

***Ethmia penyagolosella* sp. n. (Lepidoptera: Ethmiidae), a new species from Spain**

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Abstract: *Ethmia penyagolosella* DOMINGO & BAIXERAS sp. n. (Lepidoptera, Ethmiidae) is newly described from Spain. The holotype male is deposited in Museo Nacional de Ciencias Naturales (Madrid, Spain). The adult and male and female genitalia are figured and a differential diagnosis is provided for the closely related species, *E. chrysopygella* (KOLENATI, 1846). Including this new species, the European ethmiid fauna now totals 29 species. The new species is also the first record in the Iberian Peninsula for the *nigripedella* species-group that shows an interesting trophic and biogeographical behaviour within the ethmiids.

***Ethmia penyagolosella* sp. n. (Lepidoptera, Ethmiidae), eine neue Art aus Spanien**

Zusammenfassung: *Ethmia penyagolosella* DOMINGO & BAIXERAS sp. n. (Lepidoptera, Ethmiidae) wird aus Spanien beschrieben. Imago sowie männliche und weibliche Genitalien werden abgebildet, und eine Differentialdiagnose zur nächstverwandten Art, *E. chrysopygella* (KOLENATI, 1846), wird gegeben. Der männliche Holotypus befindet sich im Museo Nacional de Ciencias Naturales (Madrid, Spanien). Einschließlich der neuen Art umfaßt die europäische Fauna nunmehr 29 Spezies. Die neue Art ist der Erstdnachweis eines Vertreters der trophisch und biogeographisch besonders interessanten *nigripedella*-Artengruppe für die Iberische Halbinsel.

***Ethmia penyagolosella* sp. n. (Lepidoptera, Ethmiidae), una nueva especie de España**

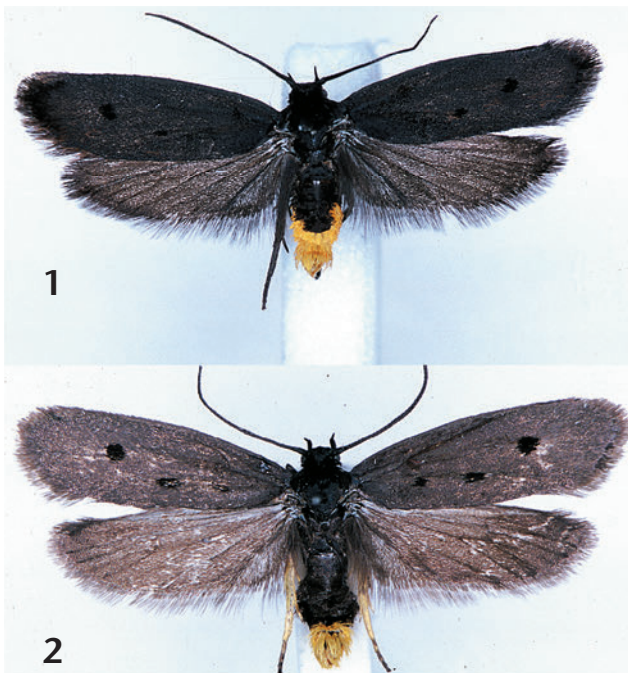
Resumen: *Ethmia penyagolosella* DOMINGO & BAIXERAS sp. n. (Lepidoptera, Ethmiidae) se describe por primera vez de España. El holotipo se deposita en el Museo Nacional de Ciencias Naturales (Madrid, España). Se representan los adultos y las genitales masculina y femenina, y se proporciona

una diagnosis diferencial de su especie más relacionada, *E. chrysopygella* (KOLENATI, 1846). Incluyendo esta nueva especie, la fauna europea de étmidos totaliza 29 especies. La nueva especie es, al mismo tiempo, la primera cita para la Península Ibérica del grupo de especies *nigripedella*, que muestra una biogeografía y un comportamiento trófico interesantes entre los étmidos.

Introduction

The taxonomic position of the Ethmiidae in the superfamily Gelechioidea is rather controversial. Some authors, such as MINET (1990), LERAUT (1997) or HODGES (1998), consider it to be an Elachistidae subfamily whereas others such as SATTLER (1967), VIVES MORENO (1994), BALDIZZONE et al. (1995), RIEDL (1996), POWELL et al. (1998) and AARVIK et al. (2000) elevate it to family level. In any case, 250 species are included in this microlepidopterous group most of which are placed in the genus *Ethmia* HÜBNER, [1819]. The highest biodiversity of this family is found in subtropical and tropical regions that have slightly dry periods during the year (HODGES 1998).

In Europe, 27 species had been recorded until recently (RIEDL 1996), all of them included in the genus *Ethmia* and separated into 13 species-groups. Externally, ethmiids are distinctive species of Microlepidoptera; consequently, they are quite well known with regard to their taxonomy (SATTLER 1967). To find new species in Europe is very rare, and we only know of one taxon being described from this area during the last decades (KARS-HOLT & KUN 2003).



Figs. 1–2: *Ethmia* spp., adults. **Fig. 1:** *E. penyagolosella* sp. n. (holotype) ♂. **Fig. 2:** *E. chrysopygella* ([Austria], Teriol. sept., Finstermünz, 1200 m, 10. vi. 1977, BURMANN). **Fig. 3:** The peak of Penyagolosa mountain, the biotope of *E. penyagolosella* sp. n.

Depositories are abbreviated as follows:

ICBBE Institut Cavanilles de Biodiversitat i Biologia Evolutiva. Universitat de València (València, Spain).

MNCN Museo Nacional de Ciencias Naturales (Madrid, Spain).

NHM Naturhistorisches Museum (Vienna, Austria).

TLMF Tiroler Landesmuseum Ferdinandeum (Innsbruck, Austria).

Ethmia penyagolosella DOMINGO & BAIXERAS sp. n.

Holotype: ♂, [Spain], "Penyagolosa, Castellón, 23. v. 2002, J. DOMINGO" (coll. MNCN).

Paratypes (2 ♂♂, 3 ♀♀, all Spain): 2 ♂♂, same data as holotype; 1 ♀, idem, but 26. v. 2001; 2 ♀♀, idem, but 20. vi. 2002 (colls. ICBBE, MNCN, TLMF). — Including 2 ♂ and 2 ♀ genitalia slides.

Etymology: The species is named after the type locality, Penyagolosa mountain, 1814 m (Castellón, eastern Spain).

Comparative material examined: *E. chrysopygella*: **Austria:** 3 ♂♂, 1 ♀, Tirol, Finstermünz, 1200 m, 10. vi. 1977, leg. BURMANN; 1 ♂, Tirol, Längenfeld, 1200 m, 6. vii. 1984, leg. BURMANN; 2 ♂♂, Serfaus, Argenweg, 1400 m, 9. vii. 1983, leg. SÜSSNER; 1 ♂, idem, but 4. vii. 1983 (coll. TLMF). — **Switzerland:** 1 ♂, Graubünden, Bergün, 6. vi. 1915, leg. THOMANN (coll. TLMF); 1 ♂, idem, but 1873, leg. ZELLER (coll. NHM). — **Russia:** 1 ♂, Krasnoarmeysk ("Sarepta"), 1869 (coll. NHM). — Including 3 ♂, 1 ♀ genitalia slides.

Diagnosis

Adult (Fig. 1): Head and labial palpi black. Legs black in both sexes, completely lacking yellowish-orange. Forewing, wingspan: ♂, 16.0–17.5 mm (n = 3); ♀, 15.5–18.0 mm (n = 3); forewing upperside black, rarely with few dark brown scales, particularly at tornus; three deep black dots: two in fold at $\frac{1}{4}$ and $\frac{1}{3}$, one at distal end of cell. Hindwing upperside black but less densely scaled than forewing and, as a consequence, lighter in general appearance. Abdomen: first segments black in both sexes; ♂, tergite VII (occasionally VI) yellowish-orange (short scales), tergite VIII and external parts of genitalia yellowish-orange (long scales); ♀, sternite and tergites V–VII yellowish-orange. Abdominal sternum II with a pair of short, broad venulae, without apodemes.

Male genitalia (terminology after SATTLER 1967, Figs. 4–5, 8, 10): Uncus broad, with pair of ear-like distal projections, deeply separated medially; gnathos caudally with strong teeth, orally finely dentate; labis broadly rounded; costa well separated, distally rounded; cucullus short, broadly rounded at base, apical part pointed; saccu-

lus unevenly rounded, broadest in distal part; aedeagus small, strongly curved, without cornutus.

Female genitalia (Figs. 12–13, 16, 18): Papillae anales sclerotized, large, about length of segment VIII; apophyses posteriores slightly longer than papillae anales; segment VIII short, medially largely membranous, laterally strongly sclerotized; apophyses anteriores largely reduced lobes; antrum extremely long, entrance with spiny plate; corpus bursae well separated from antrum, suboval, with accessory bursa; signum a spiny plate, subrhombic, one transverse median ridge strongly developed, the other less sclerotized.

Bionomics: Immature stages and host-plant are unknown. Closely related species included in the *nigripedella* species-group feed on *Thalictrum* species (Ranunculaceae), such as *T. minus* LINNAEUS 1753 (THOMANN 1923) and *T. foetidum* LINNAEUS 1753 (LHOMME 1949). Two *Thalictrum* species are present in the study area and could be the host-plants: *T. minus* subsp. *valentinum* DE BOLÒS & VIGO 1974 and *T. flavum* subsp. *costae* (TIMB.-LAGR. ex DEBEAUX) ROUY & FOUÇ 1893 (VIGO 1968, SERRA et al. 2000). Adults were collected by day with a net on the summit of Penyagolosa peak (1814 m). Only one flight period is known, from the end of May to late June.

Habitat: The adults inhabit the east face of Penyagolosa peak with slopes varying from 30–45° (Fig. 3). The habitat of *E. penyagolosella* is just above the tree line (formed by *Pinus sylvestris* LINNAEUS 1753 and *P. nigra* subsp. *salzmanii* (DUNAL) FRANCO 1943) and is covered by chamaephytic vegetation that is adapted to strong winds and high altitude Mediterranean weather. The main cover plants in this habitat are *Juniperus sabina* LINNAEUS 1753 and *Erinacea anthyllis* LINK 1831 that have adaptations to low temperatures and provide a safe resting place for *E. penyagolosella*. When disturbed the adults make short flights just above the chamaephytic vegetation.

Remarks: *E. penyagolosella* sp. n. belongs to the *nigripedella*-group as defined by SATTLER (1967). It differs from most species by the presence of only three black dots on the forewing, the lack of black tornal dots and the absence of black thoracic spots. The genitalia suggest a close relationship to *E. chrysopygella* (KOLENATI, 1846) (compare Figs. 1–2, 3–19), from which the new species may be distinguished by a number of characters (Table 1): *E. penyagolosella* sp. n. is characterized by the

Table 1: Differential diagnosis of *E. penyagolosella* sp. n. and *E. chrysopygella*.

Important diagnostic characters	<i>E. penyagolosella</i> sp. n.	<i>E. chrysopygella</i>
Forewing colour	black	dark grey
Abdomen (male)	tergites VII–VIII and sternites V–VIII yellowish-orange	tergite VIII and sternite VIII yellowish-orange
Abdomen (female)	segments V–VII yellowish-orange	segment VII yellowish-orange
Hindleg	black	distal half of tibia, tarsus 1 and partially tarsus 2 yellowish-orange
Abdominal sternum II	short, broad venulae; no apodemes	short, narrow venulae; short apodemes
Sacculus	unevenly rounded	evenly rounded
Papillae anales	length of segment VIII	longer than segment VIII
Signum	subrhombic	suboval

Table 2: The European ethmiid fauna and its host-plant preferences.

European ethmiid species	Host-plants records
(distigmatella group)	
<i>E. distigmatella</i> (ERSCHOFF, 1874)	?
<i>E. quadrinotella</i> MANN, 1861	Boraginaceae: <i>Heliotropium</i>
(lybiella group)	
<i>E. lepidella</i> (CHRÉTIEN, 1907)	Boraginaceae: <i>Echium</i> , <i>Anchusa</i>
(vitalbella group)	
<i>E. vitalbella</i> CHRISTOPH, 1877	?
(dodecea group)	
<i>E. dodecea</i> (HAWORTH, [1828])	Boraginaceae: <i>Lithospermum</i> , <i>Cynoglossum</i>
<i>E. quadrillella</i> (GOEZE, 1783)	Boraginaceae: <i>Symphytum</i> , <i>Pulmonaria</i> , <i>Lithospermum</i> , <i>Myosotis</i>
<i>E. fumidella</i> (WOCKE, 1850)	?
<i>E. candidella</i> (ALPHÉRAKY, 1908)	Boraginaceae: <i>Lithospermum</i> , <i>Cerithe</i> , <i>Borago</i> , <i>Asperugo</i> , <i>Pulmonaria</i>
<i>E. pusiella</i> (LINNAEUS, 1758)	Boraginaceae: <i>Lithospermum</i> , <i>Pulmonaria</i>
(rothschildi group)	
<i>E. rothschildi</i> (REBEL, 1912)	?
(terminella group)	
<i>E. terminella</i> T. FLETCHER, 1938	Boraginaceae: <i>Echium</i>
(aurifluella group)	
<i>E. aurifluella</i> (HÜBNER, [1810])	Boraginaceae: <i>Anchusa</i>
<i>E. lugubris</i> (STAUDINGER, 1879)	Boraginaceae: <i>Symphytum</i>
<i>E. quadripunctella</i> EVERSMAAN, 1844	?
(pyrausta group)	
<i>E. pyrausta</i> (PALLAS, 1771)	Ranunculaceae: <i>Thalictrum</i>
<i>E. discrepitaella</i> REBEL, 1901	?
(bipunctella group)	
<i>E. bipunctella</i> (FABRICIUS, 1775)	Boraginaceae: <i>Echium</i> , <i>Symphytum</i> , <i>Cynoglossum</i> , <i>Anchusa</i> , <i>Lithospermum</i>
<i>E. iranella</i> ZERNY, 1940	?
<i>E. mariannae</i> KARSHOLT & KUN, 2003	?
<i>E. cirrhocnemis</i> LEDERER, 1870	?
(chrysopyga group)	
<i>E. chrysopyga</i> (ZELLER, 1844)	?
<i>E. andalusica</i> (STAUDINGER, 1879)	?
(haemorrhoidella group)	
<i>E. haemorrhoidella</i> (EVERSMANN, 1844)	?
(nigripedella group)	
<i>E. nigripedella</i> ERSCHOFF, 1877	?
<i>E. chrysopygella</i> (KOLENATI, 1846)	Ranunculaceae: <i>Thalictrum</i>
<i>E. nigrimaculata</i> SATTLER, 1967	?
<i>E. flavianella</i> (TREITSCHKE, 1832)	Ranunculaceae: <i>Thalictrum</i>
<i>E. penyagolosella</i> sp. n.	?
(tripunctella group)	
<i>E. tripunctella</i> STAUDINGER, 1879	Boraginaceae: <i>Onosma</i>

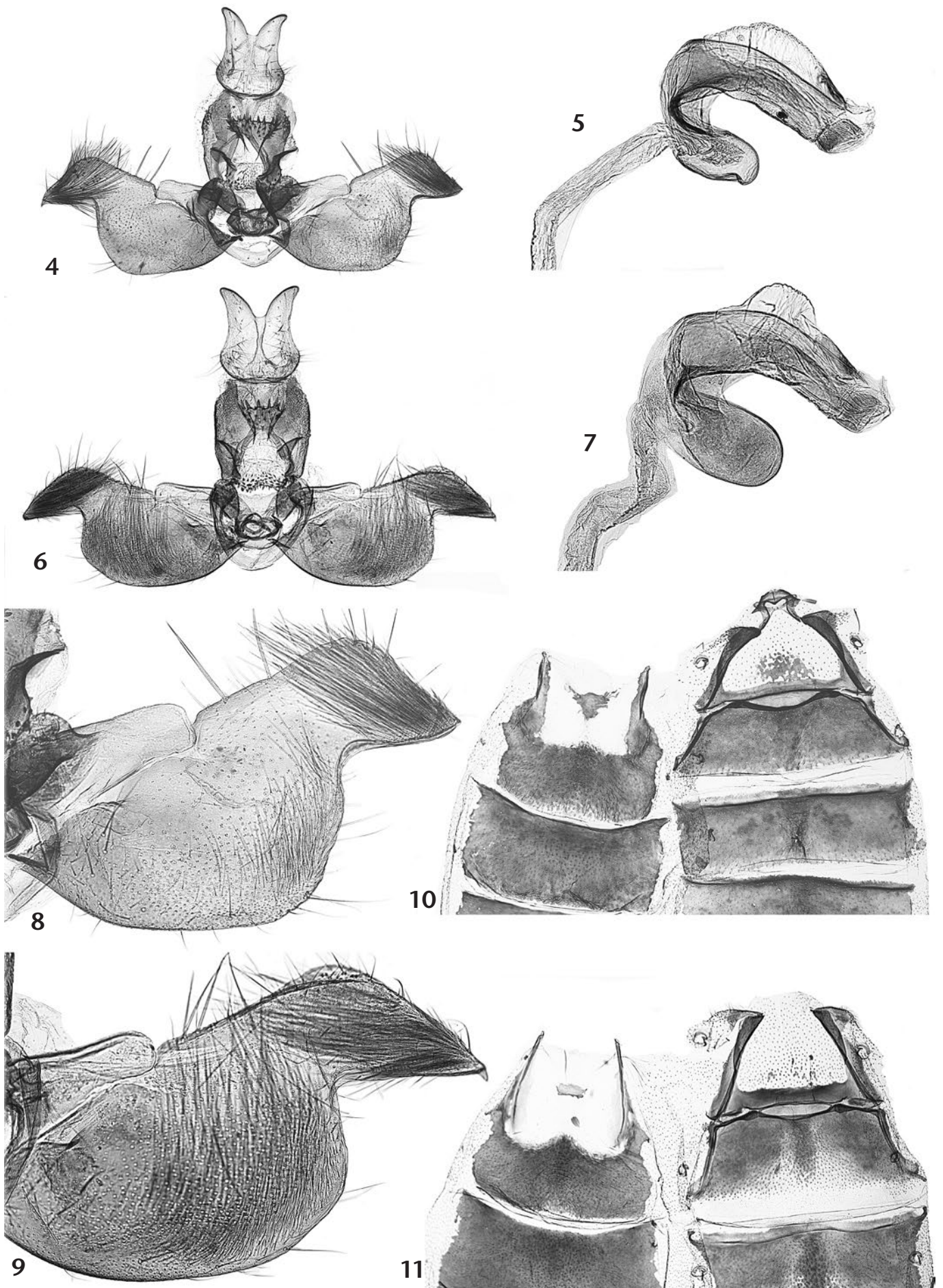
extended yellowish-orange part of the abdomen and the completely black hindlegs that are distally suffused with yellowish-orange in *E. chrysopygella*. As in the entire species-group, the genitalia structures of both taxa are quite similar. However, *E. penyagolosella* sp. n. has a slightly shorter and broader labis and a stouter shape of the sacculus that is unevenly rounded; furthermore, the caudal part of the gnathos is more densely covered with spines. The female genitalia of the new species differ from those of *E. chrysopygella* by the longer segment VIII and the subrhombic signum.

Discussion

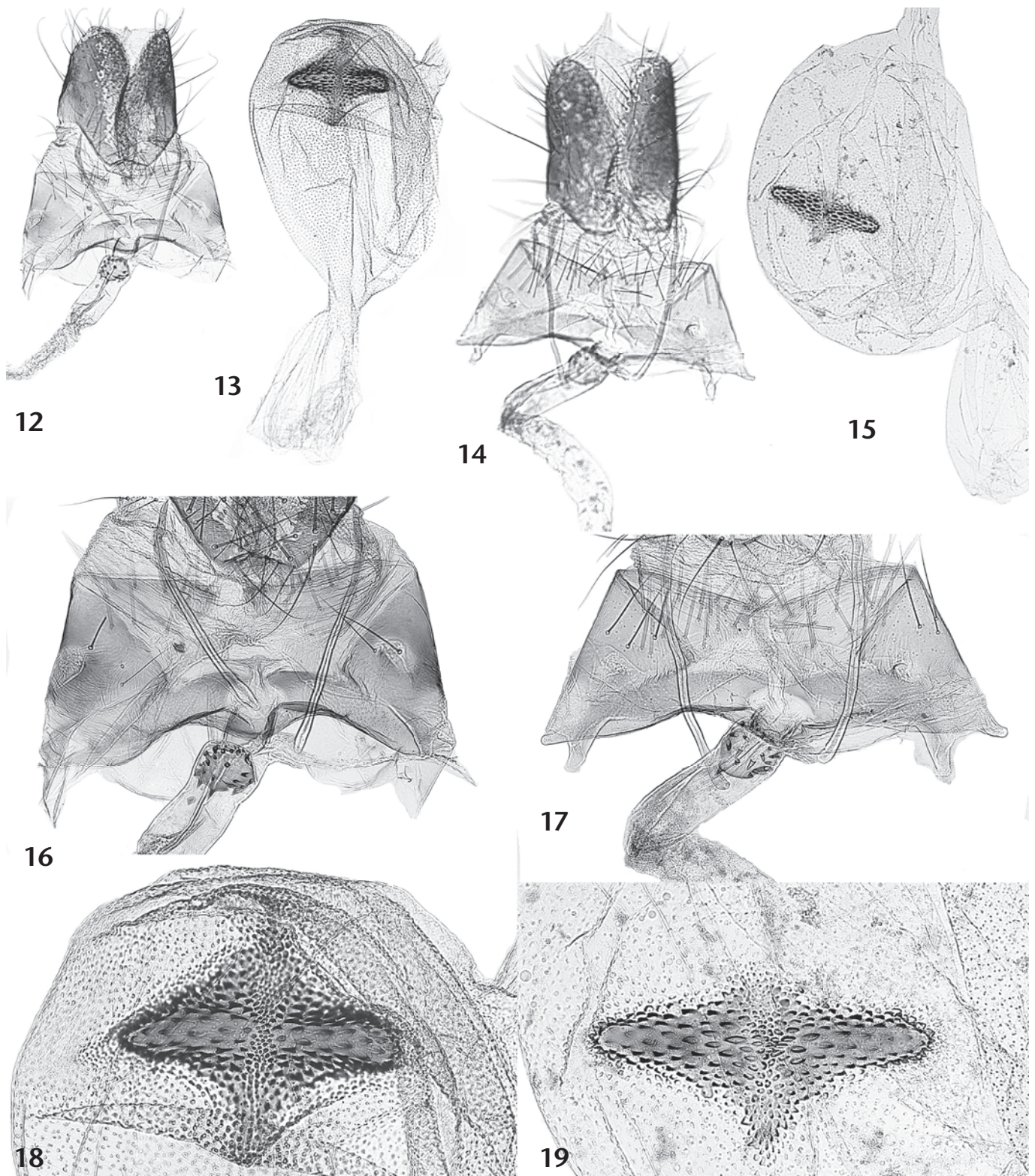
About 80% of known ethmiids feed on Boraginales (POWELL 1973, POWELL et al. 1998) that includes the families Boraginaceae, Ehretiaceae and Hydrophyllaceae. The two last-mentioned plant families are not represented in Europe, therefore most of the European ethmiids are restricted to Boraginaceae. In Europe a few species also feed on Ranunculaceae (SATTLER 1967). HODGES (1998) includes other families such as Papaveraceae, Rosaceae, Sabiaceae and Scrophulariaceae as host-plants, but those records are only valid for tropical and subtropical species. Some other records lacking authenticity with this trophic pattern are compiled by SATTLER (1967). Host-plant incongruities are common in taxonomic revisions (e.g., SATTLER 1967, PITKIN 1984, HUEMER & KARSHOLT 1999). Old records, botanical nomenclature changes and incorrect plant identification are probably the reasons for such erroneous data. In the case of ethmiids, host-plant records and trophic behaviour observations are limited and scarce.

Trophic preferences in the European ethmiids are shown in Table 2. As shown for other microlepidopterous groups, taxonomic division is corroborated by trophic preferences. While most of the species feed on Boraginaceae, some species-groups feed on Ranunculaceae, specifically on high mountain *Thalictrum* species. No host-plant records are known for *E. penyagolosella* but the species included in the *nigripedella* species-group, such as *E. chrysopygella* and *E. flavianella* (TREITSCHKE, 1832), are known to feed on those high-altitude plants and show an interesting biogeographical pattern as they are isolated in the highest Palaeartic mountain systems. Only one additional group, the *pyrausta* species-group, shares this scheme. In both cases, trophic and biogeographical patterns are also corroborated by a dark wing and body habitus in the adults and a diurnal flight activity, as in most high-altitude species; while most of the Boraginaceae-feeding ethmiids occur at lower altitudes, are nocturnal and have lighter wing patterns. Nevertheless, further knowledge of trophic behaviour and latitudinal and altitudinal distribution of Palaeartic ethmiids is needed to confirm such an ecological hypothesis.

Feeding on Boraginaceae or Ranunculaceae is not a common pattern among Lepidoptera and only a few species feed on these plant families. Feeding on both plant



Figs. 4–11: *Ethmia* spp., male genitalia. Figs. 4–5: *E. penyagolosella* sp. n. Figs. 6–7: *E. chrysopygella*. Figs. 8–9: *Ethmia* spp., male genitalia (valva). Fig. 8: *E. penyagolosella* sp. n. Fig. 9: *E. chrysopygella*. Figs. 10–11: *Ethmia* spp., male abdomen (segments I–III). Fig. 10: *E. penyagolosella* sp. n. Fig. 11: *E. chrysopygella*.



Figs. 12–19: *Ethmia* spp., female genitalia. Figs. 12–13: *E. penyagolosella* sp. n. Figs. 14–15: *E. chrysopygella*. Figs. 16–17: *Ethmia* spp., female genitalia (segment VII). Fig. 16: *E. penyagolosella* sp. n. Fig. 17: *E. chrysopygella*. Figs. 18–19: *Ethmia* spp., female genitalia (signum). Fig. 18: *E. penyagolosella* sp. n. Fig. 19: *E. chrysopygella*.

families, as in the Ethmiidae, is exceptional. No phylogenetic relationship is known between Boraginaceae and the tribe Ranunculeae (where *Thalictrum* species are placed), nor phytochemical convergences, but this trophic pattern is also recorded in the genus *Euchalcia* HÜBNER, 1821 („1816“) (Noctuidae), with some species feeding on Ranunculaceae (*E. variabilis* (PILLER & MITTER-

PACHER, 1783) and *E. bellieri* (KIRBY, 1900)) and others on Boraginaceae (*E. modestoides* POOLE, 1989 and *E. consona* (FABRICIUS, 1787)).

High-altitude ethmiids feeding on *Thalictrum* could be an appropriate group to bring some light on speciation processes in high mountain Microlepidoptera. The description of a new, probably endemic *Ethmia* from east-

ern Spain is therefore most interesting, the more so as it shows a close relationship to *E. chrysopygella*, a species from the xeromontane regions of central Europe (Alps), southern Russia and Azerbaijan. Most likely, long glacial and postglacial isolation processes have resulted in the splitting into two species, as already known in many other groups. Unfortunately, the ethmiids are not well known in southern Europe, and many Iberian mountain systems still remain unexplored. Prospection of potential contact areas between both species in northern Spain (especially in the Pyrenees) and other eastern Mediterranean refugia would be of much biogeographical interest.

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