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Two new species of *Agonopterix* (Depressariidae, Lepidoptera) from Europe

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Abstract

The species *Agonopterix tripunctaria* **sp. nov.** and *Agonopterix medelichensis* **sp. nov.** are described. *A. tripunctaria*, previously misidentified as *Agonopterix nodiflorella* (Millière, 1866), was recognized as specifically different by the distinctive male genitalia. 19 specimens have been examined, DNA-barcoding yielded full 658 bp fragment of COI from two specimens and a 639 bp sequence from a third, confirming the impression of a rather isolated species. Specimens from Italy, Slovenia, Croatia and Greece had been checked, among them one reared from *Ferulago campestris*. *A. medelichensis* was misidentified as *Agonopterix rotundella* (Douglas, 1846) in NHMV; its male genitalia are erroneously depicted as *A. rotundella* in Hannemann (1953) and (1995). 20 specimens have been examined, from one a 555 bp fragment of COI was obtained, confirming that it is not closely related to *A. rotundella.* Specimens from Austria, Italy, Hungary, Slovakia, Croatia and Greece have been checked, among them one reared from *Trinia glauca,* which had been misidentified as *A. hippomarathri*. A report of *A. rotundella* from Russia also belongs to this species.

Key words: Lepidoptera, Gelechioidea, Depressariidae, Depressariinae, Agonopterix, Europe, new species, DNA barcoding

Introduction

Depressariidae as a family initially included the genera *Semioscopis*, *Luquetia*, *Levipalpus*, *Exaeretia, Agonopterix* and *Depressaria* (Depressariidae Meyrick, 1883). According to van Nieukerken *et al.* (2011) it became a subfamily of the Elachistidae, before being reduced to a tribe (Depressariini, subfamily Depressariinae, Elachistidae). Heikkilä *et al.* (2014) again separate Depressariinae from Elachistidae and propose a wider concept of Depressariidae. Here this view is followed.

I started working on Depressariidae in 2010 as a co-author of "Microlepidoptera of Europe [ME]: Depressariidae". The main goal of this series is to provide an identification guide, but inevitably it requires at least a partial revision, and the first results are presented here.

During this work unidentified specimens were dissected and misidentified specimens were found. In most cases identification was possible, but unresolved questions remained. One of the unanswered questions related to a species referred to *A. nodiflorella* in TLMF and ZSM, but with different genitalia, which turned out to be undescribed. Another open question concerned the drawing of the male genitalia of *A. rotundella* in Hannemann (1953) and Hannemann (1995), which clearly do not show this species. The origin of this figure had been found by coincidence: Dissecting the *Agonopterix*-species from NHMV to produce genitalia photos for "ME: Depressariidae", the genitalia of the specimens referred to *A. rotundella* show perfect correspondence with Hannemann´s drawing. That opened the door to the realization that there is an undescribed species hidden under "*A. rotundella*".

Material and methods

Material has been examined from NHMV (Natural History Museum Vienna, "Naturhistorisches Museum Wien"), NMPC (Národní Muzeum v Praze, Česko, "Natural Museum Prague, Czech Republic"), TLMF ("Tiroler

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Landesmuseum Ferdinandeum", Innsbruck), MFSN ("Museo Friulano di Storia Naturale", Udine), ZSM ("Zoologische Staatssammlung München"), ZMHU ("Museum für Naturkunde der Humboldt-Universität", Berlin) and ZMUC ("Zoological Museum, University of Copenhagen", Denmark). Additionally specimens from many private collectors have been checked, here only listed [in alphabetic order] if the material was of particular importance for this paper: Helmut Deutsch (Austria), Theo Grünewald (Germany), Rudi Keller (Germany), Knud Larsen (Denmark), Toni Mayr (Austria), Lucio Morin (Italy), Ignác Richter (Slovakia), Ivan Richter (Slovakia), Willibald Schmitz (Germany), Peter Sonderegger (Switzerland), Ľubomír Srnka (Slovakia), J. Šumpich (Czech Republic), Zdenko Tokár (Slovakia) and Joachim Viehmann (Germany). 19 specimens of *A. tripunctaria* and 20 of *A. medelichensis* have been examined, each species includes both reared and light-trapped specimens.

Morphological examination. Genitalia preparations followed standard techniques (Robinson 1976). Male preparations were stained with mercurochrome and females with chlorazol. Decisive for the choice of the specimens as holotypes was a good state of preservation and the presence of detailed informaton about the foodplant. Holotypes will be placed in TLMF, Innsbruck.

Photographic documentation: Photos of specimens in total view were taken with Canon EOS 5D Mark III and Canon lens EF 100mm 2.8 L IS USM at 1:1. Specimens are illuminated with two diffused flashes, using a third flash for setting the background white. Photos of head details were taken with Canon lens MP-E 65 at 4:1, using ring flash. Genitalia photos were taken with microscope (Wild Heerbrugg) using a 10x objective and a 2.5x ocular. All photos were edited using the software Helicon Focus 4.80 and Adobe Photoshop 6.0.
For creating the black and white photos, the G alpha channel of the RGB originals was used in males and the Y alpha channel of the CMYK originals in females.

DNA-Barcoding. Full-length lepidopteran DNA barcode sequences are a 648 basepair long segment of the 5' terminus of the mitochondrial COI gene (cytochrome c oxidase 1). DNA samples (dried leg) were prepared according to the accepted standards and were processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) to obtain DNA barcodes using the standard high-throughput protocol described in deWaard *et al.* (2008). DNA sequencing of three specimens of *A. tripunctaria* resulted in two 2 full barcode fragments and one of 639 bp, and the specimen of *A. medelichensis* resulted in a sequence of 555 bp; detailed specimen data are listed under Genetic data of species-description. Sequences were submitted to GenBank, accession numbers are listed in an appendix. Further details including complete voucher data and images can be accessed in the public dataset DS-DEEUR324 at http://dx.doi.org/10.5883/DS-DEEUR324 in the Barcode of Life Data Systems (BOLD; Ratnasingham and Hebert 2007). Neighbor-joining trees of DNA barcode data were constructed using Mega 5 (Tamura *et al.* 2011) under the Kimura 2 parameter model for nucleotide substitutions.

Results

Agonopterix tripunctaria sp. nov.

Material: Holotype (figs. 1, 3–6): ♂, Italia, L.d.Garda [Lago di Garda], Mt. Maderno, 250 m, e.l. *Ferulago nodiflora* [*F. campestris*] 25. 7. [19]63, leg. K. Burmann, *A. nodiflorella* prov. det. K. Burmann, DEEUR [Depressariidae of Europe] specimen number 0412, gen. prep. P. Buchner, coll. TLMF.
Paratypes: ♀, same locality as holotype, e.l. 4. 8. [19]63, leg. K. Burmann, coll. TLMF.

♂, Italia sept., Prov. Verona, Monte, 300 m, 18. 6. 1986, leg. K. Burmann, coll. TLMF.

♂, Monti Lessini, Monte, 400 m, 45° 34.00´N; 10° 50,00´E, 15. 9. 2001, leg. et coll. Toni Mayr.

♂, I[talia], Friuli v. Giulia UL87 [in capital letters], GO Redipuglia loc: (alture di) Polazzo 4-IV-2001, Lucio Morin legit, *A. ? rotundella* prov. det. L. Morin 2003, DNA barcode id. TLMF Lep 07167, gen. prep. DEEUR 1556 P. Buchner, coll. L. Morin.

♂, Slowenien [Slovenia], Primorska, Zazid, südost. Kulturland, 410–430 m, 22. 3. 2014 LF [light trapped], leg. et coll. H. Deutsch.

♀, Slovenia, Koper, Crni Kal, 24. 4. 2004, leg. et coll. J. Liška [access by J. Šumpich].

♂, Slovenia, Črni Kal VL14, Osp, 50 m, 15. 3. 1999, leg. Lasan, coll. J. Liška [access by J. Šumpich].

♂, Slovenia, Kozina, Prešnica, 30. 3. 2006, leg. et coll. J. Skyva [access by J. Šumpich].

2♂, Slovenia, Nanos, 400 m, 1. 4. 2006, leg. et coll. J. Skyva [access by J. Šumpich].

2♂, Slovenia, Nanos, 400 m, 3. 4. 2010, leg. et coll. J. Skyva [access by J. Šumpich].

♂, Croatia, South Velebit [in capital letters], 26. 7. 2006, lgt. L. Srnka, DNA barcode id. TLMF Lep 07106, gen. prep. DEEUR 0991 P. Buchner, coll. L. Srnka.

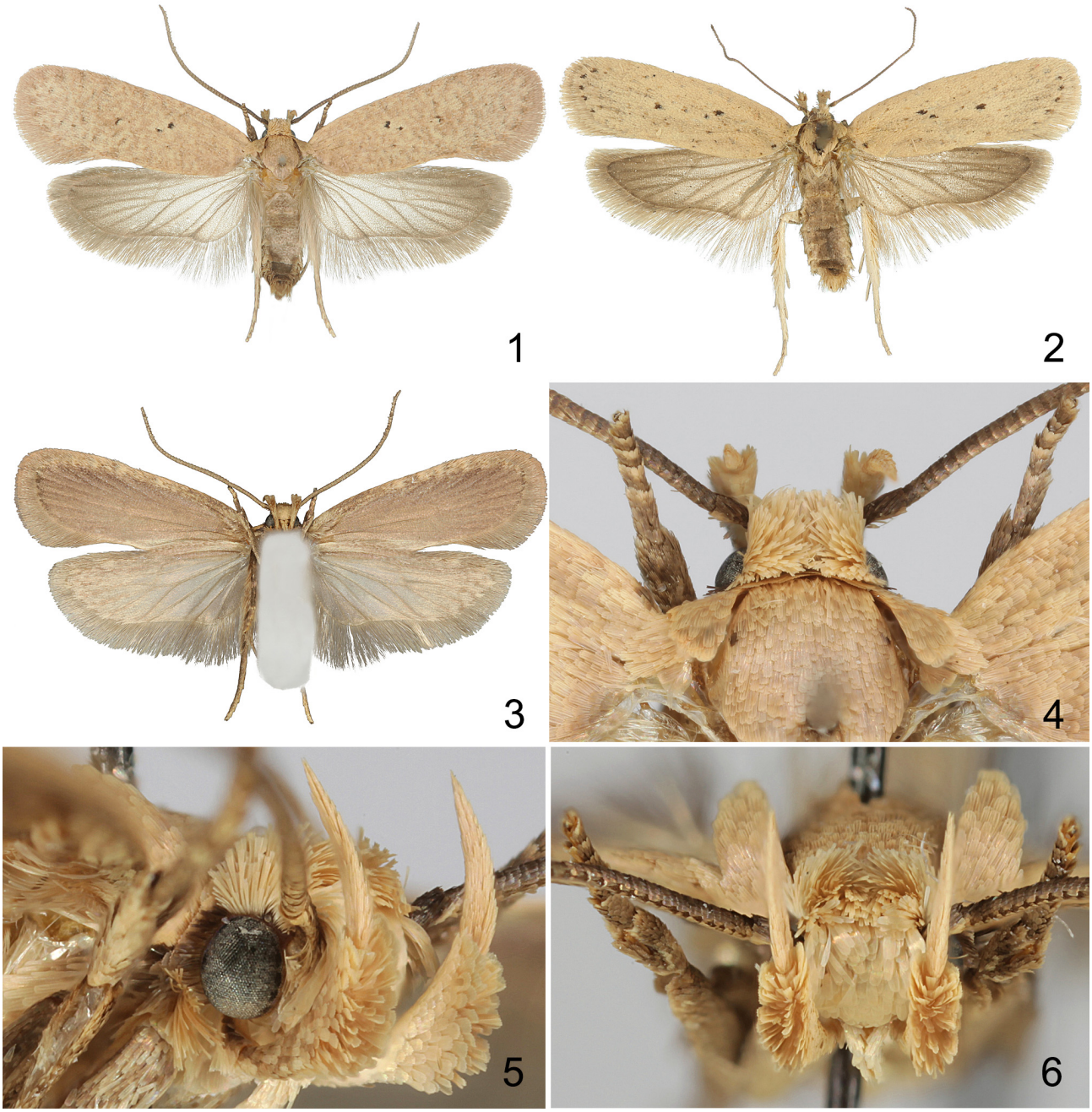
♀, Croatia, South Velebit, 28. 4. 2012, lgt. Ignác Richter, DNA barcode id. TLMF Lep 07127, gen. prep. DEEUR 1175 P. Buchner, coll. Ignác Richter.

♀, Croatia, Krk Island, Baška, 250 m, 30. 4. 2002, leg. J. Šumpich, coll. NMPC.

♂, Graecia [Greece], Pelop[onnes], Zachlouru (Kalav[ryta]) [in capital letters], ex l. 15. VII 1958 J. Klimesch, "Raupe an einer Umbellifere" [larva from an Apiaceae], coll ZSM.

♂, Griechenland [Greece], Delphi, 600m, 22.–23. 3. 1993, leg. et coll. Dr Grünewald.

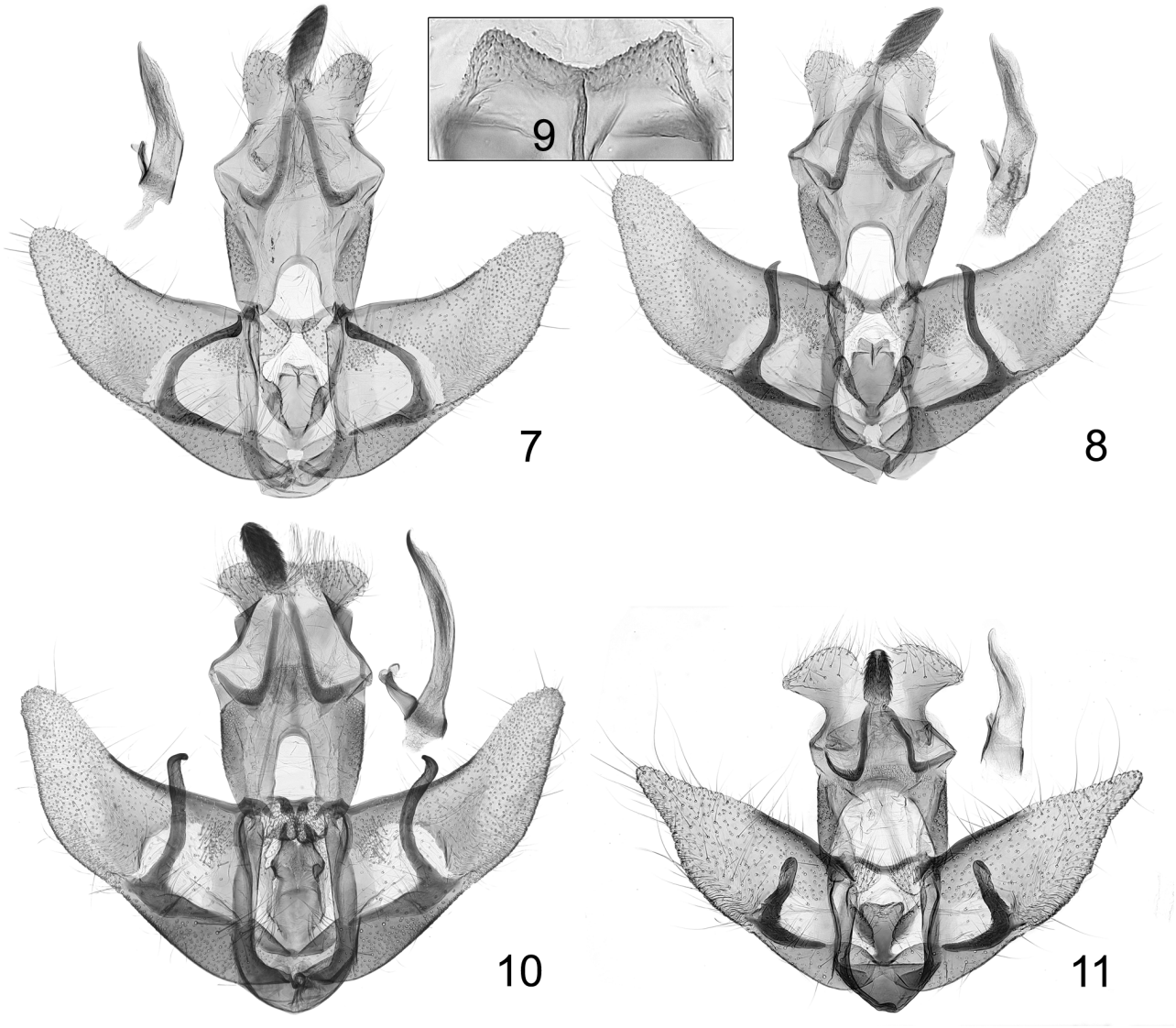
♀, Griechenland [Greece], Pandeo-Gebirge, Rodolinos, 350 m, 06. 04. 2014, leg. et coll. J. Viehmann.



FIGURES 1, 3–6. *A. tripunctaria*, holotype (Italy, Lago di Garda), 1: general view, 3: under side, 4: details of head and thorax, 5: labial palp, lateral view, 6: labial palp, frontal view

FIGURE 2. *A. nodiflorella* (France)

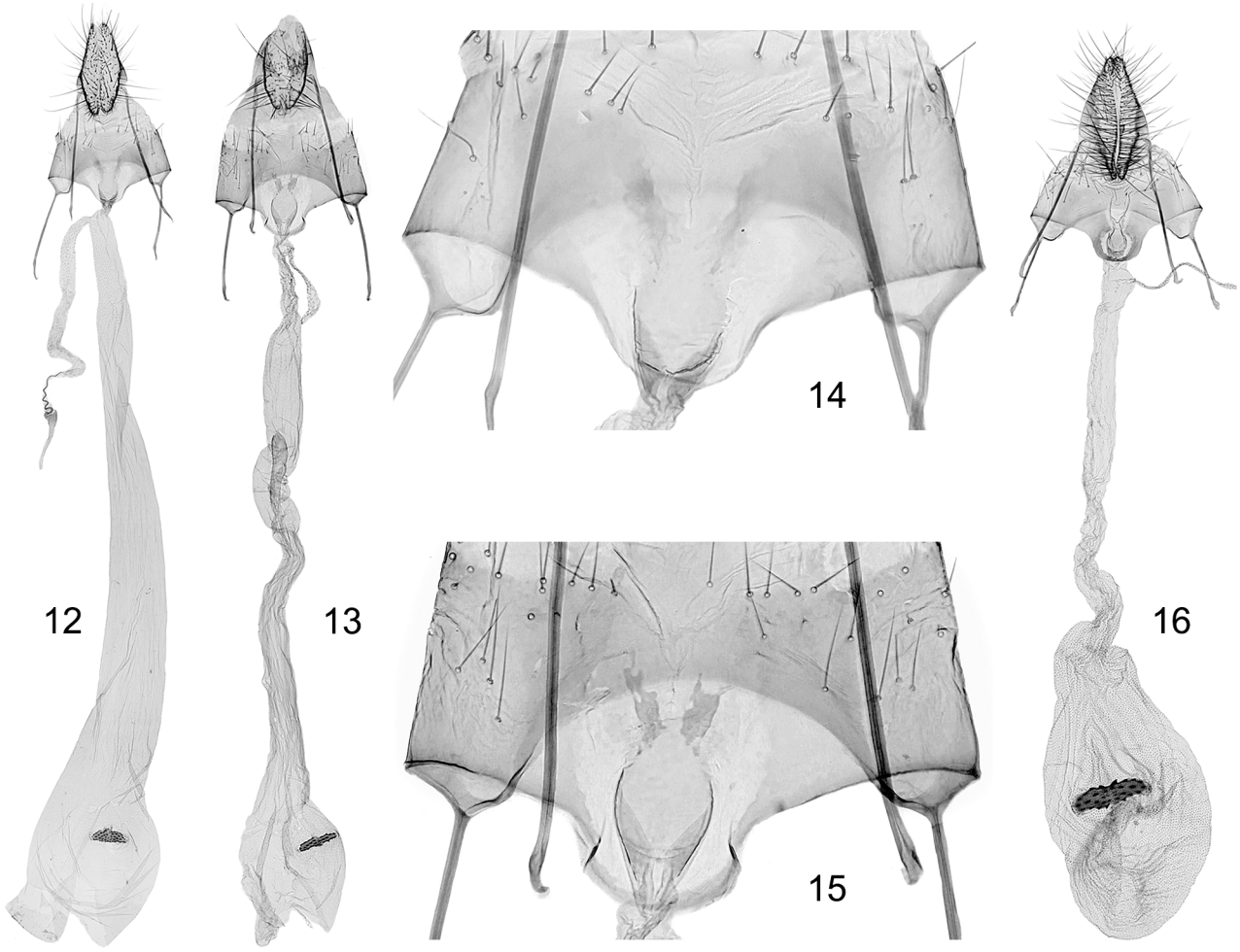
Diagnosis. *A. nodiflorella* (fig. 2), with which the new species was confused by Burmann, is indeed rather similar externally in wing pattern and size, but differs by the lack of the flesh-coloured tinge, the presence of a dark dot near the base and a more or less conspicuous concentration of dark scales along the veins on forewings, and also by narrower more pointed hindwings. Male genitalia of *A. tripunctaria* (figs. 7–9) are distinctly different from those of *A. nodiflorella* (fig. 11). Externally also similar to *A. medelichensis* (figs. 18–24, described in this paper, details see below). In male genitalia cuiller is similar to that of *Agonopterix socerbi* Šumpich, 2012 (fig. 10), but this is the only detail which corresponds. The combination of small socii, characteristic shape of cuiller and verrucose process of anellus is unique in male genitalia within *Agonopterix*. Female genitalia differ from most other species of *Agonopterix* by the strongly bulged anterior margin of sternite VIII with at least the anterior half of ostium within this bulge. Only *A. silerella*, *A. medelichensis* (see figs. 30–33) and *A. selini* are somewhat similar in this detail. In *A. silerella* (fig. 16) the bulge is more rounded and the ostium nearly entirely within the bulge and there are no diverging strips posterior from the ostium. In *A. medelichensis* the bulge starts more seamlessly and not gradually as in *A. tripunctaria.* Against *A. selini* the most distinctive detail is the number of turns of the ductus seminalis: 4 in *A. tripunctaria* and 8 in *A. selini.* (Buchner, P., unpublished).



FIGURES 7–11. Fig. 7: *A. tripunctaria* holotype (Italy, Lago di Garda); Fig. 8: *A. tripunctaria*, paratype (Italy, Friuli, Redipuglia); Fig. 9: *A. tripunctaria*, paratype (Croatia, South Velebit), verrucose extension of the anellus lobe in detail; Fig. 10: *A. socerbi* (Italy, Trieste, e.l. *Ligusticum lucidum*); Fig. 11: *A. nodiflorella* (Lebanon).

Description. Imago (figs. 1 and 3–6): Wingspan 17–18.5 mm. Head light yellowish brown with tinge of pink, face yellowish. Labial palp yellowish, without dark rings or other markings, only second segment with some scattered brown scales on outer side. Antenna: scape and base dark brown with some interspersed yellowish scales, remainder of flagellum dark brown. Thorax without posterior crest, medium brown with flesh-coloured tinge; tegulae similar, but with reduced flesh-coloured tinge at caudal part. Forewing predominantly with scales of two slightly different colours: yellowish and brownish, both with flesh-coloured tinge; scales of each colour form small, diffuse groups, which are irregularly mixed and not forming any pattern, giving the forewing a somewhat scruffy appearance; only at distal end of veins, medium brown scales concentrated between veins, forming diffuse, slightly darker dots; basal field of forewing like the rest, indicated only with hint of weak brightening in posterior part; in centre of forewing three blackish dots: two at about one-third, oblique, proximal nearer to costa and larger, rarely confluent, sometimes surrounded by a few ochreous or whitish scales, especially at distal margin, third one at about one-half, usually surrounded by a few ochreous or whitish scales on proximal margin; cilia concolorous with wings. Hindwing moderately translucent at base, becoming increasingly opaque toward distal part, medium greyish brown, in translucent parts visible colour dependent on background; veins darker; cilia concolorous with wings. Legs and abdomen uniformly brownish, without particular pattern except abdomen with two rows of indistinct dark spots.

Variation: Within the examined specimens little variation was found. Only size of the three dark dots and the number of bright scales surrounding them vary to some extent.



FIGURES 12 + 14. *A. tripunctaria*, paratype, Croatia, South Velebit, female genitalia, gen. prep. DEEUR 1175, 12: general view, 14: ostium-region enlarged

FIGURES 13 + 15. *A. tripunctaria*, paratype, Greece, Pangeo-mountains, Rodolinos, gen. prep. DEEUR 1938, 13: general view, 15: ostium-region enlarged

FIGURE 16. *A. silerella*, Austria, Maiersdorf, gen. prep. DEEUR 1488.

Male genitalia (figs. 7–9): The most obvious detail is shape of cuiller: long, reaching or exceeding costa, slender, moderately curved, swollen shortly before end and asymmetrically tapering at very end, resembling lateral view of a bird's head. Socii also differ from usual shape found in *Agonopterix*: rather small, outer margins nearly parallel-sided in standard preparation. The third distinctive feature is a bilobed verrucose extension of anellus lobe, directed toward transtilla in standard preparation (fig. 9). Altogether male genitalia are very distinct and can clearly separated from any other species.

Female genitalia (figs. 12–15): Anterior margin of sternite VIII strongly bulged, ostium oval, anterior half of ostium within this bulge; posterior to ostium two slightly diverging strips of sclerotisation. Ductus seminalis with about 4 turns. Ductus bursae rather smooth. Corpus bursae relatively small with a typical signum; signum oval (lateral extension 2.5 respectively 4 times longer than the longitudinal extension in the two females examined), rather small (maximum diameter about 1/4 diameter of bursa)

Remarks. Male genitalia: End of cuiller does not touch valva in natural position of genitalia, but in making preparation, spreading and flattening presses cuiller against valva and tips turn either inward (fig. 7) or outward (fig.8). The two different positions are preparation artifacts and do not represent individual variation.
Female genitalia: Shape of signum shows a rather wide intraspecific variation in genus Agonopterix, so it is of only limited value for determination.

Genetic data. Barcodes under TLMF Lep 07106 (639 bp., ♂, Croatia, South Velebit, 44° 17.00´N; 15° 28,00´E, 26. 7. 2006, leg. et coll. Ľubomír Srnka, gen. prep. DEEUR 0991), 07127 (658 bp., ♀, Croatia, South Velebit, 1000m, 44° 17.00´N; 15° 28,00´E, 28. 4. 2012, leg. et coll. Ignác Richter, gen. prep. DEEUR 1175) and 07167 (658 bp., ♂, Italia, Friuli-Venezia, Giulia, 20 m, 45° 51.00´N; 13° 29,00´E, 4. 4. 2001, leg. et coll. Lucio Morin, gen. prep. DEEUR 1556 P. Buchner). Neighbor-joining analysis shows *Agonopterix broennoeensis* Strand, 1919, as the nearest neighbor with 3.36% p-distance.

Related species. Searching for the most closely related species based on neighbor-joining tree and genitalia patterns of both sexes has not achieved a satisfactory result in *A. tripunctaria*. Compared with the nearest neighbor, there are clear differences: *A. broennoeensis* is an Asteraceae-feeder, forewings are bright yellow with different markings, in male genitalia the cuiller is straight, blunt and ends markedly before costa, and in female genitalia the ostium is near the centre of sternite VIII. Looking further to the second nearest neighbor, there are two species with an equal p-distance of 3.52%: *Agonopterix scopariella* (HEINEMANN, 1870) and *Agonopterix irrorata* (STAUDINGER, 1871). *A. scopariella* is a Fabaceae-feeder, only *A. irrorata* is an Apiaceae-feeder and corresponds with *A. tripunctaria* in this biological aspect. But genitalia of both species are distinctly different from those of *A. tripunctaria*. Starting the search based on genitalia the result is not much more satisfying: Female genitalia are close to those of *A. silerella*, but not male genitalia or genetic data. In male genitalia the striking shape of tip of cuiller is similar to that of *A. socerbi*, but this is apparently a coincidence, because transtilla and anellus are markedly different, as is the external appearance. Moreover, *A. socerbi* is well nested within the *A. alpigena/selini* group, confirmed by genitalia and genetic data, although within this group it is the only species with such a cuiller. This suggests that a single distinctive feature may develop independently in different groups. Likewise, because of the stochastic events giving rise to barcode differences, quite unrelated species may appear as near neighbors according to their barcode-distances. The conclusion on present evidence is that *A. tripunctaria* is a rather isolated species.

Distribution. So far known from Italy, Slovenia, Croatia and Greece. In Italy it had been collected from Mt. Maderno near Lago di Garda and Monti Lessini (Prov. Verona), in Slovenia from several localities (Primorska, Koper, Črni Kal, Kozina, Nanos), in Croatia from South Velebit, in Greece from Zachlorou (Peloponnes), Delphi and Pangeo Mountains (west Rhodopes).

Biology. Burmann reared one moths from larvae collected on *Ferulago nodiflora* (an Apiaceae now valid as *F. campestris* and well known as feeding plant of *A. nodiflorella*) from Mt. Maderno, Italy (this specimen selected as holotype), and Klimesch from an undetermined Apiaceae from Zachlorou, Greece. No information is available on the appearance of the larva. Reared specimens emerged in midsummer, and worn specimens have been caught in spring, indicating that the species hibernates as adults.

Derivation of name. The only prominent markings of forewing, three black dots, were decisive for the species name "*tripunctaria*", which means "with three points".

Remarks. Burmann (1984) reports under *A. nodiflorella*:

South Tyrol: In addition to the only previous discovery, Naturns, light trapped ♂ 20.–30.6.1935, there are now

further reports from Vinschgau,..... So the northern limit of distribution of *nodiflorella* seems to reach the upper Vinschgau. Because *Ferulago nodiflora* is absent in the whole Vinschgau, *nodiflorella* must feed on another Apiaceae here.

Trient: Pietramurata 5.3.1959. Not reported from province Trient formerly. (In the neighboring province Verona I caught *nodiflorella* near Ferrara di Monte Baldo early 3.1967 and late 4.1968, each one ♂ (det. Hannemann). From province Brescia I own a number of specimens reared from *Ferulago nodiflora* from Mt. Maderno, e.l. 25.7.–9.8.1963, and 1 ♂ from Tresnico 19.6.1963 (det. Hannemann)." (translated from German)

In this paper there was a lot of confusion concerning *A. nodiflorella*. As far as can be checked, not one of these reports belong to this species. Apparently the fact that the reared specimens, which had been misidentified as *A. nodiflorella* were collected from *Ferulago nodiflora (= Ferulago campestris)* reinforced the opinion that it was *A. nodiflorella* without any doubt, so not even the absence of *Ferulago campestris* in the Vinschgau was taken to indicate an error.

The specimens from Mt. Maderno belong to *A. tripunctaria*. The "♂ from Tresnico 19.6.1963" has not been found in TLMF, but one of the same collection, without abdomen, labelled as "Italia L.d.Garda | Tresnico 350 m | 19.6.1963 | leg.K. Burmann" and an additional label "*nodiflorella* ♀ Mill | det. H. Pröse" is in fact *A. hippomarathri.* The specimens from "near Ferrara di Monte Baldo early 3.1967 and late 4.1968" are in fact *A. rotundella.*

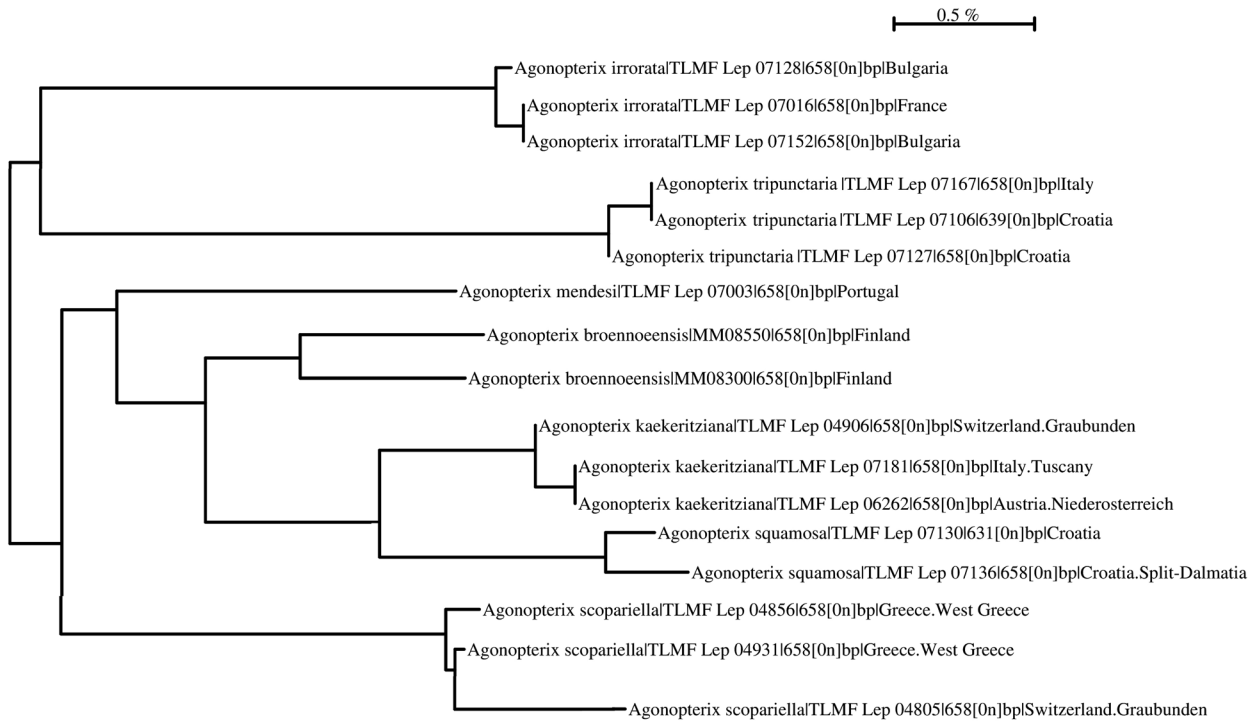


FIGURE 17. Neighbor-joining tree of *Agonopterix tripunctaria* and its closest clusters.

Agonopterix medelichensis sp. nov.

Material. Holotype (figs. 18–22): ♀, Italia sept., Prov. Verona, Monte, 300 m, 19. 7. 1985, e.l. *Trinia glauca*, leg. K. Burmann, *A. hippomarathri* prov. det. K. Burmann, coll. TLMF, DEEUR [Depressariidae of Europe] specimen number 1642, gen. prep. P. Buchner, coll. TLMF.

Paratypes: ♂, [Austria] Wien, Mödling, 6. 3. 1910, leg. Predota, coll MHMV, *A. rotundella* prov. det. Predota [?], gen. prep. DEEUR 0160 P. Buchner.

♂, genitalia, slide from ZMHU, left label: Zoolog. Museum Berlin, 82. | *Depr. rotundella* Dgl., right label: T. 95. Wien kre | Coll. Hinnebg. 62443 | Dez. 51 Hannemann.

♀, [Italia] Terolis merid, Naturns p. Meran, el. 6. 8. 1935, leg. J. Klimesch, *A. rotundella* prov. det. J. Klimesch, coll. ZSM.

♂, [Italia] Terolis merid, Naturns p. Meran, 30. 7. 1935, el. *Seseli* ?, leg. J. Klimesch, *A. rotundella* prov. det. J. Klimesch, coll. ZSM (fig. 24).

♂, Italia, Monti Lessini, Monte, 400 m, 45° 34.00´N; 10° 50,00´E, 25. 3. 2000, leg. et coll. Toni Mayr, gen. prep. DEEUR 1697 P. Buchner.

♂, Italia, Monti Lessini, Monte, 400 m, 45° 34.00´N; 10° 50,00´E, 25. 3. 2000, leg. et coll. Toni Mayr, DNA barcode ID DEEUR1805 [differing numbering in this specimen: sample ID DEEUR1805, process ID LEFIJ2418-14!].

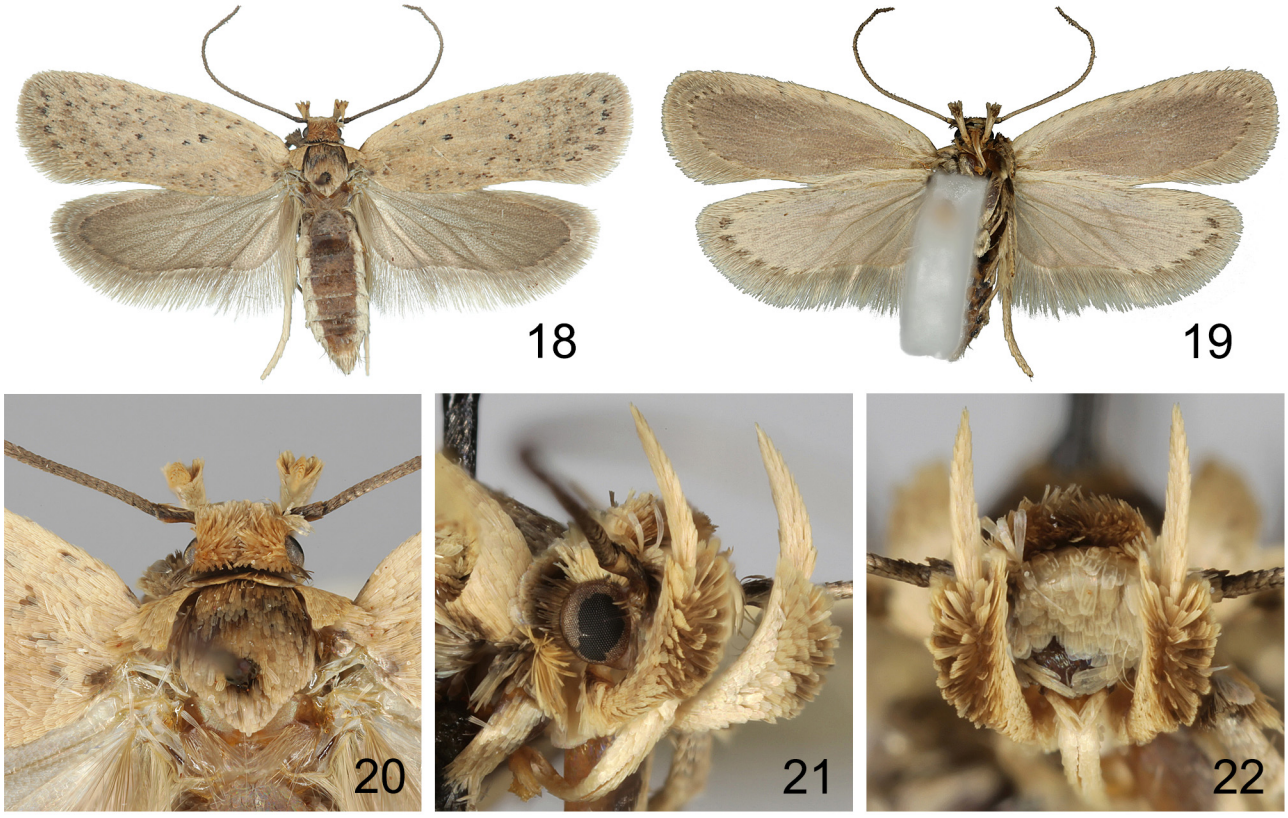
9 ♂, 1 ♀, Italia, Monti Lessini, Monte, 400 m, 45° 34.00´N; 10° 50,00´E, 25. 3. 2000, leg. et coll. Toni Mayr.

♀, Slovakia, Slovensky kras, Hrhov, 4. 5. 2002, leg. et coll. Z. Tokár, *A. rotundella* prov. det. Z. Tokár.

♂, [Hungary] Budapest, ex collect Staudinger, *A. hippomarathri* prov. det. Staudinger [no further data] coll. ZMHU, gen. prep. DEEUR 1873 P. Buchner.

♂, Griechenland [Greece], Falakron-Gebirge, Panorama, 800m, 30. 8. 2008, leg. & coll. W. Schmitz, gen. prep. DEEUR 1933 P. Buchner.

Diagnosis. In size and wing pattern *A. medelichensis* is similar to *A. nodiflorella* (fig. 2), but ground colour darker and somewhat scruffy, the three dark dots more diffuse, no concentration of dark scales along veins. Also similar to *A. tripunctaria* (figs. 1 + 3–6), where position and size of the three dark dots is nearly the same, but only *A. tripunctaria* shows flesh-coloured tinge on forewings. On cursory examination also similar to *A. rotundella*, but in this species the inner marking of forewing is usually a single dot, not a pair of dots as in *A. nodiflorella* and *A. medelichensis.*



FIGURES 18–22. *A. medelichensis*, holotype (Italy, Lago di Garda), 18: upperside, 19: underside, 20: head and thorax in detail, 21–22: labial palp in detail, 21: lateral view, 22: frontal view.

Male genitalia of *A. medelichensis* (figs. 25–27) are distinctly different from those of the externally similar species mentioned above, especially from those of *A. rotundella* (fig. 28). For diagnostic characters see description of male genitalia. Female genitalia differ from most other species of *Agonopterix* by the strongly bulged anterior margin of sternite VIII with at least the anterior half of ostium within this bulge. Only *A. silerella*, *A. tripunctaria* (see figs. 12–15) and *A. selini* are somewhat similar in this detail. In *A. silerella* (fig. 16) the bulge is even more prominent and corpus bursae is more clearly separated from ductus bursae. In *A. tripunctaria* the bulge starts more

gradually and against *A. selini* the most distinctive detail is the number of turns of ductus seminalis: 4 in *A. medelichensis* and 8 in *A. selini.* (Buchner, P., unpublished).

FIGURE 23. *A. medelichensis*, paratype (Italy, Monte, light trapped in spring)
FIGURE 24. *A. medelichensis,* paratype (Italy, Naturns, reared)

Description. Imago (figs. 18–24): Wingspan 14.5–18 mm. Head with light yellowish grey scales above eyes, ochreous to rusty brown on vertex, face silvery grey. Labial palp yellowish, without dark rings or other markings, second segment with ochreous to rusty brown scales in furrow seen from front. Antenna dark brown. Thorax without posterior crest, medium greyish brown, tegulae similar (reared specimens tend to have dark brown to blackish parts on front part of thorax and also on parts of legs and abdomen, but this must be caused by greasing as it does not happen if specimens are collected in spring). Forewing medium grey with an individually varying tinge of brown or straw-colour; small groups or single darker brown to blackish scales in individually varying number irregularly scattered over forewing, neither forming any patterns nor concentrated along veins, but become generally more dense toward apex; only between ends of veins darker scales form spots; basal field of forewing a little lighter than adjacent parts, but inconspicuously so, with a small, brown dot on dorsal base; constant markings two blackish dots at about one-third, oblique, the proximal nearer to costa, sometimes a little larger and a third at about one-half, all three dots not surrounded or centred by brighter scales; cilia concolorous with wings. Hindwing in fresh specimens scarcely translucent at base, increasingly opaque towards the distal part, medium to darker greyish brown, similar to forewing coloration, veins darker and conspicuous, a dark border line present; cilia more or less concolorous with wings with two darker parallel lines. Legs: femur grey to brown, tibia with long strawy yellowish hairs, especially on hindleg. Abdomen with silvery grey scales, ventrally with four dark spots on each segment, forming four rows.

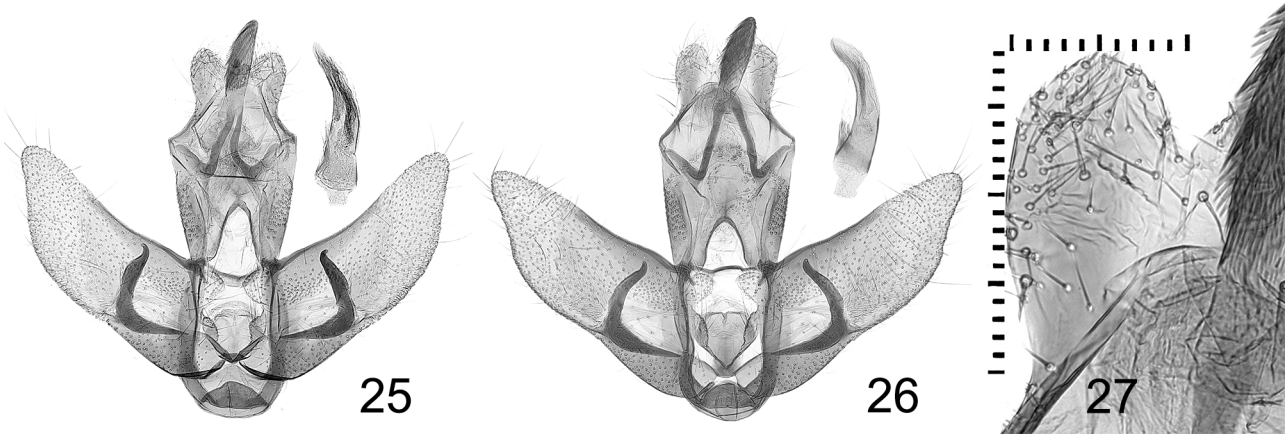


FIGURE 25. *A. medelichensis*, paratype (Italy, Monte), male genitalia (gen. prep. DEEUR 1697)
FIGURES 26–27. *A. medelichensi*, paratype (Austria, Mödling), male genitalia (gen. prep. DEEUR 0160), 26: general view, 27: socius with ratio-scale.

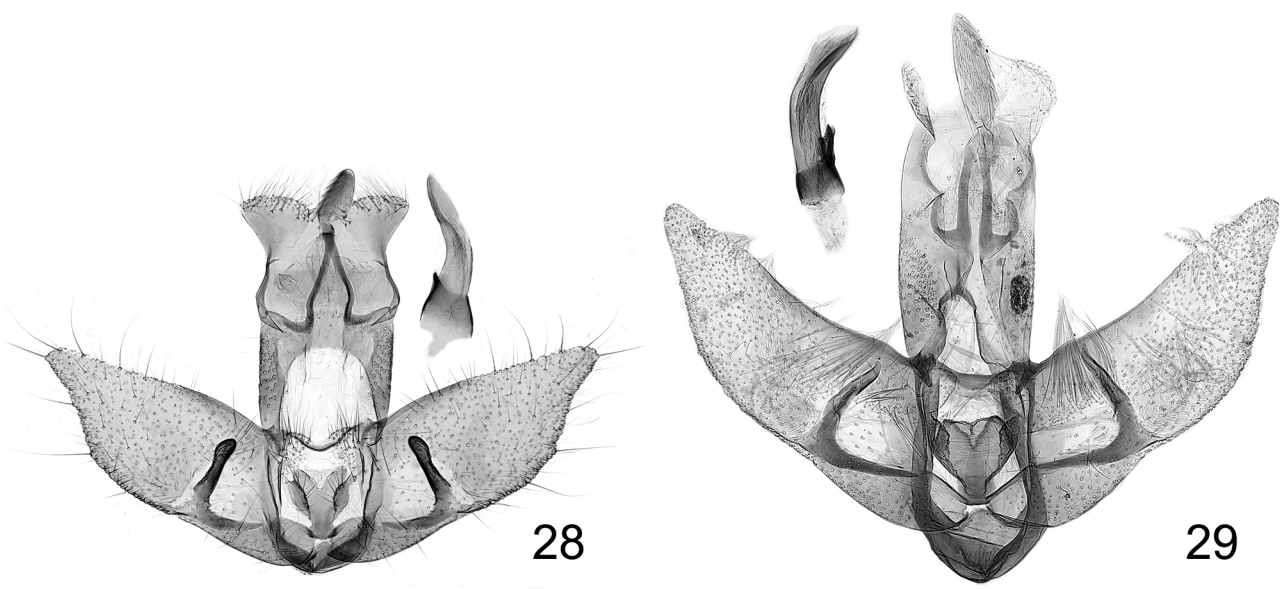
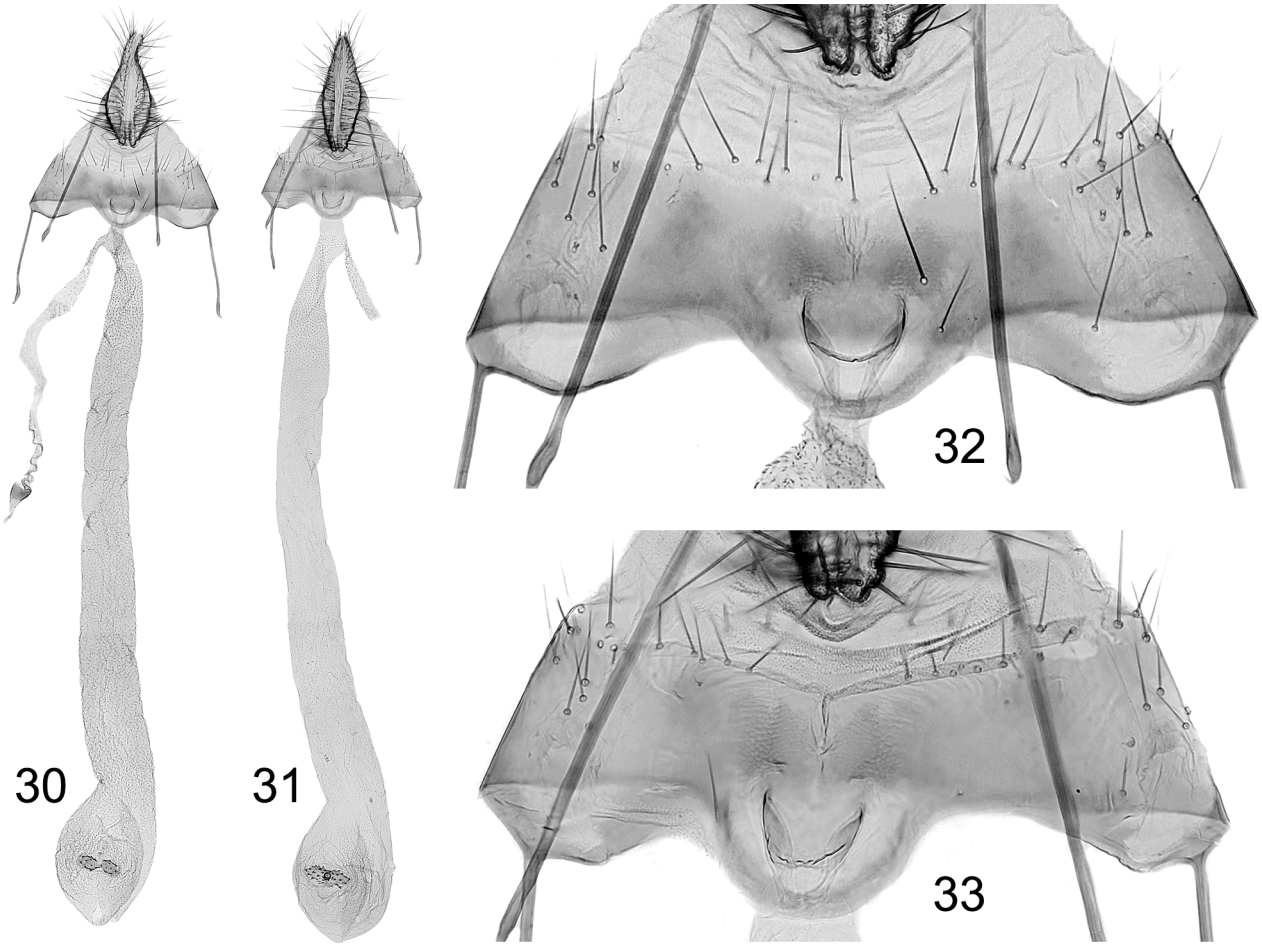


FIGURE 28. *A. rotundella* (Switzerland, Fully, e.l. *Daucus carota*), male genitalia (gen. prep. DEEUR 0620)
FIGURE 29. *A. medelichensis*, male genitalia, slide from ZMHU, left label: [printed headline:] Zoolog. Museum Berlin | [handwritten:] 82. | *Depr. rotundella* Dgl. ["*Depr. rotundella*" underlined in red], right label: [printed headline:] Zoolog. Museum Berlin | [handwritten:] T. 95. Wien kre | Coll. Hinnebg. 62443 | Dez. 51 Hannemann.



FIGURES 30+32. *A. medelichensis*, holotype, (Italy, Monte) female genitalia (gen. prep. DEEUR 1642) 30: general view, 32: ostium-region enlarged
FIGURES 31+33. *A. medelichensis*, paratype, (Italy, Monte) female genitalia (gen. prep. DEEUR 1803) 31: general view, 33: ostium-region enlarged

Variation: Upperside of forewings shows variation in number of interspersed dark scales and in colour from grey to yellowish grey to brown. Scales in the furrow of second segment of labial palps and on vertex vary from bright yellowish to rusty brown. The range and variability of legs and abdomen coloration cannot be described exactly because in all fresh specimens there is some greasing, especially on femur of foreleg and abdomen, while specimens caught in spring, which are not greasy, have lost most scales in this region.

Male genitalia (figs. 25–27) are typical for the genus *Agonopterix* without any unusual features. To find diagnostic characters, it is necessary to look at the combination of shape of cuiller and socii: cuiller rather stout and slightly bent inwards in standard preparation, at 3/4 tapering and bent outwards, ending in a point just before the costa. Socii conspicuously narrow, length/width-ratio 1.8 (see fig. 27) and therefore much smaller than the average shape in genus *Agonopterix*. Gnathos fusiform, overtopping rear border of socii by about half its length. Anellus lobes very narrow.

Female genitalia (figs. 30–33): Anterior margin of sternite VIII straight with a semicircular bulge which starts rather seamlessly; ostium oval, nearly entirely within this bulge. Ductus seminalis with about 4 turns. Ductus bursae rather smooth, diameter markedly large (about 1/4–1/3 of lateral extension of sternite VIII in standard preparation) . Corpus bursae small (maximum diameter about twice as large as diameter of ductus bursae). The signa of both examined females are constricted in the middle. Experience shows that the signum exhibits a certain amount of infraspecific variation in *Agonopterix*. It is therefore too soon to be sure if this similarity is coincidence or a typical feature of *A. medelichensis.*

Genetic data. Barcode under DEEUR1805 (555 bp., ♂, Italia, Monti Lessini, Monte, 400 m, 45° 34.00´N; 10° 50,00´E, 25. 3. 2000, leg. et coll. Toni Mayr, gen. prep. DEEUR 1805) [Note differing numbering in this specimen: sample ID DEEUR1805, process ID LEFIJ2418-14, specimen ID DEEUR 1805!]. Neighbor-joining analysis shows *Agonopterix argillacea* as the nearest neighbor with 3.88 % p-distance; in European fauna it is *A. scopariella* with 4.55 % p-distance.

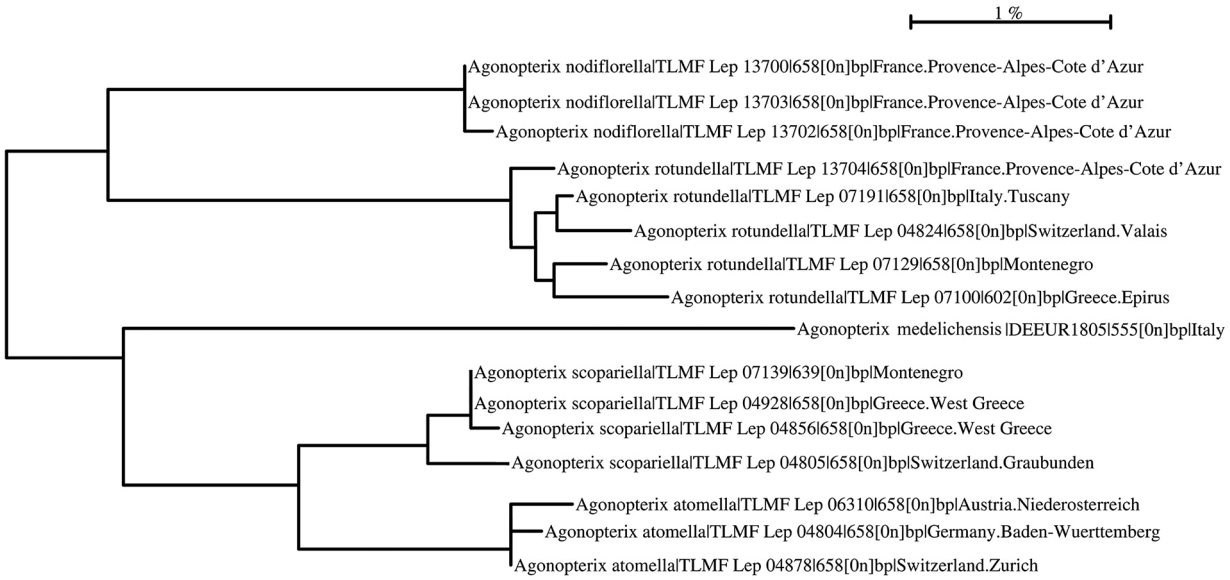


FIGURE 34. Neighbor-joining tree of *A. medelichensis* and its closest clusters.

Relatedness. Based on genitalia patterns of both sexes and genetic data, *A. medelichensis* appears to be rather isolated, and in particular it is not a close relative of *A. rotundella*.

Distribution. So far known from Austria, Italy, Slovakia, Hungary, Greece and Russia. In Austria it had been collected from Mödling near Vienna, stored in NHMV under *A. rotundella.* In Italy the larva had been collected in Monte (Monti Lessini, Prov. Verona) on *Trinia glauca* by Burmann, the reared specimen stored in TLMF under *A. hippomarathri*, and also from Naturns near Meran (South Tyrol) on *? Seseli* by Klimesch, the reared specimen stored in ZSM under *A. rotundella.* In Slovakia the moth had been collected in Slovensky kras (private collection Z. Tokár, stored under *A. rotundella*), in Hungary from Budapest, stored in ZMHU under *A. hippomarathri* and in Greece from Falakron-Mountains (private collection Viehmann, undetermined). And "*Agonopterix rotundella* (Douglas, 1846) (Lepidoptera, Depressariidae) collected in Omsk Province is reported as new to Russia" (Lvovsky

& Knyazev 2013) is misidentified: the photograph of the moth and the drawing of the male genitalia show clearly they had found *A. medelichensis.*

Biology. Reared from larvae collected on *Trinia glauca* and another undetermined Apiaceae (no further details available). Reared specimens emerged in midsummer, and worn specimens have been caught in spring, indicating that the species hibernates as adults.

Derivation of name. "*medelichensis*" means "from Medelicha", the Latin name of "Mödling", a city in Lower Austria near Vienna, where the specimen was collected, which was the first to reveal by dissection that this is not *A. rotundella* but a new species.

Remarks. It is worth considering why the specimens from Mödling had been misidentified as *A. rotundella* and not as *A. nodiflorella*, which is more similar based on wing pattern (proximal marking usually a double dot in *A. nodiflorella* and *A. medelichensis*, but a single dot in *A. rotundella*). Because *A. rotundella* and *A. nodiflorella* are remarkably similar, the biology may have been decisive: *A. nodiflorella* feeds on *Ferulago campestris*, not growing in Austria, and *A. rotundella* feeds on *Daucus carota*, present around Vienna. A similar consideration may have resulted in the determination as *A. hippomarathri* by Burmann. The specimen was reared from *Trinia glauca*, a well known foodplant of *A. hippomarathri*. Based on the appearance of the moth this misidentification is puzzling, because fresh specimens of *A. hippomarathri* are markedly different from *A. medelichensis*. Why Klimesch also misidentified his specimens as *A. rotundella* is difficult to guess, but it is possible he had seen the specimens in NHMV. But none of these determinations had been checked by dissection. One person who dissected the specimens stored in NHMV under *A. rotundella* was Hannemann, but he accepted the determination, publishing the drawing of the male genitalia of *A. medelichensis* as *A. rotundella* in Hannemann (1953) and subsequently unchanged in Hannemann (1995). According to Hannemann (1953) he examined three males: "Untersucht: 1 Männchen von Wien, 1 Männchen von Italien, 1 Männchen vom Taurus-Gebirge, coll. Staudinger (Mus. Berlin)" In ZMHU only the slide of the male from Vienna could be found (fig. 29), but not the males from Italy and Taurus mountains, so the question to which species they belong remains unanswered.

Hannemann´s misidentification had obviously caused the record of "*A. rotundella* new for Russia" (Lvovsky & Knyazev 2013). Also the record "*Agonopterix nodiflorella* neu für Deutschland" [*A. nodiflorella* new for Germany] (Derra 1989) may have been caused by Hannemann´s error: Derra determined his male specimen by dissection using Hannemann (1953), in which the male genitalia of *A. nodiflorella* are depicted correctly. Since the genitalia of genuine *A. rotundella* are nearly indistinguishable from those of *A. nodiflorella,* and because Hannemann´s "*A. rotundella*" shows *A. medelichensis*, then using Hannemann (1953) to identify true *A. rotundella* inevitably leads to "*A. nodiflorella*".

Looking for reports of specimens belonging to *A. medelichensis* in Burmann (1984) it is natural to look under *A. rotundella*. In the Klimesch-collection, now in ZSM, February 2014 I had found a specimen stored under *A. rotundella* (♂, Terolis merid, Naturns p. Meran, 30. 7. 1935, el. *Seseli* ?, leg. J. Klimesch) belonging to *A. medelichensis*. But Burmann didn´t report findings of *A. rotundella* from the "Tyrol" (Tyrol incuding South Tyrol and province Trient, Italy) at all. That indicates these specimen had been stored under undetermined material until at least 1984. Monte (province Verona), where he reared "*A. hippomarathri*" (now holotype of *A. medelichensis*) from *Trinia glauca* is not covered by this paper. The reports listed under *A. hippomarathri* are correct as far as they could be checked.

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APPENDIX. Table with details to BIN, Sample ID, Process ID and GenBank Accession for 43 BIN-conform sequences, used for the trees in this paper.

Species	BIN	Sample ID	Process ID	GenBank Accession
Agonopterix atomella	BOLD:ABZ0059	TLMF Lep 04804	DEEUR014-11	KP976143
Agonopterix atomella	BOLD:ABZ0059	TLMF Lep 04878	DEEUR088-11	KP976156
Agonopterix atomella	BOLD:ABZ0059	TLMF Lep 06310	DEEUR285-11	KP976160
Agonopterix broennoeensis	BOLD:AAF7537	MM08300	LEFIE111-10	HM873859
Agonopterix broennoeensis	BOLD:ACF4026	MM08550	LEFIE232-10	HM873966
Agonopterix irrorata	BOLD:ABX3036	TLMF Lep 07016	DEEUR337-12	KP976157
Agonopterix irrorata	BOLD:ABX3036	TLMF Lep 07128	DEEUR449-13	KP976136
Agonopterix irrorata	BOLD:ABX3036	TLMF Lep 07152	DEEUR473-13	KP976147
Agonopterix kaekeritziana	BOLD:AAF7198	TLMF Lep 04884	DEEUR094-11	KP976134
Agonopterix kaekeritziana	BOLD:AAF7198	TLMF Lep 04906	DEEUR116-11	KP976164
Agonopterix kaekeritziana	BOLD:AAF7198	TLMF Lep 04917	DEEUR127-11	KP976146
Agonopterix kaekeritziana	BOLD:AAF7198	TLMF Lep 06262	DEEUR237-11	KP976158
Agonopterix kaekeritziana	BOLD:AAF7198	TLMF Lep 07181	PHLAI977-14	KP976138
Agonopterix medelichensis **sp. nov.**	BOLD:ACO8533	DEEUR1805	LEFIJ2418-14	KP976149
Agonopterix mendesi	BOLD:ABZ7581	TLMF Lep 06982	DEEUR303-12	KP976162
Agonopterix mendesi	BOLD:ABZ7581	TLMF Lep 07003	DEEUR324-12	KP976167
Agonopterix nanatella	BOLD:ABA0908	TLMF Lep 04803	DEEUR013-11	KP976142
Agonopterix nanatella	BOLD:ABA0908	TLMF Lep 04875	DEEUR085-11	KP976150
Agonopterix nanatella	BOLD:ABA0908	TLMF Lep 07097	DEEUR418-13	KP976163
Agonopterix nanatella	BOLD:ABA0908	TLMF Lep 06673	PHLAH173-12	KP976139
Agonopterix nodiflorella	BOLD:ABV2118	TLMF Lep 13700	LEATF388-14	KP976166
Agonopterix nodiflorella	BOLD:ABV2118	TLMF Lep 13701	LEATF389-14	KP976135
Agonopterix nodiflorella	BOLD:ABV2118	TLMF Lep 13702	LEATF390-14	KP976132
Agonopterix nodiflorella	BOLD:ABV2118	TLMF Lep 13703	LEATF391-14	KP976152
Agonopterix rotundella	BOLD:AAJ6714	TLMF Lep 04824	DEEUR034-11	KP976131
Agonopterix rotundella	BOLD:AAJ6714	TLMF Lep 07100	DEEUR421-13	KP976161
Agonopterix rotundella	BOLD:AAJ6714	TLMF Lep 07129	DEEUR450-13	KP976155
Agonopterix rotundella	BOLD:AAJ6714	TLMF Lep 13704	LEATF392-14	KP976145
Agonopterix rotundella	BOLD:AAJ6714	TLMF Lep 07191	PHLAI987-14	KP976148
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 04805	DEEUR015-11	KP976159
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 04856	DEEUR066-11	KP976137
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 04880	DEEUR090-11	KP976168
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 04928	DEEUR138-11	KP976169
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 04931	DEEUR141-11	KP976151
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 07060	DEEUR381-13	KP976154
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 07139	DEEUR460-13	KP976165
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 01637	PHLAB837-10	HQ968841
Agonopterix scopariella	BOLD:ABZ0060	TLMF Lep 01638	PHLAB838-10	HQ968842
Agonopterix squamosa	BOLD:ACF7120	TLMF Lep 07130	DEEUR451-13	KP976140
Agonopterix squamosa	BOLD:ACF7120	TLMF Lep 07136	DEEUR457-13	KP976133
Agonopterix tripunctaria **sp. nov.**	BOLD:ACF6882	TLMF Lep 07106	DEEUR427-13	KP976153
Agonopterix tripunctaria **sp. nov.**	BOLD:ACF6882	TLMF Lep 07127	DEEUR448-13	KP976144
Agonopterix tripunctaria **sp. nov.**	BOLD:ACF6882	TLMF Lep 07167	PHLAI963-14	KP976141