

New faunistic and taxonomic insights on little known Crambidae from forested habitats of Italian Peninsula (Lepidoptera: Pyraloidea)

S. Scalercio, A. Ienco & S. Greco

Abstract

We provided new distribution data and taxonomic notes concerning eleven Crambidae species new or little known for the Italian fauna. Most records were collected in Calabria, the southernmost region of peninsular Italy, where forested habitats were surveyed during last years. Some accessory data were mined from Barcode of Life Data System (BOLD) and were used to refine the distribution of treated species. In detail, we found three species new for Italian fauna: *Evergestis subfuscalis* (Staudinger, 1870), *Udea languidalis* (Eversmann, 1842), and *Hyperlais siccalis* (Guenée, 1854). Three species not recorded in peninsular Italy so far: *Cynaeda gigantea* (Wocke, 1871), *Evergestis dumerlei* Leraut, 2003, and *Catoptria staudingeri* (Zeller, 1863). Four species not recorded in southern Italy so far, *Evergestis infirmalis* (Staudinger, 1870), *Cynaeda dentalis* ([Denis & Schiffermüller], 1775), *Paratalanta pandalis* (Hübner, 1796), *Hodebertia testalis* (Fabricius, 1794). *Evergestis sophilis* (Fabricius, 1787) was for the first time recorded in Calabria. Barcoding analysis allowed us to confirm the status of *Evergestis subfuscalis* as bona species, eastern vicariant of *E. mundalis*. Furthermore, we underlined the needs of a revision of the *Udea fimbriatralis* species group as barcodes of western and eastern European specimens appear to be intermingled, suggesting the presence of one unique variable species. In conclusion, the importance of the Italian peninsula as a bridge between western and eastern European faunas was remarked.

KEY WORDS: Lepidoptera, Pyraloidea, *Evergestis subfuscalis*, *Udea languidalis*, *Hyperlais siccalis*, fauna, barcoding, Calabria, Italy.

Nuevos conocimientos faunísticos y taxonómicos sobre los Crambidae poco conocidos de los hábitats boscosos de la Península Italiana (Lepidoptera: Pyraloidea)

Resumen

Proporcionamos nuevos datos de distribución y notas taxonómicas con respecto a once especies de Crambidae nuevas o poco conocidas para la fauna italiana. La mayoría de los registros fueron colectados en Calabria, la región más meridional de Italia peninsular, donde los hábitats boscosos fueron registrados durante los últimos años. Algunos datos accesorios fueron extraídos del código de barras genético “Life Data System (BOLD)” y fueron usados para afinar la distribución de especies tratadas. En detalle, encontramos tres especies nuevas para la fauna italiana: *Evergestis subfuscalis* (Staudinger, 1870), *Udea languidalis* (Eversmann, 1842) y *Hyperlais siccalis* (Guenée, 1854). Cuatro especies no registradas, hasta ahora, en Italia peninsular: *Cynaeda gigantea* (Wocke, 1871), *Evergestis dumerlei* Leraut, 2003 y *Catoptria staudingeri* (Zeller, 1863). Tres especies no registradas, hasta ahora, en el sur de Italia, *Evergestis infirmalis* (Staudinger, 1870), *Cynaeda dentalis* ([Denis & Schiffermüller], 1775), *Paratalanta pandalis* (Hübner, 1796), *Hodebertia testalis* (Fabricius, 1794). *Evergestis sophilis* (Fabricius, 1787) fue registrado por primera vez en Calabria.

El análisis con el código de barras genético permitió que confirmáramos el estado de *Evergestis subfuscalis* como buena especie vicariante oriental de *E. mundalis*. Además, subrayamos la necesidad de una revisión de la especie de *Udea fimbriatralis* cuando se agrupan con el código de barras genético de las muestras europeas occidentales y orientales parecen estar mezclados, indicando la presencia de una única clase variable. En conclusión, se comenta la importancia de la península italiana como un puente entre faunas europeas occidentales y orientales.

PALABRAS CLAVE: Lepidoptera, Pyraloidea, *Evergestis subfuscalis*, *Udea languidalis*, *Hyperlais siccalis*, fauna, código de barras genético, Calabria, Italia.

Introduction

Recent papers demonstrated how the Pyraloidea fauna in Italy is far from being sufficiently known. To our knowledge, during last ten years one species new to science, *Catoptria apenninica* Bassi 2017, and 19 species new to the Italian fauna were reported in literature (BALDIZZONE *et al.*, 2013; BASSI, 2017; HUEMER, 2012; LERAUT, 2012; PINZARI *et al.*, 2010; SCALERCIO *et al.*, 2014; ZILLI & PAVESI, 2015). Furthermore, a few species had their Italian distribution significantly refined (PINZARI *et al.*, 2013; SCALERCIO, 2016; SCALERCIO *et al.*, 2016a, 2016b; SCALERCIO & SLAMKA, 2015) filling several gaps in Central and South Italy.

This paper listed the most interesting findings for Italian fauna concerning Crambidae species as the result of surveys carried out in the main forest type of the Calabria Region, the southernmost territory of Italian Peninsula. In detail, we surveyed (1) beech and *Acer*-dominated forests of the Pollino National Park, (2) Calabrian black pine forests and *Alnus*-dominated woodlots of the Sila National Park, (3) silver-fir forests of the Regional Park of the Serre Mountains, (4) chestnut woodlots of the Catena Costiera Mountains, and (5) mixed forest of Calabrian black pine and beech of the Aspromonte National Park. Notes concerning species range, biology and taxonomy were also provided.

Methods

Samplings were carried out using UV LED light traps (INFUSINO *et al.*, 2017) powered by portable batteries, under weather conditions favourable to moth activity and trap efficiency, i.e. low wind speed, temperatures near the average of a given period, low or absent moonlight, low or absent rain. Exact locations of sampling sites were reported in the list of species. Further records available in the public repository Barcode of Life Data System (BOLD) were utilized to refine the range of species and their presence in Italy.

Identification was carried out using specialised literature concerning European Crambidae (GOATER *et al.*, 2005; LERAUT, 2012; SLAMKA, 2006, 2008, 2013). Most difficult species were dissected, and genitalia were mounted on microscope slides. Nomenclature followed the Fauna Europaea available online at www.faunaeur.org. Specimens and slides of genitalia were preserved in the Lepidoptera collection of the Research Centre for Forestry and Wood, Rende, Italy.

Some specimens were submitted to DNA barcoding, an analysis of the 658bp long sequence of the mitochondrial 5' cytochrome oxidase gene, subunit 1 (COI), using the standard procedures of the Canadian Centre for DNA Barcoding (CCDB). Obtained sequences were blasted in the BOLD data systems (RATNASINGHAM & HEBERT, 2007), to compare sequences with those available. For barcoded specimens we reported: the sample ID, the length of the obtained COI sequences (bp), the Barcode Index Number (BIN) to which they belong and their statistics, i.e. average (Av.dist.) and maximum percentage distances (Max.dist.) among sequences belonging to the same BIN and percentage distance from the Nearest Neighbor (NN), and, finally, the name and the BIN of the NN.

Results

CRAMBIDAE ODONTIINAE

Cynaeda gigantea (Wocke, 1871)

Original records - Italy, Calabria, Saracena, Serra Ambruna, 1035 m, 39.8234°N-16.0768°E, 1 ♂, 20-VII-2015, S. Scalercio & M. Infusino leg. (slide CREA-0204); Italy, Calabria, Saracena, Serrapaolo, 1010 m, 39.8225°N-16.0883°E, 1 ♂, 20-VII-2015, S. Scalercio & M. Infusino leg.

BOLD record - Italy, Abruzzi, Taranta Peligna, Pian di Valle, 770 m, 42.026°N-14.162°E, 1 ex., 20-VII-2011, P. Huemer leg. (BOLD sample ID: TLMF Lep 06066).

It is known from South-East Europe, Asia minor through West Afghanistan (SLAMKA, 2006). In Italy it was only recently reported from the North (LERAUT, 2012), but the exact locality was unspecified. These are the first records from peninsular Italy. Calabrian specimens were collected by light traps in two localities of the Pollino National Park with dry and sunny habitats, typical for this species, and where larvae can find their foodplants *Echium* and *Onosma* (SLAMKA, 2006).

Identification was based on wing pattern (Fig. 1) and morphology of genitalia (Fig. 12). It can be easily distinguished as the phallus has two cornuti, whereas in *C. dentalis* ([Denis & Schiffermüller], 1775), the only congeneric species known to fly in the same range, cornuti are absent (SLAMKA, 2006).

Cynaeda dentalis ([Denis & Schiffermüller], 1775)

Original records - Italy, Calabria, Saracena, Piano del Minatore, 1433 m, 39.7798°N-16.0774°E, 2 ♂♂, 30-VII-2016, S. Scalercio & M. Infusino leg.; Italy, Calabria, San Fili, Fiego, 740 m, 39.3302°N-16.1293°E, 1 ♀, 14-IX-2015, S. Scalercio & M. Infusino leg.; Italy, Calabria, Mendicino, Ianni-Pirillo, 1100 m, 39.220°N-16.141°E, 1 ♂, 8-VI-2000, S. Scalercio & M. Aceto leg.

It was found from Europe to Central Asia, Middle East, North Africa, Madeira and Mediterranean Islands, absent from the northernmost European regions (LERAUT, 2012). In Italy was reported from the North, Latium, Sicily and Sardinia (PINZARI *et al.*, 2010). This is the first record from South Italy, where it was collected by light traps in a prairie of the Pollino National Park, and in a chestnut woodlot and a sunny grassland of the Catena Costiera Mountains. Larvae feed on *Echium*, *Anchusa* and *Onosma* (SLAMKA, 2006). Identification was based on the wing pattern (Fig. 2).

EVERGESTINAE

Evergestis dumerlei Leraut, 2003

Original record - Italy, Calabria, Spezzano Piccolo, Righio, 1341 m, 39.3153°N-16.5273°E, 1 ♂, 31-V-2017, S. Scalercio & M. Infusino leg. (BOLD sample ID: LEP-SS-00694).

BOLD record - Italy, Latium, Rieti, Monte Terminillo, 1730 m, 42.4833°N-13.0000°E, 2 exx., 11-VII-2010, P. Huemer leg. (BOLD sample IDs: TLMF Lep 01521, TLMF Lep 01522).

Recorded from Morocco, Spain, France (LERAUT, 2012) and Italy where it is known from the surroundings of Bolzano, Alto Adige (HUEMER, 2012). These are the first records from peninsular Italy. Calabrian specimen was found during daytime in a humid grassland of the Sila National Park. Larval foodplants are probably Brassicaceae (SLAMKA, 2006). For this species it is reported one generation per year from July to October (SLAMKA, 2006; LERAUT, 2012), however the finding of late-May suggests the presence of two generations per year, the first in Spring and the second in Summer-early Autumn.

Identification was based on wing pattern (Fig. 3) and DNA barcoding which showed a low intraspecific variability among sequenced specimens (Table I), and a high similarity between Calabrian and Central Italy samples (99.85%).

Table I.– Details concerning samples deposited in the Barcoding Of Life Database (BOLD), specifically: the sample ID, the length of the obtained COI sequences (Bp), Barcode Index Number (BIN) and their statistics, i.e. average (Av.dist.) and maximum (Max.dist.) percentage distances among sequences belonging to the same BIN and percentage distance from the Nearest Neighbor (NN), code of the nearest BIN and taxon to which they belong.

Species	Sample ID	Bp	BIN			Nearest BIN		Taxon
			BOLD:	Av.dist. %	Max.dist. %	Dist.NN %	BOLD:	
<i>Evergestis dumerlei</i>	LEP-SS-00694	65 8						
<i>Evergestis dumerlei</i>	TLMF Lep 01521	65 8	AAJ0 346	0.29	0.86	4.82	AAQ19 86	<i>Evergestis politalis</i>
<i>Evergestis dumerlei</i>	TLMF Lep 01522	65 8						
<i>Evergestis subfuscalis</i>	LEP-SS-00322	65 8						
<i>Evergestis subfuscalis</i>	BC MTD Lep 500	65 8						
<i>Evergestis subfuscalis</i>	BC MTD Lep 501	65 8	AAO 3308	0.34	0.46	2.39	ACO51 91	<i>Evergestis mundalis</i>
<i>Evergestis subfuscalis</i>	BC MTD subfuscalis	65 8						
<i>Evergestis subfuscalis</i>	BC MTD 01778	65 8						
<i>Evergestis infirmalis</i>	LEP-SS-00693	65 8						
<i>Evergestis infirmalis</i>	BC ZSM Lep 78577	65 8	AAO4 591	0.08	0.16	2.41	AAI55	<i>Evergestis caesialis</i>
<i>Evergestis infirmalis</i>	TLMF Lep 01658	65 8						
<i>Evergestis infirmalis</i>	TLMF Lep 04208	65 8						
<i>Udea languidalis</i>	LEP-SS-00716	65 8						
<i>Udea languidalis</i>	BC MTD Lep 00753	65 8						
<i>Udea languidalis</i>	BC MTD Lep 01809	65 8	AAO4 485	0.96	1.77	2.41	ACA97 16	<i>Udea</i> sp.
<i>Udea languidalis</i>	TLMF Lep 06418	65 8						
<i>Udea languidalis</i>	BC MTD Lep 01668	65 8						
<i>Hyperlais siccalis</i>	LEP-SS-00688	658 8	ADJ6	0.48	0.48	6.26	ABV2095 95	<i>Hyperlais</i> sp.
<i>Hyperlais siccalis</i>	LEP-SS-00689	65 8	942					

Evergestis subfuscalis (Staudinger, 1870)

Original records - Italy, Calabria, Saracena, Bruscata, 1370 m, 39.8103°N-16.0468°E, 2 ♂♂, 20-V-2015, S Scalercio & M. Infusino leg. (slide CREA-0203); Italy, Calabria, Saracena, Serrapaolo, 1010 m, 39.8225°N-16.0883°E, 1 ♂, 20-V-2015, 1 ♂, 20-VII-2015, S. Scalercio & M. Infusino leg. (slide

CREA-0202) (BOLD sample ID: LEP-SS-00322); Italy, Calabria, Saracena, Serra Ambruna, 1035 m, 39.8234°N-16.0768°E, 1 ♂, 20-VII-2015, S. Scalercio & M. Infusino leg.

According to GOATER *et al.* (2005), it is known from Bulgaria, former Yugoslavia and Greece, but probably belong to this species also the populations of *E. mundalis* reported from Middle-East to Armenia in LERAUT (2012). This is the first record from Italy, where it was collected by light traps in three localities of the Pollino National Park, within beech forest stands. Immature stages are unknown (GOATER *et al.*, 2005).

Identification was based on the morphology of genitalia and DNA barcoding, as wing pattern (Fig. 4) is not enough to separate it confidently from *E. mundalis* (Guenée, 1854). Male genitalia are characterized by rather short parallel-sided valvae with rounded apex, and by the distal portion of phallus slender than in *E. mundalis*, with an oblique row of strong cornuti near base (GOATER *et al.*, 2005) (Fig. 13). However, DNA barcoding was decisive for species identification as also morphology of genitalia is questioned leading some authors to consider *E. subfuscalis* a synonym of *E. mundalis* (LERAUT, 2012). In fact, the COI sequence of Calabrian specimen showed a marked genetic distance from those of *E. mundalis* from France (Table I) but share the same BIN with two Iranian and two Greek specimens, demonstrating definitively its eastern affinity, and confirming also the existence of an eastern species distinct from *E. mundalis* (Fig. 18).

In Italy *E. mundalis* is known from Central and North regions (BASSI *et al.*, 1995), whilst none record is available for southern regions, so far. Recently, several specimens regarded as *E. mundalis* were reported from Central Italy (PINZARI *et al.*, 2010). It should be interesting to verify the exact identity of these specimens and to assess the distribution of the *mundalis* / *subfuscalis* species pair along the Italian Peninsula.

Evergestis sophialis (Fabricius, 1787)

Original records - Italy, Calabria, Alessandria del Carretto, Vallone Lupara, 1345 m, 39.9245°N-16.3609°E, 1 ♂, 19-VII-2017, S. Scalercio & M. Infusino leg. (slide CREA-0210).

It is known from South Europe, eastwards to southern Siberia (GOATER *et al.*, 2005). In Italy it was only reported from the North and the South (BASSI *et al.*, 1995). This is the first record from Calabria, where it was collected by light traps in a locality of the Pollino National Park, within an ecotonal habitat between a dry and sunny calcareous slope and a young *Acer* forest. Immature stages on *Descurainia sophia* (L.) Webb ex Prantl. and *Sisymbrium* spp. (GOATER *et al.*, 2005).

Identification was based on the morphology of male genitalia, with valvae, uncus and gnathos clearly different from those of the similar *E. infirmalis* (Staudinger, 1870), and with the phallus bearing two dense clusters of long cornuti in *E. sophialis* and two clusters of small cornuti in *E. infirmalis* (GOATER *et al.*, 2005) (Fig. 14). Wing pattern is sometimes useless, especially in worn specimens as the male we recorded (Fig. 5).

Evergestis infirmalis (Staudinger, 1870)

Original records - Italy, Calabria, Alessandria del Carretto, Vallone Lupara, 1345 m, 39.9245°N-16.3609°E, 1 ♂, 19-VII-2017, S. Scalercio & M. Infusino leg. (slide CREA-0209) (BOLD sample ID: LEP-SS-00693).

BOLD records - Italy, Basilicata, Lagonegro, Monte Sirino, 1390 m, 40.1596°N-15.8401°E, 1 ex., 29-VIII-2013, A. Hausmann leg. (BOLD sample ID: BC ZSM Lep 78577); Italy, Abruzzi, Rieti, Monte Terminillo, 1730 m, 42.4833°N-13.01°E, 1 ex., 16-VII-2010, P. Huemer leg. (BOLD sample ID: TLMF Lep 01658); idem, 1 ex., 17-VII-2010, T. Mayr leg. (BOLD sample ID: TLMF Lep 04208).

According to PINZARI *et al.* (2010), it is known from Greece, European Russia, Turkey, Syria and Italy, where it was found in Central Apennine. In Calabria it was collected by light traps in the same locality and during the same night of *E. sophialis*, i.e. within an ecotonal habitat between a dry and sunny calcareous slope and a young *Acer* forest of the Pollino National Park. Early stages are unknown (GOATER *et al.*, 2005).

Identification was based on the morphology of male genitalia, as wing pattern (Fig. 6) is not

always enough to separate it confidently from *E. caesialis*. (Herrich-Schäffer, 1849). In male genitalia of *E. infirmalis* the main distinctive features from *E. caesialis* are the slightly bulbous uncus, the slender gnathos without evident teeth, the valva dilated at base and tip, and the distal portion of the spinulose phallus bearing two clusters of small cornuti (GOATER *et al.*, 2005). The dissected male genitalia of the Calabrian specimen perfectly matched this description (Fig. 15). DNA barcode of the dissected specimen has a great homogeneity with other Italian specimens deposited in BOLD that belong to the same BIN (Table I) (Fig. 19), demonstrating their conspecificity.

PYRAUSTINAE

Udea languidalis (Eversmann, 1842)

Original record - Italy, Calabria, Alessandria del Carretto, Difesa Privitera, 1285 m, 39.9274°N-16.3572°E, 1 ♂, 19-VII-2017, S. Scalercio & M. Infusino leg. (slide CREA-0164) (BOLD sample ID: LEP-SS-00716).

BOLD records - Italy, Piedmont, Valdieri, Cuneo, 950 m, 44.2836°N-7.3977°E, 2 exx., 1-VIII-2010, P. Huemer leg. (BOLD sample IDs: BC MTD Lep 00753, BC MTD Lep 01809); Italy, Abruzzi, Pescara, Santo Spirito/Roccamorice, 850m, 42.181N-14.221E, (1ex.), 23-VII-2011, P. Huemer leg.) (BOLD sample ID: TLMF Lep 06418); Italy, Abruzzi, Chieti, Lama dei Peligni, 750 m, 42.0333°N-14.1833E, 1 ex., 12-VII-2009, H. Schreiber leg. (BC MTD Lep 01668).

Recorded from South-East Europe, Turkey, North Iran and Turkmenistan (SLAMKA, 2013). This is the first record for Italy. Calabrian specimen was collected in a small clearing within an Acer forest on calcareous substratum, in the Pollino National Park. Preimaginal stages are unknown (SLAMKA, 2013).

Identification was not easy as the congeneric *U. fimbriatralis*, also not mentioned for the Italian fauna so far, has similar wing pattern and genitalia of both species are rather similar and quite variables (SLAMKA, 2013). According to MALLY & NUSS (2011), based on molecular and morphological evidences, *fimbriatralis* - *languidalis* compose a strictly related species-pair the former having a western and the latter an eastern range (SLAMKA, 2013). LERAUT (2012) considers *languidalis* the eastern subspecies of *fimbriatralis*. Here we used the name *languidalis* for our specimen as markings on wings are well developed (Fig. 7), and a small thorn is present on the distal part of the phallus (Fig. 16), both characters attributable to *U. languidalis* (SLAMKA, 2013). The great intra-BIN genetic variability justifies the taxonomic uncertainty present in this species group (Table I). We can hypothesize the presence of only one variable species, but the question deserves further studies.

Paratalanta pandalis (Hübner, 1796)

Original record - Italy, Calabria, Serra San Bruno, Cattarinella, 940 m, 38.5492°N-16.3195°E, 1 ♂, 26-VIII-2015, S. Scalercio & M. Infusino leg..

Eurasian species (SLAMKA, 2013), in Italy known from North and Central regions and from Sicily (SLAMKA, 2013). This is the first record for southern Italy, where it was collected by light traps in a silver fir forest. Larva feeds on several plants (SLAMKA, 2013). Identification was based on the wing pattern (Fig. 8).

SPILOMELINAE

Hodebertia testalis (Fabricius, 1794)

Original record - Italy, Calabria, Montalto Uffugo, Glicarello, 550 m, 39.4072°N-16.1256°E, 1 ♂, 9-XI-2015, S. Scalercio & M. Infusino leg.

Tropical and subtropical species, probably resident in the Mediterranean Basin (SLAMKA, 2013), also known in northern Italy and Sicily (BASSI *et al.*, 1995). This is the first record for

southern Italy, where it was collected by light traps in a chestnut orchard. Larva feeds mainly on Asclepiadaceae (SLAMKA, 2013). Identification was based on the wing pattern (Fig. 9).

CYBALOMIINAE

Hyperlais siccalis (Guenée, 1854)

Original records - Italy, Calabria, Saracena, Serra Ambruna, 1035 m, 39.8234°N-16.0768°E, 2 ♂, 20-V-2015, S. Scalercio & M. Infusino leg. (slide CREA-0205) (BOLD sample IDs: LEP-SS-00688, LEP-SS-00689).

Known from France, Spain and Morocco (GASTÓN *et al.*, 2015), this is the first record from Italy where it was collected by light traps in a locality of the Pollino National Park within a dry and sunny prairie surrounded by broadleaved forests, on calcareous substratum to which it appears to be associated (COURTOIS, 1986). Early stages feed on *Iberis pinnata* L. (L'HOMME, 1935).

Identification was based on the morphology of male genitalia and DNA barcoding, as wing pattern (Fig. 10) is not always enough to separate it from congeneric species. Male genitalia perfectly match those figured in LERAUT (2012) and in GASTÓN *et al.* (2015) (Fig. 17). Barcoded specimens belong to a BIN from which the nearest neighbor has a marked genetic distance and belong to a not specified *Hyperlais* species (Table I).

CRAMBINAE

Catoptria staudingeri (Zeller, 1863)

Original records - Italy, Calabria, Santo Stefano in Aspromonte, Tre Limiti, 1440 m, 38.12°N-15.87°E, 1 ♂, 26-VIII-2016, S. Scalercio, F. Manti & E. Castiglione leg.; Italy, Calabria, San Giovanni in Fiore, Montagna Grande, 1355 m, 39.2717°N-16.6062°E, 1 ♂, 13-IX-2016, S. Scalercio & M. Infusino leg.; Italy, Calabria, San Giovanni in Fiore, Mangiatoie, 1275 m, 39.2369°N-16.6625°E, 1 ♂, 13-IX-2016, S. Scalercio & M. Infusino leg.

Known from Portugal, Spain, South France and Sicily (SLAMKA, 2008), this is the first record from continental Italy where it was collected by light traps in a small clearing within a beech forest of the Aspromonte National Park, and two shrublands of the Sila National Park within a Calabrian black pine forest. Early stages feed on mosses (SLAMKA, 2008). Identification was based on the wing pattern (Fig. 11).

Discussions and conclusions

In this paper we provided new distribution data concerning eleven Crambidae species new or little known for the Italian fauna. Most interesting findings concerned three species new for Italian fauna, namely *Evergestis subfuscalis*, *Udea languidalis*, and *Hyperlais siccalis*. In addition, *Cynaeda gigantea*, *Evergestis dumerlei*, and *Catoptria staudingeri* were not previously recorded from peninsular Italy, and four species were not recorded in southern Italy so far, namely *Evergestis infirmalis*, *Cynaeda dentalis*, *Paratalanta pandalis*, and *Hodebertia testalis*. *Evergestis sophialis* was for the first time recorded in Calabria.

Most of listed species have in Italy the western boundary of their range (*Cynaeda gigantea*, *Evergestis subfuscalis*, *E. caesialis*, *E. infirmalis*, *Udea languidalis*), but *Evergestis dumerlei*, *Hyperlais siccalis* and *Catoptria staudingeri* have there the eastern boundary of their range. The presence of eastern and western elements in the Italian fauna, especially along the peninsular territory, is the result of the complex biogeographic history of this geographic area and is one of the reasons that make lepidopteran fauna of Italy the richest of Europe.

Barcoding analysis allowed us to confirm the status of *Evergestis subfuscalis* as bona species and eastern vicariant of *E. mundalis* and enabled us to underline the needs of a revision of the *Udea fimbriatralis* species group as haplotypes of western and eastern Europe of species belonging to it

appear to be not well differentiated and intermingled, suggesting the presence of a unique variable species.

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*S. S., S. G.

Council for Agricultural Research and Economics
Research Centre for Forestry and Wood (CREA-FL)
Contrada Li Rocchi
I-87036 Rende (CS)
ITALIA / ITALY

*E-mail: stefano.scalercio@crea.gov.it
<https://orcid.org/0000-0002-5838-1315>
E-mail: silvia.greco@crea.gov.it
<https://orcid.org/0000-0003-3264-505X>

A. I.

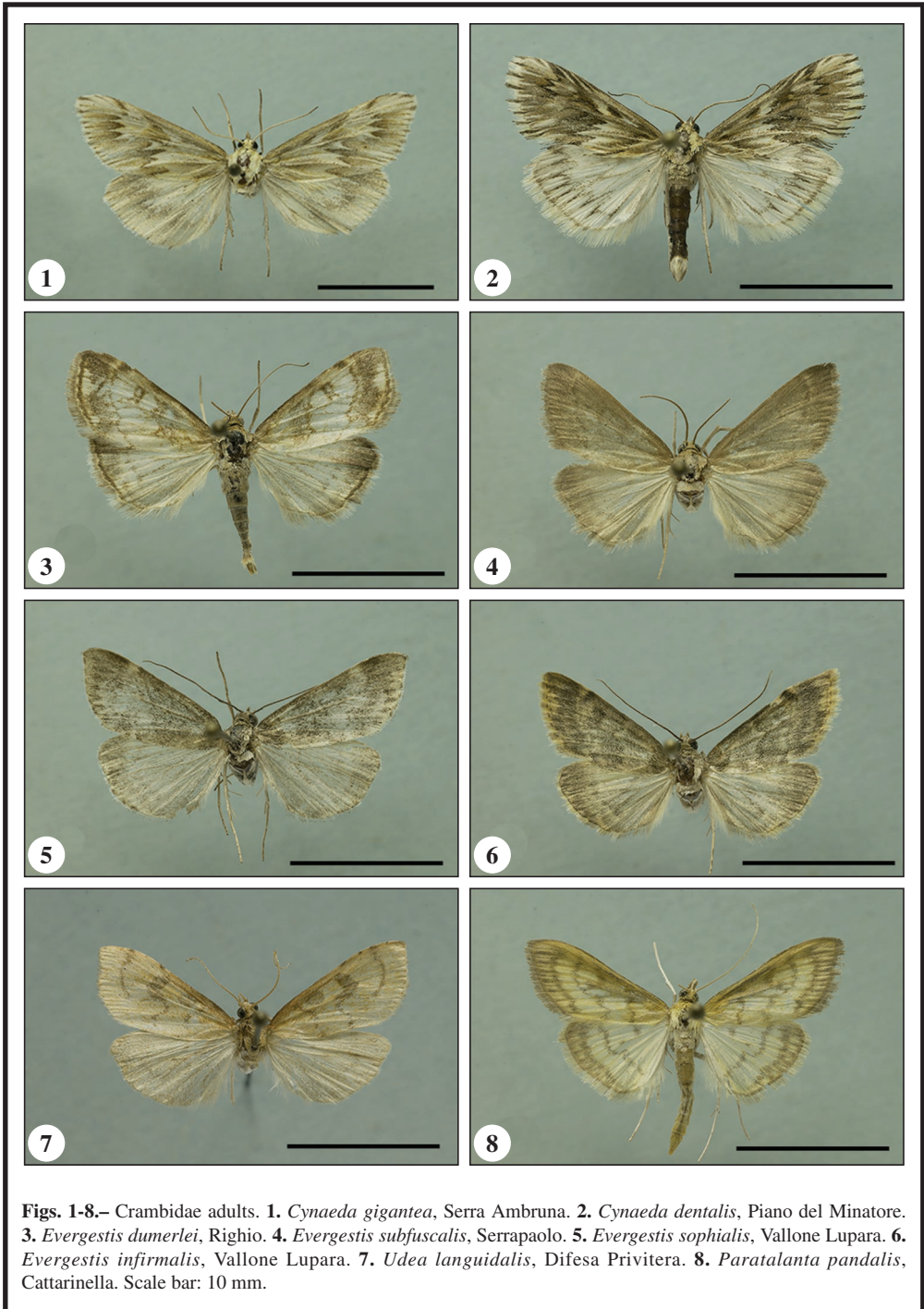
Via Castelvetere 40
I-89041 Caulonia, Reggio Calabria
ITALIA / ITALY
E-mail: annamaria.ienco@gmail.com
<https://orcid.org/0000-0001-8260-1528>

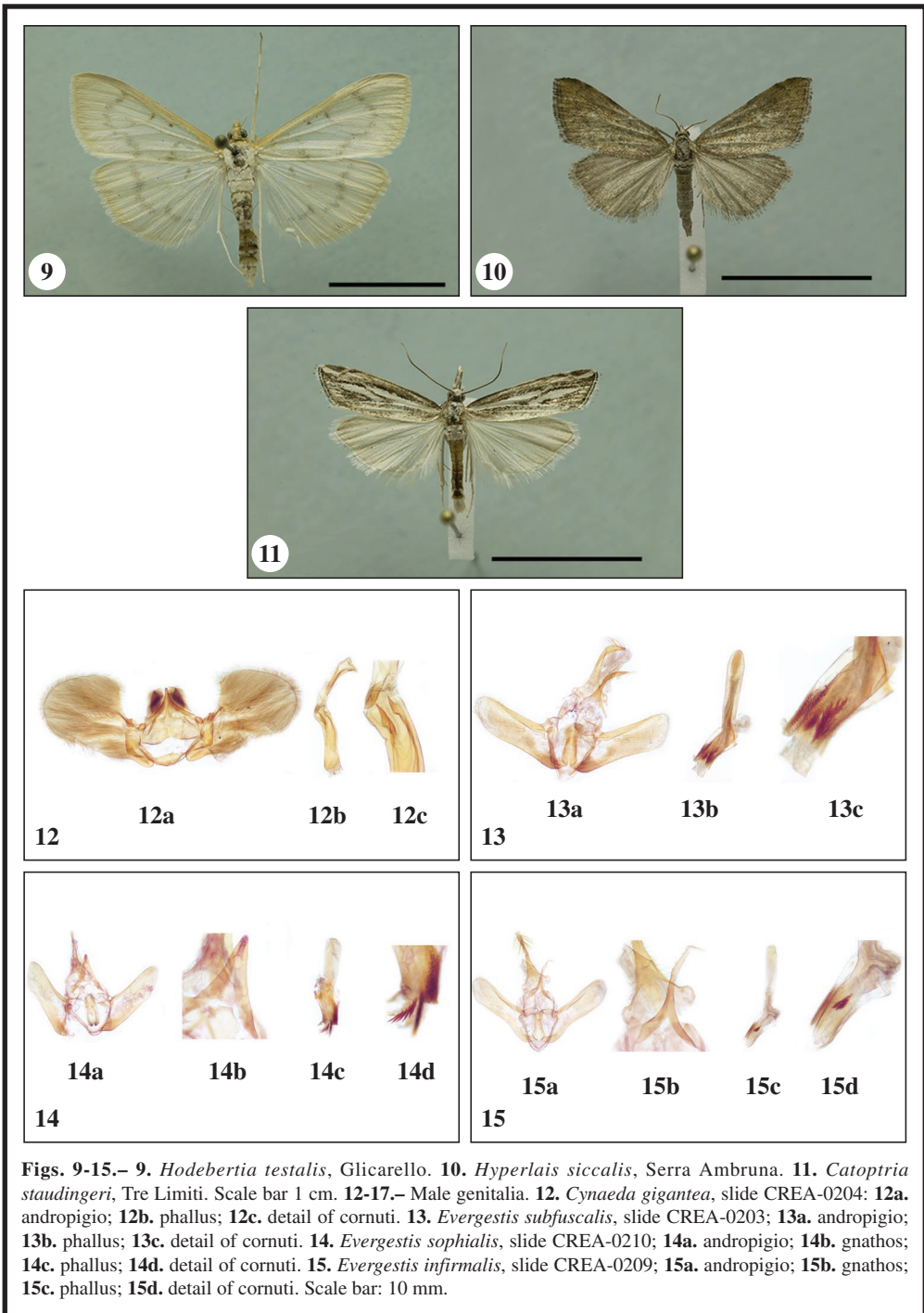
*Autor para la correspondencia / *Corresponding author*

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Figs. 9-15.– 9. *Hodebertia testalis*, Glicarello. 10. *Hyperlais siccalis*, Serra Ambruna. 11. *Catoptria staudingeri*, Tre Limiti. Scale bar 1 cm. 12-17.– Male genitalia. 12. *Cynaeda gigantea*, slide CREA-0204; 12a. andropigio; 12b. phallus; 12c. detail of cornuti. 13. *Evergestis subfuscalis*, slide CREA-0203; 13a. andropigio; 13b. phallus; 13c. detail of cornuti. 14. *Evergestis sophialis*, slide CREA-0210; 14a. andropigio; 14b. gnathos; 14c. phallus; 14d. detail of cornuti. 15. *Evergestis infirmalis*, slide CREA-0209; 15a. andropigio; 15b. gnathos; 15c. phallus; 15d. detail of cornuti. Scale bar: 10 mm.

