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# Western Palaearctic *Ectoedemia (Zimmermannia)* Hering and *Ectoedemia* Busck s. str. (Lepidoptera, Nepticulidae): five new species and new data on distribution, hostplants and recognition

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## Abstract

The nine western Palaearctic species of the subgenus *Zimmermannia* Hering, 1940 and 48 species in the subgenus *Ectoedemia* Busck, 1907 of the genus *Ectoedemia* are reviewed. One species in the subgenus *Zimmermannia* and four species in the subgenus *Ectoedemia* are described as new: *Ectoedemia* (*Zimmermannia*) *vivesi* A. Laštůvka, Z. Laštůvka & Van Nieukerken **sp. n.** from southern Spain and Cyprus with unknown host plant, *Ectoedemia* (*E.*) *hendrikseni* A. Laštůvka, Z. Laštůvka & Van Nieukerken **sp. n.** from southern France on *Quercus suber*, *E.* (*E.*) *heckfordi* Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.** from southern England on *Quercus petraea* and Q. *robur*, *E. (E.) phaeolepis* Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.** from Spain and Portugal probably on *Quercus ilex* and *Q. rotundifolia* and *E.* (*E.*) *coscoja* Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.** from Spain on *Quercus coccifera*. The following species are redescribed: *Ectoedemia* (*Zimmermannia*) *hispanica* Van Nieukerken 1985, *Ectoedemia* (*Zimmermannia*) *reichli* Z. & A. Laštůvka 1998, *Ectoedemia* (*E.*) *algeriensis* van Nieukerken 1985, *E.* (*E.*) *pseudoilicis* Z. & A. Laštůvka 1998 and *E.* (*E.*) *alnifoliae* van Nieukerken 1985. *Ectoedemia albiformae* Puplesis &

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Diškus 2003 is synonymised with *E. spinosella* (Joannis, 1908). *Ectoedemia jacutica* Puplesis 1988, previously synonymised with *E. agrimoniae* (Frey, 1858), is here synonymised with *E. spiraeae* Gregor & Povolný 1983. Updated keys to the subgenus *Zimmermannia* and the *Quercus* feeding *Ectoedemia* are provided.

**Keywords**
Leafminer, barkminer, Fagaceae, Rosaceae, Salicaceae, Ulmaceae, Anacardiaceae, hostplant, keys, Europe

## Introduction

The Western palaearctic species of the subgenera *Zimmermannia* Hering, 1940 and *Ectoedemia* Busck, 1907 in the genus *Ectoedemia* were revised more than 20 years ago (Van Nieukerken 1985). Since then only a small number of new species have been described: two from Greece: *E. (Zimmermannia) reichli* Z. & A. Laštůvka, 1998 and *E. (E.) pseudoilicis* Z. & A. Laštůvka, 1998, one from Ukraine (the Crimea): *E (E.) similigena* Puplesis, 1994 and two from Turkmenia: *E. (E.) albida* Puplesis, 1994 and *E. (E.) albiformae* Puplesis & Diškus, 2003 (Laštůvka and Laštůvka 1998; Puplesis 1994; Puplesis and Diškus 2003).

In the same period the knowledge of the family Nepticulidae has increased enormously: three major fauna books were published (Johansson et al. 1990; Laštůvka and Laštůvka 1997; Puplesis 1994) and a host of checklists and faunistic papers appeared, several particularly relevant for Nepticulidae (e.g. France: Van Nieukerken et al. 2006, Greece: Laštůvka and Laštůvka 1998, Iberian peninsula: Van Nieukerken et al. 2004a, Italy: Laštůvka and Laštůvka 2005, Russia: Van Nieukerken et al. 2004b and Sweden: Bengtsson et al. 2008). The faunistic knowledge was summarised in two European checklists, the latest on the internet (Van Nieukerken 1996; 2004, 2009).

In this paper we aim to update the taxonomic, faunistic and biological knowledge of these two subgenera. In the 1985 revision two species associated with *Quercus* were mentioned from Spain, but remained undescribed because of lack of material. Both species have now been found in numbers and one has been reared. A very similar but different one also suddenly appeared in southern England (Edmunds 2009). Another new *Quercus* feeding species was discovered in southern France and a new *Zimmermannia* was discovered in Spain and Cyprus. Additional material made it possible to describe the females of *Ectoedemia (Zimmermannia) hispanica* and *E. (Z.) reichli* and the males of *Ectoedemia (E.) alnifoliae.* Rearing and collecting large numbers of *E. (E.) algeriensis* from France (Van Nieukerken et al. 2006) showed that the supposed male in the 1985 treatment was correctly associated. Studies on molecular markers in the genus aided us in decisions about species status, and will be published elsewhere.

We concentrate on the Western Palaearctic region, here restricted to the land mass west of the biogeographic meaningful "Turgai straits", now more or less following the 64–65 east meridian, from North to South along the rivers Ob, Tobol, Turgay, Aral See, Karakum desert and border between Iran and Afghanistan/Pakistan. This means that one species treated in 1985 is excluded as East Palaearctic: *Ectoedemia (Zimmer-*

*mannia) nuristanica* Van Nieukerken, 1985; further the four species described from Tadzhikistan since 1985 are excluded (Puplesis 1988a; 1994). However, the Kopet Dag range in Turkmenistan and all of Iran are included: they have an essentially European-Mediterranean fauna.

The fauna associated with oaks apparently is much richer than was understood in 1985, and especially in the Mediterranean region identification can be difficult. We recognize now 26 species in all, seven in the *suberis* group, and 19 in the *subbimaculella* group, although the specific status of a few in the latter is uncertain. To aid in the identification, we provide new keys for the *Quercus* feeding species as well as one for the subgenus *Zimmermannia*. Together with the recent revision of the oak mining species of *Stigmella* (Van Nieukerken and Johansson 2003), all western Palaearctic Nepticulidae mining *Quercus* can now be safely identified in the adult stage. As in *Stigmella*, identification of mines alone is only possible for some of the species, but DNA barcoding of larvae is already becoming a good alternative to rearing adults (Van Nieukerken & Doorenweerd in preparation).

## Methods

This paper should be seen as an update to the earlier revision (Van Nieukerken 1985); because that is now also available online we try to avoid unnecessary repetition. Thus we only give descriptions for new species and redescriptions for those discovered after 1985, or for which much more material has become available since then. Diagnoses are given for species related to the newly described species since 1985, and where we have additional data compared to 1985.

After the species heading, full references, nomenclatorial details and synonymies are only given for taxonomic decisions published after Van Nieukerken (1985).

A section "Biology" is given for all species, including all the available hostplant information. A section "Distribution" summarises new records and only in some cases (re)describe the complete distributional area. For the material section see below.

**Terminology.** The terms for morphological structures in principle follow Van Nieukerken (1985). We appreciate that some of this terminology is slightly outdated, due to more recent studies of morphology, e.g. the term aedeagus as used in most Lepidoptera refers to a different structure than in most other insect orders (Kristensen, 2003). This prompted Kristensen, followed by several authors, to suggest to use the term phallus for this structure. However, for the sake of comparibility with the earlier descriptions in *Ectoedemia* and Nepticulidae in general we maintain the use of aedeagus here as a descriptive term.

**Preparation.** Methods for preparation of the genitalia follow Nieukerken (1985), with some minor changes; for staining male genitalia we used in recent years in addition to (Mayers) haemaluin, also phenosaffranin. In the last years when preparing genitalia

in recent material, EJvN often extracted the DNA from the abdomen, using a slightly adapted protocol according to Knölke et al. (2005). DNA results are no part of this paper, but relevant vouchers for later studies are cited here and DNA identifications have been used and also influenced some decisions about species identities.

**Illustrations.** Photographs (by EJvN) were usually made from slide mounted genitalia in euparal, drawings (by AL) were often made from genitalia in glycerine, which could be easier manipulated and then viewed from all sides.

Photographs of moths, leafmines and genitalia slides were taken with a Zeiss AxioCam digital camera attached respectively to a Zeiss Stemi SV11 stereo-microscope or a Zeiss Axioskop H, using Carl Zeiss AxioVision software.

**Measurements.** Measurements of genitalia were obtained from digital images, using AxioVision, 20× objective for male genitalia and 10× or 20× for females. Older measurements, used for the 1985 revision were taken with an eyepiece graticule, with a precision of about 5 µm. Capsule length was measured from vinculum to middle of pseuduncus; valva length from tip of posterior process to ventral edge, excluding the sublateral process; aedeagus length was measured from the sclerotized tube, from tip of ventral process/carina, excluding any protruding vesica parts. Bursa length is measured from point of entrance of ductus spermathecae to anterior tip. Genitalia measurements are usually rounded off to nearest 5µm. Numbers of setae on female terminal segments usually refer to one half of the segment.

Forewing length was measured from tip of fringe to attachment on thorax, usually at magnification of 20×. Antennal segment counts include scape and pedicel.

**Material.** For the collections the abbreviations (codons) from Evenhuis and Samuelson (2004) are used, with the following additions:

**AL** A. Laštůvka personal collection (Prostejov, Czech Republic)
**GB** G. Baldizzone personal collection (Asti, Italy)
**GD** G. Derra personal collection (Reckendorf, Germany)
**JJ** J. Junnilainen personal collection (Vantaa, Finland)
**MC** M. F. V. Corley personal collection (Faringdon, United Kingdom)
**PT** P. Triberti personal collection (Verona, Italy)
**RJ** R. Johansson personal collection (Växjö, Sweden), to be deposited in ZMUC
**RS** R. Sutter personal collection (Bitterfeld, Germany)

Here we list only material additional to the 1985 revision and the various faunistic papers listed in the introduction and when new and sigfnificant. Thus in general we do not list material from the northern and north-western parts of Europe, nor from France, Spain and Portugal, but we do list all Greek and Turkish records. All material and literature data are databased in EJvN's database of material; an Excel version of the data in this paper, plus those published in our earlier papers, including coordinates, is available as Appendix A and shared with the Global Biodiversity Information Facility (GBIF, http://www.gbif.org/).

Data for specimens examined are arranged here alphabetically by country and locality; when applicable, the province name is given as the first item in the locality.

## Systematics

### Genus *Ectoedemia* Busck

*Ectoedemia* Busck, 1907: 97. Type species *Ectoedemia populella* Busck, 1907: 98 by original designation and monotypy; see Van Nieukerken 1986: 75 for synonymy.

The genus *Ectoedemia* has been divided in five subgenera (Van Nieukerken 1986): the two treated here, *Ectoedemia* s. str., *Zimmermannia* Hering, 1940, further *Etainia* Beirne, 1945, *Fomoria* Beirne, 1945 and *Laqueus* Scoble, 1983. The latter, which is also preoccupied, has later been synonymised with *Fomoria* (Van Nieukerken 2008; Puplesis 1994). Preliminary molecular analyses (E.J. van Nieukerken, personal data) indicate that the monophyly of *Ectoedemia* in this wide sense is problematic in relation to *Parafomoria* Borkowski, 1975 and *Acalyptris* Meyrick, 1921. However, in all analyses, *Ectoedemia* s. str. and *Zimmermannia* remain closely related.

**Diagnosis.** The two subgenera here are recognised from other Nepticulidae by the collar comprising hairscales (lamellar scales in *Stigmella* and most *Bohemannia*), bifurcate Rs+M in hindwing (trifurcate in *Trifurcula*) and absence of uncus in the male genitalia. Males often have a hairpencil on the hindwing, forewing cilia line usually conspicuous.

### Checklist of West Palaearctic species

***Ectoedemia*** Busck, 1907
**subgenus *Zimmermannia*** Hering, 1940
*atrifrontella* (Stainton, 1851)
*liebwerdella* Zimmermann, 1940
*longicaudella* Klimesch, 1953
*hispanica* Van Nieukerken, 1985
*vivesi* A. Laštůvka, Z. Laštůvka & Van Nieukerken **sp. n.**
*monemvasiae* Van Nieukerken, 1985
*amani* Svensson, 1966
*liguricella* Klimesch, 1953
*reichli* Z. & A. Laštůvka, 1998

**subgenus *Ectoedemia*** Busck, 1907
*populella* group
*intimella* (Zeller, 1848)

*hannoverella* (Glitz, 1872)
*turbidella* (Zeller, 1848)
*similigena* Puplesis, 1994
*albida* Puplesis, 1994
*klimeschi* (Skala, 1933)
*argyropeza* (Zeller, 1839)

*preisseckeri* group
*preisseckeri* (Klimesch, 1941)

*suberis* group
*aegilopidella* (Klimesch, 1978)
*caradjai* (Groschke, 1944)
*suberis* (Stainton, 1869)
*hendrikseni* A. Laštůvka, Z. Laštůvka & Van Nieukerken **sp. n.**
*andalusiae* Van Nieukerken, 1985
*heckfordi* Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.**
*phaeolepis* Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.**

*subbimaculella* group
*quinquella* (Bedell, 1848)
*algeriensis* Van Nieukerken, 1985
*coscoja* Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.**
*gilvipennella* (Klimesch, 1946)
*leucothorax* Van Nieukerken, 1985
*haraldi* (Soffner, 1942)
*ilicis* (Mendes, 1910)
*pseudoilicis* Z. & A. Laštůvka, 1998
*heringella* (Mariani, 1939)
*alnifoliae* Van Nieukerken, 1985
*rufifrontella* (Caradja, 1920)
*albifasciella* (Heinemann, 1871)
*cerris* (Zimmermann, 1944)
*pubescivora* (Weber, 1937)
*contorta* Van Nieukerken, 1985
*subbimaculella* (Haworth, 1828)
*heringi* (Toll, 1934)
*liechtensteini* (Zimmermann, 1944)
*phyllotomella* (Klimesch, 1946)

*terebinthivora* group
*terebinthivora* (Klimesch, 1975)

*angulifasciella* group
*erythrogenella* (Joannis, 1908)
*spiraeae* Gregor & Povolný, 1983
    *jacutica* Puplesis, 1988 **syn. n.**
*agrimoniae* (Frey, 1858)
*hexapetalae* (Szőcs, 1957)
**sp. n.** Norway
*angulifasciella* (Stainton, 1849)
*atricollis* (Stainton, 1857)
*arcuatella* (Herrich-Schäffer, 1855)
*rubivora* (Wocke, 1860)
*spinosella* (Joannis, 1908)
    *albiformae* Puplesis & Diškus, 2003 **syn. n.**
*mahalebella* (Klimesch, 1936)

*occultella* group
*occultella* (Linnaeus, 1767)
*minimella* (Zetterstedt, 1839)

## Subgenus *Zimmermannia*

*Zimmermannia* Hering, 1940: 266. Type species *Ectoedemia liebwerdella* Zimmermann, 1940: 264 by original designation and monotypy.

**Diagnosis.** Most species relatively large for Nepticulidae, wingspan 6–10 mm. Colour pattern either absent or restricted to small dorsal spot and rarely a costal spot. Vestiture often rather dark brownish. Males often with conspicuous humeral lobe on hindwing around hairpencil, females often with very hairy abdominal tip. Pale headed species may resemble *Trifurcula* species, but males of those always with velvet patch of raised scales on hindwing underside or black androconials on forewing underside (in *T. (Glaucolepis) melanoptera* Van Nieukerken & Puplesis, 1991). In females genitalia dissection may be necessary when the venation is not clearly seen.

## Key to male *Zimmermannia*

The key follows from couplet 2 in the 1985 key (page 9). *E. nuristanica* is deleted, and *E. vivesi* added.

1. Frontal tuft dark fuscous brown to black..... **2**
– Frontal tuft yellowish or orange, sometimes mixed with fuscous ..... **7**
2. Thorax dorsally white or pale ochreous, contrasting with darker forewings ....**3**
– Thorax dorsally brown with at most white tips on mesoscutum and tegulae....**4**

3. Thorax dorsally white with darker tips on mesoscutum and tegulae. Hindwing with white hair-pencil and distinct humeral lobe..... ***E. atrifrontella***
– Thorax dorsally ochreous. Hindwing with short white hair-pencil and humeral lobe almost absent.....***E. hispanica***
4. Hair-pencil in male indistinct, without distinct humeral lobe in hindwing, sometimes with surrounding fuscous scales ..... ***E. vivesi***
– Hair-pencil distinct, conspicuous humeral lobe and costal emargination present ..... **5**
5. Hair-pencil show-white. Forewing often with small tornal and costal white spots beyond middle ..... ***E. liebwerdella***
– Hair-pencil fuscous or yellowish brown. Forewing with at most a tornal spot beyond middle ..... **6**
6. Hair-pencil surrounded by brown scales..... ***E. monemvasiae***
– Hair-pencil surrounded by white scales..... ***E. longicaudella***
7. Large species, forewing length 3.0–4.5 mm. Cilia-line indistinct. Aedeagus with 2 or 3 pairs of carinae..... **8**
– Smaller species, forewing length 1.9–2.9 mm (rarely 3.0 mm). Cilia-line distinct. Aedeagus with one pair of carinae only ..... ***Ectoedemia* s.s.**
8. Antennae with 31–41 segments, hindwing with white hairpencil surrounded by white androconials and costal emargination .....***E. amani***
– Antennae with 38–44 segments, hindwing with a very indistinct greyish hairpencil, not surrounded by androconial scales, no costal emargination ..... .....***E. reichli***
– Antennae with 42–48 segments, hindwing without hair-pencil or costal emargination, nor androconial scales.....***E. liguricella***

***Ectoedemia (Zimmermannia) atrifrontella*** (Stainton)

**Biology.** Hostplants: reared from *Quercus robur* L. and *Quercus pubescens* Willd.. Adults have been collected in forests with only other species of *Quercus.* Larvae with a one or two year life cycle. Adults fly from June (earliest date 21) to September (latest 24).

**Distribution.** Norway: Van Nieukerken and Johansson 1990; Latvia: Savenkov et al. 1996; Poland: Mazurkiewicz and Pałka 2004; Czech Republic: Laštůvka and Laštůvka 1991; Slovakia: Laštůvka and Laštůvka 1991; Portugal: Van Nieukerken et al. 2004a; Italy, Sicily: Laštůvka and Laštůvka 2005; Ukraine (Crimea): Budashkin 1988; Puplesis 1994. The record for Rumania (Diószeghy 1935) was earlier overlooked, it is here confirmed by material. We record it new for Russia and we also provide the first detailed records for Croatia and Greece. Records from Lithuania (Ivinskis 1993; Ivinskis 2004; Ivinskis et al. 1985) are dubious, because they seem to relate to mines only, which could also belong to one of the next two species.

**Remarks.** In the Iberian Peninsula and S. France the species can be confused with the externally similar *E. hispanica*. The hairpencil and costal emargination in the

male are diagnostic, as are the differences in number of setae on the female terminal segments.

**Material. Croatia:** 33♂, 8♀, Krk, various localities, 1975–2008, G. Baldizzone, E. Jäckh (GB, RMNH, USNM); **Greece:** 1♂, Evro, 35 km N Alexandropolis, Kirki, 500m, 20–21.VIII.1985, A. Moberg (NHRS). **Portugal:** 2♂, 6♀, Algarve, pr. Bensafrim, 4 + 24.IX.1973, P. Grotenfelt; 2♂, 4♀, Baia Alentejo, Odemira, 1.IX.1973, P. Grotenfelt (MZH, RMNH). **Rumania:** 1♀, Retezat mountains, 1100 m, 1.VII.1929, Dióshegy (NMW). **Russia:** 1♂, Belgorod, Borisovka, Les na Vorskle res., 28.VIII.1985, Krivochatskij (ZIN).

### ***Ectoedemia (Zimmermannia) liebwerdella*** Zimmermann

**Biology.** Hostplants: reared from *Fagus sylvatica* L. Adults have been collected in forests without *Fagus*, and only *Quercus* present, and also far outside the distribution area of *Fagus*, so oaks are the likely alternative host. Larvae with a one or two year life cycle. Adults fly from 7 June to 22 August.

**Distribution.** Norway: Aarvik et al. 2006; Switzerland: Bryner et al. 2004; Spain, Portugal: Van Nieukerken et al. 2004a; Russia: Van Nieukerken et al. 2004b; Bulgaria: Cicak et al. 2006. See also Baldizzone 2004; Van Nieukerken et al. 2006. We record the first adults for Bulgaria and the species as new for Macedonia, Turkey and San Marino and we present many additional records for Germany, Greece and Italy.

**Remarks.** *Ectoedemia liebwerdella* is almost inseparable from the previous species in the male and female genitalia. However, the white thorax of *atrifrontella* and the larger humeral lobe in *liebwerdella* usually suffice to separate the taxa. Some studies in Eastern Europe suggested that larvae of this species might be a vector for the "beech bark necrotic disease" (caused by Ascomycete fungi of the genus *Nectria* (Fr.) Fr.), but most cannot find a significant correlation (Cicak et al. 2006; Mihal and Cicak 2001; Rojek 2005; Zubrik et al. 2002).

**Material. Bulgaria:** 5♂, 2♀, Burgas, 40 km SE, Ropotamo, 26–27.VI.2001, J. Junnilainen (JJ); 1♀, Sliven, 25.VI.2001, J. Junnilainen (JJ). **Croatia:** 5♂, 1 ♀, Krk, various localities, 1978–2006, G. Baldizzone (GB, RMNH), 3♂, Orašac, 12.VII.2000, A. Laštůvka (AL). **Germany:** 1♂, Rheinland-Pfalz, Schlossböckelheim, Felsenberg, 20.VI.2007, A. Werno (AW), Saarland, Lauterbach/Warndt, Waldweg, 28.VII.2006, A. Werno (AW). **Greece:** 1♂, Akhaia, 5 km N of Kalavrita, 800m, 24.VI.1991, olive orchard, li, R.T.A. Schouten (RMNH); 8♂, 3♀, Akhaia, Kalavrita, 20.VI.1997, A. & Z. Laštůvka (AL); 2♂, 1♀, Evro, Kavisos, 22–23.VIII.1985, A. Moberg, (NHRS); 1♂, 5♀ Evro, 35 km N Alexandropolis, Kirki, 500 m, 20–21.VIII.1985, M. Fibiger, A. Moberg (NHRS, ZMUC); 3♂, 4♀, Evros, Alexandropolis, Kirki, 24–27.VII.1985, P. Grotenfelt (MZH, RMNH); 2♂, 2♀, Florina, Vatochorion, 16.VII., 7–9.VIII.1985 P. Grotenfelt, (RMNH); 6♂, 4♀, Fthiotis, Ayios Kharalambos, 22.VI.1998, A. & Z. Laštůvka (AL); 3♂, Ioannina, Pindos Konitsa, Pades, 6.VII.1981, P. Grotenfelt (MZH, RMNH); 2♂, Ioánnina, Smolikas, 10 km W of Paraskevi by Konitsa, 600

m, 24.VII.1990, M. Fibiger (ZMUC, RMNH); 5♂, 1♀, Lakonia, Nea Marathea, 19.VI.1996, A. & Z. Laštůvka (AL); 3♂, 2♀, Messinía, Kardamili, 20.VI.1996, A. & Z. Laštůvka (AL); 2♂, Préveza, Thesprotiko, 11.VI.1997, A. & Z. Laštůvka (AL). **Italy:** 1♂, Alessandria, Capanne di Marcarolo, Capanne super, sent. Cascina Porassa, 850 m, 9.VII.2003, G. Baldizzone (GB); 2♂, Alessandria, Parco NR Capanne di Marcarolo, Cascina Cappellana, 450 m, 15.VII.2005, G. Baldizzone (GB, RMNH); 2♂, 1♀, Alessandria, Parco NR Capanne di Marcarolo, str. Cirimilla-Capanne, 350 m, 6.VII.2005, G. Baldizzone (GB, RMNH); 1♀, Alessandria, Parco NR Capanne di Marcarolo, loc. Cirimilla, 300 m, 7.VI.2005, G. Baldizzone (RMNH); 1♂, Cosenza, Longobucco (Calabria-La Sila), 1600, 3.VIII.1982, J.H. Kuchlein (coll. Kuchlein); 3♂, Cuneo, Parco Natur. Reg. Alpi Marittime: Valdieri, Reserva, Nat. Spec. Juniperus phoenicea, 900 m, 12.VII.1999, G. Baldizzone (GB, RMNH); 9♂, Latina, Monti Aurunci, 4 km NW Castelforte, 33T, VF07, 400 m, 22–23.VI.1969, 1–11.VII.1972, R. Johansson (RJ); 1♂, Latina, Mti Aurunci, Castelforte, 23.VI.1969, E. Jäckh (USNM); 1♂, Perugia, Lago Trasimeno, S. Felioiano, 260 m, 5.VII.1964, F. Hartig (MRSN); 1♂, RD Calabria, Aspromonte, Solano sup., 1000 m, 9.VIII.1971, F. Hartig (MRSN); 1♂, Savona, Testico, 470 m, 11.VIII.1968, E. Jäckh (USNM). **Macedonia:** 1♂, Trojáci, 10.VI.1996, A. & Z. Laštůvka (AL). **San Marino:** 4♂, SM, San Marino, 9.VII.1991, P. Grotenfelt (MZH, RMNH). **Turkey:** 1♂, 1♀, Ankara, 10 km NW Kizilcahamam, 1150–1250m, 8.vi-8.VII.1989, Fibiger & Esser (ZMUC); 1♂, Yozgat [on label given as Çorum prov.], Çekerek, 1300 m, 17.VII.1989, Fibiger & Esser (ZMUC).

### *Ectoedemia (Zimmermannia) longicaudella* Klimesch

**Biology.** Hostplants: reared from *Quercus robur* L. Adults have been collected in forests with other species of *Quercus* as well. Larvae with a one or two year life cycle. Adults fly from 6 June to 30 August, not as late as *atrifrontella*.

**Distribution.** Norway: Van Nieukerken and Johansson 1990; Finland: Mutanen et al. 2001; Latvia: Savenkov et al. 1996; Portugal: Van Nieukerken et al. 2004a, Laštůvka and Laštůvka 2008; Czech Republic: Laštůvka and Laštůvka 1991; Slovakia: Laštůvka and Laštůvka 1991; Greece: Laštůvka and Laštůvka 1998; Russia: Van Nieukerken et al. 2004b; Puplesis 1994. See also Baldizzone 2004; Van Nieukerken et al. 2006. Here recorded new for Bulgaria, Macedonia, San Marino and Switzerland and first detailed record for Georgia.

**Material. Bulgaria:** 12♂, Burgas, Burgas, 40 km SE, Ropotamo, 16–20, 26–27. VI.2001, J. Junnilainen (JJ, RMNH); 3♂, Kresna, 31.v-2.VI.2002, J. Junnilainen (JJ); 2♂, 3♀, Sliven, 18–23.VI.2000, 25.VI.2001, J. Junnilainen (JJ, RMNH), 1♂, 1♀, Montana, 25.VI.1998, A. & Z. Laštůvka (AL). **Croatia:** 23♂, 5♀, Krk, various localities, 1975–2007, G. Baldizzone, E. Jäckh (GB, RMNH, USNM); 2♂, Velebit, 17 km E Karlobag, 26.VI.1983, B.Å. Bengtsson (BÅB). **Georgia:** 1♂, Abchazia, Tumistinskij zapov., 7.VII.1978, Zagulajev (ZIN). **Greece:** 1♂, Evros, Alexandropolis, Kirki, 27.VII.1985, P. Grotenfelt (MZH); 1♂, Florina, Vatochorion, 16.VII.1985, P.

Grotenfelt (MZH); 2♂, Ioannina, Pindos Katara, P. Grotenfelt, 3.VII.1981 (MZH, RMNH); 2♂, 4♀, Ioannina, Pindos Konitsa, Pades, 6.VII.1981, P. Grotenfelt (MZH, RMNH); 5♂, Trikala, Pindos Kastraki, Meteora, 2.VII.1981, P. Grotenfelt (MZH, RMNH). **Macedonia:** 1♂, Istibani, 9.VI.1996, A. & Z. Laštůvka (AL), 1♂, Negotino, 8.VI.1997, A. & Z. Laštůvka (AL), 1♂, Trojáci, 10.VI.1996, A. & Z. Laštůvka (AL). **San Marino:** 1♂, San Marino, 09.VII.1991, P. Grotenfelt (MZH). **Switzerland:** 1♂, Wallis, Leuk-Pfynwald, 600 m, 6.VI.2001, li, B. Landry & Merz (MHNG); 1♀, Wallis, Sierre Damona, Garten H. Gerber, 800m, 28–29.VI.2006, R. Seliger (coll Seliger). **Turkey:** 2♂, 1♀, Ankara, 20 km NW Kizilcahamam, 36T, VK5866, 1200 m, 24.VI.1986, M. Fibiger (RJ); 1♂, Ankara, Camlidere, 1300 m, 31.VII.1996, K.E. Stovgaard (ZMUC); 1 adult, Içel [Mersin], Güzeloluk NW Erdemli, Taurus, 1400 m, 16.VII.1986, M. Fibiger (RJ).

***Ectoedemia (Zimmermannia) hispanica*** Van Nieukerken
Figs 5–6, 14–15

**Diagnosis.** *E. hispanica* resembles *E. atrifrontella*, both have a pale thorax, but overall *hispanica* is paler and less contrasting and the thorax more yellowish than in *atrifrontella*. Males of *atrifrontella* have a distinct humeral lobe, with distinct costal emargination, and large white hairpencil, *hispanica* has a shorter hairpencil without costal emargination. Male genitalia cannot be mistaken, the female genitalia are characterised by ductus spermathecae with 4 convolutions, the very large number of setae on tergites 7 and 8 and anal papillae, and relatively short signa.

**Redescription.** Male. Forewing length 2.5–3.3 mm, wingspan 6.2–7.2 mm. Head: frontal tuft and collar fuscous to black. Antennae long, with 46–56 segments. Thorax yellowish white, forewings brown, irrorate with yellowish brown, wing base as thorax, often an indistinct pale tornal spot. Cilia line indistinct, terminal cilia yellowish white. Hindwing with a short white hairpencil of at most one third wing length, surrounded by a few white scales; humeral lobe not pronounced, no costal emargination. Abdominal tufts yellowish white.

Female. Forewing length 2.3–3.0 mm, wingspan 6.0–6.6 mm. Antennae with 37–42 segments. Hindwing without hairpencil.

Male genitalia (Figs 5–6). See original description.

Female genitalia (Figs 14–15). Along anterior margin of T8 (partly on T7?) a crescent shaped field of about 80–90 very long setae, on rest of T8 ca 50 setae, scales absent. Anal papillae (T9) with ca 40 setae. Posterior apophyses reaching beyond anterior apophyses. Vestibulum wide, without distinct sclerotizations. Corpus bursae ca 1300 µm long, covered with pectinations, partly in concentric bands around signa; signa elongate, slightly dissimilar, resp 290 and 330 µm long (n=1), ca 5 cells wide. Ductus spermathecae with 4 convolutions.

**Biology.** Hostplants: not reared, most likely feeding on evergreen *Quercus*. Adults fly from 8 June to 23 August.

**Distribution.** Restricted to south-western Europe. Southern France: Laštůvka and Laštůvka 1997; Van Nieukerken et al. 2006; Portugal: Van Nieukerken et al. 2004a.

**Remarks.** Since the original description was based on just two worn males, the species is here redescribed. The material includes also that given earlier for France, Spain and Portugal (Van Nieukerken et al. 2004a; 2006).

**Material. Spain:** 3♂, 1♀, Almeria, Maria, 1200 m, 8–15.VII.2007, M. Delnoye (RMNH); 1♀, Sierra de Baza, 1300 m, 18.VII.1987, G. Baldizzone & E. Traugott-Olsen (GB); 2♂, Barcelona, Santa Maria d´Olo, 25.VI.2008, A. & Z. Laštůvka (AL); 2♂, Granada, Trevelez, 5 km SW, 1500 m, 31.VII.1999, J. Junnilainen (JJ); 1♂, Malaga, Jubrique, 16.VI.2008, A. & Z. Laštůvka (AL); 1♀, Huelva, El Corchuelo, 19.VI.2007, A. & Z. Laštůvka (AL); 1♂, Tarragona, Baix Camp, Prades, Col de les Masies, 980 m, 13.VII.2006, E. Requena & De-Gregorio (RMNH); 1♂, Tarragona, 3 km S Fayón, 8.VI.2009, A. & Z. Laštůvka (AL).

***Ectoedemia (Zimmermannia) vivesi*** A. Laštůvka, Z. Laštůvka & Van Nieukerken **sp. n.**
urn:lsid:zoobank.org:act:09EE7B26-02AA-4F7F-B52B-84F2EF481788
Figs 1–4, 11–13

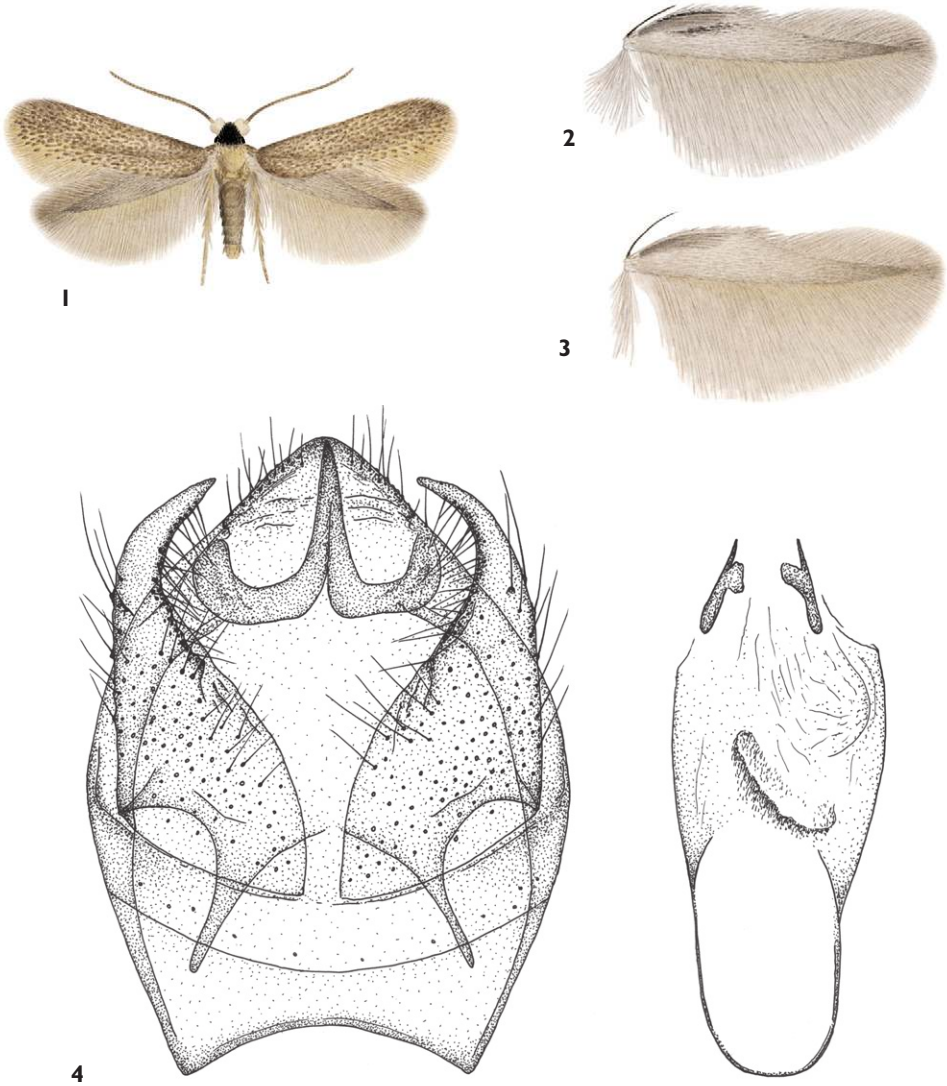
**Type material.** Holotype ♂, **Spain**, prov. Málaga, Istán, 1.VII.1994, A. & Z. Laštůvka leg. (AL). – Paratypes: **Cyprus:** 3♂, Laneia, N. Limassol, 23–29.VI.1997, M. Fibiger, A. Madsen, D. Nilsson & P. Svendsen leg. (ZMUC, RMNH); **Spain:** 1♂, prov. Albacete, Socovos, 7.VII.2001, A. & Z. Laštůvka leg. (AL).

**Diagnosis.** Externally similar to *Ectoedemia hispanica,* but thorax greyish brown and not pale and hindwing with a pale grey-brown hair pencil (white in *hispanica*). Male genitalia very different from all other *Zimmermannia* species by presence of one pair of carinae (ventral) only and simple triangular valvae, more reminiscent of *Ectoedemia* s. str. Female as yet unknown.

**Description.** Male (Figs 1–3). Forewing length 2.8 mm, wingspan 6.0–6.2 mm. Head: frontal tuft and collar black; scape white; antenna with 49–51 segments, dark greyish brown. Thorax greyish brown with dark scales anteriorly. Forewing ground colouration greyish ochreous, covered densely with brownish black scales, nearly continuously in the basal half; cilia-line indistinct; cilia greyish ochreous; underside grey. Hindwing and its cilia dark grey, hair pencil pale grey-brown, about one third wing length, bordered with fuscous scales in two specimens from Cyprus; no costal emargination; underside grey. Abdomen grey-brown. Legs ochreous grey.

Female. Unknown.

Male genitalia (Figs 4, 11–13). Capsule length ca. 350 µm. Vinculum distinctly concave anteriorly. Tegumen broad, blunt, with simple long setae. Gnathos large, lateral processes short and broad, central process long and acute. Valva length ca 225 µm, more or less triangular, with long distal process, distinctly curved towards middle, sublateral processes about one third transtilla length. Aedeagus ca 355 µm long, with only



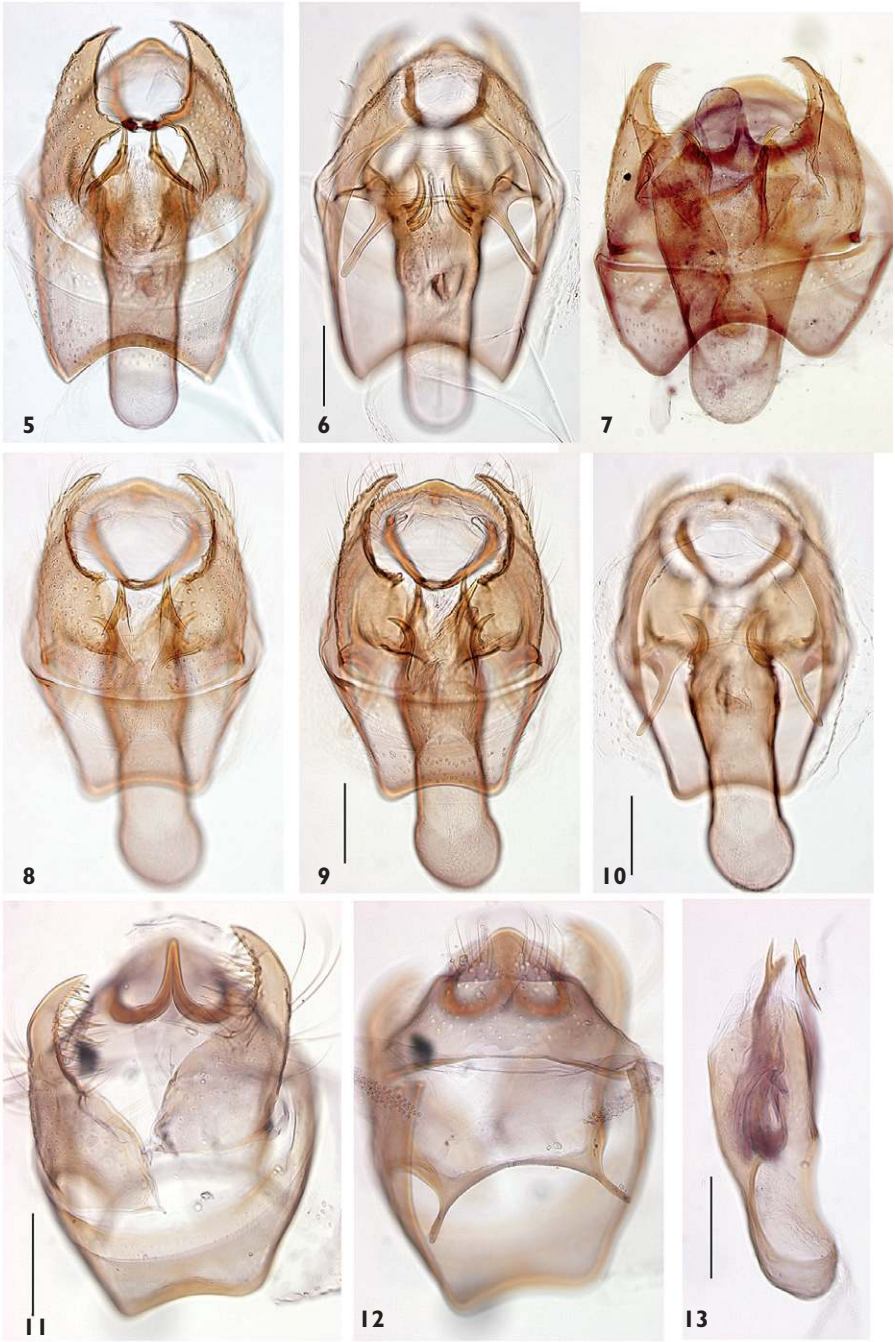

**Figures 1–4.** ***Ectoedemia (Zimmermannia) vivesi*** **male. 1** Paratype male, Spain, Albacete, Socovos **2–3** hindwings of male **2** Paratype, Cyprus, Laneia, N.Limassol **3** Holotype, Spain, Málaga, Istán **4** Male genitalia, paratype, Spain, Albacete, Socovos.

ventral pair of carinae, each with subapical spine; vesica with conspicuous cathrema, without any cornuti.

**Biology.** Hostplant unknown. Adults collected in late June and early July in Mediterranean macchia.

**Distribution.** Spain (Andalusia), Cyprus.

**Remarks.** *Ectoedemia vivesi* differs from all other *Zimmermannia* species by the absence of lateral and dorsal carinae on the aedeagus, therefore missing an important




**Figures 5–13.** ***Ectoedemia (Zimmermannia)*** **species, male genitalia, ventral aspect. 5–6** *E. hispanica*, Spain, Granada, Pueblo Dn. Fadrique, slide RMNH.INS.22580 **7** *E. amani*, Japan, Honsyu, Seibu, slide JCK15117 (USNM) **8–10** *E. reichli*, Krk, Str. Krk-Vrbnik, slide RMNH.INS.22709 **11–13** *E. vivesi*, paratype, Laneia, N. Limassol, RMNH.INS.23832. Scales 100µm.

apomorphy. Overall it resembles *Zimmermannia* species better in the combination of colour pattern, hair pencil, gnathos shape, valva and aedeagus shape than *Ectoedemia* s. str. We expect that this is also a barkminer, possibly of *Quercus*, but other hosts are also possible. The distributional disjunction is remarkable.

**Etymology.** Named after Dr. Antonio Vives Moreno (Madrid), in gratitude for his long lasting support of our investigations in Spain; *vivesi* is a noun in genitive case.

***Ectoedemia (Zimmermannia) monemvasiae*** Van Nieukerken

**Biology.** Hostplants: not reared, most likely feeding on evergreen *Quercus*. Adults fly from 15 June to 22 September.

**Distribution.** Here recorded new for Crete.

**Remarks.** In the female genitalia of two specimens (EJvN3106, Tahir Geçidi and EJvN3121, Kirki), some small spines were noted in the ductus bursae, also the setae were not pectinate as in the original specimens. Since not many female genitalia have been thoroughly compared we are not certain whether this is due to variation, or that these represent another unknown species or may be the unknown female of *E. vivesi*.

**Material. Greece, Crete:** 1♂, 2♀, Irakleio, Mt. Ida, Astiraki[on], 500 m, 23.VII.1984, li, G. Baldizzone (GB, RMNH). **Greece, mainland:** 1♂, Evro, Kavisos, 100 m, 22–23.VIII.1985, A. Moberg (NHRS); 1♀, Evro, 35 km N Alexandropolis, Kirki, 500 m, M. Fibiger, 20–21.VIII.1985 (ZMUC); 1♂, Evro, Alexandropolis, Kirki, 24.VII.1985, P. Grotenfelt (MZH); 10♂, Ioannina, Pindos Konitsa, Pades, 06.VII.1981, P. Grotenfelt (MZH, RMNH); 3♂, 1♀, Lakonia, Apidia, 15.VI.1997, A. & Z. Laštůvka (AL); 1♂, Messinía, Kardamili, 20.VI.1996, A. & Z. Laštůvka (AL); 3♂, Pieria, Leptokaria, 25.VI.1996, A. & Z. Laštůvka (AL); 1♂, Serres, Strimon, Delta, asl, 16.VIII.1985, A. Moberg (NHRS). **Turkey:** 1♂, Kayseri, SW. Erciyes Dagi, 1500 m, 25.VII.1996, K.E. Stovgaard (ZMUC); 1♀, Agri, Tahir Geçidi, 2400 m, 18.IX.1985, G. Derra (GD).

***Ectoedemia (Zimmermannia) amani*** Svensson
Fig. 7

*Ectoedemia (Zimmermannia) emendata* Puplesis ,1985: 69 [synonymised by Puplesis 1994]

**Biology.** Hostplants: *Ulmus* sp., not reared, but barkmines often found in association with adults. Adults fly from 18 May to 19 August.

**Distribution.** Norway: Van Nieukerken and Johansson 1990, Germany: Pröse 2006, Biesenbaum and Rutten 2008; Great Britain: Dickerson 1995; 1996; France:

Van Nieukerken et al. 2006; Poland: Laštůvka and Laštůvka 1997 (records below); Czech Republic: Laštůvka and Laštůvka 1991; Laštůvka et al. 1992; Slovakia: Laštůvka and Laštůvka 1991; Hungary: Laštůvka and Laštůvka 1997; Slovenia: Laštůvka and Laštůvka 1997; Croatia: Laštůvka and Laštůvka 1997; Ukraine (Crimea): Budashkin 1988; Puplesis 1994; Italy: Karsholt et al. 1995; Laštůvka and Laštůvka 2005; Greece: Laštůvka and Laštůvka 1998, Azerbaijan: Puplesis 1994. Here recorded for the first time from Bulgaria, first detailed records for Azerbaijan, Croatia and Hungary, a second record for Italy and a third and fourth for France. It also occurs in the East Palaearctic (Puplesis 1994) and is here recorded for the first time from China and Japan (Fig. 7).

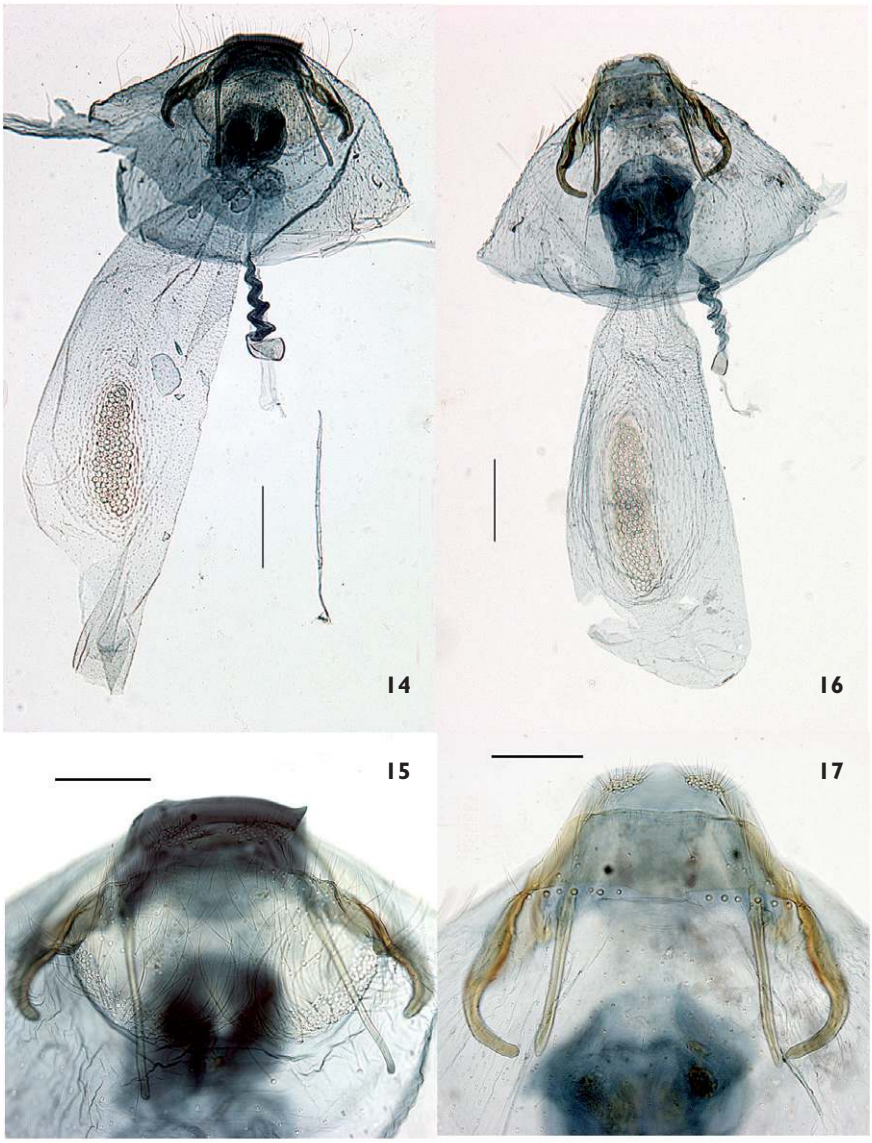
**Remarks.** The knowledge of the distribution of this species has been increased enormously. In 1990 it was known from a number of records from Sweden, Norway, Denmark, Austria and Macedonia. Now it is known from almost all European countries except the Iberian Peninsula. Since this species has a trans-palaearctic distribution, a range expansion seems a possibility. However, statistical data (see discussion) do not support an increasing proportion of this species in the total record of Nepticulidae, so that increased collection effort currently provides the best explanation.

**Material. Azerbaijan**. 1♂, Lenkoran, Lerik, Lesnaja zona, 5.VII.1964, Zagulajev (ZIN), 1♂, Talysh, e. Aurora, Girkanskij les, 10.VII.1964, Pastuchov (ZIN). **Bulgaria:** 1♀, Asenovgrad, 20.VI.2000, J. Junnilainen (JJ); 5♂, 2♀, Burgas, 40 km SE, Ropotamo, 16–27.VI.2001, J. Junnilainen (JJ, RMNH); 1♂, Kresna, 31.V–2.VI.2002, J. Junnilainen (RMNH). **Croatia:** 2♂, Istria, Poreč, 17.VII.1996, Z. Laštůvka leg. (AL), 2♂, Krk, Kampelje, 28.VII.2005, G. Baldizzone (GB, RMNH); 1♂, Krk, Misucaynica, 19.VIII.1976, E. Jäckh (USNM). **Czech Republic:** 2♂, Bohemia sept., Žatec, Stroupeč, 19.VI.1998, J. Liška leg. (AL), 2♀, Moravia, Moravian Karst, Pustý žleb Valley, 7.VII.2000 and 16.VII.2001, Z. Laštůvka leg. (AL). **France:** 1♀, Alpes Maritimes, S of Tende, Saorge, 482 m, 3–4.VII.2008, O. Karsholt (ZMUC); 1♂, Var, Connens, 12–18.V.2007, R. Seliger (coll. Seliger). **Greece:** 8♂, 5♀, Larissa, Stomio, 9.VI.1999, A. & Z. Laštůvka (AL). **Hungary:** Gyor, and Gánt, both 25.IX.1994, mines on *Ulmus laevis*, A. Laštůvka (AL). **Italy:** 1♀, Campania, Átena Lucana, 25.VI.2000, A. & Z. Laštůvka (AL).

**East Palaearctic: China:** 1♂, Heilongjiang, Fenglin Nature Reserve, 200–500 m, 28.VI–10.VII.2000, P. Sihvonen (MZH). **Japan:** 1♀, Hokkaido, Koshimizu-cho, Hamakoshimizu, 30.VII.2002, S. Kawahara (RMNH); 1♂, Hokkaido, Koshimizu-cho, Mt Mokotoyama, 280 m, 21.VIII.2001, S. Kawahara (RMNH); 1♂, Honsyu, Seibu, Hoki, Daisen, 14.VII.1950, S. Issikii (USNM). **Russia:** 2♂, Primorje, Ussuriskij Res., 250 m, 29–31.VII.1998, Jalava, Kullberg & Kaare (MZH).

***Ectoedemia (Zimmermannia) reichli*** Z. & A. Laštůvka
Figs 8–10, 16–17

*Ectoedemia (Zimmermannia) reichli* Z. & A. Laštůvka, 1998: 316. Holotype ♂, **Greece:** Préveza, Thesprotikó, 1l.VI.1997, lgt. A. & Z. Laštůvka (AL) [examined].




**Figures 14–17.** ***Ectoedemia (Zimmermannia)*** **species, female genitalia (14, 16) and detail of terminal segments (15, 17), dorsal aspect. 14–15** *E. hispanica*, Spain, Málaga, Ronda, slide RMNH.INS.22581 **16–17** *E. reichli*, Krk, Draga Baska, slide RMNH.INS.22708. Scales 200µm (14, 16), 50µm (15, 17).

**Diagnosis.** Externally similar to the other pale headed species *E. amani* and *E. liguricella*. Males of *amani* have a more conspicuous white hairpencil, surrounded by white androconials and males of *liguricella* are completely without hairpencil. Females cannot be separated from *E. amani* without dissection; the more blunt ovipositor separates it from *E. liguricella*, in which the ovipositor is more or less pointed. The male genitalia

differ from other *Zimmermannia* by the shape of the valva, short gnathos and configuration of carinae. Female genitalia resemble most those of *E. liguricella*, but have fewer convolutions in the ductus spermathecae.

**Redescription.** Male. Forewing length 2.7–3.8 mm, wingspan 6.8–7.2 mm. Head: frontal tuft yellowish white to ferruginous, collar paler, whitish. Antennae long, with 38–44 segments. Thorax and forewings brown, slightly irrorate with yellowish brown, often an indistinct pale tornal spot. Cilia line indistinct, terminal cilia yellowish white. Hindwing with a very indistinct greyish hairpencil, not surrounded by androconial scales; humeral lobe not pronounced. Abdominal tufts grey white.

Female. Forewing length 3.6–4.2 mm, wingspan 8.0–9.1 mm. Antennae with 40–43 segments. Hindwing without hairpencil.

Male genitalia (Figs 8–10). Capsule length ca. 380 µm. Tegumen broadly rounded, forming indistinct pseuduncus. Gnathos with short, rather broad central element. Valva length ca. 270–275 µm, broadly triangular, in middle suddenly narrowing strongly into curved distal process. Sublateral processes long, almost as long as transverse bar of transtilla. Aedeagus length ca. 380–395 µm long; ventral carinae long, parallel and wide apart; a pair of outwards curved strong lateral carinae, and a pair of similar outwards curved dorsal carinae (in slides often hidden behind lateral pair). Vesica with one straight long and pointed cornutus, and some very small additional ones.

Female genitalia (Figs 16–17). T8 with a row of 8–10 setae along anterior margin of T8, ca 4–6 setae on disc, scales absent. Anal papillae (T9) with ca 24–27 setae. Posterior apophyses reaching beyond anterior apophyses. Vestibulum wide, without distinct sclerotizations. Corpus bursae ca 1040–1180 µm long, covered with pectinations, partly in concentric bands around signa; signa elongate, slightly dissimilar, longest 405–170 µm and shortest 380–440 µm long (n=2), ca 5 cells wide. Ductus spermathecae with ca 4 convolutions.

**Biology.** Hostplant unknown. Adults collected from 26 May to 18 June in Greece and 28 June to 7 August elsewhere.

**Distribution.** Described from the male holotype from Greece (Preveza) and later recorded from the Czech Republic (Šumpich et al. 2007). Here we report new records from (northern) Italy, Slovakia (see also Tokár et al. in press), Croatia: Krk and Switzerland.

**Remarks.** Since the original description was based on a single male, and published in German, the species is here redescribed. The species was regularly collected in forests without *Quercus*, but we have no positive indication what tree or shrub the hostplant could be.

**Material. Croatia:** 1♀, Krk, Draga Baska, 30.VII.1986, G. Baldizzone (GB); 3♂, Krk, Str. Krk-Vrbnik, G. Baldizzone, 2–3.VIII.1988, 30.VII.1990, at light, (GB, RMNH). **Czech republic:** 3♀, Moravia centr., Čelechovice, 4+ 7.VIII.2004, 30.VII.2005, A. Laštůvka (AL); 1♂, Moravia occ., Ketkovice, Ketkovický hrad Castle ruin, J. Šumpich leg. (J. Šumpich collection). **Greece:** 1♂, Arkadia, Sapounakaika, 15.VI.1998, A. & Z. Laštůvka (AL); 1♂, Fokis, Itea, 26.V.1999, A. & Z. Laštůvka (AL); 3♂, Messinia, Pirgos, 18.VI.1998, A. & Z. Laštůvka (AL). **Italy:** 1♀, Alessandria, Parco NR Capanne di Marcarolo, str. Cirimilla-Capanne, 350 m, 7.VII.2005, at light, G. Baldizzone (GB); 3♂, Alessandria, Parco NR Capanne di Marcarolo, Laghi

di Lavagnina, 370 m, 28.VI.2005, at light, G. Baldizzone (GB, RMNH); 1♂, Alessandria, Parco NR Capanne di Marcarolo, Boschi sotto Bano, 300 m, 12.VII.2005, at light, G. Baldizzone (GB). **Slovakia:** 1♀, Slovakia or., Viniansky hradny vrch Castle ruin, 22.VII.1995, Z. Tokár leg. (coll. Tokár). **Switzerland:** 1♂, Tessin, Campora, Casa Castagna, 540 m, 20.VII.2005 at light, A. Kopp (coll.Kopp); 1♂, Tessin, Campora, Wanderweg u. PP, 600 m, 21.VII.2005, A. Kopp (coll. Kopp).

### *Ectoedemia (Zimmermannia) liguricella* Klimesch

**Biology.** Hostplants: not reared; although evergreen *Quercus* usually occurs in many of its localities, we have no positive indication that it is the hostplant. Adults fly from 25 April to 1 October.

**Distribution.** Portugal: Corley et al. 2000. New records in Spain: Laštůvka and Laštůvka 2008.

**Material. Portugal:** 1♂, Baia Alentejo, Odemira, 1.IX.1973, P. Grotenfelt (MZH). **Spain**: Almeria, Maria, 1200 m, 1–12.X.2008, M. Delnoye (RMNH); 2♂, Caceres, Guadalupe, 11.VI.2009, A. & Z. Laštůvka (AL); 2♂, Granada, Trevelez, 5 km SW, 1500 m, 31.VII.1999, J. Junnilainen (JJ); 6♂, Malaga, 5 km W Archez, Casa Las Jaras, 500 m, 26.V–3.VI.2008, H.W. van der Wolf (RMNH). 1♂, Tarragona, Baix Camp, Prades, Col de les Masies, 980 m, 29.VII.2006, E. Requena & De-Gregorio (RMNH); 1♂, Tarragona, 3 km S Fayón, 8.VI.2009, A. & Z. Laštůvka (AL).

## Subgenus *Ectoedemia*

**Diagnosis.** Moderately sized Nepticulidae, usually with a distinct cilia line and pale cilia, and pale (dull white or metallic) fascia or separate spots; scaling rather coarse. Male abdominal tip usually with conspicuous anal tufts. In Europe other *Ectoedemia* subgenera that resemble these species are *Etainia* Beirne, 1945, which all have a fascia in addition to a dorsal and costal spot and *Fomoria* Beirne, 1945, which usually have a dorsal spot only (also in *Ectoedemia intimella*, but that has a pale antenna), and when a costal spot is present as well, both spots are far apart. The few species without colour pattern may be confused with *Bohemannia pulverosella* (Stainton, 1849) or *Trifurcula*, see generic diagnosis.

## Key to males of Fagaceae feeding species

The keys of the previous revision (Van Nieukerken 1985) can still be used to identify most *Ectoedemia* (s.s.) species, since most additions are in the Fagaceae feeders, we provide here a new key to males for that group. This key works best for freshly collected or reared males; worn specimens may be difficult to identify without dissection. For checking hairpencils the forewing needs to be slightly lifted.

Since females are much harder to identify by external characters, we do not provide a key for those. When no males are present, often the genitalia need to be dissected.

1. Forewing without colour pattern, irrorate brown or ochreous. Hindwing without hairpencil, but with costal bristles ..... **2**
– Forewing with distinct pale spots or fascia. Hindwing either with hairpencil or costal bristles ..... **4**
2. Ground colour white, with scattered brown to black scales. Hindwing with dark fuscous or black hairpencil ..... ***E. gilvipennella***
– Ground colour brown or ochreous, mixed with pale yellowish white scales. Hairpencil absent, costal bristles present ..... **3**
3. Antenna with 28–37 segments. Occurs in *Quercus pubescens* stands in southern half of Europe ..... ***E. rufifrontella***
– Antenna with 36–44 segments. Occurs on evergreen *Quercus* in eastern Mediterranean (Fig. 73) ..... ***E. alnifoliae***
4. Forewing with pale dorsal spot only, no other pattern ..... **5**
– Forewing with additional pale marking(s) on costa ..... **7**
5. Hindwing upperside and forewing underside with patch of brown androconial scales ..... ***E. heringella***
– No androconial scales present ..... **6**
6. Genitalia: gnathos undivided, serrate margin (Fig. 82). Species of SW Europe ..... ***E. ilicis***
– Genitalia: gnathos divided, basal part with serrate margin (Fig. 83). Species of Greece and Turkey ..... ***E. pseudoilicis***
7. Forewing with fascia or opposite costal and dorsal spot only ..... **8**
– Forewing with additional spots, either a discal spot beyond middle, or a basal spot or streak connected to fascia ..... **16**
8. Hindwing with distinct hairpencil. Fascia usually unbroken..... **9**
– Hindwing without hairpencil, with costal bristles. Usually separate costal and dorsal spots, often costal spot closer to wing base ..... **14**
9. Small species (wingspan 4.0–4.2 mm) of Eastern Mediterranean, brown androconial scales on hindwing, antennae with 35–36 segments (Fig. 44) ..... ..... ***E. aegilopidella***
– Larger species, wingspan 4.8 mm or much larger. Occur in western Europe, east to Sardinia and Sicily. Antennae with 36–60 segments ..... **10**
10. Hairpencil white. Hindwing with white androconial scales, reaching one third of hindwing. Antenna with 49–60 segments. Flying from (July) August to October (Fig. 33, 34) ..... ***E. suberis***
– Hairpencil ochreous or brown. Androconial scales white or brown. Antennae with 36–57 segments. Flying from April onwards ..... **11**
11. Hindwing covered with white androconial scales only..... **12**
– Hindwing covered with brown and sometimes some white androconial scales..... **13**

12. Androconial scales covering hindwing up to dorsal margin. Antenna with 36–44 segments (Fig. 35, 36) ..... ***E. hendrikseni***
– Androconial scales covering hindwing only on costal two thirds, leaving dorsal third part free. Antenna with 48–57 segments (Fig. 37, 38) ..... ***E. andalusiae***
13. Androconial scales mixed white and brown. Male valva with slight bump on inner margin. Species of deciduous oaks, known from Southern England (Fig. 39, 40) ..... ***E. beckfordi***
– Androconial scales brown only. Male valva without bump on inner margin. Species of evergreen oaks, on Iberian Peninsula (Fig. 41, 42)... ***E. phaeolepis***
14. Hindwing upperside and forewing underside with patch of brown androconial scales. Costal spot usually much smaller than dorsal spot (Fig. 112) ..... ***E. heringella***
– Androconial scales absent. Costal spot as large as dorsal one ..... **15**
15. Forewing ground colour fuscous blackish, only slightly speckled. Male valva without bulging outer margin. Species of deciduous oaks, males not further identifiable ..... ***E. albifasciella* complex**
– Forewing ground colour brown, more irrorate by pale scale bases. Male valva with bulging outer margin. Species of evergreen oaks, in Mediterranean region ..... ***E. haraldi***
16. Forewing with a discal spot at 2/3. Haipencil on hindwing present..... **17**
– Forewing without discal spot, a basal spot present. Hairpencil absent, costal britsles present ..... **18**
17. Thorax completely white. Frontal tuft black. Forewing brownish (Fig. 71)..... ***E. algeriensis***
– Thorax completely white. Frontal tuft yellowish ochreous to ferruginous. Forewing dark brown (Fig. 72) ..... ***E. coscoja***
– Thorax blackish, with white tips, sometimes the black reduced to antrerior margins. Frontal tuft black. Forewing fuscous (Fig. 70)..... ***E. quinquella***
18. Costal spot distinctly more proximal than dorsal spot, not forming a fascia. Basal spot clearly separate from dorsal. Hindwing with costal bristles. Males not further identifiable ..... ***E. subbimaculella*-complex**
– Costal spot opposite dorsal, usually forming a fascia. Basal spot extending along dorsal margin, often confluent with fascia. Hindwing with hair-pencil or costal bristles ..... **19**
19. Thorax white. Frontal tuft intensively orange. Hindwing with costal bristles.... ..... ***E. leucothorax***
– Thorax fuscous black. Frontal tuft yellowish, or mixed with fuscous. Hindwing with hair-pencil (Fig. 43)..... ***E. caradjai***

## The *Ectoedemia populella* group

Two species have been described since 1985: *E. albida* Puplesis, 1994 and *E. similigena* Puplesis, 1994. They are very similar to *E. turbidella,* and these species will be diagnosed below. Since only few worn specimens of the new species were available, we only provide a partial redescription. Also males of *E. argyropeza* have been described since 1985 (Bond and Van Nieukerken 1987).

### *Ectoedemia (Ectoedemia) intimella* (Zeller)

**Biology.** Hostplants: *Salix caprea* L., *S. cinerea* L., *S. pentandra* L., *S. fragilis* L., *S. phylicifolia* L., *S. dasyclados* Wimm. (Ellis 2007). In Finland a population of *E. intimella* was discovered feeding on *Populus balsamifera* L. These mines resemble those of *E. hannoverella*, but the mine usually enters the leaf blade further away from the petiole and the larva doesn't show the characteristic plates of *E. hannoverella* (Gustafsson and Nieukerken 1990). Univoltine, larvae in September to November, adults from May to July.

**Distribution.** Norway: Aarvik et al. 1997; Ireland: Shackleton 1977; Latvia: Šulcs and Šulcs 1989; Lithuania: Ivinskis et al. 1985; Slovakia: Laštůvka and Laštůvka 1990b; Spain: Laštůvka and Laštůvka 2008. For new French records: Van Nieukerken et al. 2006, here we record it new from southern France. Also found in far eastern Russia: Sakhalin (Puplesis 1994). Here for the first time recorded from Japan, Hokkaido, not far from Sakhalin.

**Material. France:** 1 larva, Alpes Maritimes, Les Mesches, 6 km WSW Tende, 1450 m, 10.X.2008, leafmine on *Salix caprea*, EJvN2008224, RMNH.INS 17603, E.J. van Nieukerken & C. Doorenweerd (RMNH). **Finland:** 4 larvae, leafmines, OK: Joensuu, 18.X.2005, *Populus ?balsamifera*, A. Karhu & A. Matero (RMNH). **Italy:** larvae, Cuneo, Palanfré, W., 1440–1540 m, 14.X.2008, mines on *Salix caprea*, EJvN2008300, RMNH.INS12990, 17642–3, E.J. van Nieukerken & C. Doorenweerd (RMNH). **Japan:** 1♀, Hokkaido, Kitami-shi, Toyochi-oohashi, 8.VI.2004, S. Kawahara (RMNH).

### *Ectoedemia (Ectoedemia) hannoverella* (Glitz)

**Biology.** Hostplants: *Populus nigra* L. and *P.* × *canadensis* Moench. Univoltine, larvae September to November, adults fly from May to July.

**Distribution.** Sweden: Svensson 1987; Latvia: Savenkov 1989; Great Britain: Langmaid and Young 2004; Prichard and Clifton 2004; Spain: Van Nieukerken et al. 2004a; Lithuania: Puplesis et al. 1990; Bulgaria: Chorbadziev 1915 (overlooked in 1985, confirmed by record here); Russia (including Siberia): Van Nieukerken et al. 2004b; Puplesis 1994. Further records in France and Italy: Baldizzone 2004; Van Nieukerken et al. 2006. Also recorded from Northeastern China in the botanical garden of Harbin (Van Nieukerken and Liu 2000), possibly as an introduction. New record for Rumania.

**Remarks.** *Ectoedemia hannoverella* seems to be expanding its range, and has done so in the last 20 years at least westwards to Britain and northwards to Sweden.

**Material. Bulgaria:** 1♀, Sliven, 25.VI.2001, J. Junnilainen (JJ). **Rumania:** old mines on last year's leaves, Calafat, 26.VI.1997, *Populus nigra*, A. Laštůvka (AL).

***Ectoedemia (Ectoedemia) turbidella*** (Zeller)
Figs 21–23, 27–28

**Diagnosis.** Externally *E. turbidella* cannot be distinguished from *E. albida* or *E. similigena*, although these two are generally paler. The male genitalia are characterised by the short demarcated valval tip, the relatively longer aedeagus (1.22–1.27 × capsule length) and triangular gnathos (Figs 21–23). Female genitalia have prominent widened posterior apophyses, reaching beyond anterior ones and very short and narrow signa (5–6 cells wide, 2.7–5.1 × as long as wide) (Figs 27–28). For differences from *hannoverella* see diagnosis of that species (Van Nieukerken 1985).

**Biology.** Hostplants: *Populus alba* L. and *P. canescens* (Aiton.) Sm., never on saplings. Univoltine, larvae from September to November, adults fly from April to June.

**Distribution.** Finland: Mutanen et al. 2001; Estonia: Jürivete et al. 2000; Latvia: Šulcs and Šulcs 1984; Lithuania: Diškus 2003; Belarus: Merzheevskaja et al. 1976; Bulgaria: Chorbadziev 1915 [overlooked in 1985]; Russia: Jürivete et al. 2000; Van Nieukerken et al. 2004b. Iran to be removed (see *E. albida*).

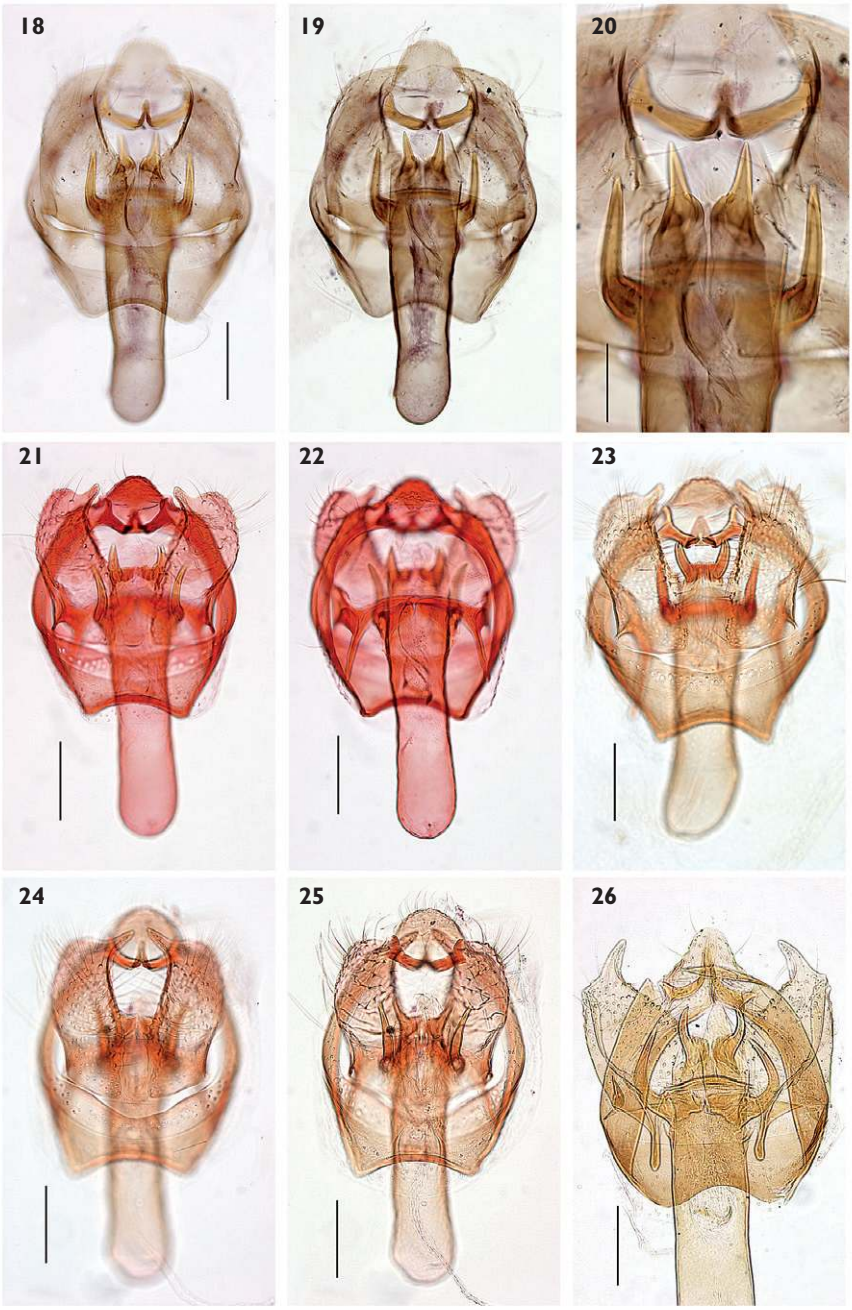
***Ectoedemia (Ectoedemia) similigena*** Puplesis
Figs 24–26, 31–32

*Ectoedemia (Ectoedemia) similigena* Puplesis, 1994: 180. **Holotype** ♂ [Ukraine]: the Crimea, Yalta, Nikita (Nikitskiy) botanical garden, 20.V.1981, leg. Vasilyeva (ZIN).

**Diagnosis.** *Ectoedemia similigena* is very similar to *E. turbidella* and cannot be distinguished by external characters on the basis of the little material studied. The male genitalia have a distinctly longer valval tip than *turbidella*, and the gnathos is much narrower. The female genitalia have the posterior apophyses not reaching beyond the anterior ones and the signa are distinctly wider.

**Partial redescription.** Male forewing length ca. 3.0 mm, antennal segments 55. Female forewing length 2.6 mm, antenna broken. Specimens too much worn or broken for detailed description, similar to *E. turbidella*, overall paler.

Male genitalia (Figs 24–26). Capsule length 325 µm. Tegumen produced into widely rounded pseuduncus. Gnathos with central element narrowly triangular, smooth. Valva length 215 µm, in ventral view with almost parallel sides, evenly curved towards demarcated, inwards curved tip, pointed and cut off at end. Aedeagus 365 ♂µm long, very long (1.12 × capsule length) and stout, with two pairs of prominent




**Figures 18–26.** ***Ectoedemia (Ectoedemia) populella*** **group, male genitalia, ventral aspect. 18–20** *E. albida*, paratype, Turkmenistan, Ay-Dere, slide RMNH.INS.23857 **21–22** *E. turbidella,* Hungary, Pest, Tatárszentgyörgy, 15 km NW Lajosmizse, slide RMNH.INS.23933 **23** *E. turbidella,* Netherlands, Limburg, St. Pietersberg, slide RMNH.INS.23938 **24–26** *E. similigena,*paratype Ukraine, Crimea, Jalta, slide EJvN 3924. Scales 100 µm, 50µm (20).

carinae; ventral pair at extreme posterior tip, basally connected, pointed; dorsolateral pair more anteriorly placed, longer than ventral ones, strongly curved in lateral view, dorsally connected, slightly asymmetrical.

Female genitalia (Figs 31–32). T7 without row of setae, T8 relatively narrow, hardly tapering posteriorly, margins almost parallel, with two groups of ca 27 setae. Anal papillae narrow, with 14 setae in total. Anterior apophyses widened in middle. Posterior apophyses slightly widening anteriorly, not reaching beyond anterior ones. Vestibulum with vaginal sclerite, a dorsal spiculate pouch with many (ca 100) single, equally spaced, spines; and a patch of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae small. ca 420 µm long, covered with small pectinations, except in anterior part; signa slightly dissimilar, 275 and 290 µm long, relatively wide (7–8 cells), ca 2.9 × as long as wide. Ductus spermathecae with 2.5 convolutions.

**Biology.** Hostplant unknown, a *Populus* is likely. Adults found in May.

**Distribution.** *Ectoedemia similigena* is only known from its type locality, Jalta botanical garden, on the Crimea (Ukraine). The species has not been found again, and we consider it possible that it is actually a species from somewhere in Central or Eastern Asia, introduced with plants.

**Remarks.** *E. similigena* is very similar to *E. turbidella* (see diagnosis), but on the basis of the differences seen we conclude tentatively that it is a separate species.

**Material. Ukraine:** 1♂, 1♀, Krim, Yalta, Bot. rag., on Cypress, 20.V.1981, paratypes (VPU).

***Ectoedemia (Ectoedemia) albida*** Puplesis
Figs 18–22, 29–30

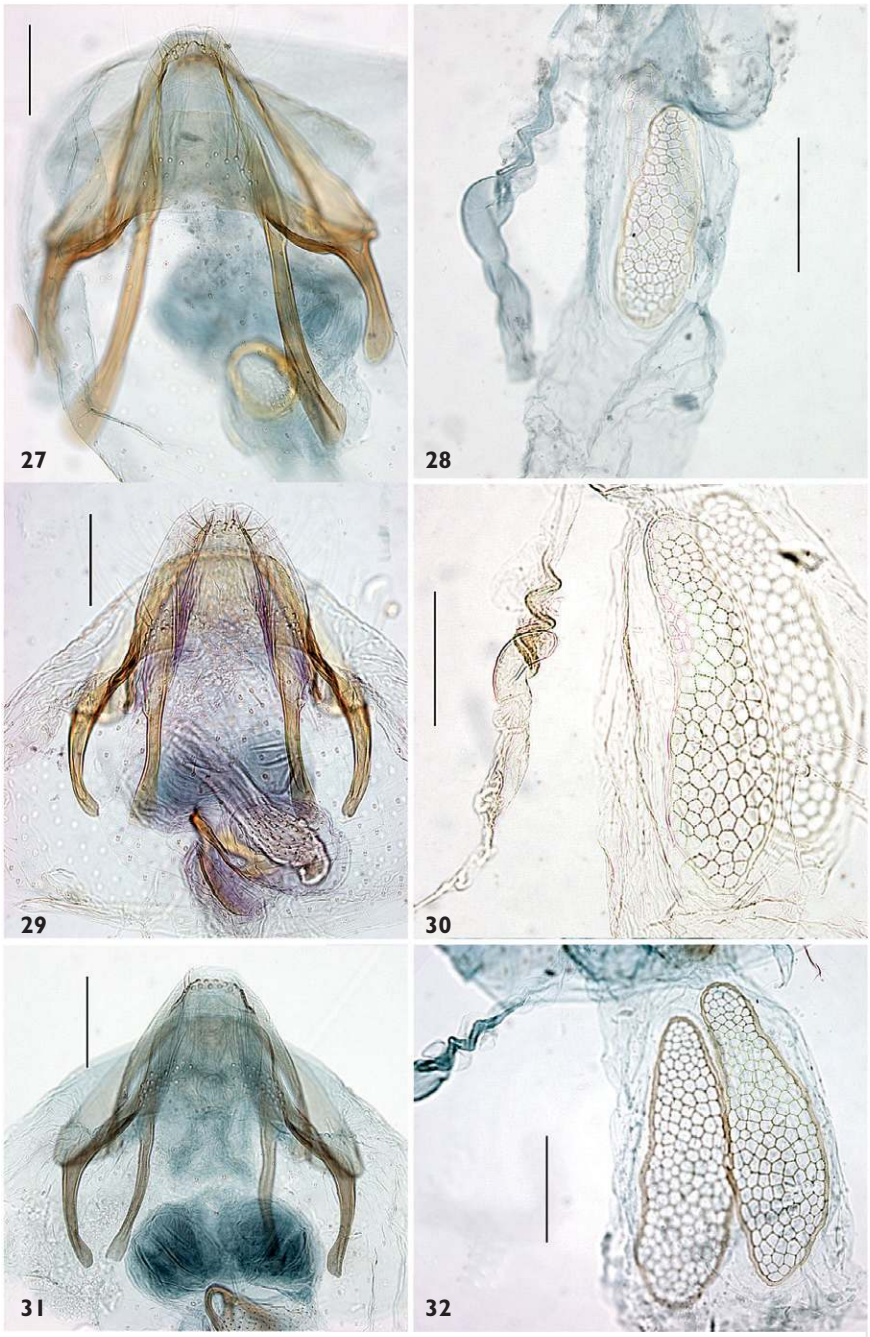
*Ectoedemia (Ectoedemia) turbidella*; Van Nieukerken 1985: 31 [partim, only females from Iran].[misidentification]

*Ectoedemia (Ectoedemia) albida* Puplesis, 1994: 179. **Holotype** ♂ Turkmeniya: env. Kara-Kala [Garrykala], Aydere, 3.V.1981, leg. Nesterov (VPU).

**Diagnosis.** *Ectoedemia albida* is similar to *E. turbidella* and *similigena* and cannot be distinguished by external characters. The male genitalia have no demarcated valval tip, and the gnathos is narrow as in *similigena*. The female genitalia have the posterior apophyses not reaching beyond the anterior ones (similar to *similigena*) and the signa are intermediate between *turbidella* and *similigena*. A remarkable character is the hyaline bar in the vestibulum.

**Partial redescription.** Male forewing length 2.6 mm, antenna broken. Female wingspan ca 7.4 mm, forewing length 2.9–3.4 mm (n=2), antenna broken. Colour pattern as in *E. turbidella*, overall paler.

Male genitalia (Figs 18–22). Capsule length 335 µm. Tegumen produced into widely rounded pseuduncus. Gnathos with central element narrowly triangular, smooth. Valva length 215 µm, in ventral view basally widest, gradually narrowing




**Figures 27–32** ***Ectoedemia (Ectoedemia) populella*** **group, female genitalia, dorsal details of terminal segments (27, 29, 31) and bursa with signa (28, 30, 32), dorsal aspect. 27–28** *E. turbidella,* Netherlands, Zuid-Holland, Oostvoorne, slide RMNH.INS.23939 **29–30** *E. albida*, Iran, Keredj, slide RMNH. INS.21492 **31–32** *E. similigena,*paratype Ukraine, Crimea, Jalta, slide EJvN 3925. Scales 100 µm.

towards slightly inwards curved tip, tip not demarcated, almost triangular. Aedeagus 375µm long, very long (1.12 × capsule length) and stout, with two pairs of prominent carinae; ventral pair at extreme posterior tip, pointed; dorsolateral pair more anteriorly placed, longer than ventral ones, strongly curved in lateral view, dorsally connected.

Female genitalia (Figs 29–30). T7 without row of setae, T8 relatively narrow, tapering posteriorly, with two groups of ca 20 setae. Anal papillae narrow, with 20 setae in total. Anterior apophyses widened in middle. Posterior apophyses widening anteriorly, just reaching to anterior ones. Vestibulum with vaginal sclerite, a dorsal spiculate pouch with many (ca 60) single, equally spaced, spines; a patch of densely packed pectinations near entrance of ductus spermathecae and a conspicuous hyaline bar. Corpus bursae small. ca 550 µm long, covered with small pectinations, except in anterior part; signa slightly dissimilar, shortest 225–280 and longest 240–335 µm long, relatively wide (6–7 cells), ca 2.7–3.4 × as long as wide. Ductus spermathecae with 2.5 convolutions.

**Biology.** Hostplant unknown, a *Populus* is likely. Adults found in April and May.

**Distribution.** South Turkmenistan and N. Iran.

**Remarks.** The females from Iran, tentatively identified as *Ectoedemia turbidella* by Van Nieukerken (1985) belong to this species, known only from Turkmenistan and Iran.

**Material. Iran:** 1♀, Keredj [=Karaj], 27.IV.1970, exp. Mus. Vind. (RMNH); **Turkmeniya:** 1♂ Turkmeniya: Kara-Kalinskiy r-n [Garrykala], s. Ay-Dere, 3.V.1981, leg. Nesterov, paratype; 1♀, [Garrykala], Ay-Dere, 9.V.1984, leg. Ivinskis (RMNH), paratype.

### ***Ectoedemia (Ectoedemia) klimeschi*** (Skala)

**Biology.** Hostplants: *Populus alba* L., only on saplings or young leaves on tree branches. Univoltine, larvae September to November, adults fly from May to July.

**Distribution.** Latvia: Savenkov 1989; Lithuania: Diškus 2003; Northern Germany: Roweck and Savenkov 2007; Bohemia: Laštůvka et al. 1992; Greece: Laštůvka and Laštůvka 1998, here recorded new for Bulgaria. Widespread in Europe, but not extending into western or northern Europe.

**Material. Bulgaria:** 1♂, Kresna, 31.V–2.VI.2002, J. Junnilainen (JJ); **Greece:** 2♂, Serres, Promachones, 45 km NW Serres, 4.VI.2005, J. Junnilainen (JJ, RMNH);

### ***Ectoedemia (Ectoedemia) argyropeza*** (Zeller)

**Biology.** Hostplants: *Populus tremula* L., in North America on *P. tremuloides* Michx. Univoltine, larvae September to November, adults fly from April to June.

**Distribution.** Ireland: Bond and Van Nieukerken 1987; Latvia: Savenkov et al. 1996; Lithuania: Ivinskis et al. 1985; Belarus: Merzheevskaja et al. 1976. Also recorded from Northeastern China (Van Nieukerken and Liu 2000), possibly as an introduction.

**Remarks.** In Ireland a few males of this parthenogenetic species were discovered and described (Bond and Van Nieukerken 1987).

***Ectoedemia (Ectoedemia) preisseckeri*** (Klimesch)

**Biology.** Hostplants: *Ulmus* spp. Univoltine, larvae September to October, adults fly from April to June.

**Distribution.** Slovakia: Laštůvka et al. 1992; Italy: Karsholt et al. 1995; Laštůvka and Laštůvka 2005; Bulgaria: mines recorded by Beiger 1979; 1980, Tomov and Krusteva 2007, here confirmed by an adult; Greece: Laštůvka and Laštůvka 1998. Also found in far eastern Russia (Puplesis and Diškus 2003) and in northeastern China (Van Nieukerken unpublished).

**Material. Bulgaria:** 1♂ , Burgas, 40 km SE, Ropotamo, 26–27.VI.2001, J. Junnilainen (JJ).

## The *Ectoedemia suberis* group

In southwestern Europe a group of species forms a complex around *Ectoedemia suberis*. Only *E. caradjai* and *E. aegilopidella* do not belong to this complex. Apart from *E. suberis* and *E. andalusiae*, we recognise three more new species in this complex.

These species have very similar external features and can be best separated on the male hairpencil colour and that of associated special scales and the hairiness of the female abdominal tip. The male and female genitalia show only some subtle differences, and also the leafmines are inseparable.

The decision to name these forms as full species was supported by molecular analyses both of the genes CO1 and Elongation Factor, which range from 5.07% to 8.23 % in CO1 and 2.5–2.9% in Elongation Factor, comparable to the differences found in the *populella* group and larger than between species in the *albifasciella* complex. These data will be published elsewhere (Van Nieukerken & Doorenweerd, personal communication). Table 1 summarizes the differences in this complex and the rather similar *E. caradjai*.

***Ectoedemia (Ectoedemia) aegilopidella*** (Klimesch)
Fig. 44

**Biology.** Hostplants: *Quercus ithaburensis* Decne subsp. *macrolepis* (Kotschy). Larvae found in September, adults reared in April, in the field collected in August, suggesting a second generation.

**Distribution.** Only known from Greece: Rhodos, to be expected in Turkey. Old leafmines, found in mainland Greece (Lakonia), may be this species, but since *E. heringi* also occurs on the same host and may have rather similar mines, we cannot record it definitely from mainland Greece.

**Material. Greece:** 4♂, 4♀, 17 sex unknown, Rhodos: Kalythies, 26–30.VIII.1991, R. Johansson (RJ, RMNH); 2♂, 1♀, Rhodos, 5 km S. Rodos, 250m, 4–8.VII.2000, M.Fibiger (ZMUC).

**Table 1.** Diagnostic characters for the species in the *Ectoedemia suberis* group in Western Europe.

| | ***caradjai*** | ***suberis*** | ***hendrikseni*** | ***andalusiae*** | ***heckfordi*** | ***phaeolepis*** |
|---|---|---|---|---|---|---|
| forewing | basal white streak and fascia | white fascia only | white fascia only | white fascia only | white fascia only | white fascia only |
| male hairpencil | white | white | brown | ochreous to brown | brown | brown |
| special scales surrounding hairpencil | absent | white scales reaching one third of wing | white scales reaching dorsal margin | white scales reaching one third of wing | white, and brown towards dorsum | brown scales reaching dorsum |
| underside forewing | | | distinct fuscous patch under costal fold | | | |
| antennal segments male | 43–51 | 49–60 | 36–44 | 48–57 | 43–47 | 36–45 |
| antennal segments female | 30–32 | 37–43 | 29–34 | 31–38 | 30–31 | 29–32 |
| valva inner margin | evenly curved | with strong basal hump | with strong basal hump | with strong basal hump | with slight basal hump | almost evenly curved |
| ratio aedeagus/ capsule | 1.08–1.28 | 1.25–1.41 | 1.24 | 1.24–1.49 | 1.43–1.51 | 1.27–1.44 |
| setae on female abdominal tip | many (pectinate) setae (ca 150 on T7 and 8) | many smooth setae (ca 200–300 on T7 and 8) | many smooth setae (ca 150 on T7 and 8) | a few smooth setae only (8–15) | ca 35 smooth setae on T8 | ca 35–40 smooth setae on T8 |
| setae on each anal papilla | ca 40 | ca 30–40 | ca 88 | 17–24 | 10 | 12–14 |

***Ectoedemia (Ectoedemia) caradjai*** (Groschke)
Figs 43, 53

**Diagnosis.** *Ectoedemia caradjai* can be separated from all other species in the *suberis* group by the white basal patch on the forewings, and in the male by the absence of androconial scales surrounding the hairpencil on the hindwing. In the male genitalia the truncate gnathos is diagnostic, the valvae resemble those of *E. phaeolepis,* and somewhat *E. heckfordi* (Fig. 53).

**Biology.** Hostplants: *Quercus pubescens* Willd., *Q. petraea* (Matt.) Liebl., *Q. pyrenaica* Willd., *Q. frainetto* Ten., *Q. infectoria* Olivier, *Q. coccifera* L. (Van Nieukerken 1985; Van Nieukerken et al. 2004a) Larvae from July to October. Adults from April to September. Since in Croatia from July larvae adults still emerged in July and from August larvae in September, we assume that there are at least three generations (at least partly) in southern Europe.

**Distribution.** Spain, Portugal: Van Nieukerken et al. 2004a; Czech Republic, Slovakia: Laštůvka and Laštůvka 1990b; Russia: Van Nieukerken et al. 2004b; Bulgaria: Beiger 1980, here confirmed by adults. One specimen from Portugal, listed by Van

Nieukerken et al. (2004a), was a misidentification for *E. phaeolepis*, see there. New records from Spain: Laštůvka and Laštůvka 2008 and below.

**Material. Bulgaria:** 2♂, Montana, 25.VI.1998, A. & Z. Laštůvka (AL). **Croatia:** 3♂, 5♀, Dalmatia, Orašac, 12.VII.2000 mines with larvae, 1♂, 2♀ ex l. VII.2000, 23.VIII.2001, mines with larvae, 3♀ ex l. IX.2001, 22.VII.2005, mines with larvae, 2♂ ex l. VII.2005, A. Laštůvka leg. (AL), 67♂, 17♀, Krk, various localities, 1976–2008, G. Baldizzone, E. Jäckh (GB, RMNH, USNM). **Greece, Crete:** 1♂, Lasithi, Kritsa, 15.IV.1989, R. Johansson (RJ). **Greece, Kerkyra:** leafmines, Kerkyra, Markos, 22.X.1987, J.H. Donner (RMNH); **Greece, Lesvos:** 1♂, Sikaminia, 520 m, 13.IX.2008, L. Kaila & J. Kullberg (MZH); 1♂, 2 km NNE Megalochori, 770 m, 11.IX.2008, L. Kaila & J. Kullberg (MZH). **Greece, Samos**: 1♀, Samos, Kokkari, 17.VI.1996, R. Sutter (RS). **Greece, mainland**: 1♂, Akhaia, Kalavrita, 23.VI.1996, A. & Z. Laštůvka (AL); 1♂, 1♀, Arkádia, Sapounakeika, 15.VI.1998, A. & Z. Laštůvka (AL); 1♂, Arkadia, Techniti L. Ladonas, 25.VI.1991, P. Grotenfelt (MZH); 3♂, 6♀, Evro, 35 km N Alexandropolis, Kirki, 500m, 20–21.VIII.1980, M. Fibiger, A. Moberg (NHRS, ZMUC); 1♂, Evros, Alexandropolis, Kirki 2, 27.VII.1985, P. Grotenfelt (MZH); 1♂, 1♀, Florina, Vatochorion, 17.VI. 8.VIII.1985, P. Grotenfelt (MZH, RMNH); 2♂, Fokida, Itea, 26.V.1999 (1♂), 6.VI.1999 (1♂), A. & Z. Laštůvka (AL); 3♂, 2♀, Fthiotida, Agios Haralambos, 21.VI.1997, 22.VI.1998, 27.V.1999, A. & Z. Laštůvka (AL); 1♂, 2♀, Ilia, Loutra Killinis, 9.VIII. 9.X.1980, 19.VI.1981, P. Grotenfelt (MZH); 1♂, 1♀, Ioannina, Pindos Konitsa, Pades, 7.VI.1981, P. Grotenfelt (MZH); 3♂, 2♀, Korinthia, Agios Vassilios, 17.VI.1996, A. & Z. Laštůvka (AL); 4♂, Lakonia, Apidia, 18.VI.1996, 15.VI.1997, A. & Z. Laštůvka (AL); 1♂, 1♀, Messinia, Exohori, 18.VI.1997, 2.VI.1999, A. & Z. Laštůvka (AL); 1♂, Messinia, Filiatra, 18.IX.1980, P. Grotenfelt (MZH); 5♂, 1♀, Messinia, Kardamili, 20.VI.1996, 19.VI.1997, 17.VI.1998, A. & Z. Laštůvka (AL); 2♂, Pieria, Leptokaria, 22.VI.1997, 23.VI.1998, A. & Z. Laštůvka (AL); 1♂, Preveza, Thesprotiko, 11.VI.1997, A. & Z. Laštůvka (AL); 1♂, 1♀, Trikala, Oxinia, 8.VI.1999, A. & Z. Laštůvka (AL); 3♂, 1♀, Serres, Kalókastro, 24.VI.1997, A. & Z. Laštůvka (AL); 1♀, Serres, Strimon, delta, asl, 16.VIII.1985, A. Moberg (NHRS); 1♂, Thesprotia, Kallithea, 9.VI.1998, A. & Z. Laštůvka (AL). **Portugal:** 3♂, 2♀, [Beira Baixa] Castelo Branco, Capinha, 12.VI.2009, A. & Z. Laštůvka (AL); 1♂, 2♀, Santarém, Valverde, 14.VI.2009, A. & Z. Laštůvka (AL). **Spain:** 1♂, Tarragona, Baix Camp, Prades, Col de les Masies, 980 m, 13.VII.2006, E. Requena & De-Gregorio (RMNH). **Turkey:** 1♀, Adana, Taurus, 4 km NE Feke, 1000 m, 7.IX.1983, G. Derra (GD); vacated mines, Antalya, Termessos, ruins, 890–1000 m, 2.III.2005, *Quercus coccifera*, E.J. van Nieukerken (RMNH).

***Ectoedemia (Ectoedemia) suberis*** (Stainton)
Figs 33, 34, 48

**Diagnosis.** Male *Ectoedemia suberis* is separated from the four following species by the completely white androconial field on the hindwing, surrounding a white hair-pencil, and scales not reaching the dorsal margin of the hindwing (Figs 33, 34). *E. caradjai* has a basal white streak on the forewing and lacks the androconial field; other similar

*Ectoedemia* (such as *haraldi*) are usually smaller, have fewer antennal segments and have no hairpencil. Females are distinguished from *E. andalusiae*, *heckfordi* and *phaeolepis* by the hairy abdominal tip, and from *hendrikseni* by the larger number of antennal segments. Male genitalia differ from *E. andalusiae* and *hendrikseni* by the very slight basal bump, which is much more distinct in the other species, whereas this bump is virtually absent in *E. phaeolepis* and *caradjai* (Fig. 48). See also *E. phaeolepis.* Aedeagus at 360–400 µm distinctly longer than in *E. phaeolepis* and *andalusiae* (less than 350µm). In female genitalia hard to distinguish from *E. andalusiae* or *E. phaeolepis*, apart from slight statistical differences in numbers of setae on anal papillae and number of convolutions in ductus spermathecae (6 in *andalusiae*, 5.5 in *heckfordi*, 4.5 in *phaeolepis*).

**Biology.** Hostplants: evergreen oaks *Quercus ilex* L., *Q. rotundifolia* Lam., *Q. suber* L. and *Q. coccifera* L. and possibly on semi-evergreen oak *Q. faginea* Lam. (vacated mines only) (Van Nieukerken 1985;Van Nieukerken et al. 2004a; 2006). Mine not separable from the similar mines on evergreen oaks of *E. andalusiae, phaeolepis* and *hendrikseni*, but on *Q. coccifera*, *E. andalusiae* is more often found than *suberis*. Univoltine, with larvae from January (Algarve, Andalusia) to late April (Spanish mountains, France) and adults flying from July to October.

**Distribution.** Earlier records from Tunisia, based on leafmines only, are confirmed by the record of reared adults below. Given the fact that the closely related *E. hendrikseni, E. andalusiae* and *E. phaeolepis* cannot be separated by their mines, the previous records from Algeria on the basis of their leafmines (Van Nieukerken 1985) should be reconsidered and regarded as doubtful, although in the light of distribution data *suberis* is still the most likely candidate.

**Material. Portugal:** 11♂, Algarve, pr. Bensafrim, 4–24.IX.1973, P. Grotenfelt (MZH); 39♂, 9♀, Baia Alentejo, Odemira, 1.IX.1973, P. Grotenfelt (MZH,RMNH). **Tunisia:** 2♂, 1♀, 7 km S Ain Draham, les Chênes, 22.III.1986, leafmines on *Quercus suber*, el, O. Karsholt (RMNH).

***Ectoedemia (Ectoedemia) hendrikseni*** A. Laštůvka, Z. Laštůvka & Van Nieukerken **sp. n.**
urn:lsid:zoobank.org:act:82826666-EA92-46C6-825E-1E0C64C821FB
Figs 35, 36, 45, 49, 54, 58, 62, 65

**Type material.** Holotype ♂ France, Alpes-Maritimes, Domaine de Maure Vieil, 26.V.2000, H. Hendriksen leg. (ZMUC). – Paratypes 41♂, 9♀: **France**: 38♂, 7♀, same locality: 1♂ 26.V.2000, 1♂ 31.V.2000, 1♂ 2.VI.2000, 1♂, 6.VI.2000, 1♂, 11.VI.2001, 1♂, 12.VI.2001, 1♂, 20.V.2003, 2♂, 22.V.2003, 1♂, 1♀, 25.V.2003, 1♂, 28.V.2003, 3♂, 29.V.2003, 2♂, 30.V.2003, 3♂, 31.V.2003, 2♂, 1.VI.2003, 1♂, 2.VI.2003, 1♂, 3.VI.2003, 3♂, 4.VI.2003, 5♂, 1♀, 5.VI.2003, 1♂, 8.X.2002, all H. Hendriksen leg. (ZMUC); 23.III.2002 mines with larvae, 1♂, 3♀, ex l. IV.2002, 26.III.2004 larvae, 2♂, 2♀, ex l. IV–V.2004, A. Laštůvka leg. (AL (RMNH)); Var, Agay, 27.III.2004 larvae, 1♂, 1♀, ex l. IV.2004 (AL (RMNH)); 3♂, Var, Colobriéres, 25.IX.1997, A. Laštůvka leg. (AL); Bagnols en Foret, 27.III.2004 larvae, 2♂, 1♀, ex l. IV–V.2004, A. Laštůvka leg. (AL).

**Diagnosis.** *Ectoedema hendrikseni* males are separated from similar *suberis* by the brown hairpencil and both from *suberis* and *andalusiae* by the white scaling on hindwing reaching the dorsal margin of the wing, with brown scales towards base. In the genitalia the shape of the valva is characteristic for the male, as is the number and length of the setae on the female T8 .

**Description.** Male (Figs 35–36). Forewing length 2.6–3.0 mm, wingspan 6.0–6.8 mm. Head: frontal tuft ochreous, collar greyish; scape yellowish white; antenna with 36–40 segments, brown-grey. Thorax and forewings fuscous black, thorax with some grey scales anteriorly and on metathorax, metallic shiny. Forewing: basal half covered with coarse black scales, medial fascia sharp, ochreous, narrowed towards costa; distal to fascia are individual coarse scales distinct, sometimes with ochreous ground colouration between them, especially on edge; cilia-line interrupted; cilia ochreous grey; underside grey. Hindwing: grey, with brown hair pencil near frenulum, surrounded by white androconial scales in basal half, partly brown towards base; cilia grey; underside ochreous grey. Abdomen and legs ochreous brown-grey.

Female. Forewing length 2.8–3.0 mm, wingspan 6.3–6.6 mm. Antenna with 29–34 segments. The coloration as in male, hindwing grey, without androconial scales.

Male genitalia (Figs 45, 49). Vinculum distinctly concave anteriorly. Tegumen with a bulbous, rounded pseuduncus, with several long setae. Gnathos broad, its processes and connecting bar of equal breadth, lateral processes rounded at their ends, only slightly shorter than central element. Valva broad, with an angular inner lobe on its base and with only slightly elongate distal process, sublateral processes about ¼ transtilla length. Aedeagus with distinct cathrema, with numerous very small cornuti in vesica, carinae simple, slightly curved, not pointed.

Female genitalia (Figs 54, 58, 62). T7 on either side with a patch of ca 35 long setae along margin with T8; T8 on disc with ca 40 long setae on either side; T8 with rounded corners, slightly indented posteriorly. Papillae anales broadly rounded, with many short setae, approximately 80–90 on each. Apophyses short and thick. Vestibulum with distinct vaginal sclerite and a spiculate pouch with small spines arranged as pectinations. Corpus bursae ca. 790µm long, almost globular, covered with minute pectinations; signa dissimilar, resp. ca 415 and 610 µm long (n=1), approximately 2.1–2.9 as long as wide. Ductus spermathecae with about 5.5 narrow sclerotized convolutions.

**Biology.** Hostplants: only reared from Quercus coccifera L. (Van Nieukerken 1985; Van Nieukerken et al. 2004).

**Figures 33–44.** ***Ectoedemia (Ectoedemia) suberis*** **group, males and male hindwing in dorsal view.** **33, 34** *E. suberis*, France (Var), Brignoles, e.l. VIII.2000, larva on *Quercus ilex* 21.III.2000 **35, 36** *E. hendrikseni*, paratype, France (Alpes Maritimes) Maure Vieil, e.l. IV.2002, larva on *Q. suber* 23.III.2002 **37, 38** *E. andalusiae*, Portugal, Assumadas, e.l. IX.2002, larva on *Q. coccifera* 26.VI.2002 **39, 40** *E. heckfordi*, paratype, Hembury Woods, nr. Buckfastleigh, Devon, e.l. 18.V.2005, larva on *Q. petraea* 5.IX.2004 **41** *E. phaeolepis*, paratype, Spain, Toledo, Robledo del Buey, 18.VI.2002 **42** *E. phaeolepis*, paratype, Spain, Teruel, Vivel del Rio, 24.VI.2001 **43** *E. caradjai,* Bulgaria, Montana, 25.VI.1998 **44** ***E.*** *aegilopidella,* Rhodos, 5 km S. Rodos, 250m, 4–8.VII.2000, M. Fibiger.

33

*suberis*

34

35

*handrikseni*

36

37

*andalusiae*

38

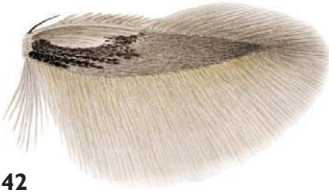
39

*heckfordi*

40

41

*phaeolepis*



42

43 *caradjai*

44 *aegilopidella*

Leafmines (Fig. 65). Probably indistinguishable from the mine of *E. suberis*; a narrow, partly contorted gallery in the first half changes suddenly in a large blotch mine with two lateral bands of frass.

Larva. Green.

Life history. Larvae collected in March, several weeks earlier than in *E. suberis*, most adults on the wing in May and June; an individual record in October may represent a (partial) second generation or a late emerging specimen. In this case the species flies together with *E. suberis*.

**Distribution.** Known from a small area in the Provence region in Southern France: the Estérel massif in the Alpes Maritimes and Var.

**Etymology.** Dedicated to the memory of Henning Hendriksen (Copenhagen) who collected this species for the first time; *hendrikseni* is a noun in the genitive. The ardent collector and specialist of microlepidoptera Hendriksen died in February 2009 at the age of 80.

***Ectoedemia (Ectoedemia) andalusiae*** Van Nieukerken
Figs 37, 38, 50, 57, 61

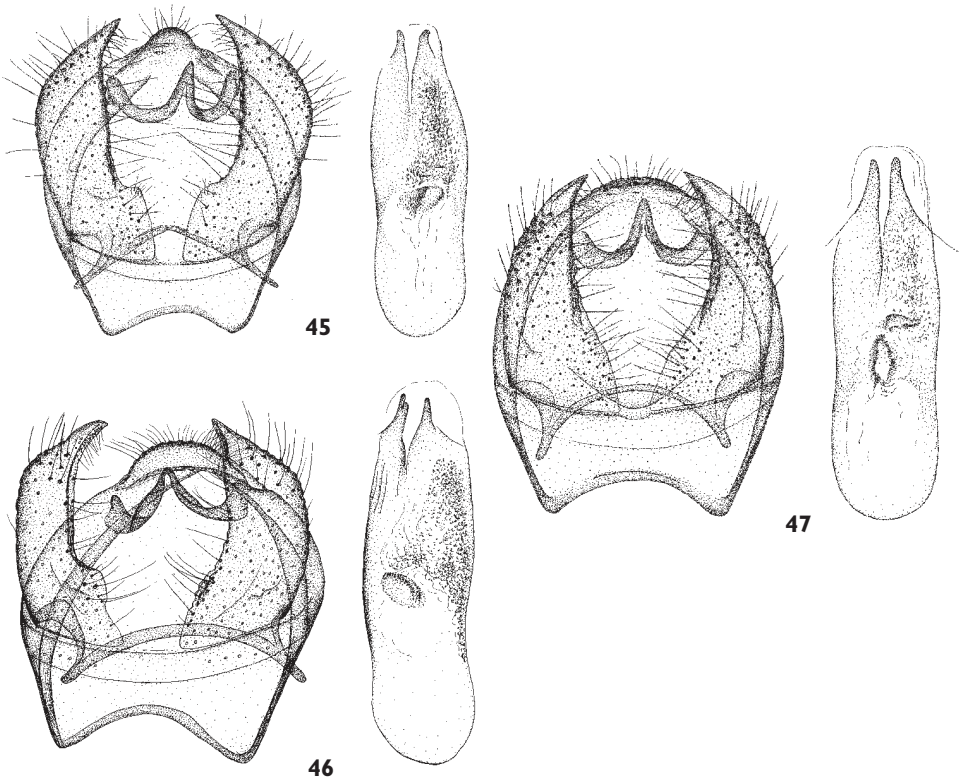
**Diagnosis.** Male *Ectoedemia andalusiae* is separated from the very similar *E. suberis* by the ochreous hairpencil, from *E. hendrikseni* by the field of white scales that does not reach the dorsal margin of the hindwing (Figs 37, 38). Male genitalia most similar to *suberis*, but capsule shorter and with blunt and wide tegumen (Fig. 50). Female genitalia resemble those of *E. heckfordi* and *E. phaeolepis*, but have more convolutions in the ductus spermathecae (6 against 4.5–5.5) (Figs 57, 61).

**Biology.** Hostplants: only reared from *Quercus coccifera* L. (Van Nieukerken 1985; Van Nieukerken et al. 2004). Mine not separable from that of *E. suberis* or *phaeolepis*. Possibly bivoltine, with larvae from January to March and in June, and adults flying from April to July and September-October. From larvae collected in the middle of June in Algarve we reared adults in following days (end of June, beginning July), so that more than two generations are possible in Portugal. The second generation may fly together with *E. suberis*.

**Distribution.** Southwestern Europe. France: Van Nieukerken 2006; Portugal: Corley et al. 2000.

***Ectoedemia heckfordi*** Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.**
urn:lsid:zoobank.org:act:85DD1EB3-ED04-4304-A24D-5E5573A26926
Figs 39, 40, 46, 51, 55, 59, 63, 68, 69, 111, 122

**Type material**. **Holotype** ♂: **Great Britain:** Devon, Hembury Woods, near Buckfastleigh, SX7268, 29.VIII.2004, green larva in leafmine on *Quercus petraea*, e.l. 24.IV.2005, EJvN no 2004903 [reared in Leiden], R. J. Heckford, Genitalia




**Figures 45–47.** ***Ectoedemia (Ectoedemia) suberis*** **group, male genitalia of new species, paratypes.** **45** *E. hendrikseni*, France (Alpes Maritimes), Domaine de Maure Vieille, 12.VI.2001 **46** *E. heckfordi,* slide EJvN 3914 (in glycerin) **47** *E. phaeolepis,* Spain (Málaga), Alpandeire, 30.VI.1994.

slide EJvN 3730, DNA extracted protocol Knölke et al., RMNH INS no 23730 (RMNH).

**Paratypes** 4♂, 6♀. **Great Britain:** 2♂, 2♀, Devon, Hembury Woods near Buckfastleigh, SX7268, 5.IX.2004, leafmines on *Quercus petraea,* e. l. 15–22.V.2005, R. J. Heckford, Genitalia preparations EJvN3914 (♂), 3915 (♀) (glycerine) (BMNH, Heckford collection); 2♂, same locality, 20.VIII.2005, leafmines on *Quercus petraea,* e. l. 20+23.V.2006, R. J. Heckford, genitalia slide EJvN 3849 (DNA extracted) (RMNH, BMNH); 1♀, Devon, River Dart, SX699711, 20.VIII.2005, leafmines on *Quercus petraea,* e. l. 20.V.2006, R. J. Heckford, genitalia slide EJvN 3848 (DNA extracted) (RMNH); 3♀, Devon, Bench Tor [SX6971], ix.2006, leafmines on *Quercus petraea,* e. l. 14–18.V.2007, P.H. Sterling (BMNH, Sterling coll.).

**Diagnosis.** The wing pattern resembles *E. suberis* and related species, but male *E. heckfordi* is separated from all except *E. phaeolepis* by the ochreous hairpencil on the hindwing base, which is surrounded by white androconial scales close to the hairpencil and brown scales along dorsum. The females lack the hairy abdominal tip of *E. suberis* and *hendrikseni*, but closely resemble *E. andalusiae* and *phaeolepis*, which

are externally not separable. Male genitalia differ from *suberis*, *andalusiae* and *hendrikseni* by the very slight basal bump, which is much more distinct in the other species, whereas this bump is virtually absent in *E. phaeolepis* and *caradjai*. This and the next species differ from *E. caradjai* by the pointed gnathos (truncate in *caradjai*). Aedeagus at 360–400 µm distinctly longer than in *E. phaeolepis* and *andalusiae* (less than 350µm). In female genitalia hard to distinguish from *E. andalusiae* or *E. phaeolepis*, apart from slight statistical differences in numbers of setae on anal papillae and number of convolutions in ductus spermathecae (6 in *andalusiae*, 5.5 in *heckfordi*, 4.5 in *phaeolepis*).

**Description.** Male (Figs 39, 40, 111). Forewing length 2.2–2.7 mm (2.5±0.2,5), wingspan 4.8–5.8 mm. Head: frontal tuft yellowish white to ochreous, collar ditto; scape yellowish white; antenna brown grey, with 43–47 (44.2±1.8,5) segments. Thorax and forewings dark fuscous to black with paler scale bases giving some irroration; a straight dull white, medial fascia, usually wider at dorsum than costa; cilia-line more or less distinct; cilia ochreous grey; underside brown-grey, a narrow line of dark fuscous scales under costal fold near wing base. Hindwing and cilia grey, distinct field of androconial scales on basal half, reaching up to the dorsal margin, dark brown along dorsum, white near hairpencil, hair pencil ochreous; underside grey. Abdomen brownish black, with yellowish anal tufts.

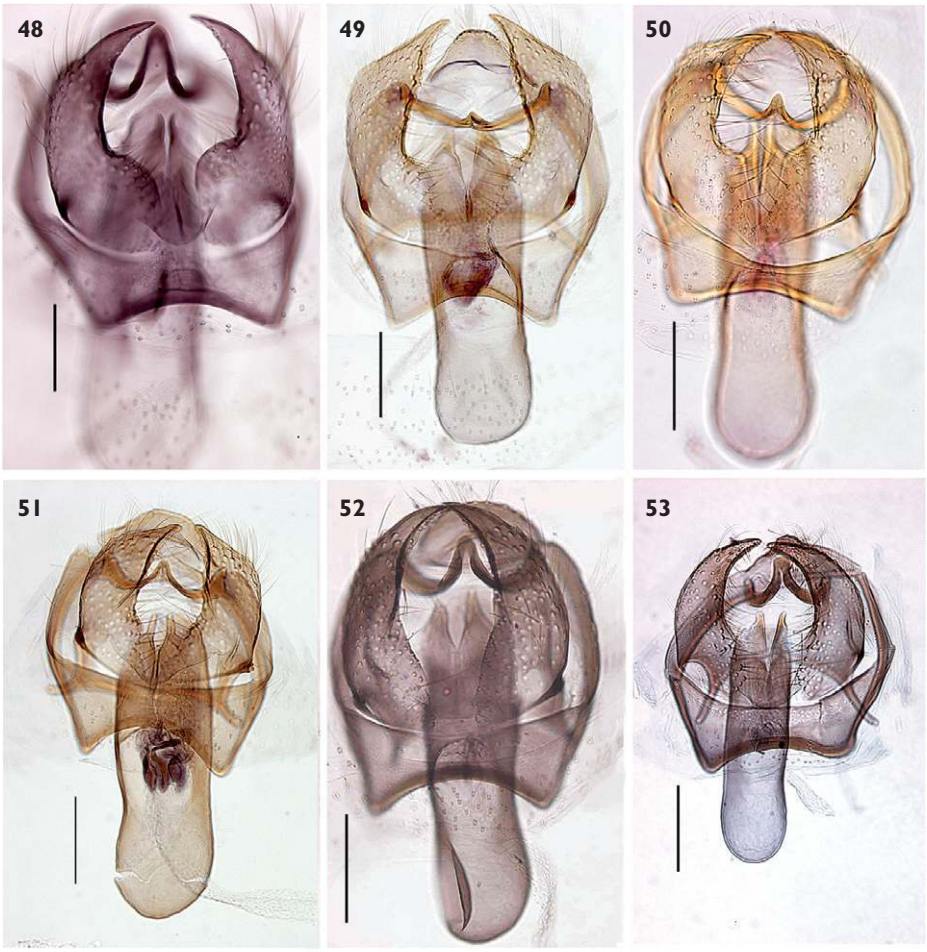
Female. Forewing length 2.2–2.6 mm (6), wingspan 4.9–6.2 mm. Antenna with 30–34 (5) segments. As in male, but hindwing without androconial scales.

Male genitalia (Figs 46, 51). Capsule length 250–265 µm. Vinculum distinctly concave anteriorly. Tegumen broadly rounded to almost truncate, without distinct processes or lobes caudally, with several long setae. Gnathos central element broadly triangular, lateral processes broad and rounded caudally. Valva length 185–210 µm, broad, inner margin with an indistinct basal bump, suddenly narrowed, not evenly curved; outer margin also slightly angled ca ¼ from tip, sublateral processes shorter than ½ transtilla length. Aedeagus 360–400 µm long, with distinct cathrema, with many very small cornuti in vesica, ventral pair of carinae simple, pointed.

Female genitalia (Figs 55, 59, 63). T8 with ca 14–17 setae on either side; T8 with rounded corners, and posteriorly straight. Papillae anales broadly rounded, with about 12–15 short setae each. Apophyses short and thick. Vestibulum with distinct vaginal sclerite and a "spiculate" pouch without spines. Corpus bursae ca. 560–600µm long, almost globular, covered with minute pectinations; signa almost similar, ca 330–370 µm long (n=2), approximately 1.9–2.1 as long as wide, ca 12 cells in width. Ductus spermathecae with about 5.5 sclerotized convolutions.

**Biology.** Hostplant. Reared from *Quercus petraea* (Matt.) Liebl.; in 2006 vacated mines were also found on *Q. robur* L.. Most mines were found on saplings, seedlings or low growth of *Q. petraea* and in the shade.

Leafmines (Figs 68, 69, 122). Egg on leaf underside, against leaf margin or a vein. Mine starts as a short, highly contorted gallery, occupying a small space only, filled with black frass, later broken; mine suddenly enlarged into an elongate blotch, with




**Figures 48–53.** ***Ectoedemia (Ectoedemia) suberis*** **group, male genitalia, ventral aspect. 48** *E. suberis*, Portugal, Odemira, slide RMNH.INS.23742 **49** *E. hendrikseni*, paratype, slide RMNH.INS.23720 **50** *E. andalusiae*, Spain, Serrania de Ronda, slide RMNH.INS.23073 **51** *E. heckfordi*, holotype, slide RMNH.INS.23730 **52** *E. phaeolepis*, paratype, Spain, Madrid, Cadalso, slide RMNH.INS.22516 **53** *E. caradjai*, France, Lot, Craberets, slide RMNH.INS.23509.Scales 100 µm.

frass concentrated in two lines along the edges. Mine similar to that of other species in this group.

Larva. Distinctly green.

Life history. Larvae have been found from 2 August to early September and adults emerged indoors in April and May, certainly univoltine.

**Remarks.** The mines of this species were discovered by Bob Heckford in a small forest in Devon. In the following years he and Phil Sterling found the mines in two more localities, all close to the first one. The mines were either on saplings, seedlings

or on low branches of the trees, always in the shade. These mines were first reported in Britain as "*Ectoedemia caradjai*" (Edmunds and Langmaid 2004).

**Distribution.** England: Devon.

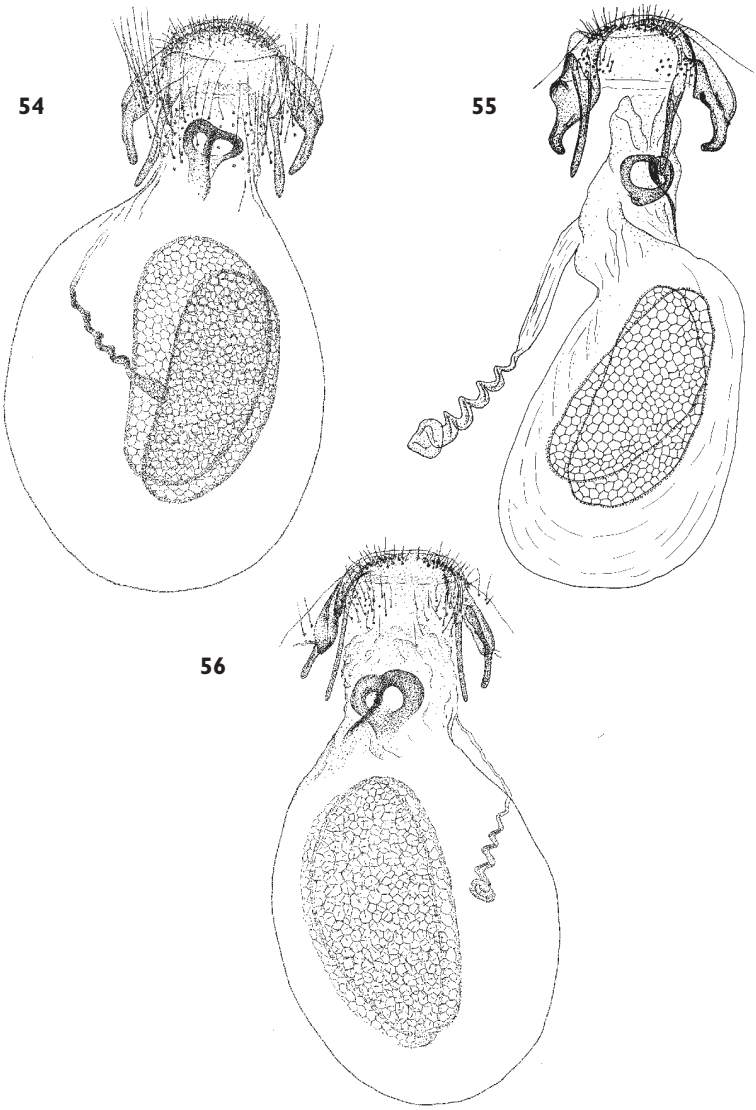
**Etymology.** The species is dedicated to Robert Heckford who found the larvae in Britain and successfully reared the adults; *heckfordi* is a noun in the genitive.

***Ectoedemia phaeolepis*** Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.**
urn:lsid:zoobank.org:act:9CC5C9D4-101E-45C3-94F9-880394F3C577
Figs 41, 42, 47, 52, 56, 60, 64, 66

*Ectoedemia* species (specimen 1843); Van Nieukerken 1985: 39.

**Type material.** Holotype ♂: **Spain:** prov. Teruel, Ejulve, 29.VI.2005, leg. A. & Z. Laštůvka (RMNH). **Paratypes** 106♂, 61♀. **Portugal:** 2♂, [Algarve], prov. Faro, Assumadas, 22.VI.2005; 1♂, Algarve, Serra de Monte Figo, 24.V.2001, M.F.V. Corley (MC); 2♂, [Beira Baixa], prov. Castelo Branco, Zebreira, 20.VI.2002; 2♂, [Ribatejo], prov. Santarém, Monsanto, 19.VI.2005. **Spain:** 1♂, prov. Albacete, El Pardal, 30.VI.2003; 1♂, 1♀, 22.VI.2009; 3♂, prov. Almeria, Turillas, 19.VI.2009; 3♂, prov. Almeria, Uleila del Campo, 9.VII.1993; 1♂, Barcelona, Anoia, Odena, Salze, 25.VI.2006, E. Requena (RMNH); 2♂, prov. Cáceres, Guadalupe, 11.VI.2009; 4♂, 14♀, prov. Cádíz, Alcalá del Vale, 11.VII.1993; 1♂, prov. Cuenca, Casas del Egidillo, 30.VI.2004; 3♂, prov. Cuenca, Gabaldón, 1.VII.2002; 1♂, 3♀, prov. Granada, Diezma, 2.VII.2001; 2♂, 29.VI.2002; 1♂, 2♀, 29.VI.2003; 2♂, 1♀, 28.VI.2004; 2♂, 2♀, prov. Granada, El Molinillo, 27.VI.2004 (1♂, 1♀ RMNH); 4♂, 1♀, 24.VI.2005; 2♀, 25.VI.2005; 1♂, prov. Granada, Puebla de Don Fadrique, 26.VI.2005; 1♂, prov. Granada, Puebla de Don Fadrique, La Sagra, 21.VI.2009; 3♀, prov. Granada, Puerto del Pinar, 29.VI.2001; 1♂, 1♀, 28.VI.2003; 2♀, prov. Granada, Zújar, 20.VI.2009; 1♂, 1♀, prov. Madrid, Cadalso, 15.VII.1985, C. Gielis (RMNH); 1♂, prov. Madrid, Riazza, 3.VIII.1986, C. Gielis (RMNH); 6♂, 2♀, prov. Málaga, Alpandeire, 30.VI.1994; 12♂, 7♀, prov. Málaga, Archidona, 13.VII.1993; 7♂, 3♀, prov. Málaga, Jimera de Líbar, 28.VI.1994; 3♀, 27.VI.2002 (1 RMNH); 2♂, 1♀, 27.VI.2003; 1♀, 23.VI.2005; 1♂, prov. Málaga, Monda, 26.VI.2005; 2♂, Tarragona, Baix Camp, Prades, Col de les Masies, 980 m, 29.VII.20060729, E. Requena & DeGregorio (RMNH); 2♂, prov. Teruel, Ejulve, 29.VI.2005 (1 RMNH); 1♂, prov. Teruel, Montalban, 16.VI.2002; 1♂, 15.VI.2003; 1♂, Teruel, Rubielos de Mora, 4.VII.1967, Arenberger (SMNK); 2♂, prov. Teruel, Segura de los Banos, 6.VII.2002; 7♂, 3♀, prov. Teruel, Vivel del Rio, 24.VI.2001; 2♂, 1♀, 2.VII.2003; 1♀, prov. Toledo, Buenasbodas, 14.VI.2005; 3♂, 10.VI.2009; 10♂, 3♀, prov. Toledo, Robledo del Buey, 18.VI.2002; 4♂, 1♀, 18.VI.2003; 1♂, 2♀, prov. Toledo, Robledo del Mazo, 19.VI.2003; except where mentioned otherwise, all leg. A. & Z. Laštůvka (AL).

**Diagnosis.** Very similar to *E. heckfordi*, but the dark brown androconial scales on the hindwing reach nearly to the middle of the wing and to its hind margin, hair pencil fuscous, see further *E. heckfordi.*




**Figures 54–56.** ***Ectoedemia (Ectoedemia) suberis*** **group, female genitalia of new species, paratypes.** **54** *E. hendrikseni*, France (Alpes Maritimes), Domaine de Maure Vieille, e.l. iv.2002 **55** *E. heckfordi,* slide EJvN 3915 (in glycerin) **56** *E. phaeolepis,* Spain, Málaga, Archidona, 13.VII.1993.

**Description.** Male (Figs 41, 42). Forewing length 2.4–2.8 mm, wingspan 5.4–6.0 mm. Head: frontal tuft dark ochreous, with several brownish scales, collar ochreous; scape yellowish white; antenna dark brown-black, with 39–41 segments. Thorax nearly black with several brownish scales in its hindpart. Forewing covered with dense black scales, the light ground coloration partly visible only near apex; fascia nearly white, with a sharp basal and more blurred distal edge; cilia-line more or less distinct; cilia

ochreous grey; underside brown-grey. Hindwing and cilia grey, distinct field of black androconial scales in its basal half, it reachs up to the hind margin of the wing, hair pencil fuscous; underside grey. Abdomen brownish black. Legs ochreous grey.

Female. Forewing length 2.5–2.7 mm, wingspan 5.5–6.0 mm. Antenna with 28–31 segments. The coloration as in male, hindwing without androconial scales.

Male genitalia (Figs 47, 52). Capsule length 225–260 µm. Vinculum distinctly concave anteriorly. Tegumen broad, rounded, without distinct processes or lobes caudally, with several long setae. Gnathos broad, lateral processes broad and rounded caudally, distinctly shorter than central element. Valva length 180–210 µm, broad, continuously narrowed caudally, with acute distal process, sublateral processes shorter than ¼ transtilla length. Aedeagus 325–350 µm long, with distinct cathrema, with many very small cornuti in vesica, carinae simple, pointed.

Female genitalia (Figs 56, 60, 64). T8 with ca 17–19 setae on either side; T8 with rounded corners, and posteriorly straight. Papillae anales broadly rounded, with about 10–14 short setae each. Apophyses short and thick. Vestibulum with distinct vaginal sclerite and a "spiculate" pouch without spines. Corpus bursae ca. 610 µm long, almost globular, covered with minute pectinations; signa almost similar, ca 325–390 µm long (n=2), approximately 1.9–2.5 as long as wide, ca 10 cells in width. Ductus spermathecae with about 4.5 sclerotized convolutions.

**Biology.** Hostplant. Adults have always been collected near *Quercus ilex* L. or *Q. rotundifolia*, repeatedly accompanied by vacated mines on these evergreen oaks; these are thus the most likely hostplants.

Leafmines (Fig. 66). Described from vacated mines found in association with adults. Egg position not observed. Mine starts as a narrow sinuous gallery which changes later into a large blotch with two lateral bands of frass, similar to those of other species in the *suberis* complex).

Larva. Unknown.

Life history. Adults were collected from late May to early August.

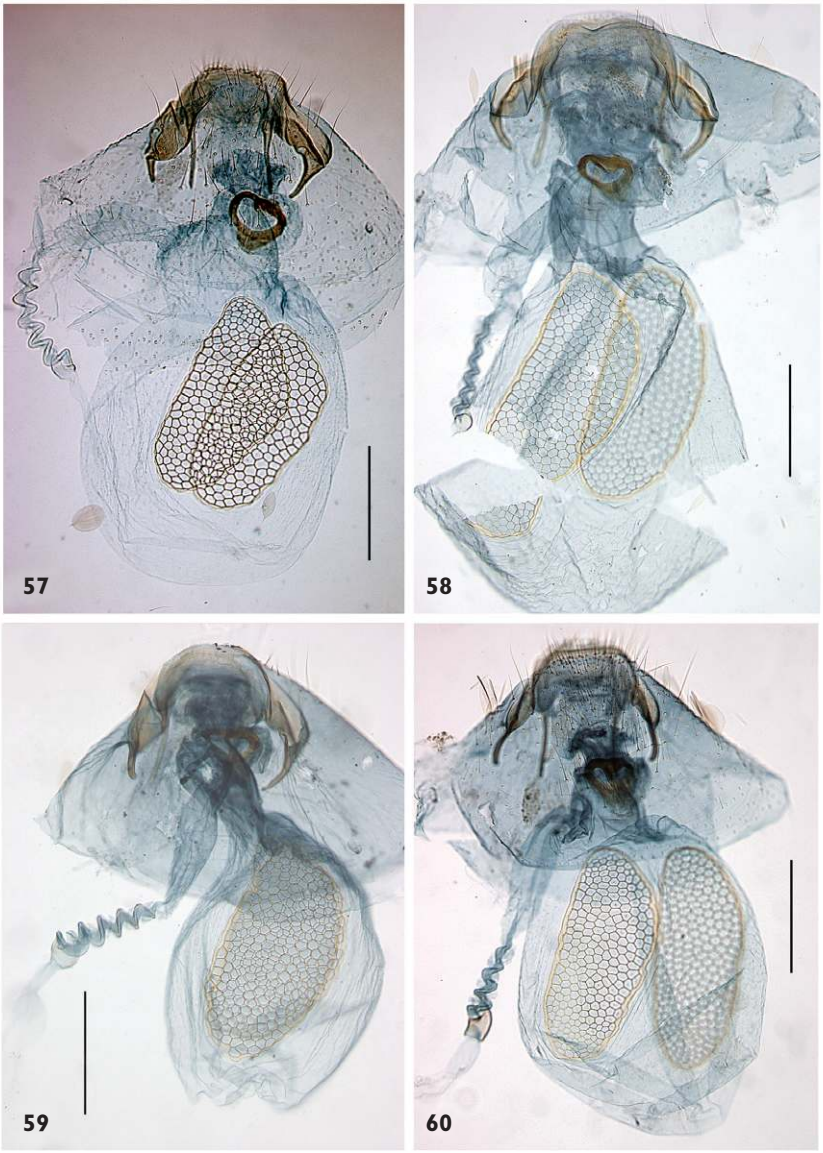
**Distribution.** Iberian Peninsula: Portugal and Spain.

**Etymology.** The name *phaeolepis*: is derived from Greek phaios, dusky, brown and lepis, scale: with brown scales, referring to the androconial scales on the hindwing; it should be treated as a noun in apposition.

**Remark.** The specimen from Portugal, Serra de Monte Figo was earlier misidentified as *E. caradjai* (Van Nieukerken et al. 2004a).

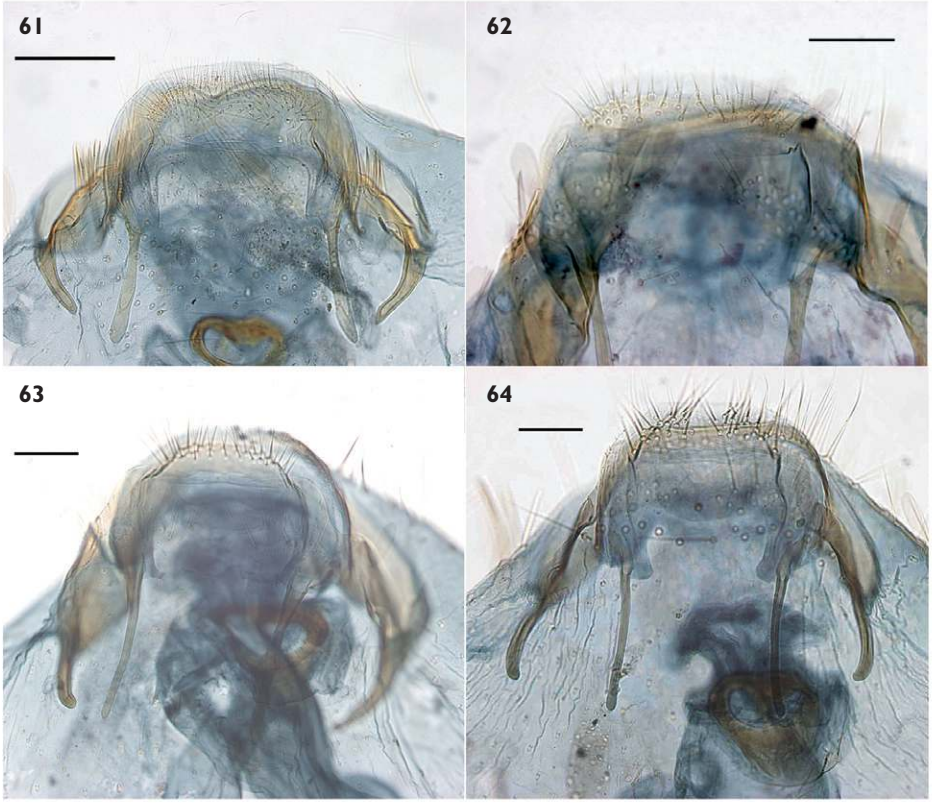
### ***Ectoedemia (Ectoedemia) quinquella*** (Bedell)
Figs 70, 76, 85, 119

**Diagnosis.** *Ectoedemia quinquella* is very similar to *E. algeriensis* and *E. coscoja*, but has a dark thorax, at least the anterior part (Fig. 70). *E. coscoja* also differs in having a pale head. Male genitalia (Fig. 76) similar to those of *E. coscoja*, valva tip less pronounced; female genitalia (Fig. 85) compared with *E. algeriensis* and *E. coscoja* only with few setae on terminal segments.




**Figures 57–60.** ***Ectoedemia (Ectoedemia) suberis*** **group, female genitalia, dorsal aspect. 57** *E. andalusiae*, Portugal, Algarve, Alportel, slide EJvN 3476 **58** *E. hendrikseni*, paratype, slide RMNH.INS.23828 **59** *E. heckfordi*, paratype, slide RMNH.INS.23848 **60** *E. phaeolepis*, paratype, Spain, Madrid, Cadalso, slide RMNH.INS.22515. Scales 200 µm.

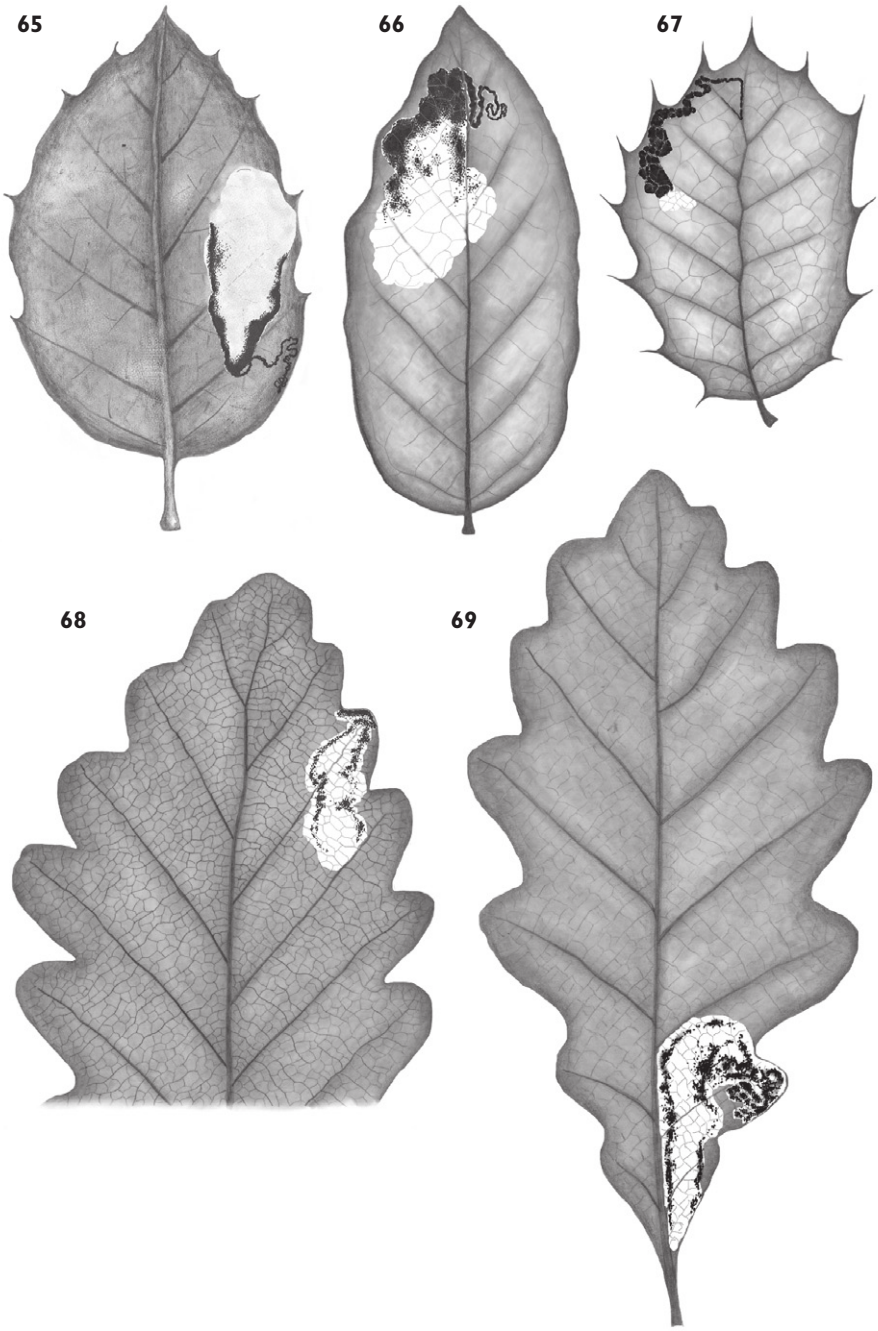
**Biology.** Hostplants: *Quercus robur* L., *Q. petraea* (Matt.) Liebl., *Q. pubescens* Willd. (new record). Univoltine, larvae (Fig. 119) very late in the season, from mid October to late November (once young larvae in September), adults fly in June and July. Larvae may be confused with those of *E. rufifrontella*, see Figs 119, 120.




**Figures 61–64.** ***Ectoedemia (Ectoedemia) suberis*** **group, female terminal abdominal segments, dorsal aspect. 61** *E. andalusiae*, Spain, Málaga, Marbella, slide RMNH.INS.23427 **62** *E. hendrikseni*, paratype, slide RMNH.INS.23828 **63** *E. heckfordi*, paratype, slide RMNH.INS.23848 **64** *E. phaeolepis*, paratype, Spain, Madrid, Cadalso, slide RMNH.INS.22515. Scales 50 µm, 100 µm (61).

**Distribution.** Netherlands: Alders and Donner 1992. A record from Rumania (Căpuşe and Kovacs 1987) needs to be confirmed, the record from Croatia (Laštůvka and Laštůvka 1997) was a mistake. The records from Italy by Jäckh (Van Nieukerken 1985) based on illustrations only, are here confirmed by the study of the original specimens (see below). The species is expanding northwards in Belgium and the Netherlands: Alders 2006; Huisman et al. 2001; Van Nieukerken 2006; Van Nieukerken and Van As 2008.

**Remarks.** The character to distinguish *E. quinquella* from *E. algeriensis*, the partly darker thorax (with white tegulae and posterior tip of thorax) is problematical in the Italian specimens which have an almost completely white thorax. Still, most specimens retain at least one row of black scales along the anterior margin of the thorax and the dark scaling of the forewings is much darker (more black) than in *algeriensis.* In the 1985 description the figures for aedeagus length were wrong, they should read: 250–270 µm.




**Figures 65–69.** ***Ectoedemia (Ectoedemia),*** **leafmines of new species. 65** *E. hendrikseni,* France (Alpes Maritimes), Maure Vieil, 23.III.2002 on *Quercus suber* **66** *E. phaeolepis,* Spain (Teruel), Vivel del Rio, VI.2001 old vacated mines on *Q. rotundifolia* **67** *E. coscoja*, Spain, type locality, on *Q. coccifera* **68–69** *E. heckfordi,* Great Britain, type locality, on *Q. petraea*.

**Material. France:** 1 larva [DNA identified] Alpes Maritimes, Sospel, 5 km N, W of Col de Brouis, 914 m, 14.X.2008, leafmine on *Quercus pubescens*, EJvN2008313, E.J. van Nieukerken & C. Doorenweerd (RMNH.INS 17672); **Greece:** 1♀**,** Akhaia, Kalavrita, 20.VI.1997, A. & Z. Laštůvka (AL); 3♀, Pieria, Leptokaria, 22.VI.1997, A. & Z. Laštůvka (AL)**. Italy:** 3♂, 2♀, Savona, Andora, Conna, S. Sebastiano, 500 m, 4.VII.1969, li, E. Jäckh (USNM); 1♂, 1♀, Savona, Testico, 470 m, 5.VII.1969, E. Jäckh (USNM).

***Ectoedemia (Ectoedemia) algeriensis*** Van Nieukerken
Figs 71, 79, 86, 88

**Diagnosis.** Resembles *E. quinquella* and *E. coscoja*, which both have a similar pattern of three spots, but the spots are usually less distinct in *algeriensis*. *E. coscoja* is separated by the pale head, and *E. quinquella* by the partially black thorax (anterior part), which is completely white in *algeriensis*, and the yellow hairpencil in *quinquella*, versus the white one in *algeriensis*. *E. algeriensis* has also many more antennal segments than the other two species.

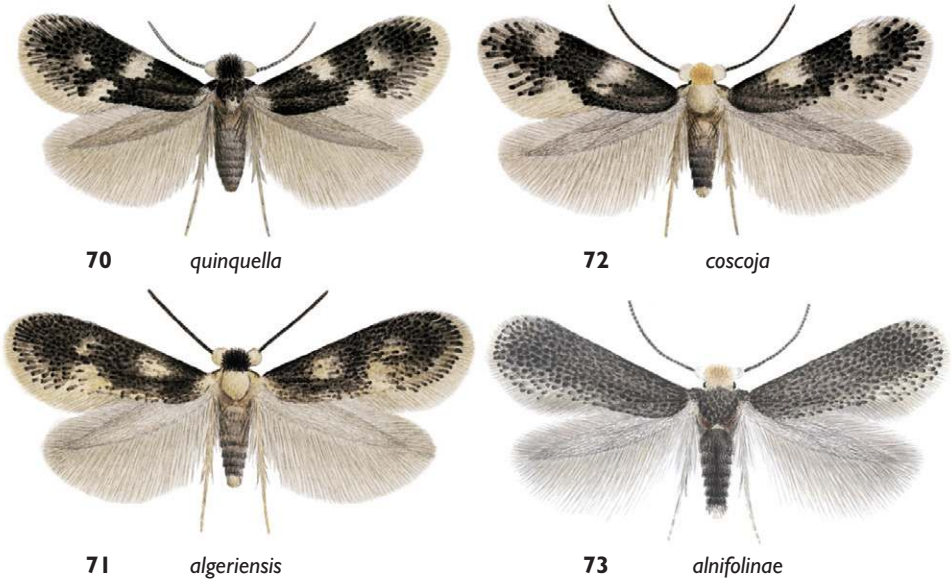
**Redescription.** Male (Fig. 71). Forewing length 2.4–2.9 mm, wingspan 5.3–5.7 mm. Head: frontal tuft almost black, collar slightly paler; scape white; antenna brown, with 48–54 segments. Thorax and tegulae completely white. Forewing brown, with pattern of two to three indistinct white spots, one at 1/3 at costa, one at dorsal margin slightly beyond middle and the third at 2/3 in disc, usually not touching costa, often reduced or almost absent; sometimes a small indistinct basal spot present; cilia-line distinct; cilia silvery white; underside light brown-grey. Hindwing and cilia dark grey; a white hairpencil, surrounded by yellow scales. Abdomen grey, with white anal tufts.

Female. Forewing length 2.1–2.6 mm, wingspan 4.9–5.6 mm; antenna with 27–35 segments. Hairpencil absent, further as male.

Male genitalia (Fig. 79). Capsule 245–260 µm long. Tegumen rounded. Gnathos with central element divided, distal part prominent, broadly spatulate, basal part with serrate margins. Valva length 195–215 µm, inner margin concave, tip wide, strongly curved inwards and truncate, dorsal surface with few setae; sublateral processes about 1/3 length of transverse bar of transtilla. Aedeagus 250–275 µm, carinae pointed, single, bi- or trifurcate.

Female genitalia (Figs 86, 88). T8 (and T7?) with more than 70 long setae, partly in row along anterior margin, no scales. Anal papillae with 24–28 setae. Vestibulum with vaginal sclerite, a prominent dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 605–660 µm without pectinations; signa dissimilar, longest 386–450 µm (2), shortest 355–420 µm, 3.5–3.9× as long as wide (2). Ductus spermathecae with 2 indistinct convolutions.

**Biology.** Hostplants. Evergreen oaks *Quercus rotundifolia* Lam., *Q. ilex* L., *Q. suber* L. (Van Nieukerken 1985; Van Nieukerken et al. 2006).




**Figures 70–73.** ***Ectoedemia (Ectoedemia) subbimaculella*** **group, males in dorsal view. 70** *E. quinquella,* Greece, Pieria, Leptokaria, 22.VI.1997 **71** *E. algeriensis*, France, Aix en Provence, Rousset, e.l. VI.2000, larva on *Quercus ilex,* 21.III.2000 **72** *E. coscoja*, paratype, Spain (Málaga), Jimera de Líbar, 27.VI.2003 **73** *E. alnifoliae*, Cyprus, Troodos mts., Platres, 11–16.V.1999.

Leafmine. Egg on leaf upperside. Mine a highly contorted gallery, often following veins partially, filled with black frass. Not separable from other gallery mines of *E. haraldi, ilicis* or *heringella*.

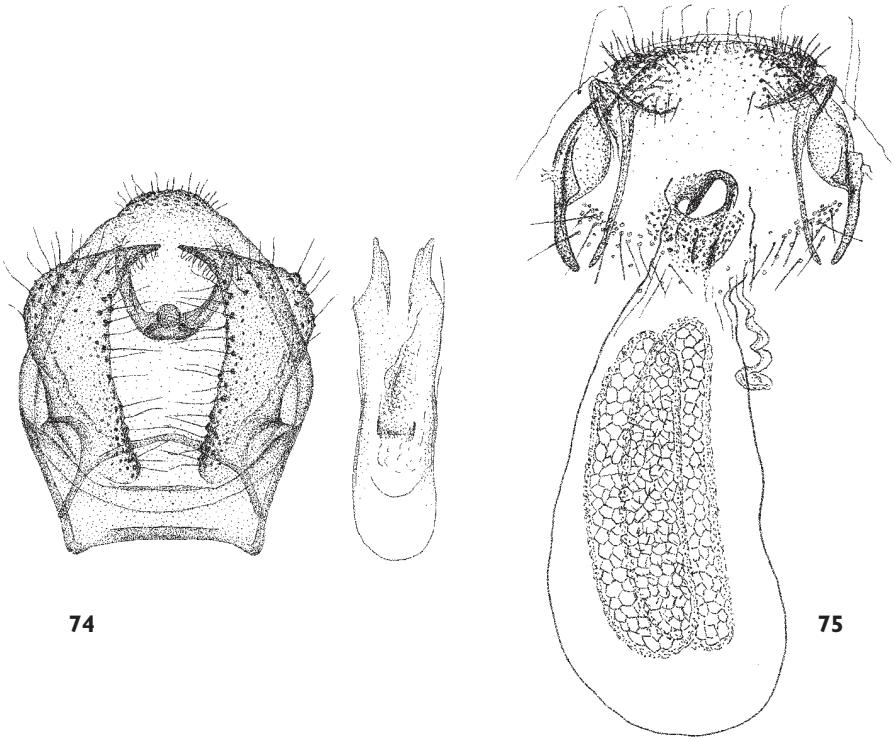
Larva. According to original description the larva is green. However, while collecting the French material, EJvN did not note any green colour and larvae were tentatively identified as *ilicis/haraldi*. Since the latter have normally whitish larvae, the original description is probably incorrect, or refers to the colour as appearing inside the mine. No ventral plates have been observed.

Life history. Probably univoltine, adults on the wing in June and July, larvae found in February-March in France, April in Algeria (high mountains).

**Distribution.** France, Mediterranean area: Van Nieukerken et al. 2006. Otherwise only known from the Atlas mountains in Algeria and Morocco.

***Ectoedemia coscoja*** Van Nieukerken, A. Laštůvka & Z. Laštůvka **sp. n.**
urn:lsid:zoobank.org:act:69DCE920-02B9-48C0-99EA-D7220F41573D
Figs 67, 72, 74, 75, 77, 78, 87, 89

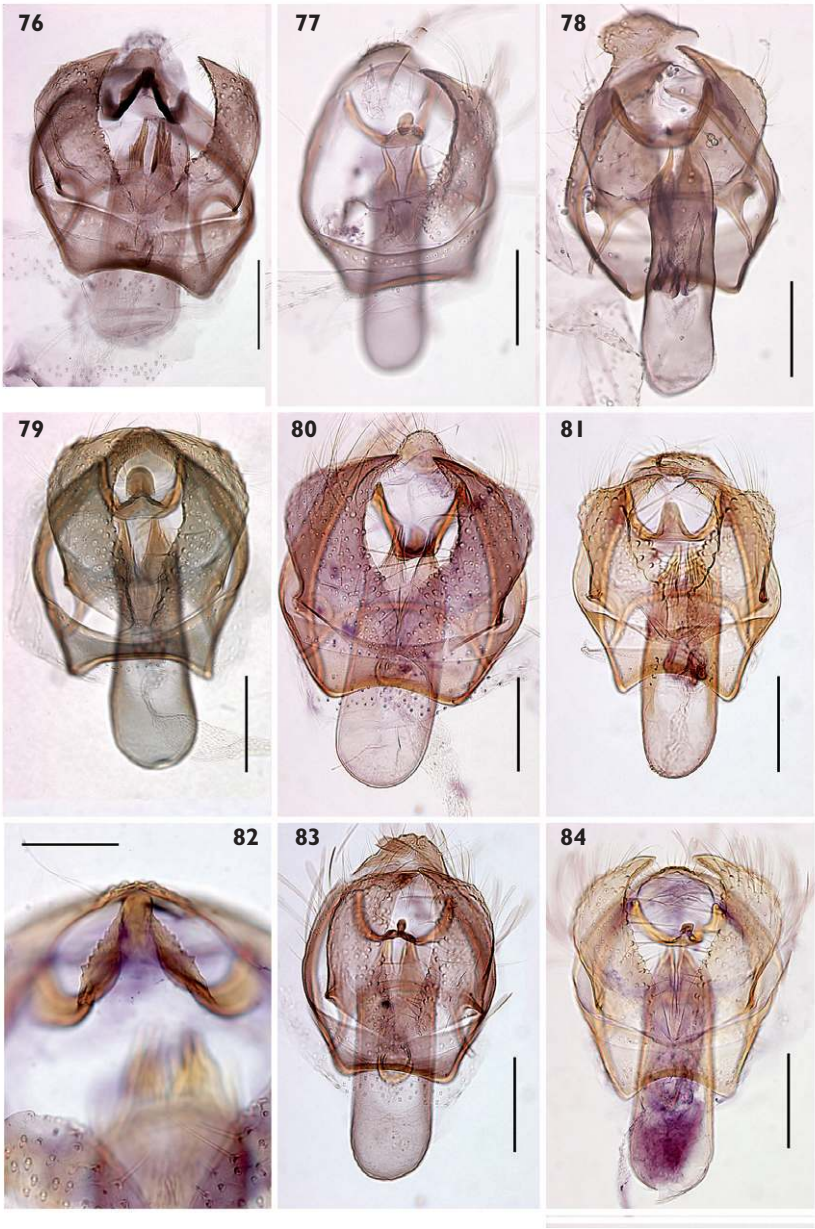
**Type material.** Holotype ♂: **Spain:** [prov.] Málaga, 3 km NE Marbella, road to Ojén, 200m, 30S UF3244, 15.I.1988, leafmines on *Quercus coccifera*, e.l. 8.IV-8.V.1988




**Figures 74–75.** ***Ectoedemia (Ectoedemia) coscoja*, genitalia. 74** male, Spain (Málaga), Jimera de Líbar, 27.VI.2003 **75** female, Spain (Málaga), Jimera de Líbar, 28.VI.1994.

(RMNH)/EJvN no 88043, E.J. van Nieukerken, genitalia slide 3066 RMNH INS no 23066 (RMNH).

**Paratypes** 10♂, 19♀: **Spain:** 2♂, data as holotype (RMNH); 1♂, prov. Albacete, El Pardal, 22.VI.2009, A. & Z. Laštůvka (AL); 1♀, prov. Almería, Uleila del Campo, 23.VI.1994, A. & Z. Laštůvka (AL); 1♀, prov. Barcelona, Vilafranca del Penades, 25.VI.1991, A. & Z. Laštůvka (AL); 1♀, Huesca, Penalba, 300 m, 28.VI.1986, P. Skou (ZMUC); 1♀, [prov.] Málaga, 7 km N. Benahavis, road to Ronda, 800m, 7.II.1984, leafmines on *Quercus coccifera*, e.l. 17–18.IV.1984, EJvN no 84034, E.J. van Nieukerken (ZMAN); 1♀, prov. Málaga, Istán, 1.VII.1994, A. & Z. Laštůvka (AL); 1♀, prov. Málaga, Jimera de Líbar, 28.VI.1994; 1♂, 2♀, 27.VI.2002 (2♀ RMNH); 1♂, 27.VI.2003; 2♀, 23.VI.2005, A. & Z. Laštůvka (AL); 1♀, prov. Málaga, Monda, 28.VI.2002; 1♂, 1♀, 26.VI.2004, A. & Z. Laštůvka (AL); 1♀, prov. Málaga, La Majada Higuera, 18.VI.2009, A. & Z. Laštůvka (AL); 1♀ [prov.] Málaga, Serrania de Ronda, road C339, 7 km SE Igualeja, 850m, 30S UF1551, 18.I.1988, leafmines on *Quercus coccifera*, e.l. 22.IV.1988 (RMNH)/EJvN no 88063, E.J. van Nieukerken (RMNH); 1♀, prov. Tarragona, 3 km S Fayón, 8.VI.2009, A. & Z. Laštůvka (AL); 2♂, 1♀, prov. Teruel, Vivel del Rio, 24.VI.2001 (2♂ RMNH); 1♂, 1♀, 2.VII.2003, A. & Z. Laštůvka (AL); 1♀, prov. Valencia, Jarafuel, 3.VII.1992, A. & Z. Laštůvka (AL); 1♂, prov. Zaragoza, Tosos, 1.VII.2004; A. & Z. Laštůvka (AL).




**Figures 76–84.** ***Ectoedemia (Ectoedemia) subbimaculella*** **group, male genitalia, ventral aspect. 76** *E. quinquella,* Netherlands, Limburg, Bemelerberg, slide RMNH.INS.15007 **77** *E. coscoja,* holotype, slide RMNH.INS.23850 **78** *E. coscoja,* paratype, Spain, Teruel, Vivel del Rio, slide RMNH.INS.23830 **79** *E. algeriensis,* France, Var, Massif de l' Estérel, slide RMNH.INS.23203 **80** *E. haraldi,* Spain, Málaga, Marbella, slide RMNH.INS.23426 **81** *E. alnifoliae,* Turkey, Antalya, Phaselis, slide RMNH.INS.23707 **82** *E. ilicis,* detail gnathos, Spain, Teruel, Vivel del Rio, slide RMNH.INS.23841 **83** *E. pseudoilicis,* Greece, Arkadia, Techniti L. Ladonas, slide RMNH.INS.23780 **84** *E. heringella,* Italy, Verona, Negrar, slide RMNH.INS.23615. Scales 100 µm, 50 µm (82).

**Diagnosis.** Forewing with three white spots as in *E. quinquella* and *E. algeriensis*, but separated from both by pale frontal tuft, which is black in the other two. The thorax is completely white as in *algeriensis*, the spots are almost touching the wing margins, whereas the distal spot in *quinquella* is usually separate. The male genitalia are very similar to those of *algeriensis*, but differ by the shorter valvae with a more pointed apex. The female genitalia have very characteristic terminalia with very large setose anal papillae with many setae.

**Description.** Male (Fig. 72). Forewing length 2.0–2.2 mm, wingspan 4.3–5.1 mm. Head: frontal tuft yellowish ochreous to ferruginous, collar paler; scape white; antenna brown, with 32–35 segments. Thorax completely dull white. Forewing dark brown, with indistinct pale basal streak and three distinct white spots, one at 1/3 near costa, usually separated from costa by some brown scales, one at dorsal margin in middle and the third at 2/3 near costa, also often separate; cilia-line distinct; cilia silvery white; underside light brown-grey. Hindwing and cilia dark grey; an short ochreous hairpencil; underside ochreous grey. Abdomen grey, with white anal tufts.

Female. Forewing length 1.8–2.3 mm, wingspan 4.4–5.0 mm; antenna with 26–29 segments. Hairpencil absent, further as male.

Male genitalia (Figs 74, 77, 78). Capsule 235–260 µm long. Vinculum very slightly concave anteriorly. Tegumen broadly round-shaped, with several short setae. Gnathos with central element divided, distal part short and tongue-shaped, basal part widened, with serrate margin. Valva length 190–200 µm, inner margin slightly concave to straight, tip acute and curved inwards, distal process with dense short setae on dorsal surface; sublateral processes about ½ length of transverse bar of transtilla. Aedeagus ca 240–265 µm long, pair of ventral carinae pointed.

Female genitalia (Figs 75, 87, 89). Female terminalia very broad and rounded. T8/T7 with two large groups of ca 25–45 long setae along border between segments. Papillae anales broad, appearing as hairy pads, each with more than 100 densely placed short setae. Apophyses anteriores extremely thick in their basal half, forming a keel, which is separated from anal papillae by a distinct groove; thin distally; apophyses posteriores thin. Vestibulum with vaginal sclerite, a prominent dorsal spiculate pouch, and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae 495–695 µm without pectinations; signa dissimilar, longest 320–415 µm (3), shortest 310–370 µm, 3.3–4.3× as long as wide (3). Ductus spermathecae with 2 convolutions.

**Biology.** Hostplant. *Quercus coccifera* L.

Leafmines (Fig. 67). Egg deposited on leaf upperside. Mine a sinuate or contorted gallery, often following veins, slightly and continuously enlarging in its second part, filled with brown to black frass. Not separable from other gallery mines that occur sympatrically: *E. haraldi* and *ilicis*.

Larva. Whitish, no chain of ventral plates.

Life history. Larvae collected in January and February. Probably univoltine, adults on wings in June and July.

**Distribution.** Spain: Catalunya, Aragon, Andalusia, most records not far from the coast.

**Etymology.** The name *coscoja* is the Spanish vernacular word for *Quercus coccifera,* referring to the hostplant and distribution. To be pronounced in the Spanish way as "koskokha". A noun in apposition.

**Remarks.** One female paratype from Marbella (1984) was treated previously under the remarks of *E. algeriensis* (Van Nieukerken 1985: 45) as a specimen with uncertain identity.

***Ectoedemia (Ectoedemia) gilvipennella*** (Klimesch)

**Biology.** Hostplant: *Quercus cerris*. Univoltine, larvae very late in the season, mid October to late November, adults fly in June.

**Distribution.** Czech Republic: Laštůvka et al. 1992; Slovakia: Laštůvka and Laštůvka 1991; Italy, Sicily: Laštůvka and Laštůvka 2005; Macedonia: Laštůvka and Laštůvka 1997, detailed record given here; Greece: Laštůvka and Laštůvka 1998.

**Material. Macedonia:** 1♂, Negotino, 8.6.1997, 1♂, 1♀, Trojáci, 10.6.1996, A. & Z. Laštůvka (AL).

***Ectoedemia (Ectoedemia) leucothorax*** Van Nieukerken

**Biology.** Hostplants: unknown, probably evergreen *Quercus,* adults have usually been collected near *Quercus ilex* L. or *Q. rotundifolia* Lam. Adults fly from 25 April to 23 July.

**Distribution.** Up to now only known from three provinces in southern Spain: Cádiz, Málaga and Valencia: Laštůvka and Laštůvka 2008; Van Nieukerken et al. 2004a.

***Ectoedemia (Ectoedemia) haraldi*** (Soffner)
Figs 80, 93, 98, 102, 106, 117

**Diagnosis.** See *E. alnifoliae* for differences with that species.

**Biology.** Hostplants: evergreen oaks *Quercus ilex* L., *Q. rotundifolia* Lam., *Q. suber* L. and *Q. coccifera* L. (Van Nieukerken 1985; Van Nieukerken et al. 2004a; 2006). Mine often not separable from other gallery mines (*E. algeriensis, coscoja, ilicis, pseudoilicis, alnifoliae*), but compared with these usually less contorted, occupying a larger area of the leaf and somewhat larger (Fig. 117). Throughout distribution area univoltine, with larvae January to March and adults flying from April to late June.

**Distribution.** Here recorded new for Morocco, Greece: Crete and Turkey. Apparently the most widespread *Ectoedemia* species feeding on evergreen oaks.

**Material. Greece, Crete:** 2♂, Irakleio, Potamies, 17–19.IV.1989, flying around *Quercus coccifera* in dusk, R. Johansson (RJ). **Greece**, **Lesvos:** 5♂, 10♀, Sikaminia, 520 m, 11.V.2007, L. Kaila & J. Kullberg (MZH); 1♀, Nr Dafia, 8.V.2007, L. Kaila & J. Kullberg (MZH); **Greece, mainland:** 1♂, Arkadia, Oreini Meligou, 7 km SW Astros,

Parnon Oros, 9.II.1990, leaf-mines on *Quercus coccifera*, el 18.III.1990, E.J. van Nieukerken (RMNH); 4♂, 6♀, Kozani, Kozani NE, 23–24.V.2003, J. Junnilainen (JJ, RMNH); 1♀, Lakonia, 7 km SW Monemvasia, 9.IV.1981, B. Skule (ZMUC); 3♀, Lakonia, 8 km NW Monemvasia, road junction to Vélias, 13.II.1990, leaf-mines on *Quercus coccifera*, el 21–27.III.1990, E.J. van Nieukerken (RMNH); 1♂, 5♀, Messinía, 2 km N Exokhóri, W. of Tseria, 17.II.1990, leaf-mines on *Quercus coccifera*, el 2.IV.1990, E.J. van Nieukerken (RMNH); 2♂, 1♀, Messinía, Kardhamili, gorge with dense maquis, 18.II.1990, leaf-mines on *Quercus coccifera*, el 24–27.III.1990, E.J. van Nieukerken (RMNH); 1♂, 1♀, Pieria, Kato Milia, 23.V.1999, A. & Z. Laštůvka (AL); 2♀, Pieria, Litochoro, 400 m, 16–18.VI.1994, at light, O. Karsholt (ZMUC, RMNH); 2♂, 2♀, Pierία, Leptokaria, 15 km E Olympos, 750 m, 21–27.V.2001, J. Junnilainen (JJ, RMNH). **Morocco:** 1♂, Khemitra, Forêt de Mamora, 1.V.1990, G. Bassi, Olmi & Scaramozzino (coll. Bassi). **Spain:** 3♀, Barcelona, Malgrat de Mar, 2–10.V.2005, A. Schreurs (RMNH). **Turkey:** 6♂, 1♀, Antalya, Antalya 20 km W, 28.IV, 5–10.V.1996, K. Nupponen & J. Junnilainen (JJ, RMNH); 1♀, Antalya, Olympos village, 1.III.2005, leaf-mines on *Quercus coccifera*, el 30.III.2005, E.J. van Nieukerken (RMNH); 8♀, Antalya, Termessos, ruins, 890–1000 m, 2.III.2005, leaf-mines on *Q. coccifera*, el 30.III–6.V.2005, E.J. van Nieukerken (RMNH).

***Ectoedemia (Ectoedemia) ilicis*** (Mendes)
Figs 82, 90, 95, 100, 104

**Diagnosis**. See *E. pseudoilicis* for differences with that species.

**Biology.** Hostplants: evergreen oaks *Quercus ilex* L., *Q. rotundifolia* Lam., *Q. suber* L. and *Q. coccifera* L. (Van Nieukerken 1985; Van Nieukerken et al. 2004a; 2006). Mine usually not separable from other sympatric gallery mines (*E. algeriensis, coscoja, haraldi*), but compared with *haraldi*, the frass is often more broken and the mine more contorted. Univoltine, with larvae from January to March and adults flying from April to July.

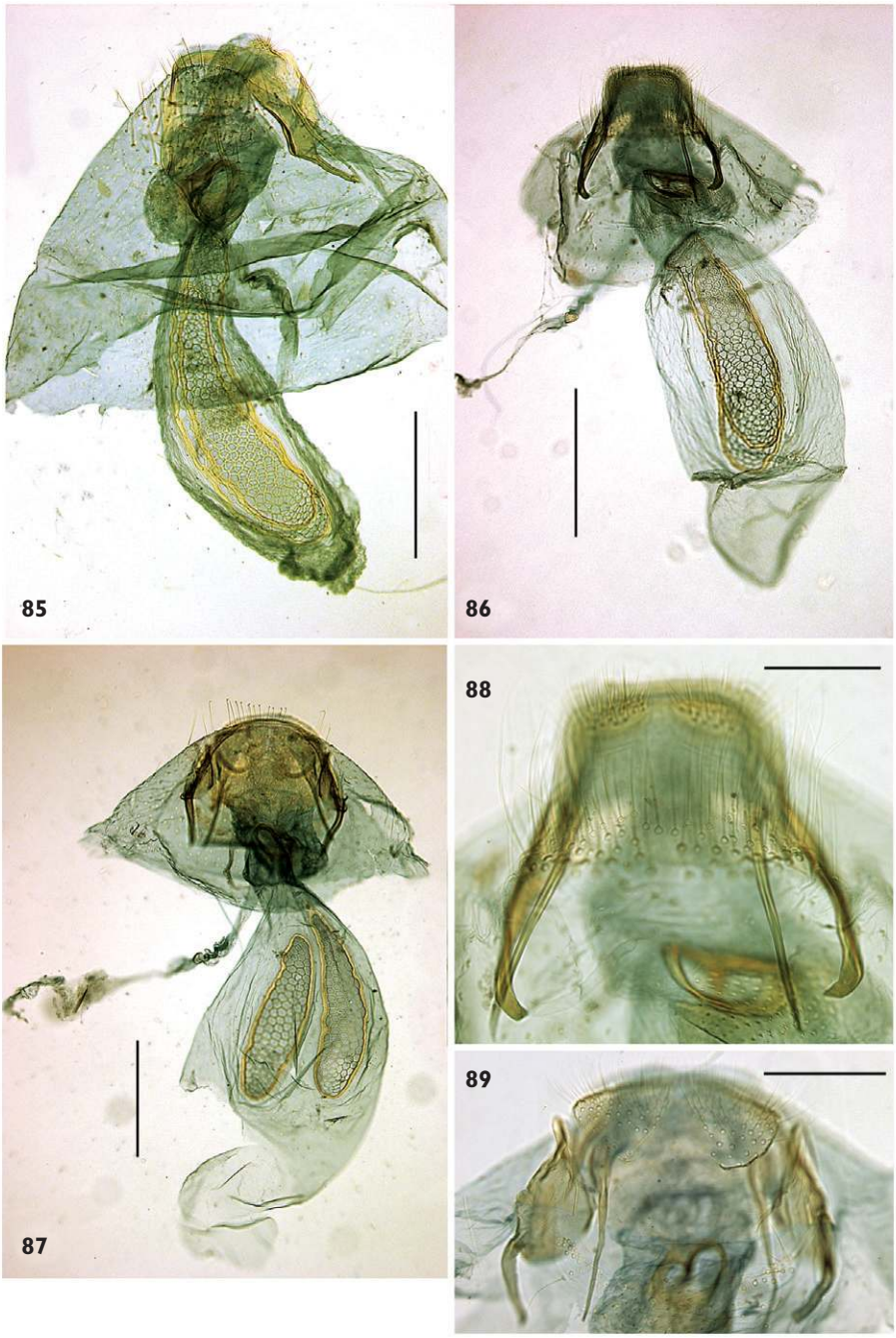
**Distribution.** Only in Southwestern Europe and Northwest Africa (Van Nieukerken 1985; Van Nieukerken et al. 2004a; 2006).

**Material. Spain:** 4♂, 4♀, Almeria, Maria, 1200 m, 29.V–7.VI.2008, M. Delnoye (RMNH); 1♀, Barcelona, Anoia, Odena, Salze, 25.VI.2006, E. Requena (RMNH); 3♂, 4♀, Cáceres, Guadalupe, 11.VI.2009, A. & Z. Laštůvka (AL).

***Ectoedemia (Ectoedemia) pseudoilicis*** Z. & A. Laštůvka
Figs 83, 91, 97, 101, 105

*Ectoedemia (Ectoedemia) pseudoilicis* Z. & A. Laštůvka, 1998: 317. Holotype ♂, Greece, Pierία, Leptokariá, 25.VI.1996, A. & Z: Laštůvka (AL).

**Diagnosis.** Resembles *E. ilicis* closely, but distribution is completely vicariant. *E. pseudoilicis* has the dorsal spot slightly beyond middle, whereas this is exactly in the middle




**Figures 85–89.** ***Ectoedemia (Ectoedemia) subbimaculella*** **group, female genitalia, dorsal aspect, 85 in ventrolateral aspect. 85** *E. quinquella,* Netherlands, Limburg, St. Pietersberg, slide RMNH. INS.15008 **86, 88** *E. algeriensis,* France, Var, Massif de l' Estérel, slide RMNH.INS.23204 **87, 89** *E. coscoja,* paratype, Spain, Huesca, Penalba, slide RMNH.INS.23190 Scales 200 µm, 100 µm (88, 89).

in *ilicis*. Female *E. pseudoilicis* can be easily recognised by the protruding ovipositor. Male genitalia similar to those of *E. ilicis* and *heringella*, but *ilicis* has the gnathos undivided, albeit with a serrate margin and the valvae of *pseudoilicis* are more elongate, tip less curved. *E. heringella* easily separated by the androconial scales on the hindwing.

**Redescription.** Male. Forewing length 1.8–2.5 mm, wingspan 3.8–5.4 mm. Head: frontal tuft yellow to ferruginous , collar paler; scape white, sometimes with a few brown scales; antenna brown, with (32) 35–41 segments. Thorax and forewing dark brown with single dorsal white spot, slightly beyond middle, of varying size; cilialine distinct; cilia silvery white; underside pale brown. Hindwing and cilia dark grey; costal bristles present, no hairpencil. Abdomen grey, with brown anal tufts.

Female. Forewing length 2.0–2.8 mm, wingspan 4.2–5.9 mm; antenna with 27–32 segments. Abdomen with distinct protruding narrow ovipositor.

Male genitalia (Figs 83, 91). Capsule length 240–260 µm. Tegumen forming broadly rounded pseuduncus. Gnathos with central element divided, distal part spatulate, basal part with serrate margin. Valva length 175–195 µm; narrow, with inner margin evenly concave, with inwards curved pointed apex, less strongly so than in *E. ilicis*. Aedeagus 235–275 µm long, ventral carinae usually not split.

Female genitalia (Figs 97, 101, 105). Terminal segments forming narrow protruding ovipositor. T7 with irregular row of ca 3–5 long setae on either side. T8 with a row of 3–5 setae on either side, close to posterior margin; narrow and protruding. Anal papillae with ca 17–24 setae each. Apophyses long, apophyses anteriores thick in their whole length, apophyses posteriores thin. Vestibulum with vaginal sclerite, a prominent spiculate pouch and a group of densely packed pectinations near entrance of ductus spermathecae. Corpus bursae ca. 845–870 µm, without pectinations; signa different in length and shape, longer 474–520 µm, shorter 415–455 µm. Ductus spermathecae with ca. 2.5 very indistinct convolutions.

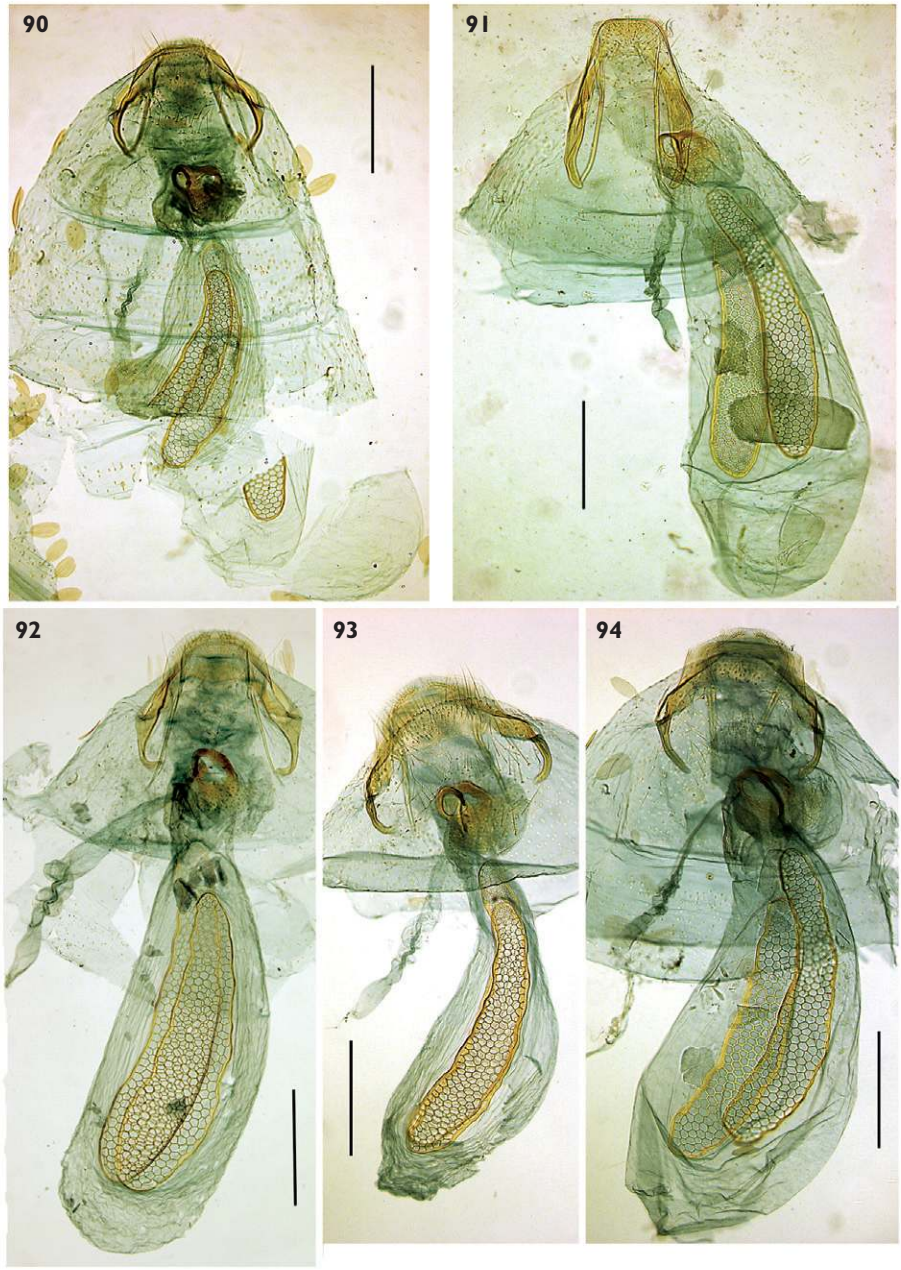
**Biology.** Hostplant: *Quercus coccifera* L., here confirmed by reared adults.

Leafmine. Egg on leaf upperside. Mine a more or less contorted gallery, almost filled with black frass. In the Greek localities almost always occurring together with *E. haraldi*; it has been impossible to separate the mines from these mixed samples.

Univoltine, larvae collected in February, adults flying in April to July.

**Distribution.** Widespread in mainland Greece, also newly recorded here from Greece: Crete and Turkey. Apparently vicariant with the western Mediterranean *Ectoedemia ilicis*.

**Material. Greece, Crete:** 1♂, Nom. Chania, Skines, 5.VI.2004, B.Skule, C.Hviid, E.E.Vesterhede (ZMUC); 1♀, Irakleio, Potamies, 19.IV.1989, R. Johansson (RJ). **Greece, mainland:** 1♂, Akhaia, Glástra, 4.VI.1999, A. & Z. Laštůvka (RMNH); 1♂, Arkadia, 10 km S of Leonidi, 800 m, 10.VII.1991, R.T.A. Schouten (RMNH); 2♂, 1♀, Arkadia, Oreini Meligou, 7 km SW Astros, Parnon Oros, 9.II.1990, leaf-mines on *Quercus coccifera*, el 14.IV–8.V.1990, E.J. van Nieukerken (RMNH); 1♂, Arkádia, Sapounakeika, 15.VI.1998, A. & Z. Laštůvka (RMNH); 10♂, 9♀, Arkadia, Techniti L. Ladonas, 25–26.VI.1991, P. Grotenfelt (MZH, RMNH); 5♀, Evros, Alexandropolis, Kirki, 24–26.VII.1985, P. Grotenfelt (MZH, RMNH); 5♂, Ilia, Loutra Killinis, P. Grotenfelt, 13, 19.VI.1981 (MZH, RMNH); 1♂, Korinthia, Khalkío, 21.VI.1998, A.




**Figures 90–94.** ***Ectoedemia (Ectoedemia) subbimaculella*** **group, female genitalia, dorsal aspect.** **90** *E. ilicis,* France, Hérault, St. Pons-de-Thomières, slide RMNH.INS.23667 **91** *E. pseudoilicis,* Greece, Akhaia, Glástra, slide RMNH.INS.23831 **92** *E. heringella,* Italy, Alessandria, Parco NR Capanne di Marcarolo, slide RMNH.INS.23674 **93** *E. haraldi,* Portugal, Trás-os-Montes, Freixode Numao, V.N. da Foz Côa, slide JCK15027 **94** *E. alnifoliae,* Greece, Samos, slide RMNH.INS.15010. Scales 200 µm. Figures **91**, **93**, **94** are mirror image of the original (genitalia embedded ventrally), in order to make comparisons easier.

& Z. Laštůvka (RMNH); 2♂, 1♀, Lakonia, 3.5 km N Molaoi, maquis, 14.II.1990, leaf-mines on *Quercus coccifera*, el 1–.2.V.1990, E.J. van Nieukerken (RMNH); 4♂, 3♀, Lakonia, 8 km NW Monemvasia, road junction to Vélias, 13.II.1990, leaf-mines on *Quercus coccifera*, el 28.IV–5.V.1990, E.J. van Nieukerken (RMNH); 1♂, 1♀, Messinía, 2 km N Exokhóri, W. of Tseria, 17.II.1990, leaf-mines on *Quercus coccifera*, el 10–20.V.1990, E.J. van Nieukerken (RMNH); 1♀, Messinía, 4 km W Artemisía, gorge of Nedon Potamos, 19.II.1990, leaf-mines on *Quercus coccifera*, el 15.V.1990, E.J. van Nieukerken (RMNH); 1♀, Messinía, Kardhamili, gorge with dense maquis, 18.II.1990, leaf-mines on *Quercus coccifera*, el 1.V.1990, E.J. van Nieukerken (RMNH). **Turkey:** 1♂, Antalya, Alanya, Taurus, Güzelbag, 16.VI.2005, day catch, W. Mey (NHMB).

***Ectoedemia (Ectoedemia) heringella*** (Mariani)
Figs 84, 92, 112, 115, 116

**Biology.** Hostplants. *Quercus ilex* L., *Q. alnifoliae* Poech., ? *Q. robur* L. In northern Italy the species was frequently found in localities without any evergreen oaks (G. Baldizzone, personal communication), such as the Parco NR Capanne di Marcarolo. Since in Britain in an outbreak situation mines on *Quercus robur* have been seen, we assume that *E. heringella* can also feed on deciduous *Quercus*.

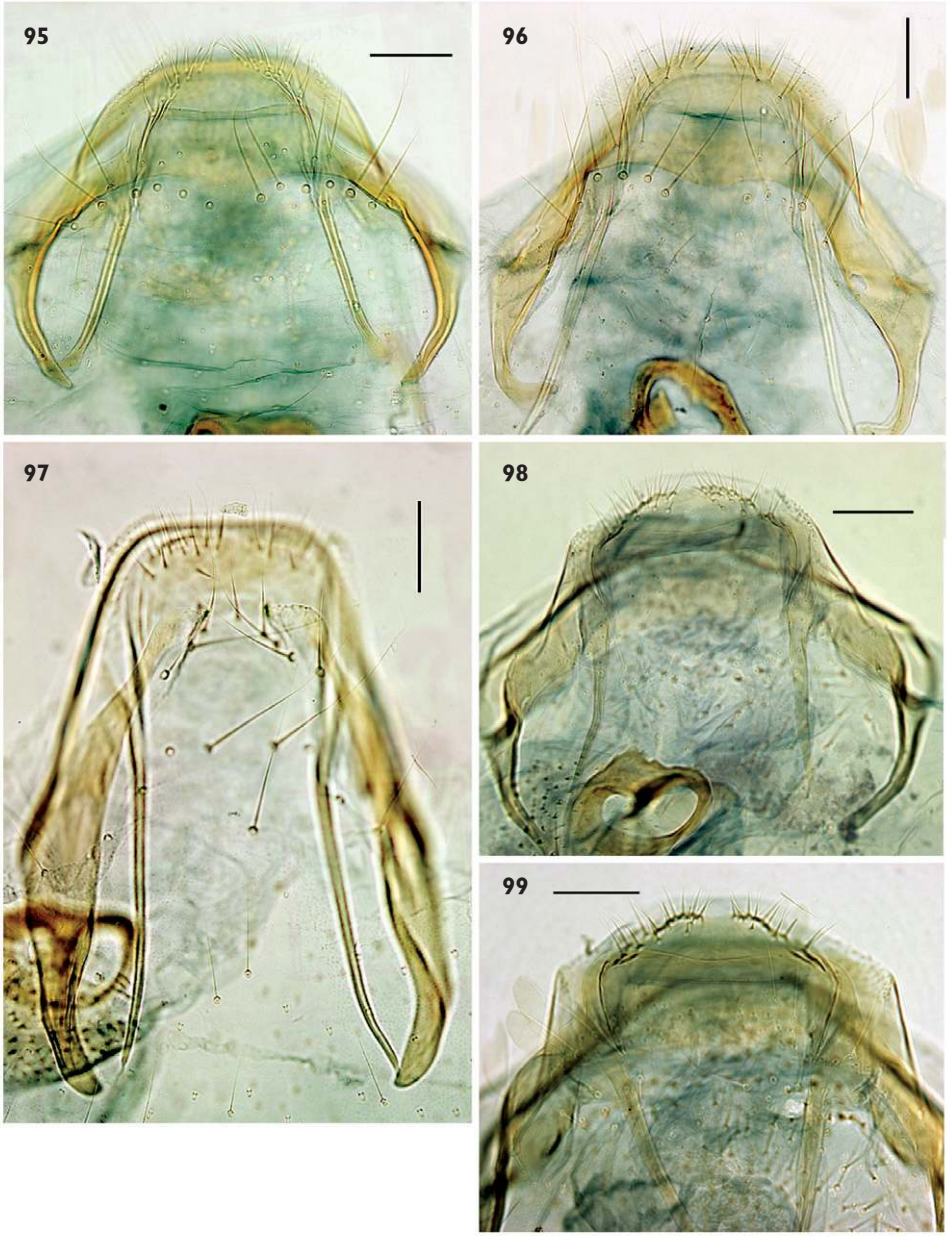
Leafmines (Figs 115, 116) cannot be separated from other related gallery miners, in its distribution area mostly *E. haraldi* and *pseudoilicis*.

Univoltine, larvae from November to April, adults May (April?) to July.

**Distribution.** Widespread in Eastern Mediterranean, from Cyprus westwards to Corsica and southeastern France (Alpes Maritimes), recently recorded as invasive insect from Great Britain: Langmaid and Young 2003; Prichard 2005; Vickery 2004; Palmer 2008; Sims 2008. Records for France: Van Nieukerken et al. 2006; Greece: Laštůvka and Laštůvka 1998. Here new for Sardinia and tentatively recorded for Tunisia on the basis of two females.

**Remarks.** *Ectoedemia heringella* suddenly appeared in the beginning of this century in the parks of London, where it soon reached almost pest status with sometimes all leaves of the planted *Quercus ilex* covered in mines (Fig. 116). The first adults were collected in the Wildlife Garden of the Natural History Museum (Langmaid and Young 2003; Prichard 2005; Vickery 2004), from where EJvN identified the unrecognised specimens in 2000. It is likely that the species was introduced to Britain, possibly with plant material, the nearest natural occurrence being the Alpes Maritimes in France. Recently it has been spreading through southern England. EJvN found similar vacated mines in Paris: Jardin des Plantes, but it is not certain that they belong to this species.

**Material. Great Britain:** 2♀, London, Buckingham Palace garden, 9.V.2002, M. Honey (RMNH); 2♂, ibidem,. 14.VI, 5.VII.2001, D.J. Carter (BMNH); thousands of mines [rearing failed], London, Fulham: Fulham Palace Gardens, 6.II.2005, larvae on *Quercus ilex,* E.J. van Nieukerken (RMNH); 4♀, London: Kensington Palace, 16.IV.2002, larvae on *Q. ilex,* el, M. Honey (BMNH); 4♂, 4♀, London: Nat. Hist.




**Figures 95–99.** ***Ectoedemia (Ectoedemia) subbimaculella*** **group, female , terminal abdominal segments, dorsal aspect. 95** *E. ilicis,* France, Hérault, St. Pons-de-Thomières, slide RMNH.INS.23667 **96** *E. heringella,* Italy, Alessandria, Parco NR Capanne di Marcarolo, slide RMNH.INS.23674 **97** *E. pseudoilicis,* Greece, Akhaia, Glástra, slide RMNH.INS.23831 **98** *E. haraldi,* Turkey, Antalya, Termessos, slide RMNH.INS.15003 **99** *E. alnifoliae,* Greece, Samos, slide RMNH.INS.15010. Scales 50 µm.

Mus. Wildlife Garden, 10.VII.1996, 9.VI.1997, 17.VII.1998, 26.VI.2001, at light, M.R. Honey (BMNH, RMNH); vacated leafmines, London, Richmond: Kew Gardens, *Q. ilex,* 1.VII.2001, E.J. van Nieukerken (RMNH); 20♂, 20♀, London, Westminster: Kensington Gardens, 13.II.2005, larvae on *Q. ilex,* e.l. 14.IV–13.V.2005, E.J. van Nieukerken (RMNH). **Italy:** 3♂, 10♀, Alessandria, Parco NR Capanne di Marcarolo, various localities, 300–450 m, 28.VI–15.VII.2005, G. Baldizzone (GB, RMNH); 1♀, La Spézia, Levante, Monte Rossola, 210 m, 19.VI.2002, T. Karisch (mus. Dessau); 6♂, 5♀, Verona, Negrar, Monte Masua, 400 m, 12.VI.2002, at light, P. Triberti (PT, RMNH); 1♂, 1♀, Verona, Torricelle, 300 m, 15.II.2002, larvae *Q. ilex*, e.l. 24–29.V.2002, P. Triberti (PT). **Italy, Sardinia:** 2♂, Nuoro, Aritzo, 1200 m, 17.VI.1978, F. Hartig (PT). **Tunisia:** 2♀, Ain Draham area, 5–18.V.1988, O. Karsholt, (ZMUC, RMNH).

***Ectoedemia (Ectoedemia) alnifoliae*** Van Nieukerken
Figs 73, 81, 94, 99, 103, 107, 113, 114, 118

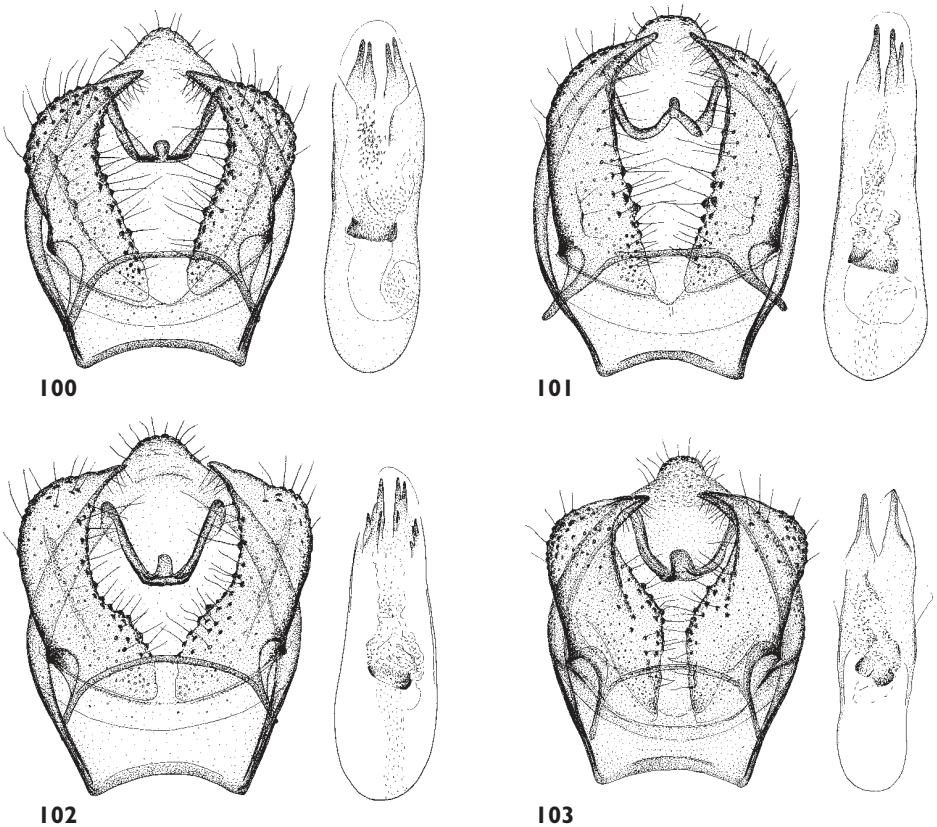
**Diagnosis.** Externally *Ectoedemia alnifoliae* is similar to *E. rufifrontella*, but is overall more uniform, has fewer pale scales and is more distinctly yellow. The male genitalia most resemble those of the *E. albifasciella* complex, but the valva is more "bulging" distally; the valva reminds of *E. haraldi*, but that has an overall concave inner margin and a divided gnathos. The female genitalia differ from those of *E. rufifrontella* by having just two convolutions in the ductus spermathecae against ca 13–14 in *rufifrontella*, female genitalia hardly separable from those of *haraldi*.

**Redescription.** Male (Figs 73, 113). Forewing length 2.0–3.0 mm, wingspan 4.5–6.7 mm. Head: frontal tuft orange, collar ochreous; scape white, often with some darker scales; antenna brown, with 36–44 segments. Thorax and forewing unicolorous, covered with coarse brown scales, less dense in tornus, and few pale scales; cilia-line distinct; terminal cilia silvery white; underside brownish grey. Hindwing and cilia dark grey, hindwing with costal bristles, no hairpencil. Abdomen fuscous, anal tufts ochreous.

Female (Fig. 114). Forewing length 2.2–3.0 mm, wingspan 4.9–6.6 mm. Antennae with 27–31 segments.

Male genitalia (Figs 81, 103). Capsule length 230–310 µm. Vinculum slightly concave anteriorly. Tegumen distinctly produced in a hemispheric pseuduncus, with simple long setae. Gnathos with central element short, with blunt, truncate tip, not separated in two parts; lateral processes long. Valva length 175–220 µm, broad with distal process pointed and strongly curved inwards, outer margin slightly bulged, inner margin in middle distinctly convex, with long setae on dorsal surface and on caudal part, sublateral processes more than one third transtilla length. Aedeagus 250–300 µm long, with distinct cathrema, numerous very small cornuti in vesica, carinae simple, elongate.

Female genitalia (Figs 94, 99, 107). T7 without row of setae. T8 with two lateral groups of scales and a few setae; posterior margin slightly indented, with rounded corners. Anal papillae with ca 15–20 setae. Vestibulum with vaginal sclerite, a prominent spiculate pouch and a group of densely packed pectinations near entrance of ductus




**Figures 100–103.** ***Ectoedemia (Ectoedemia) subbimaculella*** **group, male genitalia 100** *E. ilicis,* Spain, Teruel, Montalbán, 24.VI.2001 **101** *E. pseudoilicis,* Greece, Leptokaria, 25.VI.1996 **102** *E. haraldi,* Italy, Bordano **103** *E. alnifoliae,* Cyprus, Platres, 11–16.V.1999, C. Hviid & B. Skule.

spermathecae. Corpus bursae ca. 650–770 µm, without pectinations; signa different in length and shape, longer 460–540 µm, shorter 365–480 µm. Ductus spermathecae with 2 very indistinct convolutions [in diagnosis in original description incorrectly given as 3].

**Biology.** Hostplants: evergreen oaks: *Quercus coccifera* L. and *Q. alnifoliae* Poech (Cyprus).

Leafmines (Fig. 118). Egg usually on leaf upperside, on underside in Cyprus specimen. Leafmine a much contorted gallery, usually confined to small part of the leaf; mine following short straight courses and often turns suddenly ca. 90 degrees or more, often doubling back, in this way using up the majority of a small portion of the leaf; last part of the mine a wide gallery, wider than larva, resembling a blotch; frass black and almost completely filling the narrow gallery part, a bit more dispersed in final part.

In Turkey similar to more or less sympatric *E. haraldi*, but *E. alnifoliae* mines tend to be more contorted and angulated than those of *haraldi*.

Larva. White with greenish or yellowish tinge, brown head and prothoracic shield, distinct row of ventral ganglia. In earlier instars row of ventral plates absent.

Life history. Larvae found in early March, adults found in second half of April and May, in indoor breedings emerging from March. Most likely univoltine.

**Distribution.** Cyprus, new records for Turkey (south coast and east, Hakkari) and Greece: Samos. Apparently widespread in eastern Mediterranean region.

**Remarks.** The species was originally described on the basis of a single female from Cyprus. The finding of males in Cyprus and the reared series from Turkey has made it possible to redescribe it fully here.

**Material. Cyprus:** 1♂, 1♀, Troodos mts., Platres, 11–16.V.1999, C. Hviid & B. Skule (ZMUC). **Greece:** 14♂, 10♀, Samos, 26.IV–1.V.1983, L. Kohonen (RMNH). **Turkey:** 1♂, 1♀, Antalya, Antalya 20 km W, 30.IV.1996, K. Nupponen & J. Junnilainen (JJ, RMNH); 1♂, ditto, 15.V.2000 (JJ); 10♂, 2♀, Antalya, Phaselis ruins, 3km NE Tekirova, sea level, 4.III.2005, leafmines on *Quercus coccifera*, e.l. 2–17.IV.2005, E.J. van Nieukerken (RMNH); 6♂, 7♀, Antalya, Çirali, N. Olympos, near beach, sea level, 1.III.2005, leafmines on *Quercus coccifera*, e.l. 25.III–6.V.2005, E.J. van Nieukerken (RMNH); 1♂, Hakkâri, Tanin Daglari, 3 km E Mutluca, 0.5 km W Baharan Köy, 1250 m, 23.IV.1987, H.P. Schreier (coll. Derra).

***Ectoedemia (Ectoedemia) rufifrontella*** (Caradja)
Fig. 120

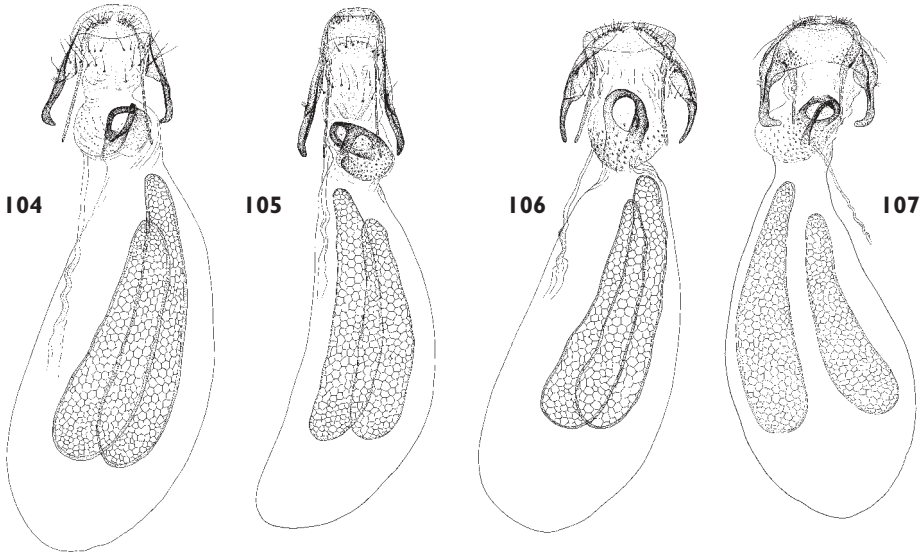
*Trifurcula rufifrontella* Caradja 1920: 161.
*Nepticula nigrosparsella* Klimesch 1940: 91 [synonymised by Van Nieukerken 1987].
*Ectoedemia (Ectoedemia) rufifrontella*; Van Nieukerken 1987: 142 [Lectotype selection, identity, Synonymy]
*Ectoedemia (Ectoedemia) nigrosparsella*; Van Nieukerken 1985: 51.

**Biology.** Hostplants: *Quercus pubescens* Willd., *Q. petraea* (Matt.) Liebl. Univoltine, larvae very late in the season, October-November, adults fly in May-July.

**Distribution.** Widespread, but nowhere common in southern half of Europe; not yet found on Iberian Peninsula and in most Balkan countries. France: Van Nieukerken et al. 2006; Macedonia: Laštůvka and Laštůvka 1997, detailed record given here; Greece (northern): Laštůvka and Laštůvka 1998, Switzerland: Schmid 2007. Here recorded new for Bulgaria.

**Remarks.** Mines and larvae may be confused with those of *E. quinquella* (Fig. 119) and *pubescivora*, which both also have black plates in the early instars, but *rufifrontella* has characteristic broken frass in early mine, the larva has a strong greenish tinge (Fig. 120); the mine of *E. pubescivora* usually runs along veins (Fig. 121).

**Material. Bulgaria:** 4♂, 1♀, Pirin, 1500m, 29.V.2006, J. Junnilainen (JJ, RMNH). **France:** 3 larvae [DNA confirmed], Alpes Maritimes, Fontan, 1.7 km N., near Berghue inf., 900m, 11.X.2008, *Quercus pubescens*, EJvN2008242, E.J.




**Figures 104–107.** ***Ectoedemia (Ectoedemia) subbimaculella*** **group, female genitalia 104** *E. ilicis,* Spain, Albarracin, 24.VI.2001 **105** *E. pseudoilicis,* Greece, Leptokaria, 25.VI.1996 **106** *E. haraldi,* Spain, Anglés, 5.VII.1994 **107** *E. alnifoliae,* Cyprus, Platres, 11–16.V.1999, C. Hviid & B. Skule.

van Nieukerken & C. Doorenweerd,(RMNH.INS17675–7); 1♂, Vaucluse, 4 km E Sault, 825 m, 25.V.2004, O. Karsholt (ZMUC) [DNA confirmed]. **Italy:** 2♂, Alessandria, Cardona, 32T, MQ39, 300, 4.VI.1977, G. Baldizzone (GB); 3♂, 1♀, 24 adults, Savona, Andora - Conna, 250 m, 13.VII.1969, 21.VI–21. VII.1970, E. Jäckh (USNM, RJ); 1 adult, Savona, Andora, Conna, nei boschi, 300 m, 15.VI.1973, E. Jäckh (USNM); 2♂, Savona, Conna, 300 m, 9.VI.1978, G. Baldizzone (GB, RMNH); 1♂, 3♀, Savona, Testico, 470 m, 19.VI.1962, 3–4.VI.1964, E. Jäckh (USNM); 1♀, Torino, Piossasco, Casc. Levrino, 580 m, 11.VI.1991, G. Delmastro (GB); 1♀, Torino, Rocciamelone, V. Susa, 1000 m, 19720617, E. Jäckh (USNM); 1♀, Trento, Val Sarca, Pietramurata, 260 m, 5.VI.1958, E. Jäckh (USNM); 1♂, ditto, 470 m, 9.VI.1970, E. Jäckh (USNM); 2♂, 2♀, Verona, Negrar, Monte Masua, 400 m, 12.VI.2002, P. Triberti (PT, RMNH). **Macedonia:** 2♂, 1♀, Istibani, 9.VI.1996, 1♂, 1♀, Trojáci, 10.VI.1996, both A. & Z. Laštůvka (AL).

### ***Ectoedemia (Ectoedemia) albifasciella*** (Heinemann)

**Biology.** Hostplants: *Quercus robur* L., *Q. petraea* (Matt.) Liebl., *Q. pyrenaica* Willd., *Q. pubescens* Willd. (Van Nieukerken 1985; Van Nieukerken et al. 2004a); in Tunisia, Ain Draham probably feeding on *Q. faginea*, the common oak there on which EJvN found old mines of the *albifasciella* type.

Mines with larvae are inseparable from those of *E. contorta* and *E. heringi*, vacated mines also resemble *E. pubescivora*. Larvae sometimes already appearing early August and occur until late October. Adults fly from May to July.

**Distribution.** Estonia: Kerppola 1994; Latvia: Savenkov 1989; Lithuania: Puplesis et al. 1990; Portugal: Van Nieukerken et al. 2004a. Here recorded for the first time from Tunisia. New records for Spain: Laštůvka and Laštůvka 2008. We present some detailed records from southern Europe, where *E. albifasciella* occurs sympatrically with *E. contorta* (Valdieri) and *E. pubescivora* (all localities in Alpes Maritimes).

**Material. France:** 2 larvae [DNA identification] Alpes Maritimes, Col de Petit Braus, 3.7 WSW of Sospel, 1080 m, 8.X.2008, leafmines *Quercus pubescens*, EJvN2008150, E.J. van Nieukerken & C. Doorenweerd (RMNH.INS12974–5); 2 larvae [DNA identification], Alpes Maritimes, Fontan, 1.5 km N., near Berghue inf., 740–845 m, 11.X.2008, leafmines *Q. pubescens* EJvN2008239, E.J. van Nieukerken & C. Doorenweerd (RMNH.INS12999–13000); 2♂, 5♀, Mont Méras, N. slopes, ca 4.5 km SW of Sospel, 8, 15.X.2008, leafmines *Q. pubescens* EJvN2008156, 2008324, e.l. 25.IV–4.V.2009, E.J. van Nieukerken & C. Doorenweerd. **Italy:** 9♂, 6♀, Alessandria, Capanne di Marcarolo, Gli Olmi, 758 m, 9–10.VI.2003, G. Baldizzone (GB,RMNH); 2♂, Alessandria, Capanne di Marcarolo, Capanne super, sent. Cascina Porassa, 850 m, 5.VI.2003, G. Baldizzone (GB); 1♂, 1♀, Alessandria, V. Borbera, Carrega Ligure, SP147 – Cartesegna, 850 m, 15.VI.2007, C. Cabella (GB); 1 larva [DNA identification], Cuneo, Valdieri, 850–940 m, 12.X.2008, leafmine on *Q. pubescens,* EJvN2008256, E.J. van Nieukerken & C. Doorenweerd. **Rumania:** 1♂, 3♀, Vinju Mare, 8.VI.1996, A. & Z. Laštůvka (AL). **Tunisia:**, 1♀, Ain Draham area, 5–18.V.1988, O. Karsholt (ZMUC).

***Ectoedemia (Ectoedemia) cerris*** (Zimmermann)

**Biology.** Hostplant: *Quercus cerris* L.

Larvae September to October. Adults fly from May to June.

**Distribution.** Slovakia: Patočka 1980, Croatia: Laštůvka and Laštůvka 1997, detailed record given here; Greece: Laštůvka and Laštůvka 1998. Here recorded new from Turkey.

**Material. Croatia:** 1♂, 3♀, Zadar, ex l. iv.2002, larvae 25.IX.2001 on *Q. cerris*, A. & Z. Laštůvka (AL). **Turkey**: 1♂, 2♀, Ankara, Kizilcahamam, 925 m, 18.VI.1968, M. & W. Glaser (SMNK, RMNH).

***Ectoedemia (Ectoedemia) pubescivora*** (Weber)
Fig. 121

**Biology.** Hostplants: *Quercus pubescens* Willd. and *Q. pyrenaica* Willd. (Van Nieukerken et al. 2004a).

Larvae found in October, adults fly from May to July.

**Distribution.** Spain, Portugal: Van Nieukerken et al. 2004a, Laštůvka and Laštůvka 2008. A record from Ukraine: Crimea (Budashkin 1988) is not accepted, it is probably the record later interpreted as *E. contorta* (see there). Here recorded new for San Marino. Widespread in SW Europe, with easternmost records in northern Italy near Verona.

**Remarks.** Mines and larvae of this species can be separated from those of *E. albifasciella*, *E. contorta* and *E. heringi* by the presence of ventral black plates on the larva until early final stage (Fig. 121). Often sympatric with these three species.

**Material. France, all Alpes Maritimes:** 2 larvae (1 dead), Col de Braus, 0.5 km S, SW of Sospel, 1063m, 8, 15.X.2008, leafmines *Quercus pubescens* EJvN2008147, 2008319 (RMNH.INS17612, 17705); 2 larvae, Col de Petit Braus, 3.7 WSW of Sospel, 1080 m, 8, 15.X.2008, leafmines *Q. pubescens*, EJvN2008150, 2008323, (RMNH.INS 12971, 17667); 4 larvae, Mont Méras, N. slopes, ca 4.5 km SW of Sospel, 1080–1130m, 8, 15.X.2008, leafmines *Q. pubescens* EJvN2008156, 2008324 (RMNH.INS 12965, 17709–11); 1 larva, Alpes Maritimes, Fontan, 1.5 km N., near Berghue inf., 740–845 m, 11.X.2008, leafmines *Q. pubescens* EJvN2008239 (RMNH.INS 17674); 3 larvae [DNA controlled], Fontan, 1.7 km N., near Berghue inf., 900m, 11.X.2008, leafmines *Q. pubescens* EJvN2008242 (RMNH.INS12900–12901, 12998); 1 larva Paganin, N. of Fontan, E. slopes, 540–660m, 11.X.2008, leafmines *Q. pubescens* EJvN2008301 (RMNH.INS 17673); all leg E.J. van Nieukerken & C. Doorenweerd (RMNH). **Italy:** 1♂, 2♀, Alessandria, Alfiano Natta, 23.VI.1978, G. Baldizzone (GB, RMNH); 2♂, 1♀, Asti, fraz. Valmanera, Oasi WWF, 130 m, 29.V–13.VI.2006, G. Baldizzone (GB); 1♀, Modena, Zocca, 758 m, 19.V.1956, U. Parenti, (coll. Parenti); 1♀, Savona, Conna, 300 m, 27.VI.1976, G. Baldizzone (GB); 1♀, Savona, Testico, 470 m, 5.VII.1969, E. Jäckh (USNM); 10♂, 1♀, Verona, Negrar, Monte Masua, 400 m, 12.VI.2002, P. Triberti (PT,RMNH). **Portugal:** 1♂, 1♀, Badajoz, Povolide, 21.VI.2004, A. & Z. Laštůvka (AL); 8♂, 9♀, Tras-os-Montes, PN Montesinho: Montesinho, 20.VI.2004, A. & Z. Laštůvka (AL). **San Marino:** 3♂, 1♀, San Marino, 5–8.VI.1991, P. Grotenfelt (MZH, RMNH).

***Ectoedemia (Ectoedemia) contorta*** Van Nieukerken

**Biology.** Hostplants: *Quercus pubescens* Willd., *robur* L., *Quercus faginea* Lam. is reported as possible new host from Spain (Laštůvka and Laštůvka 2008). Leafmines are inseparable from those of *E. albifasciella* and *heringi*. The larvae are separated from *E. pubescivora* by the absence of a chain of black plates in the earlier instars. Larvae found in August (Laštůvka and Laštůvka 1991; Laštůvka et al. 1992) and October; adults fly from late May to July.

**Distribution.** Czech Republic: Laštůvka et al. 1992; Slovakia: Laštůvka and Laštůvka 1991; Italy: Karsholt et al. 1995 (detailed records below); Greece: Laštůvka

and Laštůvka 1998; Spain: Laštůvka and Laštůvka 2008. Here recorded new for Croatia. A record from Ukraine: Crimea (Puplesis 1994), although possible, is not accepted, as it is based on a male only. Wide distribution from Central Spain through northern Italy to Slovakia and northern Greece. Not yet recorded from France.

**Remarks.** Contrary to the earlier opinion that *E. contorta* and *pubescivora* are vicariant species (Van Nieukerken 1985), they appear to be (almost) sympatric at least in Spain and northern Italy (e.g. Conna). Both can also be found in sympatry with *E. albifasciella (E. contorta* and *albifasciella* in Valdieri), and leafmines and larvae of *albifasciella, contorta* and *heringi* are inseparable, males of the whole complex can only be separated by DNA analysis. Overall *E. contorta* seems to be the rarest species of this complex.

**Material. Croatia:** 3♂, 7♀, Istria, Paz, 23.X.1999, mines with larvae, *Quercus pubescens,* ex l. IV.2000, A. Laštůvka (AL, RMNH). **Italy:** 2♂, 3♀, Alessandria, Cardona, 300 m, 4.VI.1977, at light, G. Baldizzone (GB, RMNH); 1♂, 1♀, Savona, Conna, 300 m, 9.VI.1978, at light, G. Baldizzone (GB, RMNH). 1 larva [DNA identification], Cuneo, Valdieri, 850–940 m, 12.X.2008, leafmine on *Q. pubescens,* EJvN2008256, E.J. van Nieukerken & C. Doorenweerd (RMNH.INS12948).

### ***Ectoedemia (Ectoedemia) subbimaculella*** (Haworth)

**Biology.** Hostplants: *Quercus robur* L., *Q. petraea* (Matt.) Liebl., *Q. pyrenaica* Willd., *Quercus pubescens* Willd., in Hungary, Moravia and Bosnia found on *Q. cerris* L. Rarely on *Q. rubra* L. Univoltine, larvae from September until November, adults flying from May to July.

**Distribution.** Ireland: Shackleton 1977; Estonia: Kerppola 1994; Latvia: Savenkov 1989; Lithuania: Diškus 2003; Spain, Van Nieukerken et al. 2004a; Greece: Laštůvka and Laštůvka 1998. Here recorded new for San Marino and Tunisia.

**Remarks.** Many records of adults that haven't been reared are uncertain, males cannot be identified when not reared, unless by DNA analysis. The population on *Quercus cerris* in Hungary and southern Moravia deviates from sympatric populations on other oaks: larvae were found much earlier, usually in the first half of September (larvae of *E. subbimaculella* occur more than one month later on *Quercus robur* and *Q. petraea* growing together with *Q. cerris*).

**Material. Hungary:** 2♂, 4♀, Gánt, 18.IX.2004, larvae on *Quercus cerris*, e.l. V.2005, A. Laštůvka (AL, RMNH). **San Marino:** 1♂, San Marino, 9.VII.1991, P. Grotenfelt (MZH). **Tunisia:** 11♂(cf), 4♀, Ain Draham area, 5–18.V.1988, O. Karsholt, (ZMUC, RMNH).

### ***Ectoedemia (Ectoedemia) heringi*** (Toll)

**Biology.** Hostplants: *Quercus pubescens* Willd., *Q. robur* L., *Q. petraea* (Matt.) Liebl., *Q. faginea* Lam., *Q. ithaburensis* Decne subsp. *macrolepis* (Kotschy) (new record), *Cas-*

*tanea sativa* Miller. Leafmines are inseparable from those of *E. albifasciella* and *contorta*. Larvae found from September to November; adults fly from May to July.

**Distribution.** Netherlands: Van Nieukerken et al. 1993; Belgium: De Prins 1998; Van Nieukerken 2006; Portugal: Van Nieukerken et al. 2004a; Greece: Laštůvka and Laštůvka 1998. Here recorded new for Crete.

**Material. Greece:** 2 larvae [DNA identification] and vacated mines, Arkadia, Leonidhion, 5 km NE, coastal road, 10.XI.2009, leafmines on *Quercus ithaburensis* subsp. *macrolepis,* E.J. van Nieukerken (RMNH.INS17766–7); 1 young larva, Lakonia, Mystras, ancient town, 400, 470, 11.XI.2008, *Q. pubescens*, E.J. van Nieukerken (RMNH). **Greece, Crete:** 1♀, Rethymnon, Agia Galini, 20 m, 20.V.1994, R. Sutter (RS).

***Ectoedemia (Ectoedemia) liechtensteini*** (Zimmermann)

**Biology.** Hostplant: *Quercus cerris* L., occasionally on *Quercus pubescens* Willd., *Q. petraea* (Matt.) Liebl. Larvae found in October and November; adults fly from (April, reared) May to June.

**Distribution.** Slovakia: Patočka 1980.

**Remarks.** The status of this species is not yet settled: adults are inseparable from *E. heringi* and *phyllotomella*. Molecular studies are currently in progress.

***Ectoedemia (Ectoedemia) phyllotomella*** (Klimesch)

**Biology.** Hostplant: *Quercus cerris* L.. Larvae in October-November, adults in April-May.

**Distribution.** Still only known from Italy, where it can be found in large numbers as recorded here.

**Remarks.** The status of this species is not yet settled: adults are inseparable from *E. heringi* and *liechtensteini*, but the larval habit (cutting out a case) is striking and unique for Nepticulidae. Molecular studies are currently in progress.

**Material. Italy:** 19♂, 22♀, Firenze, San Benedetto in Alpe, 24.X.1999, larvae on *Quercus cerris*, e.l.IV.2000, A. Laštůvka (AL).

***Ectoedemia (Ectoedemia) terebinthivora*** (Klimesch)

**Biology.** Hostplant: *Pistacia terebinthus* L. Larvae found from May to November, adults at least in May-August. Probably with several generations.

**Distribution.** The new data fill in the known distribution throughout Greece, the islands and southern Turkey. It is here often very abundant where its host occurs.

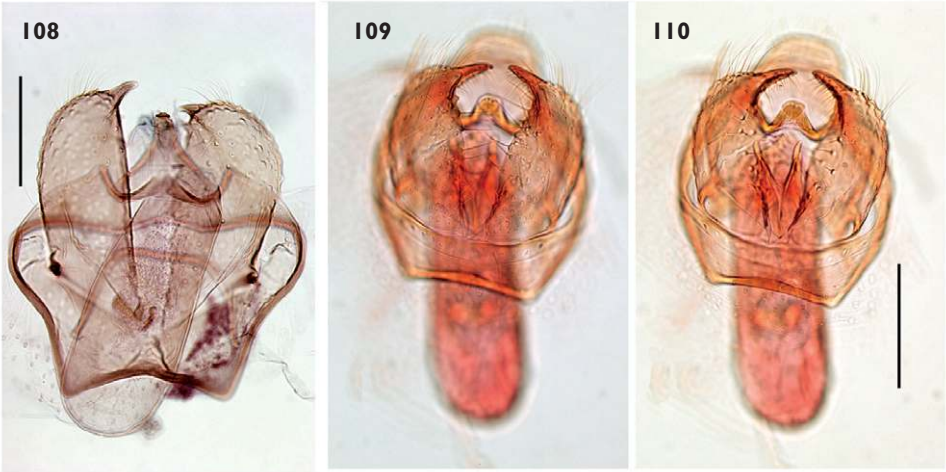
**Material. Greece:** vacated mines, Argolis, Ligourio, Epidauros theater archeological site, 360 m, 8.XI.2008, E.J. van Nieukerken (RMNH); vacated mines, Argolis, Kolaki, S of Arkhaia Epidavros, 374 m, 8.XI.2008, E.J. van Nieukerken (RMNH);

vacated mines, Arkadia, Plaka, E. of Leonidhion, 9.XI.2008, E.J. van Nieukerken (RMNH); vacated mines, Chios: Anavatos, 500 m, 3.VIII.1999, C. van den Berg (RMNH); larvae and vacated mines, Fokis, Dhelfoi, archeological site, 600–640 m, 6.XI.2008, E.J. van Nieukerken (RMNH); 1♀, Ioánnina, 10 km NE Geroplatanos by Konitsa, 800 m, 24.VII.1990, M. Fibiger (ZMUC); 1♂, Ioannina, 4 km SW Geroplatanos, 800 m, 12.VII.1998, D. Nilsson & B. Skule (ZMUC); Kerkyra, Pandokrator, 24.X.1987, J.H. Donner (RMNH); vacated mines, Lakonia, Mystras, ancient town, 400–470 m, 11.XI.2008, E.J. van Nieukerken (RMNH); 16♂, 13♀, Messinía, Kardamili, 20.VI.1996, e.l. VI.1996, A. & Z. Laštůvka (AL); 3♂, Pieria, Leptokaria, 22.VI.1997, A. & Z. Laštůvka (AL). **Turkey:** 2 vacated mines, Antalya, Chimaera/Khimaira, ca 5 km N Olympos, 130 m, 1.III.2005, E.J. van Nieukerken (RMNH). All leafmines on *Pistacia terebinthus.*

## The *Ectoedemia angulifasciella* group

***Ectoedemia (Ectoedemia) erythrogenella*** (Joannis)
Fig. 123

**Biology.** Hostplants: mainly evergreen *Rubus* species: mainly *R. ulmifolius* Schott. and *R. sanctus* Schreb. (sometimes regarded as synonyms). Larvae found from autumn throughout winter, September to April, again in July; adults in April to July. In the northern part of its range certainly univoltine, possibly with more generations in parts of the mediterranean.




**Figures 108–110.** ***Ectoedemia (Ectoedemia) angulifasciella*** **group, male genitalia. 108** *E. spiraeae*, Russia, SW Altai, Katun valley, slide RMNH.INS.15041 **109, 110** *E. spinosella,* paratype of *E. albiformae*, Turkmenistan, 40 km E Kara Kala, slide EJvN 3922.

**Distribution.** Here recorded new for Sardinia and Turkey. Earlier records from Greece and Tunisia based on leafmines are confirmed by reared adults.

**Material. Croatia:** 1♀, Krk, Str. Krk-Vrbnik, 23.VII.1988, G. Baldizzone (GB). **Greece:** larvae, Fokis, Glifadha-Spilia, 7.XI.2008, *Rubus ulmifolius*, E.J. van Nieukerken (RMNH); leafmines, Lakonia, 4 km SW Yíthion, coastal plain, 15.II.1990, E.J. van Nieukerken (RMNH); 2♂, 1♀, Lakonia, Nomia, 7 km SW Monemvasia, 13.II.1990, e.l. 6–18.IV.1990, E.J. van Nieukerken (RMNH); leafmines, Messinía, Kardhamili, gorge with dense maquis, 18.II.1990, E.J. van Nieukerken, (RMNH); **Italy, Sardinia:** 1♂, Cagliari, Domusnovas, Sa Duchessa, 350 m, 28.VI.2004, at light, P. Triberti & G. Baldizzone (PT). **Tunisia:** 1♀, Ain Draham, 21.IV.1973, larvae on *Rubus* sp., e.l. V.1973, G. Deschka (AL); 1♂, 5 km E Tamera, leafmines *Rubus* sp., el 21–25.III.1986, O. Karsholt (ZMUC). **Turkey:** 1♂, Antalya, Olympos, ancient ruins near beach, 1.III.2005, leafmines on *R. sanctus*, e.l. 22.IV.2005, E.J. van Nieukerken (RMNH); 2♂, Antalya, Phaselis ruins, 3km NE Tekirova, 4.III.2005, leafmines on *R. sanctus*, e.l. 18.IV.2005, E.J. van Nieukerken (RMNH).

***Ectoedemia (Ectoedemia) spiraeae*** Gregor & Povolný
Fig. 108

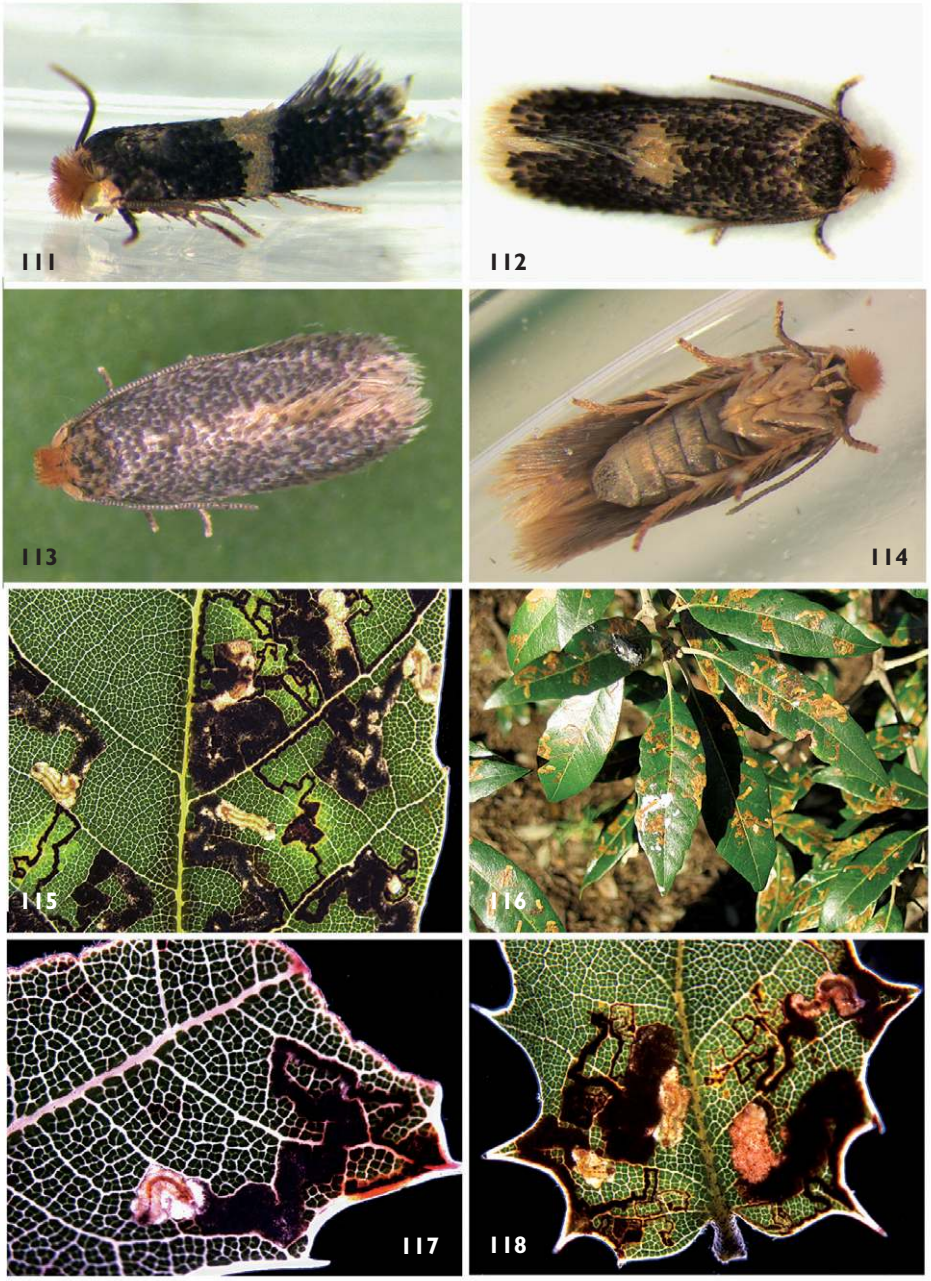
*Ectoedemia jacutica* Puplesis, 1988b: 26. Holotype ♂ Russia: okrestnosti g. [surroundings of] Yakutska, nebol'shoy sosnyak [small pine forest], 5.VII.1986, Rastorguev (ZIN). **Revised synonymy**.

**Biology.** Hostplant: in Europe only *Spiraea media* F. Schmidt, in East Asia probably also on other species of *Spiraea*, although *S. media* has a large distribution throughout Siberia as far as Japan (Sokolov et al. 1980). Leafmines may be confused with those of *Stigmella inopinata* A. & Z. Laštůvka (Laštůvka and Laštůvka 1990a), they only differ in the more jagged early mine of *spiraeae* versus a straight one in *S. inopinata*. Univoltine, larvae from July to October, they appear in some years (e.g. 1990) in July after a cold spell, in other years not before September or October (Laštůvka and Laštůvka 1991). Adults from May to July.

**Distribution.** In Europe only known from a very small area near the border of Hungary and Slovakia (see also Laštůvka and Laštůvka 1991), widespread in East Palaearctic. A new record from western Siberia is given here (Fig. 108).

**Remarks.** Puplesis (1994) synonymised the Siberian *E. jacutica* with *E. agrimoniae*. However, study of one of the specimens shows that it is in fact identical to *E. spiraeae*, which is also clear from the original genitalia drawing (absence of carinal processes, shape gnathos, valva). This also fits the distribution, *E. spiraeae* being known from Japan and China as well [unpublished data EJvN] in contrast to *E. agrimoniae*, that is only known from Europe.

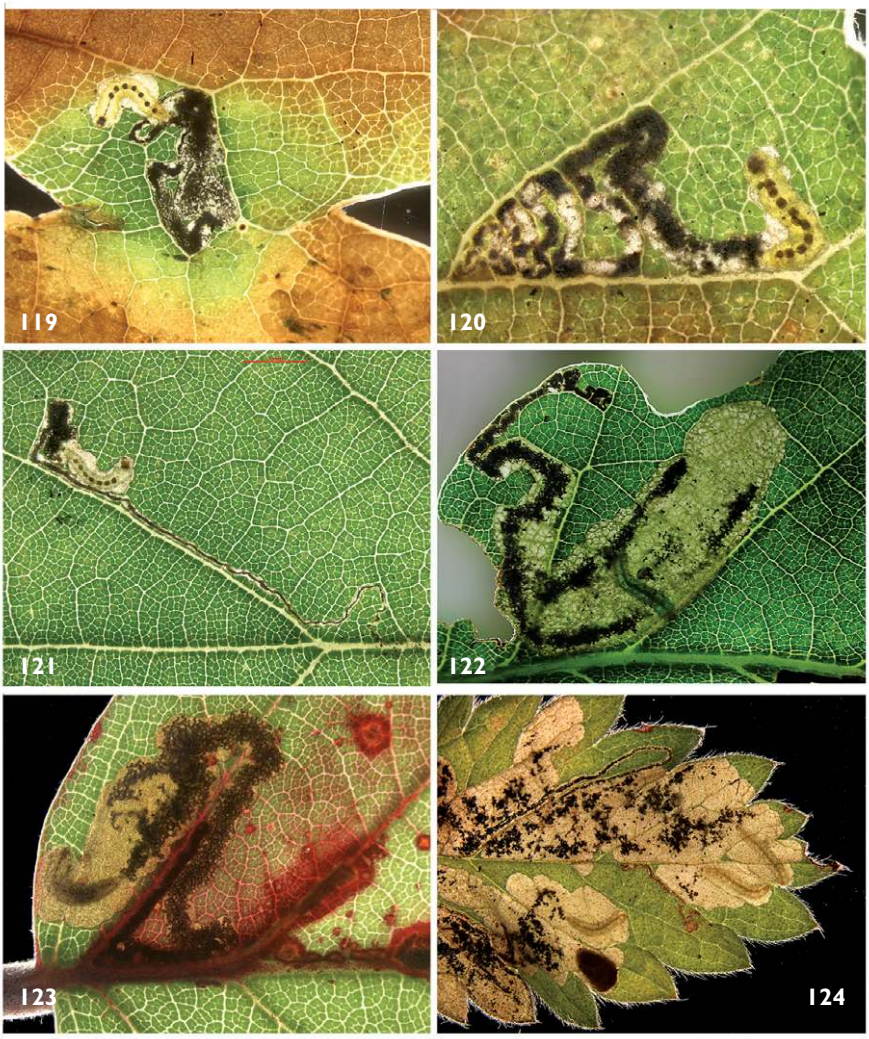
**Material. Russia:** 5♂, Altay: SW Altai, Katun valley, 10 km W. Katanda, 28.vi-19.VII.1983, Mikkola, Hippa & Jalava (MZH, RMNH).




**Figures 111–118. *Ectoedemia (Ectoedemia)* species, life history. 111** *E. heckfordi* male holotype, 24.IV.2005 **112** *E. heringella* male, London, Kensington gardens, 14.IV.2005 **113** *E. alnifoliae* male, Turkey, Antalya, Phaselis ruins, 3.IV.2005 **114** *E. alnifoliae* female underside, Turkey, Antalya, Çirali, 29.III.2005 **115, 116** *E. heringella*, masses of mines and larvae on *Quercus ilex*, London, Kensington gardens, II.2005 **117** *E. haraldi*, mine and larva on *Q. coccifera*, Turkey, Antalya, Termessos, 5.III.2005 **118** *E. alnifoliae* mines and larvae on *Q. coccifera*, Turkey, Antalya, Phaselis ruins, 8.III.2005.

***Ectoedemia (Ectoedemia) agrimoniae*** (Frey)
Fig. 124

**Biology.** Hostplants: *Agrimonia eupatoria* L. and *Aremonia agrimonoides* (L.) DC. Although the species is univoltine in most of central and northern Europe, there are more generations in southern Europe, eg France (Van Nieukerken et al. 2006), and




**Figures 119–124.** ***Ectoedemia (Ectoedemia)*** **species, life history 119** *E. quinquella*, 3rd instar larva on *Quercus robur*, Netherlands, Oostvoorne, 31.X.2008 **120** *E. rufifrontella*, 3rd instar larva on *Quercus pubescens,* France, Alpes Maritimes, Fontan, 16.X.2008 **121** *E. pubescivora*, 3rd instar larva on *Quercus pubescens,* France, Alpes Maritimes, Fontan, 16.X.2008 **122** *E. heckfordi*, final instar larva on *Quercus petraea*, England, Devon, ix. 2004, photo Ian Thirwell **123** *E. erythrogenella*, final instar larva on *Rubus ulmifolius*, France, Alpes Maritime, Contaron, 24.X.2008 **124** *E. agrimoniae*, final instar larvae and cocoons on *Agrimonia eupatoria*, Italy, Cuneo, Valdieri, 31.VIII.2007.

at least two generations in Croatia, where the larvae of the second generation leave the mine before pupation. Larvae: June-July, August-October. Mines can be found much later in the season, with cocoons inside. Adults in April to June and again July-August.

**Distribution.** Latvia: Savenkov et al. 1996; Belgium: De Prins 1998; Van Nieukerken 2006; Italy: Karsholt et al. 1995 (detailed records below); Bulgaria: Beiger 1979; Buszko and Beshkov 2004. Cited occurrence in Siberia (Puplesis 1994) incorrect, see *E. spiraeae.* As yet unknown from Russia.

**Material. Croatia:** 22♂, 14♀, Vrlika, mines 10.VII.2000, adults ex l. VII.2000, A. Laštůvka leg. (AL). **Italy:** 2♂, Chieti, Vacri surroundings, 300m, e.l. 20–25.VIII.1954, U. Parenti (coll. Parenti); 30♂, 34♀, Cuneo: Valdieri, Ris. Naturale Speciale Juniperus phoenicea, 860–950 m, 14.VIII.2007, young larvae on *Agrimonia eupatoria*, e.l. 11–28.IV.2008, E.J. van Nieukerken (RMNH); 14♂, 5♀, Cuneo, Entracque, Trinità, between Ponte del Suffiet and Gias d'Ischietto, 1240 m, 13.X.2008, on *Agrimonia eupatoria*, EJvN 2008255, e.l. 25.IV–1.V.2009, E.J. van Nieukerken & C. Doorenweerd (RMNH).

### ***Ectoedemia (Ectoedemia) hexapetalae*** (Szőcs)

**Biology.** Hostplant: *Filipendula vulgaris* Moench. The record in France is from an area where this host is unknown (Dupont 1990), so that it probably feeds there on another host, possibly another rosaceous herb. Larvae in June, July and August-September, adults in May and again late June to July.

**Distribution.** France: Van Nieukerken et al. 2006. Otherwise still only known from eastern Austria and central Hungary.

### ***Ectoedemia (Ectoedemia)* sp. n.**

*Ectoedemia* sp. n.? Bengtsson et al. 2008: 273.

This species, related to *E. hexapetalae*, was found in Norway. Additional findings in France prove its separate identity, it will be described elsewhere.

### ***Ectoedemia (Ectoedemia) angulifasciella*** (Stainton)

**Biology.** Hostplants: *Rosa* species, *Sanguisorba minor* Scop., *S. officinalis* L., *Filipendula vulgaris* Moench. On the last host only found in Hungary (Van Nieukerken 1985), and commonly on the islands of Öland and Gotland, Sweden, where it occurs sym-

patrically on *Rosa* (Bengtsson et al. 2008). Univoltine, larvae in autumn, occasionally from July, to November. Adults from June to August.

**Distribution.** Bulgaria: Buszko and Beshkov 2004. A record for Siberia (Dovnar-Zapol'skij and Tomilova 1978; Sinev 2008) is based on leafmines only, and highly unlikely, given the fact that the species has not been found in Russia at all.

***Ectoedemia (Ectoedemia) atricollis*** (Stainton)

**Biology.** Hostplants: oligophagous on Rosaceae: Maloideae (*Crataegus* spp., *Malus sylvestris* Mill., *Pyrus communis* L., *Mespilus germanica* L., *Prunus avium* L., *P. mahaleb* L., *P. cerasifera* Ehrh.) and *Staphylaea pinnata* L. (Staphylaeaceae). Larvae from August to October, adults in June-July.

**Distribution.** Norway: Aarvik et al. 2004; Latvia: Savenkov 1989; Lithuania: Ivinskis et al. 1985; Bulgaria: Tomov and Pelov 1998; Russia: Van Nieukerken et al. 2004b. The species occurs in Tadzhikistan, probably as an introduction (Puplesis 1994).

***Ectoedemia (Ectoedemia) arcuatella*** (Herrich-Schäffer)

**Biology.** Hostplants: *Fragaria vesca* L., *F. moschata* Duchesne, *F. viridis* Weston, *Potentilla erecta* (L.) Rauschel, *P. sterilis* (L.) Garcke. Univoltine, larvae from August until October, adults from May to July.

**Distribution.** Latvia: Savenkov et al. 1996; Lithuania: Diškus 2003; Ireland: Heal 1985; Belgium: Van Nieukerken 2006; France (confirmation): Van Nieukerken et al. 2006, here recorded new from southern France. Also recorded outside Europe from Kazakhstan (Alma Ata) (Puplesis et al. 1996).

**Material. France:** larvae, Alpes Maritimes, Tende, vallon de Réfréi, near/on camping, 820 m, 10.X.2008, EJvN2008206, E.J. van Nieukerken & C. Doorenweerd (RMNH); 4♂, 3♀, Alpes Maritimes, St. Dalmas de Tende, W., Beonia, 1050 m, 10.X.2008, EJvN2008213, e.l. 9–16.V.2009, E.J. van Nieukerken & C. Doorenweerd (RMNH). **Italy:** 3 larvae, Cuneo, Valdieri, Ris. Naturale Speciale Juniperus phoenicea, 860–950 m, 14–16.VIII.2007, E.J. van Nieukerken (RMNH); larvae, Cuneo, Entracque, Trinità, S., 1070 m, 13.X.2008, EJvN2008268, E.J. van Nieukerken & C. Doorenweerd (RMNH); larvae, Cuneo, Entracque, Trinità, Ponte del Suffiet, 1190 m, 13.X.2008, EJvN2008273, E.J. van Nieukerken & C. Doorenweerd (RMNH); larvae, Cuneo, Palanfré, W., 1440–1540 m, 14.X.2008, EJvN2008295, E.J. van Nieukerken & C. Doorenweerd (RMNH); 1♂, Potenza, Mte Vulture, Laghi di Monticchio, 19.V.1970, F. Hartig (MRSN); 1♂, Torino, Giaglione, Valsusa, 650 m, 16.VI.1993, G. Bassi (coll Bassi). All larvae on *Fragaria vesca*.

***Ectoedemia (Ectoedemia) rubivora*** (Wocke)

**Biology.** Hostplants: *Rubus* species, particularly on *R. caesius* L., *R. saxatilis* L., *R. chamaemorus L.* and *R. arcticus* L., but also on forms of the *fruticosus* L. complex. In the Netherlands we found several times vacated mines resembling those of *rubivora* on *Agrimonia eupatoria* in areas where *E. rubivora* is abundant on *Rubus*. These mines are very different from those of *E. agrimoniae*, which is not known from the Netherlands. Univoltine, larvae from late August until Octorber, adults in June and July.

**Distribution.** Norway: Aarvik et al. 2004; Latvia: Savenkov et al. 1996; Lithuania: Diškus 2003.

***Ectoedemia (Ectoedemia) spinosella*** (Joannis)
Figs 109, 110

*Ectoedemia (Ectoedemia) albiformae* Puplesis & Diškus, 2003: 186. **Holotype** ♂ Turkmenistan: 40 km E Kara Kala, western part of Kopet dag ridge, 800 m, 30.V–27. VI.1993, Puplesis & Diškus (VPU) [paratype examined]. **New synonymy**

**Biology.** Hostplants: *Prunus* spp., *P. spinosa* L., *P. domestica* L., *P. cerasifera* Ehrh., *P. fruticosa* Pallas, *P. dulcis* (Miller), *P. webbii* (Spach) Fritsch. (new record). In most of Europe *P. spinosa* is the main host, in Greece the almonds *P. dulcis* and *P. webbii*. On most other hosts confusion with mines of *E. mahalebella* is possible. Univoltine in much of its area, in Greece bivoltine. Larvae in June (Greece) and again July to November, depending on latitude and season. Adults fly in May-July.

**Distribution.** Russia: Van Nieukerken et al. 2004b; Belgium: Van Nieukerken 2006; Switzerland: Sauter 1983. Also recorded from Turkmenistan: Kopet Dag (Puplesis et al. 1996). A former record from Lithuania (dot on map, Van Nieukerken 1985) was a mistake. The record from France (26): Les Prés (Van Nieukerken et al. 2006) wa misidentification for *Ectoedemia mahalebella.*

**Remarks:** *E. albiformae* was described from Turkmenistan, Western Kopet Dag. The authors compared it with *E. petrosa* Pupesis, 1988, but (after studying a male paratype, see Figs 109, 110) we cannot separate it from *E. spinosella* in any detail, apart from the white colour of the androconial scales that surround the brown hairpencil, which are brown in normal *spinosella*. We also once found this form in Greece, and since *E. spinosella* also occurs in the western Kopet Dag (Puplesis et al. 1996), we assume *albiformae* is most likely a colour aberration of *spinosella*, and hence synonymise it here. A female paratype of *albiformae* turned out to be an unknown *Stigmella* species.

**Material. Greece:** vacated mines, dead larvae, Argolis, Ligourio, Epidauros theater archeological site, 360, 8.XI.2008, *Prunus webbii*, E.J. van Nieukerken (RMNH); lar-

vae and vacated mines, Fokis, Dhelfoi, archeological site, 600–640 m, 6.XI.2008, E.J. van Nieukerken (RMNH); 3♂, 2♀, Fokis, Itea, 12.VI.1998, A. & Z. Laštůvka (AL); 1♂ ["*albiformae*"], 2♀, Messinia, Pírgos, 18.VI.1998, A. & Z. Laštůvka (AL); 2♂, Préveza, Thesprotiko, 11.VI.1998, e.l. VII.1998, A. & Z. Laštůvka (AL). **Italy:** 1♂, 1♀, Cuneo, Valdieri, Ris. Naturale Speciale Juniperus phoenicea, 860–950 m, 14–16. VIII.2007, e.l. 7.V.2008, E.J. van Nieukerken (RMNH). **Turkmenistan:** 1♂, 40 km E Kara Kala, western part of Kopet dag ridge, 800 m, 14.VI.1993, Puplesis & Diškus (VPU) (paratype *albiformae*).

***Ectoedemia (Ectoedemia) mahalebella*** (Klimesch)

**Biology.** Hostplants: *Prunus* spp., particularly *P. mahaleb* L., further *P. cocomilia* Ten. (Greece), *P. tenella* Batsch (Hungary), *P. fruticosa* Pallas, *P. avium* L., *P. cerasus* L., *Prunus cerasifera* Ehrh. (new record), *P. domestica* L. and *P. spinosa* L. (new record). On many hosts, confusion with mines of *E. spinosella* is possible, as happened with records from France, Les Prés which were partly misidentified as *spinosella* (see there). In this particular locality *E. mahalebella* was common on *Prunus mahaleb*, but also occurred on *P. spinosa* and *P. domestica*. Leafmines of *E. mahalebella* occur more often away from the midrib, near leaf margin, but this character is not absolute (see Van Nieukerken 1985). Univoltine in much of its area, bivoltine further south. Larvae in June (Greece) and again in July to November. Adults fly in May-August, the latter probably of the second generation.

**Distribution.** Widespread in southern half of Europe, but not yet found in Iberian Peninsula, northernmost record in northern France: Dun sur Meuse (Van Nieukerken et al. 2006). Switzerland: Sauter and Whitebread 2005; Czech Republic, Slovakia: Laštůvka and Laštůvka 1990b; Bulgaria: Tomov and Pelov 1998.

**Material. Croatia:** 2♂, 4♀, Krk, Draga Baska; Kampelje and Misucaynica, 6.VII.1976, 30.VII.1986, 13.VIII.2004, 17.VIII.2007, 27.VII.2008, G. Baldizzone, E. Jäckh (GB, RMNH, USNM). **Greece:** 1♂, Larissa, Stomio, 9.VI.1999, *Prunus cerasifera,* e.l. vii.1997, A. & Z. Laštůvka (AL).

***Ectoedemia (Ectoedemia) occultella*** (Linnaeus)

**Biology.** Hostplants: *Betula* spp., *Salix pentandra* L. (only northern Finland, not reared). Larvae from August to November, adults fly from May to July.

**Distribution.** Lithuania: Ivinskis et al. 1985; Belarus: Merzheevskaja et al. 1976; Corsica: Van Nieukerken et al. 2006. J. Buszko (in litt.) observed tenanted mines in Bulgaria (see below), thus providing a new record.

**Material. Bulgaria:** tenanted mines, Bačkovo, 20.X.2004, on *Betula pendula*, J. Buszko, observation.

***Ectoedemia (Ectoedemia) minimella*** (Zetterstedt)

**Biology.** Hostplants: *Betula pubescens* Ehrh., *B. nana* L., *B. pendula* Roth., *Alnus viridis* (Chaix) DC. in Lam. & DC. (Alps), *Corylus avellana* L. (British Isles). Larvae from July to October, adults fly from May to July.

**Distribution.** Estonia: Jürivete et al. 2000; Latvia: Savenkov 1989; Lithuania: Diškus 2003. See also Baldizzone 2004; Van Nieukerken et al. 2006 for records in France and Italy.

## Discussion

**State of knowledge.** In 1985 (Van Nieukerken 1985), 50 species were recognised for the West Palaearctic, eight in *Zimmermannia* and 42 in *Ectoedemia* s. str., including two unnamed species. One of the *Zimmermannia's* is now regarded as east Palaearctic, so that 49 (7 + 42) remain. With the new descriptions since and in this paper, in 20 years the number has grown to 57 (9 + 48), an increase of 17% (eight species). Although a considerable part of Europe and West Asia have been better investigated in the last decades, there are still many gaps in our knowledge which may lead to new discoveries and a better knowledge of biology and distribution. Whereas we have many data from the Iberian Peninsula by light collecting in summer and mine collecting in winter, the "normal" autumn fauna of the deciduous forests remains virtually unstudied. One autumn visit could reveal several new records. Much less known are the potentially rich areas of Turkey, the Caucasus and northern Iran and other parts of the Middle East, which probably will harbour several undescribed *Ectoedemia* species; also northern Africa is still poorly investigated. In addition, detailed molecular studies can reveal hidden species and complex cases of evolution.

**Range expansion.** Some species seem to have been collected much more frequently in recent years, giving the impression of range expansion. Particularly for southern European species it is logical to attribute this largely to an enormous increase of collecting effort: very little collecting has taken place there before the seventies. Especially bark-mining species in the subgenus *Zimmermannia*, that are almost only known from light collected specimens, have been collected frequently in recent years: this is apparent from the numerous new records of *E. amani* and *E. reichli.* However, there is little reason to attribute this to range expansion. Table 2 shows the increase of records of *Zimmermannia* in the database of material studied by Van Nieukerken (including records contributed by the co-authors), the total being 483 (one record is defined as the catching of any number of specimens of a single species on one date or date range on a single locality). The proportion of *E. amani* records varies between 6 and 8.5% from the seventies to the present decade. Since a few records are available from earlier decades, these data do not show a significant change of the proportion of this species in the *Zimmermannia* records, thus the enormous increase of collecting effort is most likely the best explanation for the numerous new records recently.

The finding of the new species *E. heckfordi* in the south of England is very surprising, and could indicate a real range expansion of a species hitherto hidden in Western France,

**Table 2.** Number of total records of *Zimmermannia* species per decade. All data prior to 1960 lumped in first column.

| | **before 1960** | **1960's** | **1970's** | **1980's** | **1990's** | **2000's** | **total** |
|---|---|---|---|---|---|---|---|
| *Ectoedemia amani* | 4 | 2 | 8 | 3 | 6 | 10 | 33 |
| *Ectoedemia atrifrontella* | 15 | 5 | 30 | 23 | 8 | 13 | 94 |
| *Ectoedemia hispanica* | | 1 | | 9 | 10 | 24 | 44 |
| *Ectoedemia liebwerdella* | | 5 | 5 | 16 | 12 | 11 | 49 |
| *Ectoedemia liguricella* | 3 | 6 | 12 | 16 | 15 | 29 | 81 |
| *Ectoedemia longicaudella* | 27 | 17 | 27 | 29 | 15 | 29 | 144 |
| *Ectoedemia monemvasiae* | | 1 | 5 | 12 | 4 | | 22 |
| *Ectoedemia reichli* | | | | 3 | 4 | 10 | 17 |
| *Ectoedemia vivesi* | | | | | 2 | 1 | 3 |
| Total | 49 | 37 | 87 | 111 | 76 | 127 | 487 |

where there has hardly been collecting activity. On the other hand, such a species might also have been overlooked in the few small forests where it has been found to date.

The range expansion of *E. heringella* in Britain since the late nineties is obvious, but almost certainly aided by man. In the Netherlands we have seen a range expansion of *E. quinquella*, which appeared in the eighties in the far south, in this century it was found more to the north and since 2007 also in the coastal dunes. This expansion is likely to have been the result of the changing weather or climate: *E. quinquella* has a Mediterranean-atlantic distribution type, indicating that it is probably susceptible to cold winters. Another species that shows range expansion is *E. hannoverella* which turned up in Sweden in the eighties and in Britain in 2002. The range expansion of poplar feeders (*E. hannoverella* and *turbidella*) may be related to extensive planting of poplars now all over Europe.

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## Appendix A

Specimen locality data (XLS format) of *Ectoedemia*: subgenera *Ectoedemia* and *Zimmermannia* (Lepidoptera: Nepticulidae), in the Western Palaearctic region up to 2009. File format: Microsoft Excel (1997–2003). doi: 10.3897/zookeys.32.282.app.1.ds.

**Note:** The spreadsheet contains two worksheets: *Ectoedemia* specimen records and Checklist.

The records comprise all those used for this paper, and all the previous ones collected by the senior author for his earlier publications (cited for each relevant record) and records of more common species that have never been published in detail. We have not tried to get georeferences for all records, but they are included for about 75% of the records. The records are mostly in Darwin Core format, with a few additional fields, and will also be shared with the Global Biodiversity Information Facility (GBIF, http://www.gbif.org/).

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## Citations of the datasets:

Dataset published as Appendix A:

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