

## ***Depressaria infernella* Corley & Buchner, a new Iberian species of the *Depressaria douglasella* group (Lepidoptera: Depressariidae)**

M. F. V. Corley, P. Buchner & S. Ferreira

### **Abstract**

*Depressaria infernella*, a new species most similar to *D. cinderella* Corley, 2002 is described from the mountains of north-east Portugal and Sierra de Gredos in Spain. Photos of adults and male and female genitalia of the new species and *D. cinderella* are given. Morphological and genetic characteristics that demonstrate the distinctiveness of *D. infernella* from other species of *Depressaria* are presented.

KEY WORDS: Lepidoptera, Depressariidae, *Depressaria*, new species, Portugal, Spain.

*Depressaria infernella* Corley & Buchner, uma nova espécie ibérica do grupo *Depressaria douglasella* (Lepidoptera: Depressariidae)

### **Resumo**

*Depressaria infernella*, uma nova espécie muito similar a *D. cinderella* Corley, 2002, é descrita das montanhas do nordeste de Portugal e da Serra de Gredos em Espanha. Os adultos e a genitália do macho e da fêmea da espécie nova e de *D. cinderella* são ilustradas fotograficamente. As características morfológicas e genéticas que permitem a distinção de *D. infernella* das restantes espécies de *Depressaria* são apresentadas.

PALABRAS CHAVE: Lepidoptera, Depressariidae, *Depressaria*, nova espécie, Portugal, Espanha.

*Depressaria infernella* Corley & Buchner, una nueva especie ibérica del grupo *Depressaria douglasella* (Lepidoptera: Depressariidae)

### **Resumen**

Se describe *Depressaria infernella*, una nueva especie muy similar a *D. cinderella* Corley, 2002 de las montañas del nordeste de Portugal y de la Sierra de Gredos en España. Los adultos y la genitalia del macho y de la hembra de la nueva especie y de *D. cinderella* son ilustradas fotograficamente. Son presentadas las características morfológicas y genéticas que permiten la distinción de *D. infernella* de las restantes especies de *Depressaria*.

PALABRAS CLAVE: Lepidoptera, Depressariidae, *Depressaria*, nueva especie, Portugal, España.

### **Introduction**

Within the large and diverse genus *Depressaria* Haworth, 1811 there are a number of clearly defined groups (HANNEMANN, 1953). One of these is the *Depressaria douglasella* group, characterised by relatively short forewings with a number of mainly short blackish lines associated with the wing-veins and a pale spot at end of discal cell, male genitalia with clavus and cuiller (a

process arising from end of sacculus and directed toward or across the costa of valva), aedeagus without cornuti (HANNEMANN, 1953). In contrast to most *Depressaria* many of the species do not hibernate in the adult stage (PALM, 1989). There are some fairly easily identified species in the group, but there are also a number of species that present problems of identification. Ideally a full revision of the entire group should be made, but knowledge of the group is too limited for this to be practicable at present. The reasons for this lack of knowledge are outlined below. In the meantime, any additional taxa that can be clearly established will make the ultimate goal of a full revision more feasible, so one such species is described here.

Taxonomic problems in the *D. douglasella* group stem from several causes. There is a general similarity in external appearance between different species, but there is also a degree of infraspecific variation, not just in external appearance, but also in genitalia. Genitalia differences between species are often slight, particularly in females. More than one species may occur at the same time in a single locality, so that there can be a problem establishing which males and females are conspecific. Some species that have been accepted for many years are in fact junior synonyms, but barcode studies indicate that some of the more widespread species may include additional taxa (P. B., own studies). For a few taxa type material is unavailable. All these factors have contributed to the taxonomic confusion.

The difficult species fall into two subgroups, those including and closely related to *D. douglasella* Stainton, 1849 and *D. sordidatella* Tengström, 1848 in which the cuiller is forked at the apex or at least with a small tooth (rarely absent) on the outer margin. These species are for the most part widespread. The *D. incognitella* subgroup species have a smooth, unforked cuiller; the species mainly inhabit montane areas and have restricted distribution, only *D. incognitella* Hannemann, 1990 extends from Croatia, Greece, central Italy and the Alps into northern Spain. The other species are *D. nemolella* Svensson, 1982 (type locality: Sweden, island of *Gotland*) and *D. cinderella* Corley, 2002 (Portugal and Spain). In this paper we describe a new species, closely related to *D. cinderella*, also from Portugal and Spain.

## Abbreviations

MFN	Museum für Naturkunde, Berlin, Germany
NHMUK	Natural History Museum, London, U. K.
NMPC	National Museum, Prague, Czech Republic
ZMUC	Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

## Methods

Most specimens have been captured at 125 w mercury vapour light over a white sheet, with additional material from larvae found by searching in daytime. Dissections were made using standard techniques (ROBINSON, 1976). DNA extraction and sequencing was done following the procedures in CORLEY *et al.* (2018). The average divergence (uncorrected p-distance) between the sequence of Portuguese specimens and sequences available in BOLD was calculated in MEGA v.5.2.1 (TAMURA *et al.*, 2011).

### *Depressaria infernella* Corley & Buchner, sp. n.

Material examined: Holotype ♂: PORTUGAL, Serra da Estrela, Poço do Inferno, 13-VI. ex 1-V-[20]03, M. F. V. Corley, *Conopodium*. (Foto 6672 ME Depressariinae, P. Buchner). To be deposited in NHMUK.

Paratypes: PORTUGAL, 1 ♂, Serra da Estrela, Poço do Inferno, 9-IX-2001, M. F. V. Corley, gen. prep. 1620 (Corley coll.); 1 ♀, Serra da Estrela, Poço do Inferno, 9-IX-2001, M. F. V. Corley, gen. prep. 1979 (Corley coll.); 1 ♂, Serra da Estrela, Poço do Inferno, 16-VI ex 1. V-[20]03, M. F. V.

Corley, *Conopodium*. Corley gen. prep. 1940 (Corley coll.); 2 ♂♂, Serra da Estrela, Poço do Inferno, 18-VI ex l. V-[20]03, M. F. V. Corley, *Conopodium*. (Fotos 6671, 6675 ME Depressariinae, det./rev. P. Buchner); 1 ♀, Serra da Estrela, Poço do Inferno, 24-VI- ex l. V-[20]03, M. F. V. Corley, *Conopodium*. Corley gen. prep. 1951 (Corley coll.); 1 ♀, Serra da Estrela, Vale de Zêzere, Albergaria, 1500 m, 5-VIII-2011, M. Corley (Corley coll.). Corley gen. prep. 5653, specimen barcoded (INV00786); 1 ♂, Trás-os-Montes, Serra de Alvão, Arnal, 2-IX-2002, M. F. V. Corley, gen. prep. 1778 (Corley coll.); 1 ♂, Trás-os-Montes, Montalegre, Serra do Larouco, 21-IX-2005, M. F. V. Corley, gen. prep. 2495 (Corley coll.). SPAIN, 1 ♂, Ávila, Sierra de Gredos, 15 km SSW Hoyos del Espinos, 1720 m, 27-28-VII-1988, leg. M. Fibiger, Corley gen. prep 1835 (ZMUC); 1 ♂, Ávila, Sierra de Gredos, 15 km SSW Hoyos del Espinos, 1720 m, 27-28-VII-1988, leg. M. Fibiger. (Foto 2723 ME Depressariinae, det. / rev. P. Buchner). 1 ♂, Prov[incia de] Ávila, S[ier]ra de Gredos, Alman[z]or, 15-20-VII-1999, leg. Dr. U. Koschwitz (MFN) (Foto 6848 ME Depressariinae, det. / rev. P. Buchner); 2 ♀♀, Prov[incia de] Ávila, S[ier]ra de Gredos, Almanzor, 15-20-VII-1999, leg. Dr. U. Koschwitz (MFN) (Fotos 6846, 6847 ME Depressariinae, det. / rev. P. Buchner).

To avoid confusion only dissected specimens have been included as paratypes.

Description: Adult. (Figs 1-3, 5). Wingspan 18-18.5 mm. Head with brownish-black scales with white tips on neck and crown, face white. Labial palp segment 3 four-fifths length of segment 2, segment 2 whitish with two grey-brown bands, outer side with additional grey-brown scales often obscuring bands, upper edge white, segment 3 with two blackish rings, not always distinct due to mixture of whitish and dark brown scales in middle of segment, tip white to buff. Antenna with scape blackish, flagellum dark grey-brown with narrow deep brown rings. Thorax blackish anteriorly, white posteriorly, position of boundary variable, tegulae with some buff scales. Forewing deep grey-brown, with scales more or less tipped blackish; whitish grey scales thinly scattered over most of wing, absent from area between fold and dorsum before middle, more concentrated between cell and costa and at middle of dorsum and forming a spot in middle of cell and a larger one at end, an ill-defined curved fascia beyond end of cell, and a series of spots between veins to termen before terminal spots; blackish brown spots at extreme base of costa and dorsum; white spot on costa following basal spot; black streaks at base of cell and in middle between two whitish cell-spots, another between second cell streak and costa, one on costa at middle, interrupted streaks between veins to costa, narrow streaks between veins to termen, spots on margin between vein-ends from costa at three-quarters around termen; cilia light grey, with deep grey cilia line. Hindwing pale grey, slightly darker posteriorly; cilia light grey with two weak cilia lines; underside with series of blackish spots around termen. Abdomen light grey.

Variation: The appearance of the crown of the head varies according to the length of the white tip of the scales. The extent of white on the thorax also varies according to how far the dark scales extend.

Male genitalia (Figs 7, 8): Gnathos from broad base, slightly longer than wide; socii as wide as long, divergent with shallow notch between them; valva with costal margin slightly convex in basal half, cuiller angled outwards, straight, smooth, tapering evenly, curved inwards just before it crosses costal margin, with about one-fifth of its length projecting beyond costa, pointed; clavus without hairs at base, especially on inner side, otherwise hairy with long hairs exceeding anellus; anellus slightly longer than wide, widest at two-thirds, not or hardly notched at apex; saccus with margins slightly concave, apex rounded; aedeagus slender, slightly curved in basal half, very slightly expanded beyond middle, tapering at four-fifths to parallel-sided apex.

Female genitalia (Figs 11, 13-15): Apophyses posteriores as long as segment VIII, apophyses anteriores short; segment VIII with characteristic lobes developed antero-laterally, posterior margin slightly concave, anterior margin of tergite VIII deeply excavated; ostium near posterior margin with broad sclerotised curved lip tapering laterally to a narrow fold, in lateral view this lip is strongly protruding; ductus bursae without sclerotisation, posteriorly straight, towards corpus bursae with a single spiral twist, corpus bursae elliptical, signum large, rhomboidal, sometimes folded and then appearing triangular, covered with triangular teeth.

Diagnosis: *D. infernella* and *D. cinderella* are closely related and occupy nearly contiguous regions. *D. infernella* is characterised by the deep grey-brown colouring with whitish grey markings. The black streaks are inconspicuous against the dark ground colour. *D. cinderella* (Figs 4, 6) has similar colouring, but has some whitish scales in area between fold and dorsum and for this reason appears more grey. In male genitalia, *D. cinderella* differs from *D. infernella* in the absence of hairs on the clavus (Figs 7-10). Female genitalia differ in the shape of the anterior margin of tergite VIII, deeply excavated in *D. infernella*, slightly concave in *D. cinderella*. DNA barcode from the specimen from Serra da Estrela exhibited a distinct haplotype of the partial COI gene sequence with *D. cinderella* being the most closely related species (uncorrected p-distance 2.7%) and other species including *D. douglasella* with sequences available with over 3.5% divergence (Table 1).

**Table 1.**— Estimates of Net Evolutionary Divergence between Groups of Sequences. The number of base differences per site from estimation of net average between groups of sequences are shown. Standard error estimate(s) are shown above the diagonal. The analysis involved 13 nucleotide sequences. Codon positions included were 1st+2nd+3rd+Noncoding. All ambiguous positions were removed for each sequence pair. There were a total of 658 positions in the final dataset. BOLD code: accession codes of BOLD database (<http://www.boldsystems.org>).

	<i>D. infernella</i>	<i>D. cinderella</i>	<i>D. incognitella</i>	<i>D. nemolella</i>	<i>D. sordidatella</i>	<i>D. douglasella</i>	<i>D. libanotidella</i>	<i>Agonopterix scopariella</i>	BOLD code
<i>D. infernella</i>		0.6%	0.7%	0.8%	0.7%	0.8%	1.0%	1.1%	IBILP466-19
<i>D. cinderella</i>	2.6%		0.6%	0.6%	0.6%	0.7%	1.0%	1.0%	DEEUR311-12, DEEUR306-12, DEEUR325-12
<i>D. incognitella</i>	4.0%	2.4%		0.7%	0.6%	0.7%	1.0%	1.0%	PHLAB845-10, PHLAB846-10, DEEUR171-11
<i>D. nemolella</i>	4.6%	2.9%	3.2%		0.8%	0.9%	1.0%	1.0%	LEFIK064-10
<i>D. sordidatella</i>	4.0%	2.7%	2.7%	4.0%		0.6%	1.0%	1.0%	LEFIL707-10, TYPFN061-11
<i>D. douglasella</i>	5.0%	3.5%	3.8%	4.9%	2.4%		1.0%	1.1%	LEFIL625-10
<i>D. libanotidella</i>	8.1%	7.2%	7.4%	7.6%	7.4%	8.2%		0.9%	LEFIK559-10
<i>Agonopterix scopariella</i>	8.5%	7.1%	7.8%	7.8%	7.3%	8.2%	7.1%		IBILP112-17

*D. incognitella* has male genitalia with apical part of cuiller not angled as it crosses costa of valva and not much tapered. *D. nemolella* has a relatively short and stout aedeagus and hairy clavus not exceeding the anellus. In the female genitalia both *D. incognitella* and *D. nemolella* lack the antero-lateral lobes on segment VIII which are present in *D. infernella* and *D. cinderella*, although they are not figured in the drawing in CORLEY (2002).

Larvae of *D. cinderella* have greenish pinacula and feed on basal leaves of *Conopodium* before flowers are available (CORLEY, 2002). The host-plant *Conopodium capillifolium* given in CORLEY (2002) is a misidentification, but the *Conopodium* species in question remains unidentified.

Larva: Final instar. Light green, three dark green dorsal lines; head yellowish with four blackish dots posteriorly; prothoracic plate green, with black “square-bracket” markings on either side posteriorly, reduced to four dots when body retracted, two small <-shaped markings laterally; legs green; anal plate green; pinacula fine, black.

Biology: Host-plant *Conopodium majus*, feeding from a spinning among stem leaves, flowers or

developing seeds. Larvae have been found in late May; adults from late June to September. It has been found at altitudes from 920 m to 1500 m in Portugal, and up to 1800 m in Spain.

Distribution: Currently known from inland northern Portugal from Serra da Estrela (Beira Alta) to Serra do Alvão and Serra do Larouco (Trás-os-Montes) and in Spain in Sierra de Gredos (Ávila).

Etymology: The name *infernella* is derived from the type locality Poço do Inferno (Well of Hell) in Serra da Estrela, central Portugal, but also reflects the infernally difficult taxonomy of the *Depressaria douglasella* group.

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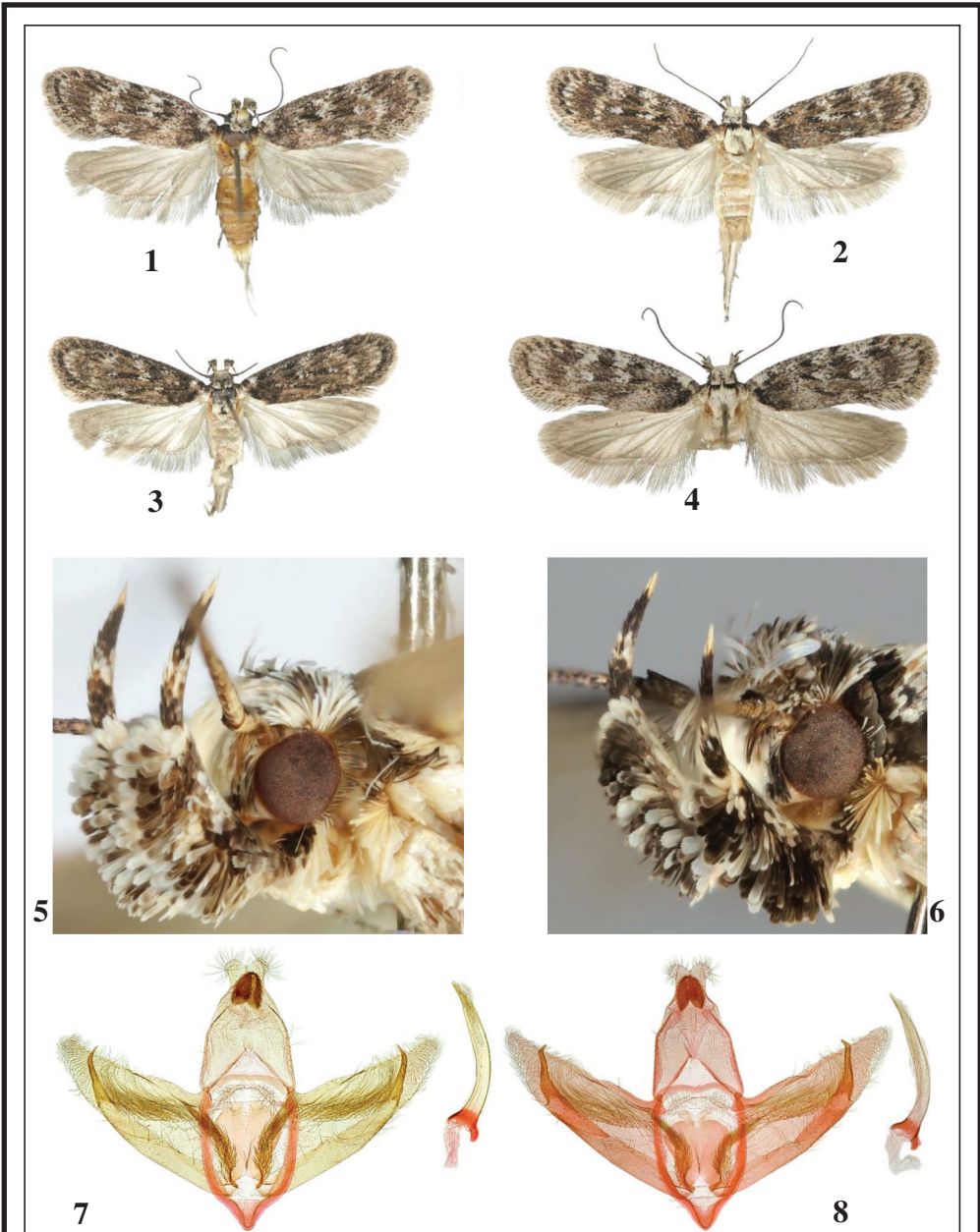
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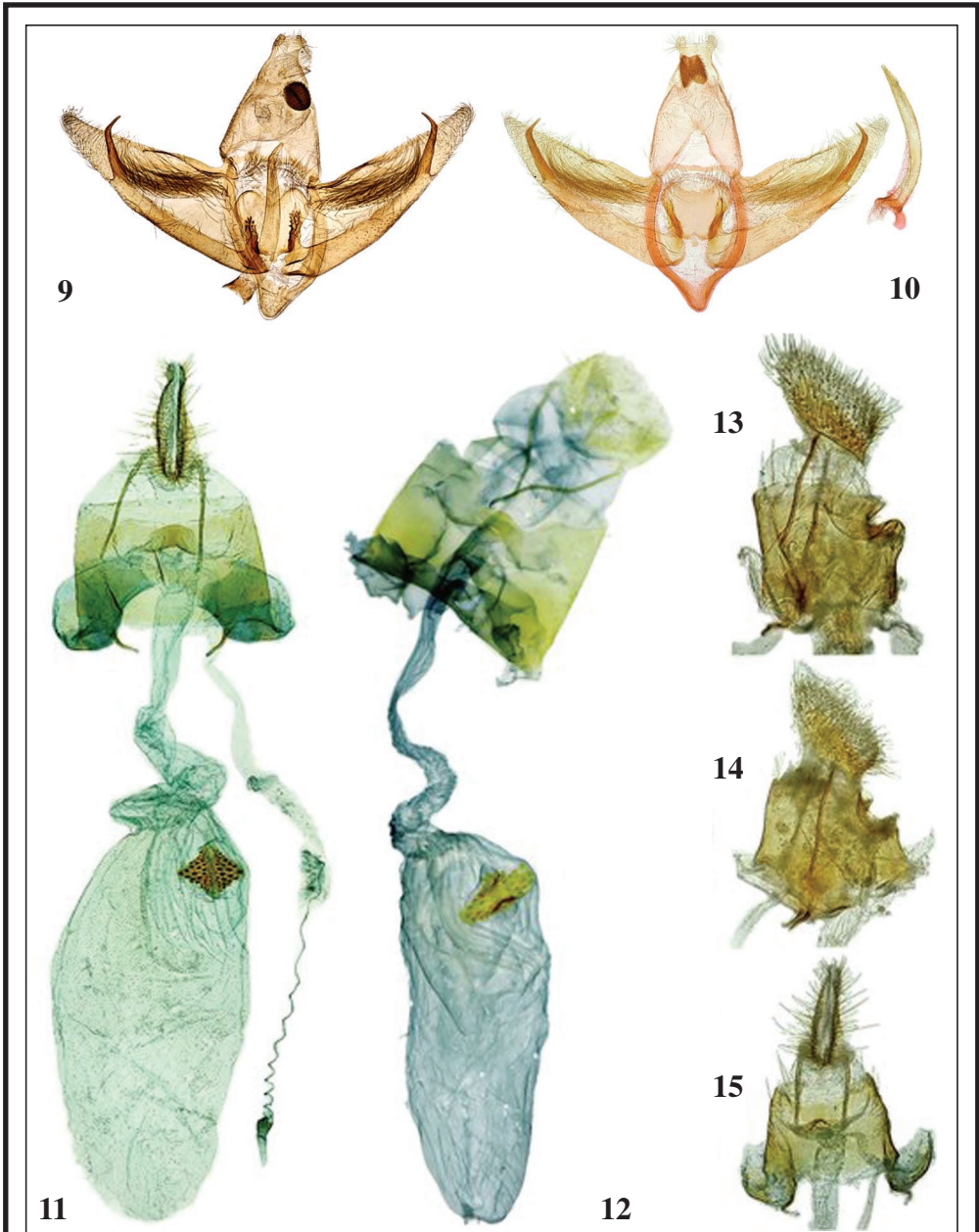
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**Figs 1-8.**— Adults: **1-3.** *Depressaria infernella* Corley & Buchner, sp. n., paratypes; **4.** *Depressaria cinderella* Corley. **5-6.**— Heads: **5.** *Depressaria infernella* Corley & Buchner, sp. n., paratype; **6.** *Depressaria cinderella* Corl **7-8.** Male genitalia: **7.** *Depressaria infernella* Corley & Buchner, sp. n., holotype; **8.** *Depressaria infernella* Corley & Buchner, sp. n., paratype.



**Figs 9-15.**— Male genitalia: **9-10.** *Depressaria cinderella* Corley. **11-15.** Female genitalia: **11.** *Depressaria infernella* Corley & Buchner, sp. n., paratypes; **12.** *Depressaria cinderella* Corley, paratype **13-14.** Segment VIII, lateral view: *Depressaria infernella* Corley & Buchner, sp. n., paratypes; **15.** Segment VIII, ventral view: *Depressaria infernella* Corley & Buchner, sp. n., paratype.