festgelegt. *Phalaena radiella* Goeze, 1783 wird als Typusart von *Depressaria* Haworth, 1811 festgelegt.

Key words. Biological control, nomenclature of Microlepidoptera, Depressariidae, *Agonopterix*, *Heracleum mantegazzianum*, Caucasus.

## Introduction

Over the last century classical biological control, the use of living organisms to control pest populations, has become an increasing practice for controlling invasive weeds (Fowler & Holden 1994; Wittenberg & Cock 2001). It is hypothesized that weeds become invasive partly because they are introduced without their natural enemies (Blossey & Nötzold 1995; Keane & Crawley 2002). Released from the regulatory effect of plant diseases and insect herbivory, the plants establish themselves and proliferate rapidly in the introduced region. The strategy of classical weed biocontrol is therefore to search the native area of the plant for suitable natural enemies and introduce the biological control agents into the invaded regions.

Giant hogweed, *Heracleum mantegazzianum* Sommier & Lévier (Apiaceae), is an invasive weed in Europe and has spread rapidly during the last decades. The plant is native to the Caucasus, South-West Asia, where it occurs in forest edges and meadows,




**Figs. 1–6.** Adults of *Agonopterix* species. **1–2.** *A. caucasiella* sp. n. ♀, Paratypes from Russia, Caucasus, Karachay-Cherkessie Rep., Zelenchukskaya environment. **3–5.** *A. heracliana* (Linnaeus). **3, 5.** ♂, Denmark. **4.** ♀, Poland. **6.** *A. ciliella* (Stainton). ♂, Denmark.

or at stream sides in montane areas (Mandenova 1950; Tiley et al. 1996). Strikingly impressive in size and height, *H. mantegazzianum* was brought to European botanical gardens as an ornamental in the late 19th century (Pysek 1994). Due to high competitive ability and abundant seed production the plant has established in many countries of Europe, especially in Central Europe, where typical habitats are river banks, damp places and waste ground.

Once established, *H. mantegazzianum* can become the dominant vegetation forming monospecific stands which may reduce biodiversity and degrade habitat quality. Another main reason for controlling the plant is the health hazard to humans. The reaction of human skin to contact with plant sap and subsequent sun exposure causes

severe blistering followed by postinflammatory hyperpigmentation (Lundström 1984; Pathak 1986). The need for sustainable solutions to stop further spread and prevent future invasions led to the initiation of the "Giant Alien" Project. This collaborative multidisciplinary project was a part of the EU 5th Framework Program with the overall objective to develop an integrated management strategy that comprises effective, practicable and sustainable means of controlling giant hogweed. Biological control may act as a component of an integrated approach to prevent the spread of the plant, and during 2002 and 2003 herbivorous insect species and fungal plant pathogens associated with *H. mantegazzianum* were sought in the area of origin in the north-western Caucasus (Seier et al. 2003; Hansen et al. 2006).

In 2003, larvae and pupae of an undescribed species of the genus *Agonopterix* Hübner, 1825 (Depressariidae) were found in the flowering umbels of *H. mantegazzianum* at a single location in the Russian Caucasus. In the following year the search for this species was intensified and several stands of *H. mantegazzianum* were investigated in the area of the first discovery. Based on observations and collections during field expeditions in 2003 and 2004 the aim of this paper is to describe the biology, morphology, systematics and nomenclature of the new species, compared with its closest relatives.

## Materials and methods

Two field surveys of phytophagous insects associated with *H. mantegazzianum* were undertaken in the north-western Caucasus from 8–15 August 2003 and 23–30 July 2004. Six different populations located in the Karachay-Cherkessia Republic, Russian Federation were visited. Grid references and altitude of the locations surveyed in 2004 are listed below in Tab. 1.

The habitats included river banks, abandoned fields, mountain slopes and forest clearings and the populations each comprised at least one hundred adult individuals in a flowering or reproductive stage. In forest clearings and mountain slopes at higher altitudes (Fig. 15) the giant hogweed plants were scattered in a tall herb community, while the plants formed more dense stands in habitats such as abandoned fields (Fig. 13).

Collecting was mainly focused on the search for larvae in the flower buds and the umbels but also leaf sheaths were examined for pupae. Other plant parts such as leaves and stems were only briefly investigated. Adult moths were not observed during the surveys and no attempts were made to collect adults by light or bait trapping. Three of the six localities were also visited on a second occasion where all flower buds and umbels of randomly selected plants were registered and thoroughly examined for larvae. Umbel diameter, position, and phenology (early flower, mature flower, late flower, early seed, mature seed) were recorded and the length of larvae collected was measured. At each locality between 14 and 22 plants were examined.

The larvae and pupae were collected in plastic containers, adding fresh food when necessary. After rearing the immature stages to adult emergence in climatic chambers at room temperature the moths were identified. No larvae or pupae of other species of Lepidoptera were found during examination of the *Heracleum* plants in the Caucasus.

**Abbreviations**

| | |
|---|---|
| BMNH | The Natural History Museum, London, UK |
| ICZN | International Commission for Zoological Nomenlature |
| ZIN | Zoological Institute, Academy of Sciences, St. Petersburg, Russia |
| ZMUC | Zoological Museum, University of Copenhagen, Denmark |
| ‡ | Unavailable name |

## RESULTS

### *Agonopterix caucasiella* sp. n.

Material. Holotype: ♂, "**Russia**, Caucasus | 44°09'N, 40°04'E | Majkop, 1300 m | Lago Naki 1 | pup. 12.viii.2003 | *Heracleum mantegazzianum* | leg. C. Nielsen" "Gen. præparat No 4374♂ Agonopterix sp. H. Hendriksen." (ZIN). Paratypes (all "Russia, Caucasus, *Heracleum mantegazzianum*, leg. C. Nielsen" – for longitude/latitude of specimens from 2004 see table 1): 1♀, 44°07'N, 40°02'E, Adigeya Rep., Majkop, Lago Naki 3, 1514 m, pup. 12.viii.2003; 3♂, 43°39'N, 41°24'E; Karachay-Cherkessie Rep., Arhyz, Karacevesk, 1762 m, la. 9.viii.2003; 1♂, 2♀, Karachay-Cherkessie Rep., 8 km S Storozhevaya, 1020 m, la[rva] 24.vii.2004; 8♂, 6♀, Karachay-Cherkessie Rep., 6 km W Pregradnaya, 960 m, la[rva].25.vii.2004; 8♂, 10♀, Karachay-Cherkessie Rep., 7 km SEE Pregradnaya, 950 m, la.25.–28.vii.2004; 7♂, 6♀, Karachay-Cherkessie Rep., Zelenchukskaya env., 920 m, la. 25.–29.vii.2004; 3♂, 2♀, Karachay-Cherkessie Rep., Zelenchukskaya region, 6 km SSW Nizhnij Arkhyz, 1760 m, la. 27.vii.2004; 3♀, Karachay-Cherkessie Rep., Zelenchukskaya region, 6 km SW Nizhnij Arkhyz, 1350 m, la. 27.–28.vii.2004 (paratypes in coll. ZIN, ZMUC and C. Nielsen).

**Diagnosis.** The new species (Figs. 1–2) is externally very close to *A. ciliella* (Stainton, 1849) (Fig. 6) and *A. heracliana* (Linnaeus, 1758) (Figs. 3–5), differing from them in the forewing which has two distinct white spots in the middle of the cell (*A. ciliella* and *A. heracliana* have two black dots here, with only a little white admixture), and a transverse patch of lighter reddish brown between discal dot and termen. The main difference is in the structure of the male genitalia, especially in the shape of the cuiller. The new species is characterized by the noticeably curved cuiller with an oppositely curved apex (Fig. 7). *A. ciliella* and *A. heracliana* have slightly curved cuiller with the apex turned in the same direction (Figs. 8, 9).

**Description.** Forewing length 9–11 mm, wingspan 20–24 mm. Head yellowish white mottled with grey, frons white. Antenna grey with black transverse bars on upper surface; upperside of scape black, underside white. Second segment of labial palpus white with black scales, sometimes mottled with pink scales; apical segment white with pink shade and two black rings near base and near apex. Thorax covered with black, brown and white scales. Forewing rather dark reddish brown mixed with black scales, near the base some white scales; along the costal margin black scales alternating with pink scales; discal dot white; in the middle of the cell two white dots, the lower one being especially large and conspicuous; between these two dots and the discal dot is an additional small white dot, which is sometimes absent; fringe brownish grey; between discal dot and termen is a transverse patch of lighter reddish brown. Hindwing grey with grey fringe and darker veins. Underside of forewing dark grey with a row of pale dots along the costal and outer margins. Female similar to male.

The specimens of the type series exhibit only minor variation. Worn specimens tend to be lighter than freshly emerged ones.

Male genitalia (Figs. 7, 7a). Gnathos elongated, spindle-shaped and spinuliferous. Transtilla of uniform width. Valva narrowing to rounded apex. Cuiller (sclerotized process on the distal end of sacculus) noticeably curved towards apex of valva, with apex of cuiller curved towards the costal margin of the valva. Phallus rather short, more or less straight, with tiny cornuti.

Female genitalia (Figs. 10, 10a). Ovipositor short. Ostium close to anterior margin of sternum VIII. Apophyses anteriores two-thirds length of apophyses posteriores. Ductus bursae membranous, rather long; corpus bursae with very small, more or less oval signum.

The female genitalia are similar to those of *A. ciliella* (Figs. 11, 11a) and *A. heracliana* (Figs. 12, 12a). Small differences are found in the form of the margin of the ostium (not angular in *A. caucasiella*) and in size and form of signum. In *A. caucasiella* the signum is more or less oval, differing from the more rounded signum of *A. ciliella*. In *A. caucasiella* the signum is much smaller than in *A. heracliana*.

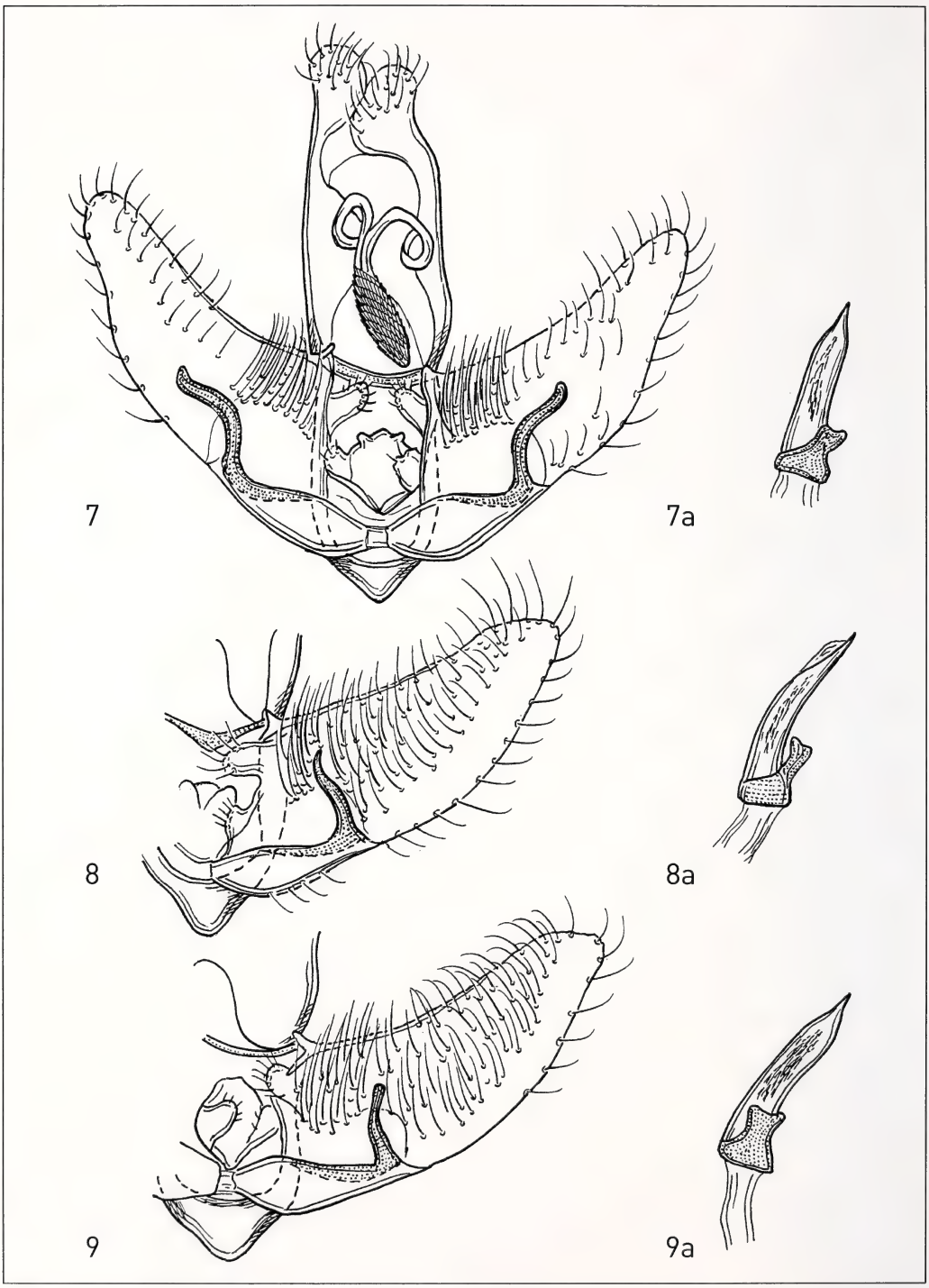
**Distribution.** Russia, North Caucasus: Krasnodarskiy krai and south of Stavropolskiy krai.

**Life history.** The length of the larvae found varied from 4 to 18 mm covering all but the very early larval instars. The larvae were rather easy to obtain by cutting down flowers and fruits of *H. mantegazzianum* in late July. Six localities were investigated in 2004 and immature stages of the moth were found at all study sites (Tab. 1). The larvae fed on buds, flowers and developing fruits within the umbels. In some cases a web was constructed around a portion of the partial umbel and the larva was feeding inside.

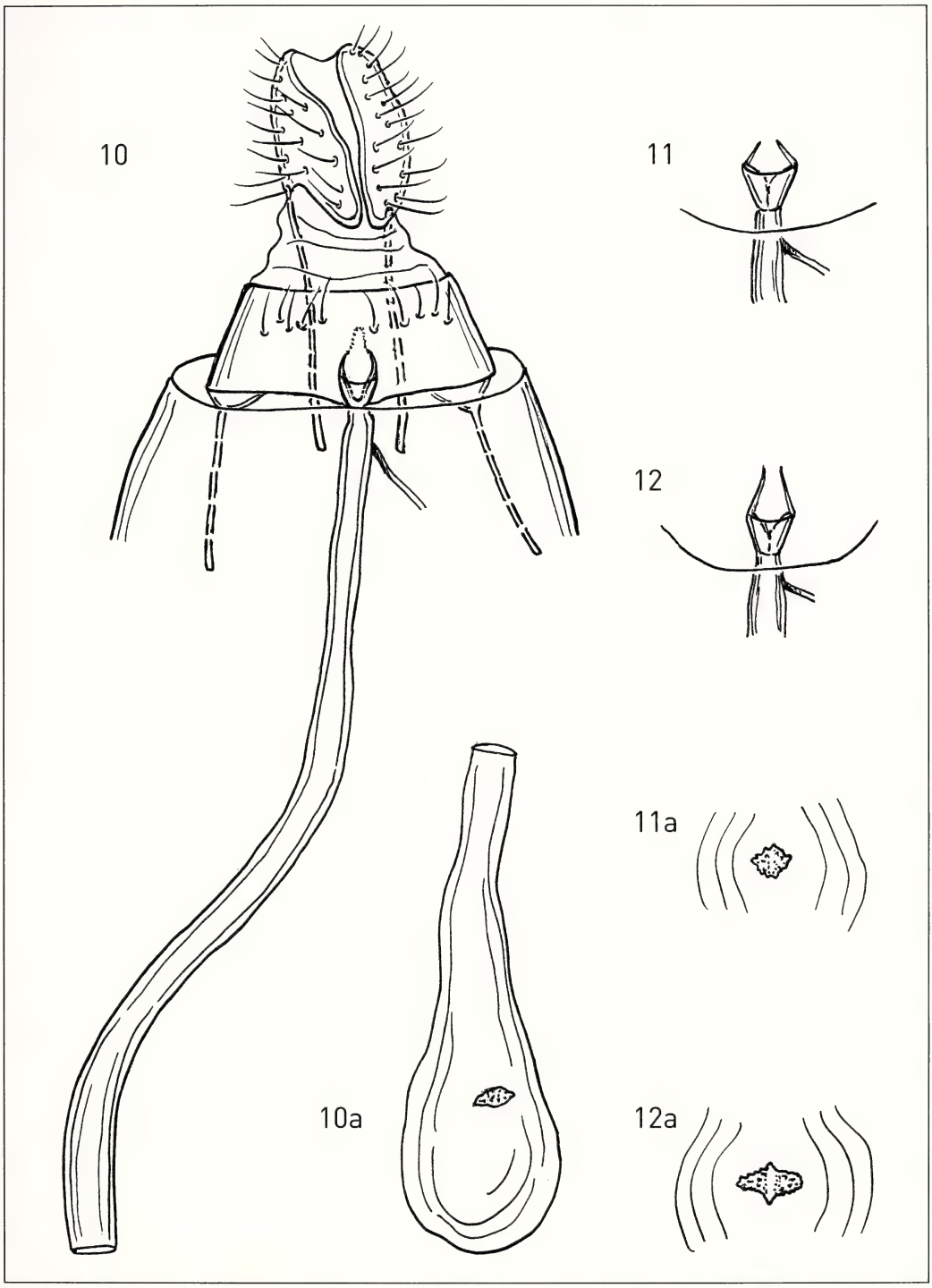
In the early larval instars the body was yellowish pale green, liberally speckled with small, but distinct blackish brown pinacula; prothoracic plate pale brown and head orange-brown. Later, as the larvae grew more than 10 mm long, the colour of the body became more green, with dorsal and subdorsal lines dark green and a pale brownish green head; thoracic and anal plates green. Near pupation the body turned reddish brown dorsally. A few pupae were located in the umbels or in the leaf sheaths. Pupation took place in late July or early August and this stage lasted about 2–4 weeks under laboratory conditions.

At the second visit to localities 3, 4, and 6 (Tab. 1) all flower buds and umbels of randomly selected plants were registered and carefully searched for larvae. In total, 724 umbels and 95 flower buds of 57 plants were examined and the collection of 47 larvae from 21 plants indicated a low density and rather clumped distribution of the larvae. The feeding larvae were found on umbels of diameters ranging from 5 to 58 cm, and larval attack was not related either to plant height or size of umbel (data not shown). However, synchrony between the development of the larvae and umbel phenology seemed evident as larval length increased with the maturation of the fruits in the umbels (Tab. 2). Host range of the larvae needs further testing before the potential of the moth as biocontrol agent against *H. mantegazzianum* is assessed.

**Parasites.** Two species of Hymenoptera parasites were reared from larvae of *A. caucasiella*: *Apanteles sicarius* Marshall, 1885 (Braconidae) (V. I. Tobias det.) and *Triclistus aethiops* (Gravenhorst, 1829) (Ichneumonidae) (V. I. Tolkanitz det.).




**Figs. 7–9.** Male genitalia. **7, 7a.** *A. caucasiella* sp. n. (7: Genitalia with phallus removed, Fig. 7a. Phallus). **Figs. 8, 8a.** *A. heracliana* (Linnaeus). **8.** Right valva, saccus, part of anellus and juxta. **8a.** Phallus. **Figs. 9, 9a.** *A. ciliella* (Stainton). **9.** Right valva, saccus, part of anellus and juxta. **9a.** Phallus.




**Figs. 10–12.** Female genitalia. **10, 10a.** *A. caucasiella* sp. n. (10: Proximal part of genitalia with ductus bursae; 10a: Corpus bursae with signum). **11, 11a.** *A. ciliella* (Stainton). **11.** Margin of sternum VIII with ostium, antrum and proximal part of ductus bursae. **11a.** Part of corpus bursae with signum. **Figs. 12, 12a.** *A. heracliana* (Linnaeus). **12.** Margin of sternum VIII with ostium, antrum and proximal part of ductus bursae. **12a.** Part of corpus bursae with signum.

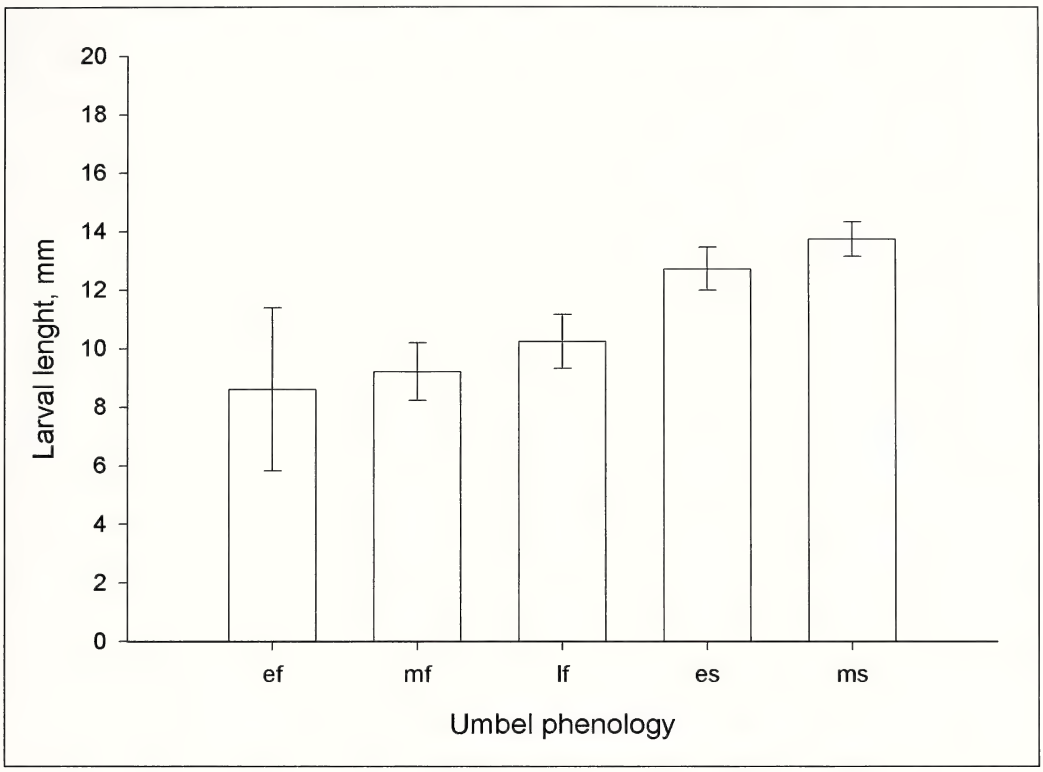
**Tab. 1.** Description of localities sampled in 2003 and 2004 in the Karachay-Cherkessia Republic, Russia and the number of collected larvae and emerged adults of *A. caucasiella*.

| Locality no. | Administrative description | Grid reference | Altitude | Description of locality | Plant development stage | Date | No of collected larvae and pupae | No of emerged adults |
|---|---|---|---|---|---|---|---|---|
| 1 | 8 km S Storozhevaya | N43°49'07.6" E41° 7'35.3" | 1020 m | abandoned field | Late flowering, reproductive | 24.vii. | 4 | 3 |
| 2 | 6 km W Pregradnaya | N43°57'02.9" E41° 6'02.3" | 960 m | road side / abandoned field | Late flowering | 25.vii. | 11 | 5 |
| 3 | 7 km SEE Pregradnaya | N43°54'45.7" E41° 7'02.8" | 950 m | abandoned field | Late flowering, reproductive | 25.–28.vii. | 24<br>19 | 13 |
| 4 | Zelenchukskaya env. | N43°53'10.0" E41° 2'23.8" | 920 m | abandoned field / river bank | Reproductive | 25.–29.vii. | 27<br>7 | 15 |
| 5 | 6 km SSW Nizhnij Arkhyz, Zelenchukskaya region | N43°39'28.1" E41° 4'99.3" | 1760 m | hill slope | Early flowering | (9.vii. 2003)<br>27.vii. | (3)<br>6 | (3)<br>2 |
| 6 | 6 km SW Nizhnij Arkhyz, Zelenchukskaya region | N43°39'22.3" E41° 3'30.5" | 1350 m | forest clearing / hill slope | Mature flowering, early reproductive | 27.–28.vii. | 15<br>21 | 18 |

**Remarks.** *Agonopterix caucasiella* sp. n. is closely related to *A. ciliella* (Stainton) and *A. heracliana* (Linnaeus). The nomenclature of the latter is unusually complicated and confusing and we therefore find it appropriate, in connection with the description of a new species feeding on *Heracleum*, to discuss it in some detail. Another related species is the North American *A. clemensella* (Chambers, 1876), which also uses *H. mantegazzianum* as a host plant (Berenbaum 1982; Robinson et al. 2005), but it differs in details of the genitalia of both sexes (Clarke 1941).

***Agonopterix heracliana* (Linnaeus, 1758: 532) (*Phalaena* (*Tortrix*))**
[*Phalaena*] *punctata* Clerck, 1759: pl. 2, fig. 15.
‡*Phalaena* (*Tortrix*) *heracleana* Linnaeus, 1761: 347.
*Pyralis applana* Fabricius, 1777: 294.
‡*Phalaena cerefolii* Retzius, 1783: 45.
‡*Phalaena heraclei* Retzius, 1783: 45.
*Tinea heraclella* Fabricius, 1798: 484.
*Tinea applanella* Fabricius, 1798: 484.
*Tinea cicutella* Hübner, 1796: 39, pl. 12, fig. 79.
*Depressaria heraclei* Haworth, 1811: 505.
*Depressaria heracliella* Doubleday, 1859: 29.

**Tab. 2.** Average larva length (± S.E.) in relation to umbel phenology (ef = early flower, mf = mature flower, lf = late flower, es = early seeds, ms = mature seeds), n = 45. Two larvae found in the flower buds are not included in the figure.




*Phalaena* (*Tortrix*) *heracliana* was based on an unstated number of specimens. The type locality was (indirectly) given as Sweden (see also (Linnaeus, 1761)). It was stated that it occurred in umbels of *Heracleum*. In addition to his diagnosis of *heracliana* Linnaeus also gave references to figures in the works of De Geer (1752: pl. 29 figs. 6–7) and Réaumur (1736: pl. 16 figs. 1–4). Those by De Geer are of the species with larva feeding in rolled leaves of (e.g.) *Anthriscus sylvestris*, viz. *Agonopterix heracliana*, while those of Réaumur show a larva feeding in the umbels of a species of Apiaceae (*Depressaria radiella*). In Linnaeus' collection Robinson & Nielsen (1983: 215) found five specimens representing both of the above mentioned species.

Before them Bradley (1966) had studied the material in Linnaeus' collection, recognizing only two specimens, both belonging to the *Agonopterix* species, and designated one of them as the lectotype. By this action he fixed the name *heracliana* to the *Agonopterix* species. This was a most inappropriate action because the stability of nomenclature for the involved species became upset by: 1) the specific name *heracliana* was moved from being the valid name for one well known species (in *Depressaria*) to becoming the valid name of another well known species (in *Agonopterix*), 2) the long established name *applana* (Fabricus) was sunk as a synonym, 3) the long established name *heracliana*

(in the combination *Depressaria heracliana* (Linnaeus)) was replaced by a name, *D. pastinacella* (Duponchel), which turned out not to be the oldest name for the species, and 4) *Phalaena heracliana* (Linnaeus) is the type species of the genus *Depressaria* Haworth, 1811 (Nye & Fletcher 1991: 91), and the lectotype designation by Bradley (1966) resulted in a case with a genus having a misidentified type species. Under the previous code such a case should have been referred to the ICZN, but that did not happen.

There would probably have been a good case for asking the ICZN to preserve the name *Phalaena heracliana* (Linnaeus) for the *Depressaria* species. Now, nearly 40 years later, this possibility is probably lost, because the use of *heracliana* in *Agonopterix* has been broadly accepted, and a return to its former use within *Depressaria* would cause additional confusion.

*Phalaena punctata* was based on a figure published by Clerck (1759). According to Robinson & Nielsen (1983: 224) there is no material of *P. punctata* in Clerck´s collection, and it is likely that Clerck figured a specimen from Linnaeus´ collection.

*Phalaena* (*Tortrix*) *heracleana* is an incorrect subsequent spelling (misspelling) of *P.* (*T.*) *heracliana* Linnaeus, 1758 (Robinson & Nielsen 1983: 215).

*Pyralis applana* was described from an unspecified number of specimens collected by Sehested in Kiel, Germany (Fabricius 1777). In Fabricius´ collection in ZMUC are three specimens, all in rather poor condition, but clearly referable to *applana*, one of them labelled "applana" in Fabricius´ handwriting. In the Sehested & Tønder Lund collection in ZMUC is a male, unset but in good condition. Seen in the light of the nomenclatorial confusion around the name *applana* it seems justifiable to designate the last mentioned male as the lectotype. It is labelled: "Mus. Seh. & T. L. | T. applanella | Lectotype, Pyralis applana Fabricius, 1775, O. Karsholt design., 2005". The three specimens in Fabricius´ collection are labelled as paralectotypes.

Retzius diagnosed and named insects described by De Geer (1752) without using the Principle of Binominal Nomenclature (ICZN 1999, article 5). However, the work by Retzius (1783) was not consistent in application of binominal nomenclature, and therefore it does not meet the demands of the Code (ICZN, 1999: article 11.4) and the names published therein are invalid under the Code. We are aware that names proposed by Retzius (1783) are used as valid for several species of Lepidoptera, and also for species of other insect groups, but a discussion of this problem falls outside the present study.

Retzius was aware that Linneaus (1758) had mixed two species under *Ph. heracliana*, viz. the one figured by Réaumur (1736) and the one figured by De Geer (1752). For the latter which, as stated above, is the *Agonopterix* species, he proposed the name *Ph. cerefolii*.

The other species (the one figured by Réaumur) is, according to Retzius (1783) and in agreement with most later authors, the real *Ph.* (*T.*) *heracliana* (Linnaeus), which was later placed in the genus *Depressaria*. Linnaeus had placed this species in his "subgenus" *Tortrix* and had, accordingly given it a name ending in *–ana*. Retzius did not use *Tortrix*, but placed most moths in the genus *Phalaena*, and emended its

name to *heraclei*. Although being an emendation under the present Code, it should be noted that at the time of Retzius a change of termination of species-group names was customary when changing the generic combination used. Being an emendation of *Ph.* (*T.*) *heracliana* Linnaeus the type of *Ph. heraclei* Retzius is the same as that of *Ph.* (*T.*) *heracliana*. Due to the unfortunate lectotype designation of *Ph.* (*T.*) *heracliana* Linnaeus by Bradley (1966) (see above) *Ph. heraclei* moreover becomes a misidentification, since Retzius described the *Depressaria* species, but used his emended name of *heracliana*, which since 1966 belongs to the *Agonopterix*. Besides being both an emendation and a misidentification (of *Ph.* (*T.*) *heracliana* Linnaeus) *Ph. heraclei* is moreover invalid under the Code.

*Tinea heraclella* is both a misidentification and an unjustified emendation of *Phalaena* (*Tortrix*) *heracliana* Linnaeus, Fabricius (1798) clearly referred to *Phalaena heracleana* [sic!] Linnaeus, but none of the three specimens in his collection are conspecific with the lectoptype of *Ph.* (*T.*) *heracliana* Linnaeus designated by Bradley (1966). However, being an emendation, the type of *T. heraclella* is the same as that of *Ph.* (*T.*) *heracliana*, which belongs to the *Agonopterix* species. As discussed above, at the time of Fabricius the change of termination in a species name had to follow the change in generic combination.

*Tinea applanella* is an emendation, which was made by Fabricius (1798) when transferring *applana* from the genus *Pyralis* to the genus *Tinea*.

*Tinea cicutella* was described from an unstated number of specimens from Augsburg in Germany ["Sie ist hier ...anzutreffen" (Hübner, 1796: 39)].

*Depressaria heraclei* Haworth is an emendation of *Phalaena* (*Tortrix*) *heracliana* Linnaeus, thus being an objective synonym of the latter. It is also a misidentification, as Haworth under the name of *D. heraclei* described *Depressaria radiella* (Goeze), and it is a homonym of *Ph. heraclei* Retzius.

*Depressaria heracliella* Doubleday is an unjustified emendation of *Phalaena* (*Tortrix*) *heracliana* Linnaeus (cited as 'heracliana, 'De Geer", and it is, after the lectotype designation by Bradley (1966) a misidentification of *Depressaria radiella* (Goeze).

It adds to the confusion of the involved species that *Heracleum* is not a main host plant for *A. heracliana* (Zeller, 1854: 203).

***Depressaria radiella* (Goeze, 1783: 162) (*Phalaena* (*Tinea*))**
*Tinea radiata* Geoffroy *in* Fourcroy: 1785: 320.
*Haemilis pastinacella* Duponchel, 1838: 153, pl. 291 figs. 4–5.
*Depressaria sphondiliella* Bruand d'Uzelle, 1851: 73.
*Depressaria ontariella* Bethune, 1870: 3.
*Depressaria caucasica* Christoph, 1877: 293.
*Depressaria heracliana* auct.; misidentification.
‡*Depressaria heraclei* (Retzius); misidentification.

This species was for more than 200 years known as *Depressaria heracliana* (Linnaeus). Due to the lectotype designation of *Ph.* (T.) *heracliana* Linnaeus by Bradley (1966) it had to change name, and Bradley suggested the oldest synonym known to him, *Haemilis pastinacella* Duponchel. Over the next decades this name came slowly into use.

**Fig. 13.** *Heracleum mantegazzianum* in the native area of western Caucasus. The stand is located in an abandoned field (locality 1), altitude: ca. 1020 m.

However, in the second edition of the French checklist, Leraut (1997) listed three older synonyms (two of which are accepted here). In a comment Leraut (1997: 314) stated that he considered *Depressaria heraclei* (Retzius) as the oldest name for this species, referring to "Leraut, *in prep.*". Now eight years later no details of this synonymy has been published and, as discussed above, *Ph. heraclei* Retzius is an emendation of *Ph.* (T.) *heracliana* Linnaeus, and therefore an objective synonym.

Goeze (1783) named a number of taxa, which had been described by Geoffroy (1762) without using the Principle of Binominal Nomenclature (ICZN 1999, article 5). *Phalaena* (*Tinea*) *radiella* is one of them. The type locality is the area of Paris.

The works of Goeze and Retzius were both published in 1783. We have no information on more exact dates for their publication but we suggest, seen in the light of the doubtfulness on the validity of the names proposed in Retzius´ work, that whenever it becomes relevant the work of Goeze should pre-date that of Retzius.

Also Fourcroy (1785) gave Latin names to taxa described by Geoffroy. However, for the species already named by Goeze (1783) the names of Fourcroy, as in this case, became objective synonyms. There has been a great deal of confusion as to whether Fourcroy or Geoffroy should be cited as the author of these names, but a discussion of this falls outside the present study.

**Fig. 14.** A population of *H. mantegazzianum* growing on a hill slope (locality 5), altitude 1760 m. In western Caucausus stands of *H. mantegazzianum* were found in altitudes up to approximately 2000 m.

*Haemilis pastinacella* was described from an unstated number of specimens from Austria, Bohemia and France. According to Zeller (1854) they included at least two different species. A lectotype was published by Bradley (1966: 226).
*Depressaria sphondiliella* Bruand d'Uzelle is an unneccessary replacement name for *Depressaria pastinacella* (Duponchel).
*Depressaria caucasica* was described from an unstated number of specimens (2 males and 1 female are deposited in the BMNH) collected by Christoph in southern Daghestan in Caucasus. It is considered as a highland form of *D. pastinacella* (Duponchel) (Lvovsky 1998).
*Depressaria ontariella* was described from an unstated number of specimens bred from parsnip (*Pastinaca*) in Ontario, Canada.
As discussed above, the lectotype of *Ph.* (*T.*) *heracliana* belongs to the *Agonopterix* species (Bradley 1966), and all uses of the name *heracliana*, and its emendations *heraclei*, *heraclella* and *heracliella* for the *Depressaria* species thereby become misidentifications. Further variations in spelling of the species-group name *heracliana* are found in the literature, but all are misspellings and thus invalid.
As mentioned above *Phalaena* (*Tortrix*) *heracliana* is the type species of the genus *Depressaria* (Nye & Fletcher 1991: 91), and the lectotype designation by Bradley

(1966) resulted in a case of a misidentified type species of this genus. Under previous editions of the Code such cases of misidentification had to be referred to the ICZN, but that was not done. Under the present code (ICZN 1999, article 70.3) it is left to authors who discover cases of misidentification to correct these in the way that best serves stability. We accordingly select, and thereby fix as type species for the genus *Depressaria* Haworth, 1811, *Phalaena radiella* Goeze, 1783 (= *Phalaena* (*Tortrix*) *heracliana* auct., nec Linnaeus, 1758).

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**References**

Berenbaum, M., 1982. New hostplant records for *Agonopterix clemensella* (Oecophoridae). – Journal of the Lepidopterists' Society **36**: 160.

Bethune, C. J. S. 1870. Larva infesting the parsnip. – The Canadian Entomologist **2**: 1–4.

Blossey, B. & R. Nötzold 1995. Evolution of increased competitive ability in invasive non-indigenous plants: A hypothesis. – Journal of Ecology **83**: 887–889.

Bradley, J. D. 1966. Some changes in the nomenclature of British Lepidoptera. Part 4. – Entomologist´s Gazette **17**: 213–235.

Bruand d'Uzelle, C. T. 1851. Catalogue Systématique et Synonymique des Lépidopteres du Département du Doubs. Tinéides. – Mémoires de la Société d'émuation du Doubs **3** (3) (1849): 1–102. [Published 11th March 1851, according to Viette 1977, Bulletin de la Société Linnéene de Lyon **46**: 287].

Christoph, H. 1877. Sammelergebnisse aus Nordpersien, Krasnowodsk in Turkmenien und dem Daghestan. – Horae Societatis entomologicae Rossicae **12** (1876): 191–348, pls. 5–8.

Clarke, J. F. G. 1941. Revision of the North American moths of the family Oecophoridae, with descriptions of new genera and species. – Proceedings of the United States National Museum **90**: 33–286, i–viii, pls. 1–48.

Clerck, C. 1759–64. Icones Insectorum Rariorum. – Holmiae. [viii] + [iii] pp., 55 pls.

De Geer, C. 1752. Mémoires pour server à l'histoire des Insectes **1**. – Stockholm, Gresing. xiv + 708 pp, 39 pls.

Doubleday, H. 1859. The Zoologist synonymic list of British butterflies and moths, edn 2. – London, Edward Newmann. 40 pp.

Duponchel, P.–A. J. [1838–1840]. Nocturnes, 8. – *In*: J.-B. Godart, Histoire Naturelle des Lépidoptères ou Papillons de France **11**. – Paris, Méquignon-Marvis. 720 pp., pls. 287–314.

Fabricius, J. C. [1777]. Genera insectorum eorumque characteres naturales secundum numerum, figuram, situm et proportionem omnium partum oris adiecta mantissa specierum nuper detectarum. – Chilonii, Carolus Ernesto Bohnii. [viii] + 1–310.

Fabricius, J. C. 1798. Supplementum entomologiae systematicae. – Hafniae, Proft & Storch. [ii] + 1–572.

Fourcroy, A. F. de 1785. Entomologia parisiensis; sive catalogus Insectorum quæ in Agro Parisiensi reperiuntur; secundum metodum Geoffræanam in sectiones, genera & species distributus: cui addita funt nomina trivialia & fere trecentæ novæ Species **2**: 235–544. – Paris.

Fowler, S. V. & A. N. G. Holden 1994. Classical biological control for exotic invasive weeds in riparian and aquatic habitats – practice and prospects. Pp. 173–182. – *In*: J. C. de Waal, L. E. Child, P. M. Wade & J. H. Brook (eds), Ecology and management of invasive riverside plants. – John Wiley & Sons Ltd, Chichester.

Geoffroy, E. L. 1762. Histoire abrégée des Insectes, qui se trouvent aux environs de Paris, dans laquelle ces Animaux sont rangés suivant un ordre méthodique **2**: 1–690, pls. 11–22. – Paris, Durand.

Goeze, J. A. E. 1783. Entomologische Beyträge zu des Ritter Linné zwölften Ausgabe des Natursystems **3** (4). – Leipzig, Weidmanns Erben & Reich. xx + 178 pp.

Hansen, S. O., J. Hattendorf, R. Wittenberg, S. Ya. Reznik, C. Nielsen, H. P. Ravn & W. Nentwig 2006. Phytophagous insect fauna on the weed *Heracleum mantegazzianum* (Apiaceae) in the invaded areas of Europe and in the native area of the Western Caucasus. – European Journal of Entomology (in press).

Haworth, A. H. 1828. Lepidoptera Britannica **4**: 512–609. – Londini, J. Murray.

Hübner, J. 1796–[1836]. Sammlung europäischer Schmetterlinge **8**, 78 pp. (1796), 71 pls. (1796–[1836]). – Augsburg, J. Hübner.

ICZN 1999. International code of zoological nomenclature. 4th ed. xxix + 306 pp. London, International Trust for Zoological Nomenclature.

Keane, R. M. & M. J. Crawley 2002. Exotic plant invasions and the enemy release hypothesis. – Trends in Ecology and Evolution **17**: 164–170.

Leraut, P, 1997. Liste systématique et synonymique des Lépidoptères de France, Belgique et Corse (deuxième edition). – Alexanor (Suppl.), Paris 526 pp.

Linnaeus, C. 1758. Systema Naturae per regna tria naturae, secundum classes, ordines genera, species, cum characteribus, differentiis, synonymis, locis. 10th ed. – Holmiae. 534 pp.

Linnaeus, C. 1761. Fauna Svecica sistens animalia Sveciæ regni: mammalia, aves, amphibia, pisces, insecta, vermes, distribute per classes & ordines, genera & species, cum differentiis specierum, synonymis auctorum, nominibus incolarum, locis natalium, descrepitionibus insectorum. – Stockholmiae. [43] + 578 pp., 2 pls.

Lundström, H. 1984. Giant Hogweed, *Heracleum mantegazzianum*. A threat to the Swedish countryside. – Weeds and weed control, 30th Swedish Crop Protection Conference **2**: 51–58.

Lvovsky, A. L. 1998. On the little-known species *Depressaria caucasica* Christoph, 1877 (Lepidoptera: Depressariidae). – Zoosystematica Rossica **7**: 311–312.

Mandenova, I. P. 1950. Caucasian species of the genus *Heracleum*. – Monographs, Ser. A, Systematics & Plant Geography, Tbilisi. 104 pp. [In Russian].

Nye, I. W. B & D. S. Fletcher 1991. The Generic Names of the Moths of the World **6**. Microlepidoptera. – London, Natural History Museum Publications. xxix + 368 pp.

Pathak, M. A. 1986. Phytophotodermatitis. – Clinics in Dermatology **4**: 102–121.

Pysek, P. 1994. Ecological aspects of invasion by *Heracleum mantegazzianum* in the Czech Republic. Pp. 45–54. – *In*: J. C. de Waal, L. E. Child, P. M. Wade & J. H. Brook (eds), Ecology and management of invasive riverside plants. John Wiley & Sons Ltd, Chichester.

Réaumur, M. de 1736. Mémoires pour servier à l'histoire des Insectes **2**. – Paris, De l'Imprimerie Royale. xlviii + 466 pp, 40. pls.

Retzius, A. J. 1783. Caroli De Geer genera et species insectorum e generosissimi auctoris scriptis extraxit, degessit, latinae quoad partem reddidit, et terminologiam insectorum Linneanam addidit. – Lipsiae, Siegfried Lebrecht Crusium. 6 + 220 pp.

Robinson, G. S., P. R. Ackery, I. J. Kitching, G. W. Beccaloni & L. M. Hernández 2002. HOSTS – a database of the hostplants of the world's Lepidoptera. – http://www.nhm.ac.uk/entomology/hostplants/index.html

Seier, M. K., R. Wittenberg, C. A. Ellison, D. H. Djeddour & H. C. Evans 2003. Surveys for natural enemies of giant hogweed (*Heracleum mantegazzianum*) in the Caucasus Region and assessment for their classical biological control potential in Europe. Pp. 149–154. – *In*: J. M. Cullen, D. T. Briese, D. J. Kriticos, W. M. Lonsdale, L. Morin & J. K. Scott (eds), Proceedings of XI International Symposium on Biological Control of Weeds, 27 April – 2 May 2003, Canberra, CSIRO Entomology.

Tiley, G. E. D., F. S. Dodd & P. M. Wade 1996. *Heracleum mantegazzianum* Sommier & Levier. Biological Flora of the British Isles. – Journal of Ecology **84**: 297–319.

Wittenberg, R. & M. J. W. Cock (eds) 2001. Invasive alien species: A toolkit of best prevention and management practices. – CAB International, Wallingford. 228 pp.

Zeller, P. C. 1854. Die Depressarien und einige ihnen nahe stehende Gattungen. – Linnaea Entomologica **9**: 189–403, pls. 2–3.

# *Adela alurgis* sp. n. from Syria (Adelidae)

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**Abstract.** *Adela alurgis* sp. n., described from specimens collected in Syria, is closely related to *A. violella* ([Denis & Schiffermüller], 1775) from which it differs by the purplish colour of the distal part of the forewing, the blackish head, and the silver-grey distal part of the antenna. The male of *A. alurgis* has a hook-like medial protuberance at the base of the valva, a shorter vinculum (<2.1× length of valva), a narrower distal part of the valva, and a thick phallus (length to medial diameter ratio around 15).

Key words. *Adela*, Adelidae, taxonomy, Syria.

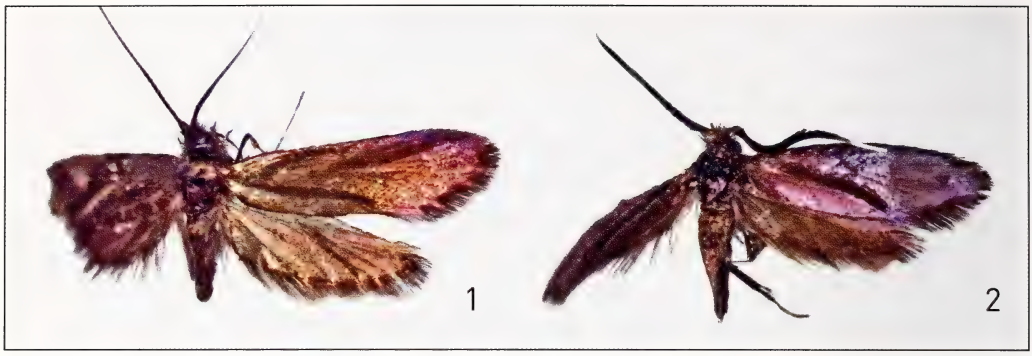
## Introduction

The fairy moth genus *Adela* Latreille, 1796 is clearly defined by the presence of hook-shaped, outwardly directed antennal pegs considered an autapomorphy (Nielsen 1980). Nearctic species of *Adela* have been revised by Powell (1969), while the identities of the East Palaearctic species were examined by Kozlov (1997) and Hirowatari (1997). To date, the European fauna is believed to include 11 species (Karsholt & van Nieukerken 2005), with none reported from Syria (Stainton 1867, van Nieukerken 2005). The nomenclature of some of the European species is debatable, and applications have been made to the International Commission of Zoological Nomenclature to insure the stability of several scientific names including *A. australis* (Kozlov & van Nieukerken 2003) and *A. croesella* (Kozlov 2006).

In the early 1990s, while surveying materials of the Natural History Museum (London), I discovered four specimens labelled by Walsingham as types of *A. alurgis*. This was a manuscript name and for a long time I hesitated to formally describe this species because of its close affinity to *A. violella* ([Denis & Schiffermüller], 1775). However, my investigations of dozens of *A. violella* specimens convinced me that differences between *A. alurgis* and *A. violella* exceed the 'normal' range of geographical variation. In this paper I take the risk of introducing this new name in isolation from my comprehensive taxonomic revision of the genus *Adela* that is in progress now, but that won't be completed within the next few years.

## *Adela alurgis* sp. n. (Figs. 1–7)

Material. Holotype ♂: **Syria**, near Aleppo; labelled: 8 mm circle with red border, print 'Holo- | type'; 8 × 15 mm, print 'Shar Devesy | HALEB [=Aleppo] | 1893 | (Nat. Coll.) Leech'; 8 × 10 mm, print 'Walsingham | Collection | 1910-427'; 8 × 18 mm, black frame, black ink + print 'Adela | alurgis | Type ♂ W | Named by Wlsm.'; 9 × 16 mm, print 'B. M. | Genitalia slide | No. 29995'; 6 × 18 mm, print 'HOLOTYPE ♂ | *Adela* | *alurgis* Kozlov'. Paratypes: 1♀, labelled: 8 mm circle with yellow border, print 'Para- | type'; 8 × 15 mm, print 'Shar Devesy | HALEB [=Aleppo] | 1893 | (Nat. Coll.) Leech'; 8 × 10 mm, print 'Walsingham | Collection | 1910-427'; 8 × 18 mm, black frame, black ink + print 'Adela | alurgis | Type ♀ W | Named by Wlsm.'; 6 × 18 mm, print 'PARATYPE ♀ | *Adela* | *alurgis* Kozlov'. 2♀, labelled: 8 mm circle with yellow border, print 'Para- | type'; 8 × 15 mm, print + black ink 'Shar Devesy | HALEB [=Aleppo] | 1893 | (Nat. Coll.) Leech | 61350 [or 61351]'; 8 × 10 mm, print 'Walsingham | Collection | 1910-427'; 6 × 18 mm, print 'PARATYPE ♀ | *Adela* | *alurgis* Kozlov'. The type specimens are deposited in the Natural History Museum, London.

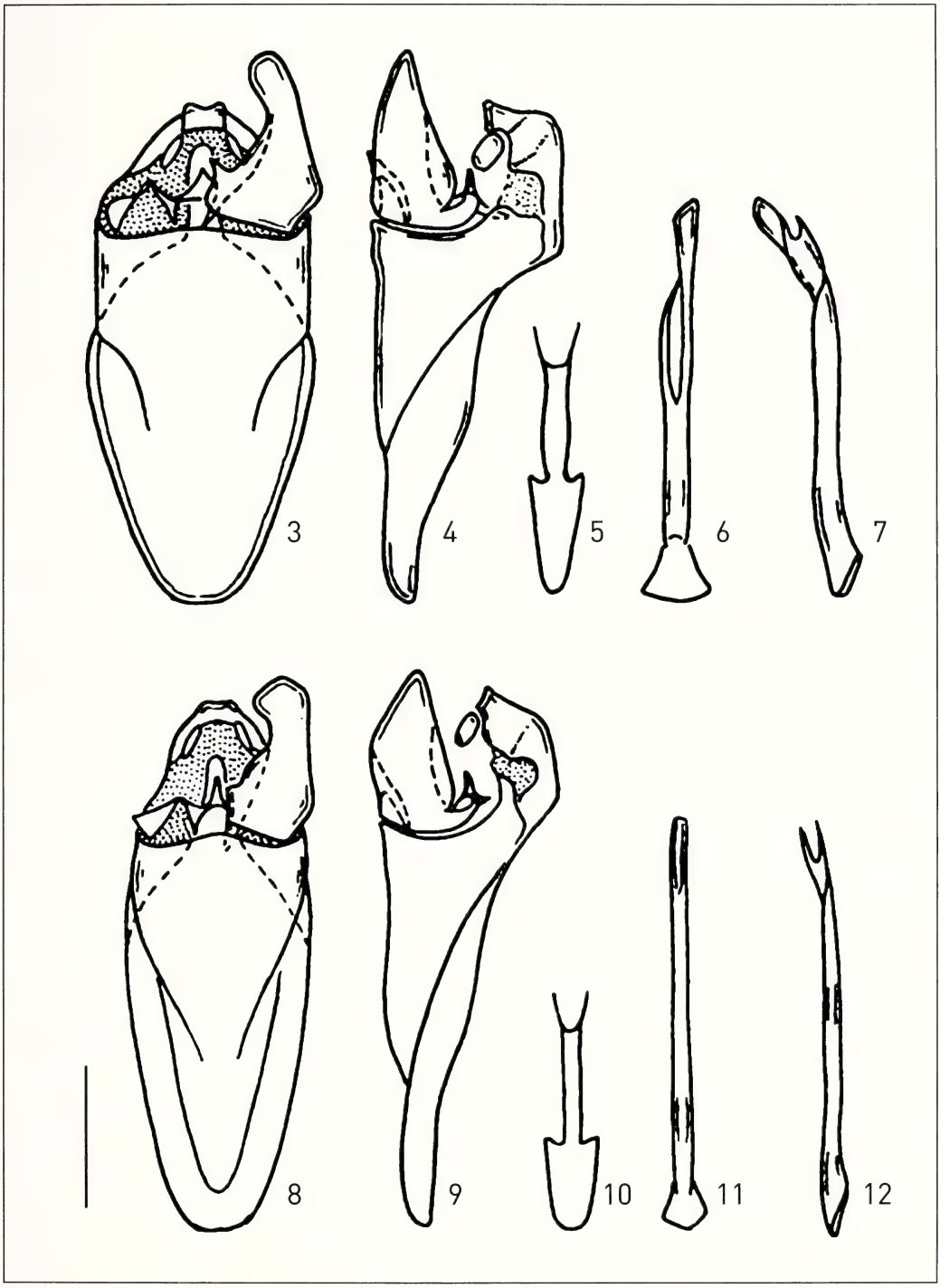



**Figs. 1–2.** *Adela alurgis*. **1.** Male holotype. **2.** Female paratype.

**Diagnosis.** Closest to *A. violella*, from which it differs by the purplish colour of the distal part of the forewing, the blackish head, the silver-grey distal part of the antenna, the presence of a hook-like medial protuberance at the base of the valva, the shorter vinculum (< 2.1 × length of valva), the narrower distal part of the valva (compare figs. 3–4 and 8–9), and the thick phallus (length to medial diameter ratio around 15; compare figs. 6–7 and 11–12).

**Description.** Male (Fig. 1). Forewing length 5.6 mm, width / length ratio 0.30. Vertex blackish, with sparse yellow scales; frons light glossy golden. Labial palpus 1.7 × vertical eye diameter, light brown, with blackish raised piliform scales. Proboscis light brown, base with bronze scales. Eyes not enlarged; interocular index 0.6. Antenna > 2 × forewing length (tip broken). Scape and base of flagellum (up to 0.7 × forewing length) dark bronze, then colour gradually changing to silver-white. Tegulae and thorax dark bronze. Forewing dark bronze basally to purplish bronze apically; cilia purplish to bronze. Hindwing coppery brown; costal area grey; cilia bronze to light brown. Legs from bronze to light yellowish brown. Epiphysis at 0.5, not reaching apex of tibia. Abdomen dorsally dark brown with bronze lustre, ventrally light greyish bronze.

Male genitalia (Figs. 3–7). Tegumen dome-shaped, without medial ridge. Socii oval, 1.0–1.2 × diameter of phallus. Vinculum 2.0 × length of valva (2.2–2.5 in *A. violella*), wide (seen from ventral side: length / width ratio 1.75, compared to 2.0–2.2 in *A. violella*) with slightly convex lateral margins; distal margin nearly straight (shallowly W-shaped in *A. violella*; compare figs. 3 and 8). Valva extending far beyond tip of tegumen; ventral margin with deep indentation; base with hook-like medial protuberance; dorsal margin slightly convex; tip nearly rectangular, narrow (seen from ventral side: distal part of valva 1.5 × medial diameter of phallus, compared to 3–4 in *A. violella*). Anellus 0.35 × length of valva. Transtilla with short triangular medial process. Juxta 0.6 × length of phallus, arrow head narrow (width / length ratio 0.45), with rounded tip and short lateral arms. Phallus nearly equal to length of vinculum, almost straight, relatively thick (length to medial diameter ratio around 15, compared to 30 in *A. violella*); distal 0.25 with right wall developed into lobe; with small hook-like process in middle of dorsal side; base of phallus widely funnel-shaped.




**Figs. 3–12.** *Adela alurgis*, male genitalia. **3.** Genital complex, ventral view (right valva not shown). **4.** Genital complex, lateral view. **5.** Juxta. **6.** Phallus, ventral view. **7.** Phallus, lateral view.
**Figs. 8–12.** *Adela violella*, male genitalia. **8.** Genital complex, ventral view (right valva not shown). **9.** Genital complex, lateral view. **10.** Juxta. **11.** Phallus, ventral view. **12.** Phallus, lateral view.

Female (Fig. 2). Forewing length 5.1–5.2; antenna 1.3–1.4 × forewing length; basal 0.35–0.45 of flagellum thickened by coppery black scales; distal part of flagellum silvery white. Otherwise similar to male.

**Remark.** Sattler (1979: 286) mentioned that the correct spelling of the geographical name is 'Shar Deresy', and that it may actually belong to Turkey, not Syria. I was unable to clarify the exact position of the type locality.

**Acknowledgements**

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**References**

Hirowatari, T., 1997. A taxonomic revision of the genus *Adela* Latreille (Lepidoptera, Adelidae) from Japan. – Transactions of Lepidopterological Society of Japan **48** (4): 271–290.

Kozlov, M. V., 1997. Family Adelidae. – In: V. S. Kononenko (ed.), Key to the Insects of Russian Far East. 5. Trichoptera and Lepidoptera, **1**: 274–289. – Dalnauka, Vladivostok [in Russian].

Kozlov, M. V., 2006. *Phalaena croesella* Scopoli, 1763 (currently *Adela croesella*; Insecta, Lepidoptera): proposed conservation of the specific name. – Bulletin of Zoological Nomenclature **63** (in press).

Kozlov, M. V. & E. J. van Nieukerken, 2003. *Nematois australis* Heydenreich, 1851 (currently *Adela australis*; Insecta, Lepidoptera): proposed precedence over *Tinea aldrovandella* Villers, 1789. – Bulletin of Zoological Nomenclature **60**: 290–292.

Nieukerken, E.J. van, 2004: Adelidae. In: Karsholt, O. & E.J. van Nieukerken (eds.). Lepidoptera, Moths. – *Fauna Europaea* version 1.1, http://www.faunaeur.org [online 16 December 2004].

Nielsen, E. S., 1980. A cladistic analysis of the Holarctic genera of adelid moths (Lepidoptera: Incurvaroidea). – Entomologica Scandinavica **11**: 161–178.

Powell, G. A., 1969. A synopsis of Nearctic Adelid moths, with descriptions of new species (Incurvariidae). – Journal of the Lepidopterists' Society **23**: 211–240.

Sattler K. 1979. A taxonomic revision of the genus *Deltophora* Janse, 1950 (Lepidoptera: Gelechiidae). – Bulletin of the British Museum (Natural History). Entomology 38: 263–322.

Stainton, H. T., 1867. The Tineina of Syria and Asia Minor. – J. van Voorst, London, 84 pp.

# *Pasiphila hyrcanica* sp. n. (Geometridae, Larentiinae) – a new species from Azerbaijan and Iran

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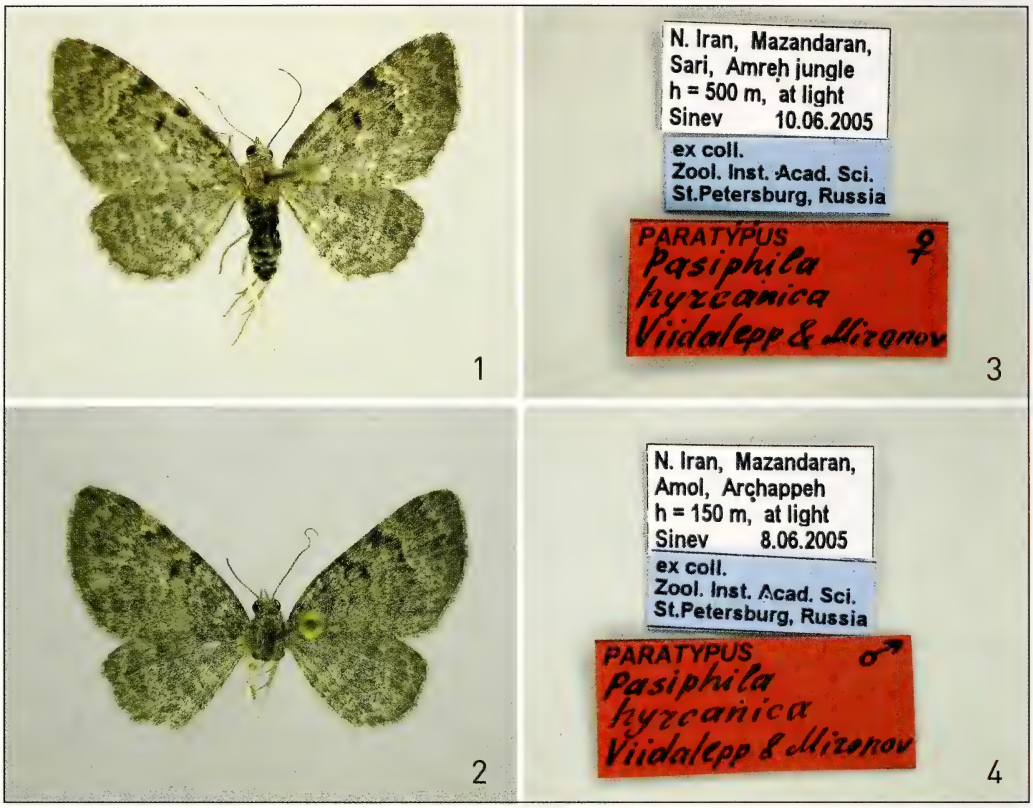
**Abstract.** A description of a new geometrid moth, *Pasiphila hyrcanica* Viidalepp & Mironov, sp. n. (Geometridae, Larentiinae), from south-eastern Azerbaijan (Talysh Mts.) and northern Iran (foothills of the Elburz mountains) is given. The holotype and some paratypes of the new taxon from Azerbaijan are kept in the collection of the Institute of Agriculture and Environment, Estonian Agricultural University Tartu (IAET), while other paratypes from Azerbaijan and Iran are kept in the collections of the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia (ZISP), of the Estonian Natural History Museum (NHMT) and in the private collection of T. Marnot, Tallinn.

Key words. Lepidoptera, Geometridae, *Pasiphila hyrcanica*, new species, Azerbaijan, Iran.

## Introduction

The tribe Eupitheciini includes at least 39 genera and more than 1.700 species distributed worldwide. Of these, four genera and 133 species have been recorded from Europe (Mironov 2003). They are small, often greyish or brownish moths and their larvae feed on flowers and seeds rather than on leaves. Species belonging to the genus *Pasiphila* are characterized by having the forewing vein $R_1$ short and almost completely united with Sc and a short accessory cell without transverse vein. Their male genitalia, are characterized by the vesica of the phallus bearing two apical horn-like cornuti and numerous minute spines. The Catalogue of the Geometridae of the World (Scoble et al. 1999) includes 36 species of the genus *Pasiphila*. The majority of them, at least 27 species, are distributed in New Zealand and only 8 species are presently known from the Palaearctic Region. Holloway (1997) discussed the diagnostic characters of *Pasiphila* Meyrick, 1883 and of the related taxa *Gymnodisca* Warren, 1894 and *Rhinoprora* Warren, 1894, considering the Indo-Australian fauna. He stressed the different conformation of male antennae, that are fasciculate in *Pasiphila* and filiform in *Gymnodisca* (= *Rhinoprora*), and combined ten Bornean and Indo-Australian species under the subgenus *Gymnodisca* of *Pasiphila*. In this article we describe one new species, *Pasiphila* (*Gymnodisca*) *hyrcanica* Viidalepp & Mironov, sp. n., from the territory of Azerbaijan and Iran. The species was mentioned earlier as *Rhinoprora talyshensis* (nom. nud.) in the list of species of the tribe *Eupitheciini* of the U.S.S.R. (Mironov 1990) and in the checklist of Geometridae of the former U.S.S.R. (Viidalepp 1996).




**Figs. 1–4.** *Pasiphila hyrcanica* sp. n. **1.** Paratype ♀, N. Iran, Sari, ZISP. **2.** Paratype ♂, N. Iran, Amol, ZISP. **3.** Labels of paratype ♀, N. Iran, Sari. **4.** Labels of paratype ♂, N. Iran, Amol.

## *Pasiphila hyrcanica* Viidalepp & Mironov, sp. n.

Material. Holotype ♂. [**Azerbaijan**] Talysh Mts. 20.vi.1984 | Dasdatuk leg. Marnot (coll. IAET). – Paratypes: ♂ Talysh, leg. Prasolov (coll. IAET); 5♂, 7♀ Talysh, 20.–29.vi.1984, Dashdatyuk, leg. Marnot & Lindt (slides nos 1759, 3191) (coll. IAET, Marnot and Lindt); 1♂, 4♀ Talysh, 17.–26.vi.1984, Lerik, leg. Jürivete, Lindt (coll. IAET, NHMT); 1♀ Talysh, 30.vi.1984, Alekseevka [village] leg. Lindt, (coll. NHMT); 1♀ Talysh (Mts.), Hyrcansky Forest, Alekseevka vill., on the glade at day, 13.v.1964, leg. Zaguljaev (ZISP); 1♀ Lenkoran, Avrora vill., Hyrcansky Forest, forest zone, at light, 23.v.1964, leg. Zaguljaev (ZISP); 1♂, N. **Iran**, Mazandaran, Amol, Archappeh, 150 m, at light, 8.vi.2005, leg. Sinev, (ZISP); 6♀ Mazandaran, Sari, Amreh jungle, 500 m, at light, leg. Sinev, 10.vi.2005 (ZISP). 2♀ Iran, prov. Mazandarăn, 1 km E of Razan, 1190 m, 9.v.2000, leg. Szabó & Hentschel (coll. Sommerer, Munich).

**Description.** (Figs. 1–4). Wingspan 16–19 mm; length of forewing 8–10 mm. Labial palpi elongate and narrow, lanceolate-oblong, about 1.5 times longer than diameter of eye, pale grey irrorated by black scales. Frons, vertex and nothum pale grey or grey. Forewing broad with slightly arched costa, evenly curved terminal margin and more or less obtuse apex; ground colour grey; transverse lines blackish grey; antemedial line evenly curved; medial line dentated, inconspicuous; postmedial line angled twice between costa and M3 (as in *P. rectangulata* (Linnaeus, 1758), but less prominent than in this species); terminal area slightly darker with inconspicuous whitish subterminal line; terminal line narrow, blackish; discal dot distinct, intensely black, obliquely ovoid.

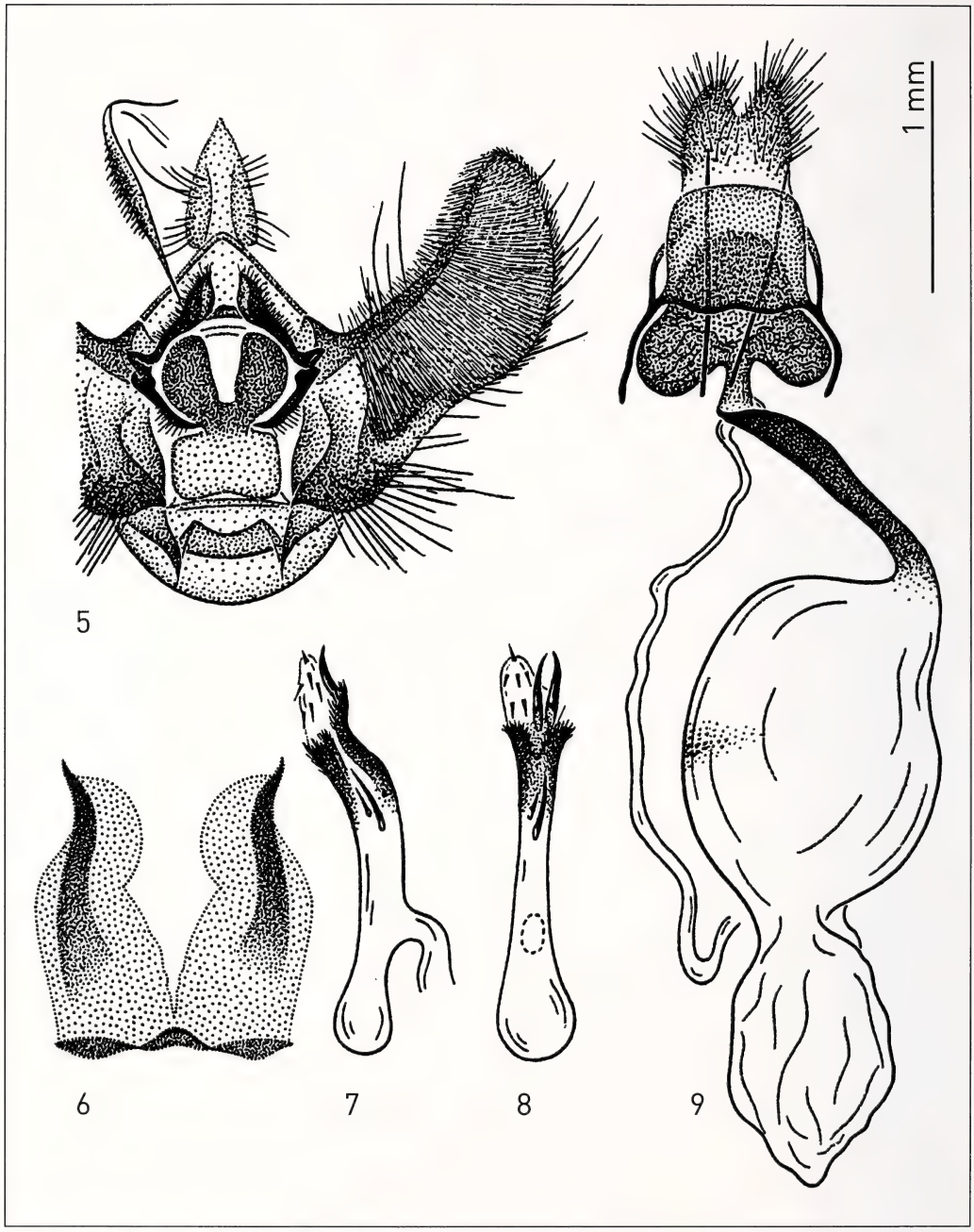
Fringe short, slightly chequered pale and dark grey. Hindwing of the same colour of the forewing, with indistinct transverse lines; postmedial line forming an angle near M3 vein; terminal area usually slightly darker, with very inconspicuous pale subterminal line; discal dot small, pale, rounded or ovoid, sometimes indistinct; terminal line and fringes as in forewing. Underside of wings paler than upperside; pattern similar to the upperside but inconspicuous, with the exception of the postmedial lines and discal dots on both fore- and hindwings. The postmedial lines are often distinct, broader and darker, more blackish than on the upperside. Abdomen covered with a mixture of pale grey and black scales.

Male genitalia (Figs. 5–8). Uncus elongate, broadened basally, membranous with numerous pores and some long setae. Anal tube thin, with elongate patch of short stout setae. Valve relatively short, with smoothly curved ventral margin, medially slightly broadened. Anterior arms of labides without membranous papillae, but covered with medium-sized setae on each apex. Juxta broad, rectangulate, with heavily sclerotized broad and elongated apical lobes. Vinculum large, broad, semicircular. Phallus thin and elongated, slightly curved, with broadened anterior end, shorter than length of valve. Vesica armed with two apical horn-like cornuti, one thin spine-like cornutus near ductus ejaculatorius base and some small spine-like cornuti. Sternite A8 large, broad, with narrow, heavily sclerotized basal margin and two broad apical rods which are curved, pointed and sclerotized to their apices.

Female genitalia (Fig. 9). Bursa copulatrix large, ovate, membranous, with large globular membranous diverticulum at base, armed with small, rather indistinct scobinate signa in the medial part. Ductus bursae thin and elongated, inclined to one side, heavily sclerotized. Ductus seminalis long and thin, membranous, attached to the posterior part of the ductus bursae near to the border with the antrum. Colliculum absent. Antrum narrow, slightly sclerotized. Lamella antevaginalis large, almost inversely heart-shaped, heavily sclerotized and wrinkled. Tergite A8 almost quadrate, with narrowly sclerotized anterior margin and rounded posterior corners. Anterior and posterior apophyses relatively short and thin, but anterior apophyses slightly thicker than posterior ones. Basal arms of anterior apophyses thin, slightly broadened to apices. Papillae anales large, elongated, tapering to tips.

**Habitat.** The species was collected in the northern slopes of the Elburz Range along the southern coast of the Caspian Sea and in Talysh Mts., at the altitude of about 150–500 m above sea level, in the humid hyrcanic forests. Most specimens were collected at light during the night; only one specimen was collected in the daytime. The natural vegetation of the area consists of the broad-leaved humid hyrcanic forest with *Quercus castaneifolia*, *Fagus orientalis*, *Tilia begonifolia* and also *Crataegus meyeri*, *C. microphylla*, *C. kyrtostyla*, *Pyrus grossheimii*, *Malus orientalis*, *Prunus divaricata* and *P. spinosa* dominating.

**Life history.** The moths were collected from the mid-May to late June together with *Pasiphila rectangulata* (Linnaeus, 1758) and *Chloroclystis v-ata* (Haworth, 1809). The foodplants are unknown, but the larvae may feed on flower buds or flowers of *Prunus* or *Crataegus*.




**Figs. 5–9.** Male and female genitalia of *Pasiphila hyrcanica* sp. n. **5.** Male genitalia. **6.** Male eighth sternite. **7–8.** Phallus lateral and ventral, with vesica semi-everted (slide no. 1759, IAET). **9.** Female genitalia (slide no. 3191, IAET).

**Distribution.** The species is known from the northern slopes of the Elburz Range along the southern coast of the Caspian Sea (North Iran), including Talysh Mts. (south-eastern Azerbaijan).

**Derivatio nominis.** The name of the new species is derived from that of Hyrcanian biogeographical province, where the species is distributed. Initially the same species was supposed to be a local endemic of Talysh Mts. and mentioned in literature as *Pasiphila talyshensis* Viidalepp (*nomen nudum*) (Mironov, 1990). The subsequent citation (Viidalepp 1996) does not validate this name (ICZN 11.5.2), and we propose for the species a new name, *Pasiphila hyrcanica* Viidalepp & Mironov. Talysh area is merely northern periphery of the Hyrcanian province, and the new name will indicate wider distribution of the species in the province.

**Differential diagnosis.** This species is externally very similar to *Pasiphila chloerata* (Mabille, 1870) and can easily be confused with the latter. It differs from *P. chloerata* and *P. rectangulata* in the straighter course of dark postmedial line underneath and for having larger black discal spots. However, the male genitalia of *P. hyrcanica* may be easily distinguished by the elongated patch of stout setae on the ventral surface of the anal tube, the narrowly rounded apex of valve, the longer and broader apical lobes of juxta, the longer and slimmer phallus and the shape of the eighth sternite with broader lyre-shaped apical arms than in *P. chloerata*. Female genitalia differ in the shape of bursa copulatrix, in having one patch of very small, indistinct scobinate signa, and for the inclined and sclerotized ductus bursae, the narrower antrum and the almost inversely heart-shaped wrinkled lamella antevaginalis. In our opinion, *P. hyrcanica* must be placed near to *P. chloerata* (Mabille, 1870) and *P. subcinctata* (Prout, 1915) in the list of species of the genus *Pasiphila*, based on external similarity to both these species and on the basis of the structure of the male and female genitalia.

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**References**

Holloway, J. D. 1997. The Moths of Borneo, vol. 10. Family Geometridae, subfamilies Sterrhinae and Larentiinae. – Malayan Nature Journal **51**: 1–242.

Mironov, V. 1990. Sistematicheskij katalog pjadenitz triby *Eupitheciini* (Lepidoptera, Geometridae) fauny SSSR, I [A systematic Catalogue of geometrid moths of the tribe *Eupitheciini* (Lepidoptera, Geometridae) of the fauna of the U.S.S.R., I] – Entomologicheskoe Obozrenie **69** (3): 656–670.

Mironov, V. 2003. Larentiinae II (Perizomini and Eupitheciini). – *In*: A. Hausmann (ed.), The Geometrid Moths of Europe **4**: 463 pp. Apollo Books, Stenstrup.

Scoble, M. J. (ed.), L. M. Pitkin, M. S. Parsons, M. R. Honey & B. R. Pitkin. 1999. Geometrid Moths of the World: A Catalogue (Lepidoptera, Geometridae). 2 vols. – CSIRO Publishing and Apollo Books, Stenstrup. 1016 pp. (+ 129 pp. index).

Viidalepp, J. 1996. Checklist of the Geometridae (Lepidoptera) of the former U.S.S.R. – Apollo Books, Stenstrup. 111 pp.

# Revision of the *Turanana endymion* species-group (Lycaenidae) – a correction

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In my recent paper entitled 'Revision of the *Turanana endymion* species-group (Lycaenidae)', on page 265, text lines 8 & 9 of *Nota lepid.* 27 (4), of the year 2004, one can read that 'Valvae with the above-described configuration are also illustrated in Tshikolovets (1998) from Turkmenistan', implying that the Turkmenistan *Turanana* under consideration are *endymion ahasveros* (Bytinski-Salz & Brandt, 1937). This was based on Tshikolovets' treatment of this taxon as it appears in his book 'The butterflies of Turkmenistan', Kyiv, 1998, 237 pp., as well as on the appended rather unclear genitalia illustrations. Since then I received a corrective message from Dr. Vladimir Dubatolov of Russia, who told me that the Turkmenistan *Turanana* specimens under consideration from the Kopetdagh Mts. (this being the same locality as for the Tshikolovets specimens) are actually *Turanana dushak* Dubatolov, 1989 (Trudy Zool. inst. 200: 136, figs. 1–7), a separate species with distinct valval characters. The valva of this species is also clearly illustrated in 'A guide to the butterflies of Russia and adjacent territories' by Tuzov et al., Pensoft, Sofia, Bulgaria, 2000, vol. 2: 580 pp.

In conclusion I would like to extend my thanks to Dr. Dubatolov for providing the information needed for making this correction.

# *Reisseronia arnscheidi* sp. n. aus den Südkarpaten Rumäniens (Psychidae)

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**Zusammenfassung.** Eine neue Art wird in der Gattung *Reisseronia* Sieder, 1972 aus den rumänischen Südkarpaten beschrieben und Angaben zur Lebensweise und Verbreitung gegeben. Weitere Psychidennachweise aus der Kleinen Walachei (Südkarpaten: Muntii Capatenei und Muntii Lotrului) aus dem Zeitraum von 2000 bis 2005 werden bekannt gegeben.

**Abstract.** A new species of the genus *Reisseronia* Sieder 1972 is described from the Romanian South-Carpathians. Information is provided on the distribution and life history of the new species. Further species of Psychidae are recorded from the Walachia Minor (South-Carpathiaen: Capatenei Mountains and Lotrului Mountains) from the period of 2000 to 2005.

K e y w o r d s . Romania, Carpathians, Psychidae, Epichnopteryginae, *Reisseronia arnscheidi* sp. n.

## 1. Einführung

Die Psychiden des Balkans sind in neuerer Zeit Gegenstand einiger Bearbeitungen (Herrmann & Weidlich 1990; 1999; König & Weidlich 2001; Weidlich, im Druck) gewesen, wobei auch die Gattung *Reisseronia* Sieder, 1972 bereits einbezogen wurde (Weidlich 1989). Aus dieser Gattung sind bislang 10 Arten bekannt, deren Verbreitung sich über Frankreich, Mitteleuropa, Sizilien, den Balkan, der Türkei bis an die russische Wolga und in das Donetzk-Becken der Ukraine erstreckt.

Vor einigen Jahren bekam der Autor aus dem Museum Thomas Witt (München) auch eine Serie einer *Reisseronia*-Art zur Bestimmung übersandt. Es handelte sich um eine offensichtlich noch nicht beschriebene Art. Die Tiere wurden seinerzeit vom österreichischen Psychidenspezialisten Herbert Meier (Knittelfeld) im Jahre 1974 bei „Cozia“ in den Südkarpaten gesammelt. Bei einigen in jüngerer Zeit durchgeführten Balkanexpeditionen konnte diese *Reisseronia*-Art nun näher studiert, umfangreiches Material gesammelt und Angaben zur Lebensweise und Verbreitung gewonnen werden. In den Muntii Capatenei der Südkarpaten wurden am 09. Mai 2000 die ersten acht *Reisseronia*-Säcke bei Salistea (Abb. 1) in der Umgebung von Brezoi gefunden, woraus im Juni die ersten Imagines schlüpften. Die Umgebung des „Monastir Cozia“, entsprechend der Etikettierung von Meier, wurde im Jahre 2002 abgesucht, jedoch ohne Erfolg. Auch eine anschließende Exkursion in die Muntele Cozia erbrachte ebenfalls keinen Nachweis dieser Art, aber eine bemerkenswerte Häufigkeit der *Eosolenobia manni* (Zeller, 1852), über deren Verbreitung in Rumänien bereits berichtet wurde (Weidlich, im Druck).

**Abb. 1.** Lebensraum von *Reisseronia arnscheidi* sp. n. in den Muntii Capatenei, 1 km W Salistea, 450 m, 15.iv.2005 (Foto: Weidlich).

## 2. Beschreibung von *Reisseronia arnscheidi* sp. n.

M a t e r i a l . Holotypus: 1♂ **Romania**, Karpaten, Monastir Cozia, 300 m, 8.vi.1974, leg. Meier, coll. Museum Witt (München). Paratypen (die gezüchteten Exemplare jeweils mit Sack und Puppenhülle): 38♂ gleiche Daten wie Holotypus, aber 28.v., 1., 3., 5., 8., 10., 11., 12., 15., 17., 18., 20., 21., 22., 23., 24., 25., 26., 28.vi., 1.vii.1974 (ex larva), 2♂ (Dauerpräparate) 28.05., 22.06.1974, 26♀ gleiche Daten wie Holotypus, aber 1.vi.–10.vii.1974, leg. Meier. 5♂, 1♀ Südkarpaten, NO Muntii Capatenei, 1 km W Salistea, 450 m, 1., 4., 6.vi.2000, 20.v.2001, E.v.2005 (alle ex larva) [+5 Säcke 9.v.2000, 6 Säcke 15.iv.2001, 10 Säcke 25.iv.2002, 8 Säcke 19.iv.2003, 15 Säcke 15.iv.2005]; 4♂, 6♀ Südkarpaten, Muntii Capatenei, NO Brezoi, W Valea Lui Stan, 350–400 m, 1.v., 18., 19.v., 3.vi., M., E.vi.2002, 29.v.2003, A.vi.2004 (alle ex larva) [+5 Säcke 15.iv.2001; 18 Säcke 25.iv.2002, 21 Säcke 19.iv.2003, 38 Säcke 15.iv.2004]; 9♂, 8♀ Südkarpaten, NO Muntii Capatenei, 3 km N Chiaculata, 350 m, 11., 12., 19., 20., 26., 27.v., A.vi.2004, A.vi.2005 (alle ex larva) [+ 4 Säcke 25.iv.2002, 64 Säcke 18./19.iv.2003, 69 Säcke 18.iv.2004, 73 Säcke 15.iv.2005]; 3♂, 5♀ Südkarpaten, S Muntii Lotrului, 5 km N Brezoi, 350 m, M.v.2004, A.vi.2005 (alle ex larva) [+8 Säcke 19.iv.2004, 3 Säcke 15.iv.2005]; 1 Sack 10.v.2000, Südkarpaten, NO Muntii Capatenei, Valea Mascesului, 600 m; 2 Säcke Südkarpaten, NO Muntii Capatenei, 3 km S Brezoi, 350 m, 15.iv.2001, leg. Weidlich. Das Material befindet sich im Museum Witt (München), Naturkundemuseum der Humboldt-Universität zu Berlin, coll. W. Arnscheid (Rösrath / Deutschland), coll. E. Hauser (Wolfern / Österreich), coll. P. Hättenschwiler (Uster / Schweiz) und coll. M. Weidlich.

**Diagnose.** M ä n n c h e n . Kleine Falter mit einer Flügelspanne von 7,5–9,5 mm. Augen schwarz, rund, ohne Ocellen, Augenabstand etwas größer als der Augendurchmesser (etwa 1,2). Stirnschopfbehaarung, schwarzbraun, dicht und eng anliegend (Abb. 2).

**Abb. 2.** *Reisseronia arnscheidi* sp. n., Paratypus, 3 km N Chiaculata, 350 m, Anfang Juni 2004 (e. l.), Foto: Knut Leeder.

Fühler relativ kurz, Fühlergliederzahl insgesamt 19, 16 Fühlerglieder doppelkammzähnig, welche etwa doppelt so lang wie die Fühlerglieder sind. Kammzähne sind lang und schütter bewimpert. Vordertibie ohne Epiphyse, Mittel- und Hintertibien mit jeweils einem Spornpaar. Alle Beine mit 5 Tarsengliedern. Körper schwärzlich behaart, erscheint dunkler als die Flügel. Vorderflügelfärbung schwarzbraun, dicht beschuppt mit zweizackigen, schmalen Schuppen (Schuppenklasse I nach Sauter 1956), Fransen einzackig, Färbung nicht andersartig. Aderung unter der Beschuppung nicht erkennbar. Vorderflügeladerung mit Anhangszelle und 8 Discoidalzelladern. Hinterflügelfärbung wie die der Vorderflügel, Adern ebenfalls unter der Beschuppung nicht erkennbar.

M ä n n l i c h e s G e n i t a l (Abb. 3). *Reisseronia*-typisch, Tegumen-Dach schmal, gewölbt, Clavus lang, schmal mit sägezahnartiger Spitze, Saccus kurz aber deutlich sichtbar. Aedaeagus weist keine Besonderheiten auf, ohne Cornuti.

W e i b c h e n . Körper gestreckt, flügellos, von bräunlicher Färbung; Körperdurchmesser 1–1,5 mm, Länge 4–4,5 mm. Kopf und Thorax stärker sklerotisiert, dadurch dunkler, Augen schwarz, oval ohne Ocellen, Fühlergliederzahl 2–3. Beine mit 1–2 Tarsengliedern. Körper mit weißen Haaren, besonders lang und deutlich erkennbar am Kopf und Thorax, am 7. Abdominalsegment kranzförmig und sehr dicht ausgebildet, Legeröhre relativ kurz.

S a c k (Abb. 4). Säcke geschlechtsdimorph; die weiblichen Säcke deutlich größer als die der Männchen. Länge 5–7 mm (♂), 8–10 mm (♀), Durchmesser 1 mm (♂), 2 mm (♀), langgestreckt und *Reisseronia*-typisch etwas bauchig. Sie bestehen aus eng anliegenden Grasteilchen, die längs ausgerichtet sind. Selten werden auch kleine Blattteilchen in den Sack eingebaut.

**Abb. 3.** Männlicher Genitalapparat von *Reisseronia arnscheidi* sp. n., caudal (Zeichnung: W. Arnscheid).

**Differentialdiagnose.** Aufgrund deutlicher artspezifischer Unterschiede kann auf eine genauere vergleichende Darstellung mit der sizilianischen *Reisseronia hofmanni* (Heylaerts, 1879), der österreichischen parthenogenetischen *R. gertrudae* Sieder 1962, der griechischen *R. magna* Hättenschwiler, 1982 und *R. (Tsikalasia) malickyi* Hauser, 1996, der kleinasiatischen *R. flavociliella* (Mann, 1864) und osteuropäischen *R. staudingeri* (Heylaerts, 1879) und *R. tschetverikovi* Solyanikov, 1990 verzichtet werden. Einbezogen in die vergleichende Untersuchung wurden aber die ähnlichen Arten *R. tarnierella* (Bruand, 1851), *R. nigrociliella* (Rebel, 1934) und *R. pusilella* (Rebel, 1941). Bei den Männchen unterscheidet sich *R. arnscheidi* sp. n. von diesen drei Arten durch die um mindestens 1 höhere Anzahl von gekämmten Fühlergliedern sowie durch die längere Bewimperung der Kammzähne. Von *R. tarnierella* ist sie durch die konstant größere Flügelspannweite sowie die Länge der Kammzähne, welche etwa 2,5 mal so lang wie die Fühlergliederlänge sind verschieden, während sie bei *R. tarnierella* nur etwa 2 mal so lang sind (gemessen am 9. und 10. Fühlerglied); außerdem ist die Ausbildung des Saccus unterschiedlich. Von *R. nigrociliella* und *R. pusilella* ist *R. arnscheidi* durch einen anderen Genitalbau unterscheidbar, insbesondere durch die Ausbildung des Tegumendaches und die Form des Clavus (vgl. Tab. 1). Die Weibchen der neuen Art zeigen deutliche Unterschiede zu denen von *R. pusilella* in der Anzahl der Fühler- und Tarsenglieder und zu denen von *R. nigrociliella* vor allem in der Tarsengliederzahl. Die Unterschiede der Weibchen zu *R. tarnierella* sind relativ gering, bei Serienuntersuchung lassen sich unterschiedliche Durchschnittswerte in der Anzahl der Fühler- und Tarsenglieder sowie in der Körpergröße feststellen. Die *R. tarnierella* Weibchen sind durchschnittlich größer. Der Sackaufbau ähnelt dem der näher verglichenen Arten.

**Derivatio nominis.** Diese neue Art ist meinem Freund Wilfried Arnscheid in Dankbarkeit gewidmet.

### 3. Zur Verbreitung und Lebensweise von *Reisseronia arnscheidi*

Nach den ersten Funden im Jahre 2000 wurden während der nachfolgenden Jahre in den Muntii Capatenei verschiedene Populationen gefunden. So konnte *R. arnscheidi* sp. n. bei Chiaculata, Brezoi, Valea Lui Stan, Salistea und Valea Macesului in mehreren Populationen nachgewiesen werden, die stellenweise individuenstark waren. Einen weiteren Fund in den nördlich benachbarten Muntii Lotrolui nördlich von Brezoi gab es dann 2004. Schwerpunktmäßig kommen sie in Höhen zwischen 350 und 450 m NN vor, im Valea Macesului bei 600 m NN.

**Abb. 4.** *Reisseronia arnscheidi* sp. n. **Oben.** Männlicher Sack mit Puppenhülle, 3 km N Chiaculata, 350 m, Anfang Juni 2004 (e. l.). **Unten**. Weiblicher Sack, W Valea Lui Stan, 400 m, 01. Mai 2002 (e. l.).

Die Lebensräume bilden Felshänge und Felswände mit anstehendem Gestein, die südost-, süd- und südwestexponierte Lagen aufweisen.
Aktive Raupen wurden hauptsächlich auf Moospolstern aufgefunden. Im Allgemeinen leben sie sehr versteckt und oftmals fressen sie sich regelrecht in die Moospolster hinein und schauen nur mit dem hinteren Teil des Sackes heraus. Zur Verpuppung spinnen die Raupen ihren Sack meist in Felsspalten an, teilweise aber auch an Grashalmen.
Die Art ist univoltin. Die Imagines schlüpften bei der Zucht zwischen Mitte Mai und 01. Juli (Männchen) und Anfang Mai bis Ende Juni (Weibchen).
Die Schlupfzeit der Männchen wurde in den Morgenstunden zwischen 7 und 10 Uhr registriert, lockende Weibchen konnten um 11 Uhr (MSZ) beobachtet werden.
*R. arnscheidi* sp. n. ist mit folgenden Psychidenarten vergesellschaftet: *Siederia transsilvanica* Herrmann & Weidlich, 1999, *Dahlica triquetrella* (Hübner, 1813), *Dahlica* sp., *Taleporia tubulosa* (Retzius, 1783), *Melasina ciliaris* (Ochsenheimer, 1810)., *Psyche casta* (Pallas, 1767), *Psyche crassiorella* (Bruand, 1851), *Bijugis* sp., *Rebelia* sp., *Canephora hirsuta* (Poda, 1761) und *Apterona helicinoides* (Vallot, 1827).

## 4. Weitere Beobachtungen zur Psychidenfauna der Muntii Capatenei und Muntii Lotrului in den Jahren 2000 bis 2005

Die nachfolgenden Angaben stammen aus den Zeiträumen 9.–10.v.2000, 15.iv.2001, 24.–25.iv.2002, 18.–19.iv.2003, 18.–19.iv.2004 und 14.–15.iv.2005. Eine Gesamtübersicht ist in der Tab. 2 dargestellt.

**Tab. 1.** Übersicht wichtiger Merkmale von *Reisseronia*-Arten (ergänzt nach Sieder 1972 und Weidlich 1989).

| | ***Reisseronia tarnierella*** | ***Reisseronia nigrociliella*** | ***Reisseronia pusilella*** | ***Reisseronia arnscheidi*** |
|---|---|---|---|---|
| **Männchen** | | | | |
| Schopf | dunkel graubraun | schwarz, dicht behaart | schwarz, lang behaart | schwarz, lang behaart |
| Fühlerglieder | 13 bis 15 | 12 bis 14 | 12 bis 14 | 16 |
| Länge 9./10.Kammfühlerglied/Fühlergliedlänge | ca. 2 | ca. 2 | ca. 2 | 2,5 |
| Länge Kammfühlerbehaarung/Kammfühlerbreite | etwa gleichlang | etwa gleichlang | etwa gleichlang | deutlich länger |
| Vdfl.-Spannweite (mm) | 6 bis 7 | 9 bis 10 | 8 bis 8,5 | 7,5 bis 9,5 |
| Vdfl.-Färbung | schwarzbraun | mittelbraun | dunkelbraun | schwarzbraun |
| Deckschuppen - Zackigkeit | zweizackig | zweizackig | zweizackig | zweizackig |
| Tegumen - Dach | schmal, einfach gewölbt | breit, schwach doppelkopfförmig | breit, doppelkopfförmig | schmal, einfach gewölbt |
| Clavus | lang, schmal, sägezahnartig | lang, breit, sägezahnartig | lang, breit, sägezahnartig | lang, schmal, sägezahnartig |
| Saccus - Form | nicht vorhanden oder sehr, sehr kurz | nicht vorhanden | kurz, aber deutlich | kurz, aber deutlich |
| Phallus | kurz, leicht gebogen | kurz, leicht gebogen | kurz, leicht gebogen | kurz, leicht gebogen |
| **Weibchen** | | | | |
| Länge x Breite (mm) | 5 bis 6,5 × 1 bis 1,5 | 6 bis 7 × 1,5 bis 2 | 5 bis 6 × 1 bis 1,5 | 4 bis 4,5 × 1 bis 1,5 |
| Färbung | hellbräunlich | weißlichgelb | mittelbräunlich | mittelbräunlich |
| Fühlerglieder | 2 bis 3 | 2 | 5 bis 6 | 2 bis 3 |
| Tarsenglieder | 2 bis 3 | 4 bis 5 | 3 | 1 bis 2 |
| **Säcke** | | | | |
| Länge (mm) (Männchen) | 6 bis 7 | 6 bis 8 | um 7 | 5 bis 7 |
| Länge (mm) (Weibchen) | um 8 | 7 bis 12 | um 10 | 8 bis 10 |
| Durchmesser (mm) (Weibchen) | 2 | 2,5 bis 3,5 | um 2 | um 2 |
| **Phänologie** | Ende Mai - Mitte Juni | Anfang Juni - Ende Juli | Ende Juni - Mitte August | Anfang Mai - Anfang Juli |
| **Verbreitung** | | | | |
| Staat | F, D, NL,BL, I | MK, BG, GR | MK, BG, GR | RO |
| Landschaft - Fundorte | Westfalen, Brabant, Friaul | Pirin | Bistra, Pirin, Olymp | Südkarpathen |
| Höhenverbreitung | 0–300 m NN | 200–600 m NN | 600–2000 m NN | 300–600 m NN |

**Tab. 2.** Übersicht nachgewiesener Psychidenarten in der Kleinen Walachei (Südkarpathen) in den Jahren 200 bis 2005.

| | **Muntii Capatenei N Chiaculata 350 m** | **Muntii Capatenei Umg. Valea Lui Stan 350–400 m** | **Muntii Capatenei Umg. Salistea 400–450 m** | **Muntii Capatenei Umg. Malaia 500–550 m** | **Muntii Capatenei Valea Macesului 600 m** | **Muntii Lotrului Umg. Voineasa 600–1050 m** | **Muntii Lotrului N Brezoi 350–400 m** |
|---|---|---|---|---|---|---|---|
| *Dahlica triquetrella* | × | × | × | | | × | |
| *Dahlica sp.* | × | × | × | × | × | × | × |
| *Siederia transsilvanica* | × | × | × | × | | | |
| *Taleporia tubulosa* | × | × | × | × | × | × | × |
| *Melasina ciliaris* | | | | | × | × | × |
| *Proutia betulina* | | | | | | × | |
| *Psyche casta* | × | × | × | × | × | × | × |
| *Psyche crassiorella* | × | | | | × | × | |
| *Bijugis sp.* | × | | | | | | |
| *Reisseronia arnscheidi* | × | × | × | | × | | × |
| *Rebelia sp.* | | | × | | | | × |
| *Acanthopsyche atra* | | | | | | × | |
| *Canephora hirsuta* | × | | | | × | | × |
| *Ptilocephala plumifera* | | | | | | × | |
| *Apterona helicoidella* | × | | | | | | × |

Nach dem Verzeichnis der Schmetterlinge Rumäniens (Rakosy, Goia & Kovacs 2003) werden folgende Arten erstmalig aus der Kleinen Walachei (Oltenia) gemeldet:
*Siederia transsilvanica* wurde 1986 in den Südkarpaten bei Petrosani entdeckt und 1999 beschrieben. Die Vorkommen liegen in den östlichsten Teilen der Muntii Vulcanului und den westlichsten Bereichen der Muntii Paringului (Transsilvania-Siebenbürgen). Die neuen Nachweise in den Muntii Capatenei und Muntii Lotrului liegen etwa 50 bis 70 km weiter östlich (Oltenia-Kleine Walachei). Die bekannte Höhenverbreitung erstreckt sich nunmehr zwischen 300 m und 1050 m NN. Besonders häufig ist *S. transsilvanica* in der Umgebung von Malaia, wo die Säcke zu Hunderten an Felsen aufgefunden werden konnten.
*Taleporia tubulosa* ist ebenfalls weit verbreitet, aber nicht so häufig wie *P. casta* und ist hauptsächlich an Felsen bei Salistea, Valea Lui Stan, Chiaculata, Malaia, Valea Macesului, Voineasa und Brezoi zu finden.
Die Säcke von *Psyche casta* sind meist in Anzahl bei Salistea, Valea Lui Stan, Chiaculata, Malaia, Valea Macesului, Voineasa und Brezoi an Felsen zu finden.
*Acanthopsyche atra* (Linnaeus, 1767): 1 Sack, ca. 7,5 km W Voineasa, 1050 m, 10.v.2000, an Felsen angesponnen und weitere 5 Säcke am 24.iv.2002 an gleicher Stelle.
*Ptilocephala plumifera* (Ochsenheimer, 1810): 2 Säcke, ca. 7,5 km W Voineasa, 1050 m, 10.v.2000, 24.iv.2002.
Für folgende Arten liegen lediglich alte Funde bzw. Nachweise aus dem Zeitraum 1901–1980 vor (vgl. Rakosy, Goia & Kovacs 2003):
*Canephora hirsuta*: 1 Sack Valea Macesului E Voineasa, 600 m, 10.v.2000; 2 Säcke ca. 3 km N Chiaculata, 350 m, 25.iv.2002, 18.iv.2003; 1 Sack ca. 2 km S Riu Vadului bei Brezoi, 400 m, 19.iv.2004 an Felsen.
*Apterona helicinoides*: 1 Sack an Felsen, ca. 3 km N Chiaculata, 350 m, 18.iv.2003; 1 Sack 5 km N Brezoi, 350 m, 19.iv.2004.
Außerdem wurden drei noch nicht bestimmte bzw. bestimmbare Psychidenarten im Untersuchungsgebiet gefunden: *Dahlica* sp.: Ebenfalls weit verbreitet bis häufig bei Salistea, Valea Lui Stan, Chiaculata, Malaia, Valea Macesului, Voineasa und Brezoi. Ein Männchen konnte am 25.iv.2002 um 7.34 Uhr (MESZ) fliegend beobachtet werden. In der Zucht schlüpften die Männchen vom 21.iv.–15.v. und die Weibchen zwischen dem 19.–30.iv. Bei der großen Zahl an *Dahlica*-Populationen im Karpatenbogen ist es notwendig, eine umfassende Revision voranzustellen, um die Artenproblematik zu lösen und eine abgesicherte Determination zu gewährleisten. Bereits Herrmann & Weidlich (1990) haben auf diese Gesamtproblematik hingewiesen und die Populationen aus den Muntii Vulcanului und Muntii Paringului provisorisch *Dahlica wagneri* (Gozmany 1952) zugeordnet.
*Rebelia* sp.: Je 1 Sack am 19.iv.2003 1 km W Salistea 450 m und am 19.iv.2004 ca. 2 km S Riu Vadului 400 m an Felsen.
*Bijugis* sp.: Ein einzelner Sack wurde am 18.iv.2004 an Felsen ca. 3 km N Chiaculata 350 m entdeckt, der ein Weibchen am 17.vi.2004 ergab. Sehr wahrscheinlich handelt es sich um *Bijugis bombycella* ([Denis & Schiffermüller], 1775), die bereits aus der Kleinen Walachei gemeldet wurde (vgl. Rakosy, Goia & Kovacs 2003).

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**6. Literatur**

Dalla Torre, K. W. v. & E. Strand 1929. Lepidopterorum Catalogus, Pars 34 Psychidae. – Berlin, 211 pp.

Hauser, E. 1996. Ein neues Subgenus und eine neue Art aus Kreta: *Reisseronia (Tsikalasia) malickyi* (Lepidoptera: Psychidae). – Entomologische Zeitschrift **106** (11): 433-480.

Herrmann, R. & M. Weidlich 1990. Psychidenbeobachtungen in Westrumänien – Teil 1 (Lepidoptera, Psychidae). – Nota lepidopterologica **13** (1): 12–27.

Herrmann, R. & M. Weidlich 1999. Psychidenbeobachtungen in Westrumänien – Teil 2. Beschreibung von *Siederia transsilvanica* sp. n. (Psychidae). – Nota lepidopterologica **22** (1): 10–16.

Karsholt, O. & J. Razowski 1996. The Lepidoptera of Europe. – Apollo Books, Stenstrup.

König, F. & M. Weidlich 2001. Zur Schmetterlingsfauna des Banater Karstgebirges in Südwestrumäniens (Lepidoptera). – Esperiana **8**: 732–746.

Rakosy, L., M. Goia & Z. Kovacs 2003. Verzeichnis der Schmetterlinge Rumäniens. – Societatea Lepidopterologica Romana, Cluj-Napoca, 446 pp.

Sauter, W. 1956. Morphologie und Systematik der schweizerischen Solenobia-Arten. – Revue Suisse de Zoologie **63** (3): 27, 451–550.

Sieder, L. 1972. *Reisseronia* gen. nov. (Lepidoptera, Psychidae). – Zeitschrift der Wiener Entomologischen Gessellschaft **41**: 162–170.

Weidlich, M. 1989. Die Psychidenfauna Bulgarisch-Mazedoniens mit der Erstbeschreibung des Weibchens und Sackes von *Reisseronia nigrociliella* (Rebel, 1934) (Lepidoptera, Psychidae). – Nachrichtenblatt der Bayerischen Entomologen **38** (1): 1–12.

Weidlich, M. (im Druck). Zum Vorkommen von *Eosolenobia manni* (Zeller, 1852) in Rumänien mit einem Überblick zur Gesamtverbreitung in Europa (Lepidoptera: Psychidae). – Entomologica romanica.

# Factors influencing nectar plant resource visits by butterflies on a university campus: implications for conservation

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**Abstract.** Floral attributes are well known to influence nectar-feeding butterflies. However, very little information is available on butterfly species and their nectar host plant relationships from north central India. The present study was carried out on Amravati University Campus from July 2004 to January 2005. A total of 48 butterfly species was recorded belonging to five families and included five species previously unrecorded on the campus. Nineteen nectar host plants were identified belonging to 12 plant families. Visits of butterflies were more frequent to flowers with tubular corollas than to non tubular ones, to flowers of herbs and shrubs rather than trees, to flowers coloured red, yellow, blue and purple than those coloured white and pink, and to flower sources available for longer periods in the year. Flower abundance, flowering period, flower colour and flower shape correlate significantly with plant habit, trees having sparser flowers generally with shorter flowering periods, less bright colours and non tubular flower shapes. A number of butterflies were observed to visit more (*Danaus chrysippus*, *Tirumala septentrionis*) or fewer flower (*Zizula hylax*) sources than expected and one plant (*Bauhinia purpurea*) had fewer visiting butterfly species than expected. The observations support the value of the university campus in providing valuable resources for butterflies.

Key words. India, Lepidoptera, Amravati University, resources, habitat, nectar plants, diversity, plant structure.

## Introduction

Amravati University Campus (area 190 ha) is situated at about 4 km north east of city Amravati (20°50'N 77°47'E) in the Pohara Forest Range (Maharashtra State of India). The east side of the campus is hilly and covered by the Pohara Malkhed Reserved Forest range. The campus, well known for its gardens, is occupied by tree plantations, ornamental plants in garden plots, a nursery and flowering plants around buildings; wild grasses and plants are spread over the campus. Many of the flowering plants are used by butterflies as nectar plants and support a rich diversity of butterflies. To determine the conservation value of the flowering plants for butterfly diversity a study has been carried out on nectar source visits by butterflies on the university campus based on previous checklists for both plants and butterflies (Palot 1998; Nair 2002). Earlier studies in the region have demonstrated the impact of larval host plants and nectar plants on the status of butterflies (Culin 2004; Solman Raju et al. 2004).

Within the region of Amravati, butterflies do not feed indiscriminately from any flower they find. They show preference for certain nectar flowers with specific chemical composition (Kunte 2000). But, very little information is available on feeding habits and food resources of adult butterflies compared to that of the larvae (Kunte 2000). The present study on the Amravati University Campus is a preliminary attempt to determine the link between characteristics of floral nectar plants and the butterflies using them as nutrient sources.

## Methods and Materials

The findings presented here are based on a field survey and investigation carried out by the first author on a daily basis from July 2004 to January 2005 on the Amravati University Campus during the peak flowering period (tropical seasonal climate). Observations were made during a fixed daily transect carried out between 7.00 h to 10.00 h and 17.00 to 18.00 h outside teaching hours. Species were identified directly in the field or, in difficult cases, following capture or photography. Collecting was restricted to those specimens that could not be identified directly.

Butterflies were identified from Wynter-Blyth (1957), Gey et al. (1992) and Kunte (2000). Specific observations were made on each plant species visited by butterflies: plant habits, flowering period and floral characteristics such as colour and shape of corolla were examined. Specimens from the plant species visited by butterflies were photographed and/or collected and identified by the second author (VPD).

All scientific names follow Varshney (1983) and common English names are after Wynter Blyth (1957). Based on number of sightings butterfly species were categorized into very rare (< 2 sightings), rare (2–15 sightings), not rare (15–50 sightings), common (50–100 sightings) and very common (more than 100 sightings) and ranked from 1 (very rare) to 5 (very common). Availability of flowers (abundance of flowers) for flowering plants on the campus was placed into three categories, (1) sparse, (2) moderate and (3) dense, reflecting changes in abundance in orders of magnitude.

For analysis, plants were classed for habit, (tree, shrub, herb), corolla shape (tubular and non-tubular), flowering period (all year or restricted to less than half a year) and colour (white, pink, red, yellow, blue and purple with cream treated as white). Flower colour was also simplified into white/pink versus red/yellow/blue/purple. Number of flower visits by butterflies, number of flower categories visited by butterflies and number of butterfly species visiting flowers have been normalised ($sqrt_x$, $loge_x$); in all regression analyses the residuals have been tested for normality.

Four issues are investigated: (i) the relative dependence on nectar sources by butterflies, (ii) the range of nectar source use by butterflies; (iii) the size of the nectar feeding butterfly guild on flowering plants, and (iv) the influence of attributes of flowering plants (abundance, habit, colour, flowering period and corolla shape) on nectaring visits across species. For the second and third investigations, no assumption is made as to the form of the positive relationship between species making visits and visits observed beyond that it is linear following transformation for normality. This differs from the model used by Tudor et al. (2004) which assumes a strict logarithmic curve following Gleason's method of relating species number to area; although the transformations required supported a general fall off in species for increasing number of observations, this was not always found to follow a strict logarithmic model. In the second investigation, a butterfly species seen feeding frequently is likely to feed on more flower species than one seen rarely. Positive deviations from this pattern would indicate generalism, and negative deviations specialism in the feeding habits of the butterfly. In the third investigation, flower species more popular than expected will

have more butterfly species feeding on them and those less popular than expected will receive fewer butterfly species than expected. The fourth investigation involves direct comparisons applying t tests and ANOVA and associations using Gamma, which accounts for tied values (Goodman & Kruskal 1972). All analyses have been carried out in STATISTICA (Statsoft 1999).

## Results

During the course of study 48 species of butterflies, belonging to 5 families, were recorded; five were new records for the university campus. These species were found utilizing the flower nectar of 19 plants species belonging to 12 families. Most butterflies recorded belong to the Nymphalidae (22 species) with two new records to the campus (i.e., *Tirumala septentrionis* (Dark blue tiger) and *Parantica aglea* (Glossy tiger)). Eleven Lycaenidae species were recorded with one new record (i.e. *Rapala larbus* (Indian red flash)). A further 10 Pieridae species were recorded with two new records (i.e., *Cepora nerissa* (Common gull) and *Pareronia valeria* (Common wanderer)). Only 1 species is recorded from the Hesperiidae and 4 species recorded from the Papilionidae. Among the 48 butterflies recorded three species come under the protection category of the Indian Wild Life (protection) Act 1972 (Kunte 2000). Among them *Hypolimnas misippus* came under schedule I of the act. The species recorded which come under schedule II of the wild life protection act 1972 are *Hypolimnas misippus, Pareronia valeria,* and *Lampides boeticus* (Gupta & Mondal 2005). The list of butterflies along with their common names, occurrence status, and nectar plants utilized by each butterfly species is provided in Tab. 1. The plant species utilized by each butterfly species along with habit, flowering period, colour, and corolla shape is given in Tab. 2. Each plant species included in the present study was utilized by more than one butterfly species.

**Observed versus expected nectaring events.** To determine whether species were observed visiting flowers as often as expected from their general abundance on the campus, the number of nectar visits by butterfly species has been regressed against their abundance coding. A significant correlation is found ($F_{1,46} = 34.18$, $R^2 = 42.6\%$, $P < 0.00001$, $N = 48$). Three distinctive outliers exist (>|2| standard errors): *Danaus genutia* and *Parantica aglea* were observed to be nectaring far more frequently than expected from their general abundance on the campus and *Melanitis leda* far less frequently from its observed abundance (Fig. 1).

**Range of nectar plants used by butterflies.** To determine the number of nectar plants used by butterflies, the number of flower groups has been regressed against number of observations (flower visits; Fig. 2). A significant relationship is found ($F_{1,46} = 51.19$, $P < 0.00001$, $R^2 = 52.7\%$, $N = 48$ butterfly species). Three outliers were found (>|2| standard errors); *Danaus chrysippus* and *Tirumala septentrionis* visit significantly more nectar sources than expected and *Zizula hylax* significantly fewer than expected. Other species also tend to have more (e.g., *Catopsilia pomona*, *Byblia ilithyia*) or fewer (e.g., *Zizeeria karsandra*, *Chilades laius*, *Catochrysops strabo*, *Lampides boeticus*) nectar visiting sources than expected.

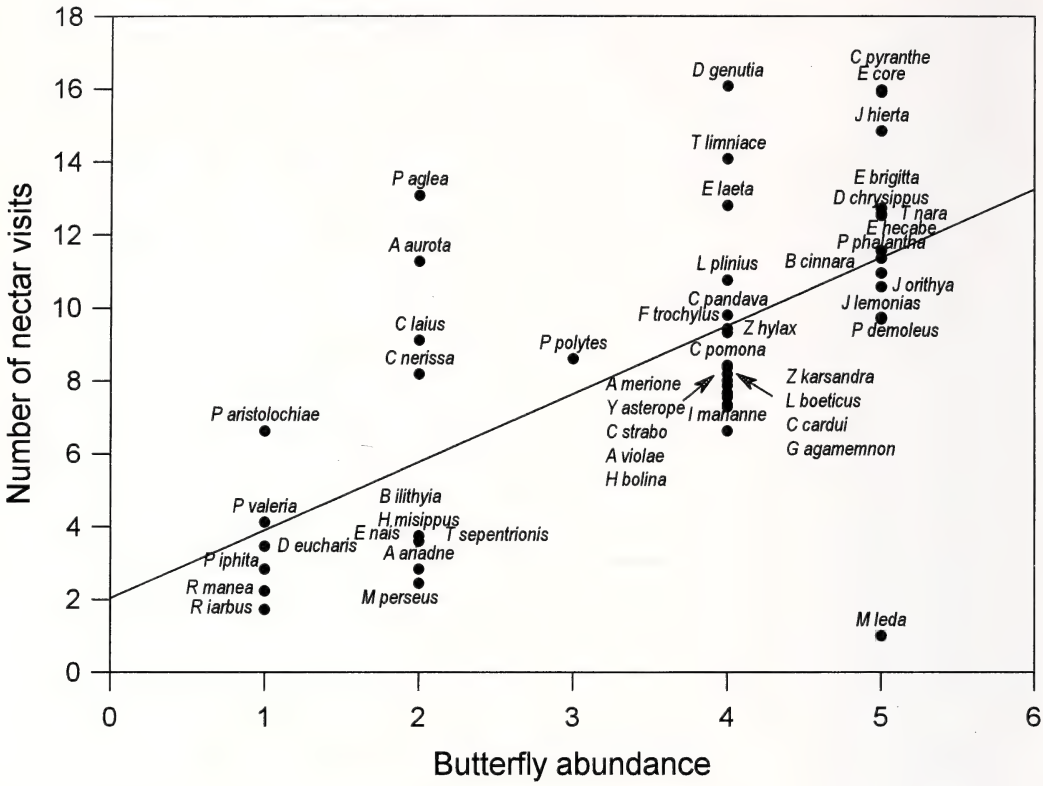


**Fig. 1.** Number of nectar visits by butterfly species in relation to butterfly abundance on the Amravati University campus. (nectar visits: square root transformed; butterfly abundance: 1 very rare (< 2 sightings), 2 rare (2–15 sightings), 3 Not rare (15–50 sightings), 4 common (50–100 sightings), 5 very common (> 100 sightings); for full names of butterfly species see Tab. 1).

**Number of butterfly species feeding on nectar sources.** To ascertain the size of the nectar feeding butterfly guild on flowering plants, the number of butterfly species has been regressed on number of observations (flower visits; Fig. 3). A significant relationship is found ($F_{1,17}$ = 79.74, P < 0.00001, $R^2$ = 82.4%, N = 19 plants). One outlier is found (>|2| standard errors), *Bauhinia purpurea*, which is visited by fewer butterfly species than expected. A number of other plants have more (e.g., *Jatropha gossypiifolia*, *Lantera camera*) or fewer (e.g., *Gaillardia* spp., *Tribulus terrestris*) butterfly species visiting them than expected.

**Factors influencing visits to flowers.** Visits to herbs and shrubs were more frequent than visits to flowering trees, but not significantly so ($F_{2,170}$ = 2.43, P = 0.09). When shrubs and herbs are combined, this difference increases ($t_{171}$ = 1.85, P = 0.07) and the ranked difference is significant (Mann-Whitney U, Z = 2.12, P = 0.03). Flowering period has a significant impact on visits for nectar ($t_{171}$ = 3.48, P = 0.0006); plants flowering all year have more visits despite the fact that the survey was carried out for seven months. Flower shape also significantly influences visits for nectar ($t_{171}$ = 3.12, P = 0.002); tubular shaped corollas have more visits than those that do not.

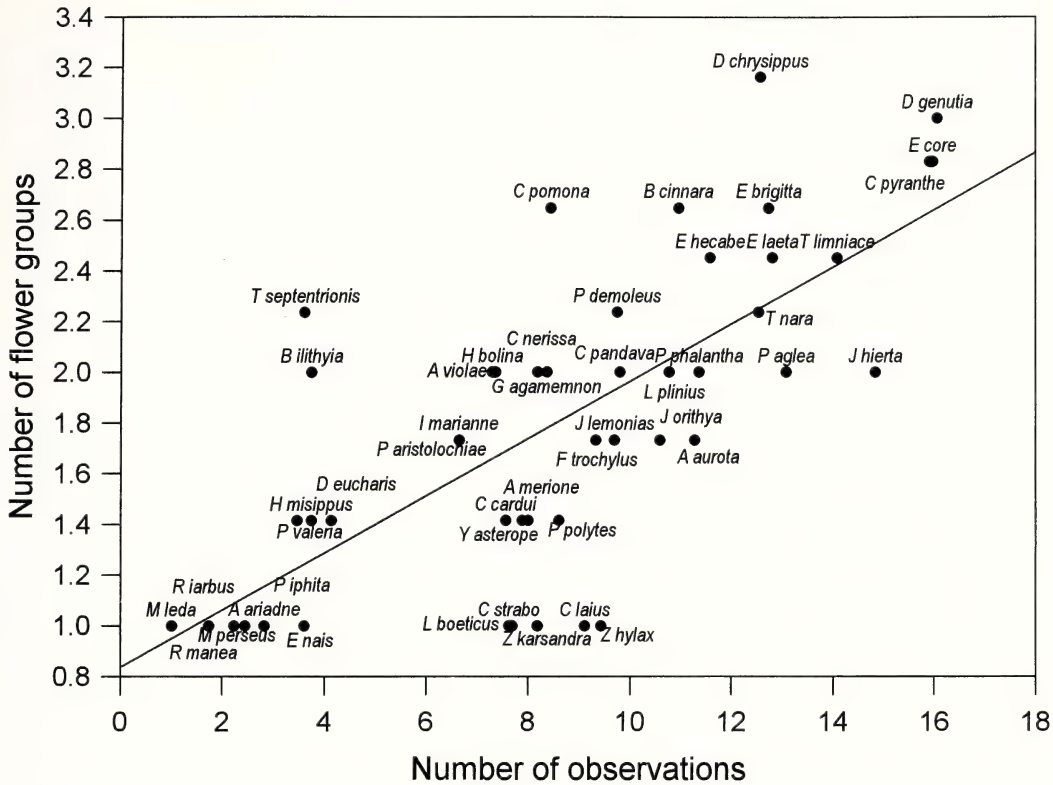


**Fig. 2.** Number of flower groups visited by butterflies in relation to the number of nectar visits observed (Both axes square root transformed; for full names of butterfly species see Tab. 1).

**Flower colour** has been tested individually, one flower colour at a time, as well as in a single test distinguishing white/pink flowers from others (red, yellow, blue and purple). White and pink flowers receive fewer visits than flowers of other colours, white flowers significantly so (white: t = 2.71, P = 0.007, pink: t = -1.16, P = 0.11, df = 171). Red, yellow and blue/purple flowers receive more visits than other colours, though not significantly for red flowers (red: t = -0.78, P = 0.44, yellow: t = -2.75, P = 0.007, blue/purple: t = -2.16, P =0.03; df = 171). When flowers are combined for colour, white/pink flowers receive significantly fewer visits than flowers of other colours (red/yellow/blue/purple) ($t_{171}$ = 3.89, P = 0.0001).

To determine the **main influences for across butterfly species visits to nectar sources**, number of visits (log transformed) have been regressed using forwards stepwise entry of variables against flower abundance (sparse, moderate, dense), habit (trees versus shrubs/herbs), flowering period (all year versus restricted period), flower shape (tubular/non-tubular) and flower colour (white/pink versus other colours). Three variables were found to significantly contribute to number of visits ($F_{3,169}$ = 14.52, $R^2$ = 20.5%, P < 0.00001, N = 173): flower abundance ($R^2$ = 12.9%), flower colour ($R^2$ = 4.1%) and

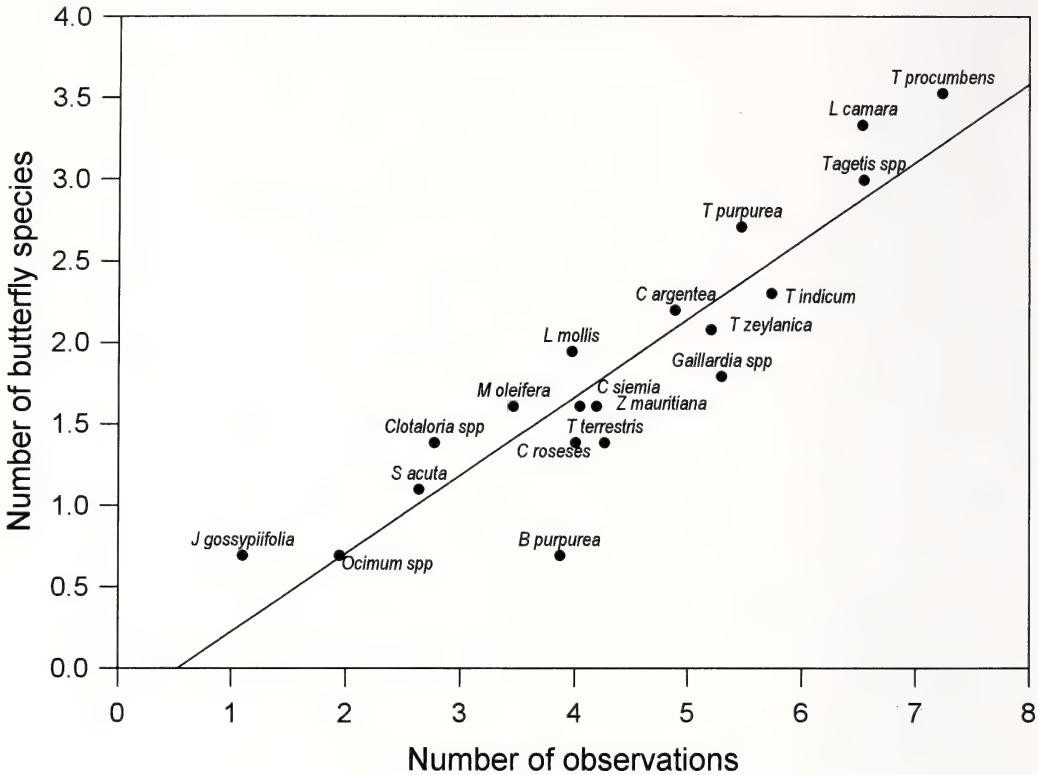


**Fig. 3.** Number of butterfly species visiting nectar flower groups in relation to the number of visits observed for each flower group. (Both axes log transformed; for full names of plant groups see Tab. 2).

flowering period ($R^2$ = 3.5%); beta coefficients for all three variables are significant at $P < 0.007$) though the overall explained variance is relatively low. However, habit is highly correlated with flower abundance (Gamma = -1.0), flowering period (Gamma = -0.94, $P < 0.0001$) and flower shape (Gamma = -0.82), and flower shape is highly correlated both with flowering period (Gamma = 0.92) and flower colour (Gamma = 0.95) ($P < 0.0001$ in both cases) (Tab. 3). Trees, which have significantly fewer nectar visits, also have a significantly sparser flowers, shorter flowering period, fewer tubular corollas and more typically have white/pink flowers rather than red, yellow or blue-purple.

## Discussion

Observations on nectar visits in butterflies on the Amravati University campus, in a tropical context, support four previous general findings on adult feeding in butterflies mainly from surveys of temperate butterflies (e.g., Faegri & van der Pijl 1979; Jennersten 1984; Porter et al. 1992; Corbet 2000; Tudor et al. 2004): (i) extensive variation in the range of dependency on nectar as a resource, (ii) varying degrees of generalism and

**Tab. 1.** Flower-visiting butterfly species of Amravati University Campus together with common name, status and nectar host plants. VC Very common (> 100 sightings), C Common (50–100 sightings), NR Not rare (15–50 sightings), R Rare (2–15 sightings), VR Very rare (< 2 sightings). For numbers in nectar host plant column, see Tab. 2.

| Butterfly species | Common Name | Status | Nectar host plant |
|---|---|---|---|
| Hesperiidae | | | |
| *Borbo cinnara* | Rice swift | VC | 4,5,6,7,16,18,19 |
| Papillionidae | | | |
| *Papilio polytes* | Common Mormon | NR | 2,18 |
| *Papilio demoleus* | Lime Butterfly | VC | 7,8,12,16,18 |
| *Pachliopta arstolochiae* | Common Rose | VR | 2,5,8 |
| *Graphium agamemnon* | Tailed Jay | C | 2,5,16,18 |
| Pieridae | | | |
| *Catopsilia pomona* | Lemon Emigrant | C | 2,3,5,7,12,15,18 |
| *Catopsilia pyranthe* | Mottled Emigrant | VC | 2,3,5,6,7,15,17,18 |
| *Eurema brigitta* | Small grass yellow | VC | 1,5,7,9,12,15,18 |
| *Eurema hecabe* | Common grass yellow | VC | 7,10,12,17,18,19, |
| *Eurema laeta* | Spotless grass yellow | C | 1,7,8,9,12,18 |
| *Delis eucharis* | Common Jezebel | VR | 12,18 |
| *Anaphaeis aurota* | Pioneer | R | 7,12,18 |
| *Ixias marianne* | White Orange Tip | C | 7,14,18 |
| *Cepora nerissa* | Common Gull | R | 5,7,12,18 |
| *Pareronia valeria* | Common Wanderer | VR | 5,11 |
| Lycaenidae | | | |
| *Zizula hylax* | Tiny Grass Blue | C | 7 |
| *Zizeeria karsandra* | Dark Grass Blue | C | 7 |
| *Freyeria trochylus* | Grass Jewel | C | 1,7,19 |
| *Lampides boeticus* | Pea Blue | C | 1 |
| *Chilades laius* | Lime Blue | R | 7 |
| *Leptotes plinius* | Zebra Blue | C | 1,7,17,18 |
| *Tarucus nara* | Rounded pierrot | VC | 6,7,12,17,18 |
| *Catochrysops strabo* | Forgot-me-not | C | 7 |
| *Chilades pandava* | Plains Cupid | C | 7,17,18,19 |
| *Rapala manea* | Slate Flash | VR | 5 |
| *Rapala iarbus* | Indian Red Flash | VR | 7 |
| Nymphalidae | | | |
| *Melanitis leda* | Common Evening Brown | VC | 7 |
| *Mycalesis perseus* | Common Bushbrown | R | 5 |
| *Ypthma asterope* | Common Three Ring | C | 5,7 |
| *Junonia hierta* | Yellow Pansy | VC | 7,8,12,18 |
| *Junonia lemonias* | Lemon Pansy | VC | 1,7,12 |
| *Junonia orithya* | Blue Pansy | VC | 7,8,18 |
| *Precis iphita* | Chocolate Pansy | VR | 12 |
| *Danaus chrysippus* | Plain Tiger | VC | 3,4,6,7,8,9,12,13,16,18 |
| *Danaus genutia* | Striped Tiger | C | 1,4,5,7,8,9,12,16,18 |
| *Tirumala limniace* | Blue Tiger | C | 5,7,8,9,13,18 |
| *Tirumala septentrionis* | Dark Blue Tiger | R | 5,7,9,13,18 |
| *Parantica aglea* | Glossy Tiger | R | 5,8,9,13 |
| *Phalanta phalantha* | Common Leopard | VC | 1,6,7,18 |
| *Euthalia nais* | Baronet | R | 7 |
| *Byblia ilithyia* | Joker | R | 5,7,14,18 |
| *Acraea violae* | Tawny Coster | C | 3,4,6,18 |
| *Ariadne merione* | Common Castor | C | 5,7 |
| *Ariadne ariadne* | Angled Castor | R | 5 |
| *Cynthia cardui* | Painted Lady | C | 7,18 |
| *Euploea core* | Common Indian Crow | VC | 4,5,6,7,8,9,11,18 |
| *Hypolimnas misippus* | Danaid Eggfly | R | 4,18 |
| *Hypolimnas bolina* | Great Eggfly | C | 1,5,10,12 |

**Tab. 2.** Nectar host plants and floral characteristics of butterfly species of Amravati University Campus. YL flowering all year: numbers indicate months of flowering; Corolla shape: T tubular, NT non-tubular; flower abundance: S sparse, M moderate, D dense.

| No | Plant species or group | Habit | Flowering period | Flower colour | Corolla shape | Flower abundance |
|---|---|---|---|---|---|---|
| | Amaranthaceae | | | | | |
| 1 | *Celosia argentea* | herb | YL | Pink/white | NT | M |
| 2 | *Cussia siemia* | tree | YL | yellow | T | S |
| | Apocynaceae | | | | | |
| 3 | *Catharanthus roseses* | shrub | YL | white | T | D |
| | Asteraceae | | | | | |
| 4 | *Gaillardia* spp. | shrub | YL | red | T | D |
| 5 | *Tagetis* spp. | shrub | YL | Red/yellow | T | D |
| 6 | *Lagasca mollis* | herb | 6–11 | white | T | D |
| 7 | *Tridax procumbens* | herb | YL | yellow | T | D |
| | Boraginaceae | | | | | |
| 8 | *Trichodesma indicum* | herb | YL | Blue/white | T | M |
| 9 | *Trichodesma zeylanica* | herb | YL | yellow | T | D |
| | Caesalpiniaceae | | | | | |
| 10 | *Bauhinia purpurea* | tree | 9–12 | purple | NT | S |
| | Euphorbiaceae | | | | | |
| 11 | *Jatropha gossypiifolia* | herb | 6–10 | red | NT | M |
| | Fabaceae | | | | | |
| 12 | *Tephrosea purpurea* | herb | YL | pink | NT | M |
| 13 | *Clotaloria* spp. | herb | YL | yellow | NT | M |
| | Lamiaceae | | | | | |
| 14 | *Ocimum* spp. | herb | 7–10 | White | T | D |
| | Malvaceae | | | | | |
| *15* | *Sida acuta* | herb | 7–11 | cream | T | D |
| | Moringaceae | | | | | |
| 16 | *Moringa oleifera* | tree | YL | white | T | S |
| | Rhamnaceae | | | | | |
| 17 | *Zizyphus mauritiana* | tree | 7–11 | cream | NT | S |
| | Verbenaceae | | | | | |
| 18 | *Lantana camara* | shrub | YL | yellow | T | D |
| | Zygophyllaceae | | | | | |
| 19 | *Tribulus terrestris* | herb | 6–10 | yellow | NT | M |

**Tab. 3.** Associations among nectar plant attributes and nectar visits (Gamma). Abundance: 1 sparse, 2 moderate, 3 dense; Habit: 1 herbs/shrubs, 2 trees; flowering period: 1 < half year, 2 all year; flower colour: 1 white/pink, 2 red/yellow, purple-blue; flower shape: 1 non tubular, 2 tubular. All coefficients are significant at $P < 0.0001$, except that between habit and flower colour with $P = 0.015$; $N = 173$.

| Variable | Visits | Flower abundance | Habit | Flowering period | Flower colour |
|---|---|---|---|---|---|
| Flower abundance | 0.50 | | | | |
| Habit | -0.66 | -1.0 | | | |
| Flowering Period | 0.69 | 0.83 | -0.94 | | |
| Flower Colour | 0.53 | 0.82 | -0.16 | 0.39 | |
| Flower shape | 0.49 | 0.96 | -0.82 | 0.92 | 0.95 |

specialism on flowering plants for nectar, (iii) the wide range in butterfly guilds on different nectar plants, and (iv) and the wide range of physical attributes used as cues for nectar quality or correlating with other (chemical) cues underlying nectar quality of flowering plants.

Butterflies differ in their dependency on nectar for somatic maintenance and reproductive potential (Gilbert 1981). In some species (e.g., *Euphydryas editha bayensis*) females emerge with a fixed number of oocytes in the ovaries, a relatively large proportion of which are chorionated and ready for deposition (Boggs & Nieminen 2004); other species (e.g., *Heliconius* spp.) display continual oogenesis and have no chorionated eggs on emergence (Gilbert 1973); the latter depend highly on adult acquired nutrition. Nutrition for egglaying may be obtained directly from adult feeding or from male reproductive investments as nuptial gifts (Boggs, 1995, Mevi-Schütz & Erhardt 2004). A relationship has previously been found between the abundance of butterflies and the diversity of nectar host plants utilized by them in India (Solman Raju 2004) as elsewhere (e.g., Feber et al. 1996, Swengel & Swengel 2001, Krauss et al. 2003). The current observations at the Amravati University campus suggest that some species (e.g., *Danaus genutia*, *Catopsilia pyranthe* and *Parantica aglea*) are greatly more dependent on nectar sources than other species (e.g., *Rapala iarbus*, *Ixias marianne*, *Mycalesis perseus* and *Melanitis leda*). The substantially fewer observations of nectar feeding in *Melanitis leda* than expected may largely owe to its crepuscular habit (Roberts 2001), but observations were carried out between 17.00 and 18.00h local time and cannot entirely explain the lack of nectar feeding in this butterfly and the closely related *Mycalesis perseus*. As grass feeders they may also be obtaining sustenance from other resources (e.g., ergot; Shreeve 1992) including rotting fruit or sap.

Butterflies have been found to differ in the range of available nectar sources used. In the parlance of host use, they are described as being generalists and specialists respectively. In a previous study in a temperate context, specialist nectar feeders were found to be species of conservation concern, having fewer broods, lower mobility and being associated with specific (taller) plant life forms; there was no relationship with wing size or proboscis length (Tudor et al. 2004). Linked with this it was also found that nectar plants have differently sized butterfly-feeding guilds on them. The present study confirms distinctions of nectar use generalism and specialism and range in guild size for plants, for a tropical context. In particular, *Danaus chrysippus* and *Tirumala septentrionis* use significantly more nectar sources than expected and *Zizula hylax* less sources than expected. Regarding butterfly nectar feeding guilds on plants, *Bauhinia purpurea*, despite being an attractive colour for butterflies, has a very limited guild of butterflies feeding on it. In a recent study of feeding by *Danaus genutia* on four nectar sources (*Crotalaria juncea*, *Nerium oleander*, *Barleria cristata* and *Bauhinia purpurea*) at the Kaziranga National Sanctuary, Assam, India, the fewest visits were also paid to *Bauhinia purpurea* (Bhuyan et al. 2005). The fact that it is a tree species with non-tubular flowers, and a flowering period restricted to a period between September and December, may form part of the reason, factors apparently not offset by flower colour. Unfortunately, biological data are unavailable for the Amravati species to determine underlying biological influences for these associations.

Nectar use has long been linked to flowering attributes, for instance, nectar concentrations (Watt et al. 1974, Pivnick & McNeil 1985), colour and pattern (Faegri & van der Pijl 1979, Jennersten 1984) and structure (e.g., corolla length) (Kingsolver & Daniel 1979) and butterfly morphology (e.g., proboscis length, wing loading) (Porter et al. 1992, Corbet 2000). Learned behaviour is also a feature of flower constancy (Goulson et al. 1997). The present study confirms the influence of flower colour and structure and adds plant habit (tree versus shrub/herb) and length of flowering time. A number of studies in temperate contexts have observed shifts in nectar flower use with emergence period and broods (Porter et al. 1992). In a tropical context flowering time is perhaps even more important than in a temperate context, as butterflies tend to be continuously brooded and require access to a continuous supply of flowering nectar-producing plants that may not be available. Shrubs and herbs provide this significantly more frequently than trees on the Amravati University campus.

The findings of the present study underline the importance of institutional estates, in this case a university campus, in providing resources for butterflies. Often, there are large open areas on college campuses and both ornamental and more functional areas can be diversified for the benefit of arthropods and other animals. Naturally, there has to be a balance between naturally grown, wild areas as well as mown grass areas. Increase in semi-natural vegetation has its dangers in a tropical context (e.g., poisonous snakes), particularly for staff and students on a university campus. There is considerable diversity of butterflies on the Amravati campus, to which five more species have been added; 32 species are common and a further 16 species relatively rare. The study not only confirms the importance of providing nectar resources for butterflies, but also reveals what kind and variety of resources are most appropriate for the butterfly fauna. Longer-lived trees provide fewer nectar resources than shorter-lived shrubs and herbs. The Botanical Garden, the University Garden and the University Dam at Amravati University are some of the rich butterfly areas on the campus and it follows that increasing these areas by planting additional nectar plants and increasing water resources would be valuable steps in the conservation of butterfly diversity on the campus. It is clear, from the specific associations of nectar visits to plants, that the obverse, a lack of flowering plants on the campus would have serious implications for the butterfly fauna and the maintenance of their populations.

Of course, this is but one aspect of resource use of butterflies on the university campus and a complete picture of habitat structure can only be obtained by research into all consumable and utility resources (Dennis et al. 2003). Butterfly populations would clearly benefit from planting indigenous, as opposed to exotic, nectar and larval host plants. In particular, attention should be paid to the seasonal availability of resources and to resources for less common butterflies on the campus. All in all, the campus provides rich ground not just for conservation but also for research into butterfly and arthropod biology for the students attending biology and ecology courses.

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**References**

Bhuyan, M., D. Kataki, M. Deka & P. R. Bhattacharyya 2005. Nectar host selection and floral probing by the Indian butterfly *Danaus genutia* (Nymphalidae). – Journal of Research on the Lepsidoptera **38**: 79–84.

Boggs, C. L. 1995. Male nuptial gifts: phenotypic consequences and evolutionary implications. – *In* S. R. Leather & J. Hardie, (eds.), Insect Reproduction, pp. 215–242. – CRC Press. Boca Raton, FL.

Boggs, C. L. & M. Nieminen 2004. Checkerspot reproductive biology. – *In*: P. R. Ehrlich & I. Hanski (eds.), On the Wings of Checkerspots. A model system for Population Biology, pp. 92–111. – Oxford University Press, Oxford.

Corbet, S. A. 2000. Butterfly nectaring flowers: butterfly morphology and flower form. – Entomologia Experimentalis et Applicata **96**: 289–298.

Culin, J. D. 1997. Relationship of Butterfly visitation with nectar qualities and flower color in Butterfly Bush, *Buddleia davidii*. – News of the Lepidopterists' Society **39**: 35–39.

Dennis, R. L. H., T. G. Shreeve & H. Van Dyck 2003. Towards a functional resource-based concept for habitat: a butterfly biology viewpoint. – Oikos **102**: 417–426.

Faegri, K. & L. van der Pijl 1979. The Principles of Pollination Ecology. – Pergamon Press, London.

Feber, R. E., H. Smith & D. W. Macdonald 1996. The effect of butterfly abundance on the management of uncropped edges of arable fields. – Journal of Applied Ecology **33**: 1191–1205.

Gey, T., J. D. Kehimkar & J. C. Punetha 1992. Common butterflies of India. – Oxford University Press, Hyderabad.

Gilbert, L. E. 1973. Pollen feeding and reproductive biology of *Heliconius* butterflies. – Proceedings of the National Acedemy of Sciences USA **69**: 1403–1407.

Gilbert, L. E. 1981. The biology of communities. – *In* R. I. Vane-Wright & P. R. Ackery (eds.), The Biology of Butterflies, pp. 41–54. – Academic Press, London.

Goodman, L.A. & W. H. Kruskal 1972: Measures of association for cross-classifications. IV. Simplification of asymptotic variances. – Journal of the American Statistical Association **67**: 415–421.

Goulson, D., J. C.Stout & S. A. Hawson 1997. Can flower constancy in nectaring butterflies be explained by Darwin's interference hypothesis? – Oecologia **112**: 225–231.

Gupta, I. J. & D. K. Mondal 2005. Red Data Book, Part II: Buttrflies of India. –Zoological Society of India, Kolkata. xv+535 pp.

Jennersten, O. 1984. Flower visitation and pollination efficiency of some North European butterflies. – Oecologia **63**: 80–89.

Kingsolver, J. G. & T. L. Daniel 1979. On the mechanics and energetics of nectar feeding in butterflies. – Journal of Theoretical Biology **76**: 167–179.

Krauss, J., I. Steffan-Dewenter & T. Tscharntke 2003. How does landscape context contribute to effects of habitat fragmentation on diversity and population density of butterflies. – Journal of Biogeography **30**: 889–900.

Kunte, K. 2000. A lifescape of butterflies of peninsular India. – University Press, Hyderabad.

Mevi-Schütz, J. & A. Erhardt 2004. Mating frequency in flower nectar amino acid preferences of *Pieris napi*. – Proceedings of the Royal Society of London, B. **271**: 153–158.

Nair, V. P. 2002. Butterflies of Government College Campus, Madappally, Kozhikode District, Kerla. – Zoos' Print journal **17**: 911–912.

Palot, M. J. 2003. Butterfly collection at Entomology Museum, M.E.S. – Mampad College, Kerla. – Zoos' Print journal **18**: 1229–1231.

Pivnick, K. A. & J. N. McNeil 1985. Effects of nectar concentration on butterfly feeding: measured feeding rates for *Thymelicus lineola* (Lepidoptera: Hesperiidae) and a general feeding model for adult Lepidoptera. – Oecologia **66**: 226–237.

Porter, K., C. A. Steel & J. A. Thomas 1992. Butterflies and communities. – *In*: R. L. H. Dennis (ed.), The Ecology of Butterflies in Britain, pp. 139– 177. – Oxford University Press, Oxford.

Roberts, T. J. 2001. The Butterflies of Pakistan. – Oxford University Press, Oxford.

Shreeve, T. G. 1992. Adult Behaviour. – *In*: R. L. H. Dennis (ed.), The Ecology of Butterflies in Britain, pp. 22–45. – Oxford University Press, Oxford.

Solman Raju, A. J. 2004. Nectar host plants of some butterfly species at Visakhapatnam. – Science and Culture **70**: 187–190.

Statsoft, 1999. STATISTICA for Windows 95/98/NT. – Tulsa.

Swengel, A. B. & S. R. Swengel 2001. The effects of prairie and barrens management on butterfly faunal composition. – Biodiversity & Conservation **10**: 1757–1785.

Tudor, O., R. L. H. Dennis, J. N. Greatorex-Davies & T. H. Sparks 2004. Flower preferences of woodland butterflies in the UK: nectaring specialists are species of conservation concern. – Biological Conservation **119**: 397–403.

Varshney, R. K. 1983. Index *Rhopalocera indica* part II. Common names of butterflies from India and neighboring countries. – Records of the Zoological Survey of India. Occasional paper No. **47**: 1–49.

Wadtkar, J. S. & M V. Shirbhate 2004. Diversity of Butterflies from Amravati University Campus, Maharashtra. – Amravati University Research Journal **1**: 4–7.

Watt, W. B., P. C. Hoch & S. G. Mills 1974. Nectar resource use by *Colias* butterflies. Chemical and visual aspects. – Oecologia **14**: 353–374.

Wynter-Blyth, M. A. 1957. Butterflies of the Indian Region. – Bombay Natural History Society, Bombay. 523 pp.

# *Elachista imatrella* Schantz, 1971 (Elachistidae): Female external morphology and redescription of the male

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**Abstract.** The female external morphology of *Elachista imatrella* Schantz, 1971 is described based on a single female specimen lacking the abdomen. The male *E. imatrella* is redescribed on the basis of new material and compared with a close relative, *E. cinereopunctella* (Haworth, 1828). The species can be distinguished most reliably by the length and shape of the aedeagus. The wing pattern of *E. imatrella* is more distinct than presumed earlier. The habitat of *E. imatrella* is described and its possible life history discussed.

Key words. Elachistidae, *Elachista imatrella*, *Elachista cinereopunctella*, taxonomy, morphology, redescription.

## Introduction

*Elachista imatrella* Schantz, 1971 was described on the basis of three male specimens collected in the vicinity of Imatra, south-eastern Finland (Schantz 1971). Later, five additional, old, and unlabelled specimens were recorded from Norway (Traugott-Olsen & Schmidt Nielsen 1977). These were the only known records of this species until it was rediscovered in Finland in 1993 (Kaila & Kerppola 1995). Those findings were made in Rovaniemi, northern Finland, where two male specimens were found by L. Sippola. Soon after that (when mapping the lepidopterous fauna of the planned Vuotos water reservoir area in Pelkosenniemi in 1994), MM captured one male specimen of this rarity by kicking it off a spruce tree in a fen area (Itämies & Mutanen 1995, 1996). This locality was later visited by other lepidopterists and three more specimens were collected in 1996 (R. Siloaho and Henry Holmberg, pers. comm.). When the Norwegian specimens were later re-examined, they were considered to belong to *E. cinereopunctella* (Haworth, 1828) (L. Aarvik, pers. comm.). Therefore, *E. imatrella* is known only from Finland, and a total of nine specimens are nowadays available. The female genitalia still remain unknown as the only known female specimen, collected from Pelkosenniemi, Lapland (H. Holmberg leg.) unfortunately lacks the abdomen.

*E. imatrella* is closely related to *E. cinereopunctella* (see Traugott-Olsen & Schmidt Nielsen 1977). The following male characteristics are mentioned as diagnostic (Traugott-Olsen & Schmidt Nielsen 1977, Kaila & Kerppola 1995): 1. The wing pattern of *E. imatrella* is very indistinct, whereas that of *E. cinereopunctella* is conspicuous; 2. *E. imatrella* is smaller on average; 3. The aedeagus of the male genitalia of *E. imatrella* is very long and slender, whereas in *E. cinereopunctella* it is much shorter and also slightly thicker. The species further differ considerably in their ecology, *E. imatrella* being confined to bogs and *E. cinereopunctella* to sandy or calcareous areas with shady spots (Traugott-Olsen & Schmidt Nielsen 1977). The more recent findings of *E. imatrella* have proved that some of the previously described characteristics either show intraspecific variation or are due to the worn condition of the type material.

In this paper, we describe the external morphology of the female and redescribe the external and genital morphology of the male *E. imatrella*. We also comment on the reliability of the above-mentioned diagnostic characteristics between *E. imatrella* and *E. cinereopunctella* and provide diagnostic features for the males of the species.

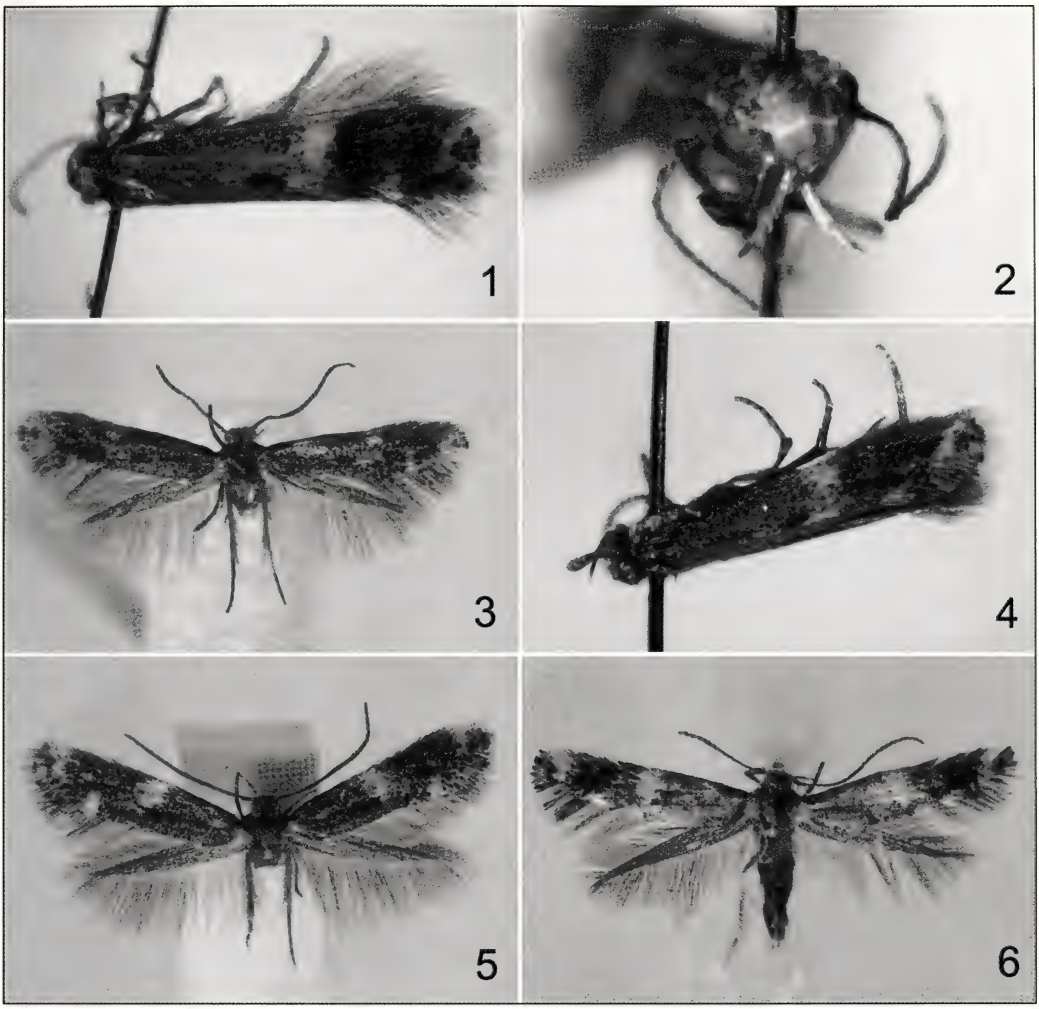
### *Elachista imatrella* Schantz, 1971

Material. *E. imatrella*: 1♂ Finland, Sa Imatra, 23.vi.1938, von Schantz leg. (slide 531/1964, von Schantz); 1♂ KemLE: Pelkosenniemi 7456:538, 21.vi.1994, Mutanen leg. (slide 867 J. Itämies); 1♂ PPn: Rovaniemi, 25.vi.1993, Sippola leg. (slide 585 M. Mutanen); 1♂ KemLE: Pelkosenniemi, 26.vi.1996, Siloaho leg.; 1♀ KemL: Savukoski 745:53 (mislabelled, the correct municipality is Pelkosenniemi), 29.vi.1996, Holmberg leg., *E. cinereopunctella*: 2♂, 1♀ Estonia, Saaremaa, 20.vi.1994, Nupponen leg. (slides 573, 574 Mutanen); 2♂ Austria, 20.v.1992, Biesenbaum leg. (slides 1390, 3501 Kaila); 1♂ Poland, Tatra Mountains, Nosul, 1150 m, 3.vii.1987, Buszko leg. (slide 3502 Kaila); 1♂ Russia, Aunus, 19.vi.1991, Kullberg leg (slide 3503 Kaila).

**Female, external morphology (Figs. 1–2).** Forewing length 3.4 mm. Labial palpus ascending; about as long as diameter of head; white above, except for tip of 3rd segment, narrowly grey, greyish below. Antennae grey, scales slightly raised on distal two thirds. Head creamy white. Neck tuft mottled grey (tips of scales greyish). Thorax and tegula mottled grey. Forewing ground colour mottled greyish/brownish from base to fascia, blackish beyond. Straight fascia situated beyond middle of costa, white and distinct, faintly broken in middle and hardly reaching dorsum. Fold area with black dot touching fascia. Tornal spot white and small. Faint white apical spot present. Tornal fringe scales grey, apical fringe scales white with clear fringe line. Legs greyish, hind leg pale inwardly. Tarsal articles grey, with broad white tip.

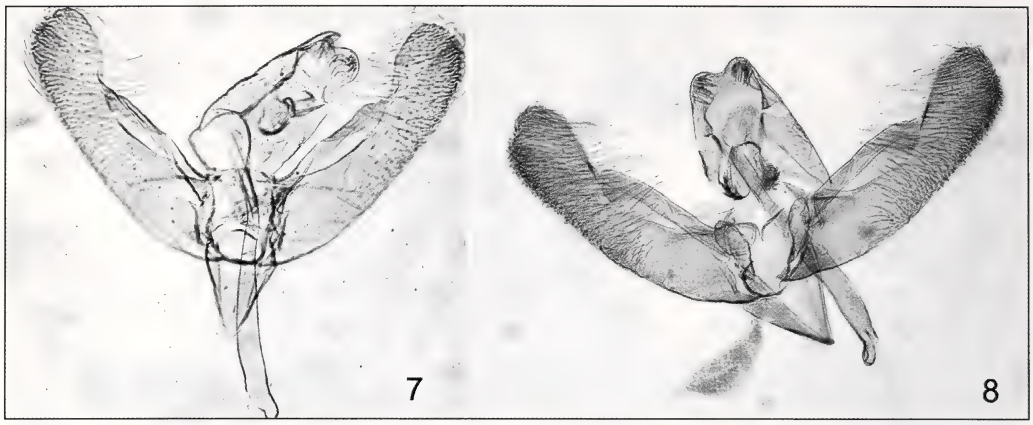
**Male, redescription (Figs. 3–4, 7).** Forewing length 3.2–3.7 mm. Labial palpus proximally greyish white, distally with dark brown-tipped scales. Head yellowish white with brownish scales between antennae. Neck tuft yellowish white, scales dark-tipped. Antennae dark brown, slightly serrated. Tegula and thorax brownish grey. Forewing ground colour greyish brown, with basally whitish scales giving mottled appearance; with three whitish markings varying in intensity; basal spot absent; fascia situated at 3/5 and not reaching dorsum; tornal spot small but distinct; apex with distinct, ochreous white streak-like spot; fringe line distinct, fringe yellowish white. Hindwing light greyish brown.

Male genitalia. Uncus lobes rounded with shallow u-shaped indentation between them. Gnathos bilobed, gnathos lobes elliptical. Distal margin of juxta lobes almost straight; digitate process broadly club-shaped, narrow at base; valva proximally broadest, narrowest before rounded and rather prominent cucullus; costal folds wide and prominent; valva length (0.521–0.581 mm). Saccus v-shaped, medial ridge not visible. Aedeagus length 0.559–0.599 mm and maximum width 0.029–0.039 mm, aedeagus comparatively long (1.00–1.01 times length of valva), slender and distally bent beyond slightly sclerotized ridges, vesica without cornuti.




**Figs. 1–6.** External appearance of *Elachista imatrella* and *E. cinereopunctella*. **1–2.** *E. imatrella* ♀ and head, Finland, KemL: Savukoski 745:53, 29.vi.1996, Holmberg leg. **3.** *E. imatrella* ♂, Finland, KemLE: Pelkosenniemi 7456:538, 21.vi.1994, Mutanen leg. **4.** *E. imatrella* ♂, Finland, KemLE: Pelkosenniemi, 26.vi.1996, Siloaho leg. **5.** *E. cinereopunctella* ♂, Estonia, Saaremaa, 20.vi.1994, Nupponen leg. **6.** *E. cinereopunctella* ♀, Estonia, Saaremaa, 20.vi.1994, Nupponen leg.

**Diagnosis.** The *E. imatrella* male is externally similar to that of *E. cinereopunctella* (see Figs. 5–6). The intensity of the wing pattern of *E. imatrella* seems to vary: wing markings may be clear or less pronounced, but hardly ever absent in fresh specimens (Figs. 3–4). The fascia is more outwardly situated in *E. imatrella* than in *E. cinereopunctella*, in which it is situated before the middle of the costa. *E. imatrella* is smaller on average than *E. cinereopunctella*, but there is some overlap because the forewing length of the studied *E. cinereopunctella* specimens varied from 3.6 to 4.0 mm. The species are most




**Figs. 7–8.** ♂ genitalia of *Elachista imatrella*. **7.** Finland, KemLE: Pelkosenniemi 7456:538, 21.vi.1994, Mutanen leg. **8.** *E. cinereopunctella*, Estonia, Saaremaa, 20.vi.1994, Nupponen leg.

reliably distinguishable based on the male genitalia, particularly the aedeagus, which is both absolutely and relatively longer in *E. imatrella*. In *E. cinereopunctella* the length of the aedeagus varies from 0.477 to 0.530 mm (n=6), being statistically significantly shorter than in *E. imatrella* ($t=7.24$, $df=9$, $p<0.001$). The ratio between aedeagus and valva is 0.86–0.93 in *E. cinereopunctella*, but 1.00–1.01 in *E. imatrella*. However, this difference appears less prominent than presented by Traugott-Olsen & Schmidt Nielsen (1977), since the illustrated aedeagus of *E. imatrella* represents the extreme type. The maximum width of the *E. cinereopunctella* aedeagus (0.028–0.035 mm) is the same as in *E. imatrella*, but the shorter aedeagus also appears stouter (see Figs. 7–8). The distal end of the aedeagus of *E. cinereopunctella* is straight or only very slightly bent (Fig. 8). Due to the scarcity of *E. imatrella* specimens in collections, the reliability of the diagnostic characteristics is slightly doubtful. The length of the aedeagus varies to the extent of possible overlap at the junction of the distributions. The females of these species closely resemble each other externally, but the fascia of *E. cinereopunctella* is more proximally situated. Additional specimens of *E. imatrella* may reveal further external differences between females, and additional characteristics are potentially diagnostic in female genitalia.

**Life history.** Unknown. The species is confined to boggy habitats. The type series was collected flying over *Eriophorum vaginatum*, which was considered the plausible food plant by Schantz (1971). We consider this an improbable food plant for several reasons: Firstly, this plant is very scarce in the Pelkosenniemi habitat. Secondly, because *E. vaginatum* is often a dominant plant species in bogs in Finland, more findings of *E. imatrella* could be expected if *E. vaginatum* really were the host plant. Thirdly, there are almost always a number of sedge (*Carex*) species present together with *Eriophorum*, and since the close relative *E. cinereopunctella* is confined to certain sedges, we believe that some species of *Carex* are more probable food plants for *E. imatrella*. The locality in Pelkosenniemi is a woody bog, with spruce and pine trees mostly less than five meters tall. Dwarf birch (*Betula nana*) stands are dense in many places. The most abundant

sedges are *Carex globularis* and *C. vaginata*. The latter typically grows around and under spruce trees, from where some *E. imatrella* adults were also swept (R. Siloaho, pers. comm.). One male specimen was caught by kicking it on flight high up from a spruce tree. In August 2000, MM, together with Tomi Mutanen, visited the place and found several empty and some inhabited *Elachista* mines on *C. vaginata*, but this rearing did not yield adults. No mines were found on *C. globularis* or *E. vaginatum* despite intensive search. We therefore consider *C. vaginata* the more probable food plant for *E. imatrella*. We have also visited the Rovaniemi locality, which resembles that of Pelkosenniemi, but has more open areas with rich *Eriophorum* and *Carex* growths. The adult of *E. imatrella* seems to be on the wing very early in the summer, in June, and we therefore consider it probable that the larva reaches maturity in autumn. When the first specimen from Pelkosenniemi was collected, species overwintering at the pupal stage (e. g. *Phyllonorycter salicicolellus* (Sircom, 1848), *P. rolandi* (Svensson, 1966), and *Callisto coffeella* (Zetterstedt, 1839)) had just started their flight.

## Discussion

The genital differences between many species groups of Elachistidae are extremely slight (see e. g. Kaila *et al.* 2001; Kaila & Junnilainen 2002; Kaila & Varalda 2004). In many cases, the differentiation of a species is based not only on differences in its external and genital morphology, but on a combination of morphological, biological, and distributional data. This is also the case in *E. imatrella*, since the morphological differences compared to *E. cinereopunctella* are slight. To our knowledge the two species live in different geographical areas and inhabit different habitats. There may be a reason for caution, however. Many lepidopteran species, such as *Clepsis pallidana* (Fabricius), *Thalera fimbrialis* (Scopoli), and *Lacanobia w-latinum* (Hufnagel), that are found in warm and dry localities in southern and central Europe, live mainly in bogs and other moist habitats in Scandinavia (Mikkola & Jalas 1977; Mikkola *et al.* 1985; Skou 1991; personal observations). Because we found intraspecific genital variation small in both species and the genital differences to be constant over the whole ranges and particularly between the closest population of *E. cinereopunctella* and *E. imatrella* in south-eastern Fennoscandia, we consider the possibility of geographic intraspecific variation in genitalia very improbable.

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**References**

Itämies, J. & M. Mutanen 1995. Kemin Lapin itäosalle uusia perhoslajeja. – Baptria **20**: 161–164.

Itämies, J. & M. Mutanen 1996. The lepidopterous fauna of the planned Vuotos reservoir area in eastern Finnish Lapland. – Bothnian Bay reports **7**: 39–51.

Kaila, L. & J. Junnilainen 2002. Taxonomy and identification of *Elachista cingillella* (H.S.) and its close relatives (Lepidoptera, Elachistidae) with descriptions of two new species. – Entomologica Fennica **13**: 167–188

Kaila, L. & S. Kerppola 1995. Mikroperhostiedonannot 1993–1994. – Baptria **20**: 91–106.

Kaila, L. & P. Varalda 2004. The *Elachista juliensis* complex revisited (Elachistidae). – Nota Lepidopterologica **27**: 217–237.

Kaila, L., B. Å. Bengtsson, I. Šulch & J. Junnilainen 2001. A revision of *Elachista regificella* Sircom-complex (Lepidoptera, Elachistidae). – Entomologica Fennica **12**: 153–168.

Mikkola, K. & I. Jalas 1977. Suomen Perhoset. Yökköset 1. – Suomen Perhostutkijain Seura/Otava. Helsinki. 256 pp.

Mikkola, K., I. Jalas & O. Peltonen 1985. Suomen Perhoset. Mittarit 1. – Suomen Perhostutkijain Seura. Tampere. 260 pp.

Schantz, M. von 1971. Zwei neue Kleinschmitterlinge (Microlepidoptera) aus Ostfennoscandien. – Notulae Entomologicae **60**: 99–101.

Skou, P. 1991. Nordens Ugler. Danmarks Dyreliv **5**. – Apollo Books. Stenstrup. 565 pp.

Traugott-Olsen, E. & E. Schmidt Nielsen 1977. The Elachistidae (Lepidoptera) of Fennoscandia and Denmark. – Fauna Entomologica Scandinavica **6**: 1–299.

# *Apatema impunctella* Amsel, 1940, stat. rev. (Autostichidae)

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**Zusammenfassung.** Für *Apatema fasciata* f. *impunctella* Amsel, 1940 wird der Lectotypus festgelegt, die Art wird als bona species wieder eingesetzt und mit der nahe stehenden *Apatema apolausticum* Gozmany, 1996 verglichen.

**Abstract.** The author designed the lectotype for *Apatema fasciata* f. *impunctella* Amsel, 1940. The species is considered as bona species and is compared with the closely related *Apatema apolausticum* Gozmany, 1996.

Key words. *Apatema impunctella*, nomenclature, lectotype designation

## Vorbemerkungen

Die Gattung *Apatema* Walsingham, 1900 ist in Europa einschließlich der Kanarischen Inseln mit 11 Arten vertreten. Die Genitaluntersuchung einer Reihe von Exemplaren zeigte die Notwendigkeit einer Revision dieser Gattung. Vorliegende Arbeit ist als ein Beitrag dazu aufzufassen.

1940 hat Amsel *Apatema fasciata* f. *impunctella* beschrieben. Er schreibt: "Bei *fasciata* tritt nun eine Form auf, die durch das Fehlen des schwarzen Punktes in der gelben Mittelbinde ausgezeichnet ist. ... Diese Form *impunctella* liegt mir vor aus: Ragusa (Dalmatien) 15.–30.9.30, Kiriath Anavim (Jerusalem) 2.5.1930, und aus Sardinien von den Fundorten: Sadali 5.7.1936, Desulo 8.7.1936, Sacasa bei Aritzo 21.–29.7.1930, sämtliche Stücke von mir gesammelt."

1952 befasste sich Amsel nochmals mit *impunctella* und bildet ohne weitere, nähere Angabe ein männliches Genital von *impunctella* ab, vergleicht dieses mit *fasciata* (Stainton, 1859) und erhebt *impunctella* in den Artrang. 1977 stellt dann Gozmany *impunctella* Amsel, fälschlich mit der Jahreszahl 1952 kombiniert, als Synonym zu *A. mediopallidum* Walsingham, 1900.

Nach Artikel 45.6.4 des ICZN (2000) ist der Name *impunctella* als subspezifisch anzusehen (erstmals vor 1961 veröffentlicht und ausdrücklich mit der Bezeichnung „f." verwendet). Die korrekte Bezeichnung ist deshalb: *Apatema fasciata impunctella* Amsel, 1940.

**Verwendete Abkürzungen**

| | |
|---|---|
| DEI | Deutsches Entomologisches Institut, Müncheberg |
| ÜMB | Überseemuseum Bremen. |
| ZSM | Zoologische Staatssammlung München |

## Ergebnisse

Im ÜMB befinden sich fünf weibliche Exemplare von *impunctella*, deren Fundorte Amsel 1940 aufgezählt hat. Diese Tiere haben ein rotes Etikett: „Paratypus leg. H. Amsel / A. fasciata f. impunctella". Weil Amsel in der Originalbeschreibung keine

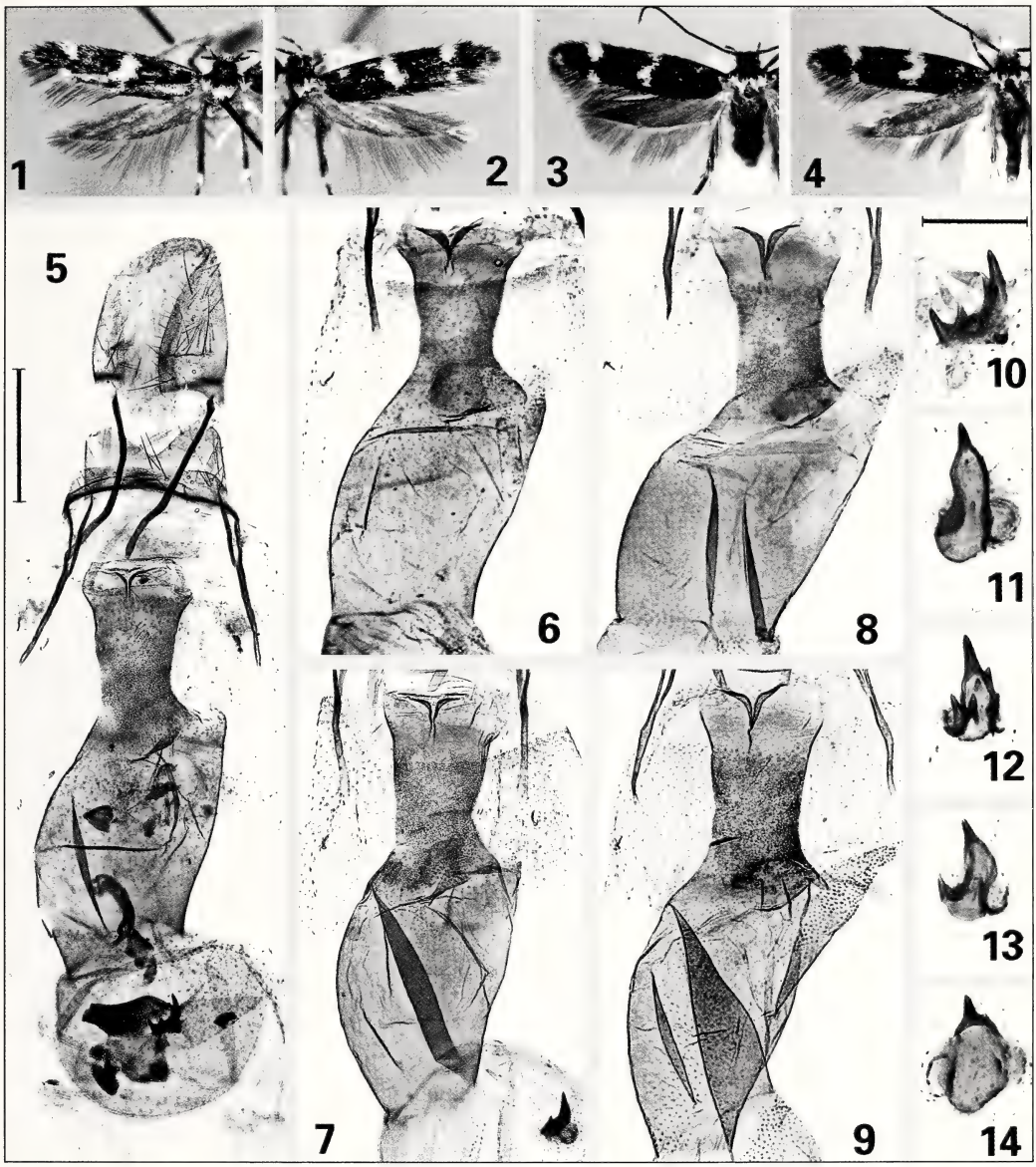
Typenkennzeichnung veröffentlicht hat, sind die vorliegenden fünf Exemplare als Syntypen anzusehen.
Das von Amsel angeführte Exemplar von Kiriath Anavim wurde weder im ÜMB noch an Amsels späterer Arbeitsstätte, dem Staatlichen Museum für Naturkunde Karlsruhe, vorgefunden.
Von einem Syntypus liegt ein Genitalpräparat vor. Dieses Exemplar wird als Lectotypus ausgewählt und hiermit festgelegt. Die Festlegung des Lectotypus erfolgt nach Artikel 74.7.3 des ICZN (2000) und dient der nomenklatorischen Stabilität.
Der Vergleich des Genitals des Lectotypus (Fig. 5) mit den Genitalien der anderen Arten zeigt eine starke Ähnlichkeit zu *A. apolausticum* Gozmany, 1996 (Figs. 8–9), während bei *mediopallidum* der Ductus bursae symmetrisch ist.
Der Lectotypus von *A. impunctella* wurde mit 17♂ und 20♀ von Sardinien verglichen. Weil sich sowohl die Männchen als auch die Weibchen genitalmorphologisch untereinander gleichen, gehören alle diese Exemplare zu *A. impunctella*. Der Vergleich mit Präparaten von *A. apolausticum* von Rumänien (Terra typica Baile Herculane), Slowenien, Kroatien, Albanien, Bulgarien und Griechenland zeigt bei den Männchen unterschiedliche Phalli, während bei den Weibchen nur geringe und nicht immer deutliche Unterschiede der Genitalien bestehen. Aufgrund der konstanten Unterschiede der Phalli liegen zwei valide Arten vor.

### *Apatema impunctella* Amsel, 1940, stat. rev.

Material. Lectotypus *A. impunctella*, ♀: 1.: Fundortetikett in Schreibmaschinenschrift, fotografisch verkleinert: „Aritzo Sacasa 24.7.1936 H. G. Amsel"; 2.: rotes Etikett: Oberseite gedruckt „Paratypus leg. H. Amsel", Unterseite handschriftlich „A. fasciata f. impunctella"; 3.: rotes Etikett: „Lectotypus ♀ Apatema impunctella Amsel, 1940 des. Sutter 2005"; 4.: weißes Etikett, handschriftlich in Blau „608"; 5.: das zwischen Deckgläsern eingebettete Genital (Fig. 5), oberseitig beschriftet „Aritzo Sacasa 24.VII.36, edt. E. Jäckh 19" und überklebt „608" und unterseitig in Rot Jäckh's Präparatnummer „5504", coll. ÜMB. – Paralectotypen *A. impunctella*: 1♀ Aritzo, Sacasa, 29.VII.1936, H. G. Amsel; 1♀ Desulo, Sardegna, 8.VII.1936, H. G. Amsel; 1♀ ohne Abdomen von Sadali, Sardegna, 5.VII.1936, H. G. Amsel leg., 1♀ Ragusa, Dalmatien, 15.–30.IX.1930, Amsel leg. [Fehlbestimmung], coll. ÜMB.

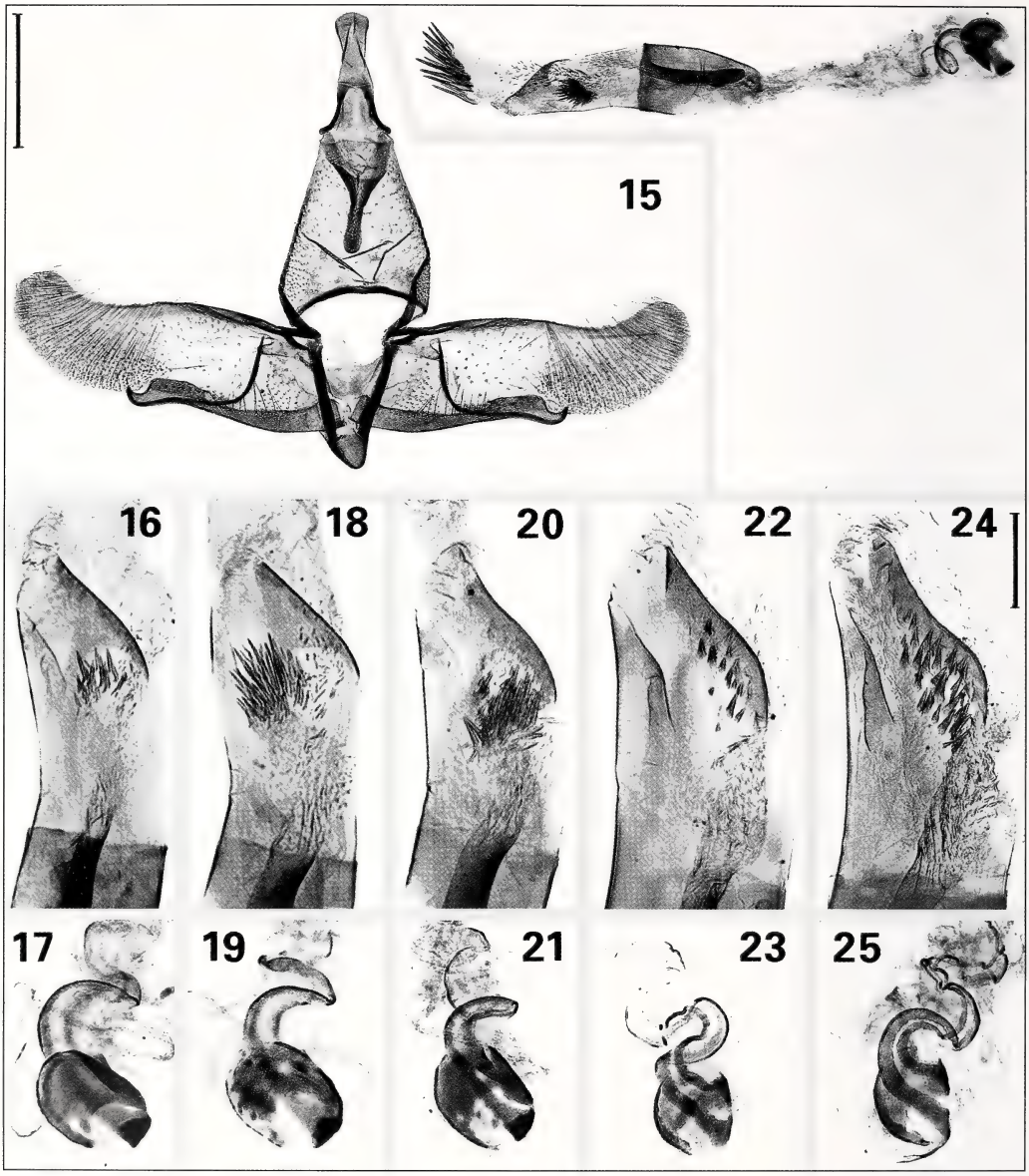
Genitaluntersuchtes Material *A. impunctella*: 1♂ **Italien, Sardinien, Prov. Nuoro**, Gennargentu, Arcu Tascussi 25.VII.1981 leg. et coll. Baldizzone; 3♂, 4♀ Villanova Strisaili, 885 m, 19., 24.,VII, 1., 7.VIII.1983, 27.VII.1984, leg. Kuchlein, coll. Kuchlein, Sutter; 1♀, gleiche Daten, aber 930 m, 24.VII.1984, leg. Kuchlein, coll. Sutter; 1♀ Orgosolo, 1080 m, 30.VII.1984, leg. Kuchlein, coll. Sutter (Fig. 13); 2♂, 3♀ **Prov. Cagliari**, Domusnovas, Sa Duchessa, 350 m, 28., 30.VI., 2.VII.2004, (Figs. 6, 11, 15); 1♂, 2♀ Monte Arcosu bei Sa Canna, 22.–24.VI.2004; 2♂, 1♀ gleiche Daten, aber 100 m, 22., 23.VI.2004 (Fig. 7); 4♂, 1♀ gleiche Daten, aber 150 m, 24.VI., 3.VII.2004 (Figs. 18, 19); 2♀ Monte Arcosu bei Su Tragu, 27., 29.VI.2004; 2♂, 2♀ gleiche Daten, aber 130 m, 29.VI, 1.VII.2004 (Figs. 4, 16, 17); 1♂, 2♀ Monte Arcosu bei Perdu Melis, 320 m, 25.VI., 3.VII.2004 (Fig. 12); 1♂, 1♀ Monte Arcosu bei Paddera 600 m, 26.VI.2004 (Fig. 3), leg. et coll. Baldizzone & Triberti. 1♂ **Italien, Festland**, Prov. Alessandria, Piemonte, Capanne di Marcarolo, Gli Olmi, 758 m, 12.VII.2002, leg. et coll. Baldizzone; 1♂, 1♀ Prov. Livorno, Antignano, 10 m, 26.VI.2004 (Figs. 20, 21), leg. et coll. Liška. 2♂, 1♀ **Frankreich, Korsika**, St. Lucia di Porto Vecchio, 19., 20.VI.1993, leg. et coll. Liška; 1♂, 1♀ Bastia-Poretta, Plage de Pineto, 12.VII.1993, leg. Liška, ♂ coll. Liška, ♀ coll. Sutter (Fig. 14). 1♂ **Frankreich, Festland**, Esterelgebirge bei St. Raphael, 50 m, 8.VII.1928, leg. Koschabek, coll. ZSM.

Abgebildetes Vergleichsmaterial von *A. apolausticum*: 1♀ **Kroatien**, Insel Krk, Risica, 0–50 m, 25.–29.VI.2000 (Fig. 8), leg. Liška, coll. Sutter. 1♂ **Bulgarien**, Nessebar, 11.–23.VII.1959 (Fig. 22), leg. Soffner, coll. DEI; 2♂ Pirin, Liljanowo, 1.–30.VI.1984 (Fig. 23) und 27.VI.–25.VII.1985 (Figs. 24, 25) leg. Eichler, coll. ZSM. 1♀ **Griechenland**, Lakonia, 5 km südl. Monemvasia, 1.VI.1983 (Fig. 9), leg. Christensen, coll. ZSM.




**Figs. 1–7, 10–14.** *Apatema impunctella* Amsel, Falter, Genital ♀ und Signa. **1, 2, 5, 10.** Lectotypus GU 5504 Jäckh, coll. ÜMB. **6.** Sardinien, GU 7300 Sutter, coll. Baldizzone. **7.** Sardinien, GU 7355 Sutter, coll. Baldizzone. **3, 4, 11–13.** Sardinien. **14.** Korsika.
**Figs. 8–9.** *Apatema apolausticum* Gozmany, Genital ♀. **8.** Kroatien, GU 6479 Sutter, coll. Sutter. **9.** Griechenland, GU 6518 Sutter, coll. ZSM. (Maßstab: Genitale 0,3 mm, Signa 0,1 mm)

**Beschreibung des Lectotypus, ♀ Falter (Figs. 1–2).** Vorderflügelspanne 9 mm, Kopf oben bis zu den Fühlerwurzeln braun mit hellen Unterschuppen, zwischen den Augen weiß beschuppt. Von den Fühlern sind nur Reste vorhanden. Das Palpenmittelglied ist außen weißlich und braun, das Endglied überwiegend schwarzbraun beschuppt. Vorderflügel dunkelbraun mit weißer Zeichnung, die Hinterflügel graubraun.




**Figs. 15–21.** *Apatema impunctella* Amsel, Genital ♂, Detail des Phallus und Lamina. **15.** Sardinien, GU 7304 Sutter, coll. Baldizzone. **16, 17.** Sardinien, GU 7308 Sutter, coll. Baldizzone. **18, 19.** Sardinien, GU 7272 Sutter, coll. Triberti. **20, 21.** Italien, Provinz Livorno, GU 7346 Sutter, coll. Liška.
**Figs. 22–25.** *Apatema apolausticum* Gozmany, Detail des Phallus und Lamina. **22.** Bulgarien, Nessebar, GU 6442 Sutter, coll. DEI. **23.** Bulgarien, Pirin-Geb., GU 7340 Sutter, coll. ZSM. **24, 25.** Bulgarien, Pirin-Geb., GU 7357 Sutter, coll. ZSM. (Maßstab: Genital 0,3 mm, Detail des Phallus und Lamina 0,1 mm)

**Diagnose (Figs. 1–4).** Vorderflügelspanne 8–11 mm (Durchschnitt ♂ 9,7 mm, ♀ 9,3 mm). Kopf oben meist fast bis zu den Fühlerwurzeln schwarzbraun und zwischen den Augen weiß oder gelblichweiß. Palpen unregelmäßig dunkel beschuppt. Fühler im

basalen Drittel beim ♂ ungeringelt, beim ♀ meist hell geringelt, aber auch undeutlich heller geringelt oder ungeringelt; die Endglieder der Fühler nicht heller abgesetzt. 2. Thorakaltergit und Tegulae ausgedehnt weiß, auch gelblich weiß. Tergite I–II hell gelbocker, die folgenden grau, das Ende oft heller. Sternite medial heller grau, auch ockerfarben aufgehellt. Vorderflügel schwarzbraun mit variabler, weißer Zeichnung, besonders bei geflogenen Tieren auch gelblichweiß. Hinterflügel graubraun.

Genital ♂ (Figs. 15–21). Phallus distal asymmetrisch. Die Vesica ist proximal sklerotisiert. Im häutigen Teil der Vesica sind fleckartig große Cornuti angeordnet. Diese sind relativ lang und dünn, meist in großer Anzahl (Figs. 18, 20), selten weniger (Fig. 16). Das Ende der Vesica ist schräg und ± gleichmäßig mit nadelförmigen Cornuti besetzt. Der Ductus ejaculatorius ist anterior des Phallus in elliptischer Form sklerotisiert (Figs. 17, 19, 21), eine Lamina im Sinne von Sattler (1979).

Genital ♀ (Figs. 5–7). Ductus bursae zwischen Bursa und dem Abgang des Ductus seminalis asymmetrisch und in der distalen Hälfte dieses Ductusteiles medial ± deutlich körnchenförmig strukturiert (Fig. 7). Der Ductus ist dorsal schwach konvex und lässt sich meist gut verebnen. Unverebnet entsteht eine schräge Falte (Fig. 7). Die Querfalte des Ductus vor dem Ostium ist für die Artunterscheidung ohne Aussage und in Figs. 5–7 verebnet. Signum der Bursa variabel (Figs. 11–14, Fig. 10 lateral).

**Differentialdiagnose.** Im Phallus von *A. apolausticum* (Figs. 22, 24) sind die großen Cornuti der Vesica in einem langgezogenen Feld verstreut. Diese Cornuti sind kürzer und basal breiter als bei *A. impunctella*, ihre Anzahl ist ebenfalls variabel. Im weiblichen Genital von *A. apolausticum* ist der Ductus bursae zwischen der Bursa und dem Abgang des Ductus seminalis im Durchschnitt breiter (Fig. 8) als bei *A. impunctella* (Fig. 6) und ± körnchenförmig strukturiert (Fig. 9).

**Verbreitung.** Die Nachweise basieren auf Lichtfängen in Höhenlagen bis zu 1080 m auf Sardinien und Korsika. Auf dem Festland wurde *A. impunctella* durch Männchen nachgewiesen vom Esterelgebirge (St. Raphael), aus dem Piemont (Capanne di Marcarolo, Gli Olmi) sowie aus der Provinz Livorno (Antignano).

**Anmerkungen.** In Amsels Veröffentlichung wird für die Funde von Aritzo Sacasa das Funddatum fälschlich mit 21.–29.7.1930 angeführt, während auf den Fundortetiketten das Jahr 1936 angegeben ist.

Der Syntypus von Ragusa (Dalmatien) ist eine Fehlbestimmung von *A. apolausticum*.

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**Literatur**

Amsel, H. G. 1940. Ueber alte und neue Kleinschmetterlinge aus dem Mittelmeer-Gebiet.– Veröffentlichungen des Deutschen Kolonial- und Übersee-Museums Bremen **3**: 37–56.

Amsel, H. G. 1952. Two New Micro-Lepidoptera from Malta. – The Entomologist **85**: 172–174.

Gozmany, L. A. 1977. The symmocid Moths (Lepidoptera) of Sardinia. – Acta Academiae Scientiarum Hungaricae **23** (3-4): 293–297.

Gozmany, L. A. 1996. Four new symmocid Species from Europe (Lepidoptera, Symmocidae). – Bolletino del Museo Regionale di Scienze Naturali, Torino **14** (1): 259–266.

International Code of Zoological Nomenclature (ICZN) 2000. Internationale Regeln für die Zoologische Nomenklatur. 4. Auflage. Offizieller deutscher Text. Ausgearbeitet von Otto Kraus. – Abhandlungen des Naturwissenschaftlichen Vereins in Hamburg (NF) **34**: 1–232.

Sattler, K. 1979. A taxonomic revision of the genus *Deltophora* Janse, 1950 (Lepidoptera: Gelechiidae). – Bulletin of the British Museum (Natural History) Entomology **38** (6): 263–322.

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