



Review of the *Eulamprotes wilkella* species-group based on morphology and DNA barcodes, with descriptions of new taxa (Lepidoptera, Gelechiidae)

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Abstract

The *Eulamprotes wilkella* species-group is revised based on morphological characters and on DNA barcodes of the mtCOI (Cytochrome c Oxidase 1) gene. Adult morphology combined with sequence information for 9 species supports the existence of 12 species, 7 of which are described as new to science: *E. mirusella* Huemer & Karsholt sp. nov. (France), *E. baldizzonei* Karsholt & Huemer sp. nov. (Italy, Slovenia, Croatia), *E. atrifrontella* Karsholt & Huemer sp. nov. (Turkey), *E. wieseri* Huemer & Karsholt sp. nov. (Kyrgyzia), *E. altaicella* Huemer & Karsholt sp. nov. (Russia: Altai, Buryatia, Tuva Republic), *E. kailai* Karsholt & Huemer sp. nov. (Kazakhstan, Kyrgyzia, Russia: Buryatia, Tuva Republic) and *E. gemerensis* Elsner sp. nov. (Slovakia). *E. buvati* Leraut, 1991 **syn. nov.** is synonymized with *E. ochricapilla* (Rebel, 1903).

Key words: Lepidoptera, Gelechiidae, *Eulamprotes*, cryptic diversity, morphology, DNA barcode, new species, western Palaearctic

Introduction

The genus *Eulamprotes* Bradley, 1971, includes a total of 16 described species in Europe (Huemer & Karsholt 2011, Karsholt 2011, Šumpich & Skyva 2012) but several additional undescribed species are known from various collections. As the genus will be dealt with in a forthcoming volume of the book series “Microlepidoptera of Europe”, we hereby present a revision of the Palaearctic species of an important portion, the *Eulamprotes wilkella*-group. Species of this group include taxa with whitish and or silvery or golden forewing markings. These have occasionally been treated in a separate genus *Argyritis* Heinemann, 1870, which is, however, a homonym of *Argyritis* Hübner, 1821 (a junior synonym of *Cucullia* Schrank, 1802). Species of the *E. wilkella*-group are, besides the silvery and whitish markings in the forewing, characterized by having the phallus (see terminology below) of about the same length as the remaining male genitalia (when seen in lateral position), a weakly sclerotized strip (transtilla) at the base of the anal tube, which is of low diagnostic significance whereas in other groups of the genus it is medially swollen, and the females have a more or less pronounced tendency to brachyptery. The *E. wilkella*-group can further be subdivided into a *E. wilkella*-subgroup (having a small process at the tip of the valva and females with normal or only slightly reduced hindwings) and a *E. libertinella*-subgroup (without a process at the tip of the valva and with more pronounced brachyptery in the females). The *E. libertinella* subgroup was revised by Huemer & Karsholt (2011) whereas the *E. wilkella* subgroup *sensu* Huemer & Karsholt (2011) remained unrevised until now. The newly described species belong to the *E. wilkella* subgroup.

The remaining species of the genus with more or less monochromatic forewings and females without tendency to brachyptery were treated by some authors in the genus *Lamprotes* Heinemann, 1870, a homonym of *Lamprotes* Reichenbach, 1817 (Noctuidae). They include further unrevised taxa and are not dealt with in our paper. *E. graecatella* Šumpich & Skyva, 2012, recently described from Greece, is excluded from our study despite its whitish wing markings which resemble some taxa of the *E. wilkella*-group as genitalia morphology and unpublished DNA barcode sequences do not support a close relationship of *E. graecatella* to the *E. wilkella*-group.

The early stages and life history of the *E. wilkella*-group are very imperfectly known and only described in details for *E. wilkella* (see below). Available data point towards moss being the primary food substrate. Moss feeding larvae are rare among Gelechiidae and mainly known in the genus *Bryotropha* Heinemann, 1870. The *E. wilkella*-group shares with the *Bryotropha similis*-group (see Karsholt & Rutten 2005) apart from the moss-feeding habit a character in the female genitalia (signum being a more or less sub-rectangular plate with one or two spinal processes at the anterior and posterior margin, respectively). Although both *Bryotropha* and *Eulamprotes* are currently placed in the subfamily Anomologinae, molecular studies have shown that they are only distantly related, whereas *Eulamprotes* is closely related to *Monochroa* Heinemann, 1870 (Karsholt *et al.* 2013).

Material and methods

Specimens. Our study is based on about 1000 specimens of the *Eulamprotes wilkella* species-group. Country records and number of examined specimens per country are listed under the sub-chapter “examined material”. New country records and extraordinary records are listed in detail. Primary type-material is quoted from the original labels, supplementing material largely follows label data with limited standardization. The material is predominantly set, but several samples were only spread and dried immediately after collecting to ensure sufficient quality of DNA samples.

Genitalia preparation/documentation. We followed standard techniques (Robinson 1976) adapted for male genitalia of Gelechiidae by the so-called “unrolling technique” (Pitkin 1986). This method proved useful for *Eulamprotes* in an earlier study (Huemer & Karsholt 2011).

Photographs of the adults were taken with an Olympus SZX 10 binocular microscope and an Olympus E performed 3 digital camera and developed using the software Helicon Focus 4.3 and Adobe Photoshop CS4 and Lightroom 2.3. Genitalia photographs were taken with an Olympus E1 Digital Camera from Olympus BH2 microscope. To clarify the very compact and complex structure of the male copulatory organs in *Eulamprotes* an alternative method for obtaining images was applied in two cases (Figs 56–57). For this purpose the following device was used: a strip of coverslip of dimensions 17 x 4 mm was mounted on a slide with one end fixed on the top of a spacer 0.5 mm deep, and its other end rested on the slide. The resulting wedge-shaped intermediate space was filled with glycerine. The genitalia, whole or in part, were inserted into the slot and adjusted to the desired position. In order to figure the selected material sharply in a two dimensional image, several sequential microscopic photographs were taken. This series was processed by means of Helicon Focus 4.40.2. The image was then compared with a real stereomicroscopic view and corrected using Adobe Photoshop 7.0 CE. The intention of this process is to obtain real and undistorted images of the genitalia structures. Optics used: FF objectives: PZO 40x0.69, Meopta 20x0.4. Camera used: Canon Power Shot A620.

DNA barcode sequences are based on a 648 base-pair long segment of the mitochondrial COI gene (cytochrome c oxidase 1). DNA samples (dried leg) were prepared according to the prescribed standards. Legs from 80 specimens of the *Eulamprotes wilkella* species-group 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 Ivanova *et al.* (2006) and deWaard *et al.* (2008). DNA sequencing resulted in a full barcode fragment of 648 bp for 66 specimens: *Eulamprotes wilkella* (n=10), *E. superbella* (n=4), *E. gemerensis* sp. nov. (n=2), *E. ochricapilla* (n=5), *E. atrifrontella* sp. nov. (n=1), *E. occidentella* (n=5), *E. baldizzoni* sp. nov. (n=7), *E. wieseri* sp. nov. (n=1) and *E. libertinella* (n=31). Furthermore we had access to 6 sequences > 600 bp and 3 sequences > 300 bp, whereas sequencing of 5 specimens failed. Details including complete voucher data and images of 65 specimens can be accessed in the public project “Lepidoptera of the Alps - *Eulamprotes wilkella*-group” in the Barcode of Life Data Systems— BOLD (Ratnasingham and Hebert 2007), as well as in the dataset dx.doi.org/10.5883/DS-LEAEW. The same DOI provides access to the sequence records, trace files, and primer sequences used for PCR amplification, together with GenBank accession numbers. Sequence divergences were quantified using the Kimura 2-parameter model implemented within the analytical tools on BOLD (Kimura 1980).

Terminology. In accordance with what seems to become general practice among Lepidoptera taxonomists we use the term phallus for the sclerotized tube enclosing the terminal eversible vesica (which is, of course, also a part of the entire intromittent organ, the phallus *s. lat.*) (see also Kristensen 2003). In this restricted sense phallus

corresponds to what in most cases has previously been termed aedeagus, but which may not be homologous with the aedeagus in the lepidopteran ground plan; use of the neutral term phallus enables taxonomists to refer to a well identifiable genital component without in every case committing themselves to interpretations about its morphological nature (aedeagus, phallobase or a composite formation).

We also here follow our (and some other gelechiid workers', e.g., Bidzilya & Li 2009, Bland *et al.* 2002) current usage of 'valva' as shorthand just for the upper part of the valva in cases where a sacculus is prominently differentiated/produced. The small posteroventral 'lateral processes' which in some recent publications (e.g. Huemer & Karsholt 2011) have been attributed to the vinculum, may in *Eulamprotes* be clearly separated from the latter and at the same time obviously synsclerotic with the principal valva portion. They thus do appear to represent the sacculus, and we have here termed them accordingly. However, in some other gelechiid taxa there are *two* pairs of processes below from the main valve portion; here the most medial pair likely does pertain to the vinculum, while it is not always clear whether the lateral pair is a derivative from the latter or is a part of the valva (i.e., is a sacculus). Where only a single process pair is present below the unquestionable valva processes, a similar uncertainty may arise, depending on the development/recognisability of the basal connections.

Abbreviations of private and institutional collections. LMK—Landesmuseum Kärnten, Klagenfurt, Austria; LNK—Staatliches Museum für Naturkunde, Karlsruhe, Germany; NHMW—Naturhistorisches Museum, Vienna, Austria; MNHP—Muséum national d'Histoire naturelle, Paris, France; RCGB—Research Collection Giorgio Baldizzone, Asti, Italy; RCGE—Research Collection Gustav Elsner, Prague, Czech Republic; RCJL—Research Collection Jan Liška, Prague, Czech Republic; RCHD—Research Collection Helmut Deutsch, Assling, Austria; RCAH—Research Collection Alfred Haslberger, Teisendorf, Germany; RCHW—Research Collection Hugo van der Wolf, Nuenen, The Netherlands; RCTM—Research Collection Toni Mayr, Feldkirch, Austria; RCJS—Research Collection Jürg Schmid, Illanz, Switzerland; RCAS—Research Collection Andreas Stübner, Jänschwalde/Ost, Germany; RCZT—Research Collection Zdenko Tokár, Šal'a, Slovakia; RCPT—Research Collection Paolo Triberti, Verona, Italy; TLMF—Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria; ZIAP—Zoological Institute, Academy of Sciences, St. Petersburg, Russia; ZMUC—Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark; ZMUH—Zoological Museum, University of Helsinki, Finland; ZMUO—Zoological Museum, University of Oulu, Finland; ZSM—Zoologische Staatssammlung, München, Germany.

Results

Checklist of species of the *Eulamprotes wilkella* species-group

Eulamprotes Bradley, 1971: 27.

Type species: *Tinea atrella* Denis & Schifferrmüller, 1775.

= *Lamprotes* Heinemann, 1870: 309; homonym.

Type species: *Tinea atrella* Denis & Schifferrmüller, 1775.

= *Argyritis* Heinemann, 1870: 283; homonym.

Type species: *Gelechia (Brachmia) pictella* Zeller, 1839.

Eulamprotes wilkella (Linnaeus, 1758)

= *merianella* (Linnaeus, 1758)

= *germarella* (Geyer, 1832)

= *pictella* (Zeller, 1839)

= *tarquiniella* (Stainton, 1862)

Eulamprotes ochricapilla (Rebel, 1903)

= *buvati* Leraut, 1991 syn. nov.

Eulamprotes superbella (Zeller, 1839)

Eulamprotes mirusella Huemer & Karsholt sp. nov.

Eulamprotes baldizzonei Karsholt & Huemer sp. nov.
Eulamprotes occidentella Huemer & Karsholt, 2011
Eulamprotes atrifrontella Karsholt & Huemer sp. nov.
Eulamprotes wieseri Huemer & Karsholt sp. nov.
Eulamprotes altaicella Huemer & Karsholt sp. nov.
Eulamprotes kailai Karsholt & Huemer sp. nov.
Eulamprotes libertinella (Zeller, 1872)
Eulamprotes gemerensis Elsner sp. nov.

Key to the species of the *Eulamprotes wilkella* species-group

Note. The key is solely based on phenotypical characters of the adults. Further supplementing data including genitalia and COI barcode divergence see below.

The females of *E. baldizzonei* sp. nov., *E. atrifrontella* sp. nov., *E. wieseri* sp. nov., *E. altaicella* sp. nov., *E. kailai* sp. nov. and *E. gemerensis* sp. nov. are unknown.

1.	Male.	2
–	Female.	13
2.	Antenna ringed black and white to apex.	3
–	Apical part of antenna unicolorous whitish.	8
3.	Small species: wingspan 7.0–8.5 mm.	<i>E. superbella</i>
–	Wingspan more than 8.5 mm.	4
4.	Head whitish or yellowish.	5
–	Head and labial palpi more or less black.	7
5.	Streak from middle of costa divided.	<i>E. mirusella</i> sp. nov.
–	Streak from middle of costa not divided.	6
6.	Larger species: wingspan 12–13 mm; pre-apical and tornal spot clearly separated.	<i>E. libertinella</i>
–	Smaller species: wingspan 9–10 mm; pre-apical and tornal spot more or less fused.	<i>E. kailai</i> sp. nov.
7.	Head black.	<i>E. atrifrontella</i> sp. nov.
–	Frons whitish.	<i>E. occidentella</i>
8.	Head black.	<i>E. gemerensis</i> sp. nov.
–	Head whitish or yellowish.	9
9.	Streak from middle of costa divided.	<i>E. baldizzonei</i> sp. nov.
–	Streak from middle of costa not divided.	10
10.	Forewing markings silvery or golden with metallic shine.	11
–	Forewing markings white with only a slight metallic shine.	12
11.	Apical quarter of antenna white.	<i>E. wilkella</i>
–	Apical two-fifths of antenna white.	<i>E. altaicella</i> sp. nov.
12.	Apical sixth of antenna white; smaller species 9–11 mm.	<i>E. ochricapilla</i>
–	Apical quarter of antenna white; larger species 12 mm.	<i>E. wieseri</i> sp. nov.
13.	Hindwing reduced.	14
–	Hindwing more or less normal.	16
14.	Hindwing rudimentary.	<i>E. libertinella</i>
–	Hindwing slender.	15
15.	Antenna with apical quarter white.	<i>E. occidentella</i>
–	Antenna ringed black and grey to tip.	<i>E. mirusella</i> sp. nov.
16.	Apical quarter of antenna white.	<i>E. wilkella</i>
–	Antenna ringed black and white to apex.	<i>E. superbella</i>

Taxonomic treatment of taxa

Eulamprotes wilkella (Linnaeus, 1758)

Phalaena (*Tinea*) *wilkella* Linnaeus 1758: 541.
Phalaena (*Tinea*) *merianella* Linnaeus 1758: 541.
Tinea *germarella* Geyer 1832: pl. 70.
Gelechia (*Brachmia*) *pictella* Zeller 1839: 202.
Gelechia *tarquiniella* Stainton, 1862: 112.

Examined material. Andorra (n=1), Austria (n=17), Bulgaria (n=2); Denmark (n=265), Finland (n=3), France (n=19), Germany (n=3), Great Britain (England) (n=2), Greece (n=5), Hungary (n=1), Italy (n=43), Macedonia (n=1), Netherlands (n=3); Norway (n=3), Poland (n=2), Romania (n=1), Spain (n=9), Sweden (n=48), Switzerland (n=2).

Kazakhstan: 2♂, Zailiskiy, Alatau, Alma-Atinskij Nat. Par., 43°05'N, 77°15'E, 1650 m, 14.vii.1990, leg. Kaila & Mikkola (ZMUH); 2♂, Dzhabul'skaya obl., 70 km NNE Frunze, 43°24'N, 75°02'E, 950 m, 18.vii.1990, leg. Kaila & Mikkola (ZMUH);

Kyrgyzia: 5♂, 30 km E Naryn, 41°25'N, 76°20'E, 2500 m, 22.–29.vii.1990, leg. Kaila & Mikkola (ZMUH); 1♂, 41 km E Naryn, 41°26'N, 76°29'E, 2500 m, 9.viii.1990, leg. Kaila & Mikkola (ZMUH); 5♂, 40 km W Lake Issyk-Kul, leg. Kaila, 13.viii.1990, leg. Kaila & Mikkola (ZMUH);

Russia: 3♂, Irkutsk oblast, 20 km S Ust-Ordynskij, leg. Sinev (ZIP); 1♂, Tuva Republic, E. Tannu-Ola Mts., 5 km ENE Khol-Oozha, 50°45'N, 94°29'E, 2175 m, 17.vi.1995, leg. Jalava & Kullberg (ZMUH); 2♂, Irkutsk obl., 40 km N Irkutsk, 1.–3.viii.1983, leg. Mikkola & Vitasaari (ZMUH); 1♂, Sakha Republic, 147 km SW Yakutsk, Elanka, 8.–11.vii.1979, leg. Ammosov (ZMUH); 1♂, Southern Primorje, Andreevka, 10.–15.viii.1998, leg. Jalava & Kullberg (ZMUH).

Turkey: 3♂, Ankara, 10 km N Kizilcahaman, 1150–1250 m, 6.–7.viii.1989, leg. Fibiger (ZMUC).

DESCRIPTION.—Adult (Figs 1–3). Male. Wingspan 10–12 mm. Labial palpus cream-white; basal third of segment 2 blackish brown on outer surface; tip of segment 3 black. Basal part of antenna blackish, becoming more distinctly lighter ringed in middle; apical quarter white. Head yellowish white with lighter frons and a dark line around eye; thorax and tegula black. Forewing black with three silvery white fasciae: first oblique from 1/6 at costa to 1/5 at fold; second from middle of costa reaching two-thirds towards dorsum; an inwards directed fascia from a cream-white pre-apical costal spot to tornal spot, often slightly interrupted; some silvery white scales in apex and along termen; cilia blackish grey, whitish grey at tip of apex. Hindwing almost as broad as forewing, light grey with grey cilia. Abdomen yellowish grey in basal third, then dark grey with yellow-white tip.

Female. Wingspan 8–11 mm. Hindwing about two-thirds as broad as forewing. Otherwise similar to male.

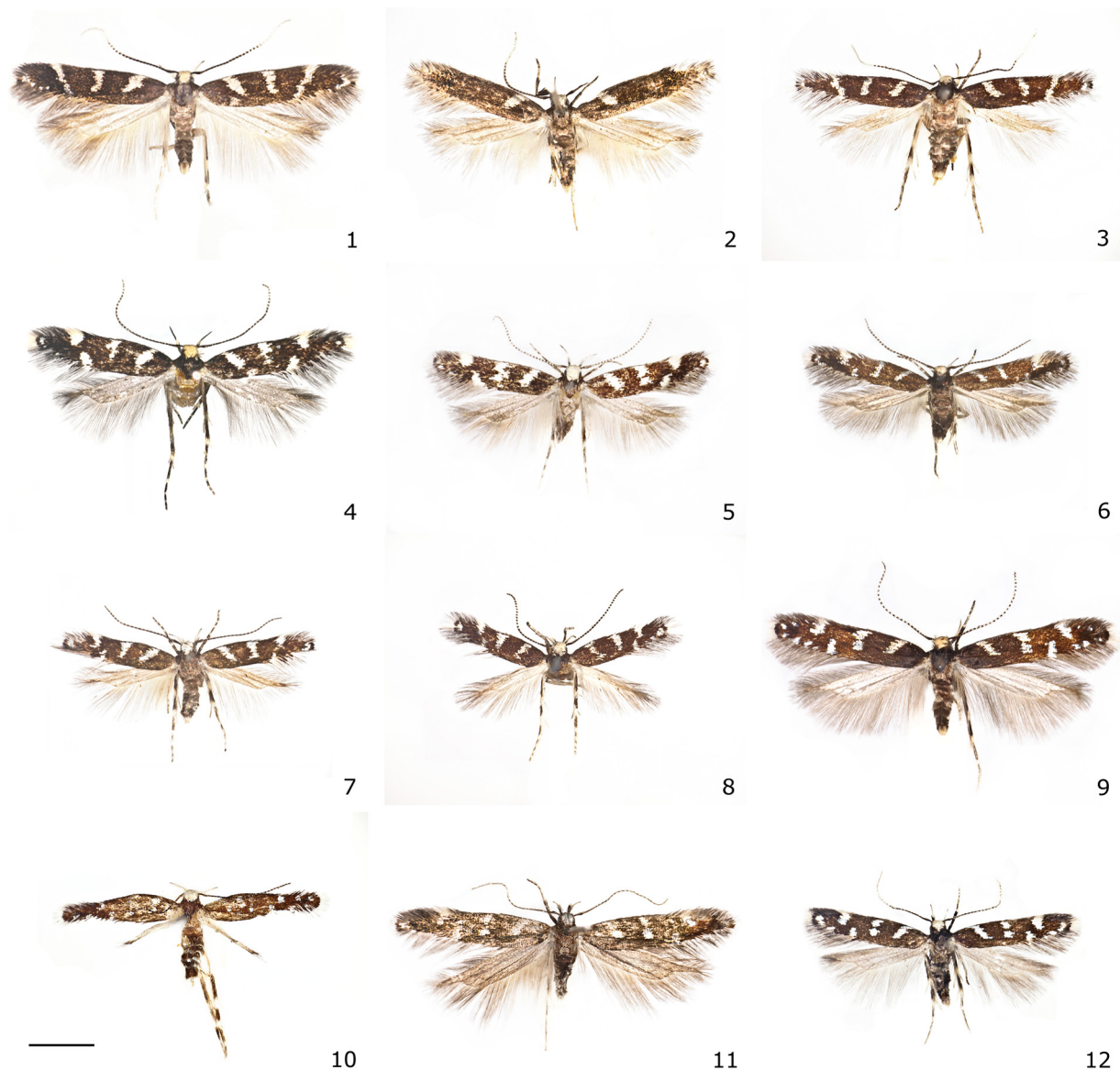
Variation. The fascia from pre-apical costal spot to tornal spot can be straight or slightly angled, and it can be interrupted or unbroken. There is some variation in the distinctness of light and dark rings in the basal three-quarters of the antenna, but the apical quarter is always white. Specimens from some British and Irish localities have the silvery white markings in the forewings reduced to only one (f. *tarquiniella*) (Fig. 2) or two fasciae. There seems to be also some variation in the wing form of females, with a tendency to (slight) reduction in breadth of hindwing and more or less acuminate forewings (see also Heckford 2002).

Male genitalia (Figs 22–23).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales, respectively. Uncus with tiny process, apically with three long and few short setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two very long and rather stout setae are arising, anterior margin nearly straight, pedunculi small; valva has shape of bird's head in lateral projection, moderately slender, with strongly convex mediodorsal (outer) and nearly straight ventral (inner) margin, distal part strongly tapered to pointed apex; separate plate-like sclerite at base of valva, covered with few setae; sacculus a broad, setose lobe; saccus about as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally evenly tapered; phallus broadly bulbous, apical fifth abruptly and strongly tapered, about one quarter of maximum width of its anterior part; vesica with number of small grains.

Female genitalia (Fig. 50).—Apophysis posterioris slender, rod-shaped, about three times length of segment VIII; segment VIII with distinctly sclerotized posteriolateral part, otherwise membranous; ostium bursae laterally with sclerotized folds; apophysis anterioris slender, rod-shaped, about 2.5 times as long as segment VIII; ductus bursae long and slender, posterior half with slender, oblong sclerite extending distinctly beyond apophysis anterioris, anterior half membranous, weakly expanded; corpus bursae sub-oval, slightly larger than segment VIII; signum a large, nearly sickle-shaped transverse plate, anterior margin with long, posterior edge with shorter stiletto-shaped process.

DIAGNOSIS.—*E. wilkella* is characterized by having the apical quarter of the antennae white, and the pre-apical costal spot and the tornal spot of the forewing are (normally) fused. For *E. wieseri* sp. nov., *E. altaicella* sp. nov. and *E. libertinella* see under these species. The almost completely reduced uncus, the slender distal part of the valva and the strongly inflated phallus are collectively diagnostic, though particularly the differences from *E.*

superbella are small with a less stout valva in *E. wilkella* and a differently shaped phallus. The female genitalia differ from all other known species in the nearly sickle-shaped of the signum.



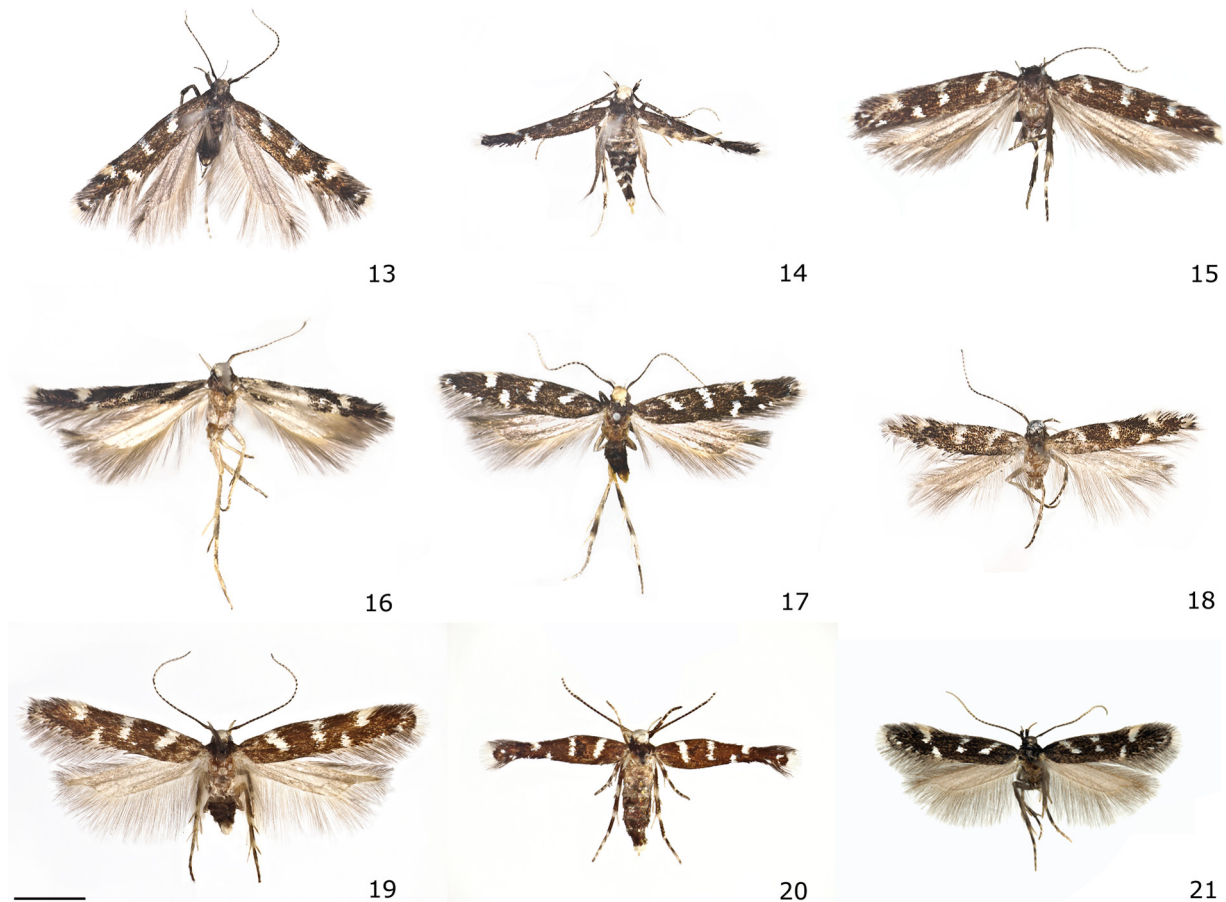
FIGURES 1–12. Adults of *Eulamprotes* spp. 1, *E. wilkella* (Zeller), ♂ (Italy); 2, *ditto*, ♂ (Great Britain, England); 3, *ditto*, ♀ (Italy); 4, *E. ochricapilla* (Rebel), ♂ (Italy); 5, *ditto*, ♀ (Austria); 6, *E. superbella* (Zeller), ♂ (Austria); 7, *ditto*, ♂ (Italy); 8, *ditto*, ♀ (Denmark); 9, *E. mirusella* sp. nov., holotype, ♂ (France); 10, *ditto*, paratype, ♀ (France); 11, *E. baldizzonei* sp. nov., paratype, ♂ (Italy); 12, *ditto*, paratype, ♂ (Italy). Scale bar = 2 mm.

GENETIC DATA.—The intraspecific divergence of the barcode region ranges from 0%–1.38% (average distance 0.62%) (n=10). The distance to the nearest neighbour *E. superbella* is 7.48%.

DISTRIBUTION.—Almost all of Europe; Turkey; Russia: Siberia. Records from China (Li 2002) and Korea (Park & Ponomarenko 2007) need verification. For records from Japan (Sakamaki 1995) see below under remarks. The form with reduced markings in the forewing is only known from a few localities in Great Britain and Ireland.

BIOLOGY.—The larva is described by Stainton (1867) and Sterling (2008). It has been reported feeding on *Cerastium fontanum* Baumg. (Stainton 1867), an observation which was widely accepted and adopted even in recent standard literature (i.e. Elsner *et al.* 1999). However, Sterling (2008) found that the larva feeds on the leaves of the moss *Syntrichia ruraliformis* (Besch.) Cardot, living in silken tubes at the base of a stem of the foodplant, extending into the sandy soil/moss mix beneath. Sterling (*op cit.*) suggests that *Cerastium* L. is only an exceptional host for *E. wilkella*; this may also have been the case with one specimen which emerged from *Cerastium* plants

collected early May at the island Møn, Denmark, together with several specimens of *Caryocolum alsinella* (Zeller) (O. Karsholt, unpublished). According to Sterling (*op cit.*) the larval period lasts from March to May and a second generation as stated by Stainton (1867) could not be verified. Continental authors such as Elsner *et al.* (1999) suggested bivoltinism, with moths flying from May to June and again from July to September but voltinism is unconfirmed and the flight period may refer to one long lasting generation only. The species seems to prefer dry habitats, coastal as well as inland, but it is also found in other types of localities like woods, gardens and parks. Males are easily attracted to light, whereas females are mostly found by sweeping vegetation during day, often where *Thymus* is flowering.



FIGURES 13–21. Adults of *Eulamprotes* spp. 13, *E. occidentella* Huemer & Karsholt, paratype, ♂ (Italy); 14, *ditto*, paratype, ♀ (Italy); 15, *E. atrifrontella* **sp. nov.**, paratype, ♂ (Turkey); 16, *E. wieseri* **sp. nov.**, holotype, ♂ (Kirgizia); 17, *E. altaicella* **sp. nov.**, holotype, ♂ (Russia, Altai); 18, *E. kailai* **sp. nov.**, holotype, ♂ (Kirgizia); 19, *E. libertinella* (Zeller), ♂ (Italy); 20, *ditto*, ♀ (Switzerland); 21, *E. gemerensis* **sp. nov.**, paratype, ♂ (Slovakia). Scale bar = 2 mm.

REMARKS.—*Phalaena (Tinea) wilkella* was described from an unspecified number of specimens. Robinson & Nielsen (1983) designated a male from Gotland (Sweden) as the lectotype and synonymized *Phalaena (Tinea) merianella* Linnaeus, 1758, described on the same page immediately before, with *P. wilkella*. Even though this interpretation of *Ph. merianella* can be disputed as Linnaeus' description differs from that of *Ph. wilkella* it serves stability best to follow the synonymization by Robinson & Nielsen (*op cit.*).

The identity of *Tinea germarella* has been disputed and we follow here the prevailing usage as a junior synonym of *E. wilkella* (Huemer & Karsholt 2011).

Gelechia (Brachmia) pictella was described from three specimens collected in August on sandy soil near Glogow (Poland) (Zeller 1839) and synonymised with *E. wilkella* by Sattler (1973).

Gelechia tarquiniella was described from an unspecified number of specimens of both sexes collected in June in the sandhills near Dublin (Ireland) (Barrett 1861, Stainton 1862) and later synonymized with *E. wilkella* by Meyrick (1928). From the original description it is clear that the name *tarquiniella* refers to the form with only a basal posterior bar. The form where only the posterior fasciae of the forewings are missing is unnamed. Bond

(1991) came to the opposite conclusion, but the specimen referred to by him as “Stainton’s type specimen” is apparently not part of the type series (K. Sattler *in litt.*).

Sakamaki (1995) recorded *E. wilkella* as new to Japan, based on comparison with specimens from North Europe. In his description of Japanese specimens he did not mention the characteristic white tips of the antennae and, according to his description, the labial palpi differ from those of *E. wilkella* in having segment 2 (and the head) yellow, whereas segment 3 is black. We examined one similar, but rather worn male from Japan, and three such specimens from Far East Russia (in ZIAP and ZMUH). We find it likely that they belong to a further species related to *E. wilkella*, but due to the condition of the examined material we refrain from describing it here.

We examined at least one correctly identified specimen of *E. wilkella* from Far East Russia (see above).

***Eulamprotes ochricapilla* (Rebel, 1903)**

Argyritis ochricapilla Rebel 1903: 96.

Eulamprotes buvati Leraut 1991: 157, figs 1, 6 [7], 8 [9], **syn. nov.**

Examined material. Austria (n=3), France (n=1), Italy (n=11).

Bulgaria: 1 ♀, 5 km N Sandanski, 130–200 m, 31.vii.–9.viii.2012, leg. O. Karsholt (ZMUC).

DESCRIPTION.—Adult (Figs 4–5). Male. Wingspan 9–10 mm. Segment 2 of labial palpus black in basal two-thirds (lighter on inner surface), cream-white in distal third; segment 3 cream-white mottled with blackish brown, especially in distal part. Antenna ringed blackish and white; apical sixth without darker rings. Head yellowish with a dark line around eye; thorax and tegula black. Forewing black with two whitish yellow-golden fasciae: first broad, oblique from 1/6 at costa to beyond fold; second from middle of costa reaching slightly beyond middle of wing, partly interrupted; pre-apical whitish yellow-golden costal and tornal spots not connected; a few whitish golden scales in apex; cilia black, whitish yellow at tip of apex. Hindwing almost as broad as forewing, dark grey. Abdomen blackish with yellowish tip.

Female. Similar to male.

Variation. The colour of the head underlies some variation from ochre to white, worn specimens become increasingly white. In the original description Rebel (1903) mentions a specimen having the blackish or dark brownish colour replaced by light brownish.

Male genitalia (Figs 24–25).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales, respectively. Uncus a short digitate process, apically with three long setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two very long and rather stout setae are arising, anterior margin nearly straight, pedunculi small; valva bird’s head-shaped, slender, with strong mediodorsal hump and nearly straight ventral (inner) margin, distal part abruptly and strongly tapered with pointed apex; separate plate-like sclerite at base of valva, covered with few setae; sacculus a broad, setose lobe; sacculus almost as long as distance from anterior margin of vinculum to tip of valva, basally broad, distally evenly tapered; phallus broadly sub-cylindrical, apical fifth strongly tapered, about one-third of maximum width of its anterior part; vesica with number of small grains.

Female genitalia (Fig. 51).—Apophysis posterioris slender, rod-shaped, about four times as long as segment VIII; segment VIII with distinctly sclerotized posteriolateral part, otherwise membranous; ostium bursae laterally with sclerotized folds; apophysis anterioris slender, rod-shaped, almost three times as long as segment VIII; ductus bursae long and slender, posterior half with slender, oblong sclerite extending to about apex of apophysis anterioris, anterior half membranous, weakly expanded; corpus bursae sub-oval, slightly larger than segment VIII; signum a large sub-rectangular plate, anterior margin with two short spines, posterior margin with one short and one longer spinal process.

DIAGNOSIS.—*E. ochricapilla* is characterized by having the basal five-sixths of the antennae ringed black and white and the apical sixth without darker rings, and by having yellow-golden forewing markings. The male genitalia somewhat resemble other species with short uncus and distally strongly tapered valva such as *E. wilkella* and *E. superbella*, but the abruptly tapered slender part of the valva is distinctive. The female genitalia differ from those of other species in the shape of the signum with the paired posterior and anterior spinal processes.

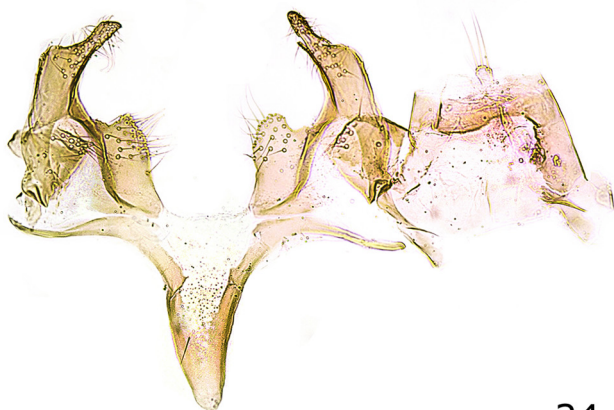
GENETIC DATA.—The intraspecific divergence of the barcode region is low and ranges from 0%–0.31% (average distance 0.12%) (n=5). The distance to the nearest neighbour *E. libertinella* is 9.38%.



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FIGURES 22–27. Male genitalia of *Eulamprotes* spp. 22, *E. wilkella* (Zeller), (Macedonia) gen. slide GEL 1194 P. Huemer; 23, *ditto*, phallus; 24, *E. ochricapilla* (Rebel), (Macedonia) gen. slide GEL 1186 P. Huemer; 25, *ditto*, phallus; 26, *E. superbella* (Zeller), (Denmark) gen. slide GU 13/1342 P. Huemer; 27, *ditto*, phallus.

DISTRIBUTION.—Only known from few localities in northern Italy (South Tyrol, Trento), Slovakia (Elsner *et al.* 1999), Czech Republic (Laštůvka & Liška 2011), Romania (Kovács & Kovács 1999), Austria (East Tyrol) (Deutsch 2012) and in southern France. New record for Bulgaria (see material examined).

BIOLOGY.—Host-plant and early stages insufficiently known. According to the original description the type series was bred from moss on old chestnut trees. Adults have been collected in a single generation from July to August in thermophilous forests at light.

REMARKS.—*Argyritis ochricapilla* was described from three males from a longer series (“in Anzahl”) bred by Hedemann in the first half of July 1902 from larvae collected in the surroundings of Bozen (South Tyrol, Italy) (Rebel 1903). A lectotype was designated by Popescu-Gorj (1992) (although given as “*ochricapitella*”). We have been able to examine a series of topotypical specimens of both sexes.

Eulamprotes buvati was described from four males and four females collected by Buvat at Viens (Vaucluse, France) but only the male holotype and a male and female paratype are explicitly mentioned in the original description (Leraut 1991). The species was compared with *E. superbella*, *E. libertinella* and *E. wilkella* but obviously the author was not aware of the existence of *E. ochricapilla*. In fact the description and figure of the adult male as well as male and female genitalia give clear evidence of conspecificity with the latter and we formally synonymise *E. buvati* syn. nov. with *E. ochricapilla*. The synonymy is fully supported by supplementary photographs of the holotype and its genitalia, kindly provided by J. Minet and J. Barbut (MNHN) and by an additional specimen from southern France (Prelles) in coll. TLMF.

Eulamprotes superbella (Zeller, 1839)

Gelechia (Brachmia) superbella Zeller 1839: 202.

Examined material. Austria (n=1), Denmark (n=68), Finland (n=5), Germany (n=4), Italy (n=3), Netherlands (n=4), Poland (n=2), Switzerland (n=1).

Greece: 1♂, Kozáni, Hrómio, 500 m, 1.v.1994, leg. Stadel Nielsen (ZMUC);

Russia: 1♀, Sakha Republic, south, Lena River, about 60°N, Pokroffskoje, 20.vi.1901, leg. Poppius (ZMUH).

DESCRIPTION.—Adult (Figs 6–8). Male. Wingspan 7.0–8.5 mm. Segment 2 of labial palpus blackish brown in basal two-thirds, apical third cream-white; segment 3 cream-white, becoming darker towards black tip. Basal part of antenna blackish, becoming more distinctly lighter ringed after one-third and until tip. Head white with dark line around eye; thorax and tegula black. Forewing black with two silvery fasciae: first oblique from 1/6 at costa to 1/5 at fold; second from middle of costa reaching three-quarters towards dorsum; pre-apical cream-white costal spot with silvery base not connected with silvery tornal spot; termen with silvery scales around apex; cilia blackish grey, whitish grey at tip of apex. Hindwing almost as broad as forewing, grey. Abdomen blackish grey with whitish grey tip.

Female. Wingspan 7.0–8.0 mm. Hindwing between half and two-thirds as broad as forewing, with more pointed apex. Abdomen distinctly larger than in male, black; posterior part of each segment silvery white. Otherwise similar to male.

Variation. The examined specimens show only minor variation. In one specimen from Finland the pre-apical costal spot and the tornal spot are connected.

Male genitalia (Figs 26–27).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales, respectively. Uncus reduced to tiny process with few short setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two very long and rather stout setae are arising, anterior margin nearly straight, pedunculi very small; valva basally broad, with strongly convex mediodorsal (outer) and concave ventral (inner) margin, more or less gradually tapered, distal part moderately slender; separate plate-like sclerite at base of valva, covered with few setae; sacculus a small, setose lobe; saccus about as long as distance from anterior margin of vinculum to tip of valva, basally broad, distally evenly tapered; phallus basally broad, distal part gradually constricted with abruptly and strongly tapered apical fifth, about one quarter of maximum width of its anterior part; vesica with number of small grains.

Female genitalia (Fig. 52).—Apophysis posterioris slender, rod-shaped, about three times as long as segment VIII; segment VIII with evenly and smoothly sclerotized posteriolateral part, otherwise membranous; ostium bursae laterally with sclerotized folds; apophysis anterioris slender, rod-shaped, about three times as long as segment VIII; ductus bursae long and slender, posterior half with slender, oblong sclerite extending to about apex

of apophysis anterioris, anterior half membranous, gradually expanded; corpus bursae sub-oval, about size of segment VIII; signum a distinct sub-rectangular plate, laterally weakly excavated, anteriorly with two short spinal processes, posterior part with one to two very short spines and several spinules.

DIAGNOSIS.—*E. superbella* is the smallest species of the *E. wilkella* group. It is moreover characterized by having the antennae ringed black and white to the tip, and by the female being almost normally winged. The male genitalia closely resemble other species with short uncus and distally strongly tapered valva, particularly *E. wilkella*, but the valva is comparatively more stout in *E. superbella* and the shape of the phallus with maximum width. The female genitalia are characterized by the sub-rectangular shape of the signum with characteristic spines.

GENETIC DATA.—The intraspecific divergence of the barcode region is low and ranges from 0%–0.15% (average distance 0.1%) (n=4). The distance to the nearest neighbour *E. wilkella* is 7.48%.

DISTRIBUTION.—Widely distributed in Europe, from France to Russia and from southern Scandinavia to the Mediterranean. Furthermore published from Mongolia (Piskunov 1990), Turkey (Koçak & Kemal 2007) and northern Africa (Algeria) (Chrétien 1917) but records from the Mediterranean and submediterranean area need verification in the light of the newly described species.

BIOLOGY.—Host-plant and early stages unknown. *E. superbella* is in the literature most often associated with *Thymus*, probably dating back to Wocke (1874) who wrote [translated from German]: “... not rare on *Thymus angustifolius* (= *serpyllum*) on which the larva also lives”. The various other host-plants given in literature, i.e. *Gnaphalium* (Elsner *et al.* 1999), are implausible. Although the adults are most often found near *Thymus* it seems rather likely that the species feeds on moss as is known from congeners. A specimen was bred from a grass-turf which was dug up in a dry coastal biotope (Buhl *et al.* 2002). Univoltine. Adults have been collected from the middle of May to the end of June. They are active during daytime and can be swept from vegetation or disturbed with smoke, especially from stands of flowering *Thymus*. They are only rarely attracted to light.

REMARKS.—*Gelechia (Brachmia) superbella* was described from many specimens collected in May and June on dry soil in the area of Glogow (Poland) (Zeller 1839). The type-locality and the precise description of important adult characters such as wing markings, head and labial palpi and particularly antennae leave no doubt about the identity.

E. superbella as figured in Elsner *et al.* (1999) is a mixture of two species. The adult figure 77 depicts a male of *E. baldizzonei* sp. nov., whilst fig. 77a represents a correctly identified female of *E. superbella*. The male and female genitalia are correctly identified and depict *E. superbella*.

***Eulamprotes mirusella* Huemer & Karsholt sp. nov.**

Examined material. Holotype. ♂. “Gallia mer. Digne 600 m 2.-5.6.1959 K.Burmann” (TLMF).

Paratypes. France: 3♂, same data as holotype [1 specimen without abdomen] (LNK, ZMUC); 1♂, Dep. Alpes de Haute-Provence, Saint Fasser(?), cocoon under stone 11.v.1901, emerged 12.vi.1901, leg. Chrétien (MNHP); 1♀, Digne, La Colle, leg. Chrétien, gen. slide GU 13/1362 P. Huemer (MNHP); 1♂, Dep. Alpes Maritimes, Bonson, 500 m, 9.vii.1975, leg. Dujardin [without abdomen] (TLMF); 1♂, Dep. Alpes Maritimes, Col de Ferrier, 1040 m, 22.vii.1977, leg. Dujardin (TLMF); 2♂, Dep. Alpes Maritimes, St. Barnabé, 950 m, 14.viii.1953, leg. Dujardin (TLMF); 1♂, Dep. Alpes Maritimes, St. Vallier, 700 m, 6.ix.1972, leg. Dujardin (TLMF); 2♂, Dep. Alpes Maritimes, St. Martin-Vésubie, 1000 m, 27.vii.2006, leg. Skou (ZMUC).

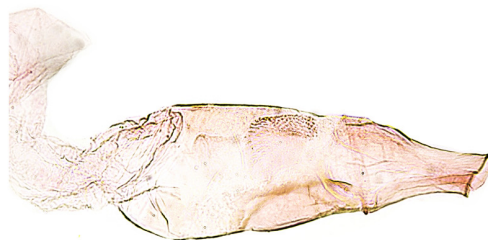
DESCRIPTION.—Adult (Figs 9–10). Male. Wingspan 9–10 mm. Segment 2 of labial palpus black with some cream-white on inner surface and distal end; segment 3 cream-white with black apical part. Antenna ringed black and white to tip. Head light yellow with a black line around eye; thorax and tegula black. Forewing black with silvery markings: an oblique fascia from 1/6 at costa to 1/5 at fold; a spot at middle of costa and another spot just below it in middle of the wing; pre-apical cream-white costal spot with silvery base not connected with tornal spot; termen with silvery scales around apex; cilia blackish, whitish grey at tip of apex. Hindwing about as broad as forewing, grey. Abdomen blackish grey with yellowish tip.

Female. Wingspan 8 mm. Labial palpus cream-white; segment 2 black on basal two-thirds of outer surface; segment 3 with black apical tip. Antenna ringed black and grey to tip. Head cream-white; thorax and tegula black. Forewing with pre-apical costal spot silvery (not bicoloured); cilia white around apex. Hindwing lanceolate, about

three-fifths length of forewing. Abdomen black; posterior part of posterior segments silvery white; tip cream-white. Otherwise similar to male.



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FIGURES 28–33. Male genitalia of *Eulamprotes* spp. 28, *E. mirusella* **sp. nov.**, holotype, (France) gen. slide GEL 1196 P. Huemer; 29, *ditto*, phallus; 30, *E. baldizzonei* **sp. nov.**, paratype, (Italy) gen. slide GEL 1197 P. Huemer; 31, *ditto*, phallus; 32, *E. occidentella* Huemer & Karsholt, paratype, (Italy) gen. slide GEL 1143 P. Huemer; 33, *ditto*, phallus.

Variation. The central fascia of the forewing can be more or less distinctly divided. The colour of the forewing markings has a slight bluish shade in fresh specimens.

Male genitalia (Figs 28–29).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales, respectively. Uncus reduced to tiny process with few short setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two very long and rather stout setae are arising, anterior margin nearly straight, pedunculi very small; valva massive, basally broad, with convex mediodorsal (outer) and nearly straight ventral (inner) margin, distal part gradually tapered; separate plate-like sclerite at base of valva, covered with few setae; sacculus a distinct setose lobe; saccus about as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally evenly tapered; phallus broadly sub-fusiform, distal part gradually constricted to distinctly tapered apical fifth, about one-third of maximum width of its anterior part; vesica with a number of small grains.

Female genitalia (Fig. 53).—Apophysis posterioris slender, rod-shaped, nearly four times as long as segment VIII; segment VIII with evenly and smoothly sclerotized posteriolateral part, otherwise membranous; ostium bursae laterally with sclerotized folds; apophysis anterioris slender, rod-shaped, about 2.5 times as long as segment VIII; ductus bursae long and slender, posterior half with slender, oblong sclerite extending beyond apex of apophysis anterioris, anterior half membranous, gradually expanded; corpus bursae sub-oval, large; signum a large sub-triangular plate, anterior edge slightly emarginated with distinct spinal process.

DIAGNOSIS.—*E. mirusella* sp. nov. is characterized by the markings of the forewings being clear silvery (with a slight bluish shade), by having the central fascia separated into two spots, and by having the antennae ringed black and white all the way to the tip. It is very similar to *E. baldizzonei* sp. nov., but that species has a darker frons and the distal third of the antenna is greyish white with only indistinctly darker rings. It can also be confused with the larger *E. libertinella* but that species has more whitish forewing markings and the central block is never divided. The female of *E. mirusella* sp. nov. has similarly reduced hindwings as the female of *E. occidentella*. However, the latter has the apical quarter of the antenna white. The male genitalia are similar to those of other species of the genus with reduced uncus and evenly tapered valva such as *E. baldizzonei* sp. nov. and *E. occidentella* but differ particularly in the massive shape of the valva. The female genitalia differ from those of most other species with known females in the singular anterior spine of the signum, from the overall similar *E. occidentella* in the sub-triangular shape of the signum and the longer spine.

GENETIC DATA.—No genetic data available.

DISTRIBUTION.—Hitherto only known from the south-western part of the French Alps.

BIOLOGY.—Host-plant and early stages unknown. Adults have been collected from early June to early September indicating possible bivoltinism. One specimen was bred from a cocoon found under a stone in May. The few records known to date are from lower mountain areas, ranging from about 500 to 1040 m.

REMARKS.—One paratype has an additional label “*mirosella*” which is probably a manuscript name from the collector, P. Chrétien. It was apparently not published.

The two specimens from Dep. Alpes Maritimes, St. Martin-Vésubie were listed as *E. libertinella* by Huemer & Karsholt (2011).

ETYMOLOGY.—The species name refers to a manuscript name created by Chrétien and is derived from the Latin adjective *mirus*, equivalent to admirable.

***Eulamprotes baldizzonei* Karsholt & Huemer sp. nov.**

Examined material. Holotype. ♂. “ITALIA sept., Südtirol Margreid, Fenner Schlucht 11°12'05''E, 46°17'16''N 460 m, 26.6.2013 leg. Huemer” “DNA barcode TLMF Lep 09986” (TLMF).

Paratypes. Italy: 3♂, Piemonte (CN), Parco Natur. Reg. Alpi Maritime, Entraque, Trinita, Vallone Grande, 1400 m, 15., 16. & 21.vii.1996, leg. Baldizzone (RCGB); 1♂, *ibid* but dintorni di Trinità, Entracque, 20.–25.vii.1996 leg. Baldizzone (RCGB, ZMUC); 2♂, ditto but Valdieri, Riserva Nat. Spec. Juniperus phoenicea, 900 m, 10. & 17.vii.1999, leg. Baldizzone (RCGB); 1♂, ditto but Palanfré, Lago d. Alberghi, 1600–1800 m, 16.vii.1999, leg. Baldizzone (RCGB); 1♂, Piemonte, Cardona, Basse Monferr, 23.v.1976, leg. Baldizzone; 1♂, same data but 5.vi.1979 (RCGB, ZMUC); 1♂, Piemonte, Palanfre, sent. Colle Garbella, 1550–1800 m, 2.vii.2000, leg. Baldizzone (barcode id TLMF Lep 05093) (ZMUC); 2♂, Prov. Südtirol, Auer, 15.–18.5.1958, leg. Burmann (LNK, TLMF); 1♂, Prov. Trento, Nago, 7.9.1981, leg. Burmann (TLMF); 1♂, Verona, 11.v.1974, leg. Triberti, genitalia

preparation 2888 Elsner (ZMUC); 1♂, Prov. Verona, M. Lessini, Fumane, 7.vi.1985, leg. Triberti (RCZT); 1♂, Prov. Verona, M. Lessini, Monte, 400 m, 22.vi.1985, leg. Triberti, genitalia preparation 1543 Elsner (RSGE); 1♂, Prov. Verona, M. Lessini, Monte, 600 m, 25.vi.1985, leg. Triberti (RCZT); 2♂, Prov. Verona, Monte Baldo, above Prada, 1200 m, 22.vii.1989, leg. Karsholt, genitalia slide 4696 Karsholt (ZMUC); 1♂, Abruzzo (AO), str. Alfedena-Rifugio Campitelli, 1200 m, 16.vii.1990, leg. Baldizzone (RCGB); 1♂, Prov. Abruzzo, Castèl di Leri, 550 m, 9.–11.vi.2005, leg. Skou (ZMUC); 2♂, Prov. Chieti, PN della Majella, Taranta Peligna, Pian di Valle, 700 m, 20.vii.2011, leg. Huemer, genitalia slide GEL 1197 P. Huemer (barcode id TLMF Lep 05037, TLMF Lep 05038) (TLMF); 1♂, Friuli-Venezia Giulia, 8 km NW Vivaro, 250 m, 28.vi.2008, leg. Nilsson & Skou (ZMUC); 2♂, Friuli-Venezia Giulia, Interneppo, 6.vi.1960 (NHMW); 1♂, same data, but leg. Burmann (LNK); 1♂, Veneto, Caorle, 1–4m, 7.vi.2012, leg. Mayr (TLMF). Slovenia: 1♂, Vipava (“Wippach”), 10.vi.1909, leg. Preissecker (NHMW); 1♂, Karst, Prešnica, 400 m, 2.vii.2002, leg. Deutsch (TLMF); 2♂, Karst, Sežana S, 360 m, 25.vi.2010, leg. Deutsch (barcode id TLMF Lep 08930, TLMF Lep 08931) (RCHD, TLMF); 3♂, Petrinski kras, Petrinja, 3.vi.2005, leg. Tokár (RCZT). Croatia: 2♂, Konjevrate, 6.vi.2005, leg. Tokár; 1♂, Pirovac-Ivinj, 5.vi.2005, leg. Tokár; 1♂, Biokovo Mts., Volšac, 1370 m, 27.vi.2006, leg. Tokár; 1♂, Malovan-Gračac, 10.vii.2004, leg. Tokár; 1♂, Gornje Bilišane, 11.vi.2005, leg. Tokár; 2♂, S Velebit Veliki Crnopac, 780 m, 22.vi.2006, leg. Tokár (barcode id TLMF Lep 08939, TLMF Lep 08940) (all RCZT).

DESCRIPTION.—Adult (Figs 11–12). Male. Wingspan 9–11 mm. Segment 2 of labial palpus black with some cream-white on inner surface and distal end; segment 3 cream-white with black apical part. Basal third of antenna blackish; middle third distinctly lighter ringed; distal third greyish white, indistinctly darker ringed. Head white with darker frons and a black line around eye; thorax and tegula black. Forewing black with silvery markings: an oblique fascia from 1/6 at costa to 1/5 at fold; a spot at middle of costa and another spot below it in middle of the wing; pre-apically cream-white costal spot with silvery base not connected with tornal spot; termen with silvery scales around apex; cilia blackish, whitish grey at tip of apex. Hindwing about as broad as forewing, grey. Abdomen blackish with yellow-grey tip.

Female. Unknown.

Variation. The examined specimens show only minor variation.

Male genitalia (Figs 30–31; 56).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and rather lanceolate scales, respectively. Uncus a tiny process, apically with several long setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two very long and rather stout setae are arising, anterior margin weakly cut-out, pedunculi small; valva long and moderately slender, weakly curved with convex dorsal (outer) and weakly concave ventral (inner) margin, distally tapered to pointed apex, valva in large part covered with setae; separate plate-like sclerite at base of valva, covered with few setae; sacculus a distinct, moderately small and setose lobe; saccus about as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally strongly tapered; phallus cone-shaped, comparatively broad and short, apical fifth abruptly tapered, about one-third width of its anterior part; vesica with a number of small grains.

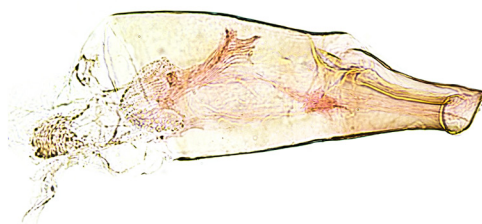
Female genitalia.—Unknown.

DIAGNOSIS.—*E. baldizzonei* sp. nov. is characterized by the markings of the forewings being clear silvery (with a slight bluish shade), by having the central silvery fascia separated into two spots, by the black segment two of the labial palpi, and by having the distal third of the antennae greyish white with only indistinct darker rings. It is very similar to *E. mirusella* sp. nov. The male genitalia are practically indistinguishable from those of other species with a short uncus and slender valva, in particular *E. occidentella* and *E. atrifrontella* sp. nov. From the latter they may be separated by the slightly stouter and thicker shape of the phallus.

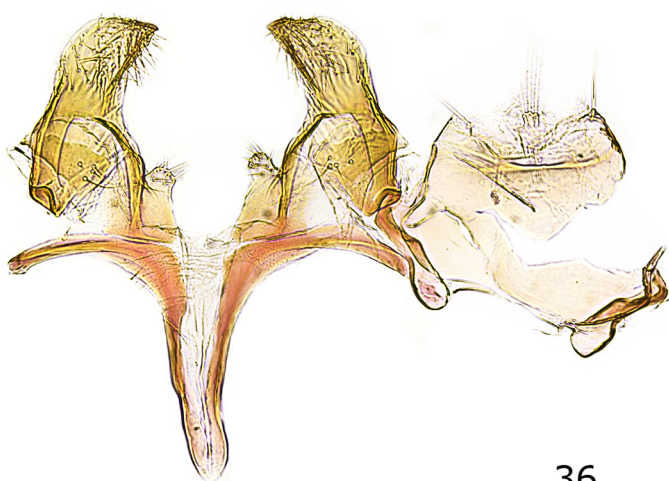
GENETIC DATA.—*E. baldizzonei* sp. nov. is genetically split into two major haplogroups. The intraspecific divergence of the barcode region of western populations ranges from 0%–1.22% (average distance 0.82%) (n=3) with a geographically related genetic distance between material from the Alps and the Apennines. The distance of these populations to the nearest named neighbour *E. atrifrontella* sp. nov. is 8.35%. However, the average distance to populations from Slovenia and Croatia is 5.3%, indicating possible cryptic diversity. Within this group a considerable geographically related divergence of maximum 1.7% can be observed.



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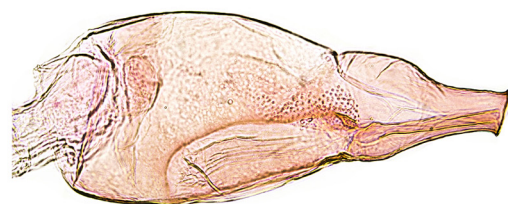
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FIGURES 34–39. Male genitalia of *Eulamprotes* spp. 34, *E. atrifrontella* **sp. nov.**, paratype, (Turkey) gen. slide GU 13/1345 P. Huemer; 35, *ditto*, phallus; 36, *E. wieseri* **sp. nov.**, holotype, (Kirgizia) gen. slide GU 13/1355 P. Huemer; 37, *ditto*, phallus; 38, *E. altaicella* **sp. nov.**, holotype, (Russia, Altai) gen. slide GEL 1212 P. Huemer; 39, *ditto*, phallus.

DISTRIBUTION.—Only known from the lower parts of the south-western and southern Alps and from the Apennines (Italy). Records from north-eastern Italy and from Slovenia and Croatia (Fig. 12) are attributed to *E. baldizzonei* **sp. nov.** despite their distinct genetic divergence, but based on the identical morphology.



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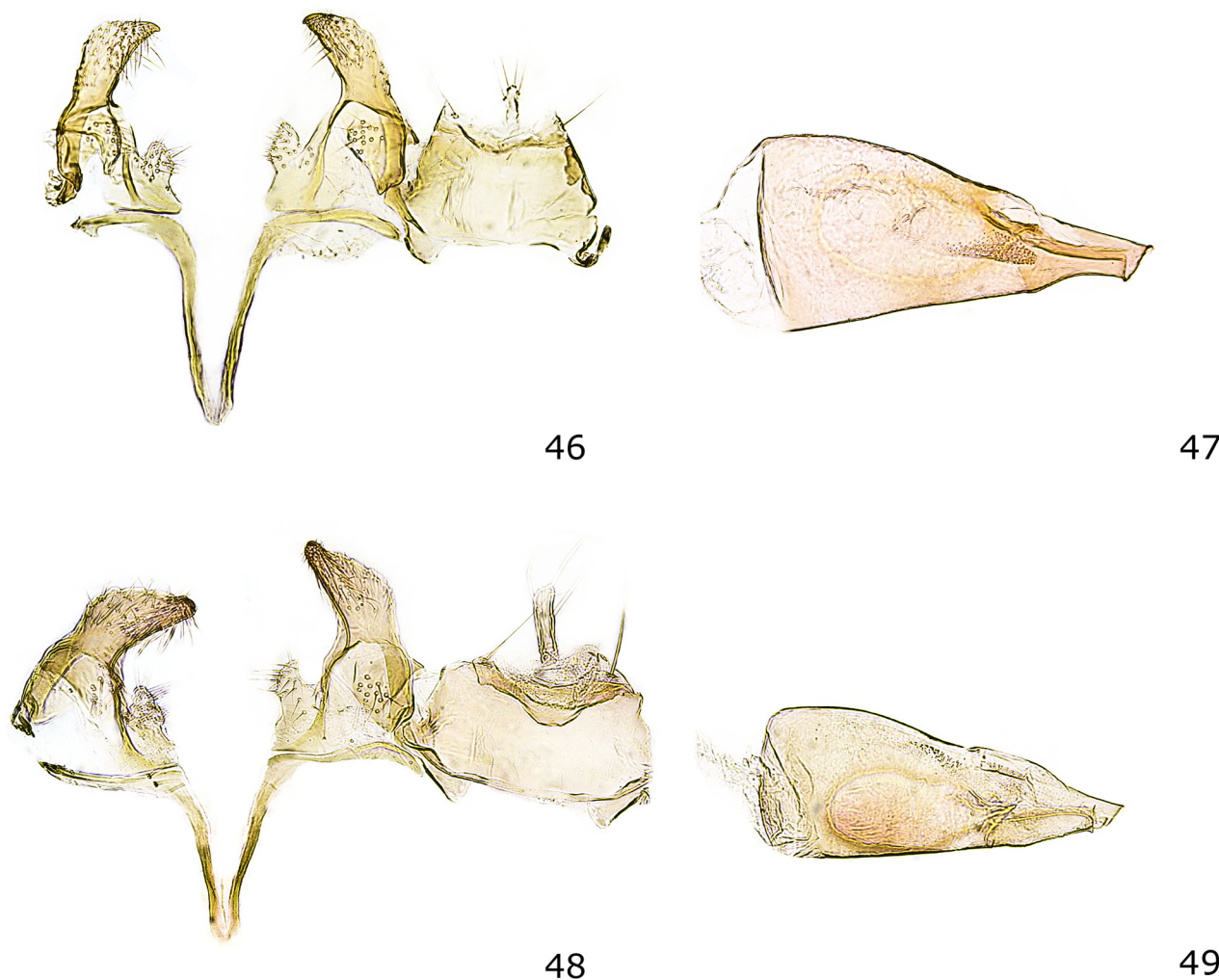
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FIGURES 40–45. Male genitalia of *Eulamprotes* spp. 40, *E. altaicella* sp. nov., paratype, (Russia, Altai) gen. slide GU 13/1359 P. Huemer; 41, *ditto*, phallus; 42, *E. kailai* sp. nov., holotype, (Kirgizia) gen. slide GEL 1196 P. Huemer; 43, *ditto*, phallus; 44, *E. kailai* sp. nov., paratype, (Kazakhstan) gen. slide GU 13/1358 P. Huemer; 45, *ditto*, phallus.

BIOLOGY.—Host-plant and early stages unknown. The adults have been collected at light from mid-June to early September indicating bivoltinism. Specimens have also been disturbed during the day with a bee-smoker. They occur at the foothills and lower parts of the Alps and Apennines up to altitudes of about 1600 m, alleged populations from the eastern part of the range also at the coast.



FIGURES 46–49. Male genitalia of *Eulamprotes* spp. 46, *E. libertinella* (Zeller), (Italy) gen. slide GEL 1154 P. Huemer; 47, *ditto*, phallus; 48, *E. gemerensis* sp. nov., paratype, (Slovakia) gen. slide GU 13/1344 P. Huemer; 49, *ditto*, phallus.

REMARKS.—The species status of *E. baldizzonei* sp. nov. is supported by phenotypical characters and the distinct DNA-Barcode. The conspecificity of specimens from the north-eastern part of Italy and from Slovenia to Croatia with western populations of *E. baldizzonei* sp. nov. is based on the congruent morphology of the adults. However, whereas external and genitalia morphology support the conspecificity, genetic distances rather contradict this hypothesis. No genetic data are available from southern alpine specimens. *E. superbella* as figured in Elsner *et al.* (1999) is a mixture of two species. The adult figure 77 depicts a male of *E. baldizzonei* sp. nov.

ETYMOLOGY.—The name (a noun in the genitive case) is dedicated to Giorgio Baldizzone (Asti, Italy) who collected important parts of the type-series.

***Eulamprotes occidentella* Huemer & Karsholt, 2011**

Eulamprotes occidentella Huemer & Karsholt 2011: 218, figs 1–2, 9–10, 21, 23, 25.

Examined material. Italy (n=45), France (n=3) (see Huemer & Karsholt (2011)).

DESCRIPTION.—Adult (Figs 13–14). Male. Wingspan 10–11 mm. Segment 2 of labial palpus black; segment 3 grey, darker on lower and outer surface. Antenna black, ringed with light grey on basal half and whitish grey towards tip. Frons cream-white with black margins; neck, thorax and tegula black. Forewing black with silvery

markings: an oblique streak from 1/6 at costa to 1/5 in middle of wing; a streak from middle of costa reaching half way towards dorsum; a tornal spot separated from pre-apical costal spot, the latter being white towards costa and silvery at base; a few silvery scales in apex and along termen; cilia blackish grey. Hindwing about as broad as forewing, dark grey, with grey cilia. Abdomen black, darkest on underside.



50



51

FIGURES 50–51. Female genitalia of *Eulamprotes* spp. 50, *E. wilkella* (Zeller), (Italy) gen. slide GEL 1229 P. Huemer; 51, *E. ochricapilla* (Rebel), (Austria) gen. slide GEL 1228 P. Huemer.

Female. Wingspan 8 mm. Antenna almost uniformly black in basal half, ringed black and white in middle; apical quarter white. Forewing broadest towards base, gradually tapering towards tip; costal spot silvery white (not bicoloured). Hindwing lanceolate, about two-thirds length of forewing. Abdomen black; posterior part of each segment silvery white; tip cream-white. Otherwise similar to male.



52

53

FIGURES 52–53. Female genitalia of *Eulamprotes* spp. 52, *E. superbella* (Zeller), (Denmark) gen. slide GU 13/1343 P. Huemer; 53, *E. mirusella* **sp. nov.**, paratype, (France) gen. slide GU 13/1362 P. Huemer.

Variation. The frons can be more or less covered with black scales. The silvery spots in the forewings vary slightly: the basal streak can be divided into two, and the costal and tornal spots can be almost confluent.

Male genitalia (Figs 32–33).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales respectively. Uncus a tiny process, apically with two long setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two moderately long and rather stout setae are arising, anterior margin weakly cut-out, pedunculi small; valva long and moderately slender, weakly curved with convex dorsal (outer) and concave ventral (inner) margin, distally evenly tapered to pointed apex, valva in large part covered with setae; separate plate-like sclerite at base of valva, covered with few setae; sacculus a distinct, moderately small and setose lobe; saccus about

as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally strongly tapered; phallus sub-cylindrical, apical quarter abruptly tapered, about one-third width of its anterior part; vesica with a number of small grains.



FIGURES 54–55. Female genitalia of *Eulamprotes* spp. 54, *E. occidentella* Huemer & Karsholt **sp. nov.**, paratype, (Italy) gen. slide GEL 1141 P. Huemer; 55, *E. libertinella* (Zeller), (Austria) gen. slide GEL 1142 P. Huemer.

Female genitalia (Fig. 54).—Apophysis posterioris slender, rod-shaped, about four times as long as segment VIII; segment VIII with evenly and smoothly sclerotized posteriolateral part, otherwise membranous; ostium bursae laterally with sclerotized folds; apophysis anterioris slender, rod-shaped, about three times as long as segment VIII; ductus bursae long and slender, posterior half with slender, oblong sclerite extending beyond apex of apophysis anterioris, anterior half membranous, gradually expanded; corpus bursae sub-oval, slightly larger than segment VIII; signum a distinct sub-oval plate, anteriorly with a small spinal process.

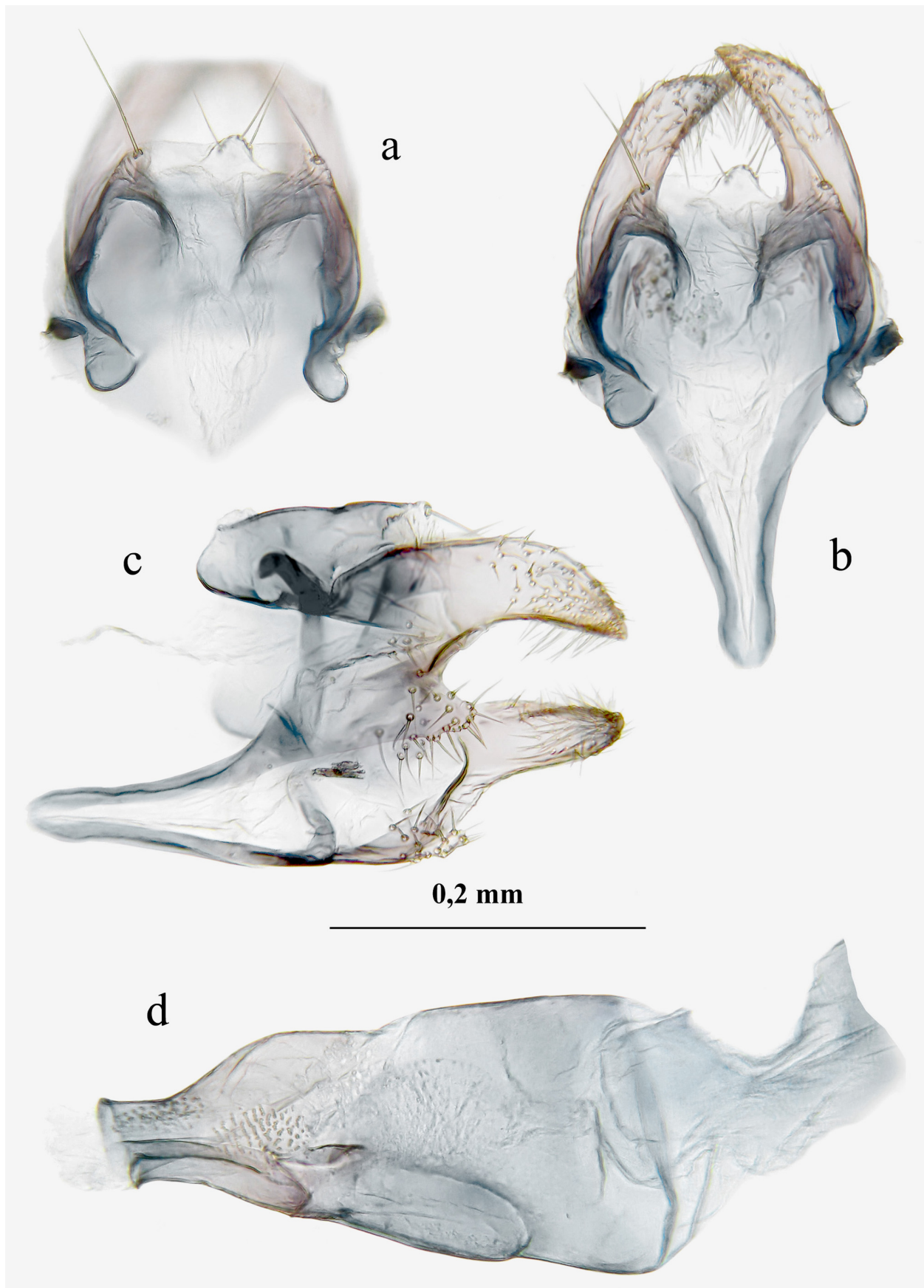


FIGURE 56. Male genitalia of *E. baldizzonei* sp. nov., gen. prep. GE/1543 (RSGE); (a–c with phallus removed): a: dorsal view focused on both pedunculi and caudal edge of tegumen, b: dorsal view, c: ventral-lateral view, d: phallus.

DIAGNOSIS.—*E. occidentella* is similar to *E. libertinella*. It can be separated from that species by being slightly smaller, by having blackish labial palpi, a dark neck and by having silvery (instead of silvery white) markings in the forewing. Females of *E. occidentella* have (like *E. mirusella* sp. nov.) hindwings of about two-thirds the length of the forewing, whereas in *E. libertinella* they are no longer than the breadth of the forewing. The male genitalia are virtually indistinguishable from those of *E. baldizzoni* sp. nov. The female genitalia differ from those of most other species with known females in the singular anterior spine of the signum, from the overall similar *E. mirusella* sp. nov. in the more rounded plate of the signum with shorter spine.

GENETIC DATA.—The intraspecific divergence of the barcode region is low, ranging from 0%–0.15% (average distance 0.05%) (n=5). The distance to the nearest neighbour *E. libertinella* is 8.85%.

DISTRIBUTION.—*E. occidentella* is restricted to a small section of the south-western Alps, namely the Cottian Alps (Italy, France).

BIOLOGY.—Host-plant and early stages unknown. The adults have been observed from late July to early August. The males are occasionally attracted to light but can also be found during the day by searching vegetation. The brachypterous female has been observed attracting males in the early morning at sunrise (Huemer & Karsholt 2011). *E. occidentella* was found on alpine scree with patchy vegetation on calcareous soil at high altitudes above the timberline.

***Eulamprotes atrifrontella* Karsholt & Huemer sp. nov.**

Examined material. Holotype. ♂. “Turkey Ankara Kizilcahaman, 20 km NW 1200m, 1.VII.1987 M. Fibiger” “Gen. prep. nr. 5181 ♂ O. Karsholt” (ZMUC).

Paratypes. Turkey: 2 ♂, same data as holotype, but one with genitalia slide GU 13/1345 P. Huemer (TLMF, ZMUC).

DESCRIPTION.—Adult (Fig. 15). Male. Wingspan 11–12 mm. Segment 2 of labial palpus blackish brown with some cream-white at distal end; segment 3 cream-white slightly mottled with black, especially at apex. Antenna ringed with blackish and greyish white to tip. Head, thorax and tegula black, frons slightly lighter. Forewing black with golden white markings: an oblique fascia from 1/6 reaching almost to fold; a fascia from middle of costa reaching two-thirds towards dorsum; pre-apical costal spot not connected with more inwards placed tornal spot; termen with some golden white scales; cilia blackish grey, whitish yellow at tip of apex. Hindwing about as broad as forewing, dark grey. Abdomen black with yellow-grey tip.

Female. Unknown.

Variation. One of the three examined specimens has the fascia from the middle of costa divided.

Male genitalia (Figs 34–35).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and rather lanceolate scales, respectively. Uncus indistinctly hump-shaped, apically with long setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two moderately long and rather stout setae are arising, each arising from the dorsolateral corner of the tegumen, anterior margin weakly cut-out, pedunculi small; valva long and moderately slender, weakly curved with convex dorsal (outer) and weakly concave ventral (inner) margin, distally tapered to pointed apex, valva in large part covered with setae; separate plate-like sclerite at base of valva, covered with few setae; sacculus a distinct, moderately small and setose lobe; saccus about as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally strongly tapered; phallus sub-cylindrical, apical fifth abruptly tapered, about one-third width of its anterior part; vesica with a number of small grains.

Female genitalia.—Unknown.

DIAGNOSIS.—*E. atrifrontella* sp. nov. is characterized by having a black head and the antennae ringed blackish and greyish white towards tip. It is most similar to *E. gemerensis* sp. nov. which can be separated by the antennae divided into a black basal part and a whitish grey apical part, and to *E. occidentella* but that species has a lighter frons and differently ringed antennae. The male genitalia are virtually indistinguishable from those of *E. occidentella* and extremely similar to *E. baldizzoni* sp. nov. from which they differ in the more slender phallus.

GENETIC DATA.—The intraspecific divergence of the barcode is unknown (n=1). The distance to the nearest neighbour *E. baldizzoni* sp. nov. is 8.35%.

DISTRIBUTION.—Hitherto only known from the Kizilcahamam area in the province of Ankara (Turkey).

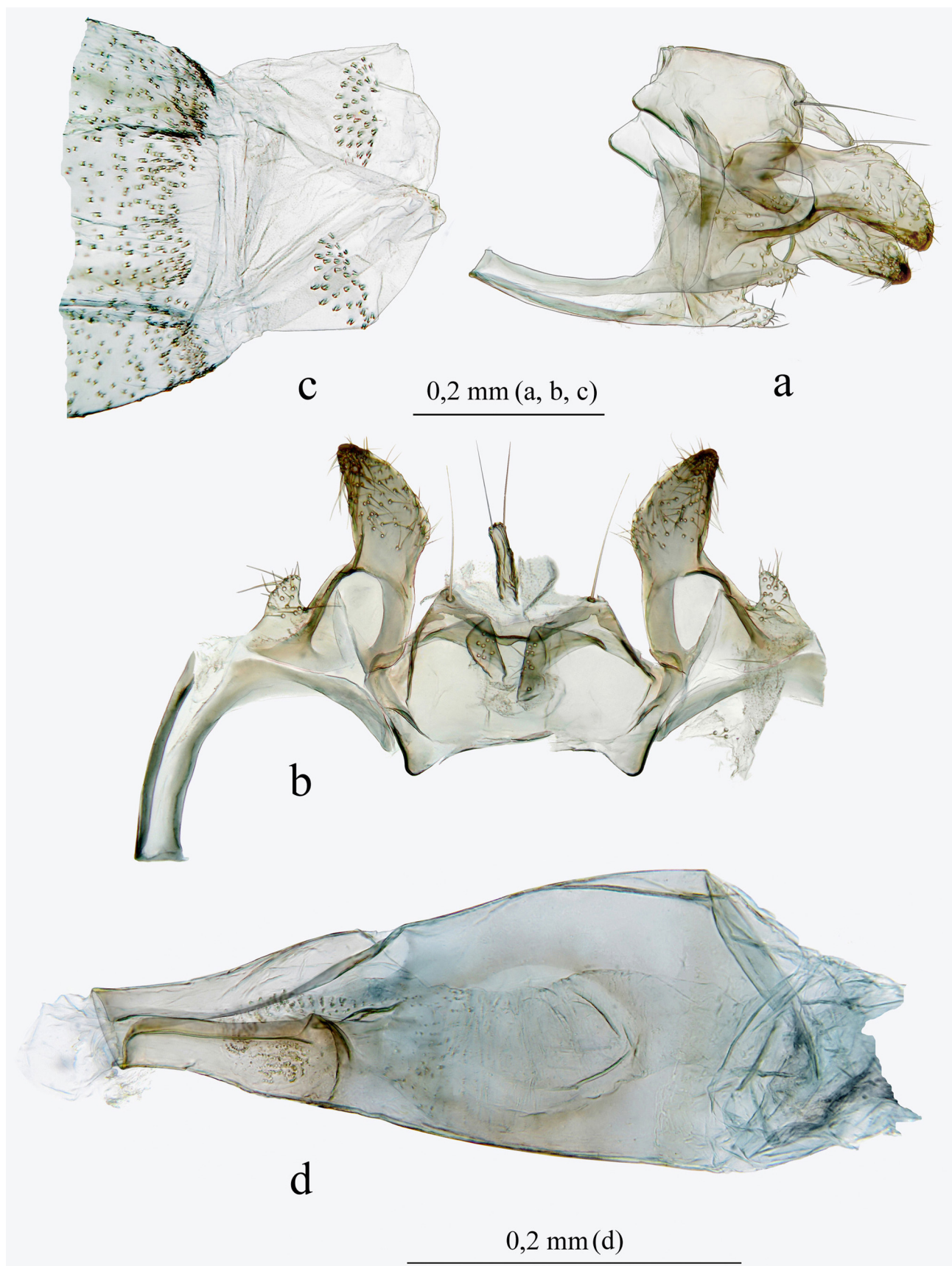


FIGURE 57. Male genitalia of *E. gemerensis* sp. nov., gen. prep. GE/2842: a: ventral-lateral view, b: unrolled, c: segment VIII, with intersegmental membrane with pair of anchor points for 2x33 androconial scales, d: phallus.

BIOLOGY.—Host-plant and early stages unknown. The type-series was collected in early July at light.

REMARKS.—The species status of *E. atrifrontella* sp. nov. is supported by phenotypical characters and the distinct DNA-Barcode, whereas the (male) genitalia morphology is of limited diagnostic value.

ETYMOLOGY.—The name is derived from the genitive singular of the Latin adjective *ater* (black) and the noun *frons* referring to the characteristic black forehead of the adult.

***Eulamprotes wieseri* Huemer & Karsholt sp. nov.**

Examined material. Holotype. ♂. “Kirgisien/Prov. Talas, Distr. Talas, West-Flanke Suusamyr Geb. Umg. Tuartscha HP49 1650–1800m 24.6.2010 GPS 42°07’33”N, 72°48’41”E leg. Dr. C. Wieser Kärntner Landesmuseum” “KLM Lep.00041” “GU 13/1355 ♂ P. Huemer” (LMK).

DESCRIPTION.—Adult. (Fig. 16). Male. Wingspan 12 mm. Labial palpus cream-white; basal half of segment 2 blackish on outer surface. Basal three-quarters of antenna ringed black and white; apical quarter white. Head white; thorax and tegula black with some lighter scales. Forewing black with white markings with only a slight silvery shine: an oblique fascia from 1/6 at costa to 1/5 at fold; an oblique fascia from middle of costa reaching two-thirds towards dorsum; a zigzag fascia from pre-apical costal spot to tornal spot; a few silvery white scales near apex; cilia blackish grey, whitish at tip of apex. Hindwing as broad as forewing, light grey with light grey cilia becoming darker toward apex.

Female. Unknown.

Variation. Only the holotype was examined.

Male genitalia (Figs 36–37).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales, respectively. Uncus a short digitate process with few moderately long setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two moderately long and rather stout setae are arising, each arising from the dorsolateral corner of the tegumen, anterior margin nearly straight, pedunculi very small; valva massive, broad, with convex anteriodorsal (outer) and weakly concave ventral (inner) margin, apical part pointed; separate plate-like sclerite at base of valva, covered with few setae; sacculus a small, setose lobe; saccus about as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally evenly tapered; phallus cone-shaped, moderately broad and long, distal part gradually constricted to distinctly tapered apical fifth, about one-third of maximum width of its anterior part; vesica with a number of small grains.

Female genitalia.—Unknown.

DIAGNOSIS.—*Eulamprotes wieseri* sp. nov. is characterized by its whitish labial palpi and head, and by white markings of the forewing having only a slight silvery shine, which separates it from the other species with white antenna-tip (e.g. *E. wilkella*). For *E. altaicella* sp. nov. see under that species. The male genitalia are separated from several otherwise similar species of the genus mainly by the massive and broad valva and the long, cone-shaped phallus.

GENETIC DATA.—The intraspecific divergence of the barcode is unknown (n=1). The distance to the nearest neighbour *E. libertinella* is 6.96%.

DISTRIBUTION.—Only known from the holotype collected in Kirgizia.

BIOLOGY.—Host-plant and early stages unknown. The holotype was collected in the last third of June at light.

REMARKS.—The species is described as new despite the limited material since it is well separated from other taxa of the *E. wilkella*-group by external characters and, as far as known, the barcode divergence.

ETYMOLOGY.—The name (a noun in the genitive case) is dedicated to Christian Wieser (LMK) who collected the holotype.

***Eulamprotes altaicella* Huemer & Karsholt sp. nov.**

Examined material. Holotype. ♂. “Russland, Süd-Sibirien Republik Altai 17.–22.VII.2009 Umgeb. Aktasch leg. Bernd Schacht” “P. Huemer GEL 1212 ♂” (TLMF).

Paratypes. Russia: 8♂, same data as holotype (RCAS, TLMF, ZMUC); 5♂, SW Altai, Katun valley, 10 km W

Katanda, 1200 m, 22.–27.vi.1983, leg. Mikkola, Hippa & Jalava, genitalia slide GU 13/1359 Huemer (RCGE, TLMF, ZMUH, ZMUC); 1♂, same data but 15.–19.vii.1983 (ZMUH); Tuva Republic, 2♂, E. Tannu-Ola Mts., Irbitel r., 50°44'N, 93°08'E, 1000 m, stony steppe slopes, 13.–16.vi.1995, leg. Jalava & Kullberg (ZMUH); 1♂, Buryatia, Barguzin range, Olso r. valley, 54°52'N, 110°55'E, 920 m, taiga, 7.vii.1996, leg. Jalava & Kullberg, genitalia in tube (ZMUH); 2♂, Buryatia, Barguzin valley, Malsky village, 54°35'N, 110°48'E, 500 m, sandy yard, 7.vii.1996, leg. Jalava & Kullberg, one genitalia in tube (ZMUH); 2♂, Buryatia, Barguzin valley, Umhej, 55°01'N, 111°08'E, 600 m, hot springs/meadow, 9.vii.1996, leg. Jalava & Kullberg, one genitalia in tube (ZMUH); 2♂, Buryatia, Barguzin valley, Djirga st., 54°55'N, 111°14'E, 600 m, Betula/meadow, 7.vii.1996, leg. Jalava & Kullberg, one genitalia in tube (ZMUH); 1♂, Altai Mts., 25 km W Aktash, 1200 m, 11.vii.1997, leg. C. Gielis (RCHW).

DESCRIPTION.—Adult (Fig. 17). Male. Wingspan 12–13 mm. Labial palpus cream-white; basal half of segment 2 blackish brown on outer surface; tip of segment 3 black. Basal part of antenna blackish, becoming more distinctly lighter ringed in middle; apical two-fifths white. Head light yellow with a dark line around eye; thorax and tegula black. Forewing black with silvery white markings: an oblique fascia from 1/6 at costa to 1/5 at fold; a fascia from middle of costa reaching two-thirds towards dorsum; pre-apical costal spot well separated from tornal spot; some silvery white scales along termen; cilia blackish grey, whitish grey at tip of apex. Hindwing almost as broad as forewing, light grey with grey cilia. Abdomen yellowish grey at base, then blackish with yellow-white tip.

Female. Unknown.

Variation. The examined specimens show only slight variation.

Male genitalia (Figs 38–41).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales, respectively. Uncus a very long digitate process with few apical setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two long and rather stout setae are arising, each arising from the dorsolateral corner of the tegumen, anterior margin nearly straight, pedunculi very small; valva moderately broad, with strongly convex mediodorsal (outer) and weakly concave ventral (inner) margin, distal part strongly tapered; separate plate-like sclerite at base of valva, covered with few setae; sacculus a distinct setose lobe; saccus about as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally abruptly tapered; phallus cone-shaped, moderately broad and long, distal part gradually constricted to distinctly tapered apical fifth, about one-quarter of maximum width of its anterior part; vesica with a number of small grains.

Female genitalia.—Unknown.

DIAGNOSIS.—*Eulamprotes altaicella* sp. nov. is characterized by its relatively large wingspan, its whitish labial palpi and head, and by having the apical two-fifths of the antennae white. The other species with light head and white antenna-tip (*E. wilkella* and *E. wieseri* sp. nov.) have only the apical quarter of the antenna white. These two species have also (most often) the pre-apical and the tornal spots fused. The male genitalia are easily separated from most taxa in the *E. wilkella*-group by the long uncus, a character which is otherwise only known from *E. gemerensis* sp. nov., a species, however, clearly separated externally.

GENETIC DATA.—No genetic data available.

DISTRIBUTION.—Only known from Russia: Altai, Buryatia, Tuva Republic.

BIOLOGY.—Host-plant and early stages unknown. The moths have been collected from late June to late July at light at altitudes between 500 and 1200 m.

REMARKS.—A specimen from SW Altai has a characteristic bilobed uncus (Fig. 40) reminiscent of the short divided uncus of *E. graecatella* with very long setae on each branch. We consider this specimen as a deviating individual form as other characters of adult and male genitalia largely agree with the nominotypical *E. altaicella* sp. nov.

ETYMOLOGY.—The name refers to the type-locality, the Altai Mts.

Eulamprotes kailai Karsholt & Huemer sp. nov.

Examined material. Holotype. ♂. “USSR, Kirgisia 41°30'N, 75°35'N [sic] 10 km SE Lake Song Köl” “steppe/river bed 26.7.1990 L. Kaila leg.” “GU 13/1361 ♂ P. Huemer” (ZMUH).

Paratypes. Kyrgyzia: 3♂, 30 km E Naryn, 41°25'N, 76°20'E, 2500 m, 29.vii.1990, leg. Kaila & Mikkola (ZMUH). Kazakhstan: 2♂, Zailiskiy, Alatau, Alma-Atinskij Nat. Par., 43°05'N, 77°15'E, 1850 m, 25.vi.1990, leg. Kaila, genitalia slide GU 13/1358 ♂ P. Huemer (TLMF, ZMUH). Russia: Tuva Republic, 10♂, Lake Tere-Khol, 50°01'N, 95°03'E, 1150 m, sand dunes, 9.–12.vi.1995, leg. Jalava & Kullberg (RCGE, ZMUH, ZMUC); 3♂, E. Tannu-Ola Mts., Irbitel r., 50°44'N, 93°08'E, 1000 m, stony steppe slopes, 13.–16.vi.1995, leg. Jalava & Kullberg (ZMUH); 1♂, E. Tannu-Ola Mts., 5 km ENE Khol-Oozha, 50°45'N, 94°29'E, 1250 m, steppe slopes, 16.–19.vi.1995, leg. Jalava & Kullberg (ZMUH); Buryatia, 1♂, Svyaloy Nos pns., Monahovo, 53°40'N, 109°00'E, 450 m, mixed forest, 27.–30.vi.1996, leg. Jalava & Kullberg (ZMUH); 1♂, Barguzin range, Olso r. valley, 54°52'N, 110°55'E, 920 m, taiga, 7.vii.1996, leg. Jalava & Kullberg (ZMUH); 1♂, Barguzin valley, Malsky village, 54°35'N, 110°48'E, 500 m, sandy yard, 7.vii.1996, leg. Jalava & Kullberg (ZMUH).

DESCRIPTION.—Adult. (Fig. 18). Male. Wingspan 9–10 mm. Labial palpus white; segment 3 with black tip. Antenna ringed black and whitish to tip. Head whitish; thorax and tegula black. Forewing black with white markings with only a slight silvery shine: an oblique fascia from 1/6 at costa to 1/5 at fold; a fascia from middle of costa reaching two-thirds towards dorsum; pre-apical costal spot close to tornal spot; apex with silvery scales around apex; cilia blackish grey, whitish grey at tip of apex. Hindwing almost as broad as forewing, grey. Abdomen yellowish grey in basal third, then dark grey with yellow-white tip.

Female. Unknown.

Variation. The pre-apical and tornal spots may be fused or divided. The colour of the head varies from pure white to whitish yellow, and the colour of the labial palpi varies from pure white to cream-white. Some specimens have dark scales at base of segment 2 of the labial palpus.

Male genitalia (Figs 42–45).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales, respectively. Uncus a short digitate process with three apical setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two very long and rather stout setae are arising, anterior margin nearly straight, pedunculi very small; valva weakly bird's head-shaped, moderately broad, with strongly convex mediodorsal (outer) and weakly concave ventral (inner) margin, distal part strongly tapered; separate plate-like sclerite at base of valva, covered with few setae; sacculus a short setose lobe; saccus almost as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally evenly tapered; phallus cone-shaped, moderately broad and short, distal part gradually constricted towards distinctly tapered apical fifth, about one-quarter of maximum width of its anterior part; vesica with number of small grains.

Female genitalia.—Unknown.

DIAGNOSIS.—*E. kailai* sp. nov. is characterized by being rather small, by having the antennae ringed black and whitish to tip, and by the almost pure white markings in the forewing with only a slight silvery shine. It is most similar to *E. libertinella*, but that species is larger (12–13 mm), the markings of the forewings more silvery shining, and the pre-apical and tornal spots are more separated. The male genitalia match several species of *Eulamprotes* with short uncus but differ from all these taxa in the shape of the valva.

GENETIC DATA.—No genetic data available.

DISTRIBUTION.—Central Asia to Siberia (Kazakhstan, Kyrgyzia, Russia: Buryatia, Tuva Republic).

BIOLOGY.—Host-plant and early stages unknown. Adults were collected in June in different kinds of biotope at altitudes between 450 and 2500 m.

ETYMOLOGY.—The name (a noun in the genitive case) is dedicated to Lauri Kaila (ZMUH) who collected the type series and numerous additional *Eulamprotes* from Asia.

Eulamprotes libertinella (Zeller, 1872)

Gelechia (*Argyritis*) *libertinella* Zeller 1872: 112.

Examined material. Austria (n=58), France (n=68), Italy (n=136), Switzerland (n=14) (see also Huemer & Karsholt (2011)).

DESCRIPTION.—Adult (Figs 19–20). Male. Wingspan 12–13 mm. Labial palpus white; basal half of segment 2 black on outer surface; tip of segment 3 black. Antenna black, distal part ringed with light grey and whitish grey

towards tip. Head whitish; thorax and tegula black. Forewing black with silvery white markings: an oblique streak from 1/6 at costa to 1/5 near dorsum; a streak from middle of costa reaching two-thirds towards dorsum; a silvery white tornal spot well separated from a cream-white pre-apical costal spot; some silvery white scales in apex and along termen; cilia blackish grey, whitish grey at tip of apex. Hindwing about as broad as forewing, grey. Abdomen blackish.

Female. Wingspan 10.5 mm. Labial palpus cream-white; distal part of segment 3 black. Head cream-white. Forewing broadest towards base, tapering towards tip; silvery white streaks from costa slender; apex without silvery white scales. Hindwing reduced, no longer than breadth of forewing, light grey. Abdomen black, lighter dorsally on basal segments; posterior part of each segment on dorsal side silvery. Otherwise similar to male.

Variation. There is some variation in the amount of dark scales in the labial palpi. The basal part of the antennae can be black for a shorter or longer distance. In the forewings the silvery white markings can be more or less whitish, and the apex can be almost without silvery scales. Some of this variation also depends on the condition of the specimens. The geographical variation in *E. libertinella* is slight.

Male genitalia (Figs 46–47).—Segment VIII with two pairs of coremata in intersegmental membrane, grouped into short tufts of moderately broad and lanceolate scales, respectively. Uncus a comparatively long digitate process with several apical setae; tegumen short, sub-rectangular, a sclerotized belt (gnathos) connects the dorsolateral corners of the tegumen, from these corners two long and rather stout setae are arising, anterior margin nearly straight, pedunculi very small; valva moderately broad, with strongly convex mediodorsal (outer) and almost straight ventral (inner) margin, apically tapered; separate plate-like sclerite at base of valva, covered with few setae; sacculus a distinct, setose lobe; saccus almost as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally gradually tapered; phallus cone-shaped, basally broad and moderately short, distal part gradually constricted to distinctly tapered apical fifth, about one-quarter of maximum width of its anterior part; vesica with a number of small grains.

Female genitalia (Fig. 55).—Apophysis posterioris slender, rod-shaped, about three times as long as segment VIII; segment VIII with weakly sclerotized posteriolateral part, otherwise membranous; ostium bursae laterally with sclerotized folds; apophysis anterioris slender, rod-shaped, about two times as long as segment VIII; ductus bursae long and slender, posterior half with slender, oblong sclerite extending distinctly beyond apex of apophysis anterioris, anterior half membranous, evenly expanded; corpus bursae suboval, small; signum a large suboval plate, anterior and posterior edge with a short spinal process.

DIAGNOSIS.—*E. libertinella* resembles *E. occidentella*, *E. kailai* sp. nov. and *E. mirusella* sp. nov. It is also similar to *E. wilkella*. The latter has almost normally winged females, has the distal part of the antenna white, and has the tornal and pre-apical costal spot of the forewing connected by an oblique fascia. The male genitalia are overall similar to several other species but differ by collectively diagnostic features, particularly the distinct digitate uncus and the shape of the valva. The female genitalia differ from other species by the shape of the signum with a single spine on the anterior and posterior edge.

GENETIC DATA.—*E. libertinella* shows an exceptional intraspecific divergence of the barcode region, ranging from 2.18%–5.43% (n=16) with geographically separated major haplotypes. Within these genetic clades divergence is low with a maximum of 1.08%. The distance of the barcode to the nearest neighbour *E. gemerensis* sp. nov. is 6.14%.

DISTRIBUTION.—Known from the major part of the Alpine arc, ranging from the Maritime Alps in the south-west up to the north-eastern Austrian Limestone Alps in the north-east and the Julian Alps in the south-east. Records from Spain (Seebold 1899), the Czech Republic (Sterneck & Zimmermann 1933) and Bosnia-Herzegovina (Rebel 1904) are unconfirmed and most likely belong to different species.

BIOLOGY.—Host-plant and early stages unknown. One female was bred from moss and lichens collected on rocks in NW Italy together with specimens of Tineidae. It ran rapidly around using legs and tips of the forewings in combination, being unable to fly (Baldizzone 2007). The adults have been collected from June to early September, depending on the altitude of the habitat. The males are easily attracted to light but can also be found during the day. The brachypterous female was observed baiting males in the evening at sunset (Huemer & Karsholt 2011). Females are rare in collections. *E. libertinella* prefers rocky habitats and scree with scattered vegetation both on calcareous and siliceous soil. It prefers altitudes between 1000 and 2600 m, but is occasionally found at lower elevation.

REMARKS.—*E. libertinella* was described from an unspecified number of specimens collected in the area of Bergün (Graubünden, Switzerland) and four specimens from the Hochschwab area and one from the Tragöstal near Bruck an der Muhr (Styria, Austria) (Zeller 1872). Huemer & Karsholt (2011) selected a male from Bergün as

the lectotype. The remarkable genetic divergence may reflect cryptic diversity but so far we have been unable to find substantial diagnostic characters in morphology.

***Eulamprotes gemerensis* Elsner sp. nov.**

Examined material. Holotype. ♂. “Slovakia centr., Muráň-hrad, 5.–7.vii.2003, M. Petrů lgt.” genitalia slide “GU 13/1344 ♂ P. Huemer” (TLMF).

Paratypes. Slovakia: 1♂, NP (National park) Slovenský kras, Plešivec, Ďulová, 415 m, 10.viii.2010, (barcode id TLMF Lep 05167), G. Elsner lgt. (TLMF); 1♂, Slovenský kras, Plešivec, Ďulová, 441 m, 8.vii.2011, (barcode id TLMF Lep 05168) G. Elsner lgt. (RCGE); 1♂, Slovenský kras, Plešivec, Ďulová, 455 m, 26.vii.2012, G. Elsner lgt., gen.prep.GE/2842 (RCGE); 1♂, Slovenský kras, Plešivec, Ďulová, 450 m, 8.viii.2008, J. Liška lgt. (RCJL); 1♂, Slovenský kras, Plešivec, Ďulová, 450 m, 19.vi.2009, J. Liška lgt. (RCJL); 1♂, Slovenský kras, Plešivec, Ďulová, 450 m, 10.viii.2010, J. Liška lgt. (RCJL); 1♂, Slovenský kras, Plešivec, Ďulová, 450 m, 19.vi.2009, J. Liška lgt. (RCJL); 1♂, Slovakia centr., Muránska planina, Muráň-Šiance, 920 m, 16.–19.vi.2004, J. Liška lgt. (RCJL); 2♂, Slov. kras, Vidová, 27.vi.2001, leg. Tokár [one specimen without abdomen] (RCZT); 1♂, Slov. kras, Vidová, 26.v.2000, leg. Tokár, gen. prep. GE/1542, (barcode id TLMF Lep 05170) (ZMUC).

DESCRIPTION.—Adult (Fig. 21). Male. Wingspan 10.5–11.5 mm. Segment 2 of labial palpus blackish brown; segment 3 light greyish except for the black frontal edge. Basal half of antenna black, apical part greyish white, several segments in middle ringed black and greyish white. Head, thorax and tegula black, frons slightly lighter. Forewing black with silvery white markings: oblique block from 1/6 reaching almost to fold; broken fascia from middle of costa (but not reaching costa) two-thirds towards dorsum; pre-apical costal spot not connected with more inwards placed tornal spot; termen with some silvery white scales; cilia blackish grey, whitish grey at tip of apex. Hindwing about as broad as forewing, grey. Abdomen dark brown above, paler on underside, terminal brush of longitudinal scales white.

Female. Unknown.

Variation. The central fascia is more or less divided into two bright spots.

Male genitalia (Figs 48–49; 57). Segment VIII with two pairs of coremata in intersegmental membrane grouped into clusters of oval and lanceolate scales, respectively. Uncus rather long moderately sclerotized lobe bearing several long setae; tegumen short, tunnel-shaped in natural position, posterior margin slightly sclerotized to membranous; uncus and tegumen loosely fused by very thin membrane, two very long and rather stout setae, each on dorsolateral corner of tegumen; pedunculi inconspicuous; beak-shaped setose valva strongly sclerotized and tapered from middle; setose, moderately sclerotized lobe (plate) connects internal base of valva with interior membrane; sacculus a distinct setose lobe; saccus almost as long as distance from anterior margin of vinculum to tip of valva, basally moderately broad, distally evenly tapered; phallus big, wedge-shaped in lateral view, terminated with unfinished circular hole; narrow slit parallel to the longitudinal axis extending from the top to about one-quarter where a strongly sclerotized transverse rib protrudes; vesica with number of small grains arranged in rows.

Female genitalia.—Unknown.

DIAGNOSIS.—*E. gemerensis* sp. nov. is characterized by having a black head and the antennae divided into a black basal part, ringed middle part and a greyish white apical part. It is similar to *E. atrifrontella* sp. nov. and to *E. occidentella*, but the latter has a lighter frons and differently ringed antennae.

GENETIC DATA.—The intraspecific divergence of the barcode region is low, ranging from 0%–0.16% (average distance 0.1%) (n = 3). The distance to the nearest neighbour *E. libertinella* is 6.14%.

DISTRIBUTION. So far known only from south-eastern central Slovakia.

BIOLOGY. Host-plant and early stages unknown. The moths occur on xerothermic limestone slopes and have exclusively been collected at light. The flight-period falls between late May and early August.

ETYMOLOGY. The name (an adjective) is derived from the noun Gemer—the name of an important tourist area that comprises both Slovak national parks, Slovenský kras (Slovakian karst) and Muránska planina (M. plateau), the only localities where the new species has been found.

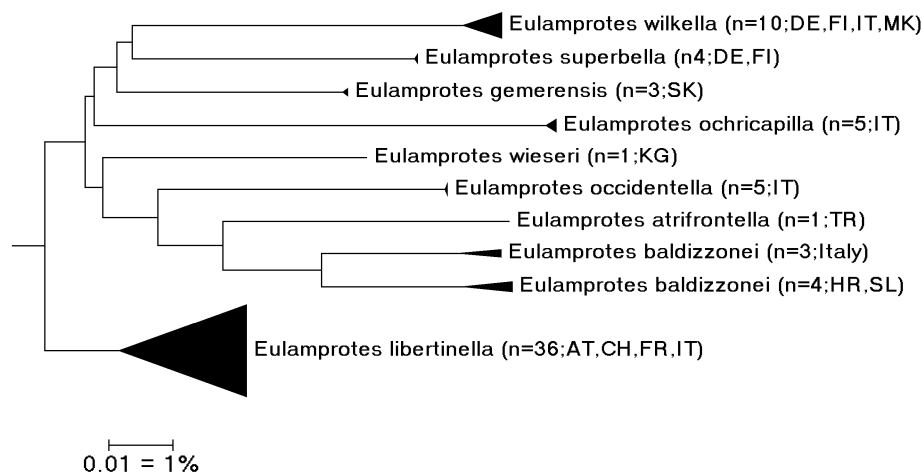


FIGURE 58. Neighbor Joining tree (Kimura 2 parameter, built with MEGA 5; cf. Tamura *et al.* 2011), only sequences (>600 bp) considered. Width of triangles represent sample size, depth the genetic variation within the cluster. Source: DNA Barcode data from BOLD (Barcode of Life Database, cf. Ratnasingham & Hebert 2007).

Discussion

Gelechiidae is one of the megadiverse though insufficiently explored and taxonomically difficult family of Lepidoptera with an estimated global 4700 described species in 500 genera (Nieuwenkerken *et al.* 2011), probably with a similar number of undescribed species (Karsholt *et al.* 2013). Even in the generally well explored European fauna a high level of unknown and frequently cryptic diversity has been found during revisionary work (i.e. Huemer & Karsholt 1999, 2010). Reasons for such shortcomings are particularly to be found in the overall morphological similarity of numerous species with subtle diagnostic characters. One particularly challenging example is the *E. wilkella*-group of species. Species delimitation of most taxa is extremely difficult, resulting in numerous misidentifications in many collections. Most of the classical identification efforts are based on phenotypical characters in this group so far. Genitalia are rarely examined, probably because of the extremely small size and three-dimensional structure of the male genitalia and the lack of diagnostic characters particularly in the male sex. Female genitalia characters, which on present knowledge are more diagnostic, are usually not examined because of the rarity of female voucher specimens. In fact females of only half of the twelve species here revised are known, most of them only from few vouchers. This lack of females is most likely due to difficulties in obtaining brachypterous Lepidoptera with inappropriate classical methods such as light trapping. Because of such shortcomings our taxonomic concept thus had to rely exclusively on males for six species. Our species concept is therefore based on diagnostic phenotypical characters for several taxa rather than on genitalia features which are normally used as standard in the diagnosis of cryptic Gelechiidae (i.e. Elsner *et al.* 1999, Huemer & Karsholt 2010). The recently rising usage of DNA barcoding as a standard method for identification of Lepidoptera (i.e. FinBOL—<http://www.finbol.org/>; All-Leps—<http://www.lepbarcoding.org/>) was thus of particular value for the differentiation of otherwise hardly separable cryptic taxa. In our study we were able to obtain sequences for nine out of twelve species. The remarkably high interspecific divergence of 10.58% on average (minimum distance 6.14%, maximum distance 13.86%) (Fig. 58) fully supports the morphological species concept and adds a further diagnostic character to several cryptic species. On the other hand intraspecific divergence is low for most taxa, or if present it is related to distribution patterns of geographically widely separated populations. Two examples of such considerable intraspecific divergence may include further unrecognized cryptic diversity. Allopatric populations of the alpine endemic *E. libertinella*, a species with strongly brachypterous and flightless female, show a remarkable divergence, ranging from 2.18% to 5.43% and probably reflecting different glacial history (Huemer & Karsholt 2011). However, morphology does not support separate taxonomic entities. Similarly barcodes of eastern and western populations of the *E. baldizzoni* sp. nov. split into two major haplogroups separated by 5.3% on average and which are further subdivided geographically. Probably these populations have had separate glacial refugia in the eastern Mediterranean and on the Italian peninsula leading to genetic separation. Despite the high barcode divergence we could not find any morphological characters which separate these haplogroups.

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