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The *Ethmia terminella* group from the Canary Islands (Spain) and Morocco (Lepidoptera: Depressariidae, Ethmiinae)

P. Falck & O. Karsholt

Abstract

The *Ethmia terminella* group is reviewed. Three species and one subspecies are recognized: *E. terminella terminella* Fletcher, 1938, *E. terminella micropunctella* Amsel, 1955, *E. bennyi* Falck & Karsholt, sp. n. (Spain: Gran Canaria) and *E. pseudoterminella* Falck & Karsholt, sp. n. (Spain: Fuerteventura, Morocco). Adults and genitalia of these four taxa are illustrated. The taxonomic results are supported by the DNA barcodes from sequencing of the 658 bp fragment of the mitochondrial COI gene.
KEY WORDS: Lepidoptera, Depressariidae, Ethmiinae, *Ethmia*, new species, Canary Islands, Spain, Morocco.

El grupo de *Ethmia terminella* de las Islas Canarias (España) y Marruecos (Lepidoptera: Depressariidae, Ethmiinae)

Resumen

Se revisa el grupo de *Ethmia terminella*. Se reconocen tres especies y una subespecie: *E. terminella terminella* Fletcher, 1938, *E. terminella micropunctella* Amsel, 1955, *E. bennyi* Falck & Karsholt, sp. n. (España: Gran Canaria) y *E. pseudoterminella* Falck & Karsholt, sp. n. (España: Fuerteventura, Marruecos). Se ilustran los adultos y la genitalia de estas cuatro taxas. El resultado taxonómico es soportado por el código de barras del ADN mitocondrial desde la secuencia de un fragmento de 658 pb del gen para COI.
PALABRAS CLAVE: Lepidoptera, Depressariidae, Ethmiinae, *Ethmia*, nuevas especies, Islas Canarias, España, Marruecos.

Introduction

Ethmiinae are a moderately small subfamily of Lepidoptera with about 250 described species in five genera (HODGES, 1998: 138). Like several other family-groups of Gelechioidea Ethmiinae have led a rather tumultuous existence in the Lepidoptera system. Until the middle of the last century they were either placed in the Yponomeutidae or in the Oecophoridae, but since then there has been consensus that Ethmiinae are nested within the Gelechioidea. Here they have been considered as a separate family (e.g. SATTLER, 1967), a subfamily or a tribe of Elachistidae or (as followed here) a subfamily of Depressariidae (HEIKKILÄ *et al*., 2013).

The Palaearctic Ethmiinae were revised by SATTLER (1967). All European and North African species are referred to the genus *Ethmia* Hübner, [1819]. SATTLER (1967) listed 25 species from Europe, and it was not until 2003 that further European species were described (DOMINGO *et al*., 2003; KARSHOLT & KUN, 2003). There are currently 28 species of *Ethmia* in Europe (KUN, 2011),

14 of which are found in the Iberian Peninsula (VIVES MORENO, 2014: 132-133). This author listed two species from the Canary Islands: *E. quadrinotella* (Mann, 1861) and *E. bipunctella* (Fabricius, 1775).

SATTLER (1967) divided the Palaearctic *Ethmia* species into 23 species-groups, based on adult and genitalia morphology. Below we deal with the *Ethmia terminella* group which until now included only one species and one subspecies.

Material and methods

All specimens were attracted to artificial light. Label data are listed in a standardized way under each species, with the islands in alphabetic sequence, and the records in chronological order. Data on holotypes are cited literally from their labels.

A part of the material was subjected to DNA barcoding (sequencing of the 658 bp fragment of the mitochondrial COI gene) for detection of genetically distinct taxa and for obtaining molecular data for new species. The K2P divergences between the examined taxa were calculated using analytic tools in BOLD systems.

The photographs of specimens were taken with Canon EOS700D camera and Soptop SZN 6745 Trinocular zoom microscope and Toup Tek P10500A-E3 / E3ISPM05000KPA-E3 / 5.0MP USB3 camera. Those of the genitalia by using a Soptop CX40T Trinocular microscope and the same camera.

Abbreviations used

GP	Genitalia preparation
KL	Collection of Knud Larsen, Dyssegård, Denmark
PF	Collection of Per Falck, Neksø, Denmark
MNCM	Collection Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain
SMNK	Staatliches Museum für Naturkunde Karlsruhe, Germany
ZMUC	Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

Results

According to SATTLER (1967: 80) characteristics for the *Ethmia terminella* group are: Male genitalia are characterized by the divided uncus; posterior part of gnathos with rows of fine rounded spines; short rounded labis and cucullus strongly tapered towards apex. Female genitalia are characterized by triangular anterior apophysis, with broad base evenly tapered towards apex; antrum fusiform; bursa copulatrix without appendix and signum dome-shaped covered with spines. Adults are whitish to greyish with four black dots on thorax.

Ethmia terminella terminella Fletcher, 1938 (Figs 1-2)
Tinea sexpunctella Hübner, [1810] *nec* Fabricius, 1794. *Samml. eur. Schmett., Tin*.: pl. 44, fig. 304
Ethmia terminella Fletcher, 1938. *Entomologist's Rec. J. Var*., **50**(5): 53

Diagnosis: Characterized by the pure white forewing, with costal quarter uniform grey from base to near apex, and light grey on the dorsal quarter from near base to near termen, and an indistinct greyish marking just below laterally to the discal spot; 6 distinct black dots around the cell: 1 at base, 3 on vein R (at 1/3, 1/2 and 1 at cell apex (discal spot)); 2 dots on vein Cu; marginal dots distinctly black. Specimens from Spain are generally darker grey along costa and dorsum. In the male genitalia (Figs 6, 6a), the triangular posterior part of gnathos, and the short rounded labis are characteristic. In the female genitalia (Figs 10, 10a) tergite VIII with anterior margin sclerotized and sloping from near ostium bursae to ventral part of anterior apophysis; the relatively short, asymmetrical antrum with micro-spines in the exit area for ductus seminalis is characteristic.

Biology: The characteristic larva feeds on *Echium vulgare* L. (Boraginaceae).

Distribution: Most of Europe, apart from northernmost parts, North Africa and Turkey (SATTLER, 1967: 81). We were able to examine specimens in ZMUC from Tunisia and northern Morocco: Ouezzane, and a sympatric occurrence of *E. terminella* and *E. pseudoterminella* sp. n. is therefore possible. Not listed from Russia (SINEV, 2008: 53).

Ethmia terminella micropunctella Amsel, 1955 (Fig. 3)

Ethmia micropunctella Amsel, 1955. *Z. wien. ent. Ges*., **66**: 281, fig. 7

Holotype ♂, leg. H. Amsel [reverse side:] Ethmia micropunctella GU 3111, 13-III-1953 Jordan Valley Zerqa R.[iver] Colony C., 100 m below S.[ea]L.[level] at light Trevor Trought (SMNK). Paratype ♂, same data as holotype but GU 3182, and 16-II-1952, 107 m below S. L. (SMNK).

Diagnosis: Characterized by the white forewing, with few grey scales along costa and 4 small black dots. The genitalia (Fig. 7) do not differ from the nominotypical subspecies.

Biology: Early stages unknown. The type specimens were collected at an altitude of about 100 m below sea level.

Distribution: Only known from the type locality in Jordan, and probably also from Israel: Sea of Galilee (SATTLER, 1967: 81).

Remarks: In the genitalia preparations of the type specimens the phallus has not been removed, and it is not possible to see details of the cornuti.

Ethmia bennyi Falck & Karsholt, sp. n. (Fig. 4)

Holotype ♂: Spain, Gran Canaria, Pie de la Cuesta, 500 m, 4-23-III-2019, leg. P. Falck (ZMUC). Paratypes: Spain, Gran Canaria, Pie de la Cuesta, 500 m, 10 ♂♂, 7 ♀♀, 4-23-III-2019, leg. P. Falck, genitalia slide 3051PF, DNA sample Lepid Phyl 0169PF; Ayacata, 1400 m, 13 ♂♂, 11 ♀♀, 4-23-III-2019, leg. P. Falck, genitalia slides 2961PF, 2962PF, 2963PF, 2965PF, 2966PF, DNA sample Lepid Phyl 0168PF, 0170PF; El Sao, 110 m, 1 ♂, 4-23-III-2019, leg. P. Falck (PF, MNCN).

Description: Wingspan 17-21 mm. Labial palpus white, segment 3 dorsally mixed grey at tip; segment 2 laterally and dorsally mixed with grey. Antenna dark grey, dorsally whitish. Frons, collar, tegula, neck and thorax white, mixed dark grey. Forewing narrow, costa almost straight, apex pointed; white, with heavy suffusion of grey to dark grey, basal streak and costa more whitish; 4 small, diffuse black dots around the cell, 2 on vein R, at its middle and at cell apex (discal spot); 2 dots on vein Cu; just below the discal spot, medially a diffuse white marking and laterally a diffuse darker grey marking; marginal dots black, very small and indistinct; fringe white, with grey suffusion. Hindwing light grey. Abdomen grey, segment 1-3 dorsally light ochreous.

Genitalia ♂ (Figs 8, 8a): Uncus with almost parallel sides, split in posterior third. Tegumen rectangular with U-shaped incision in anterior part. Posterior part of gnathos subtriangular, covered with rounded spines; anterior part of gnathos with scattered tiny spines. Anellus funnel-shaped. Labis moderately slender, long and with rounded tip. Valva rectangular in basal half. Cucullus sharply narrowed to fine point. Sacculus angled about 145º. Phallus (Fig. 8a) bent almost 180º in basal part; cornuti a group of 12-14 (n=3) spines.

Genitalia ♀ (Figs 11, 11a): Posterior apophysis slightly longer than papilla analis; anterior apophysis short triangular, base wide. Sternite VIII almost divided by a heavily sclerotized posterior rectangular incision to ostium bursae, medial margins heavily sclerotized. Antrum slightly longer than segment VIII (length from tip of anterior apophysis to posterior margin), tapering towards ductus bursae, margins slightly curved, exit for ductus seminalis in the upper right side. Ductus bursae membranous, long, helical. Corpus bursae ovoid, with one elongate, dome-shaped signum, covered with spines.

Molecular diagnosis: Three specimens of *E. bennyi* were sequenced, resulting in DNA barcode fragments of 632 bp for one specimen and 631 bp for two specimens. The nearest neighbor to *E. bennyi* is *E. pseudoterminella* with 3.69 % divergence; to *E. terminella* the divergence is 5.45%. The barcodes

of *E. bennyi* exhibit 0 % intraspecific variation. The results support the status of *E. bennyi* as a distinct species.

Differential diagnosis: Characterized by the narrow forewing, with almost straight costa, the grey to dark grey color, and very indistinct markings. In the male genitalia the slender, long labis, and the relatively short cucullus are characteristic. In the female genitalia the long, symmetrical antrum, the shape of tergite VIII which is almost divided, and the heavy sclerotization of the margins of the colliculum are characteristic.

Biology: Unknown. The specimens were collected in spring at light.

Distribution: Known only from a few scattered localities in the southern half of Gran Canaria at altitudes between 120 m and 1400 m.

Etymology: The species is named after our good friend, the Danish lepidopterologist Benny Lynggård, who helped the first author on part of a collection trip to Gran Canaria.

Remark: Despite the lack of the 4 dots on thorax, *E. bennyi* is placed in the *terminella* group, because of similar genitalia morphology both in male and female, and because the nearest neighbors in DNA barcodes are species belonging to this group.

Ethmia pseudoterminella Falck & Karsholt, sp. n. (Fig. 5)

Holotype ♂: Spain, Fuerteventura, Corralejo, 10 m, 27-II-19-III-2018, leg. P. Falck (ZMUC). Paratypes: Spain, Fuerteventura, 7 km NW Betancuria, Playa del Valle, 1 ♂, 19-I-2002, leg. O. Karsholt, genitalia slide 5349OK (ZMUC); Betancuria, 400 m, 1 ♂, 1 ♀, 27-II-19-III-2018, leg. P. Falck, genitalia slide 2761PF; Caldereta, 120 m, 1 ♂, 1 ♀, 27-II-19-III-2018, leg. P. Falck, genitalia slide 2969PF, DNA sample Lepid Phyl 0061PF; Corralejo, 10 m, 7 ♂♂, 4 ♀♀, 27-II-19-III-2018, leg. P. Falck, genitalia slides 2763PF, 3052PF; Lajares, 50 m, 7 ♂♂, 3 ♀♀, 27-II-19-III-2018, leg. P. Falck, genitalia slides 2745PF, 2970PF, DNA sample Lepid Phyl 0063PF (PF, MNCN); Barranco tras del Lomo, 100 m, 1 ♂, 25-26-II-2019, leg. K. Larsen (KL). Morocco, Tafrault, 1000 m, 1 ♀, 23-24-III-2005, leg. O. Karsholt; High Atlas, Ouirgane, 920 m, 2 ♀♀, 30-IV-5-V-2016, leg. C. Hviid, K. Larsen & D. Nilsson, genitalia slide 5360OK, genitalia slide 3054PF, DNA sample Lepid Phyl 0171PF; High Atlas, 7 km S Ouirgane, 950 m, 5 ♂♂, 1-5-V-2016, leg. C. Hviid, K. Larsen & D. Nilsson (all ZMUC).

Description: Wingspan 15-21.5 mm. Labial palpus white, segment 2 dark grey dorsally and laterally, posteriorly pure white to near segment 3. Antenna grey. Frons, collar, tegula and neck white. Thorax white with 4 indistinct dots. Scapula white with few dark grey scales. Forewing with costa slightly arched, apex pointed; color at costal third dark grey to near apex; dorsal third grey to dark grey from near base to near termen; dorsal part of base, mid-third of wing and apical area white, with suffusion of dark grey, especially between the two distal dots; 5 distinct dots around the cell: 1 at base, 2 on vein R (at 1/3 and at cell apex (discal spot)); 2 dots on vein Cu; terminal dots black, distinct. Fringe white with suffusion of grey scales. Hindwing grey, lighter towards base. Abdomen grey.

Genitalia ♂ (Figs 9, 9a): Uncus barrel-shaped, split in posterior third. Tegumen rectangular with U-shaped incision in anterior part. Posterior part of gnathos subtriangular, covered with rounded spines; anterior part of gnathos covered with small spines. Anellus funnel-shaped. Labis moderately short with rounded tip. Valva rectangular in basal half. Cucullus sharply narrowed to parallel-sided beak-like apex. Sacculus curved about 145º. Phallus (Fig. 9a) bent 180º in basal part; cornuti a group of 18-21 spines (n=2).

Genitalia ♀ (Figs 12, 12a): Posterior apophysis slightly longer than papilla analis; anterior apophysis short triangular, base wide. Sternite VIII with a posterior rectangular incision to ostium bursae, anterior margin sclerotized, sloping from middle down to apophysis anterior on right side. Antrum slightly shorter than segment VIII (length from tip of anterior apophysis to posterior margin), tapering towards ductus bursae, left margin with a bulb like thickening opposite to ductus seminalis, right margin almost straight, exit for ductus seminalis in the upper right side. Ductus bursae membranous, long, helical. Corpus bursae ovoid, with one elongate, dome-shaped signum, covered with spines.

Molecular diagnosis: Two specimens of *E. pseudoterminella* were sequenced, resulting in 658 bp, full-length DNA barcode fragment for both specimens. The nearest neighbor to *E. pseudoteminella* is *E. bennyi* with a 3.69% divergence; to *E. terminella* the divergence is 4.89%. The barcodes of *E. pseudoterminella* exhibit 0.31% intraspecific variation. The results support the status of *E. pseudoterminella* as a distinct species.

Differential diagnosis: External appearance of *E. pseudoterminella* sp. n. resembles *E. terminella* Fletcher, 1938, but differs by the suffusion with darker grey scales in the white area of the forewing and by having only five (not six) black dots in the forewing (the lack of black dot on vein R at 1/2 is characteristic for *E. pseudoterminella* sp. n.). In the male genitalia, a barrel-shaped uncus, and the medium-sized (compared to other species in the *terminella* group) labis are characteristic. In the female genitalia, the asymmetric antrum without micro spins, and the shape of sternite VIII are characteristic.

Biology: Unknown. The specimens were collected in early spring at light.

Distribution: Known from Spain (Fuerteventura) and Morocco.

Etymology: The new species most resembles *E. terminella. Pseudo* means false in Latin.

Discussion

Due to their relatively large size and distinct and/or colorful wing markings Ethmiinae are well studied compared to several other groups of the so-called Microlepidoptera, and the discovery of two undescribed species from the Canary Islands is therefore surprising. Our study is primarily based on morphology, and the use of DNA barcoding supported these results. We find it likely that the use of the latter method in other species groups of *Ethmia* may detect cryptic diversity, but that is beyond the aims of the present paper.

Although the early stages of the new species are still unknown it is probably that their larvae may live on *Echium*, which is also the host plant of *E. terminella* and several other *Ethmia* species (SATTLER, 1967: 18-19). There is a high diversity of endemic *Echium* species in the Canary Islands (ARECHAVALETA *et al*., 2010: 150-151), and at least *E. bennyi* sp. n. may be connected to one of these.

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BIBLIOGRAPHY

AMSEL, H. G., 1955.– Kleinschmetterling vom Jordantal.– *Zeitschrift der Wiener Entomologischen Gesellschaft,* **66**: 276-282, pl. 27.

ARECHAVALETA, M., RODRÍGUEZ, S., ZURITA, N. & GARCÍA, A., 2010.– *Lista de especies silvestres de Canarias (hongos, plantas y animales terrestres)* 2009: 577 pp. Gobierno de Canarias, La Laguna. Available from http://www.gobiernodecanarias.org/ http://www.gobiernodecanarias.org/medioambiente/piac/descargas/Biodiversidad/Listas-Especies/Lista_Especies_Silvestres.pdf

DOMINGO, J., HUEMER, P. & BAIXERAS, J, 2003.– *Ethmia penyagolosella* sp. n. (Lepidoptera: Ethmiidae), a new species from Spain.– *Nachrichten des Entomologischen Verein Apollo* (N. F.), **24**: 183-188.

FLETCHER, T. B., 1938.– Names of Microlepidoptera.– *The Entomologist's Record and Journal of Variation*, **50**(5): 53-54.

HEIKKILÄ, M., MUTANEN, M., KEKKONEN, M. & KAILA, L. 2013.– Morphology reinforces proposed molecular phylogenetic affinities: a revised classification for Gelechioidea (Lepidoptera).– *Cladistics,* **30**: 563-589.

HODGES, R. W., 1998.– The Gelechioidea. Pp. 131-158.– *In* N. P. KRISTENSEN (ed.): Lepidoptera, moths and butterflies 1: Evolution, systematics and biogeography.– *Handbook of Zoology,* **4**(35): 1-491. Berlin & New York.

HÜBNER, J., [1810] 1796.– *Sammlung europäischer Schmetterlinge, Tineae*: pl. 44, figs 301-307. Augsburg.

KARSHOLT, O. & KUN, A., 2003.– A new species of *Ethmia* Hübner, 1819 from the Greek island of Rhodes (Ethmiidae).– *Nota lepidopterologica,* **25**: 207-212.

KUN, A., 2004-2019.– Ethmiinae.– *In* O. KARSHOLT & E. J. van NIEUKERKEN (eds): Lepidoptera.– *Fauna Europaea* version 2.4, https://fauna-eu.org/ [Ethmiinae last updated January 2011].

SATTLER, K., 1967.– Ethmiidae.– *In* H. G. AMSEL, F. GREGOR & H. REISSER (eds). *Microlepidoptera Palaearctica*, **2**(1): I-XI, 1-185; **2**(2): pls. 1-106. Georg Fromme & Co., Wien.

SINEV, S. Yu., 2008.– Gelechiidae. Pp. 52–53, 325.– *In* S. Yu. SINEV (ed.) 2008. *Katalog Cheshuekrylykh (Lepidoptera) Rossii. Catalogue of the Lepidoptera of Russia*. 424 pp. KMK Scientific Press Ltd., St. Petersburg & Moscow.

VIVES MORENO, A., 2014.– *Catálogo sistemático y sinonímico de los Lepidoptera de la Península Ibérica, de Ceuta, de Melilla y de las islas Azores, Baleares, Canarias, Madeira y Salvajes*: 1184 pp. Suplemento a SHILAP Revista de lepidopterología, Improitalia, Madrid.

*P. F.
Aarsdalevej, 22
DK-3730 Neksø
DINEMARCA / *DENMARK*
E-mail: per.falck@live.dk

O. K.
Zoologisk Museum
Natural History Museum of Denmark
Universitetsparken, 15
DK-2100 Copenhagen
DINAMARCA / *DENMARK*
E-mail: okarsholt@snm.ku.dk

*Autor para la correspondencia / *Corresponding author*

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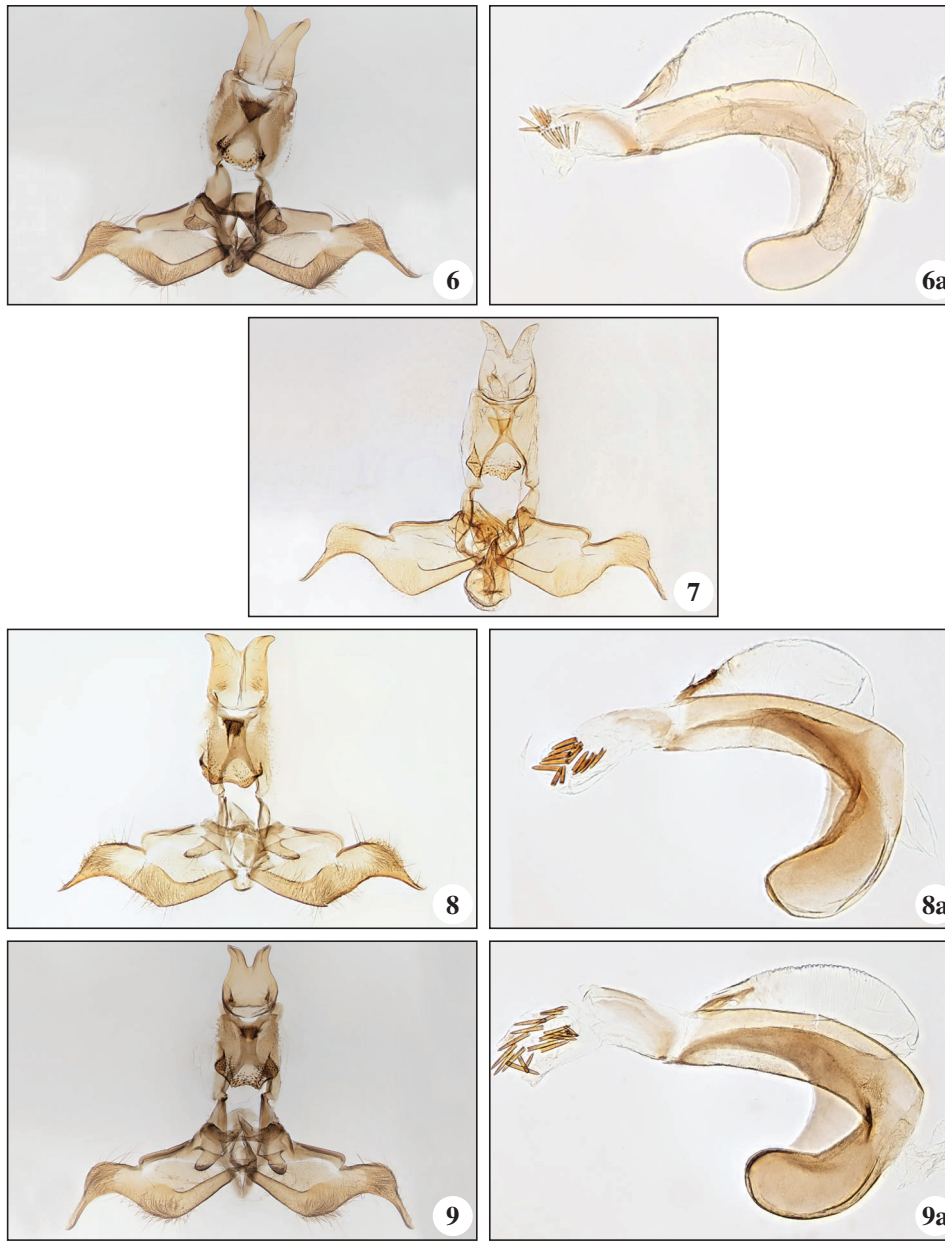
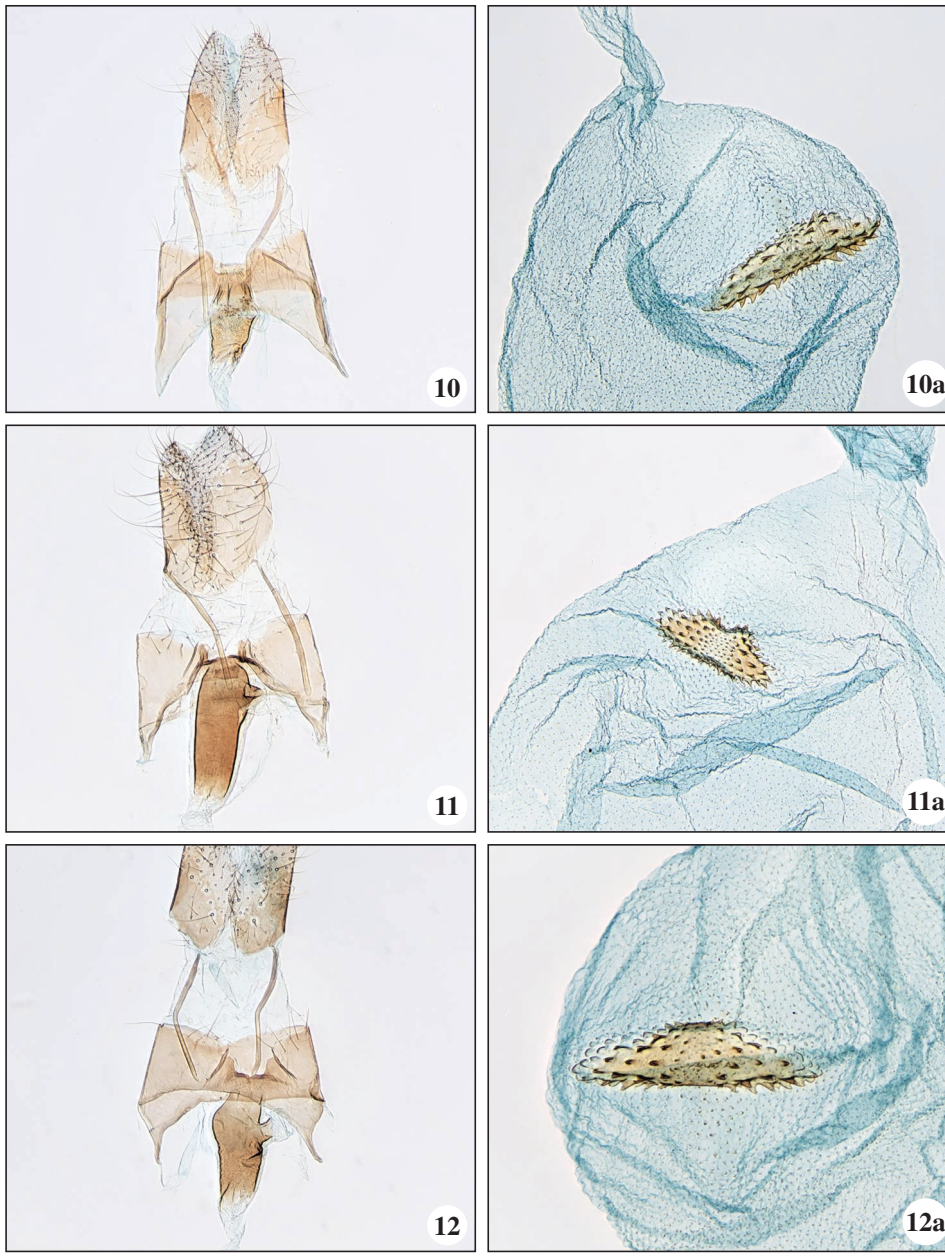
Figs 1-5.– 1. *Ethmia terminella terminella* Fletcher, 1938, ♂, Denmark, 19 mm. **2.** *Ethmia terminella terminella* Fletcher, 1938, ♂, mainland Spain, 19 mm. **3.** *Ethmia terminella micropunctella* Amsel, 1955, ♂, Jordan Valley, 19.5 mm. Holotypus. **4.** *Ethmia bennyi* Falck & Karsholt, sp. n., ♂, Gran Canaria, 21 mm. **5.** *Ethmia pseudoterminella* Falck & Karsholt, sp. n., ♂, Fuerteventura, 20 mm.



Figs 6-9.– 6. *Ethmia terminella terminella* Fletcher, 1938, Denmark, ♂, GP2759PF. **6a.** Phallus, Denmark, GP2968PF. **7.** *Ethmia terminella micropunctella* Amsel, 1955, Jordan Valley, ♂, GP3111 H. G. Amsel. Holotypus. **8.** *Ethmia bennyi* Falck & Karsholt, sp. n., Gran Canaria, ♂, GP2965PF. **8a.** Phallus, Gran Canaria, GP2962PF. **9.** *Ethmia pseudoterminella* Falck & Karsholt, sp. n., Fuerteventura, ♂, GP2745PF. **9a.** Phallus, Fuerteventura, GP2970PF.



Figs 10-12.– 10. *Ethmia terminella terminella* Fletcher, 1938, Denmark, ♀, GP3049PF. **10a.** Signum, GP3049PF. **11.** *Ethmia bennyi* Falck & Karsholt, sp. n., Gran Canaria, ♀, GP3051PF. **11a.** Signum, GP3051PF. **12.** *Ethmia pseudoterminella* Falck & Karsholt, sp. n., Fuerteventura, ♀, GP3052PF. **12a.** Signum, Fuerteventura, GP2761PF.