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REDESCRIPTION OF *AGONOPTERIX SELINI* (HEINEMANN, 1870) WITH DESCRIPTION OF *AGONOPTERIX LESSINI* SP. N. AND *AGONOPTERIX PARASELINI* SP. N. (LEPIDOPTERA, GELECHIOIDEA)

RIDESCRIPTIONE DI *AGONOPTERIX SELINI* (HEINEMANN, 1870) E DESCRIZIONE DI *AGONOPTERIX LESSINI* SP. N. E *AGONOPTERIX PARASELINI* SP. N. (LEPIDOPTERA, GELECHIOIDEA)

Abstract - *Agonopterix selini* (HEINEMANN, 1870) is redescribed and a neotype is designated for it, *Agonopterix lessini* sp. n. and *Agonopterix paraselini* sp. n. are described. The type specimen of *A. selini*, in fact, is lost. HANNEMANN (1953) pointed out the globose gnathos as *A. selini*'s diagnostic feature of male genitalia. But barcode and the inclusion of further characteristics of male and female genitalia in his description have shown that the supposed one species "selini" conceals a total of three species. From HEINEMANN's description of larva in combination with food-plant and type locality it has been possible to clarify which of the three species is the true *Agonopterix selini* (HEINEMANN, 1870). It is widespread throughout Europe, and the only one to occur in Scandinavia. *Agonopterix lessini* sp. nov. is restricted to Southern Europe, extending to Turkey. At the type locality, Monti Lessini (Italy), it seems to be the only one of the three species. *Agonopterix paraselini* sp. n. is predominantly found in Central Europe and the only one which is found around Vienna. Most of the specimens stored under *A. selini* in NHMV belong to this species, and this is the species depicted in HANNEMANN (1953) and HANNEMANN (1995) as *A. selini*.

Key words: Gelechioidea, Depressariinae, *Depressaria*, *Agonopterix*, New species, DNA barcoding, Neotype.

Riassunto - Nel presente lavoro viene ridescritta *Agonopterix selini* (HEINEMANN, 1870) e ne viene designato un neotipo, mentre vengono descritte *Agonopterix lessini* sp. n. e *Agonopterix paraselini* sp. n. Il tipo di *A. selini*, infatti, è andato perduto. HANNEMANN (1953) ha individuato il gnathos globoso quale caratteristica diagnostica del genitale maschile di *A. selini*. Tuttavia il barcode e l'inclusione di ulteriori caratteristiche dei genitali maschili e femminili nella sua descrizione hanno rivelato che la presunta specie "selini" comprende in realtà tre specie diverse. Dalla descrizione di HEINEMANN della larva, in combinazione con la pianta nutrice e la località tipica è stato possibile chiarire quale delle tre specie sia la vera *Agonopterix selini* (HEINEMANN, 1870). Questa specie è diffusa in tutta Europa, ed è l'unica presente in Scandinavia. *Agonopterix lessini* sp. nov. è limitata all'Europa meridionale, estendendosi alla Turchia. Essa sembra essere l'unica delle tre specie presente nella località tipica, i Monti Lessini (Italia). *Agonopterix paraselini* sp. n. è presente prevalentemente in Europa centrale ed è l'unica rinvenuta intorno a Vienna. La maggior parte degli esemplari conservati come *A. selini* nel NHMV appartengono a questa specie, e questa è la specie descritta in HANNEMANN (1953) and HANNEMANN (1995) come *A. selini*.

Parole chiave: Gelechioidea, Depressariinae, *Depressaria*, *Agonopterix*, Nuove specie, DNA barcoding, Neotipo.

Introduction

Already before starting to work on the volume "Microlepidoptera of Europe [ME]: Depressariinae", several species of *Agonopterix* had been reared by this author, including one from *Peucedanum cervaria* (Austria, Mödling near Vienna) and one from *P. oreoselinum* (Austria, Hainburger Berge). Based both on food-plants and external appearance, the expected species were *A. selini* and/or *A. parilella*, which can not be identified with certainty based on external characters only. According to HANNEMANN (1995),

these two species are easily separable by the shape of the gnathos: elongated in *A. parilella* - which was the case of the males reared from *P. oreoselinum* - and "round" in *A. selini*, and so it was in the males reared from *P. cervaria*. These identifications seemed uncontroversial: HANNEMANN mentions *P. oreoselinum* and *P. cervaria* for *A. parilella* and *Selinum carvifolium*, *Pe. palustre* and *P. cervaria* (listed as *Athamantha cervaria*, following HEINEMANN's original description) for *A. selini*.

Part of the work for "ME: Depressariinae", which started in 2010, was to obtain DNA barcodes from as many species of Depressariinae as possible, so

also from the reared *A. selini* from Mödling. But unexpectedly the sequence turned out to be that of *A. angelicella*. At the time, the identification as *A. selini* seemed so certain that this sequence was interpreted as the result of a local introgression. In 2011 further specimens from Switzerland, also reared from *P. cervaria* and with the same external appearance and the same shapes of genitalia as “*A. selini*” from Mödling, were barcoded, and the sequence also resulted identical with *A. angelicella*. This makes introgression rather unlikely.

At the same time, males from Italy and Croatia were dissected, which also showed a more or less round gnathos but a cuiller of very uncommon shape (figs 9-14), never seen in any figure of HANNEMANN (1953) or in any species of *Agonopterix*. Barcode resulted in a sequence corresponding with “*A. selini*” from Finland. Images of the genitalia from Finnish specimens were found on http://www2.nrm.se/en/svenska_fjarilar/a/agonopterix_genitalia.html: they correspond with the shape shown in figs 9-14. In the years 2012 and 2013, barcoding of *Agonopterix* from Southern Europe, also with round gnathos, produced a further cluster, which resulted in the discovery of constant differences in male and female genitalia. It was now clear that at least three *Agonopterix* species with round gnathos exist.

Material and methods

Material has been examined from MFSN (Museo Friulano di Storia Naturale, Udine), MFN (Museum für Naturkunde der Humboldt-Universität, Berlin), NHMV (Natural History Museum Vienna), NMPC (Národní Muzeum v Praze, Česko [“Natural Museum Prague, Czech Republic”]) TLMF (Tiroler Landesmuseum Ferdinandeum, Innsbruck), ZMUC (Zoological Museum, University of Copenhagen, Denmark) and ZSM (Zoologische Staatssammlung München).

Additionally, specimens from many private collectors have been checked (listed here only if the material was of particular importance for this paper): Helmut Deutsch, Toni Mayr, Wolfgang Stark (Austria), Jan Šumpich (Czech Republic), Knud Larsen (Denmark), Jari Junnilainen, Kari Nupponen (Finland), Günter Baisch, Friedmar Graf, Theo Grünwald, Rudolf Keller, Willibald Schmitz, Franz Theimer, Joachim Viehmann, Andreas Werno (Germany), Cs. Szaboky (Hungary), Carlo Morandini, Lucio Morin (Italy), Ivan Richter, Lubomir Srnka, Ztenko Tokar (Slovakia), Peter Sonderegger (Switzerland).

84 specimens (70 males, 14 females) of *A. selini*, 43 specimens (29 males, 14 females) of *A. lessini* sp.n. and 74 (44 males, 30 females) of *A. paraselini* sp.n. have been examined; for each species, this number includes both reared and light-trapped specimens.

Morphological examination

Genitalia preparations followed standard techniques (ROBINSON 1976), but with some differences:

- Male preparations were stained with mercurochrome and females with chlorazol, which brings a better result than using the same stain for both sexes.
- In females, a different method was used for embedding on the slide: once put into Euparal, a piece of a cover glass is put on, covering the VIII segment but not the papillae anales. On either side of the papillae anales, feet for the final cover glass are fixed. The preparation has to be stored in a dust-free place for drying about one month, before the final cover glass is put on. This double-mounting allows both a good fixation of the slide and preservation of the natural shape of papillae anales. If the shape of papillae anales in lateral view is shown, the photo was taken from the free floating genitalia before embedding. Special care was taken to preserve the ductus seminalis, because the number of turns may be an important feature for species determination.

When determining *Agonopterix* species based on female genitalia, one must always be aware that interspecific differences throughout the genus are small, while intraspecific variability is as in most Lepidoptera, that means, intraspecific variation may exceed interspecific differences. This makes it difficult, in some species groups even impossible, to get reliable determination results based on female genitalia only.

About male preparations additional remarks also have to be added: the gnathos of all three species treated in this paper appear more or less round in standard preparation, but it is not globose, in fact it is a rather flat disc (compare figs 10, 39 and 67, showing gnathos in natural position from ventral view) which must change its position during embedding in standard preparation by turning 90° to the left or the right. If the shape of gnathos is checked on a dried male without full preparation, it is important to know this, because a look at the gnathos from ventral or rear side shows a long and narrow outline. The anellus with its bilobed process toward the transtilla (as usual in the *A. alpigena/selini* - group, see figs 15-17) is prone to the formation of artifacts: figs 15-16 shows the two horns in natural position in lateral view, they are at an angle of about 70° to the plane of the finished preparation, and usually they turn towards transtilla, but sometimes they turn towards the vinculum. And if they turn toward the transtilla, they abut the lower edge of the transtilla lobes, which can cause them to bend. This should be considered when preparations are compared.

Decisive for the choice of the specimens as holotypes and neotype was a good state of preservation and the presence of DNA barcode and/or informaton about

the food-plant. 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 were illuminated with two diffused flashes, using a third flash for setting the background whiteness. Photos of specimen details were taken with Canon lens MP-E 65 at 2:1, using ring flash. Genitalia photos were taken with microscope (Wild Heerbrugg) using a 10x objective and a 2.5x ocular. All photos (except larvae) were edited using the software Helicon Focus 4.80 and Adobe Photoshop 6.0. All photos except fig. 1 had been taken by the author.

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, due to the different stains.

DNA Barcoding

The full length lepidopteran DNA barcode sequence is a 658 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 twelve specimens of *A. selini* resulted in nine full barcode fragments, three sequences are incomplete (560, 604 and 648 bp); nine specimens of *A. lessini* sp.n. resulted in eight full barcode fragments and one sequence of 229 bp; eight specimens of *A. paraselini* sp.n. all resulted in full barcode fragments. Detailed specimen data are listed under molecular data of species description. Sequences were submitted to GenBank, details including complete voucher data and images can be accessed in the public dataset DS-DEEUR326 at [http://www.boldsystems.org/index.php/Public_SearchTerms?query=DS-DEEUR326,DOI dx.doi.org/10.5883/DS-DEEUR326](http://www.boldsystems.org/index.php/Public_SearchTerms?query=DS-DEEUR326,DOI%20dx.doi.org/10.5883/DS-DEEUR326) in the Barcode of Life Data Systems (BOLD; RATNASINGHAM & HEBERT 2007). Neighbour-joining trees of DNA barcode data were constructed using Mega 5 (TAMURA et al. 2011) under the Kimura 2 parameter model for nucleotide substitutions.

Redescription of *Agonopterix selini* (HEINEMANN 1870) with designation of a neotype

Neotype: ♂, Germany, Saxonia, Oberlausitz, Kleinsaubernitz (ca. 200 km ESE Braunschweig), reared from *Selinum carvifolium* 06.VI.2011, leg. & cult. Friedmar Graf, Gp DEEUR 1862 P. Buchner, coll. TLMF. Further specimens examined:

- 1 ♀: Austria, Innsbruck, 20.VII.1941, leg. K. Burmann, coll. TLMF.
 1 ♂: Austria, Styria, Lafnitz, 15.VII.1992, leg. Kirchweiger, coll. TLMF.
 5 ♂♂: Croatia, South Velebit, 17.VIII.2007, leg. & coll. L. Srnka.
 1 ♂: Croatia, South Velebit, 26.VIII.2011, leg. & coll. I. Richter.
 1 ♂: Finland, Borga, 31.VII.1980, leg. M. Fibiger, coll. ZMUC.
 1 ♂: Germany, Bavaria, Schwandorf, 30.VII.1992, leg. & coll. F. Theimer.
 4 ♂♂, 1 ♀: Germany, Saxonia, Kleinsaubernitz, e.l. *Selinum carvifolium*, 2003 - 2011, leg. & coll. F. Graf.
 1 ♀: Greece, Litchron, 300 m, 23.VI.1957, leg. W. Thurner, coll. ZSM.
 3 ♂♂: Greece, Olympos, 800 m, 06.VII.1967, leg. J. Klimesch, coll. ZSM.
 1 ♀: Greece, Olympos, 2100 m, 19.VII.1967, leg. J. Klimesch, coll. ZSM.
 2 ♂♂, 1 ♀: Greece, Parnassos, Delphi, 700 m, 21.V.1979, leg. larva & coll. G. Baisch.
 1 ♂: Greece, Kavala, Pangeo, 1700 m, 24.VIII.1989, leg. & coll. K. Larsen.
 1 ♀: Greece, Makedonia, Thessalia, Olympos, 700 m, 26.V.1990, e.l. *Peucedanum oreoselinum*, leg. O. Karsholt, coll. ZMUC.
 1 ♀: Greece, Parnassos, Arachova, 1100 m, 12.VI.1993, leg. & coll. G. Baisch.
 1 ♂, 1 ♀: Greece, Filipei, Grevena, Voria Pindos, 1500m, e.l. *Selinum carvifolium*, 29.VII.2013, leg. & coll. J. Viehmann.
 1 ♂: Hungary, Orsegi TVK, Ketvoelgy, Afonya Csarab, 16.VII.1993, leg. & coll. Cs. Szaboky.
 2 ♂♂, 1 ♀: Italy, Mt. Baldo, 1600 m, VI.1961, e.l. *Ligusticum lucidum*, leg. K. Burmann, coll. TLMF.
 28 ♂♂, 1 ♀: Italy, Toscana, Marradi, 02.VIII.1998 - 22.VIII.2003, leg. A. Usvelli, coll. MFSN.
 1 ♀: Italy, Friuli V.G., Venzona, VI.2010, e.l. *Peucedanum oreoselinum*, leg. & coll. P. Sonderegger.
 2 ♂♂, 1 ♀: Italy, Friuli V.G., Udine, Bordano, VI.2014, e.l. *Ligusticum lucidum*, leg. & coll. P. Sonderegger.
 1 ♂: Romania, Rimetea, 600 m, 31.V.2009, leg. O. Karsholt, coll. ZMUC.
 1 ♀: Slovakia, Zvolen, 1986, e.l. *Peucedanum sp.*, coll. Z. Tokar.
 2 ♂♂: Slovakia, Michalovce, Kusin, 19.VII.1992, leg. & coll. K. Larsen.
 6 ♂♂: Slovakia, Michalovce, Vinne, 400 m, 21.VII.1992, leg. & coll. K. Larsen.
 1 ♂: Slovenia, Nanos, 1050 m, 31.V.1997, leg. H. Deutsch, coll. TLMF.
 2 ♀♀: Slovenia, Kozina, 450m, 23.V.2004, e.l. *Peucedanum sp.*, leg. H. Deutsch, coll. TLMF.
 3 ♂♂: Spain, Teruel, Sierra de Javalambre, 1820 m, leg. M. Dworak & J. Sumpich, coll. NMPC.

1 ♂: Turkey, Kars, 17 km SW Sarikamis, 2100 m, 28.VIII.1965, leg. Achtelig, coll. A. Werno.

1 ♂: Turkey, Ankara, Camildere, 08.VIII.1993, leg. F. Schepler, coll. ZMUC.

Justification for designating a neotype:

The conditions suggesting the need to designate a neotype and the criteria adopted in selecting the neotype specimen are in accordance with Art. 75 of the Code (ICZN, 1999).

HANNEMANN had failed to find the syntypes: he had checked all accessible types for his paper (HANNEMANN 1953) or at least he mentioned where they are stored, but he does not give any information about types or syntypes of *A. selini*.

Depressaria selini (so in original description) was described from an unspecified number of specimens without designation of a type. The specimen(s) which form the basis for his description were collected near Braunschweig. So it was obvious to look in museum Braunschweig at first, but without result. In museum Hannover, where the syntypes were stored according to literature (HORN et al. 1990), also nothing could be found. Looking for further (syn)types of species described by HEINMANN in 1870 (*Depressaria beckmanni* and *Depressaria silesiaca*) stored in museum Hannover according to literature brought the same negative result. There are also no records of loans or other helpful details concerning such specimens (answer per mail on 10 May 2016 from Christiane Schilling, Landesmuseum Hannover). This should be enough evidence to regard the syntypes of *A. selini* as lost.

Until now there has been some confusion around the species of *Agonopterix* with round gnathos, of which only one can be *A. selini* (HEINMANN, 1870). To clarify this situation without designating a neotype for *A. selini* would be unsatisfactory.

Justification for conspecificity of the selected species with *Agonopterix selini* (HEINMANN, 1870)

HEINMANN mentions *Selinum carvifolium* as food-plant and gives a good description of the larva: "... Schläger fand die Raupe bei Jena an *Athamantha cervaria*, ich bei Braunschweig im Mai und Juni auf *Selinum carvifolium* zwischen zusammen gewickelten Blättern. Sie unterscheidet sich von der der *A. parilella* an *Athamantha oreoselinum* (Zll. Is. 1846. 281. - Nat. hist. 6. tf. 6. fg. 2a.) vorzugsweise durch die scharze Afterklappe." (Schläger found the larva near Jena on *Athamantha cervaria*, and I near Braunschweig in May and June on *Selinum carvifolium* between coiled leaves. It differs from *parilella* on *Athamantha oreoselinum* ... especially by the black disc at rear end) (HEINMANN 1870). This makes the decision easier than initially expected: larvae corresponding to HEINMANN's description were collected from *Selinum carvifolium* in Oberlausitz near Braunschweig, and the males showed a cuiller as in Finnish specimens. Larval features from the specimens reared near Vienna are clearly different (figs 73-75 and 70-72) and the populations representing the third cluster has a strictly Southern European distribution.

Justification for the specimen selected as neotype

The selected specimen was collected recently not far from the type locality, with knowledge of the food-plant (*Selinum carvifolium*) and larval features (fig.1)

Description

Imago (figs 2-5): Wingspan 16-20 mm. Head and thorax yellowish to rusty brown, usually not unicolorous but both colours present, rusty brown



Fig. 1 - *A. selini*, full grown larva, (Germany, Saxonia, Kleinsaubernitz, leg. on *Selinum carvifolium* 27.V.2012, e. p. 10-20.VI.2012, leg., cult. & photo F. Graf).
- *A. selini*, larva matura, (Germania, Sassonia, Kleinsaubernitz, legit su *Selinum carvifolium* il 27.V.2012, e.p. 10-20.VI.2012, leg., cult. & foto F. Graf).



Fig. 2 - *A. selini*, neotype, ♂ (Germany, Saxonia, Kleinsaubernitz, e.l. *Selinum carvifolium* 06.VI.2011, leg. & cult. F. Graf, Gp. DEEUR 1862 P. Buchner, coll. TLMF).
- *A. selini*, neotipo, ♂ (Germania, Sassonia, Kleinsaubernitz, e.l. *Selinum carvifolium* 06.VI.2011, leg. & cult. F. Graf, Gp. DEEUR 1862 P. Buchner, coll. TLMF).



Fig. 3 - *A. selini*, ♂ (Italy, Veneto, Mt. Baldo, e.l. *Ligusticum lucidum*, end of May 1961, leg. & cult. K. Burmann, Gp. DEEUR 1579 P. Buchner, coll. TLMF).
- *A. selini*, ♂ (Italia, Veneto, Mt. Baldo, e.l. *Ligusticum lucidum*, fine maggio 1961, leg. & cult. K. Burmann, Gp. DEEUR 1579 P. Buchner, coll. TLMF).



Fig. 4 - *A. selini*, ♂ (Greece, Mt. Olympos, 06.VII.1957, leg. J. Klimesch, coll. ZSM).
- *A. selini*, ♂ (Grecia, Mt. Olimpo, 06.VII.1957, leg. J. Klimesch, coll. ZSM).



Fig. 5 - *A. selini*, ♀ (same data as fig. 3).
- *A. selini*, ♀ (*stessi dati della fig. 3*).

parts predominantly concentrated at the anterior side of thorax. Labial palp predominantly pale yellowish, outer side of second segment with dark scales interspersed, third segment entirely pale yellowish or only with a few dark scales, not forming a distinct ring. Antenna blackish, markedly thicker in males than in females (as usual in the *selini/alpigena* group). Forewing: Ground colour usually rusty brown (figs 3-4), sometimes yellow components are reduced in favour of violet or grey (fig. 2), basal field markedly paler, pale yellowish, but

becoming darker, usually rusty brown near the costa. Central forewing pattern: outer pair of dots with always distinct white centred distal dot, proximal dot variable, sometimes absent (fig. 3), usually black without white elements or with a few white scales (fig. 2), rarely white elements distinct and as large as in distal dot (fig. 4), this area often surrounded by a diffuse blackish field; inner pair of black dots: both dots present (fig. 2) or proximal one invisible (fig. 3), sometimes with a few white scales especially on distal side of the dots (figs

2-4). A third, somewhat elongated dot often present at half distance to dorsal forewing margin on the fold (most distinct in fig. 2).

Cilia of the same color as wings. Lower side of forewing dark grey, only costa with some pale spots (fig. 7). Hindwing medium to dark grey distally, becoming paler and moderately translucent at base, cilia of the same color as wings, usually with a narrow dark cilia line near base. Legs: tarsi covered with small, predominantly dark grey scales tending to become paler on inner side on mid- and hindlegs, at the distal end of every tarsal segment a row of longer, pale yellowish scales, in tibia and femur the small dark grey scales interspersed with an increasing proportion

of pale scales especially on mid- and hindlegs, tibia of hindlegs also with very long, pale yellowish scales (fig. 8). Abdomen medium to dark yellowish grey dorsally, on ventral side with broad dark line laterally and pale yellowish in between (fig. 7).

Variation: ground colour of forewing varying from reddish brown to greyish brown, sometimes with violet components, irregular interspersed dark elements varying from nearly absent (fig. 3) to rather dense (fig. 5), variability of central forewing pattern as in general description, dark cilia line in hindwings broader (fig. 3) or nearly invisible (fig. 5).

Beside this, every single feature shows some variability, which makes it difficult or impossible to



Fig. 6 - *A. selini*, ♂, palp (Slovakia, Zvolen, e.l. *Peucedanum* sp., 1986, coll. Z. Tokar).
- *A. selini*, ♂, palpo (Slovacchia, Zvolen, e.l. *Peucedanum* sp., 1986, coll. Z. Tokar).



Fig. 7 - *A. selini*, ♂, lower side (same data as fig. 3).
- *A. selini*, ♂, lato inferiore (stessi dati della fig. 3).



Fig. 8 - *A. selini*, ♀, lateral side (same data as fig. 2).
- *A. selini*, ♀, vista laterale (stessi dati della fig. 2).

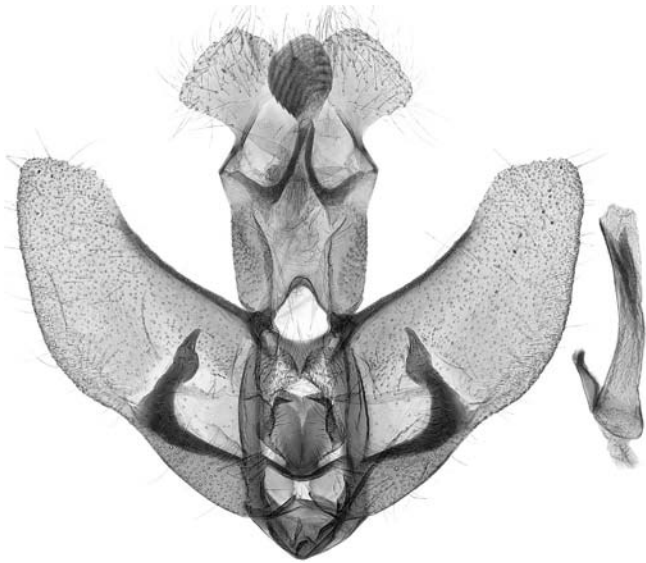


Fig. 9 - *A. selini*, neotype, (Germany, Saxonia, Kleinsaubernitz, e.l. *Selinum carvifolium* 06.VI.2011, leg. & cult. F. Graf, Gp. DEEUR 1862 P. Buchner, coll. TLMF): ♂ genitalia in standard preparation.
- *A. selini*, neotipo, (Germania, Sassonia, Kleinsaubernitz, e.l. *Selinum carvifolium* 06.VI. 2011, leg. & cult. F. Graf, Gp. DEEUR 1862 P. Buchner, coll. TLMF): genitali del ♂ in preparazione standard.



Fig. 10 - *A. selini*, neotype, (Germany, Saxonia, Kleinsaubernitz, e.l. *Selinum carvifolium* 06.VI.2011, leg. & cult. F. Graf, Gp. DEEUR 1862 P. Buchner, coll. TLMF): ventral view of gnathos, valva not opened, free floating (for details see text).
- *A. selini*, neotipo, (Germania, Sassonia, Kleinsaubernitz, e.l. *Selinum carvifolium* 06.VI.2011, leg. & cult. F. Graf, Gp. DEEUR 1862 P. Buchner, coll. TLMF): visione ventrale dello gnathos, valva non aperta, non fissata (si veda il testo per i dettagli).

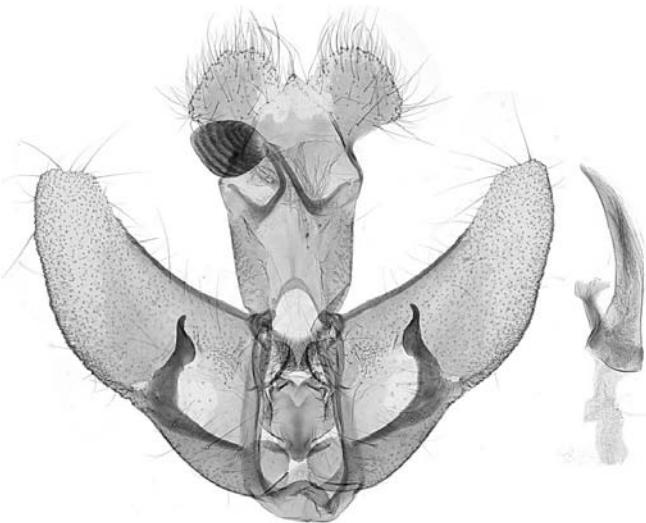


Fig 11 - *A. selini*, valva with well formed cuiller (Italy, Toscana, Badia della Valle, leg. A. Usvelli, Gp DEEUR 1195 P. Buchner, barcode TLMF-Lep-07083, coll. MFSN).
- *A. selini*, valva con cuiller ben formato (Italia, Toscana, Badia della Valle, leg. A. Usvelli, Gp DEEUR 1195 P. Buchner, barcode TLMF-Lep-07083, coll. MFSN).

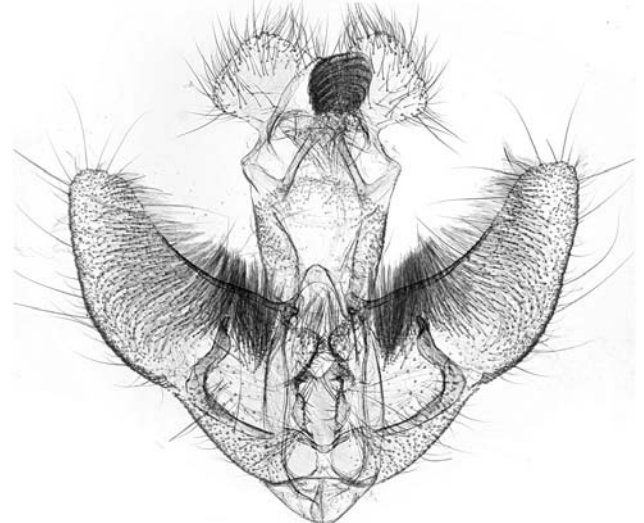


Fig. 12 - *A. selini*, valva not cleaned to show position and density of scales, not in Euparal (Italy, Veneto, Mt. Baldo, e.l. *Ligusticum lucidum*, end of May 1961, leg. & cult. K. Burmann, Gp. DEEUR 1579 P. Buchner, coll. TLMF).
- *A. selini*, valva non ripulita per mostrare posizione e densità delle scaglie, non in Euparal (Italia, Veneto, M. Baldo, e.l. *Ligusticum lucidum*, fine maggio 1961, leg. & cult. K. Burmann, Gp. DEEUR 1579 P. Buchner, coll. TLMF).

separate a single specimen from the similar species *A. parilella*, *A. lessini* sp.n. and *A. paraselini* sp.n. based on external characters. But there are tendencies, which may help to select specimens for dissection:

A. lessini sp. n. corresponds in most details with *A. selini*, but the third segment of the palp usually has distinct blackish areas, which may form a dark ring, and

the ground colour of forewings tends more to violet. For details see the description below.

A. paraselini sp. n. is usually darker, smaller and forewing patterns reduced to central dot, but external features are overlapping. But male and female genitalia are clearly different, so for further details see description of this species.

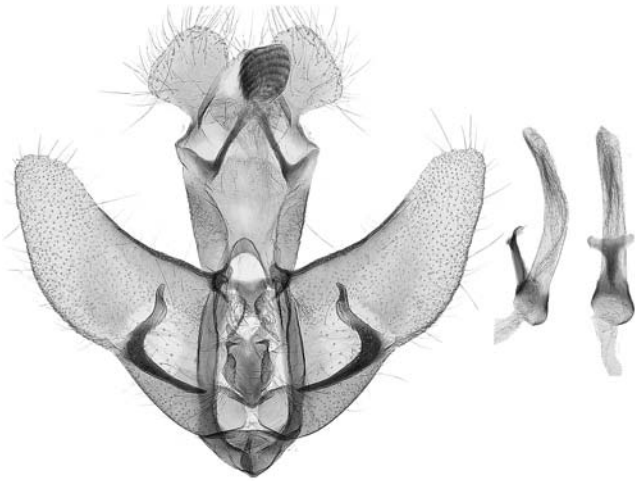


Fig. 13 - Same specimen as fig. 12, valva cleaned, phallus in lateral and ventral view.
- Stesso esemplare di fig. 12, valva ripulita, phallus in visione laterale e ventrale.

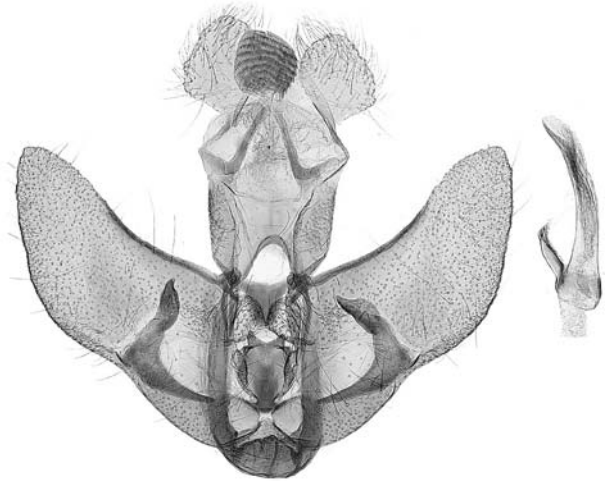


Fig. 14 - *A. selini*, valva with somewhat malformed cuiller (Slovakia, Michalovce, leg. K. Larsen, Gp. DEEUR 2809 P. Buchner).
- *A. selini*, valva con cuiller piuttosto malformato (Slovacchia, Michalovce, leg. K. Larsen, Gp. DEEUR 2809 P. Buchner).



Fig. 15 - *A. selini* (Italy, Veneto, Mt. Baldo, e.l. *Ligusticum lucidum* end of May 1961, leg. & cult. K. Burmann, Gp. DEEUR 1579 P. Buchner, coll. TLMF): valva not opened, free floating, general lateral view.
- *A. selini* (Italia, Veneto, M. Baldo, e.l. *Ligusticum lucidum*, fine maggio 1961, leg. & cult. K. Burmann, Gp. DEEUR 1579 P. Buchner, coll. TLMF): valva non aperta, non fissata, visione laterale generale.

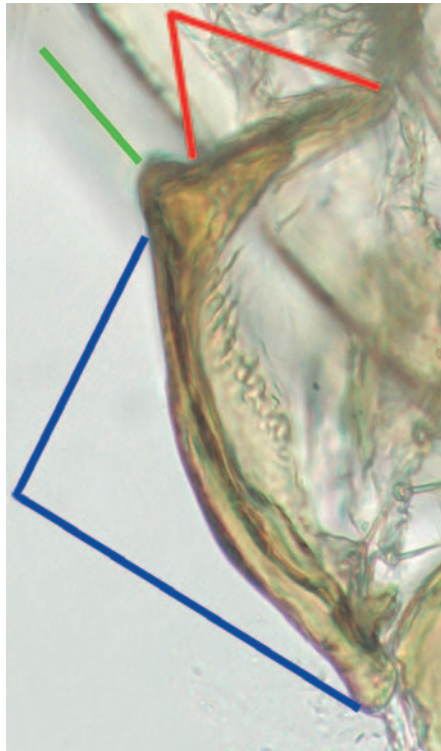
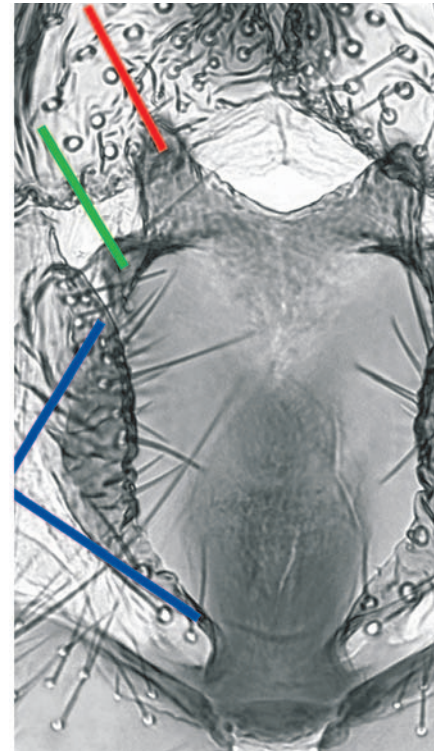


Fig. 16 - *A. selini* (Italy, Veneto, Mt. Baldo, e.l. *Ligusticum lucidum* end of May 1961, leg. & cult. K. Burmann, Gp. DEEUR 1579 P. Buchner, coll. TLMF): anellus and anellus processes in natural position compared with position in standard preparation; blue lines: anellus, green: sclerotized upper edges of anellus (common structure in *Agonopterix*), red: "bicorned" process of anellus (structure which is often distinct in *A. alpigena/selini* - group, but with wide intraspecific variability), in natural position nearly perpendicular to anellus. Apparently, this structure forms a guiding channel for the phallus.



- *A. selini* (Italia, Veneto, M. Baldo, e.l. *Ligusticum lucidum*, fine maggio 1961, leg. & cult. K. Burmann, Gp. DEEUR 1579 P. Buchner, coll. TLMF): anellus e processi dell'anellus in posizione naturale a confronto con la posizione in preparazione standard; linee blu: anellus, verdi: bordi superiori sclerotizzati dell'anellus (struttura comune in *Agonopterix*), rosse: processo bicornuto dell'anellus (struttura spesso distinta nel gruppo *A. alpigena/selini*, ma con ampia variabilità intraspecifica), in posizione naturale quasi perpendicolare all'anellus. Apparentemente, questa struttura costituisce un canale guida per il phallus.

A. parilella is slightly smaller, but over a wingspan of 15-18 mm the size ranges are overlapping. Head, thorax and basal field usually more unicolorous, most often yellow or sometimes pinkish, rusty brown areas on thorax small or absent and in basal field only in a small area on costa or absent. The fusiform and therefore completely different shape of gnathos (fig. 65), which is sometimes visible in dried specimens without any further preparation, offers the chance of certain determination sometimes even without full dissection. Therefore, this species is not discussed in more detail below.

Male genitalia

Cuiller: Form of cuiller is unique in European species of *Agonopterix*, at least in the specimens in which it is well formed: distinctly swollen shortly above the middle, bulge predominantly extending proximally, curved inward and tapering toward the end to a rather sharp tip, somewhat resembling a raptor's claw. In some specimens, however, the cuiller is more or less malformed (so it was in 6 of 20 males which were dissected in preparing this paper, example see fig. 14). If "malformed" describes the situation correctly is debatable, but most of these specimens showed left and right cuiller formed somewhat differently, i.e. asymmetric, so I see no reason to avoid this word. But always the basic structure was recognizably visible.

Outline of valva: distal half of valva not parallel-sided, compare description of *A. lessini* sp.n.

Gnathos: it appears more or less round in standard preparation, but not necessarily evenly rounded, more often it is somewhat square (figs 12-14) or a little elongated (fig. 9). But important to say, this is the lateral outline! To show the natural position of gnathos, a photo from unopened valva-complex from ventral side was taken (fig. 10). This is a very labile position, and therefore it is nearly impossible to use stacking technique, which results in the poor quality of the photo. But it is enough to demonstrate, the gnathos is in fact a disc. (For further details see "Material and methods").

Socii: large, with a square outline, gnathos - if in upright position - reaching or nearly reaching upper edge in standard preparation (figs 9 and 12-14). Ratio not clear if gnathos is turned downward (fig. 11).

Anellus: with the bilobed process toward the transtilla, as usual in the *A. alpigena/selini* - group (figs 15-17). (For further details see "Material and methods").

Transtilla and transtilla lobes: Transtilla strongly broadened in central part, bulged toward vinculum, transtilla lobes large, touching each other or nearly so, upper parts overlap transtilla and lower parts overlap anellus process (but compare remarks under "anellus" in "Material and methods").

Remark on HANNEMANN's drawing of male genitalia: HANNEMANN dissected "2 males from Braunschweig and 3 males from Vienna (Mus. Berlin)" (HANNEMANN 1953). The three slides from Vienna and one from Braunschweig have been found in MFN. All slides from Vienna represent *A. paraselini* sp.n., the one from Braunschweig is *A. selini*, but it is a specimen with malformed cuiller. Hannemann obviously also realized that the genitalia are malformed, but without realizing that the specimens from Vienna and the one from Braunschweig represent different species. As a basis for his (simplified) drawing he must have selected the preparations from Vienna only, because blunt cuiller and small transtilla lobes match *A. paraselini* sp.n. well. The gnathos in his drawing is nearly globose (not oblique elliptic) and therefore strongly simplified, neither matching *A. paraselini* sp.n. nor *A. selini*. This drawing was used unchanged in HANNEMANN (1995).

Female genitalia (figs 18-20, 23)

Anterior margin of sternite VIII somewhat extended towards the bursa, either with straight margins on each side and forming an angle of about 130° (fig. 20) or anterior margin extended towards the bursa only in central part by forming a bulge (fig. 19) or intermediate (fig. 18), ostium starting from anterior margin, elongate, its lateral folds reaching nearly to the posterior margin of sternite VIII, somewhat resembling the flame of a candle (figs 18-19), but lateral folds not always present in this shape, which may at least in part depend on preparation artefacts (fig. 20). Ductus seminalis with about 8 turns. Ductus bursae rather stout with structures common in genus *Agonopterix*, widening a little in its course. Corpus bursae of average size (diameter about 2/3 lateral extension of VIII sternite in standard preparation, i.e. dorsoventrally flattened), signum broad oval (lateral/longitudinal extension about 1-1.5), of average size (maximum diameter about 30-40 % of diameter of bursa).

If the ostium appears in the typical elongated form (figs 18-19), *A. selini* is easily discernible from externally similar species, e.g. *A. parilella*, *A. paraselini* sp.n. and *A. lessini* sp.n. If the ostium region does not appear in the typical form (fig. 20), its position at the anterior margin and the extension of the anterior margin toward bursa may help in the identification of specimens. Against *A. parilella* most helpful is the number of turns of ductus seminalis: 8 in *A. selini* (fig. 18) and 4-4 ½ in *A. parilella* (fig. 21).

Molecular data (neighbour-joining tree see fig. 48)

Barcoded material:

TLMF Lep 17710 (658 bp., ♂, Romania, Rimetra, 46.383° N; 23.583° E, 31.V.2009, leg. O. Karsholt, coll. ZMUC).

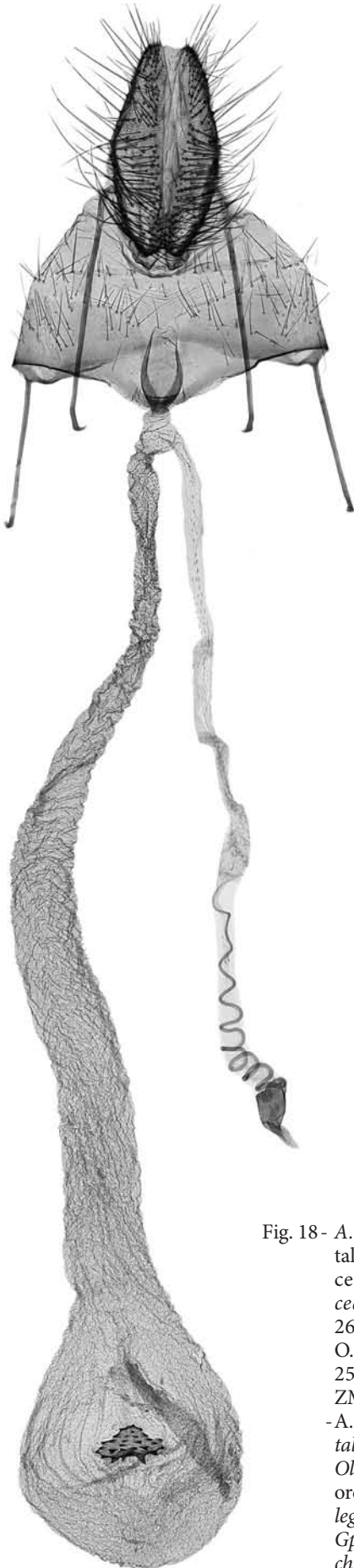


Fig. 18- *A. selini*, female genital, general view (Greece, Olympos, e.l. *Peucedanum oreoselinum*, 26.V.1990, leg. & cult. O. Karsholt, Gp. DEEUR 2544 P. Buchner, coll. ZMUC).
 - *A. selini*, visione del genitale femminile, (Grecia, Olimpo, e.l. *Peucedanum oreoselinum*, 26.V.1990, leg. & cult. O. Karsholt, Gp. DEEUR 2544 P. Buchner, coll. ZMUC).



Fig. 19- *A. selini*, female genital, VIII segment with ostium region in detail (Greece, Olympos, e.l. *Peucedanum oreoselinum* 22.VI.1957, leg. Thurner, Gp. DEEUR 2078 P. Buchner, coll. ZSM).
 - *A. selini*, genitale femminile, VIII segmento con dettaglio della regione dell'ostium (Grecia, Olimpo, e.l. *Peucedanum oreoselinum*, 22.VI.1957, leg. Thurner, Gp. DEEUR 2078 P. Buchner, coll. ZSM).

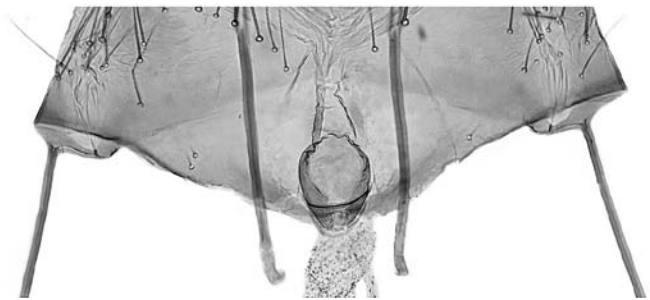


Fig. 20- *A. selini*, VIII segment with ostium region in detail. (Italy, Friuli V.G., Venzona, e.l. *Peucedanum oreoselinum* 07.VI.2010, leg. & cult. P. Sonderegger, Gp. DEEUR 2139 P. Buchner).
 - *A. selini*, VIII segmento con dettaglio della regione dell'ostium (Italia, Friuli V.G., Basovizza, e.l. *Peucedanum oreoselinum* 07.VI.2010, leg. & cult. P. Sonderegger, Gp. DEEUR 2139 P. Buchner).

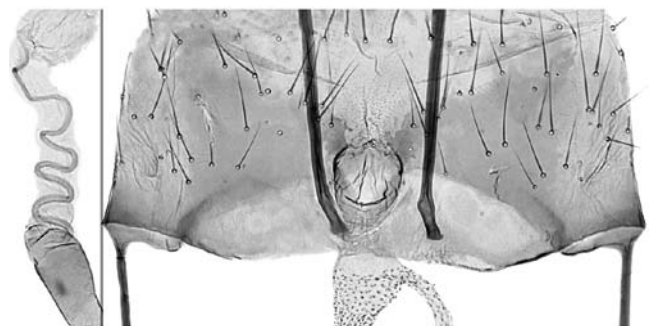


Fig. 21- *A. parilella*, VIII segment with ostium region in detail + ductus seminalis (Slovenia, Studor, 4.VIII.1999, leg. F. Graf, Gp. DEEUR 1111 P. Buchner).
 - *A. parilella*, VIII segmento con dettaglio della regione dell'ostium + ductus seminalis (Slovenia, Studor, 04.VIII.1999, leg. F. Graf, Gp. DEEUR 1111 P. Buchner).

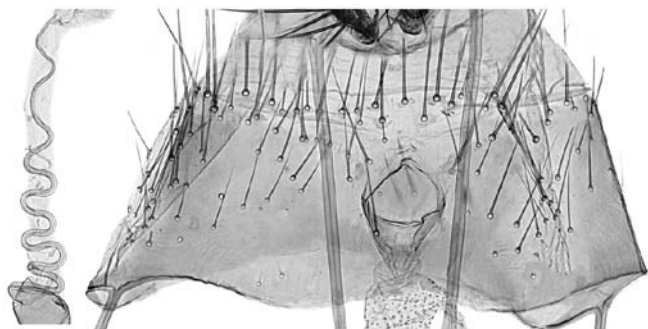


Fig. 22 - *A. paraselini* sp.n. (described in this paper), VIII segment with ostium region in detail (Lower Austria, Neusiedel/Zaya, e.l. *Peucedanum cervaria* 06.VI.2014, leg. cult. & Gp. DEEUR 2121 P. Buchner).

- *A. paraselini* sp.n. (descritta nel presente articolo), VIII segmento con dettaglio della regione dell'ostium (Bassa Austria, Neusiedel/Zaya, e.l. *Peucedanum cervaria* 06.VI.2014, leg. cult. & Gp. DEEUR 2121 P. Buchner).

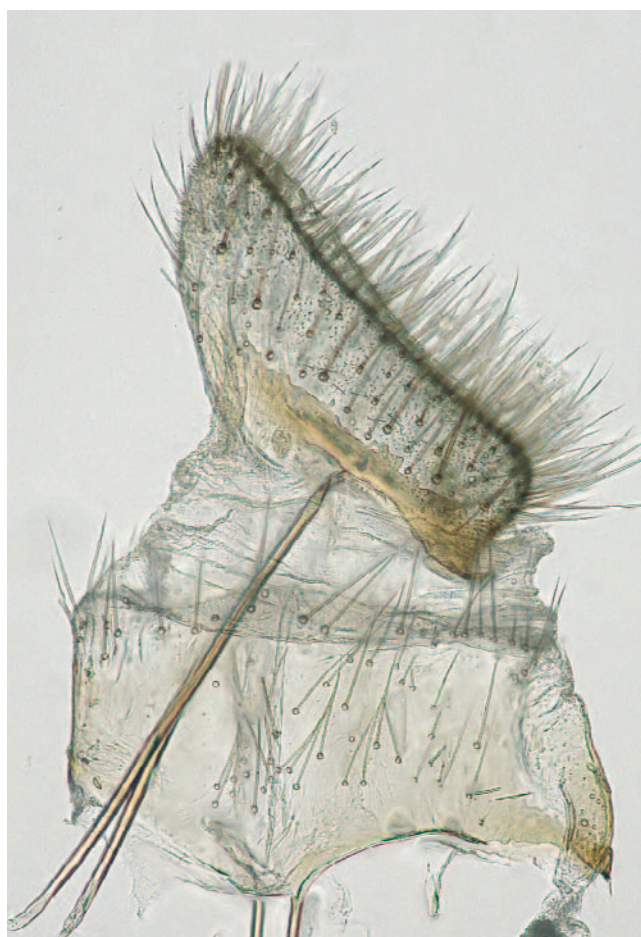


Fig. 23 - *A. selini*, sternite VIII + papillae anales in lateral view, free floating (Germany, Saxonia, Kleinsaubernitz, e.l. *Selinum carvifolium* 05.VI.2011, leg., cult. & coll. F. Graf, Gp. DEEUR 1870 P. Buchner).

- *A. selini*, sternite VIII + papillae anales in visione laterale, non fissato (Germania, Sassonia, Kleinsaubernitz, e.l. *Selinum carvifolium*, 05.VI.2011, leg., cult. & coll. F. Graf, Gp. DEEUR 1870 P. Buchner).

TLMF Lep 07092 (658 bp., ♂, Croatia, South Velebit, 44.283° N; 15.467° E, 17.VIII.2007, leg. & coll. L. Srnka, gen. prep. DEEUR 0966 P. Buchner).

TLMF Lep 07105 (658 bp., ♂, Croatia, South Velebit, 44.283° N; 15.467° E, 17.VIII.2007, leg. & coll. L. Srnka, gen. prep. DEEUR 0995 P. Buchner).

TLMF Lep 07166 (658 bp., ♂, Italy, Toscana, Badia della Valle, 44.083° N; 11.617° E, 04.VIII.1999, leg. A. Usvelli, gen. prep. DEEUR 1436 P. Buchner, coll. MFSN).

TLMF Lep 07083 (604 bp., ♂, Italy, Toscana, Badia della Valle, 44.083° N; 11.617° E, 22.VIII.2003, leg. A. Usvelli, gen. prep. DEEUR 1195 P. Buchner, coll. MFSN).

TLMF Lep 19025 (658 bp., ♂, Turkey, Ankara, Camildere, 40.483° N; 32.467° E, 08.VIII.1993, leg. F. Schepler, gen. prep. DEEUR 2353 P. Buchner coll. ZMUC).

TLMF Lep 16452 (658 bp., ♂, Greece, Filipei, Voria Pindos, 40.083° N; 21.433° E, 29.VII.2013, leg. & coll. J. Viehmann, gen. prep. DEEUR 1931 P. Buchner).

TLMF Lep 19169 (540 bp., ♂, Spain, Teruel, Sierra de Javalambre, 40.1° N; 1° W, 17.VIII.2007, leg. & coll. J. Šumpich).

Related species

Neighbour-joining analysis shows *Agonopterix alpigena* as the nearest neighbour with 1.85% p-distance. Further species which are near *A. selini* according to barcode are *A. lessini* sp.n. (described in this paper), *A. ferulae* and *A. socerbi*. That there exists a closer relatedness among these species is also supported by the presence of a bicorned process of the anellus toward the transtilla in male genitalia (e.g. fig. 16, but note, this structure shows a large variability within every species) and very large transtilla lobes, which overlap the transtilla. Together with *A. cachritis*, a species so far without barcode data, but also with corresponding features in male genitalia, these species can be grouped in an informal “*selini/alpigena*-species group”. The externally similar species *A. parilella*, *A. angelicella* and *A. paraselini* sp.n. (described in this paper) do not belong to this group.

Distribution

Specimens which have been checked by dissection or barcoding, have been obtained from Austria, Croatia, Finland, France, Germany, Greece, Hungary, Italy, Romania, Slovakia, Slovenia, Spain and Turkey.

Biology

Caterpillars had been found on and reared with *Peucedanum palustre* (Finland), *Selinum carvifolium* (Germany), *Peucedanum oreoselinum* (Italy, Greece) and *Ligusticum lucidum* (Italy). All specimens stored

in NHMV and TLMF under *A. selini*, which were reared from *P. cervaria* (Lower Austria: Mödling, Gramatneusiedel, Neusiedel/Zaya) and the specimens collected as larvae in Switzerland from *P. cervaria* by P. Sonderegger, turned out to be *A. paraselini* sp.n. During preparation of this paper, no specimen of *A. selini* has been found which was reared from *P. cervaria*. Heinemann mentioned in the original description "Schläger fand die Raupen bei Jena an *Athamantha cervaria* [*Peucedanum cervaria*]..." But these specimens could not be checked. Therefore at present it remains doubtful if *P. cervaria* is a food-plant of *A. selini* at all.

Agonopterix lessini sp. n.

Material

Holotype:

♀: Italy, Veneto, Verona: Monte di Sant'Ambrogio Valpolicella, 45°34'01" N; 10°49'52,65" E, 418 m asl, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, Gp. DEEUR 1578 P. Buchner, coll. TLMF.

Paratypes:

1♂, 1♀: Croatia, South Velebit, 26.VIII.2011 / 24.VIII.2012, Gp. DEEUR 1171 P. Buchner, leg. & coll. I. Richte.
1♂: France, Taurinya, 03.VII.1996, coll. J. Nel.

1♂: France, Col de Braus, 23.VIII.1964, Gp. DEEUR 2131 P. Buchner, leg. F. Dujardin, coll. TLMF.
2♂♂: Greece, Delphi, 10.X.1983 / 20.V.1995, Gp. DEEUR 1877 P. Buchner, leg. & coll. Th. Grünwald
1♂, 1♀: Greece, Kriti, Rethymnon, 24.IV.1996, e.l. *Ferulago* sp., Gp. DEEUR 2543 P. Buchner, leg. R. Johansson., coll. ZMUC.
1♂: Greece, Epirus, 24.VI.2012, Gp. DEEUR 1970 P. Buchner, barcode TLMF-Lep16456, leg. & coll. H. Blackstein.
1♂: Greece, Omalos, 20.VI.2014, Gp. DEEUR 3049 P. Buchner, leg. C. Hviid et al., coll. K. Larsen.
1♀: Italy, Veneto, Verona: Monte di Sant'Ambrogio Valpolicella, 20.IX.1984, leg. K. Burmann, coll. TLMF.
4♂♂, 1♀: Italy, Veneto, Verona: Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 20-29.VI.1986, leg. K. Burmann, coll. TLMF.
1♀: Italy, Verona, Monte di Sant'Ambrogio Valpolicella, 06.IX.1988, leg. K. Burmann, coll. TLMF.
2♂♂, 1♀: Italy, Friuli V.G., Carso Goriziano, 17.VIII.1992 / 24.VIII.2010, leg. & coll. L. Morin.
1♂: Italy, Friuli V.G., Monfalcone, 10.IX.1993, leg. T. Mayr, coll. TLMF.
1♂: Italy, Veneto, Verona: Monte di Sant'Ambrogio Valpolicella, 16.VI.1995, leg. & coll. T. Mayr, Gp. DEEUR 1822 P. Buchner.



Fig. 24- *A. lessini* sp.n., upper side: holotype, ♀ (Italy, Veneto, Verona: Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, Gp. DEEUR 1578 P. Buchner, coll. TLMF).
- *A. lessini* sp.n., lato superiore: olotipo, ♀ (Italia, Veneto, Verona: Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, Gp. DEEUR 1578 P. Buchner, coll. TLMF).



Fig. 25 - *A. lessini* sp.n., upper side, ♂ (Italy, Veneto, Verona: Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 20.VI.1986, leg. K. Burmann, coll. TLMF).
- *A. lessini* sp.n., lato superiore, ♂ (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 20.VI.1986, leg. K. Burmann, coll. TLMF).



Fig. 26 - *A. lessini* sp.n., upper side, ♂ (Greece, Epirus, Zagoria, 24.VI.2012, leg. & coll. H. Blackstein, Gp. DEEUR 1970 P. Buchner, barcode TLMF-Lep16456).
- *A. lessini* sp.n., lato superiore, ♂ (Grecia, Epiro, Zagoria, 24.VI.2012, leg. & coll. H. Blackstein, Gp. DEEUR 1970 P. Buchner, barcode TLMF-Lep16456).



Fig. 27 - *A. lessini* sp.n., upper side, ♂ (Greece, Kriti, Rethymnon, e.l. *Ferulago* sp. 24.IV.1996, leg. R. Johansson, Gp. DEEUR 2543 P. Buchner, coll. ZMUC).
- *A. lessini* sp.n., lato superiore, ♂ (Grecia, Creta, Rethymnon, e.l. *Ferulago* sp. 24.IV.1996, leg. R. Johansson, Gp. DEEUR 2543 P. Buchner, coll. ZMUC).



Fig. 28 - *A. lessini* sp.n., upper side; ♂, rather worn autumn specimen (Italy, Veneto, Verona: Monte di Sant'Ambrogio Valpolicella, 12.IX.2010, leg. H. Deutsch, Gp. DEEUR 1546 P. Buchner, coll. MFSN).
- *A. lessini* sp.n., lato superiore, ♂, esemplare autunnale usurato (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 12.IX.2010, leg. H. Deutsch, Gp. DEEUR 1546 P. Buchner, coll. MFSN).



Fig. 29 - *A. lessini* sp.n., lower side, ♂ (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, coll. TLMF).
- *A. lessini* sp.n., lato inferiore, ♂ (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, coll. TLMF).



Fig. 30 - *A. lessini* sp.n., detail views of palp, ♂ (Greece, Kriti, Rethymnon, e.l. *Ferulago* sp. 24.IV.1996, leg. R. Johansson, Gp. DEEUR 2543 P. Buchner, coll. ZMUC).
- *A. lessini* sp.n., dettaglio dei palpi, ♂ (Grecia, Creta, Rethymnon, e.l. *Ferulago* sp. 24.IV.1996, leg. R. Johansson, Gp. DEEUR 2543 P. Buchner, coll. ZMUC).



Fig. 31 - *A. lessini* sp.n., detail views of palp: holotype, ♀ (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, Gp. DEEUR 1578 P. Buchner, coll. TLMF).
- *A. lessini* sp.n., dettaglio dei palpi: olotipo, ♀ (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, Gp. DEEUR 1578 P. Buchner, coll. TLMF).



Fig. 32 - *A. lessini* sp.n., detail views of palp, ♂ (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, coll. TLMF).
- *A. lessini* sp.n., dettaglio dei palpi, ♂ (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, coll. TLMF).

3 ♀♀: Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 10.X.1997, coll. R. Keller.

2 ♂♂, 1 ♀: Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 15.IX.2001, leg. & coll. T. Mayr, Gp. DEEUR 1768 P. Buchner.

1 ♀: Italy, Verona, Monte di Sant'Ambrogio Valpolicella, 05.X.2001, leg. Schütze, coll. R. Keller.

1 ♂: Italy, Toscana, Marradi, 02.VIII.2002, leg. A. Usvelli, coll. MFSN.

1 ♂: Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 01.IX.2006, leg. May, coll. R. Keller, Gp. DEEUR 0674 P. Buchner.

4 ♂♂: Italy, Friuli V.G., Carso Triestino, 27.-28. VIII.2009 /08.IX.2011, leg. & coll. L. Morin.



Fig. 33 - *A. lessini* sp.n., lateral view, ♂ (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, coll. TLMF).
- *A. lessini* sp.n., visione laterale, ♂, (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, coll. TLMF).



Fig. 34 - *A. lessini* sp.n., lateral view, ♂ (Greece, Kriti, Rethymnon, e.l. *Ferulago* sp. 24.IV.1996, leg. R. Johansson, Gp. DEEUR 2543 P. Buchner, coll. ZMUC).
- *A. lessini* sp.n., visione laterale, ♂ (Grecia, Creta, Rethymnon, e.l. *Ferulago* sp. 24.IV.1996, leg. R. Johansson, Gp. DEEUR 2543 P. Buchner, coll. ZMUC).

- 1 ♂: Italy, Verona, Monte di Sant'Ambrogio Valpolicella, 12.IX.2010, leg. H. Deutsch, Gp. DEEUR 1546 P. Buchner, barcode TLMF-Lep1795, coll. MFSN.
1 ♂: Italy, Verona, Monte di Sant'Ambrogio Valpolicella, 21.V.2011, leg. & coll. C. Morandini, Gp. DEEUR 1548 P. Buchner.
1 ♂: Italy, Verona, Monte di Sant'Ambrogio Valpolicella, 11.IX.2011, leg. H. Deutsch, coll. MFSN.
1 ♂, 1 ♀: Italy, Verona, Monte di Sant'Ambrogio Valpolicella, 05.VI.2015, leg. & coll. H. Deutsch.
1 ♀: Slovenia, Mt. Nanos, 22.VIII.2015, Gp. DEEUR 4209 P. Buchner, leg. & coll. L. Morin.
1 ♂: Turkey, Erzurum, Kop gecidi, 16.IX.1993, Gp. DEEUR 2276 P. Buchner, barcode TLMF-Lep19001, leg. M. Fibiger, coll. ZMUC.

Diagnosis

Externally similar to *A. selini*, *A. parilella* and *A. paraselini* sp.n. and not possible to identify with certainty

based on external characters only, but there are tendencies: *A. selini* corresponds in most details, but third segment of the palp with distinct blackish areas (without dark areas in *A. selini*), and the brown ground colour of forewings tends more to violet than in *A. selini*. *A. parilella* and *A. paraselini* sp.n. are a little smaller in average size, but overlapping over 14-18 mm. Ground colour of *A. parilella* and *A. paraselini* sp.n. usually dark brown.

Male genitalia show clear differences: *A. parilella* has a fusiform, therefore completely different shape of gnathos (fig. 65), which is sometimes visible in dried specimens without any further preparation and offers the chance of certain identification without full dissection. *A. selini* has very distinct and clearly different cuiller (figs 9 and 11-14), and in *A. paraselini* sp.n., the transtilla lobes are rather small, not overlapping the transtilla, and the cuiller is less tapering and straight in the last one-third (figs 62-63).

Female genitalia also show differences: Ostium in *A. lessini* sp.n. circular, with fine, sharp outline

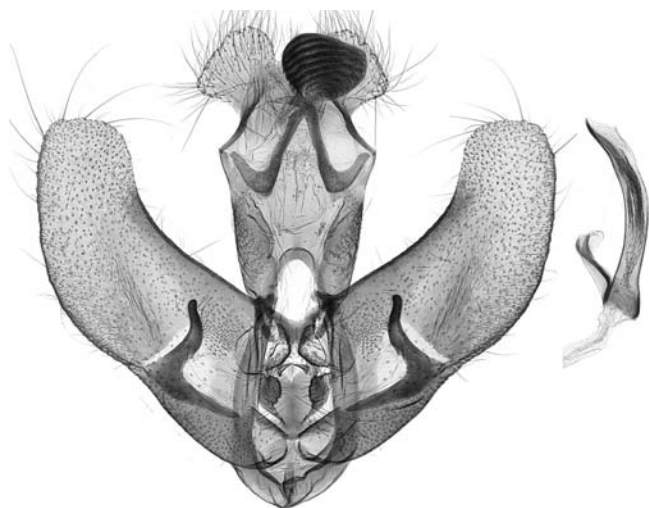


Fig. 35 - *A. lessini* sp.n., male genitalia, general view (Italy, Friuli V.G., Carso Goriziano, 24.VIII.2010, leg. & coll. L. Morin, Gp. DEEUR 1345 P. Buchner).
- *A. lessini* sp.n., genitali maschili, visione generale (Italia, Friuli V.G., Carso Goriziano, 24.VIII.2010, leg. & coll. L. Morin, Gp. DEEUR 1345 P. Buchner).

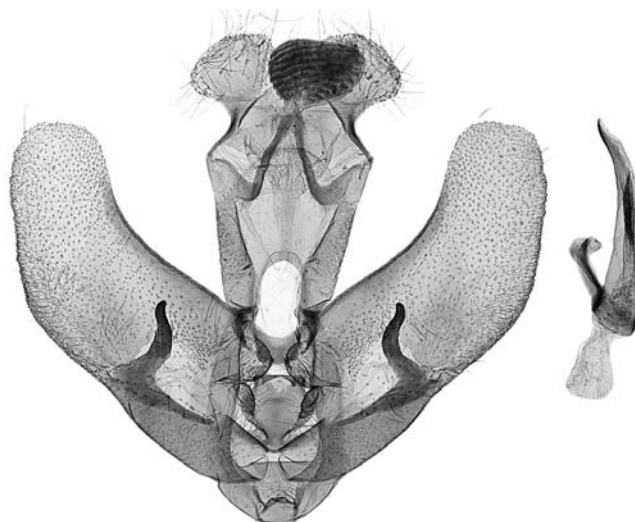


Fig. 37 - *A. lessini* sp.n., male genitalia, general view (Italy, Friuli V.G., Carso Triestino, 08.IX.2011, leg. & coll. L. Morin, Gp. DEEUR 1558 P. Buchner).
- *A. lessini* sp.n., genitali maschili, visione generale (Italia, Friuli V.G., Carso Triestino, 08.IX.2011, leg. & coll. L. Morin, Gp. DEEUR 1558 P. Buchner).

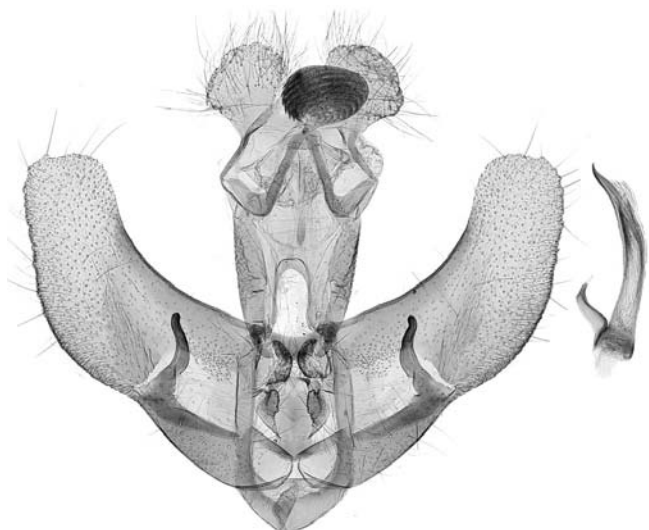


Fig. 36 - *A. lessini* sp.n., male genitalia, general view (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 15.IX.2001, leg. & coll. T. Mayr, Gp. DEEUR 1768 P. Buchner).
- *A. lessini* sp.n., genitali maschili, visione generale (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 15.IX.2001, leg. & coll. T. Mayr, Gp. DEEUR 1768 P. Buchner).



Fig. 38 - *A. lessini* sp.n., male genitalia, valva not cleaned to show the position of scales (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 01.IX.2006, leg. May, coll. R. Keller, Gp. DEEUR 0674 P. Buchner).
- *A. lessini* sp.n., genitali maschili, valva non ripulita al fine di mostrare la posizione delle scaglie (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 01.IX.2006, leg. May, coll. R. Keller, Gp. DEEUR 0674 P. Buchner).

except on caudal edge (figs 42-44). In *A. selini* it is elongated (figs 18-20) and therefore clearly different. In *A. paraselini* sp.n., *A. angelicella* and *A. parilella*, it is of average shape for genus *Agonopterix*, and additionally, in *A. parilella* there are only four turns of ductus spermathecae, compared to about seven in *A. lessini* sp.n.

To show distinctive features of ostium/antrum region of *A. lessini* sp.n., it is best to compare with *A. paraselini* sp.n. and *A. angelicella* based on figures:

A. paraselini sp.n. (figs 45, a-b, fig. 47) and *A. angelicella* (fig. 45, c) show features found in several species of *Agonopterix*, and lacking details useful for species determination:

Ostium circular or nearly so, often somewhat irregular and distorted in standard preparation, caused by pressing the ventral part of ostium to VIII sternite in the preparation process; diameter about 15 % of width of VIII segment in standard preparation. Below it (in figures) the antrum, a triangle in standard preparation



Fig. 39 - *A. lessini* sp.n. (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 12.IX.2010, leg. H. Deutsch, Gp. DEEUR 1546 P. Buchner, barcode TLMF-Lep1795, coll. MFSN): valva not opened, free floating, to show the natural proportion of gnathos from ventral view.

- *A. lessini* sp.n. (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 12.IX.2010, leg. H. Deutsch, Gp. DEEUR 1546 P. Buchner, barcode TLMF-Lep1795, coll. MFSN): valva non aperta, non fissata, al fine di mostrare la naturale proporzione dello gnathos dalla visione ventrale.



Fig. 41 - *A. lessini* sp.n., data as fig. 40: phallus, not compressed, in lateral position.

- *A. lessini* sp.n., stessi dati della fig. 40: phallus, non compresso, in posizione laterale.



Fig. 40 - *A. lessini* sp.n. (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 12.IX.2010, leg. H. Deutsch, Gp. DEEUR 1546 P. Buchner, barcode TLMF-Lep1795, coll. MFSN): phallus, not compressed, in ventral position, to show the natural length/width ratio and shape of basal process.

- *A. lessini* sp.n. (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, 12.IX.2010, leg. H. Deutsch, Gp. DEEUR 1546 P. Buchner, barcode TLMF-Lep1795, coll. MFSN): phallus, non compresso, in posizione ventrale, al fine di mostrare il naturale rapporto lunghezza/larghezza e la forma del processo basale.

(a funnel tapering cranial in natural situation) with two fusiform structures laterally. Longitudinal extension of antrum exceeding width of ostium, fusiform structures predominately located in antrum.

In *A. lessini* sp.n. (fig. 45, d-e), ventral margin of ostium runs further below (in figure) (rsp. further cranial in natural position), therefore longitudinal extension of antrum is shorter than diameter of ostium and fusiform structures predominately located in ostium. The specific form of ostium also causes a shorter dorsoventral distance of lower edge of ostium to VIII sternite, so it usually does not become distorted when dorsoventrally flattened in preparation process, resulting in a more clear circular outline in final preparation. These features allow a determination of *A. lessini* sp.n. based on female genitalia.

Description

Imago (figs 24-34): Wingspan 16-20 mm (one specimen 14 mm, fig. 27). Head, thorax and tegulae yellow or rusty brown, with a tendency to being darker on the anterior part of thorax and tegulae. Labial palp: outer side of second segment reddish brown with dark scales interspersed, inner side pale, third segment pale yellowish, dark scales at base and above middle, sometimes forming distinct rings. Antenna: upper side blackish, lower side medium grey brown, markedly thicker in males than in females (as usual in the *selini/alpigena* group). Forewing: Ground colour usually reddish brown (figs 24-25 and 28), sometimes with violet tinge (figs 26-27), basal field

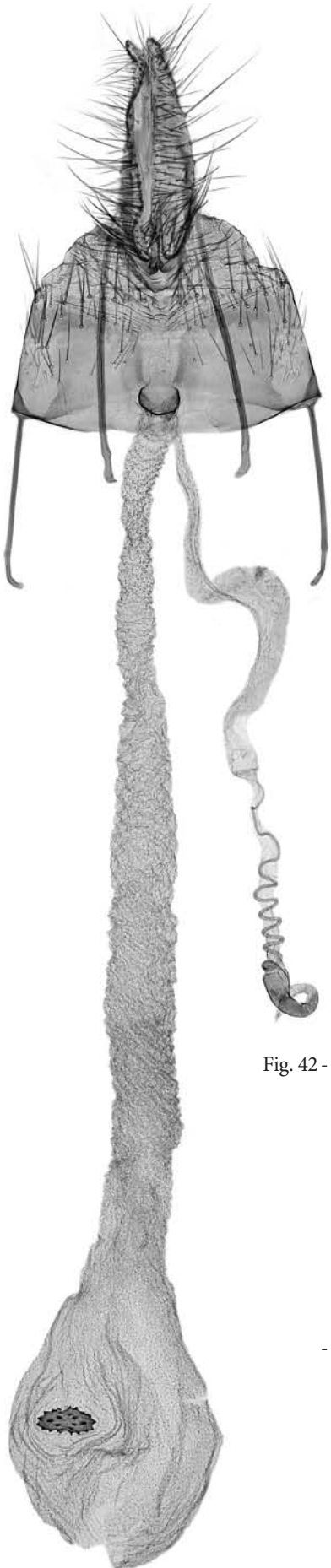


Fig. 42 - *A. lessini* sp.n., holotype, female genitalia in general view (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, Gp. DEEUR 1578 P. Buchner, coll. TLMF).
- *A. lessini* sp.n., olotipo, genitali femminili (Italia, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 24.VI.1986, leg. K. Burmann, Gp. DEEUR 1578 P. Buchner, coll. TLMF).

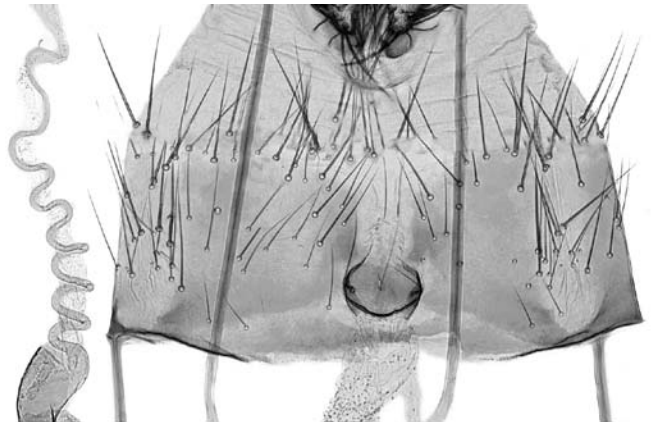


Fig. 43 - *A. lessini* sp.n., female genitalia, sternite VIII in detail + ductus seminalis (Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 29.VI.1986, leg. K. Burmann, Gp. DEEUR 2102 P. Buchner, coll. TLMF).
- *A. lessini* sp.n., genitali femminili, sternite VIII in dettaglio + ductus seminalis (Italia, Verona, Monte di Sant'Ambrogio Valpolicella, e.l. *Ferulago nodiflora* [*F. campestris*] 29.VI.1986, leg. K. Burmann, Gp. DEEUR 2102 P. Buchner, coll. TLMF).



Fig. 44 - *A. lessini* sp.n., female genitalia, sternite VIII in detail + ductus seminalis (Greece, Kriti, Rethymnon, 24.IV.1996, leg. R. Johansson, Gp. DEEUR 2542 P. Buchner, coll. ZMUC).
- *A. lessini* sp.n., genitali femminili, sternite VIII in dettaglio + ductus seminalis (Grecia, Creta, Rethymnon, 24.IV.1996, leg. R. Johansson, Gp. DEEUR 2542 P. Buchner, coll. ZMUC).

markedly paler, yellowish (figs 24 and 27), or reddish brown (figs 25-26). Central forewing pattern: outer pair of dots with always distinct white centred distal dot, proximal dot absent or indistinct and without white elements, rarely with white centre, this area often surrounded by a diffuse blackish field; inner pair of black dots present but rather indistinct, a few white scales especially on the distal side of the dots may be present or not.

Cilia concolorous with wings. Underside of forewing dark grey, only costa with some yellowish spots. Hindwing dark grey distally, moderately translucent at the base. Legs covered with a mix of dark grey and pale scales, percentage of dark scales varying individually (figs 33-34), tibia

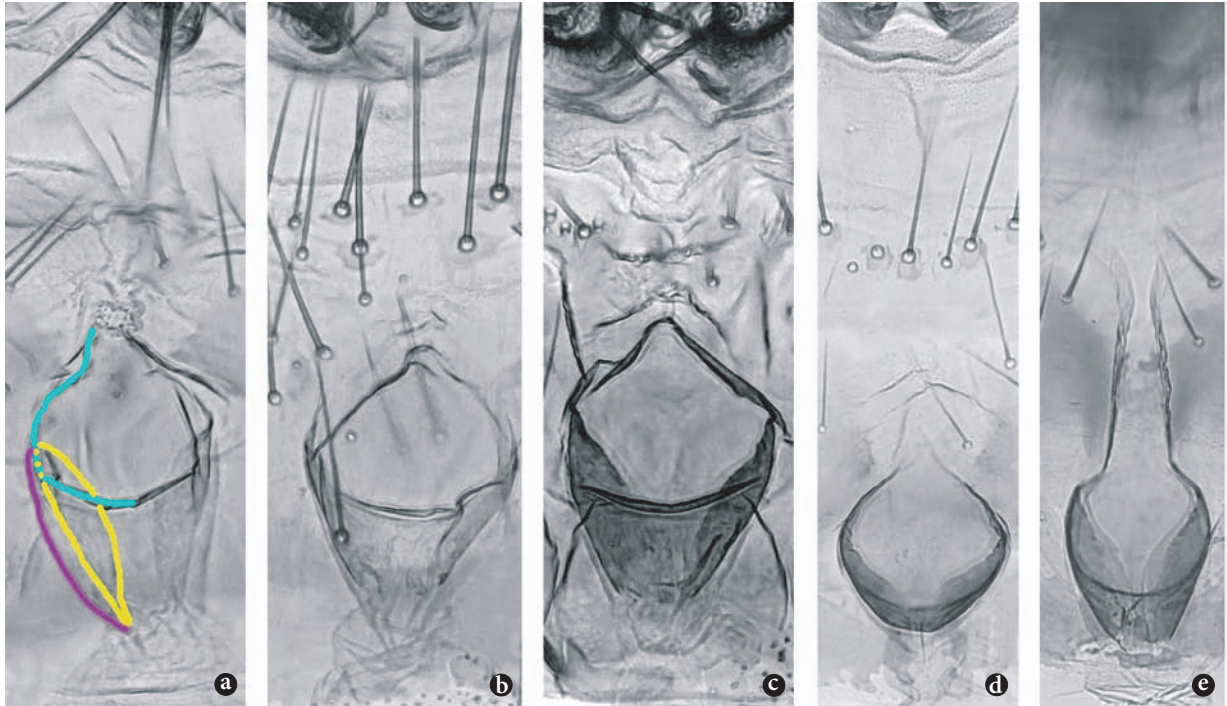


Fig. 45 - Comparison of ostium/antrum region in standard preparation, a-b: *A. paraselini* sp.n., c: *A. angelicella*, d-e: *A. lessini* sp.n. Colour lines in a: cyan=left half of ostium, magenta=left outline of antrum, yellow=left one of the two fusiform structures. - Confronto tra ostium e antrum in preparazione standard, a-b: *A. paraselini* sp.n., c: *A. angelicella*, d-e: *A. lessini* sp.n. Colori delle linee in a: ciano=metà sinistra dell'ostium, magenta=contorno sinistro dell'antrum, giallo= struttura fusiforme sinistra.



Fig. 46 - *A. lessini* sp.n., same specimen as fig. 42, sternite VIII + papillae anales in lateral view, free floating. - *A. lessini* sp.n., stesso esemplare della fig. 42, sternite VIII + papillae anali in visione laterale, non fissato.

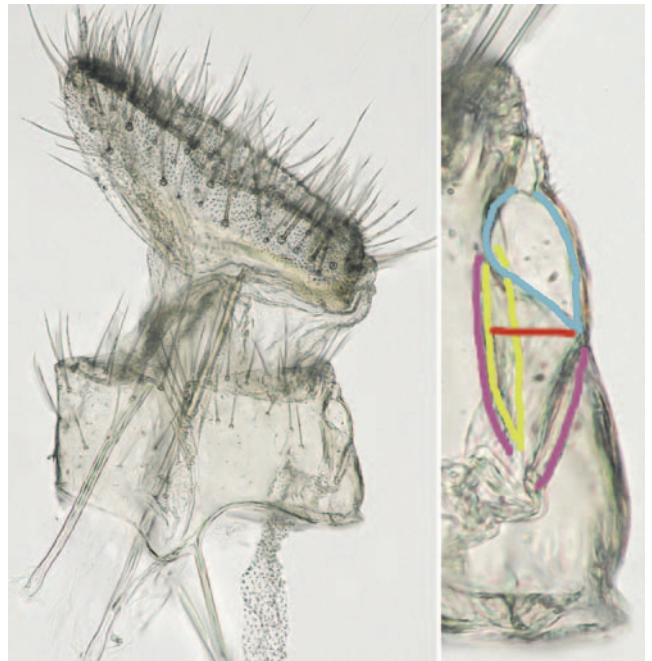


Fig. 47 - Ostium/antrum region of *A. paraselini* sp.n., lateral view in free floating genitalia. Colour lines as in fig. 45, red line shows dorsoventral distance of lower edge of ostium to VIII sternite, for further details see text.

- Ostium e antrum di *A. paraselini* sp.n., visione laterale del genitale non fissato. Colori delle linee come in fig. 45, la linea rossa mostra la distanza dorsoventrale del bordo inferiore dell'ostium all'VIII sternite, per ulteriori dettagli si veda il testo.

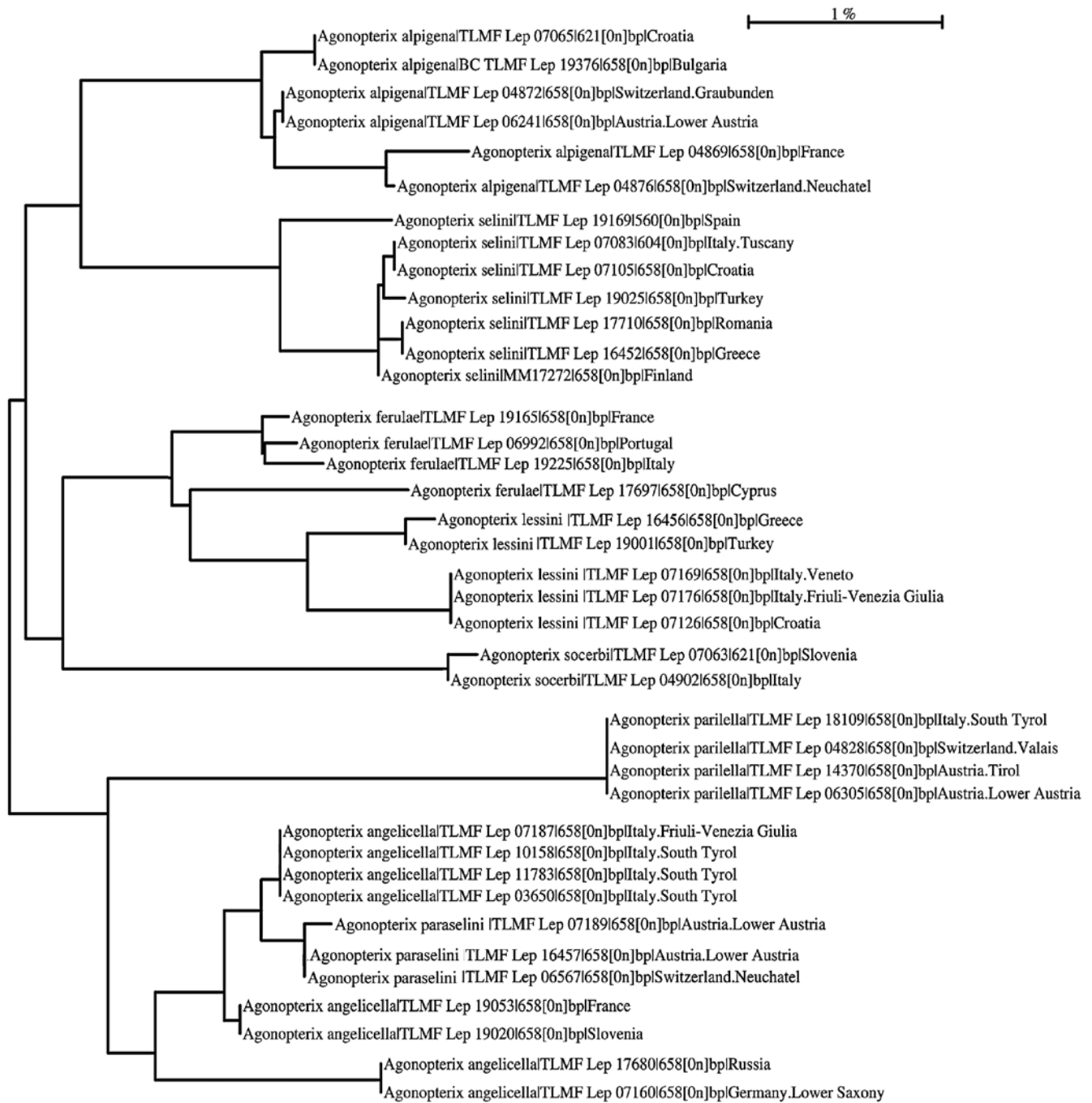


Fig. 48 - Neighbour-joining tree of *A. lessini* sp.n., *A. selini* and *A. paraselini* sp.n. and its closest clusters, including *A. angelicella* and *A. parilella*. Data accessible via http://www.boldsystems.org/index.php/Public_SearchTerms?query=DS-DEEUR326.

- Neighbour-joining tree di *A. lessini* sp.n., *A. selini* e *A. paraselini* sp.n. e dei clusters più prossimi, includenti *A. angelicella* e *A. parilella*. Dati accessibili via http://www.boldsystems.org/index.php/Public_SearchTerms?query=DS-DEEUR326.

of hindlegs with very long scales outside. Abdomen greyish, with broad dark line laterally on the ventral side (fig. 29).

Variation: ground colour of forewing varying from grey to reddish brown to very dark violet brown, forewing rarely unicolorous (fig. 27), more often irregular interspersed dark elements visible, variability of central forewing pattern as in general description. Head, thorax and basal field of forewing with different proportions of yellow areas.

Male genitalia

Cuiller: Length about two-thirds of the width of the valva, broad at the base, gradually becoming narrower, blunt, S-shaped, distal edge concave in the central half, proximal edge concave in the terminal one-fifth.

Outline of valva: very broad over all length, tapering only a little toward the middle, here bent inward approximately 35-40°, distal third parallel-sided or nearly so, ending very blunt.

Gnathos: about as broad as long in standard preparation, breadth/length ratio about 1:1 (figs 35-38). (For further details about shape of gnathos see “Material and methods”).

Socii: large, with a square outline, gnathos - if in upright position - nearly reaching the upper edge in standard preparation (figs 35-37). Ratio not clear if the gnathos is turned downward (fig. 38).

Anellus: with a bilobed process toward the transtilla, as usual in the *A. alpigena/selini* group, average size of this process within *A. lessini* sp.n. not as long and stout as e.g. in *A. selini*.

Transtilla and transtilla lobes: Transtilla strongly broadened in central part, bulged toward the vinculum, transtilla lobes large, touching each other or nearly so, upper parts overlap the transtilla and lower parts sometimes overlap the anellus process, depending on the anellus-transtilla distance, which shows large variability.

Phallus: slim (width about 10-12 % of its length), moderately curved in lateral view (about 30-35°, Figs 35-37 and 41), tapered to a sharp tip, basal process long (free part about one-third of phallus length), strongly broadened at the end in ventral view (fig. 40, note: basal process appears shorter in ventral than in lateral view, because in lateral view it is perpendicular to photo direction, but not in ventral view).

Female genitalia

Anterior margin of sternite VIII rather straight, ostium located in the anterior half of sternite VIII at some distance (about 1/2 of ostium diameter) to anterior margin, round, with narrow outline, outline not forming a complete ring but absent in the caudal margin of the ostium, from this area a diffuse pale (less sclerotized) field extends to the posterior margin of sternite VIII. Ductus seminalis with about seven turns. Ductus bursae rather stout with structures common in genus *Agonopterix*, widening a little in its course. Corpus bursae of average size (diameter about half to two-thirds of lateral extension of VIII sternite in standard preparation, i.e. dorsoventrally flattened), signum oval, about two times as broad as long, of average size (maximum diameter about 30-40 % of diameter of bursa).

Molecular data (neighbour-joining tree see fig. 48)

Barcoded material:

TLMF Lep 07169 (658 bp., ♂, Italy, Veneto, Verona, Monte di Sant’Ambrogio Valpolicella, Monti Lessini, 45.683° N; 11.217° E, 21.V.2011, leg. & coll. C. Morandini, gen. prep. DEEUR 1548 P. Buchner).

TLMF Lep 07176 (658 bp., ♂, Italy, Friuli V.G., Carso Triestino, Ceroglie, 45.733° N; 13.75° E, 08.IX.2011,



Fig. 49 - *A. paraselini* sp. n. (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 22.V. e.p. 16.VI.2011, holotype, coll. TLMF).
- *A. paraselini* sp. n. (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 22.V. e.p. 16.VI.2011, olotipo, coll. TLMF).

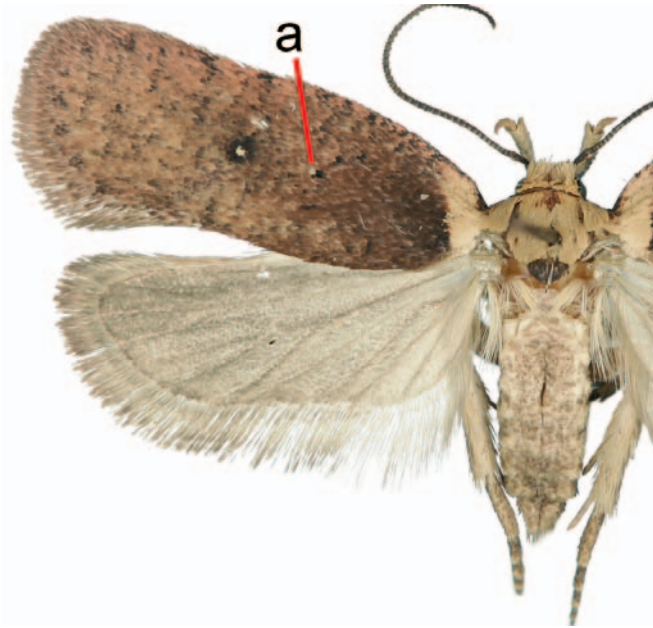


Fig. 50 - *A. paraselini* sp.n. (Switzerland, Neuenburg, Le Landeron, e.l. *Peucedanum cervaria*, leg. larva 27.V. 2005, leg., cult. & coll P. Sonderegger). For details see text under "Description".
 - *A. paraselini* sp.n. (Svizzera, Neuenburg, Le Landeron, e.l. *Peucedanum cervaria*, leg. larva 27.V.2005, leg., cult. & coll P. Sonderegger). Per i dettagli si veda il paragrafo "Description".



Fig. 51 - *A. paraselini* sp.n. (Lower Austria, Steinberg near Neusiedel/Zaya, e.l. *Peucedanum cervaria*, leg. larva 21.V., e.p. 06.VI.2014, leg., cult. & coll. P. Buchner).
 - *A. paraselini* sp.n. (Bassa Austria, Steinberg presso Neusiedel/Zaya, e.l. *Peucedanum cervaria*, leg. larva 21.V., e.p. 06.VI.2014, leg., cult. & coll. P. Buchner).

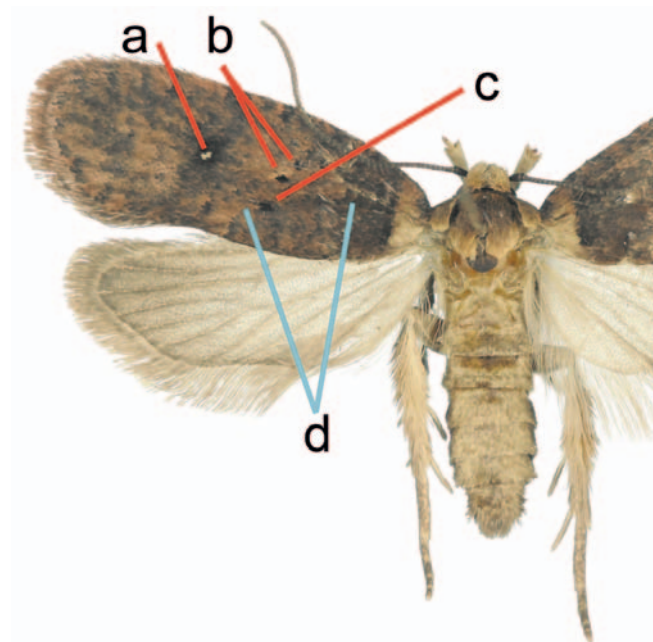


Fig. 52- *A. paraselini* sp.n. (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 17.V. e.p. 11.VI.2008). For details see text under "Description".
 - *A. paraselini* sp.n. (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 17.V. e.p. 11.VI.2008). Per i dettagli si veda il paragrafo "Description".

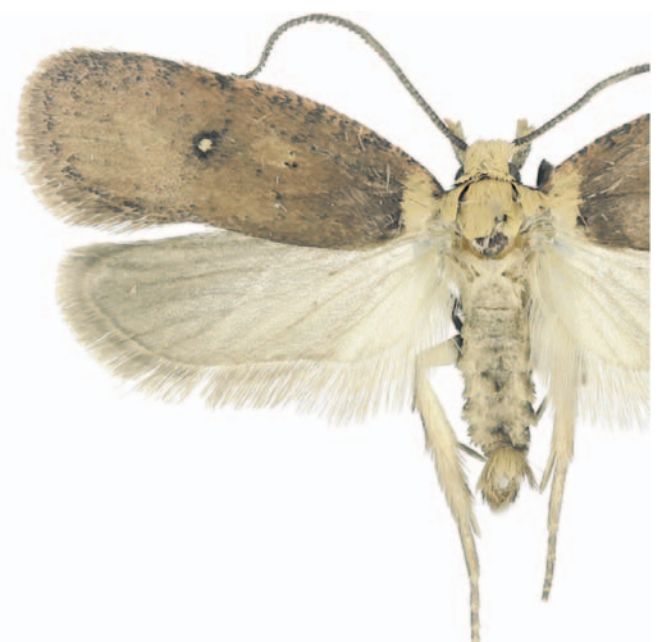


Fig. 53 - *A. parilella* (Austria, Hundsheim, e.l. *Peucedanum oreoselinum*, leg. larva 10.V. e.p. 08.VI.2008, leg., cult. & coll. P. Buchner).
 - *A. parilella* (Austria, Hundsheim, e.l. *Peucedanum oreoselinum*, leg. larva 10.V. e.p. 08.VI.2008, leg., cult. & coll. P. Buchner).

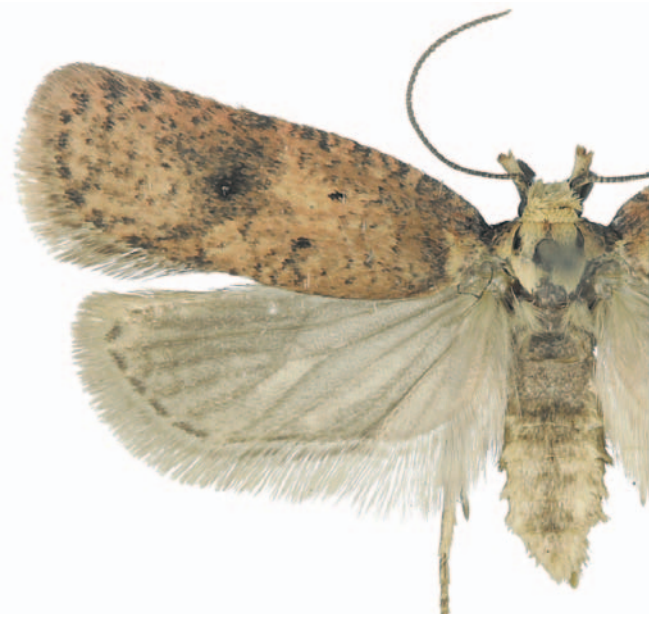


Fig. 54 - *A. angelicella* (Austria, Innsbruck, e.l. *Peucedanum* sp., leg. larva K. Burmann VI.1966, coll. TLMF).
- *A. angelicella* (Austria, Innsbruck, e.l. *Peucedanum* sp., leg. larva K. Burmann VI.1966, coll. TLMF).



Fig. 55 - *A. angelicella* (Germany, Potsdam, 08.VII.1909, coll. NHMV).
- *A. angelicella* (Germania, Potsdam, 08.VII.1909, coll. NHMV).

leg. & coll. L. Morin, gen. prep. DEEUR 1558 P. Buchner).

TLMF Lep 07180 (658 bp., ♂, Italy, Friuli V.G., Carso Goriziano, 45.833° N; 13.517° E, 24.VIII.2010, leg. & coll. L. Morin, gen. prep. DEEUR 1345 P. Buchner).

TLMF Lep 07195 (658 bp., ♂, Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, Monti Lessini, 45.683° N; 11.217° E, 12.IX.2010, leg. H. Deutsch, gen. prep. DEEUR 1546 P. Buchner, coll. MFSN).

TLMF Lep 16456 (658 bp., ♂, Greece, Epirus, Zagoria, 39.833° N; 20.767° E, 24.VI.2012, leg. & coll. H. Blackstein, gen. prep. DEEUR 1970 P. Buchner).

TLMF Lep 19001 (658 bp., ♂, Turkey, Erzurum, Kop gecidi, 40.5° N; 40.033° E, 16.IX.1993, leg. M. Fibiger, gen. prep. DEEUR 2376 P. Buchner, coll. ZMUC).

TLMF Lep 07126 (658 bp., ♂, Croatia, South Velebit, 44.283° N; 15.467° E, 26.VIII.2011, leg. & coll. I. Richter, gen. prep. DEEUR 1216 P. Buchner).

TLMF Lep 07169 (658 bp., ♂, Italy, Veneto, Verona, Monte di Sant'Ambrogio Valpolicella, Monti Lessini, 45.683° N; 11.217° E, 05.X.2001, leg. & coll. Schütze).

Related species

Neighbour-joining analysis shows *A. ferulae* as the nearest neighbour with 1.7% p-distance. Further species which are near *A. lessini* sp.n. according to barcode are *A. selini*, *A. alpigena* and *A. socerbi*. That there exists a close relatedness among these species is also supported by the presence of a bicorned process of the anellus pointing towards the transtilla in male genitalia (but note, this structure shows a large variability within every

species) and very large transtilla lobes, which overlap the transtilla. Together with *A. cachritis*, a species so far without barcode data, but also with corresponding features in male genitalia, these species can be grouped in an informal “*selini/alpigena* species group”. The externally similar species *A. parilella*, *A. paraselini* sp.n. and *A. angelicella* do not belong to this group.

Distribution

Specimens which have been checked by dissection or barcoding, have been obtained from Croatia (South Velebit), France (Col de Braus), Greece (Citi: Rethymnon; Omalos; Epirus; Delphi), Italy (Verona: Monti Lessini; Toscana: Marradi; Friuli Venezia Giulia: Carso Goriziano, Carso Triestino, Monfalcone), Slovenia (Nanos) and Turkey (Erzurum: Kop gecidi).

Biology

K. Burmann reared 6 specimens from *Ferulago nodiflora* (now valid as *F. campestris*) e.p. 20.-29.VI.1986, Italy, Verona, Monte di Sant'Ambrogio Valpolicella. With this emergence date it is possible the species overwinters as adult, but no moth has been collected in early spring. So the final answer about phenology must remain open.

Derivation of name

The choice of the epithet “*lessini*” has two reasons: First of all it is derived from the collecting place Monti Lessini, from where more paratypes have been collected

than from any other place and which is the only locality where the species has been reared on feeding plant identified to species level. The second reason for this choice is the fact, all specimens so far had been determined (if determined at all) as *A. selini*. This new species had therefore formed completely from parts of “*selini*”, and so it is also at the word’s level by taking “*selini*” and interchanging first and third letter - at least in spoken, although not exactly in written version.

Agonopterix paraselini sp. n.

Material

Holotype:

♂, Austria, Lower Austria, Eichkogel near Mödling, 48°4.8’N; 16°16.6’E, e.l. *Peucedanum cervaria*, leg. larva 22.V.2011, e.p. 16.VI.2011., leg. cult & Gp. DEEUR 5110 P. Buchner, coll. TLMF.



Fig. 56 - *A. paraselini* sp.n., lower side (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva 25.V. e.p. 07.VI.2013, leg., cult. & coll. P. Buchner).
- *A. paraselini* sp.n., lato inferiore (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva 25.V. e.p. 07.VI.2013, leg., cult. & coll. P. Buchner).



Fig. 57 - *A. paraselini* sp.n., palps and head in frontal view (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 17.V. e.p. 11.VI.2008, coll. TLMF).
- *A. paraselini* sp.n., palpi e capo in visione frontale (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 17.V. e.p. 11.VI.2008, coll. TLMF).



Fig. 58 - *A. paraselini* sp.n., lateral view (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva 25.V. e.p. 07.VI.2013, leg., cult. & coll. P. Buchner).
- *A. paraselini* sp.n., visione laterale (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva 25.V. e.p. 07.VI.2013, leg., cult. & coll. P. Buchner).



Fig. 59 - *A. paraselini* sp.n., palps in lateral view (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 17.V. e.p. 11.VI.2008, coll. TLMF).
- *A. paraselini* sp.n., palpi in visione laterale (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 17.V. e.p. 11.VI.2008, coll. TLMF).



Fig. 60 - *A. paraselini* sp.n., palps and head in lateral view (Switzerland, Neuenburg, Fig. 61 Le Landeron, e.l. *Peucedanum cervaria*, leg. larva 27.V.2005, leg., cult. & coll. P. Sonderegger).

- *A. paraselini* sp.n., palpi e capo in visione laterale (Svizzera, Neuenburg, Le Landeron, e.l. *Peucedanum cervaria*, leg. larva 27.V.2005, leg., cult. & coll. P. Sonderegger).

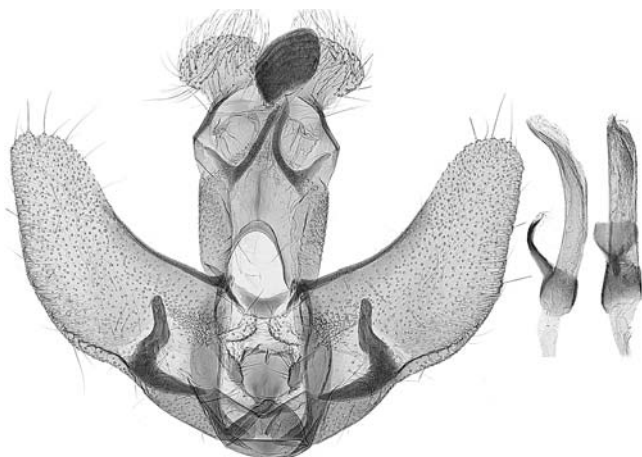


Fig. 62 - *A. paraselini* sp.n., male genitalia (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 22.V., e.p. 16.VI.2011, holotype, coll. TLMF).
- *A. paraselini* sp.n., genitali maschili (Austria, Mödling, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 22.V., e.p. 16.VI.2011, olotipo, coll. TLMF).

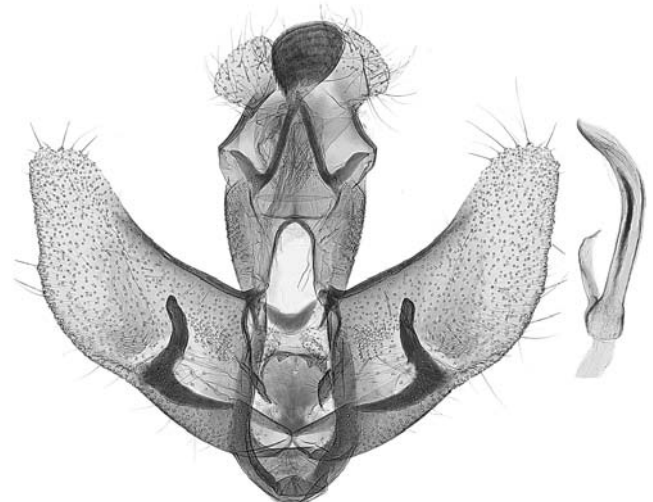


Fig. 63 - *A. paraselini* sp.n., male genitalia (Germany, Saarland, Perl, Hammelsberg, 10.VII.2014, leg. & coll. J. Peter).
- *A. paraselini* sp.n., genitali maschili (Germania, Saarland, Perl, Hammelsberg, 10.VII.2014, leg. & coll. J. Peter).

Paratypes:

- 1 ♂: Austria, Lower Austria, Mödling, 1870, no further data, interim determination as *A. parilella*, coll. NHMV.
1 ♂: Austria, Lower Austria, Gumpoldskirchen, 48°3.2'N, 16°14.4'E, e.l. *Peucedanum cervaria*, leg. Preisseecker, e.p. 25.VI.1923, coll. NHMV.
1 ♂: Austria, Lower Austria, Gramatneusiedel, 48°03'N, 16°30'E, e.l. *Peucedanum cervaria*, leg. larva F. Kasy, e.p. 13.VI.1967, interim determination F. Kasy as *A. parilella*, coll. NHMV.
1 ♀, 1 ♂: Austria, Lower Austria, Fischawiesen, 48°03'N, 16°30'E, e.l. *Peucedanum cervaria*, leg. larva E. Jäckh,

e.p. end of VI.1972, interim determination as *A. selini* E. Jäckh, coll. TLMF.

- 1 ♀, 4 ♂♂: Austria, Lower Austria, Steinberg 10 km W Hohenau/March, 48°37'N, 16°48'E, leg. F. Lichtenberger 08.VII.1988 (1 ♀) and 13.VII.1990, coll. TLMF.
1 ♀, 1 ♂: same collecting place and breeding data as holotype, but leg. 17.V.2008, e.p. 09.VI.2008, leg., cult. & coll. P. Buchner.
2 ♀♀, 5 ♂♂: same collecting place and breeding data as holotype, leg. 22.V.2011, e.p. 16.-24.VI.2011, leg., cult. & coll. P. Buchner.
6 ♀♀, 4 ♂♂: same collecting place and breeding data

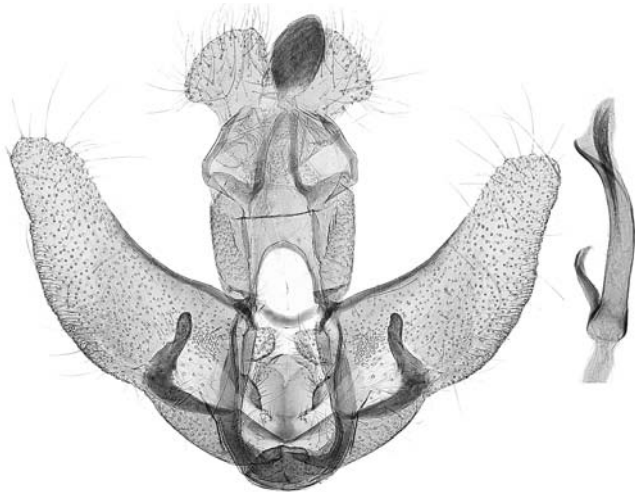


Fig. 64 - *A. angelicella* (Italy, Friuli V.G., Alpi Carniche, Mt. Crostis, 29.VII.2005, leg. & coll. L. Morin).
- *A. angelicella* (Italia, Friuli V.G., Alpi Carniche, Mt. Crostis, 29.VII.2005, leg. & coll. L. Morin).

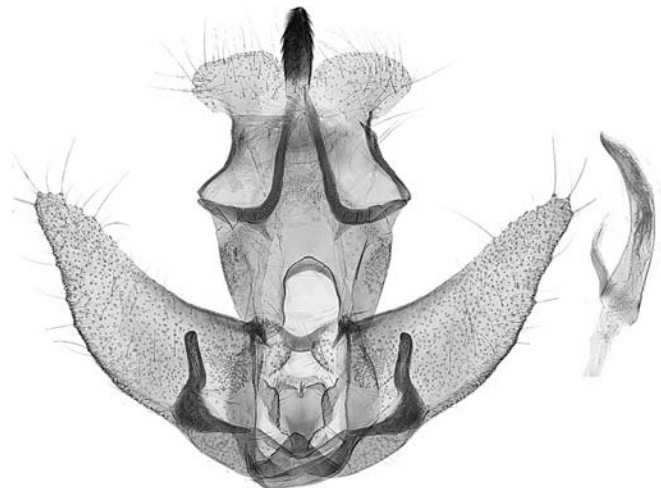


Fig. 65 - *A. parilella* (Slovakia, Laksarska nova ves, 04.VIII.2007, leg. & coll. L. Srnka).
- *A. parilella* (Slovacchia, Laksarska nova ves, 04.VIII.2007, leg. & coll. L. Srnka).

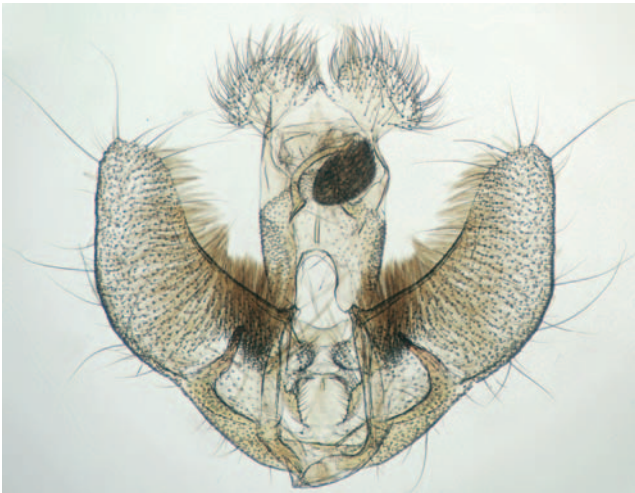


Fig. 66 - *A. paraselini* sp.n., valva not cleaned to show position and density of scales, not in Euparal (Switzerland, Neuenburg, Le Landeron, e.l. *Peucedanum cervaria*, leg. larva 27.V.2005, leg., cult. & coll. P. Sonderegger).
- *A. paraselini* sp.n., valva non ripulita per mostrare posizione e densità delle scaglie, preparato non in Euparal (Svizzera, Neuenburg, Le Landeron, e.l. *Peucedanum cervaria*, leg. larva 27.V.2005, leg., cult. & coll. P. Sonderegger).



Fig. 67 - *A. paraselini* sp.n., gnathos from ventral view, free floating (Lower Austria, Steinberg 10 km W Hohenau/March, leg. F. Lichtenberger 08.VII.1988, coll. TLMF).
- *A. paraselini* sp.n., gnathos in visione ventrale, non fissato (Bassa Austria, Steinberg 10 km W Hohenau/March, leg. F. Lichtenberger 08.VII.1988, coll. TLMF).

as holotype, but leg. 1. V.2012, e.p. 15.-22.VI.2012, leg., cult. & coll. P. Buchner.

- 1 ♀: Austria, Lower Austria, Gumpoldskirchen, 48°3.2'N, 16°14.4'E, e.l. *Peucedanum cervaria*, leg. 1.V.2012, e.p. 25.VI.2012, leg., cult. & coll. P. Buchner.
5 ♀♀, 4 ♂♂: same collecting place and breeding data as holotype, but leg. 25.V.2013, e.p. 3.-7.VII.2013, leg., cult. & coll. P. Buchner.
5 ♀♀, 6 ♂♂: Austria, Lower Austria, Waschberg, 48°25.1'N, 16°16.3'E e.l. *Peucedanum cervaria*, leg. larva 6.V.2014, e.p. 13.-19.VI.2014, leg., cult. & coll. W. Stark.

- 1 ♀, 1 ♂: Austria, Lower Austria, Steinberg 10 km W Hohenau/March, 48°37'N, 16°48'E e.l. *Peucedanum cervaria*, leg. larva 14.V.2014, e.p. 09.VI.2014 (♂) and 21.V.2014, e.p. 06.VI.2014 (♀), leg., cult. & coll. W. Stark.
4 ♀♀, 3 ♂♂: Austria, Lower Austria, Steinberg 10 km W Hohenau/March, 48°37'N, 16°48'E, e.l. *Peucedanum cervaria*, leg. larva 01.V.2015, e.p. 20.-30.VI.2015, leg., cult. & coll. P. Buchner.
6 ♂♂: Austria, Lower Austria, Waschberg, 48°25.1'N, 16°16.3'E e.l. *Peucedanum cervaria*, leg. larva 23.V.2014, e.p. 28.VI.2014, leg., cult. & coll. W. Stark

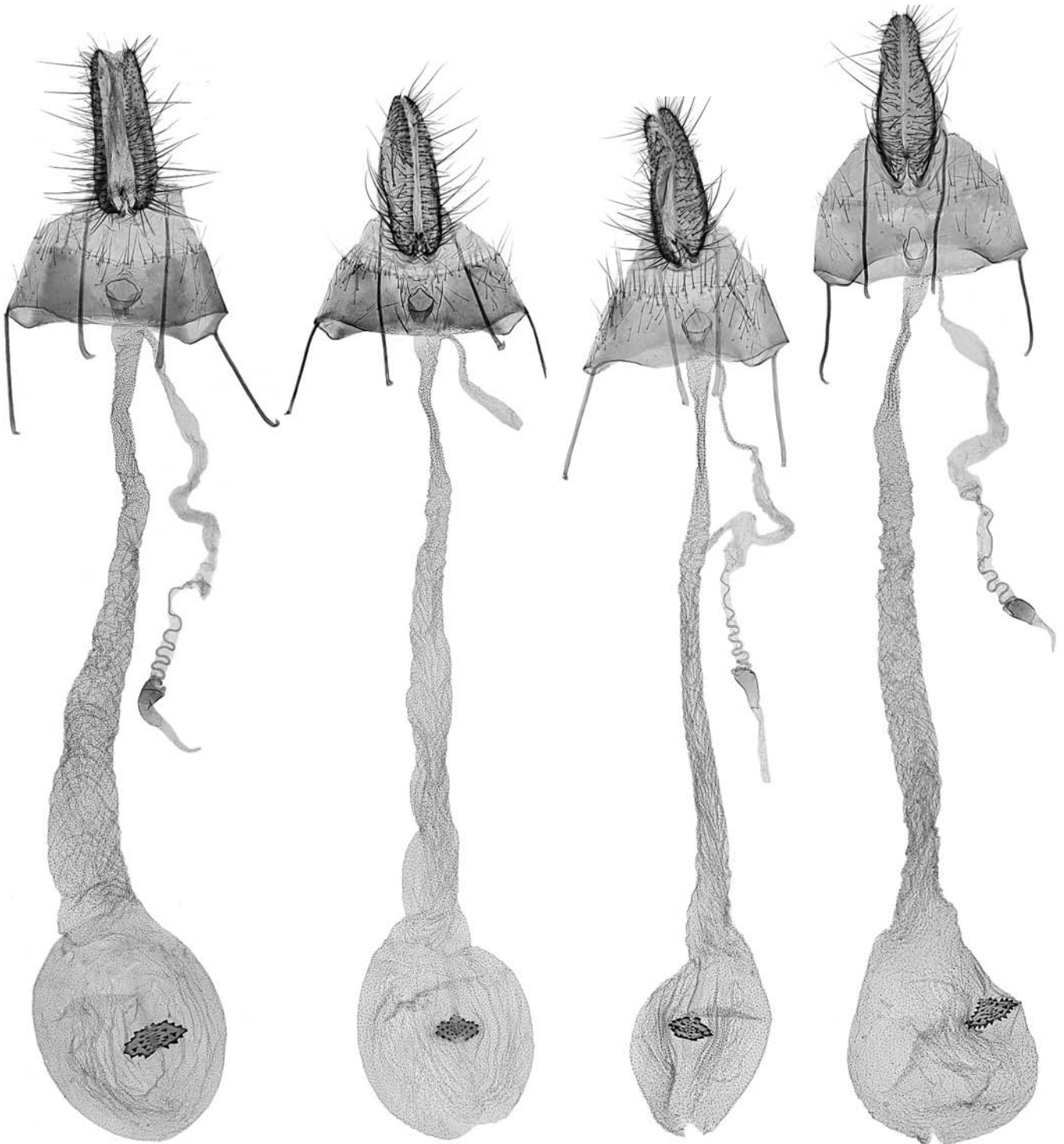


Fig. 68 - *A. angelicella* (Austria, Tyrol, Innsbruck. leg. K. Burmann 17.VII.1940, coll. TLMF).
- *A. angelicella* (Austria, Tirolo, Innsbruck. leg. K. Burmann 17.VII.1940, coll. TLMF).

Fig. 69 - *A. angelicella* (Lower Austria, Semmering, ex.l. *Angelica sylvestris*, leg. 15.VI.2006, e.l. 29.VI.2006, leg., cult. & coll. P. Buchner).
- *A. angelicella* (Bassa Austria, Semmering, ex.l. *Angelica sylvestris*, leg. 15.VI.2006, e.l. 29.VI.2006, leg., cult. & coll. P. Buchner).

Fig. 70 - *A. paraselini* sp.n. (Lower Austria, Steinberg near Neusiedel/Zaya, e.l. *Peucedanum cervaria*, leg. larva 21.V., e.p. 06.VI.2014, leg., cult. & coll. P. Buchner).
- *A. paraselini* sp.n. (Bassa Austria, Steinberg near Neusiedel/Zaya, e.l. *Peucedanum cervaria*, leg. larva 21.V., e.p. 06.VI.2014, leg., cult. & coll. P. Buchner).

Fig. 71 - *A. parilella* (Germany, Thalhaus, e.l. *Peucedanum oreoselinum*, leg. larva 10.V., e.p. 06.VII.1909, coll. ZSM).
- *A. parilella* (Germania, Thalhaus, e.l. *Peucedanum oreoselinum*, leg. larva 10.V., e.p. 06.VII.1909, coll. ZSM).



Fig. 72 - *A. paraselini* sp.n., spinning of nearly full grown larva on *Peucedanum cervaria*: unopened (Lower Austria, Mödling, 22.V.2011).

- *A. paraselini* sp.n., *astuccio non aperto della larva quasi matura su Peucedanum cervaria* (Bassa Austria, Mödling, 22.V.2011).



Fig. 73 - *A. paraselini* sp.n., spinning of nearly full grown larva on *Peucedanum cervaria*: opened with 11 mm long larva (Lower Austria, Mödling, 22.V.2011).

- *A. paraselini* sp.n., *astuccio aperto della larva (lunghezza 11 mm) quasi matura su Peucedanum cervaria*, (Bassa Austria, Mödling, 22.V.2011).



Fig. 74 - *A. paraselini* sp.n., half-grown larva, 8 mm, opened spinning on *Peucedanum cervaria* (Lower Austria, Steinberg near Neusiedel/Zaya, 21.V.2014).

- *A. paraselini* sp.n., *larva di media età (lunghezza 8 mm), astuccio aperto su Peucedanum cervaria* (Bassa Austria, Steinberg near Neusiedel/Zaya, 21.V.2014).



Fig. 75 - *A. paraselini* sp.n., nearly full grown larva, 11 mm, removed from spinning on *Peucedanum cervaria* (Lower Austria, Mödling, 12.V.2012).

- *A. paraselini* sp.n., *larva quasi matura (lunghezza 11 mm), rimossa dall'astuccio su Peucedanum cervaria*. (Bassa Austria, Mödling, 12.V.2012).

1 ♂: France, Central France, without further data, leg. Ragonot, interim determination Ragonot as *A. selini*, Gp. DEEUR 5118 P. Buchner, coll. NHMV.

1 ♂: France, Cannes, leg. Luque [recte Luquet?], without further data, interim determination as *A. selini*, Gp. DEEUR 5119 P. Buchner, coll. NHMV.

1 ♀, 1 ♂: Germany, Saarland, Perl, Hammelsberg, leg. J. Peter 10.VII.2014, Gp. DEEUR 3940 P. Buchner (♂), leg. A. Werno 15.VII.2016 (♀), coll. A. Werno.

1 ♀: Slovenia, Nanos Mts, Vipava, leg. B. Skule & C. Hvid 01.VII.2003, Gp. DEEUR 2447 P. Buchner, coll. ZMUC.

1 ♀, 1 ♂: Switzerland, Neuenburg, Le Landeron, 730m, 47°04'N, 7°02,2'E, e.l. *Peucedanum cervaria*, leg. larva 27.V.2005, interim determination as *A. selini*, leg., cult. & coll. P. Sonderegger.

2 ♂♂: Turkey, Bursa ("Brussa" in original label), 1857 and 1863, leg. Mann, interim determination as *A. parilella*, specimen collected 1863, Gp. NHMV 19869 P. Buchner, coll. NHMV.

Diagnosis

Externally most similar to *A. parilella* (fig. 53) in rather unicolorous chestnut-brown to blackish brown

forewings with a distinct white-centred central dot and absence of further distinct dots, and a distinct pale basal field. Only the average size of the central dot differs a little, being smaller in *A. paraselini* sp.n. than in *A. parilella*, but size overlaps. Based on male genitalia, it is easy to separate this species from *A. parilella* (fig. 65). Somewhat similar to *A. selini* and *A. lessini* sp.n. and not possible to identify with certainty based on external characters only, but these two species are usually larger, more bright coloured and with more distinct dots proximal to the central dot. Separating by genitalia is no problem, details under description of *A. selini* and *A. lessini* sp.n. On the other hand, *A. angelicella* has extremely similar male genitalia, but is markedly different externally (figs 54-55): central dot usually completely without white scales, only sometimes a few whitish scales present, surrounded by a diffuse dark area, which extends obliquely toward rear margin (only in very pale specimens sometimes indistinct), proximal to centre a paler area, which extends beyond the inner pair of black dots, making these dots clearly visible, but does not reach the basal field. Interneural dots more distinct, basal field less distinct than in *A. paraselini* sp.n. Based on genitalia, separating *A. paraselini* sp.n. from

A. angelicella is really a problem. Only the shape of the transtilla remains as a good feature, it is narrow overall in *A. angelicella* (fig. 64) and markedly broadened in the middle in *A. parselini* sp.n. (figs 62-63). In female genitalia, no differences have been found between these two species. In cases of doubt, biology helps to make a decision: Larvae of *A. parselini* sp.n. have been found so far on *Peucedanum cervaria* only, while those of *A. angelicella* predominantly live on *Angelica sylvestris*, with additional reports from *Peucedanum ostruthium*, *Bupleurum falcatum* and *Aegopodium podagraria*.

Description

Imago (figs 49-52 and 56-61): Wingspan (13) 14-16 (17) mm. Head and thorax predominantly yellow with rusty brown parts usually on the cranial side of the thorax. Labial palp predominantly pale yellowish, outer side of second segment with dark scales interspersed, third segment pale yellowish, but usually dark areas in the distal one-third, which may form a distinct ring, rarely entirely pale (fig. 61). Antenna blackish, thicker in males than in females. Forewing: Ground colour usually dark rusty brown, basal field markedly paler, pale yellowish, but becoming darker, usually rusty brown near the costa. Central forewing pattern: central dot nearly always white centred (fig. 52, a), rarely white centre indistinct or even invisible, no other distinct white elements, usually two indistinct oblique black dots at one-third (fig. 52, b), rarely with a few paler scales on the distal side (fig. 50, a) and a third, somewhat elongated dot (fig. 52, c) often present at half distance to rear forewing margin on the fold (52, d). Central dot usually surrounded by a darker shadow, which may extend obliquely toward rear margin. (usually indistinct, more distinct e.g. in fig. 51). Hindwing medium grey distally, moderately translucent at the base. Underside of wings unicolorous medium grey.

Cilia more or less of the same color as the wings, darker in the basal one-third especially in the hindwing, this area forming a distinct line in fresh specimens, sometimes a very faint second dark line in the distal one-third. Legs predominantly dark, especially tarsi, but with a row of pale yellowish scales at the distal end of every segment, especially in forelegs, tibia of hindleg with very long, pale, somewhat rusty brown scales outside (fig. 58). Abdomen grey without distinct pattern, proximally becoming paler ventrally.

Variation: ground colour of forewing varying from blackish brown (fig. 51) to medium brown, and from unicolorous (fig. 52) to a distinct fine irregular structure of darker and lighter areas (figs 49-50). Head and thorax beside the yellow parts with variable proportions of darker (brown to violet-brown) scales, sometimes darker scales dominate.

Male genitalia (figs 62-63 and 66-67)

Cuiller: broad, not tapering and ending bluntly at about 70-75 % of total width of valva, slightly outcurved over all its length, at the very end sometimes straight or very weakly curved.

Outline of valva: broad and not tapering in basal half, bent inward approximately 35° in the middle, moderately tapering in distal half, ending rather blunt.

Gnathos: broad elliptical in standard preparation, breadth/length ratio about 1:1.3 to 1:1.5 (But important to say, this is the lateral outline! Gnathos not or only a little (up to one-third of its length) overtopping the socii in standard preparation.

Socii: medium sized, with round outline

Anellus: about circular in outline, without a distinct bilobed process toward the transtilla.

Transtilla and transtilla lobes: Transtilla strongly broadened in the central part, bulged toward the vinculum, transtilla lobes medium sized, not touching each other but leaving a distinct gap in between, upper parts not overlapping the transtilla.

Phallus: slim (width about 10-12 % of its length), moderately curved in lateral view, tapered to a sharp tip, basal process long (free part about one-third of phallus length), strongly broadened at the end in ventral view (fig. 62 right. Note: basal process appears shorter in ventral than in lateral view, because in lateral view it is perpendicular to photo direction, but not in ventral view).

Male genitalia extremely similar to those of *A. angelicella*. Only the shape of the transtilla is different: strongly broadened in the middle in *A. parselini* sp.n. (figs 62-63) and narrow throughout in *A. angelicella* (fig. 64). The externally most similar species, *A. parilella*, has clearly different male genitalia (fig. 65).

Female genitalia (fig. 70)

Anterior margin of sternite VIII rather straight, ostium located in centre of sternite VIII, about circular in outline, representing a very common feature in *Agonopterix*, not really showing any distinctive structures. Ductus seminalis with 5 ½ to 6 turns. Ductus bursae rather narrow (diameter about the same as the diameter of ostium), with structures common in genus *Agonopterix*, consisting of a thin membrane without any sclerotisations, densely covered with tiny dots throughout and also with irregular folds, which become weaker or absent near the ostium. Corpus bursae of average size (diameter about two-thirds of the lateral extension of VIII sternite in standard preparation, i.e. dorsoventrally flattened), signum oval, about two times as broad as long, of average size (maximum diameter about 30-40 % of diameter of bursa).

In female genitalia, no diagnostic feature can be found distinguishing *A. paraselini* sp.n. from *A. angelicella*. That could be an argument that they are conspecific, but in the genus *Agonopterix*, female genitalia in general are very similar, and there are further examples of distinct species, not separable by female genitalia. As one example, a slide of *A. parilella* is added, showing female genitalia also nearly undiscernible from those of *A. paraselini* sp.n. (only with difference in the number of turns of the ductus spermathecae: four to four and one half in *A. parilella*), but a look at male genitalia removes any possibility that *A. parilella* could be conspecific with *A. paraselini* sp. n.

Molecular data (neighbour-joining tree see fig. 48)

Barcoded material:

TLMF Lep 19423 (658 bp., ♀, Germany, Saarland, Perl, Hammelsberg, 49°28'N; 6°24'E, leg. A. Werno 15.VII.2016, DEEUR 4773, coll. A. Werno).

TLMF Lep 16457 (658 bp., ♂, Lower Austria, Steinberg near Neusiedel/Zaya, 48°35'N; 16°45'E, e.l. *Peucedanum cervaria*, leg. larva 14.V., e.p. 09.VI.2014, DEEUR 2016, leg., cult. & coll. P. Buchner).

TLMF Lep 06567 (658 bp., ♂, Switzerland, Neuenburg, Le Landeron, 47°04'N; 7°03'E, e.l. *Peucedanum cervaria*, leg. larva 27.V.2005, DEEUR 0623, leg., cult. & coll. P. Sonderegger.).

TLMF Lep 07195 (658 bp., ♂, Austria, Mödling, 48°4.8'N; 16°16.6'E, e.l. *Peucedanum cervaria*, leg. larva P. Buchner 17.V. e.p. 11.VI.2008, DEEUR 0572, coll. TLMF).

TLMF Lep 06308 (658 bp., ♂, Austria, Mödling, 48°4.8'N; 16°16.6'E, e.l. *Peucedanum cervaria*, leg. larva 17.V. e.p. 11.VI.2008, DEEUR 0043, leg., cult. & coll. P. Buchner).

Biology

There are large series of reared specimens, all from *Peucedanum cervaria*. Larvae were collected in May, moth emerged in June and first half of July. In the field, specimens have also been found in midsummer. The fact that even in places where this species is abundant, no moth has been seen in early spring, indicates that it does not overwinter as an adult.

Related species

A. paraselini sp.n. is undoubtedly very closely related to *A. angelicella*. They share the barcode and the genitalia are extremely similar. For this reason it was initially considered to describe *A. paraselini* sp.n. as a subspecies of *A. angelicella*. But the distribution clearly contradicts the fact that they are subspecies. Between subspecies no genetic reproductive barrier exists, and they only

persist if there is another barrier in between (like long distance between mountain ranges or islands). But *A. paraselini* sp.n. shares a large area with *A. angelicella*, indicating that reproductive boundaries between them exist which have not yet been recognized.

Etymology

The species name "*paraselini*" means "beside the *selini*", because in all collections this species was found beside (or mixed up with) *Agonopterix selini* specimens.

Distribution

So far known from Austria, France, Germany, Slovenia, Switzerland and Turkey.

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