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A new modified night trap: more selective and less harmful to Heterocera (Insecta: Lepidoptera)

C. Lepesqueur, S. Scherrer, L. Braga & I. Rezende-Diniz

Abstract

We present one modified collection container to the "Luiz de Queiroz" light trap. This night tent-trap (or NTT) is characterized by being simple, inexpensive, and efficient in several aspects related to the capture of Heterocera: 1) even the fragile insects had few morphological damages; 2) favors selective collection of specimens, avoiding the predatory capture which contributes to the maintenance of local diversity, and 3) does not select any taxonomic groups or body sizes.
KEY WORDS: Insecta, Lepidoptera, Heterocera, collection, light trap, techniques, entomology.

Una nueva trampa de noche modificada: mayor cantidad selectiva y poco perjudicial para los Heterocera (Insecta: Lepidoptera)

Resumen

Presentamos un recipiente colector modificado para la trampa de luz "Luiz de Queiroz". Esta tienda-trampa nocturna (o NTT) se caracteriza por ser simple, económica y eficiente en varios aspectos relacionados con la captura de Heterocera: 1) incluso los insectos frágiles tenían pocos daños morfológicos; 2) favorece la recolección selectiva de especímenes, evitando la captura depredadora que contribuye al mantenimiento de la diversidad local y 3) no selecciona ningún grupo taxonómico o tamaño corporal.
PALABRAS CLAVE: Insecta, Lepidoptera, Heterocera, colección, trampa de luz, técnicas, entomología.

Introduction

Traps are important tools for insect studies, and are defined as mechanical, physical or chemical methods that capture them, whether or not they are attractive (NAKANO *et al*., 2000). Light traps are efficient devices for the attraction and capture of winged adult insects of different taxonomic orders, which have positive phototropism. The use of these traps allows passive collection of insects during longer night periods, and for several days, avoiding collectors to exposition to the dangers inherent to night work. In addition, it enables the standardization of the sampling effort, allowing spatial and temporal comparisons, thus avoiding the sample bias caused by collectors with different levels of knowledge and experience (DINIZ *et al*., 2005). These characteristics favour their use in richness and diversity studies (SILVEIRA-NETO *et al*., 1995; GUSMÃO *et al*., 2004; TESTON *et al*., 2004), seasonality (COELHO *et al*., 2003; OLIVEIRA *et al*., 2008; SILVA *et al*., 2011), spatial heterogeneity (CHOI, 2008), and habitat fragmentation (TESTON *et al*., 2009), among so many others. However, despite so many benefits they are avoided by taxonomists who need to obtain

specimens with morphological structures in perfect condition for correct identification and preservation in entomological collections.

The light trap model called "Luiz de Queiroz" (SILVEIRA-NETO *et al*., 1969) is widely used in Brazil, mainly in entomological population and pest control studies. (SILVEIRA-NETO *et al*., 1995). This trap model consists of either a 15 W or 20 W specific-wavelength, usually fluorescent, or mixed-light mercury lamp (GALLO *et al*., 2002), attached to a metal structure that intercepts the flight of nocturnal adult insects. The radius of attractiveness of the weak light source usually used in "Luiz de Queiroz" is probably less than 30 meters (BECK *et al*., 2006), restricting it to studies of communities residing in particular vegetation types or forest fragments (BRAGA *et al*., 2015, 2018). Although this trap model has a satisfactory performance in insect capture (SILVEIRA-NETO *et al*., 1984; NAKAYAMA *et al*., 1979), its collection containers have been adapted according to the researcher's interest or need (OLIVEIRA *et al*., 2008; SILVA *et al*., 2011; TESTON *et al.*, 2009).

For fragile insects, especially lepidopterans, which have easily detachable scales, several attempts have already been made to improve the preservation of specimens captured by the "Luiz de Queiroz" light trap. Some adaptations to the trap collector (catcher) had already been made, such as the use of a plastic bag containing a glass container with Ethyl Acetate and 5 x 50 cm strips of paper to prevent captured insects from breaking (PINTO *et al*., 2004; FERREIRA *et al*., 1982), and the use of cardboard trays to hold eggs inside the plastic bag, thus preventing resistant insects such as beetles from moving around and damaging the most fragile insects. (Ferro, personal com.). However, even with these adaptations, in the case of Lepidoptera, the risk of damage to delicate wings, antennae and legs remains due to the mechanical impacts of other insects within the container.

Thus, we present here another modification for the "Luiz de Queiroz" light trap collection container. This new model, the night tent-trap (NTT), consists of a three-dimensional rectangular structure (tent type) made of thin, transparent and resistant fabric (e. g. cotton tulle or Voal), 60 cm wide by 100 cm high, and 60 cm deep (Figs 1-2), connected to the funnel of the metal structure of the trap by a cylinder of 15 cm in length by 10 in diameter. The fabric is permeable and thus there is no limitation of collection and loss of quality of material collected during rainy periods, as there is no water retention inside the tent. The ends of the tent are attached by nylon strings or ropes to the vegetation or stakes to keep it always taut. One may also choose to use the rope-suspended trap in vertical stratification studies. The tent has a side opening for handling and collecting material (Figs 1-2), which remains closed by spring-hook or velcro when not in use, thus preventing the escape of insects. The size of the lateral opening allows manual collection using a deadly bottle, and sorting can be done in the field for taxonomically aware collectors.

The NTT is very simple, of low cost, easy to transport and to install. Its attractiveness remains the same, but is very efficient in capturing phototropic insects, especially several small-sized Lepidoptera families such as Gelechiidae and Elachistidae, as well as the large ones such as Saturniidae and Sphingidae (BRAGA *et al*., 2015; LEPESQUEUR *et al*., 2021 [unpubl. Data]). The morphological integrity of the specimens is maintained (see Fig. 3), as the internal volume of the container (360,000 cm^3) is sufficient to minimize physical contact with other insects, and also allows the scape from potential predators in the interior of the tent. In this way, the NTT contributes to the quality of material deposited in museums and entomological collections of research institutions.

The great methodological advantage of the NTT for ecological and conservation studies is the selectivity in sampling, which allows field specimen sorting and selective collection of insect taxa of interest to the researcher, making the method less predatory. In addition, this adaptation makes possible to use the capture-marking-recapture method, is suitable for nocturnal moth population and community monitoring, as well as for metapopulational studies, especially in protected areas. The National Action Plan for Lepidopteran Conservation - PAN (FREITAS *et al*., 2011) is one of the official management tools of the Brazilian government (BRASIL, 2018), used for ordering and prioritizing actions for the conservation of species and natural environments, it aims to expand the conservation mechanisms of lepidopterans in Brazil, with emphasis on endangered species. One of the actions of that PAN was: "Define standardized protocols for monitoring light trapped

Heterocera", and the product of this action resulted in a document entitled "General Protocol for Nocturnal Moth Sampling" in which the NTT was one of the models indicated for sampling of nocturnal Macrolepidoptera, being recommended for inventory, monitoring, rapid ecological assessments (AER) and, primarily, for conducting medium and long-term ecological studies (FREITAS *et al*., 2011), because its selectivity minimizes the effects of specimen removal over time.

Thus, the present suggestion to the "Luiz de Queiroz" light trap with insertion of the collecting tent (NTT) makes it more efficient in several aspects: 1) maintain the morphological integrity of the insects including the most fragile ones; 2) avoids the indiscriminate collection of non-research specimens, which contributes to the conservation of biodiversity; 3) does not show selective attractiveness to Heterocera, attracting various taxonomic groups of different body shapes and sizes; and 4) enables comparative studies and monitoring regardless of collector ability, comprising an excellent capture method for ecological and conservation studies.

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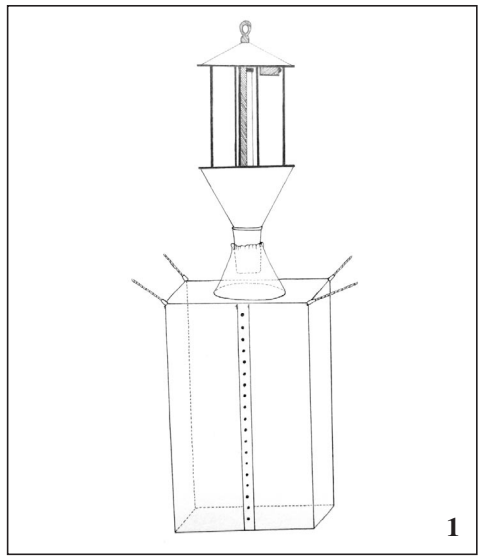

Figures 1-3.– 1. Illustrative diagram of the tent to be attached to the "Luiz de Queiroz" light trap. Illustration: Willer Bontempo. **2.** The night tent-trap (NTT) used in the cerrado sensu stricto of Brasília, DF, for nocturnal Lepidoptera. **3.** Some specimens of Lepidoptera collected with night tent-trap (NTT) in areas of Brazilian Cerrado.

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Agonopterix guanchella Buchner, sp. n., a new species of Depressariidae from Canary Islands (Spain) (Lepidoptera: Depressariidae)

P. Buchner

Abstract

Agonopterix guanchella Buchner, sp. n. is described. It has been collected from three different places, all in Gran Canaria, Canary Islands, Spain. The adult and genitalia of both sexes of the new species and some similar species are illustrated. Hostplant is unknown so far, and a species closely related to it could not be detected.
KEY WORDS: Lepidoptera, Depressariidae, *Agonopterix*, new species, DNA Barcoding, Canary Islands, Spain.

Agonopterix guanchella **Buchner, sp. n., una nueva especie de Depressariidae de las Islas Canarias (Spain) (Lepidoptera: Depressariidae)**

Resumen

Se describe *Agonopterix guanchella* Buchner, sp. n. Ha sido colectada de tres sitios diferentes, todos en Gran Canaria, Islas Canarias, España. Se ilustran el adulto y la genitalia de ambos sexos de la nueva especie y algunas especies similares. La planta nutricia es desconocida hasta el momento y no se pudo detectar una especie estrechamente relacionada con ella.
PALABRAS CLAVE: Lepidoptera, Depressariidae, *Agonopterix*, nueva especie, Código de barras ADN, Islas Canarias, España.

Introduction

In the collection of Jari Junnilainen a single male of an unnamed *Agonopterix* from Gran Canaria, Fataga, 10-XII-2014, was found in 2016. External appearance was reminiscent of some forms of *A. thapsiella* (Zeller, 1847) at a cursory glance, but presence of two white dots in forewing centre does not correspond with this species. Comparison of genitalia and barcodes showed that this specimen was not even closely related to any known species. As no females were available, description was postponed in the hope of finding females, otherwise it was scheduled to be described in the volume "Microlepidoptera of Europe: Depressariinae", which was in preparation, but far from being in a final stage at that time. In 2021, Per Falck asked for determination of several Depressariinae from Canary Islands (Spain), among them three specimens of this undescribed species, all females, opening the way for the description presented here. Several details remain unresolved. The hostplant is unknown, and it was not possible to find the closest relatives of this remarkably isolated species.

Methods

Morphological examination: genitalia preparations followed standard techniques (ROBINSON,

1976). Male preparations were stained with mercurochrome and females with chlorazol black, which brings a better result than using the same stain for both sexes.

Photographic documentation: photos of set specimens were taken with Canon EOS 5D Mark III, either with Canon lens EF 100 mm 2.8 L IS USM at 1:1, illuminated with two external flashes and using a third flash to set the background whiteness (specimens in total), or with Canon lens MP-E 65 at 2:1, using ring flash (specimen details). Genitalia photos were taken with microscope (Wild Heerbrugg) using a 10x objective and a 2.5x ocular. All photos were edited using the software Helicon Focus 4.80 and Adobe Photoshop 6.0.

Abbreviations

DEEUR	"Depressariinae of Europe", prefix for specimen-number of Depressariinae studied by P. Buchner. This unique number is pinned to all those specimens for certain identification.
MNCN	Research Collection of Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain.
NMBE	Naturhistorisches Museum, Bern, Switzerland.
RCAM	Research Collection of Anton Mayr, Feldkirch, Austria.
RCCM	Research Collection of Carlo Morandini, Udine, Italy.
RCJJ	Research Collection of Jari Junnilainen, Vantaa, Finland.
RCKN	Research Collection of Kari and Tomi Nupponen, Espoo, Finland.
RCMC	Research Collection of Martin Corley, Oxfordshire, England.
RCPF	Research Collection of Per Falck, Nexø, Denmark.
TLMF	Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria.
ZSM	Zoologische Staatssammlung München, Germany.

Agonopterix guanchella Buchner, sp. n.

Holotype 1 ♀, Spain, Canary Islands, Gran Canaria, Barranco de Guayadeque, 800 m, 9-22-VI-2021, gen. prep. DEEUR 9262 P. Buchner, Per Falck leg., deposited in coll. Museo Nacional de Ciencias Naturales, Madrid, Spain (MNCN).

Paratypes (arranged according to collection date): Spain, Canary Islands, Gran Canaria, Fataga, 1 ♂, 10-XII-2014, gen. prep. DEEUR 4558 P. Buchner, DNA barcode id. TLMF Lep 19294, Jari Junnilainen leg., deposited in coll. MNCN. Canary Islands, Gran Canaria, Ayacata (DEEUR 9273) and Barranco de Guayadeque, 800 m (DEEUR 9274), 2 ♀♀, 9-22-VI-2021, Per Falck leg., will be deposited in coll. RCPF

Adult (figs 1-9): Wingspan 22.5-26 mm. Head: face with appressed creamy white scales, these gradually change to mid grey toward frons, vertex with erect, long and narrow scales, greyish with ochreous tinge, tips markedly paler. Labial palp segment 2 inner side pale buff with a few dark grey scales interspersed, outer side medium greyish mixed with pale scales, ventral side with long, protruding, predominantly greyish scales with paler tips; segment three with a mix of grey and pale scales at base, a distinct dark grey ring beyond middle followed by a short pale section, a few blackish scales at tip. Antenna dark grey fuscous. Thorax and tegulae predominantly medium grey with a few blackish scales interspersed, with posterior crest. Forewing elongate with subacute apex forming an angle of about 70º, dull grey, extensively speckled with scattered blackish scales, some more concentrated to form small dark patches mainly near dorsum and termen, basal field grey, not clearly paler than ground colour, outwardly demarcated by a dark grey to blackish basal fascia fading into ground colour; a blackish dot at extreme base of costa, several blackish spots on costa, strongest towards apex and a series of terminal dots; a pair of blackish oblique dots at 1/3 and an elongated plical mark, white dots in middle and at end of cell, both with an incomplete ring of blackish scales, a diffuse dark grey blotch between median white dot and costa, slightly closer to proximal than to

distal white dot; underside dark grey, only on costa and near termen predominantly pale buff; fringe grey. Hindwing light to medium grey, slightly darker towards apex, underside uniformly grey in dorsal 2/3, interspersed with darker scales in costal 1/3, costal and terminal area predominantly buff, fringe light grey with three lines, only the basal distinct. Fore- and midlegs predominantly dark brown (fig. 8), hindlegs pale buff with a few dark scales interspersed (fig. 9). Abdomen light grey-buff.

Male genitalia (fig. 15): Socii elliptic, 0.2 mm wide and 0.3 mm long, outer sides nearly parallel in standard setting, uncus distinct, triangular, transverse diameter ca. 0.15 mm at base, 0.07 mm long, slightly overtopped by socii, gnathos elliptic, medium-sized, 0.15 mm wide and 0.3 mm long, equalling socii. Transtilla narrow, not widened medially with a width of about 0.02 - 0.03 mm, transtilla lobes remarkably narrow, semi-elliptic, about 0.2 mm wide and 0.1 mm long, with a gap of less than 0.1 mm in between. Anellus medium-sized, length/width 0.25/0.25 mm, gap to transtilla 0.15 mm, caudal margin with V-shaped incision which is filled with a rather thick membrane, therefore the incision is rather indistinct, anellus lobes rather small, length/width about 0.15/0.05 mm, semi-elliptic. Valva of average *Agonopterix* shape, costal margin nearly straight, ventral margin in basal half nearly straight, only in area of origin of cuiller very slightly concave, distinctly convex only between 3/5 and 4/5, then running straight to subobtuse apex; median length about 1.4 mm, 0.4-0.5 mm broad in basal half. Cuiller stout, width about 0.05 mm, not or scarcely tapering, ending about 0.05 mm before costa, blunt, very slightly curved inward over its whole length. Aedeagus stout, 1.2 mm long, gently curved near middle by about 40º, diameter 0.15-0.17 mm in basal 2/3, then tapering to subacute tip, sclerotised basal parts with a total length of about 0.4 mm, free section in ventral view rectangular, 0.25 mm long and 0.15 mm wide, terminating nearly straight, cornuti very small, numerous, in two not clearly separated groups.

Female genitalia (figs 10-14): Papilla analis about 0.7 mm long, 0.3 mm broad in lateral view, posterior apophysis 0.8 mm, anterior apophysis 0.4 mm, sternite VIII at anterior margin with semi-elliptic expansion accommodating ostium, length 0.5 mm if expansion is included and 0.3 mm if it is not included, maximum width about 1.0 mm in standard preparation, ostium elliptic, 0.2 mm long and 0.12 mm wide with distinct triangular projections of ductus bursae; lateral margins of semi-elliptic expansion with a rim, which is very distinct as long as these parts remain uncompressed and intersegmental membrane which connects segment VII and VIII is present (fig. 12, the most distinct single feature in female genitalia), in standard slide it tends to become indistinct when flattened by the pressure of the cover glass (figs 10-11); ductus bursae starting without distinct structures apart from tiny dots with a width of about 0.15 mm, after about 0.5 mm additional fine irregular folds appear, which gradually get more distinct and ductus widens to 0.4 mm in its course, after about 3 mm meeting pyriform corpus bursae (1 mm wide and 1.5 mm long in the available specimen, but corpus bursae tends to expand when females mate); signum rather small with a width/length of about 0.3/0.1 mm, with only a few teeth in two transverse rows; origin of ductus spermathecae very close to ostium and ending with about 6 turns.

Differential diagnosis: Externally the combination of grey colour, presence of two white dots in forewing centre, subsquare forewings with termen nearly straight and rather large size is distinct and will be sufficient to recognize this species in most cases. Only some forms of *A. thapsiella* (Zeller, 1847) (fig. 19) or further species of *A. adspersella* group may be similar but lack the second (proximal) white dot in forewing. Species common in Canary Islands with two white dots developed are e. g. *A. conciliatella* (Rebel, 1892) (fig. 20) and *A. scopariella* (Heinemann, 1870), both very variable externally but with different wingshape, especially termen which is concave. Genitalia of both sexes are distinct and can clarify cases of doubt.

Male genitalia: Combination of details of socii (not overtopped by broad elliptic gnathos, clearly longer than wide, with outer sides nearly parallel in standard preparation), valva rather narrow with stout, blunt, very slightly bent inward cuiller, anellus lobes small and transtilla lobes clearly wider than long is not found in any other *Agonopterix* sp. At cursory glance, male genitalia of *A. ocellana*

(Fabricius, 1775) (with very different external appearance) may be similar, but with several different details, especially shape of socii.

Female genitalia: anterior margin of sternite VIII with semi-elliptic expansion with lateral rims accommodating ostium is an unique feature. Important to note, these rims tend to become less distinct, when intersegmental membrane is removed, and genitalia are flattened by embedding. But presence of proximal expansion of segment VIII and its outline should be sufficient to exclude further species. Central expansion at anterior margin of sternite VIII is generally an unusual feature in genus *Agonopterix*, e. g. it is found in *A. silerella* (Stainton, 1865), where it is smaller and semicircular (fig. 21), also in *A. subtakamukui* Lvovsky, 1998, with rims not at lateral edges but inside the expansion and ostium near distal edge of sternite VIII (fig. 22). *A. thapsiella* and further species of *A. adspersella* subgroup have very different outline of sternite VIII (fig. 23).

Genetic data: Specimen DEEUR 4558 has been sequenced, its sequence is accessible via the public dataset DS-DEEUR392 (http://www.boldsystems.org/index.php/Public_SearchTerms?query =DS-DEEUR392), together with sequences and further data of all specimens used for the NJ-tree (fig. 24).

Related species: A determination request, using all full length sequences in BOLD database, showed the North American *A. oregonensis* Clarke, 1941 (Apiaceae-feeder, subgroup unknown) as nearest neighbour with p-distance of 3.36%, *A. straminella* (Asteraceae-feeder, *A. pallorella*-subgroup) as second nearest neighbour with p-distance of 3.82%, followed by three Apiaceae-feeder, *A. babaella* Amsel, 1977 (3.89%, *alpigena*-subgroup), *A. agyrella* Rebel, 1917 (3.90%, *A. putridella*-subgroup) and *A. alstromeriana* (Clerck, 1759) (3.99%, *A. alstromeriana*-subgroup). A critical look at this result is necessary: this calculation is not as accurate as the result down to a hundredth of a percent suggests, because the algorithm in BOLD treats sequences with a gap in between as full length. If the differences in the part of the sequence which is lacking is greater than the average of the hypothetical full length difference, the calculation shows a smaller than the real p-distance. But the inaccuracy is at most a few tenths of a percent.

More important is the fact, the five closest species belong to five (sub)groups. Obviously, distances of 3-4 % are commonly found between quite unrelated species, and the conclusion which must be drawn is that these species are nothing but unrelated species which by coincidence are the closest in p-distance.

The result of the search for the closest related species of *A. guanchella* is that it is very isolated, no species close to it could be detected.

Distribution: So far known from Canary Islands, Gran Canaria.

Biology: Foodplant unknown. Moths have been collected in June and December which suggests that the species hibernates as imago and eggs are laid in winter or early spring.

Derivation of name: The species is named after the Guanches, the indigenous inhabitants of the Canary Islands.

Acknowledgements

I am most grateful to Jari Junnilaien (Espoo, Finland) and Per Falck (Denmark) for the loan of specimens, Martin Corley for proposal of the species name, linguistic corrections including further helpful comments and to the Canadian Centre for DNA Barcoding (Guelph, Canada), whose sequencing work was enabled by funding from the Government of Canada to Genome Canada through the Ontario Genomics Institute.

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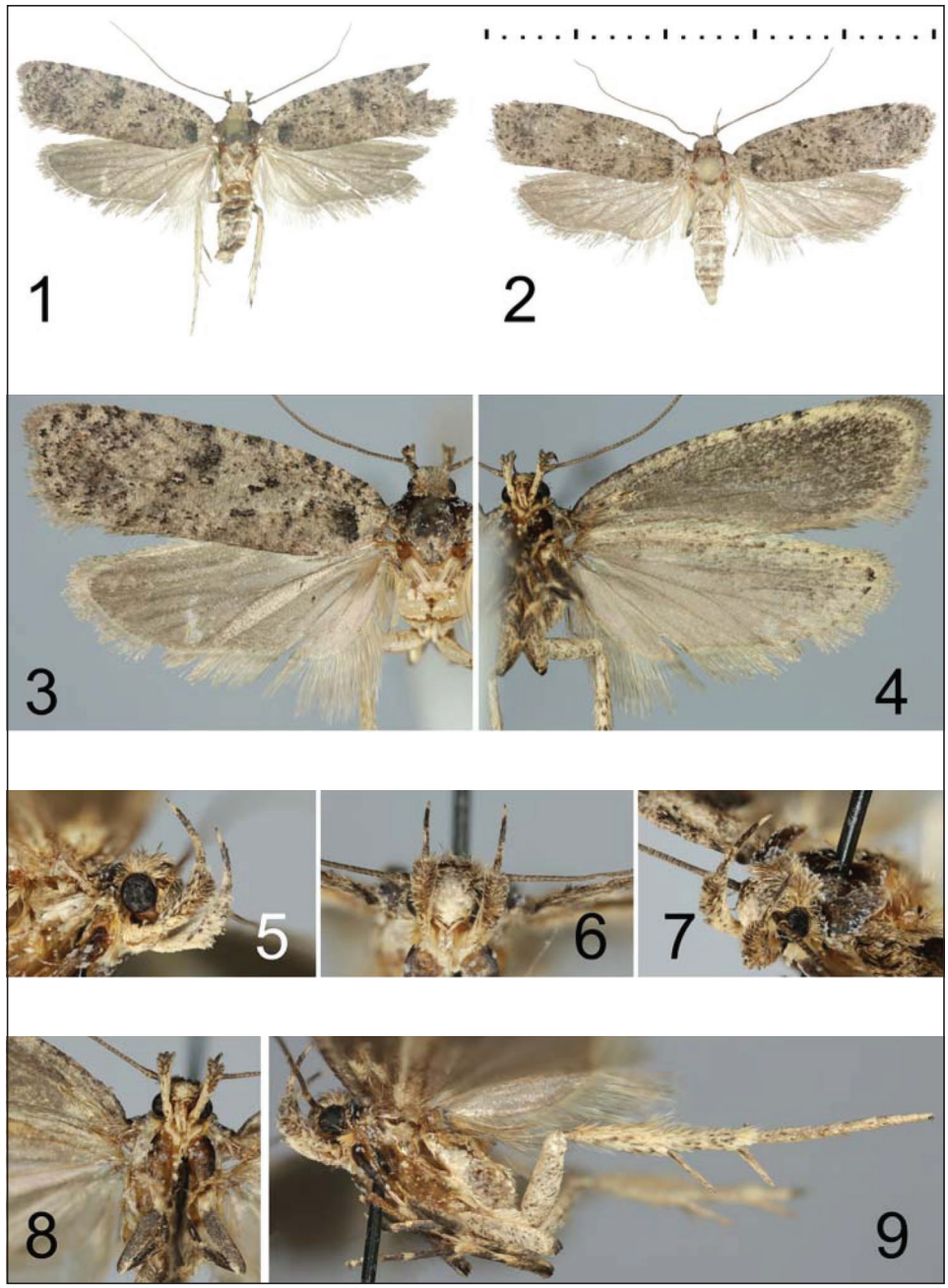
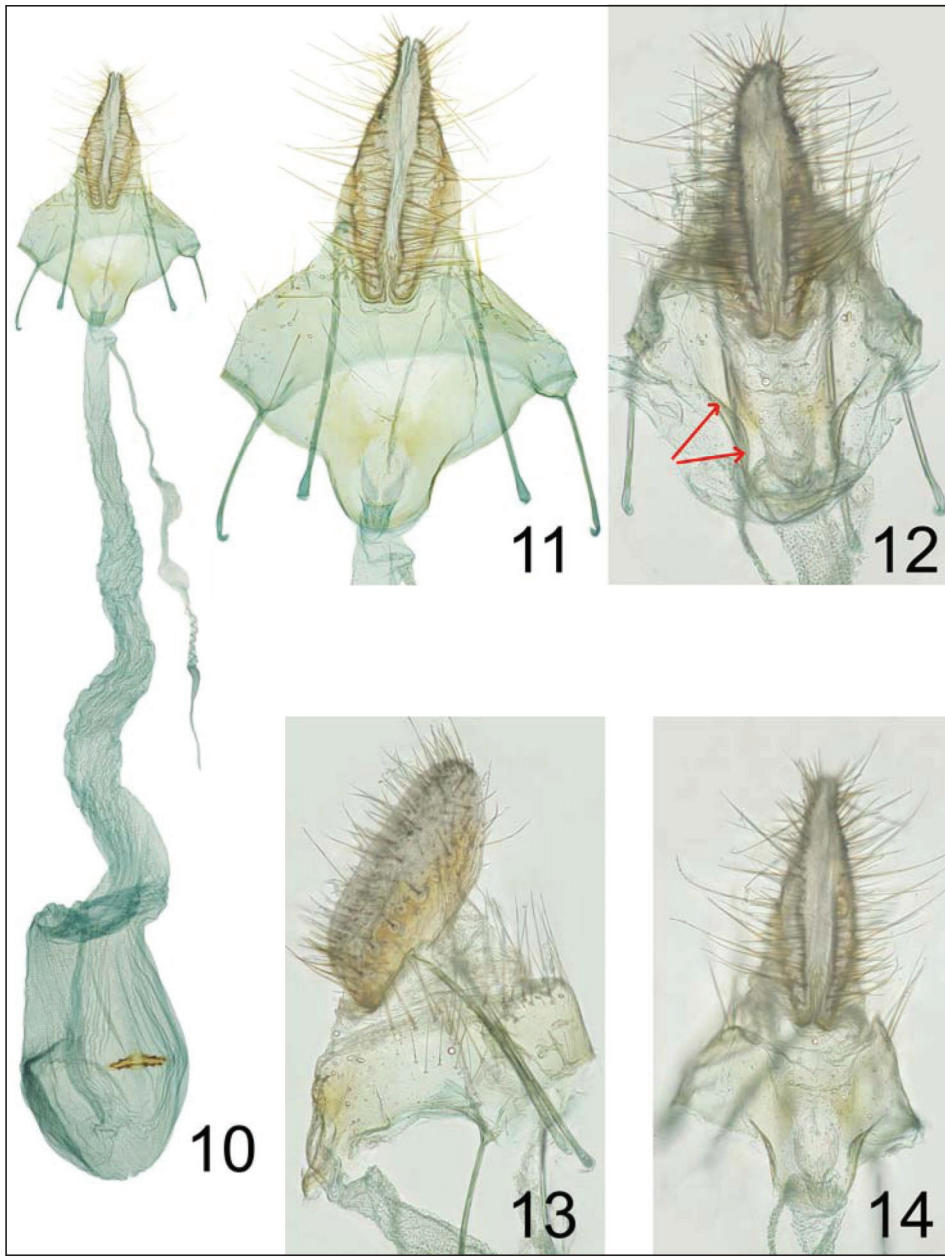
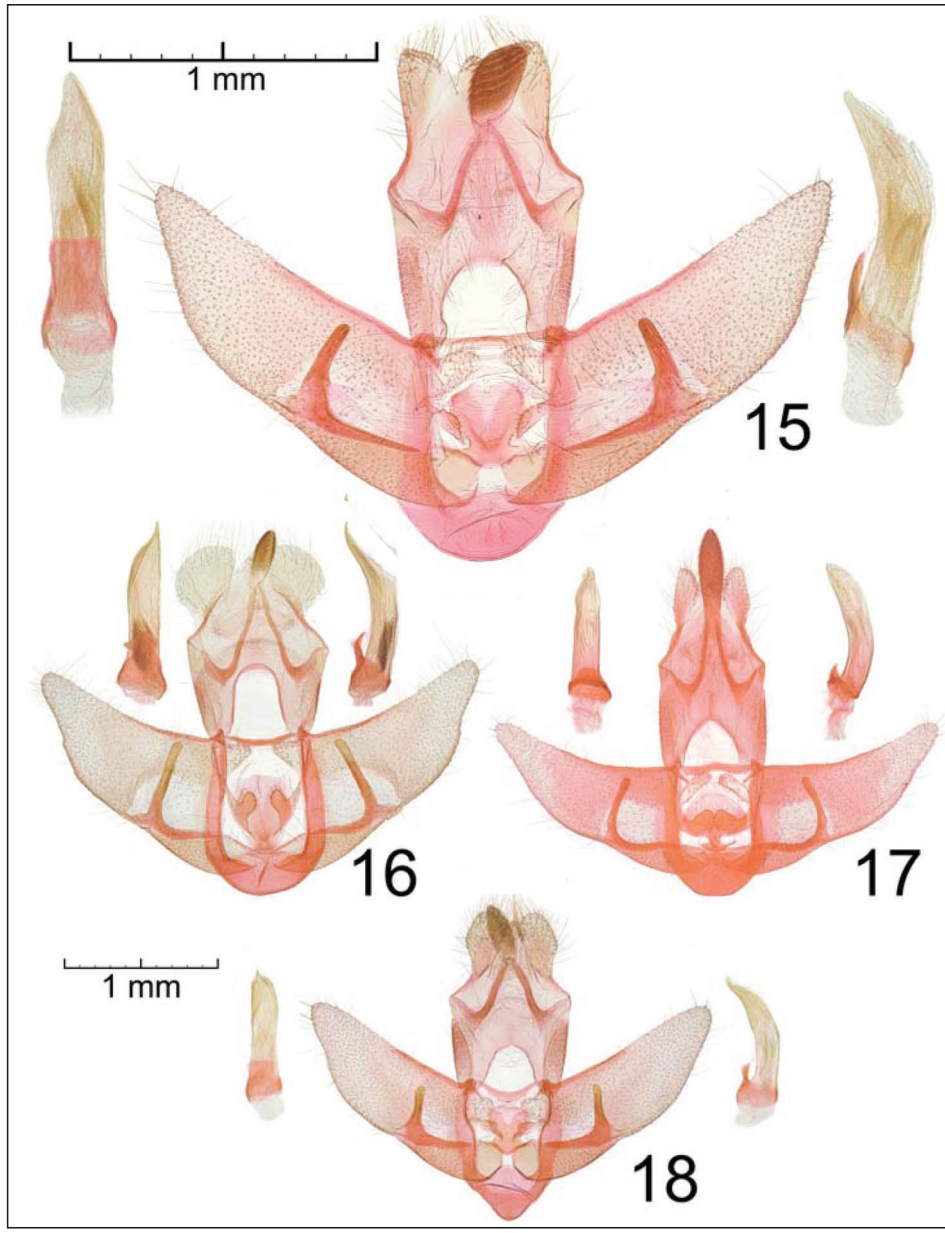


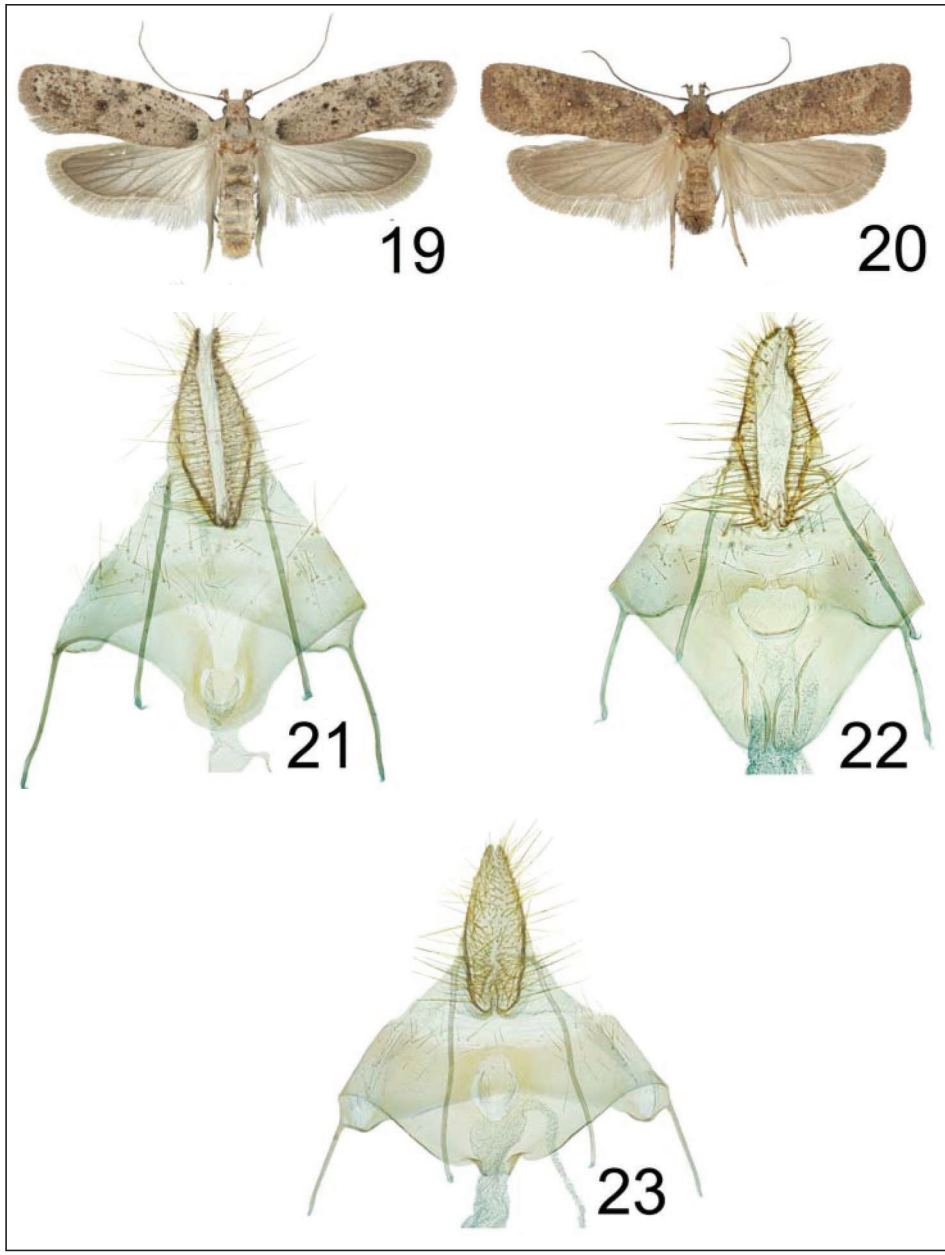
Figs 1-9.– *A. guanchella* Buchner. sp., n. **1.** holotype general view. **2.** paratype DEEUR 4558, general view. **3-9.** holotype, details of wing, head and legs.



Figs 10-14.– *A. guanchella* Buchner, sp. n., female genitalia, holotype. **10-11.** standard embedding (**10.** general view. **11.** segment VIII and papilla analis, detail). **12.** segment VIII not embedded, intersegmental membrane not removed, ventral view, red arrows point at specific distinct rim. **13.** segment VIII not embedded, lateral view. **14.** segment VIII not embedded, but intersegmental membrane removed, ventral view.



Figs 15-18.– Male genitalia, aedeagus shown in ventral view (left) and lateral view (right). **15.** *A. guanchella* Buchner, sp. n., DEEUR 4558, to scale with larger scalebar. **16-18.** further species for comparison, to scale with smaller scalebar. **16.** *A. thapsiella* (Z.), Greece, Kastoria, 13-IX-2014, RCKN. **17.** *A. conciliatella* (Rbl.), Canary Islands, La Gomera, Las Hayas, 27-XII-2018, RCAM. **18.** *A. ocellana* (F.), Russia, Orenburg district, 20-IX-2015, RCKN.



Figs 19-23.– Adult. **19.** *A. thapsiella* (Z.), grey specimen, Greece, Petres, 1-V-2012, NMBE. **20.** *A. conciliatella* (Rbl.), Canary Islands, La Gomera, El Cedro, 26-V-1965, ZSM. Female genitalia. **21.** *A. silerella* (Stt.), Italy, Friuli, 15-VII-2014, RCCM. **22.** *A. subtakamukui* (Lvsk.), Austria, Vorarlberg, 6-VII-1981, TLMF. **23.** *A. thapsiella* (Z.), Greece, Samos, 10-V-2010, NMBE.

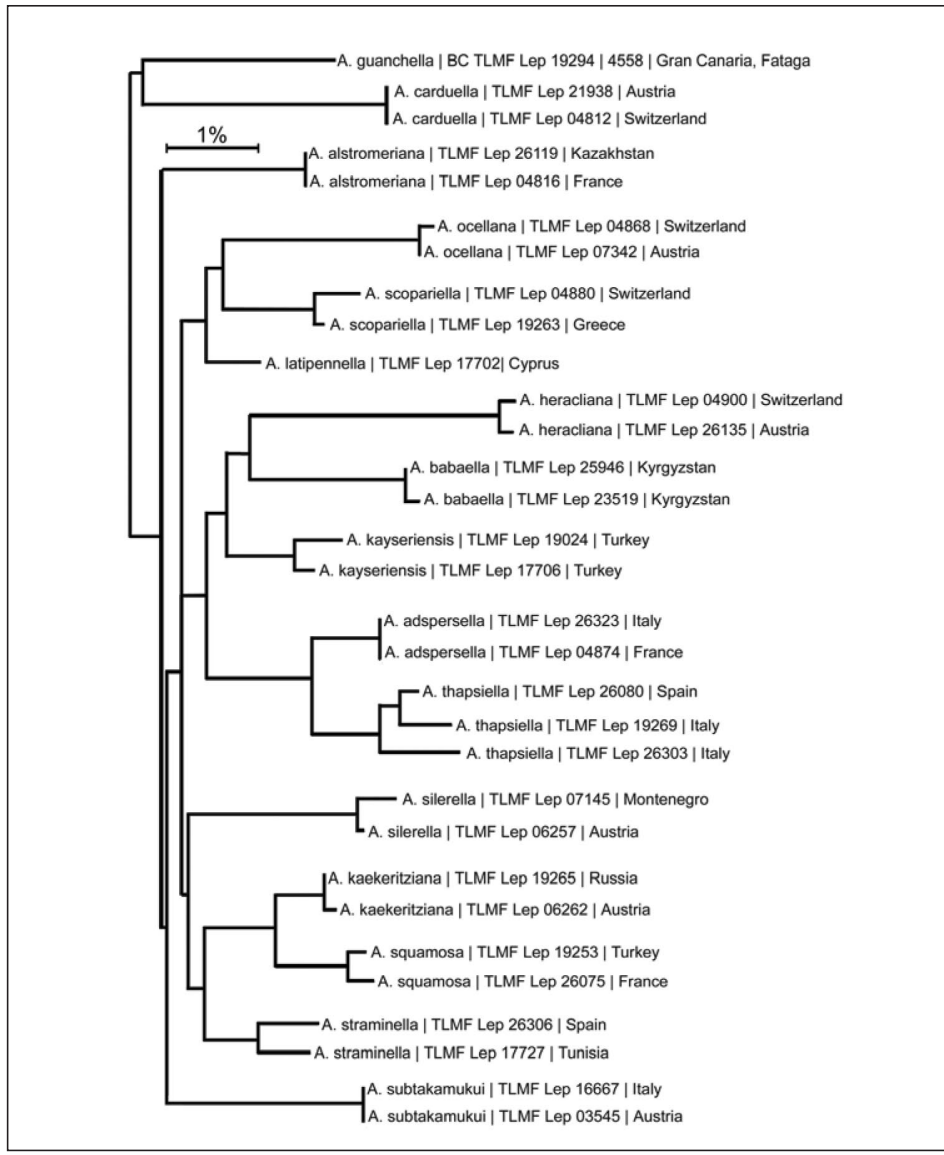


Fig. 24.– Neighbour-joining tree of *Agonopterix guanchella* and selected species and specimens from different species subgroups: *A. adspersella* subgroup (*A. adspersella* (Kollar, 1832), *A. thapsiella* (Zeller, 1847)), *A. alpigena* subgroup (*A. babaella* Amsel, 1972*, A. kayseriensis* Buchner, 2020), *A. alstromeriana* subgroup (*A. alstromeriana* (Clerck, 1759)), *A. arenella* subgroup (*A. carduella* (Hübner, [1817]), *A. ciliella* subgroup (*A. heracliana* (Linnaeus, 1758)), *A. pallorella* subgroup (*A. kaekeritziana* (Linnaeus, 1767)*, A. squamosa* (Mann, 1864)*, A. straminella* (Staudinger, 1859)), *A. ocellana* subgroup (*A. ocellana* (Fabricius, 1775)*, A. silerella* subgroup (*A. silerella* (Stainton, 1865)), *A. takamukui* subgroup (*A. subtakamukui* Lvovsky, 1998), Fabaceae feeding species group (*A. scopariella* (Heinemann, 1870)), species with group not clear (*A. latipennella* (Zerny, 1934)).

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New data on the distribution of little-known Pyraloidea species from Croatia (Lepidoptera: Pyraloidea)

D. Gumhalter

Abstract

New records and data on distribution concerning 15 Pyraloidea species (Pyralidae, Crambidae) little-known in Croatia are given. The majority of the specimens were collected around the Velebit area, or lesser-studied areas of Continental Croatia, with other material collected in Dalmatia. Three species were reported for the first time from the Mountainous and the Continental geographic area. Within these studied regions, one species was recorded for the first time after more than 150 years, six species after more than 120 years, four species after more than 100 years and five species after almost 70 years. Altogether 13 out of the total of 15 species were recorded for the first time in recent investigations from Croatia: one after an absence of 120 years, three species for the first time in 70 years and nine after almost 20 years.
KEY WORDS: Lepidoptera, Pyraloidea, distribution, faunistic, Dalmatia, Velebit, Croatia.

Nuevos datos sobre la distribución de especies poco conocidas de Pyraloidea de Croacia (Lepidoptera: Pyraloidea)

Resumen

Se dan nuevos registros y datos sobre la distribución concerniente a 15 especies de Pyraloidea (Pyralidae, Crambidae) poco conocidas en Croacia. La mayoría de los especímenes fueron colectados en los alrededores del área de Velebit, o áreas menores premeditadas de Croacia continental, con otro material colectado en Dalmacia. Tres especies fueron registradas, por primera vez, del área geográfica Montañosa y Continental. Dentro de estas regiones premeditadas, una especie fue registrada por primera vez después de más de 150 años, seis especies de más de 120 años, cuatro especies de más de 100 años y cinco especies de más de 70 años. En total 13 de las 15 especies fueron citadas en las recientes investigaciones en Croacia: una después de 120 años, tres especies por primera vez en 70 años y nueve después de casi 20 años.
PALABRAS CLAVE: Lepidoptera, Pyraloidea, distribución, faunística, Dalmacia, Velebit, Croacia.

Introduction

The Pyraloidea, comprising the families Crambidae and Pyralidae, is the third-largest superfamily of the order Lepidoptera. With over 16.300 described species they represent one of the most diverse lineages of Lepidoptera (NUSS *et al*., 2003-2020). According to LÉGER *et al*. (2021), the family Crambidae currently includes 10.347 described species and the family Pyralidae 6.032 species worldwide. About 850 species of Pyraloidea can be found in Europe (KARSHOLT & RAZOWSKI, 1996) out of which 396 are present in the fauna of Croatia, 218 taxa from the family Crambidae and 178 from the family Pyralidae (GUMHALTER, 2021). This represents about 47% of the overall European Pyraloidea fauna.

According to LÉGER *et al*. (2021), Pyraloidea exhibit an unprecedented spectrum of ecological adaptations in larval life habits, including adaptations to freshwater habitats (Acentropinae) or extreme dry environments such as deserts (some Phycitinae). The larval food spectrum ranges from detritus, lichens and mosses over lycopods and ferns to conifers and mono- and eudicotyledonous plants. Some larvae are scavengers, feeding on stored products and causing economic damage.

Due to its geographic position through three biogeographic zones, Croatia has a great biological diversity (Fig.1). Between the Mediterranean and Eurosibirian-Northamerican biogeographic zone, lies the mountainous karst area of Central Croatia. Some parts of it belong to the Croatian part of the European "Alpine biogeographical region" (EEA, 2012) and present a broad transitional zone of Continental and Mediterranean faunal elements (TVRTKOVIĆ *et al*., 2015).

Although the Croatian Pyraloidea fauna is very diverse if compared to the neighbouring countries Austria, Hungary, Italy, and Slovenia (GUMHALTER, 2020), not all Croatian regions have been equally studied in the past.

According to GUMHALTER (2019a), the best-studied part of Croatia is the coast (Mediterranean biogeographic region), with 95% of all recorded Pyraloidea species occurring. Altogether 49% of all Pyraloidea species from Croatia have been recorded in the Continental and only 31% in the Mountainous biogeographic region.

In this paper, new data on the distribution of species previously only recorded historically within the specified region of Croatia are presented. Altogether 15 species were recorded for the first time in recent investigations from the specified certain region. Three species were recorded for the first time from the regions of Continental and Mountainous Croatia. Many records represent the first ones after many decades, sometimes after more than 120 or even 150 years from that specific region. Besides, four species were recorded for the first time from Croatia after 120 and 70 years, and nine species after almost two decades.

Material and methods

This study is based completely on the material deposited in the author's private collection of Lepidoptera. The specimens were collected over a period of six years as adult moths by light trapping or at day with a net. The majority of the specimens were collected around the Velebit area, the largest mountain range in Croatia located in the least-studied region of the country, or lesser-studied areas of Continental Croatia, with other material collected in Dalmatia, the southernmost and best-studied region of Croatia.

Identification of all species based on wing pattern was conducted according to SLAMKA (2006, 2008, 2013, 2019). Dissections of genitalia were performed where necessary, by the standard procedure of maceration of abdomens in potassium hydroxide. The genitalia slides are deposited together with the specimens in the author's private collection (coll. Gumhalter).

The systematic presentation follows Fauna Europaea (NUSS *et al*., 2003-2020).

Results and discussion

List of species

PYRALOIDEA
PYRALIDAE
Phycitinae

Genus *Acrobasis* Zeller, 1839

Acrobasis legatea (Haworth, 1811)

Material examined: Dalmatia, island Brač, Nerežišća, 355 m.a.s.l., 43º20'01.1"N 16º34'33.5"E, 1

♀, 31-VIII-2016, D. Gumhalter leg.; Dalmatia, Mount Biokovo, Sveti Jure, 1700 m.a.s.l., 43º20'21.0"N 17º3'14.3"E, 1 ♂, 20-VIII-2019, D. Gumhalter leg.

Distribution: Following KARSHOLT & RAZOWSKI (1996), the species is distributed throughout the Mediterranean and some parts of Europe.

Remarks: The newest records of *A. legatea* from Croatia are from the island Krk (HABELER, 2003). The last records from Dalmatia originate from 1921 (SCHAWERDA, 1921) so these findings are the first ones for that region after 100 years (Fig. 2).

Genus *Ancylosis* Zeller, 1839

Ancylosis cinnamomella (Duponchel, 1836)

Material examined: Dalmatia, Mount Biokovo, 550 m.a.s.l., 43º15'35.8"N 17º05'24.7"E, 1 ♂, 27-VIII-2019, D. Gumhalter leg.

Distribution: According to the Lepiforum website (www.lepiforum.org), the species is distributed in Austria, Bosnia and Herzegovina, Germany, Montenegro, Spain and Ukraine.

Remarks: There are many old records from Croatia, all from the coastal region. The newest records originate from the island of Krk (HABELER, 2003). The last records from the mountains originate from 1896 (ABAFI-AIGNER *et al*., 1896) and Dalmatia from 1942 (KLIMESCH, 1942). Therefore, this record represents the first one from the Croatian mountains in more than 120 years and Dalmatia in almost 70 years (Fig. 3).

Genus *Selagia* Hübner, [1825]

Selagia argyrella ([Denis & Schiffermüller], 1775)

Material examined: Velebit area, Lika, Grabovača, 670 m.a.s.l., 44º38'33.6"N 15º21'46.6"E, 2 ♂♂, 3 ♀♀, 23-VIII-2016, D. Gumhalter leg.

Distribution: According to SLAMKA (2019), the species is widespread in Europe, excluding Ireland and the majority of the Mediterranean islands. It was recently recorded as a migrant from Sweden. Eastwards it is distributed to Russia and Central Asia.

Remarks: As the last records from the Croatian Mountainous area originate from the end of the 19th century (MANN, 1867; ABAFI-AIGNER *et al*., 1896), these records represent the first ones after more than 120 years for that geographic region. Since the species was not recorded after that, these findings also represent the first ones from Croatia after more than 120 years (Fig. 4).

Crambidae

Crambinae

Genus *Agriphila* Hübner, [1825]

Agriphila latistria (Haworth, 1811)

Material examined: Dalmatia, island Brač, Vidova gora, 700 m.a.s.l., 43º17'37.1"N 16º37'26.6"E, 1 ♂, 1 ♀, 27-VIII-2016, D. Gumhalter leg.

Distribution: According to SLAMKA (2008), the species is distributed in West and South Europe, southern Norway, southern Sweden but data from Hungary are doubtful. It is also distributed in Algeria, Asia Minor, and Iraq.

Remarks: The species is mentioned for Croatia only in historical literature: WOCKE (1871), REBEL (1891, 1914), ABAFI-AIGNER (1903) and KLIMESCH (1942). Both SLAMKA (2008) and PLANT & JAKŠIĆ (2018) cite the same sources. As the last record from Croatia originates from Dalmatia 1942 (KLIMESCH, 1942), the present findings represent the first records in almost 70 years for both, Croatia and Dalmatia.

Genus *Chrysocrambus* Błeszyński, 1957

Chrysocrambus cassentiniellus (Herrich-Schäffer, 1848)

Material examined: Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45º46'38.6"N 15º55'04.5"E, 1 ♂, 30-V-2016, D. Gumhalter leg.; Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45º46'38.6"N 15º55'04.5"E, 1 ♂, 1 ♀, 24-VI-2016, D. Gumhalter leg., gen. prep. 17, 18, 19-2021 D. Gumhalter.

Distribution: According to SLAMKA (2008), the species is distributed in South Europe, the South-Eastern part of Central Europe, Transcaucasia, Asia Minor, Syria, Jordan, Iran and Central Asia.

Remarks: There are several old records of *C. cassentiniellus* from the mountains and the coast, the newest one being from Dalmatia from 1956 (NEUSTETTER, 1956). As there are no records at all from the Continental part, these findings represent the first ones from that geographic region and for Croatia after more than 70 years.

Genus *Chrysoteuchia* Hübner, [1825]

Chrysoteuchia culmella (Linnaeus, 1758)

Material examined: Velebit area, Bojinac, 663 m.a.s.l., 44º20'57.0"N 15º25'56.1"E, 1 ♂, 28-V-2016, D. Gumhalter leg.

Distribution: According to SLAMKA (2008), the species is widely distributed from Europe to Japan.

Remarks: The species was reported from Croatia many times in historical literature. The newest records originate from the island of Krk (HABELER, 2003) and Continental Croatia (KRČMAR, 2014; KOREN, 2018). The last records from the Mountainous region are from the end of the 19th century (MANN, 1867; ABAFI-AIGNER *et al*., 1896) so this finding represents the first one after more than 120 years.

Genus *Crambus* Fabricius, 1798

Crambus pascuellus (Linnaeus, 1758)

Material examined: Dalmatia, island Brač, Nerežišća, 355 m.a.s.l., 43º20'01.1"N 16º34'33.5"E, 1 ♂, 31-VIII-2016, D. Gumhalter leg.; Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45º46'38.6"N 15º55'04.5"E, 1 ♂ , 1 ♀, 09-VI-2019, D. Gumhalter leg., gen. prep. 24, 25-2021 D. Gumhalter.

Distribution: The species is widely distributed in Europe, also known from Iceland, as well as from Japan and North America (SLAMKA, 2008).

Remarks: There is only one recent Croatian record of *C. pascuellus*, which originates from the island of Krk (HABELER, 2003). As the last record from Continental Croatia originates from the year 1925 (KOČA, 1925) and Dalmatia from 1942 (KLIMESCH, 1942), these findings represent the first records from Continental Croatia in almost 100 years and Dalmatia in almost 70 years.

Genus *Pediasia* Hübner, [1825]

Pediasia luteella ([Denis & Schiffermüller], 1775)

Material examined: Velebit area, Lika, Smiljan, 559 m.a.s.l., 44º33'55.1"N 15º18'52.1"E, 1 ♂, 24-VIII-2016, D. Gumhalter leg., gen. prep. 15-2021 D. Gumhalter.

Distribution: SLAMKA (2008) states that the species is distributed in Europe, excluding the northern parts; it is evidently absent from Spain, Great Britain, Ireland, The Netherlands and Denmark. It is also present in Asia Minor, south Kazakhstan, Central Asia, southern Siberia and Mongolia.

Remarks: The last Croatian records of this species are from HABELER (2003) from the island of Krk. Besides these, only historical records exist, mainly from the coast. The only records from the mountainous region are from 1867 (MANN, 1867) and 1896 (ABAFI-AIGNER *et al*., 1896). This finding is the first one from this geographic region of Croatia in more than 120 years.

Genus *Platytes* Guenée, 1845

Platytes cerussella ([Denis & Schiffermüller], 1775)

Material examined: Continental Croatia, Zagreb, Jarun, 119 m.a.s.l., 45º46'38.6"N 15º55'04.5"E, 4 ♂♂, 11-VIII-2016, D. Gumhalter leg.; Continental Croatia, Zagreb, Cmrok, 211 m.a.s.l., 45º50'00.3"N 15º58'29.9"E, 1 ♀, 09-VI-2019, D. Gumhalter leg.

Distribution: SLAMKA (2008) states that the species is distributed in Europe, excluding the northern parts. *P. cerusella* is also present in Turkey, Armenia and south Siberia.

Remarks: The last Croatian records are from HABELER (2003) from the island of Krk. Besides these, only old records persist, the last one being from Dalmatia from 1921 (SCHAWERDA, 1921) and the mountainous region from 1867 (MANN, 1867). Until now, the species was not reported from Continental Croatia.

Evergestinae

Genus *Evergestis* Hübner, [1825]

Evergestis politalis ([Denis & Schiffermüller], 1775)

Material examined: Continental Croatia, Zagreb, Jarun, 119 m.a.s.l, 45º46'38.6"N 15º55'04.5"E, 1 ♂, 1 ♀, 30-V-2016, D. Gumhalter leg.

Distribution: Following the Lepiforum website, the species was reported from Austria, Switzerland, Italy, Spain, France and Romania.

Remarks: There are no newer records from Continental Croatia since 1904 (REBEL, 1904), so these findings represent the first ones after almost 120 years. The last record from Croatia is from 1942 (KLIMESCH, 1942) and so these findings also represent the first ones in almost 70 years for that region and Croatia overall.

Pyraustinae

Genus *Anania* Hübner, [1823]

Anania coronata (Hufnagel, 1767)

Material examined: Velebit area, Lika, Ličko Cerje, 565 m.a.s.l., 44º21'00.2"N 15º41'18.1"E, 1 ♂, 07-IX-2016, D. Gumhalter leg., gen. prep. 26-2021 D. Gumhalter.

Distribution: According to SLAMKA (2013), it is widespread in Europe.

Remarks: Although the species was reported throughout recent surveys from Continental and Mediterranean Croatia (KOREN *et al*., 2015; KOREN, 2018; GUMHALTER, 2019a), this record from the Velebit area represents the first one from the Croatian Mountainous region since the end of the 19th century (MANN, 1867; REBEL, 1895; ABAFI-AIGNER *et al*., 1896).

Anania stachydalis (Germar, 1821)

Material examined: Velebit area, Lika, Ličko Cerje, 565 m.a.s.l., 44º21'00.2"N 15º41'18.1"E, 1 ♂, 07-IX-2016, D. Gumhalter leg., gen. prep. 23-2021 D. Gumhalter.

Distribution: According to SLAMKA (2013), it is distributed in Europe, except in the North.

Remarks: Although the species was reported throughout recent surveys from Continental and Mediterranean Croatia (HABELER, 2005; KOREN *et al*., 2015; KOREN, 2018), this record represents the first one from the Croatian Mountainous region. Following SLAMKA (2013), *A. stachydalis* is a local species (SLAMKA, 2013) so it is possible that it is also local in Croatia. Further reports from Croatia would contribute to the knowledge of its distribution in that country.

Spilomelinae

Genus *Diasemia* Hübner, [1825]

Diasemia reticularis (Linnaeus, 1761)

Material examined: Velebit area, Lika, Grabovača, 670 m.a.s.l., 44º38'33.6"N 15º21'46.6"E, 2 ♂♂, 23-VIII-2016, D. Gumhalter leg.

Distribution: According to SLAMKA (2013), it is distributed in Europe, in Britain it is recorded as a scarce migrant in the South. Elsewhere, it is recorded in Turkey, Georgia, Central Asia, South Siberia, China, India, Amur, Primorye, Kuriles and Japan.

Remarks: Although it is not a rare species, it was not recorded many times in recent investigations. The newest records originate from Continental Croatia (KOREN, 2018) and island Krk (HABELER, 2003), but from the mountains, there are no records after 1867 (Mann). In addition, the last findings from Dalmatia are from the year 1921 (SCHAWERDA, 1921). Therefore, these findings represent the first ones from the mountains in more than 150 years and from Dalmatia after almost 100 years.

Genus *Antigastra* Lederer, 1863

Antigastra catalaunalis (Duponchel, 1833)

Material examined: Dalmatia, island Brač, Sutivan, 10 m.a.s.l., 43º23'11.8"N 16º28'03.7"E, 1 ♂, 01-IX-2018, D. Gumhalter leg.; Dalmatia, Mount Biokovo, Gornja Podgora, 270 m.a.s.l., 43º14'21.4"N 17º05'21.4"E, 1 ♀, 21-VIII-2019, D. Gumhalter leg.

Distribution: According to SLAMKA (2013), the species is distributed in the Tropics and throughout the Mediterranean in dry habitats. It has been recorded as a migrant in England, Ireland, Belgium, Holland and southern Sweden. It also migrates sporadically to southern parts of Central Europe. Besides this, it is distributed in Africa, Turkey, Syria, Iran, India, Hong Kong, Costa Rica, Australia, Japan and South America (Colombia).

Remarks: The species was reported from Croatia several times in historical literature, but the newest record of this species originates from Krk (HABELER, 2003). The last record from Dalmatia is from the year 1942 (KLIMESCH, 1942) so these findings represent the first ones from this region after almost 70 years.

Udea fulvalis (Hübner, [1809])

Material examined: Mount Biokovo, Gornja Podgora, 270 m.a.s.l., 43º14'21.4"N 17º05'21.4"E, 1 ♂, 28-V-2016, D. Gumhalter leg., gen. prep. 35-2021 D. Gumhalter.

Distribution: According to SLAMKA (2013), it is distributed in Europe, except the North. It was mentioned as a scarce migrant to England and Wales. Also reported from Turkey, North Africa, Afghanistan, India, Sri Lanka, South Siberia and Primorye.

Remarks: The newest reports from Croatia are from island Krk (HABELER, 2003). The last time the species was reported from Dalmatia was in 1921 (SCHAWERDA, 1921). Therefore, this record represents the first one for that region after almost 100 years (Fig. 5).

Discussion

Many historical faunistic papers published on Croatian Lepidoptera throughout the last two centuries included Pyraloidea species (GALVAGNI, 1902; MANN, 1857, 1867, 1869; REBEL, 1891, 1895, 1903, 1904, 1917; SCHAWERDA, 1921, etc.). These publications were summarised by PLANT & JAKŠIĆ (2018). However, the majority of historic publications relate to northern parts of the Croatian coast, Istria (e.g. MANN, 1857; REBEL, 1913, 1914; STAUDER, 1914; SCHAWERDA, 1920; PROHASKA, 1922; etc.) or to southern parts of the Croatian coast, Dalmatia (e.g. MANN, 1867;

1869; REBEL, 1891; GALVAGNI, 1902; REBEL, 1917, 1919; SCHAWERDA, 1921; KLIMESCH, 1942; etc.). Mountain ranges and continental areas seem to be poorly represented in the historic literature and little was published that included micromoths from such areas (e.g. MANN, 1867; REBEL, 1895; ABAFI-AIGNER *et al*., 1896, 1903; etc.).

However, compared to other Microlepidoptera families, the Pyraloidea belong to the better-known families in Croatia. Over the last two decades, many surveys were undertaken to contribute to the knowledge of the Croatian Pyraloidea fauna (KOREN *et al*., 2015; GUMHALTER *et al*., 2018; KOREN, 2018; KOREN & ZADRAVEC, 2018; GUMHALTER, 2020; GUMHALTER *et al*., 2020; GUMHALTER & KUČINIČ, 2021; GUMHALTER, 2021) and a first checklist was published in 2019a (GUMHALTER, 2019). Because of the continuous faunal additions, the list of species occurring in Croatia was updated twice (GUMHALTER, 2019b, 2021), suggesting that the Pyraloidea fauna of that country is far from sufficiently known. This applies even to the best-studied Mediterranean biogeographic region, since the last additions to the Croatian Pyraloidea fauna originate from the coastal parts of the country (e.g. KOREN & KULIJER, 2020; GUMHALTER, 2021; KOREN, 2021; etc.).

Although recently, a paper was published covering the Croatian Pyraloidea from Continental Croatia (GUMHALTER *et al*., 2020) and Mount Biokovo (GUMHALTER & KUČINIČ, 2021), the majority of recent literature continued to deal with the Croatian coast or covered only newly recorded species. Hence, it is no surprise that the distribution and conservation status of Pyraloidea in the Continental and Mountainous region is insufficiently known. The few recent investigations conducted in these two regions resulted in a lack of information on the occurrence of many species, even for widely distributed and very common species. Many have been reported only in old historical publications, which were sometimes even older than 100 years. As these species have not been reconfirmed throughout recent surveys, their current status in a specific region or their distribution in Croatia are unclear.

The majority of the reported species are regarded as being common, cosmopolitan, or widespread. Nonetheless, as there is a lack of recent sufficient investigation, these species have not been recorded in surveys conducted over the last few decades, sometimes even over a period of more than 70, 120 or 150 years. Consequently, their distribution in Croatia or some Croatian regions remained unclear.

Continental Biogeographic Region

The most interesting records concern the findings of two species that were reported for the first time from that biogeographic region. As the species *C. cassentiniellus* and *P. cerussella* were recorded for the first time from Continental Croatia this new data widens our knowledge of the distribution of these species in that country.

The species *E. politalis* was recorded for the first time after more than 120 years from the Continental part of Croatia. *C. pascuellus* was reported for the first time in 100 years from Continental Croatia. Both species were not recorded for an extended period, so these reports contribute to the knowledge of the recent Pyraloidea fauna of this region.

Mountainous Biogeographic Region

The species *A. stachydalis* was recorded for the first time from the Mountainous biogeographic region. This new data widens our knowledge of the distribution of this species in Croatia.

The species *D. reticularis* was recorded for the first time in more than 150 years from the Croatian mountains. For five species, these records represent the first ones from the Mountainous part of the country after more than 120 years: *A. cinnamomella*, *S. argyrella, C. culmella, P. luteella* and *A. coronata*. These recent findings reconfirm that the above-mentioned species are still present in the Mountainous biogeographic region of Croatia.

MEDITERRANEAN BIOGEOGRAPHIC REGION

The species *A. legatea*, *D. reticularis* and *U. fulvalis* were reported for the first time in 100 years from Dalmatia, which is located in the Mediterranean biogeographic region of Croatia. Another five species were recorded for the first time in 70 years from Dalmatia: *A. cinnamomella, A. latistria, C. pascuellus, E. politalis* and *A. catalaunalis.* Although the biogeographic region of Mediterranean Croatia is the best-studied region of the country, many old records were not reconfirmed so these findings contribute to the knowledge of Dalmatian pyraloid moth fauna.

Also interesting are the findings of some species, which have not been reported from Croatia in recent investigations.

The record of the species *S. argyrella* is the first one from Croatia in 120 years and the record of *A. latistria, C. cassentiniellus* and *E. politalis* are the first ones from Croatia in almost 70 years. Altogether eight species were reported the last time in 2003 (HABELER, 2003) and these findings represent the first ones in almost two decades: *A. legatea, A. cinnamomella, C. culmella, C. pascuellus, P. luteella, P. cerusella, A. catalaunalis* and *U. fulvalis*.

These findings reconfirm the occurrence of the above-mentioned species in the Croatian Pyraloidea fauna; for some of them were recorded for the last time at the end of the 19th century or in the middle of the 20th century and no recent information on their status in Croatia or that region was available.

One of the consequences of global warming is a change in climate and this is likely to generate changes in habitat structure with a consequential effect on insect biodiversity. Some species may disappear from a region or a whole country. With this in mind, it is important to create species inventories and to reconfirm historical records where possible. The present study updates the databank for some species in some neglected areas, although it is clear that further research is likely to be an ongoing requirement.

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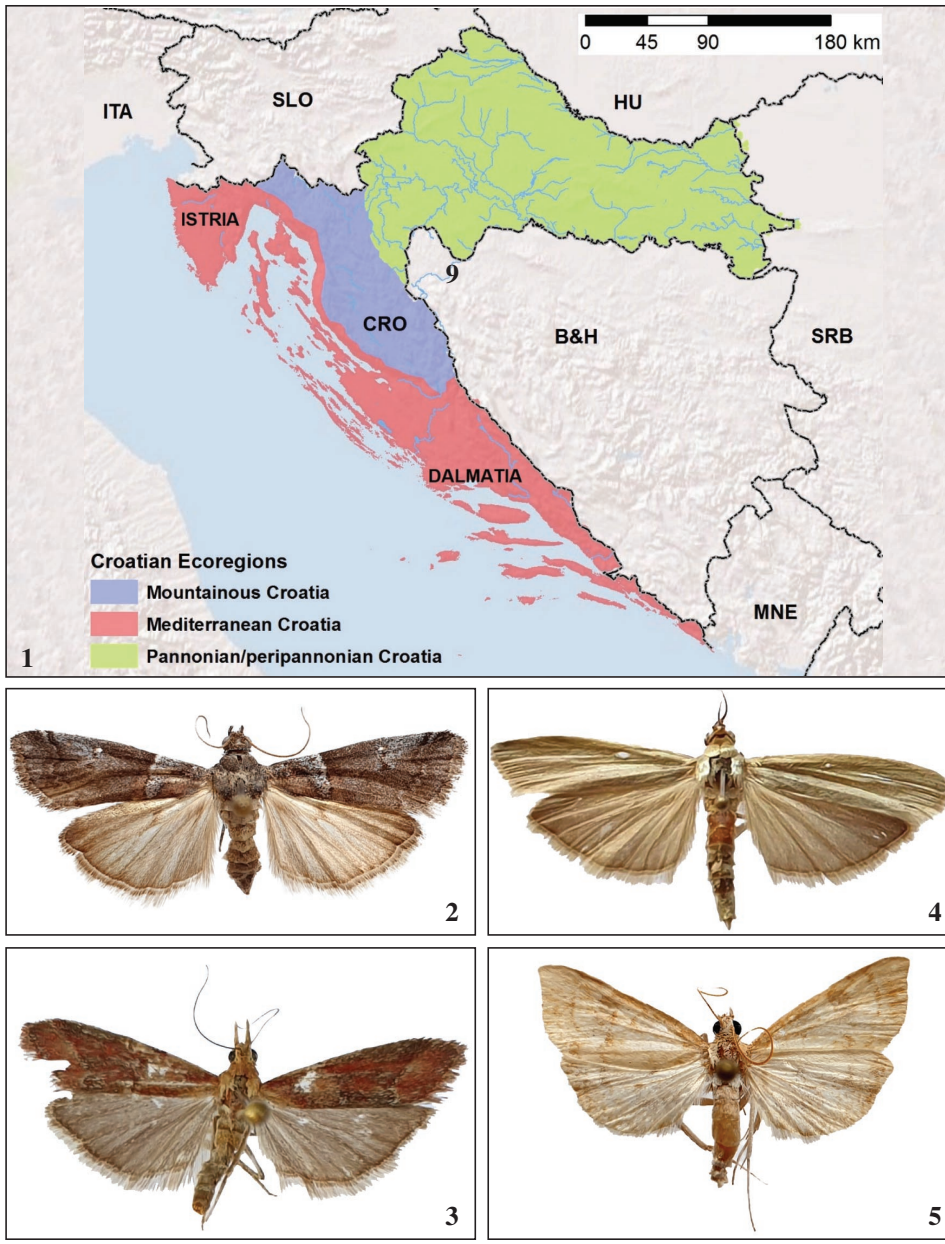

Figures 1-5.– 1. Map showing the three biogeographical regions in Croatia. **2.** First finding of *Acrobasis legatea* from Dalmatia after 100 years (wingspan: 19-25 mm). **3.** *Ancylosis cinnamomella* collected for the first time after 120 years in the Croatian mountains (wingspan: 19-26 mm). **4.** The species *Selagia argyrella* - first findings after 120 years from Croatia (wingspan: 22-28 mm). **5.** First record of *Udea fulvalis* from Dalmatia after 100 years (wingspan: 24-29 mm).

COMITÉ PARA LA PROTECCIÓN DE LA NATURALEZA, PROYECTO DE INVESTIGACIÓN CIENTÍFICA DE SHILAP / *COMMITTEE FOR THE PROTECTION OF NATURE, SHILAP SCIENTIFIC RESEARCH PROJECT*

Solicitud de autorización para recoger lepidópteros con fines científicos en España

Las solicitudes cumplirán las siguientes condiciones:

1.– Estar al día en el pago de la cuota anual de la Sociedad, antes de solicitar los permisos.

2.– Enviar un correo electrónico al Secretario General de SHILAP con todos los datos personales, incluyendo nombre, apellidos, dirección, DNI o número de pasaporte, número de teléfono (con código del país y prefijo) y correo electrónico. Estos datos serán enviados al Secretario General con un mínimo de 45 días de antelación al período de captura previsto.

3.– Se detallará el área donde se desea capturar el material (provincia y/o región), el período de tiempo (días, meses o todo el año); método de captura que se desea emplear (manga entomológica, grupo electrógeno, etc.), material que se desea recoger (especies, géneros, familias, y/o superfamilias) y cualquier otro dato que se desee añadir.

4.– Todos los socios de SHILAP que soliciten estos permisos para recoger Lepidoptera en España con fines científicos, serán incluidos en el Proyecto de Investigación Científica creado por la Sociedad y denominado: *"Faúnula Lepidopterológica Ibérica, Baleárica y región Macaronésica"*.

5.– Con el fin de contribuir con este Proyecto Científico, se ruega remitan a SHILAP, **o una copia por correo electrónico (e-mail), con el listado del material recogido en EXCEL,** sólo en este formato, indicando la Familia, Subfamilia, Tribu, nombre de la especie (género, especie, autor y año), localidad, coordenadas UTM (1 X 1) o GPS, provincia, fecha de captura, colector y número de machos y hembras capturados (**sólo 5 ejemplares por taxón y localidad, máximo**). Por favor, utilice sólo el *"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 (Insecta: Lepidoptera)*" (A. VIVES MORENO, 2014)". Esta lista es necesaria para este Proyecto Científico de SHILAP y para nuevas autorizaciones.

6.– Es obligatorio publicar en *SHILAP Revista de lepidopterología,* las nuevas especies o subespecies que se descubran y remitir a SHILAP **una parte del material TIPO**, para su posterior incorporación a la colección de Lepidoptera del Museo Nacional de Ciencias Naturales en Madrid, España.

7.– Se recuerda a todos los socios de la obligación de estar autorizados para recoger Lepidoptera, con fines científicos, en España y que está prohibida todo tipo de actividad comercial, con el material capturado.

8.– Conocer los fines científicos de SHILAP y comprometerse a pagar los gastos de participación en este Proyecto Científico, que la Junta Directiva considere en cada momento.

Application for permits to collect Lepidoptera in Spain for scientific purposes

Applications must abide by the following conditions:

1.– The Society's annual fee must be paid before applying for the permits.

2.– To send an electronic mail the General Secretary of SHILAP, with all the personal data, including name, surname, address, ID card number or Passport number, telephone number (with country code and prefix) and electronic mail address. These data must reach the General Secretary at least 45 days in advance of the foreseen collecting activity.

3.– The collecting area to be visited by the applicant should also be detailed (province and/or region), expected dates (days, months, or the whole year), collecting method (entomological net, generator, etc.), taxonomical groups of interest to be collected (species, genera, families and/or superfamilies); any other data the applicant wishes to add.

4.– All members of SHILAP who apply for these permits to collect Lepidoptera in Spain with scientific purposes, will be included in the Scientific Research Project created by the Society and called: *"Lepidopterological Fauna of the Iberian Peninsula, Balearic Islands and Macaronesian region"*.

5.– In order to contribute to this Scientific Project, it is requested to send to SHILAP, **either a copy by electronic mail (e-mail), with the listing of materials collected in EXCEL** (- only in this format, please), indicating the Family, Subfamily, Tribe, name of the species (genera, species, author's name and year), town, UTM (1 X 1) or GPS coordinates, province, dates of capture, collector and numbers of males and females captured (**only 5 specimens per taxon and locality, maximum**). Please, use only the *"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 (Insecta: Lepidoptera)* (A. VIVES MORENO, 2014)". This list is necessary for this Scientific Project of SHILAP and for new authorizations.

6.– It's obligatory to publish in *SHILAP Revista de lepidopterología*, the new species or subspecies that are discovered and to remit to SHILAP **a part of the TYPE material**, for later incorporation into the Lepidoptera Collection of the National Museum Natural Sciences, Madrid, Spain.

7.– All members are kindly reminded of the obligation to be duly authorized for collecting Lepidoptera, with scientific purposes, in Spain and that it is forbidden all type of commercial activity, with the captured material.

8.– To know about the scientific aims of SHILAP and to commit to pay the expenses of participation in this Scientific Project, that the Board of Directors considers at any given moment.

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A new species of *Pelagodes* Holloway, 1996 and a new species of *Thalassodes* Guenée, 1857 from Luzon, the Philippine islands (Lepidoptera: Geometridae, Geometrinae, Thalassodini)

A. Lindt, K. Sarv & J. Viidalepp

Abstract

Two new species of Thalassodini, *Pelagodes tuustiae* Lindt, Sarv & Viidalepp, sp. n. and *Thalassodes lennuki* Lindt, Sarv & Viidalepp, sp. n., are described from Luzon, Philippines. The adults, their male and female genitalia characteristics are described and illustrated.
KEY WORDS: Lepidoptera, Geometridae, Geometrinae, Thalassodini, new species, morphology, taxonomy, Philippine islands.

Una nueva especie de *Pelagodes* Holloway, 1996 y una nueva especie de *Thalassodes* Guenée, 1857 de Luzón, Filipinas (Lepidoptera: Geometridae, Geometrinae, Thalassodini)

Resumen

Se describen dos nuevas especies de Thalassodini, *Pelagodes tuustiae* Lindt, Sarv & Viidalepp, sp. n. y *Thalassodes lennuki* Lindt, Sarv & Viidalepp, sp. n., de Luzón, Filipinas. Se describe e ilustra el adulto y las características de la genitalia del macho y de la hembra.
PALABRAS CLAVE: Lepidoptera, Geometridae, Geometrinae, Thalassodini, nueva especie, morfología, taxonomía, Filipinas.

Introduction

Oriental tropical green coloured looper moths are relatively well studied due the publications by Inoue and Holloway. INOUE (1961) separated *Thalassodes* Guenée, 1857 in the tribe of its own, Thalassodini but it was combined within Hemitheiti by HOLLOWAY (1996). The tribal status of Thalassodini was restored by BAN *et al*. (2019).

HOLLOWAY (1996) separated from *Thalassodes* two genera, *Orothalassodes* Holloway, 1996 and *Pelagodes* Holloway, 1996. PARSONS *et al*. (1999) listed 90 Old Word species in these three genera. INOUE (2006) described further species and the fourth genus *Reniformvalva* Inoue, 2006 with one species. Han Hongxiang and Xue Dayong published a solid treatment of Chinese Geometrinae, followed by a special treatment of the Thalassodini species (2010, 2011), VIIDALEPP *et al*. (2012) added a further Chinese species. Genetic analysis was published by BAN *et al*. (2019).

PARSONS *et al*. (1999) listed 58 and 22 species for *Thalassodes* and *Pelagodes*, respectively,

INOUE (2006), HAN & XUE (2011) and VIIDALEPP *et al*. (2012) added new taxa and the genus *Reniformvalva* Inoue, 2006. This way the number of Oriental and Indoaustralian Thalassodini species has reached 123 (PLOTKIN & KAWAHARA, 2019). Quite recently the fifth genus *Sternitornatodes* Sommerer & Tautel, 2021 was added with the description a further, 124th Thalassodini species.

We add descriptions of two new species below.

Material and methods

The present study was stimulated by attempts to identify moths accumulated in the entomological collection of the Estonian Museum of Natural History (TAMZ, Tallinn) and in the entomological collection of the Institute of Zoology and Botany, of the Estonian Academy of sciences (IZBE), which is deposited at the Estonian University of Life Sciences (Tartu). The main material for this study was collected in 2013 by Aare Lindt. Additional materials were collected by Keijo Sarv from Sulawesi and compared with descriptions by DEBAUCHE (1941).

We have integrated external morphological data, male and female genitalia characteristics, spatial distribution data and wing facies data in this study. The identification of male genitalia characters by brushing scales off the last sternite is easy, but identification of female genitalia characters requires dissection. Genital slides of males and females were treated using established procedures (HARDWICK, 1950), embedded in Euparal and photographed in ventral view. The genitalia slide numbers are added to illustrations to allow their comparison with related materials.

The type specimens are registered in the PlutoF database.

Results

Pelagodes tuustiae Lindt, Sarv & Viidalepp, sp. n. (Figs 1-4)

Material: Holotype, 1 ♂, PHILIPPINES, Luzon, Naibo, 1400 m, 16º57’18”N, 20º38’59”E, 13-VI-2013 (A. Lindt), Type id. TAMZ0175908. Paratypes (2 ♂♂, 2 ♀♀): 1 ♂, PHILIPPINES, Luzon, Adams, 950 m, 18º27’14”N, 20º58’33”E, 09-VI-2013 (gen. 361) (A. Lindt); 1 ♀, Luzon, Naibo, 1400 m, 16º57’18”N, 20º38’59”E, 13-VI-2013, (gen. 385) (A. Lindt); 1 ♂, 1 ♀, Luzon, Calanasan, 850 m, 18º21’58”N, 21º02’29”E, 10-VI-2013 (A. Lindt).

The holotype is deposited in the zoological collection of the Estonian Museum of Natural History (Tallinn), the paratypes are in the Estonian Museum of Natural History, in the IZBE insect collection (Tartu) and in the private collection of A. Lindt. Association of sexes: collected in the same locality and night in Calanasan and Naibo.

Description. Wingspan, males 30-31 mm, females 32-33 mm (Figs 1-2). The frons is green, the fillet white, vertex bluish green, the palpi light brown. Antennae light brown dorsally scaled green, simple in female and pectinated in male, the length of external and inner pectination on the tenth segment as 1.3 mm and 1.0 mm, respectively. Thorax and abdomen bluish green. Wings bluish green with white strigulation and postmedial line, marginal line thin, dark, accentuated at vein ends. Male genitalia (Fig. 3): Valva distally truncate, with a thinner ventro-distal flap. Costal edge of valva convex, without any process; the dorsal edge of sacculus marked by a ridge, reaching the costa as a free spine. Juxta horseshoe-shaped with thin, curved dorsal processes. Aedeagus without cornuti. Sternite A8 with a strong, slender base with anterior processes stick-like, posterior processes consisting of inner short stick-like and external long, out curved, black, saw-dentate parts.

Female genitalia (Fig. 4) short and broad, the sterigma with a pair of folded processes, the signum bicornuate.

Female genitalia are similar to those of *Pelagodes forficatus* Inoue, 2006 but differ in the presence of a spear-shaped signum.

Diagnosis: Differing from all known species of *Pelagodes* in the shape of processes of the

eighth sternite of male abdomen which are bifid, with a short digitiform inner part and a long, out curved, black, saw-dentate external process. Female genitalia: The ostium broad, ductus bursae very short, two bold, folded postvaginalis structures present.

Discussion: The characteristics of this new species combine together a valva like in *Pelagodes ultimarius* Inoue, 2006, bipartite posterior processes of the sternite A8 of *Pelagodes cancriformis* Viidalepp, Lindt & Han, 2012 and pronounced antero-lateral processes of juxta similar to those in the species of *Orothalassodes curiosa* (Swinhoe, 1902) species group but these species have hind wings well roundish, not angulate at vein M3.

Ecology: The species inhabits mountain forests at 850-1400 m elevation.

Etymology: The new species *Pelagodes tuustiae* is dedicated to A. Tuusti, director of the Estonian Museum of Natural History, for her promoting field studies in biology.

***Thalassodes lennuki* Lindt, Sarv & Viidalepp, sp. n.** (Figs 5-8)

Material: Holotype, 1 ♂, PHILIPPINES, Luzon, Solsona, 1270 m, 11-VI-2013, 18º05’34”N, 120º53’58”E, (gen. 369) (A. Lindt), Type id. TAMZ0175907. Paratypes (6 ♂, 26 ♂, ♀♀): PHILIPPINES, Luzon, 2 ♂♂, Bongabon>E, 02-VI-2013 (gen. 416); 3 ♀♀, Calanasan, 10-VI-2013; 19 ♀♀, Solsona, 11-VI-2013 (gen. ♀410, 417, 4411); 1 ♂, Cabangan, 18º21’58”N, 21º02’29”E, 13-VI-2013; 1 ♂, 1 ♀, Cabangan, 16-VI-2016 (gen. ♂370, ♀413, 4407) (A. Lindt). 2 ♂♂, SULAWESI, Malewong, 72 m, 15-I-2015, 03º36’03”S, 120º21’56”E, (gen. 392); 1 ♀, Malino 1081 m, 13-I-2015, 05º15’11”S, 119º51’13”E (gen. 461); 1 ♀, Sulawesi, Rante Pao 791 m, 17-I-2015, 02º59’40”S, 119º52’24”E; 1 ♀, Palopo 14 km NW, 1143 m, 18-I-2015, 02º57’11”S, 120º04’15”E (K. Sarv).

The holotype is deposited in the collection of the Estonian Museum of Natural History (Tallinn), the paratypes are in the Estonian Museum of Natural History, in the IZBE insect collection (Tartu) and in the private collection of A. Lindt and in the private collection of K. Sarv.

Description: Wingspan 24-27 mm in males, 28-33 mm in females (Figs 5-6). The frons is green, the fillet between antennae bases white, the vertex bluish green. The palpi are green above, white below, projecting before the frons about 0.25 mm in males, 0.6 mm in average in females. The antenna is brownish with white dorsal scaling on its basal one-fourth. The external and inner pectination of male antennae are long, reaching 0.8 mm and 1.0 mm, respectively, on the tenth antennomere. A white dorsal line on metathorax and abdomen. The hind tarsus of male is one-half length of the tibia which is dilated and provided with a hair pencil. Wings bluish green, the antemedial and postmedial lines are white, the strigulation duller whitish, the marginal line grey, disrupted and faint. The fringe is basally greenish, distally whitish. The distal margin of forewing is slightly convex, that of hindwing subangulate at the vein M3. Geographical variation. The dorsal edging of juxta is even in one specimen from Sulawesi, while it is dilating dorsally in the specimens from Luzon.

Female genitalia with ostium parallel-sided (Fig. 8), about 0.5 mm long, the border between ductus bursae and corpus bursae with a circular fold as in *Thalassodes dissitoides* Holloway, 1996. A signum is present. The female genitalia of *T. dissitoides* has a similar circular fold between ductus and corpus bursae, but the ductus is longer, as long as corpus bursae in this species.

Diagnosis: Medium-sized species differing from other congeners with a white lined dorsum of abdomen in that the dorsal line is continuous (the dorsal line is fragmented in *Thalassodes indistantus* Inoue, 2006 and in *T. yazakii* Inoue, 2006, and other species have white spots on tergites if any). The frons is dark green in the new species and in *T. yazakii* whilst dark brown in *T. indistantus*. The valva (Fig. 7) of the male genitalia has a short spur or tiny spicule on an oblique fold near the middle of valva while other species may have a spicule on the saccular edge of the valva. The female genitalia with ductus bursae short, ending in a strong ring-fold on the corpus bursae.

Discussion: The male genitalia of *T. sundissepta* (Holloway, 1996, fig. 285) has a similar but angulate, not rounded broad edging to the juxta. *T. dissepta* (Holloway, 1996, fig. 274) has an

oblique fold traversing the valva and producing a spine at the ventral margin of valva; this spine is in the centre of valva in the new species. *T. indistantus* has a spine to ventral margin of valva and the dorsal sclerotization of juxta present but slender. Quite possibly, this species is the "closely related species from Luzon" mentioned by Holloway in the descriptive text for *T. sundissepta* (Holloway, 1996: 256). INOUE (2006: 219, fig. 101) listed *T. dissitoides* for Mindanao Isle based on a single female which has a much longer colliculum than in the new species under description.

Association of sexes: both males and females were collected together the same night at Salsona and Cabangan sites.

Etymology: The new species is named after Lennart Lennuk, head of collections of the Estonian Museum of Natural History.

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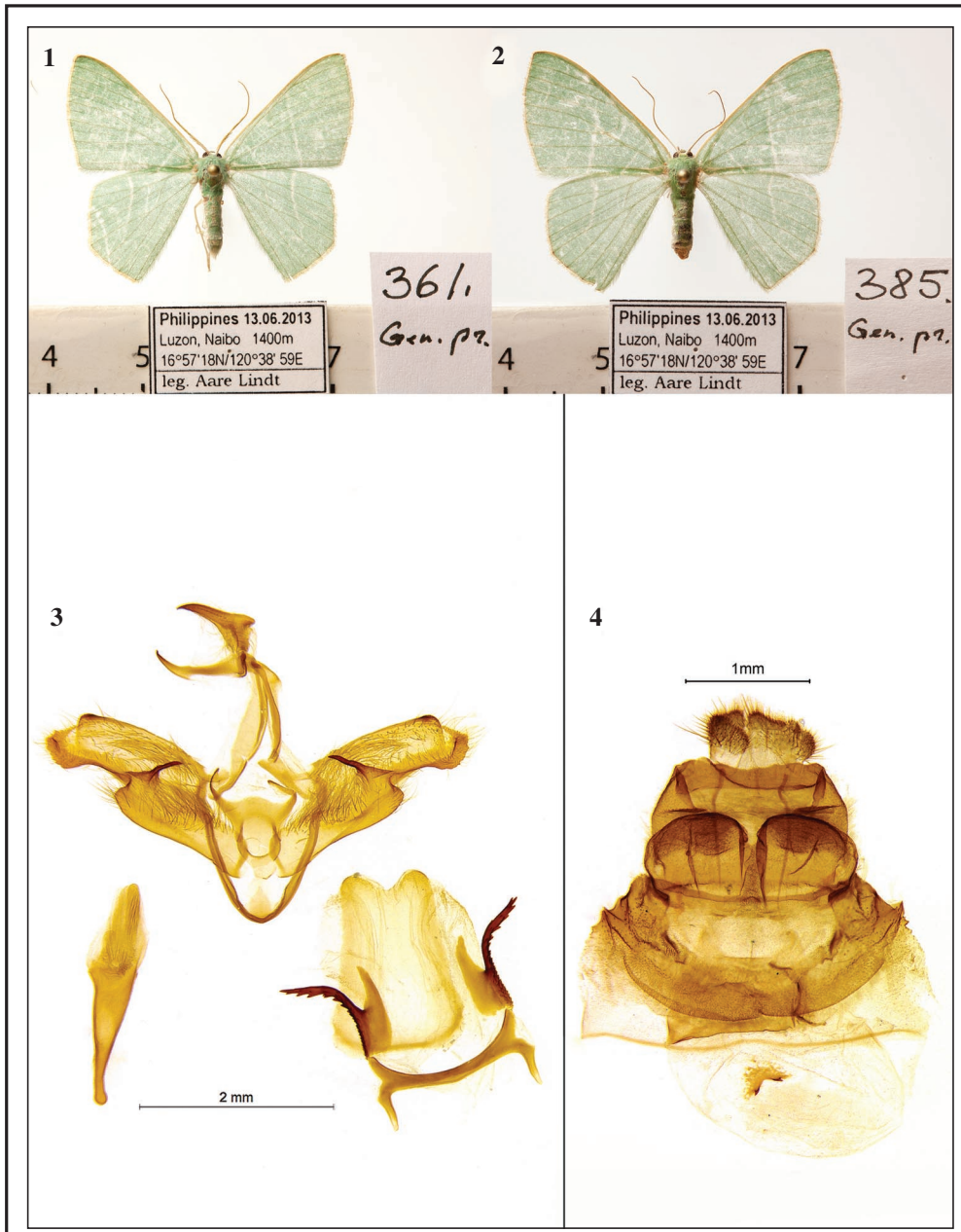
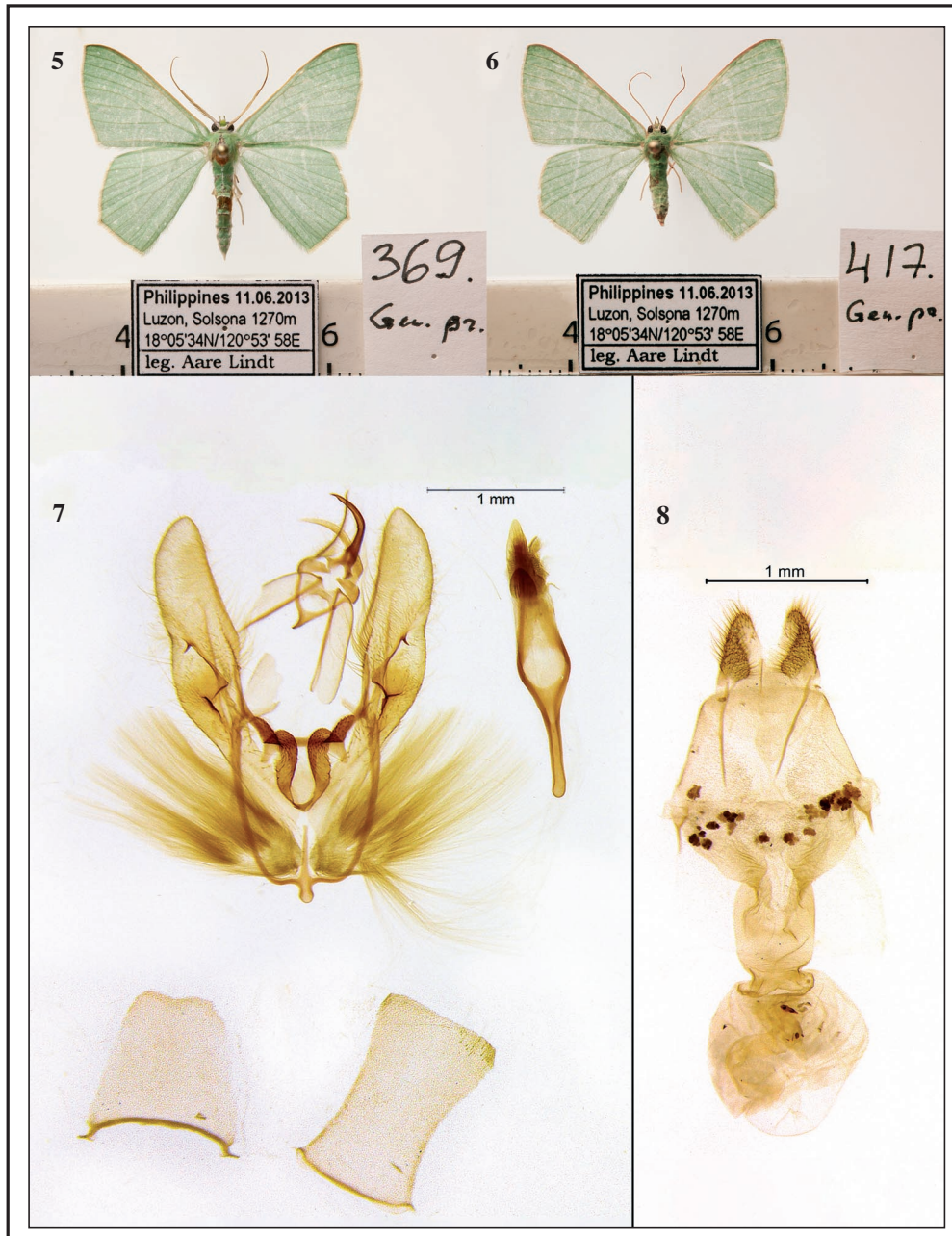


Figures 1-4.– *Pelagodes tuustiae* Lindt, Sarv & Viidalepp, sp. n. **1.** Holotype male of *Pelagodes tuustiae*, sp. n. **2.** female paratypes of *Pelagodes tuustiae* Lindt, Sarv & Viidalepp, sp. n. **3.** male genitalia, aedeagus and the last sternite of *P. tuustiae* Lindt, Sarv & Viidalepp, sp. n. **4.** female genitalia of *P. tuustiae* Lindt, Sarv & Viidalepp, sp. n.



Figures 5-8.– *Thalassodes lennuki* Lindt, Sarv & Viidalepp, sp. n. **5.** Holotype male of *Thalassodes lennuki* Lindt, Sarv & Viidalepp, sp. n. **6.** female paratypes of *Thalassodes lennuki* Lindt, Sarv & Viidalepp, sp. n. **7.** male genitalia, aedeagus and the last sternite of *Thalassodes lennuki* Lindt, Sarv & Viidalepp, sp. n. **8.** female genitalia of *Thalassodes lennuki* Lindt, Sarv & Viidalepp, sp. n.

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REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

K. Gregersen & O. Karsholt
The Gelechiidae of North-West Europe
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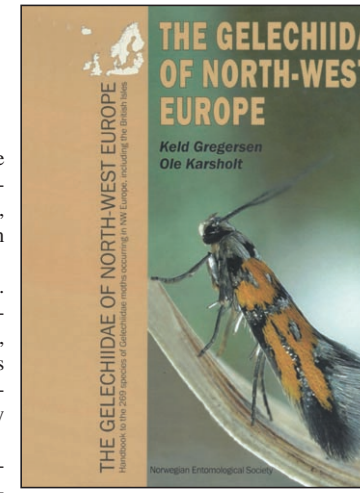

Tenemos en nuestras manos el trabajo de más de 25 años, donde los autores con sus destacados colaboradores han permitido dar a conocer esta obra sobre los Gelechiidae presentes en Escandinavia e Islandia, en el norte de Alemania y de Polonia, los países Bálticos, Holanda, Gran Bretaña e Irlanda, tratando 269 especies agrupadas en 63 géneros.

La obra comienza con la situación geográfica estudiada por países. Un capítulo sobre la historia de las descripciones, clasificación y filogenia; sobre los estudios anatómicos de esta familia de adultos y genitalia, así como las principales plantas nutricias y una lista de todas las especies conocidas en el Noroeste de Europa, considerando las subfamilias Anacampsinae, Dichomerdinae, Apatetrinae, Thiotrichinae, Anomologinae y Gelechiinae.

Ya dentro de la parte principal de la obra, se tratan todos los géneros estudiados y de cada especie, nos dan las principales sinonimias, sobre el adulto, la genitalia, diagnosis, bionomía y distribución con su correspondiente mapa, así como fotografía del adulto, larva y pupa.

Todas las especies consideradas están fotografiadas a todo color en 48 láminas, seguidas 23 láminas de la cabeza y los palpos, 45 láminas de la genitalia de los machos y 38 láminas de la genitalia de las hembras, finalizando con una detallada bibliografía, nombres científicos de las principales plantas asociadas con las diferentes especies de Gelechiidae y un índice.

Si el trabajo es importante en su totalidad, aumenta su eficacia al describirse una especie nueva *Aristotelia bengtssoni* Karsholt & Gregersen, que se localiza en el sur de Suecia y Estonia; se establecen dos sinonimias, se revisan otras dos sinonimias más y dos nuevas combinaciones, designándose un Lectotipo para *Gelechia servella* Zeller, 1830.

No podemos terminar estas líneas, sin felicitar a los autores por un trabajo bien realizado, así como a la Editorial que no ha escatimado medios para mantener el mismo nivel de calidad a lo largo de toda la obra, por lo que recomendamos vivamente su adquisición y no pudiendo faltar en cualquier biblioteca de todos aquellos interesados en los Gelechiidae. El precio de este libro es de 120 euros más gastos de envío y los interesados deben dirigirse a:

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Abundance of *Epiphyas postvittana* (Walker, 1863) in forestry nurseries of São Miguel Island (Azores, Portugal) (Lepidoptera: Tortricidae)

L. Oliveira, V. Vieira, A. O. Soares, I. Borges, P. Arruda & J. Tavares

Abstract

Epiphyas postvittana (Walker, 1863) is an invasive polyphagous pest for the Azores and its bioecology and the potential natural enemies were unknown. We evaluated the temporal profile of this species larval abundance and the number of males captured in sex pheromone traps, hypothesizing that both profiles were similar. The study was carried out on seven endemic host plants and one native species grown in two forest nurseries (Furnas and Nordeste) in São Miguel Island over two years from 2018 to 2019. A total of 827 plants attacked by *E. postvittana* were observed in Furnas nursery (2018: 503, 2019: 324) and 1227 in the Nordeste (2018: 649, 2019: 578), including the presence of 525 larvae distributed by the Furnas (2018: 178, 2019: 79) and from the Nordeste (2018: 131, 2019: 137). In 2019, the average weekly number of males captured in the sex pheromone traps (total 31 weeks) were higher in Furnas (mean ± SE: 9.68 ± 1.982) than in Nordeste (3.33 ± 0.651). In synthesis, (i) the population density varied throughout the year and as a function of the host plant species in production; (ii) the abundance profile of larval and adults suggests has at least three to four generations per year and that adults are active year-round, experiencing some delayed development during the winter; (iii) a low larval density does not represent very serious damage to Azorean endemic plants, but is reflected in the population density of its natural enemies; (iv) some biological control agents are present in the field, parasitizing the larvae (i.e., Braconidae species of *Meteorus ictericus* (Nees, 1811) and *Microgaster opheltes* Nixon, 1968); (v) finally, the knowledge of the population dynamics and its natural enemies needs further and long-term study.
KEYWORDS: Lepidoptera, Tortricidae, *Epiphyas postvittana*, endemic woody plants, forestry nurseries, Laurel Forest, Azores Islands, Portugal.

Abundancia de *Epiphyas postvittana* (Walker, 1863) en viveros forestales de la isla de São Miguel (Azores, Portugal) (Lepidoptera: Tortricidae)

Resumen

Epiphyas postvittana (Walker, 1863) es una plaga invasora polífaga en las Azores, pero su bioecología y enemigos naturales eran desconocidos. Evaluamos el perfil temporal de la abundancia de larvas de esta especie y el número de machos capturados en trampas de feromonas sexuales, con la hipótesis de que ambos perfiles eran similares. El estudio se llevó a cabo en siete plantas nutricias y una nativa cultivadas en dos viveros forestales (Furnas y Nordeste) en la isla de São Miguel durante dos años consecutivos de 2018 a 2019. Se observaron un total de 827 plantas atacadas por *E. postvittana* en el vivero de Furnas (2018: 503, 2019: 324) y 1.227 en el Nordeste (2018: 649, 2019: 578), incluyendo la presencia de 525 larvas distribuidas por el Furnas (2018: 178, 2019: 79) y del Nordeste (2018: 131, 2019: 137). En 2019, la media semanal de machos capturados en las trampas de feromonas sexuales (total 31 semanas) fue mayor en Furnas (media ± SE: 9,68 ± 1,982) que en Nordeste (3,33 ± 0,651). En síntesis, (i) la

densidad poblacional varió a lo largo del año y en función de la especie de planta nutricia en producción; (ii) el perfil de abundancia de larvas y adultos sugiere que tiene al menos de tres a cuatro generaciones por año y que los adultos están activos todo el año, experimentando cierto retraso en su desarrollo durante el invierno; (iii) una baja densidad larvaria no representa un daño muy grave para las plantas endémicas de las Azores, sino que se refleja en la densidad de población de sus enemigos naturales; (iv) algunos agentes de control biológico están presentes en el campo, parasitando las larvas (por ejemplo, especies de Braconidae de *Meteorus ictericus* (Nees, 1811) y *Microgaster opheltes* Nixon, 1968); (v) finalmente, el conocimiento de la dinámica de la población y de sus enemigos naturales necesitan más estudios a largo plazo.
PALABRAS CLAVE: Lepidoptera, Tortricidae, *Epiphyas postvittana*, plantas leñosas endémicas, viveros forestales, bosque de laurel, islas Azores, Portugal.

Introduction

In the Azores archipelago the Laurel forests already dominated the landscape and could have occupied more than 2/3 of the territory. However, the Azorean islands were extremely impacted by human activities, mainly associated with a dramatic land-use changes (only about 5% of the original forests still remain; TRIANTIS *et al*., 2010), habitat degradation and the introduction of exotic and invasive species (CARDOSO *et al*., 2010; TRIANTIS *et al*., 2010; BORGES *et al*., 2013; TERZOPOULOU *et al*., 2015).

Currently, the Official Forestry Services rear Azorean endemic plant species, which seeks the restoration of the Laurel Forest and areas with high erosion risk or sensitive from the hydrological point of view, awareness-raising activities, and support forestation by private landowners (ROSAGRO *et al*., 2019). In São Miguel Island, most of these plants are reared in two forestry nurseries located in Povoação (Furnas) and Nordeste counties. Since 2008, nursery production of endemic woody plants has increased significantly, reaching in Furnas and the Nordeste, respectively, 55,000 and 80,000 plants annually (ROSAGRO *et al*., 2019). Among about 80 endemic plants that inhabit the Azorean archipelago (VIEIRA *et al*., 2020), eight species integrating the IUCN red list are reared in both forestry nurseries (Table 1).

Table 1.– List of Azorean the endemic plant species reared in Furnas and Nordeste forestry nurseries integrating the IUCN red list.

Common name	Scientific name	Family	IUCN status
Azevinho	*Ilex azorica*	Aquifoliaceae	Least Concern
Cedro-do-mato	*Juniperus brevifolia*	Cupressaceae	Vulnerable
Faia	*Morella faya*	Myricaceae	Least Concern
Folhado	*Viburnum treleasei*	Adoxaceae	Least Concern
Ginja	*Prunus azorica*	Rosaceae	Endangered
Pau-branco	*Picconia azorica*	Oleaceae	Least Concern
Sanguinho	*Frangula azorica*	Rhamnaceae	Least Concern
Urze	*Erica azorica*	Ericaceae	Near Threatened

The use of phytopharmaceutical products is limited to a single fungicide compound, which makes endemic plants vulnerable to attack by insect pests such as aphid and lepidopteran species (ROSAGRO *et al*., 2019). Preliminary studies allowed us to identify a major lepidopteran pest attacking Azorean endemic plants and one native species (Faia) (Table 1): *Epiphyas postvittana* (Walker, 1863) (Tortricidae), an exotic species commonly named the light brown apple moth (LBAM).

Epiphyas postvittana (Fig. 1) has a long list of synonyms (e.g., see VIVES MORENO, 2014; GBIF, 2021). It is native to Southeastern Australia, but has invaded Western Australia, New Zealand, Hawaii, New Caledonia, Australasia and Pacific Islands, Europe, United Kingdom, and California - USA (BROWN *et al*., 2010; SUCKLING & BROCKERHOFF, 2010; CABI, 2021). The species is recorded in numerous areas of biogeographic regions except for Antarctica (BROWN *et al*., 2010). In

the Macaronesia region there are some records of the presence of LBAM, but in the Azores to date it was only cited on São Miguel, Pico, Terceira (VIEIRA & KARSHOLT, 2010; PÉREZ SANTA-RITA *et al*., 2018), and recently recorded to São Jorge and Flores islands (V. Vieira, unpublished). This species is considered introduced to the Macaronesia region, including in the Azores archipelago (VIEIRA & KARSHOLT, 2010).

Fig. 1.– *Epiphyas postvittana*: (A) larva, (B) pupae and (C) adult (Photos: V. Vieira).

In literature, LBAM is multivoltine and an economically important polyphagous pest species. The number of annual generations varies with latitude within its range. There is considerable overlap between generations, with development driven by temperature and larval host plant (BROWN *et al*., 2010; BUERGI, 2012; CABI, 2021). For example, in North America, *E. postvittana* completes 2-4 generations annually. Such in Australia (ZIELONKA *et al*., 2021), populations in California appear to undergo at least four generations and adults are active throughout the year. There is no winter resting stage, although overwintering larvae tend to develop slowly, with a lower threshold of development for all stages of 7.5ºC and an upper threshold of 31ºC (DANTHANARAYANA, 1975); 20ºC is the optimum for development, leading to a life cycle of 25 days (BUERGI, 2012). The variation in its cold response resulted in different forecasts of geographic distribution, which can have important management and regulatory implications (MOREY, 2015). The life cycle of adults lasts 2 to 3 weeks, depending on temperature and hostplant availability (BROWN *et al*., 2010).

Eggs are typically laid in clusters of 3-150 on the upper surface of leaves and take 8 days at 20ºC to hatch (THOMAS, 1975). These give rise to the first generation of larvae. The fully developed larvae are green and have a length from 10 to 20 mm (Fig. 1).

The larvae affect a wide range of horticultural and agricultural plant species in over 100 families (BROCKERHOFF *et al*., 2011; WANG *et al*., 2012). In the southeastern part of Australia and New Zealand, it is a pest on apples, grapes, berries, stone fruits, citrus, vegetable crops and numerous ornamentals (BROWN *et al.*, 2010; WANG *et al.*, 2012). In the Azores it occurs preferably in cultivated and garden areas (PÉREZ SANTA-RITA *et al*., 2018), and attacks the plants reared in forest nurseries. In the first stages, the larva feeds on the undersides of leaves within a silk chamber, later it

continues to feed on leaves, leaf rollers, flowers, or perforate and enter the fruit, causing leaf twisting, browning, and drying out of the needles, inhibition of the stem growth, and leaf damages serve as foci for the establishment of some entomopathogenic microorganisms.

Global knowledge of natural enemies of LBAM is well reported (ADLER, 1991; WEARING *et al*., 1991; HOGG *et al*., 2013) and some spiders, chrysopids and mirids are cited as predators of larvae. Additionally, many hymenopteran parasitoids (braconids, ichneumonids and encyrtids) or tachinid flies attack the larval and egg stages.

The life cycle of LBAM and their natural enemies in the Azores archipelago are unknown. In this study we evaluated the temporal profile in the larval abundance of LBAM in eight endemic host plants grown in two forest nurseries on São Miguel Island. Besides some information on the abundance of *E. postvittana* males captured in sex pheromone traps.

Material and Methods

Study sites

The Azorean archipelago stretches out over 615 km in the North Atlantic Ocean (37-40º N, 25-31º W), 1,584 km west of southern Europe, and 3,900 km east of the North American continent. It comprises nine main islands of recent volcanic origin, distributed in three groups: the western group of Corvo and Flores; the central group of Faial, Pico, Graciosa, São Jorge, and Terceira; and the eastern group of São Miguel and Santa Maria.

The current study was performed in São Miguel Island, the largest island in the archipelago of the Azores, with a surface area of 750 km^2.

To determine the temporal profile of larvae abundance in eight host plants (Table 1), 30 plants of each endemic host species were randomly observed on a weekly basis. One leaf from each plant were collected (with or without larvae if the plant is damage or not) to be analyzed after that in laboratory, in both nurseries at Furnas (37º 46’ 37.790” N -25º 18’ 46.193” W) and Nordeste (37º 49’ 45.128” N -25º 08’ 54.289” W), in São Miguel island. The samplings program occurred during two years between April 2018 and December 2019.

In addition, two populations were monitored weekly from April to December 2019 (total of 31 weeks), using open-sided delta traps baited with a synthetic female sex pheromone lure (containing: E11-14Ac, E9E11-14Ac) to attract males. The numbers of male individuals caught in each trap was recorded weekly. Pheromone lures were replaced once a month in each trap per local between April and December 2019.

Statistical analysis

Before data analysis, given high number of zeros, the number of observed larvae were (x+0.5) transformed to homogenize the variance (ZAR, 2010). None of the data were normally distributed (Shapiro-Wilk test, $p < 0.05$) and did not meet homogeneity of variance assumptions (Levene’s test, $p < 0.05$). Thus, analyses were performed using nonparametric Mann-Whitney U and/or Kruskal-Wallis H tests. In the last case, when significant differences were found, multiple comparisons were performed with unpaired two-samples Mann-Whitney U test applying the Bonferroni correction. All statistical tests were performed using ISPSS® Statistics v. 27, and the significance level was set at = 0.05.

Results and Discussion

The endemic plants reared in the Furnas and Nordeste nurseries, were attacked mainly by two lepidopteran species, being mostly *E. postvittana* (2018: 88.9%, 2019: 99%) and, to a minor

percentage, *Palpita vitrealis* (Walker, 1863) (Lepidoptera: Crambidae) (2018: 12.5%, 2019: 1%). The latter species strongly and exclusively attacked Pau-branco in both nurseries (Furnas: 10.3%, Nordeste: 16.3%), the pattern of which was similar in both years of the survey.

A total of 827 plants attacked by *E. postvittana* were observed in Furnas nursery (2018: 503, 2019: 324) and 1227 in the Nordeste (2018: 649, 2019: 578), including the presence of 525 larvae distributed by the Furnas (2018: 178 (35.4%), 2019: 79 (20.2%)) and from the Nordeste (2018: 131 (24.4%), 2019: 137 (23.70%)) (Table 2, Fig. 2).

Table 2.– Number of Azorean endemic host plants damaged (Total) by *E. postvittana* larvae recorded every week at Furnas and Nordeste nurseries between April 2018 and December 2019. SE= Standard error. L and NL stands for number of plants with or without the presence of larvae, respectively.

Host plants	Furnas 2018			Nordeste 2018			Furnas 2019			Nordeste 2019		
	L	NL	Total	L	NL	Total	L	NL	Total	L	NL	Total
Faia	46	73	119	47	69	116	29	44	73	20	38	58
Urze	3	7	10	2	2	4	0	1	1	0	1	1
Pau-branco	7	55	62	17	330	347	15	123	138	4	189	193
Cedro	1	7	8	3	9	12	3	4	7	1	6	7
Folhado	1	6	7	2	5	7	0	0	0	0	0	0
Sanguinho	24	57	81	26	79	105	30	69	99	38	111	149
Ginga	95	117	212	28	18	46	2	4	6	73	96	169
Azevinho	1	3	4	6	6	12	0	0	0	1	1	2
Total	178	325	503	131	518	649	79	245	324	137	441	578
Mean	22.25	40.63	62.88	16.38	64.75	81.13	9.88	30.63	40.50	17.13	55.25	72.38
SE	11.82	14.78	26.09	5.77	39.38	41.12	4.63	16.01	19.43	9.30	24.76	29.74

Concerning the weekly average abundance of larvae, in 2018, at Furnas nursery it was highest in Ginja (mean ± SE: 2.79 ± 0.577 larvae), Faia (1.35 ± 0.249) and Sanguinho (0.71 ± 0.172), while in the Nordeste it was in Faia (1.38 + 0.280), Sanguinho (0.77 ± 0.174) and Pau-branco (0.5 ± 0.175). In 2019, the highest number of larvae was observed at Furnas in Faia (0.73 + 0.139), Sanguinho (0.75 ± 0.205) followed by Pau-branco (0.38 ± 0.122), while in the Nordeste it was in Ginja (1.81 ± 0.436) followed by Sanguinho (0.94 ± 0.240) and Faia (0.50 ± 0.095). In both the Furnas and Nordeste nurseries, during the two years of observations, Urze, Cedro, Folhado and Azevinho showed a very low average weekly number of larvae (< 0.1 larvae). At the Furnas nursery in 2019, unlike in 2018, the number of larvae found on Ginja was very low due to the small number of plants in production (Fig. 3).

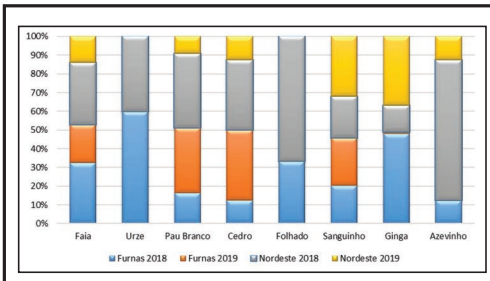

Fig. 2.– Percentage of *E. postvittana* larvae found weekly on the eight host plants at the Furnas and Nordeste nurseries during 2018 and 2019.

The weekly mean abundance of *E. postvittana* larvae only varied significantly for overall host plants during both years of observations on Ginja (Kruskal-Wallis [KW]: x^2 = 35,393; df = 3; p = 0,000) and Azevinho (KW: x^2 = 10,178, df = 3; p = 0,017). Comparing annual larval abundance on Ginja, we found a significant difference only for the Furnas 2018/Furnas 2019 (Mann-Whitney U test: Z = -46.225, p = 0.000), Furnas 2018/Nordeste 2018 (Z = 33.309, p = 0.001) and Furnas 2019/Nordeste 2019 (Z = - 31.963, p = 0.000).

The larval abundance was relatively low at both locations and seems to be dependent on the density of their host plants in production and may show a distinct profile variation from year to year. Although *E. postvittana* fed on all eight nursery-grown plants, it showed a greater preference for young plants of Faia, Sanguinho and Ginja (Fig. 3).

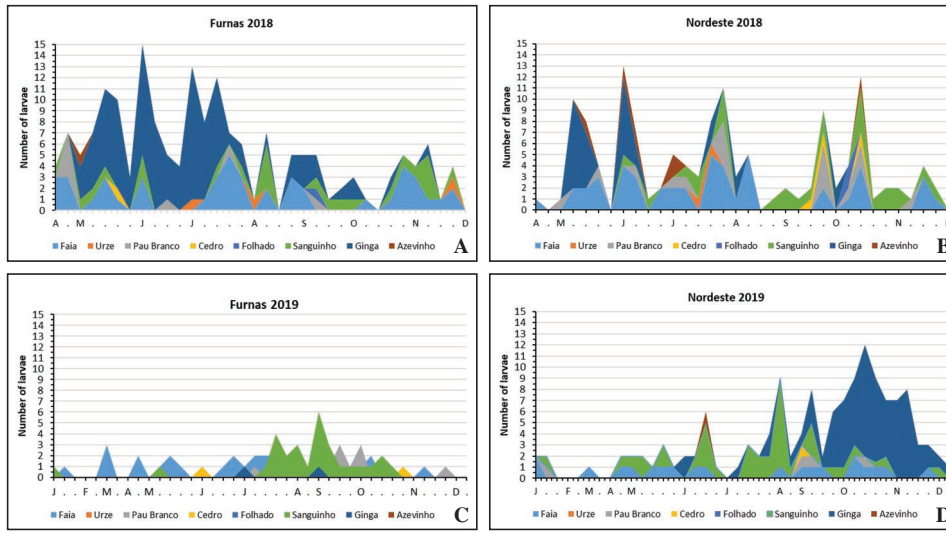

Fig. 3.– Weekly average abundance of *E. postvittana* larvae on eight Azorean endemic host plants in the Furnas and Nordeste nurseries between April 2018 and December 2019. J- January, F- February, M- Mars, A- April, M- May, J- June, J- July, A- August, S- September, O- October, N- November, D- December.

Table 3 shows that the mean weekly abundance of *E. postvittana* males captured in the sex pheromone traps between May and December 2019 (total 31 weeks) was higher at the Furnas nursery (76.14%) than at the Nordeste (23.86%) (Z = -1.960; p = 0.05). However, it was observed that the pattern of adult distribution is relatively similar for both sites (Fig. 4).

The results of the average weekly abundance of *E. postvittana* males seems to indicate overlapping generations depending on the presence/absence of host plants in production (Figs 3 and 4), under relatively stable abiotic conditions, but maintaining the pattern of abundance throughout the year at both larval and adult levels. As observed for continental regions, particularly in Australia (ZIELONKA *et al.*, 2021) and USA - California (BUERGI, 2012), there are at least 3 to 4 annual peaks in the abundance of larvae and adults, suggesting that the populations on São Miguel island appear to undergo at least three to four generations annually; also, adults are active year-round, and there is no winter resting stage.

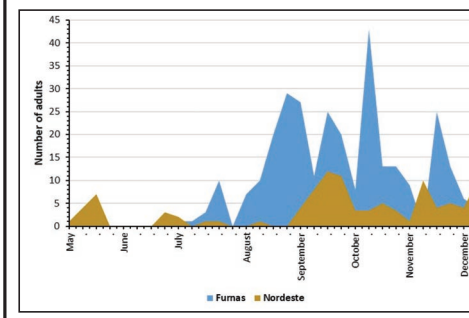

Fig. 4.– Males of *E. postvittana* caught weekly in sex pheromone traps installed in Furnas and Nordeste nurseries between May and December 2019.

Table 3.– Average weekly abundance of *E. postvittana* males collected in the sex pheromone traps, installed in the Furnas and Nordeste nurseries between May and December 2019. N = total number of males.

Local	N	Average	Standard error	Z*	*p*
Furnas	300	9.68	1.982	-1.96	0.05
Nordeste	104	3.36	0.651		

* Mann Whitney U test

Conclusions

Our results provide preliminary information on population dynamics of *E. postvittana* in the Azores, including the temporal profile of larval abundance in seven endemic host plants and one native species grown in two forest nurseries of the São Miguel Island (Furnas and Nordeste) and the abundance of males captured in sex pheromone traps.

The results suggests: (i) the population density varied throughout the year and as a function of the host plant species provided; (ii) the abundance profile in São Miguel Island indicates at the occurrence of at least three to four generations per year and that adults are active year-round, experiencing some delayed development during the winter; (iii) a low larval density does not represent very serious damage to Azorean endemic plants, but is reflected in the population density of its natural enemies; (iv) some biological control agents are present in the field, parasitizing the larvae (i.e. Braconidae species of *Meteorus ictericus* (Nees, 1811) and *Microgaster opheltes* Nixon, 1968); (v) finally, the knowledge of population dynamics and its natural enemies needs further and long-term study.

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Review on the fauna of Pterophoridae of the Republic of Guinea (Lepidoptera: Pterophoridae)

P. Ya. Ustjuzhanin, V. N. Kovtunovich & A. N. Streltzov

Abstract

The article gives a complete list of Pterophoridae species known from the Republic of Guinea. Three species, *Exelastis crudipennis* (Meyrick, 1932), *Sphenarches erythrodactylus* (Fletcher, 1911) and *Hellinsia aethiopicus* (Amsel, 1963) are reported for the fauna of this country for the first time.
KEY WORDS: Lepidoptera, Pterophoridae, biodiversity, new data, faunal review, Republic of Guinea.

Revisión sobre la fauna de Pterophoridae de la República de Guinea (Lepidoptera: Pterophoridae)

Resumen

El artículo da una lista completa de las especies de Pterophoridae conocidas de la República de Guinea. Tres especies se citan, por primera vez, para la fauna de este país: *Exelastis crudipennis* (Meyrick, 1932), *Sphenarches erythrodactylus* (Fletcher, 1911) y *Hellinsia aethiopicus* (Amsel, 1963).
PALABRAS CLAVE: Lepidoptera, Pterophoridae, biodiversidad, nuevos datos, revisión fauna, República de Guinea.

Introduction

There were nine Pterophoridae species known for the Republic of Guinea (BIGOT, 1964; GIBEAUX, 1992), all of them were collected in the eastern of Highlands of Guinea on Mount Nimba, or in its vicinity. The new specimen, were found in the vicinity of the village Pastoriah, located 140 km northeast of the capital Conakry (Fig.1). As a result, after processing this material, we added three species, new for the fauna of the Republic of Guinea.

List on the Pterophoridae fauna of the Republic of Guinea

Stenoptilodes taprobanes (Felder & Rogenhofer, 1875)
Amblyptilia taprobanes Felder & Rogenhofer, 1875. *Reise Novara*: Pl. 140, fig. 54
Type locality: CEYLON, [SRI LANKA]
= *Platyptilia legrandi* Bigot, 1962. *Bull. Soc. ent. Fr.*, **67**: 86
Type locality: Mahé, Beau Vallo, SEYCHELLES
= *Stenoptilodes vittata* Service, 1966. *Proc. R. ent. Soc. Lond. (B)*, **35**: 139
Type locality: NIGERIA
Material examined: Republic of Guinea, Kindia vic. vil. Pastoriah, N 10,093508, W.12,838956, 1 ♂, 08-11-XI-2016, K. Zaharov leg.

Distribution: Widespread throughout tropical and subtropical regions.

Buckleria girardi Gibeaux, 1992
Buckleria girardi Gibeaux, 1992. *Revue Fr. Ent.*, **14**(1): 14
Type locality: Mt. Nimba, plateau de Zouguepo, REPUBLIC OF GUINEA
Distribution: Republic of Guinea, Ghana.

Sphenarches erythrodactylus (Fletcher, 1911)
Oxyptilus erythrodactylus Fletcher, 1911. *Entomologist*, **44**: 281
Type locality: Transvaal [SOUTH AFRICA]
Material examined: Republic of Guinea, Kindia vic. vil. Pastoriah, N 10,093508, W.12,838956, 3 ♂♂, 08-11-XI-2016, K. Zaharov leg.
Distribution: Republic of South Africa, Sierra Leone, Republic of Guinea. **New species for the Republic of Guinea**.

Megalorhipida leucodactylus (Fabricius, 1794)
Pterophorus leucodactylus Fabricius, 1794. *Ent. Syst. Emendata et aucta*, **3**(2): 346
Type locality: AMERICAE MERIDIONALIS
= *Pterophorus defectalis* Walker, 1864. *Cat. Lep. Het. B. M*., **30**: 943
Type locality: SIERRA LEONE, CONGO
= *Pterophorus congrualis* Walker, 1864. *Cat. Lep. Het. B. M*., **30**: 943
Type locality: SOUTH HINDOSTAN, CHINA, SHANGHAI
= *Trichoptilus compsochares* Meyrick, 1886. *Trans. Ent. Soc. London*, **1886**: 16
Type locality: Saint Vincent, CAPE VERDE ISLANDS
Distribution: Widespread throughout tropical and subtropical regions.
Note: This species was recorded for the Republic of Guinea (BIGOT, 1964) as *Megalorhipida defectalis* (Walker, 1864).

Megalorhipida tessmanni (Strand, 1912)
Oxyptilus tessmanni Strand, 1912. *Arch. Naturgesch*., **78A**(12): 66
Type locality: Uelleburg, [EQUATORIAL GUINEA]
= *Oxyptilus aguessei* Bigot, 1964. *Bull. Inst. Franc. Afr. Noire*, (A)**26**: 178
Type locality: Ziéla, REPUBLIC OF GUINEA
= *Antarches luqueti* Gibeaux, 1994. *Faune Madagascar*, **81**: 77
Type locality: Anjiro, Marojevo, MADAGASCAR
Distribution: Equatorial Guinea, Republic of Guinea (BIGOT, 1964), Yemen, Madagascar, Reunion Island, Republic of South Africa, Ghana, Uganda.
Note: This species was recorded for the Republic of Guinea (BIGOT, 1964) as *Oxyptilus aguessei* Bigot, 1964, which is synonymized with *Megalorhipida tessmanni* (USTJUZHANIN & KOVTUNOVICH, 2010).

Xyroptilia fulbae Kovtunovich & Ustjuzhanin, 2006
Xyroptilia fulbae Kovtunovich & Ustjuzhanin, 2006. *Atalanta*, **37**(1-2): 263
Type locality: NW Mokwa, Zugurma, NIGERIA
Distribution: Nigeria, Principe Island, Republic of Guinea.
Note: This species was recorded for the Republic of Guinea (BIGOT, 1964) as *Xyroptila tectonica* Meyrick, 1914, but comparing the genitals, we concluded that it should be attributed to *X. fulbae*.

Exelastis crudipennis (Meyrick, 1932)
Marasmarcha crudipennis Meyrick, 1932. *Exot. Micr*., **4**: 252
Type locality: Kampala, UGANDA

Material examined: Republic of Guinea, Kindia vic. vil. Pastoriah, N 10,093508, W.12,838956, 1 ♂, 1 ♀, 08-11-XI-2016, K. Zaharov leg.

Distribution: Uganda, Ghana, Democratic Republic of the Congo, Republic of Guinea. **New species for Republic of Guinea**.

Exelastis phlyctaenias (Meyrick, 1911)
Marasmarcha phlyctaenias Meyrick, 1911. *J. Bomb. nat. Hist. Soc*., **21**: 106
Type locality: Puttalam, CEYLON [SRI LANKA]

Distribution: Sri Lanka, Philippines, Tanzania, Malawi, Madagascar, Reunion Island, Ethiopia, Ghana, Republic of Guinea, Virgin Islands, Oman.

Exelastis pumilo (Zeller, 1873)
Mimeseoptilus pumilio Zeller, 1873. *Verh. Zool.-bot. Ges. Wien*, **23**: 324
Type locality: Dallas, Texas, USA

Material examined: Republic of Guinea, Kindia vic. vil. Pastoriah, N 10,093508, W.12,838956, 1 ♂, 3 ♂♂, 08-11-XI-2016, K. Zaharov leg.

Distribution: Widespread throughout tropical and subtropical regions.

Hellinsia aethiopicus (Amsel, 1963)
Leioptilus aethiopicus Amsel, 1963. *Stuttg. Beitr. Naturk.*, **121**: 6
Type locality: Gembi, ETHIOPIA

Material examined: Republic of Guinea, Kindia vic. vil. Pastoriah, N 10,093508, W 12,838956, 2 ♂♂, 1 ♀, 08-11-XI-2016, K. Zaharov leg.

Distribution: Ethiopia, Congo, Nigeria, Ghana, Republic of Guinea. **New species for Republic of Guinea**.

Pterophorus lamottei Gibeaux,1992
Pterophorus lamottei Gibeaux, 1992. *Revue Fr. Ent*., **14**(1): 18
Type locality: Mt Nimba, forêt galerie de Zié, REPUBLIC OF GUINEA

Distribution: Republic of Guinea.

Pterophorus legrandi Gibeaux, 1992
Pterophorus legrandi Gibeaux, 1992. *Revue Fr. Ent*., **14**(1): 15
Type locality: Mt Nimba, forêt galerie du Zougué, REPUBLIC OF GUINEA

Distribution: Republic of Guinea.

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The identity of *Automeris ophthalmica* Moore, 1883 (Lepidoptera: Saturniidae, Hemileucinae)

V. O. Becker

Abstract

The identity of *Automeris ophthalmica* Moore, 1883, sp. rev. is recognized, based on a specimen reared from a larva that matched the description and illustration of the one from which the female holotype was reared. This finding makes *Pseudautomeris ophthalmica* (Moore), the senior synonym of the following names: *Automeris coronis* Schaus, 1913, syn. n., *Automeris parametea* Bouvier, 1936, syn. n., and *Automeris coronoides* Bouvier, 1936, syn. n.
KEY WORDS: Lepidoptera, Saturniidae, Hemileucinae, *Automeris*, identity, synonymy, distribution, Neotropical.

La identidad de *Automeris ophthalmica* Moore, 1883 (Lepidoptera: Saturniidae, Hemileucinae)

Resumen

Se reconoce la identidad de *Automeris opthalmica* Moore, 1883, sp. rev. basándose en un macho criado de una oruga idéntica a la que resultó la hembra que sirvió de base para la descripción de la especie. Este descubrimiento hace de *Pseudautomeris ophthalmica* (Moore, 1883), sp. rev., el sinónimo más antiguo de *Automeris coronis* Schaus, 1913, syn. n., *Automeris parametea* Bouvier, 1936, syn. n., y *Automeris coronoides* Bouvier, 1936, syn. n.
PALABRAS CLAVE: Lepidoptera, Saturniidae, Hemileucinae, *Automeris*, identidad, sinonimia, distribución, Neotropical.

Introduction

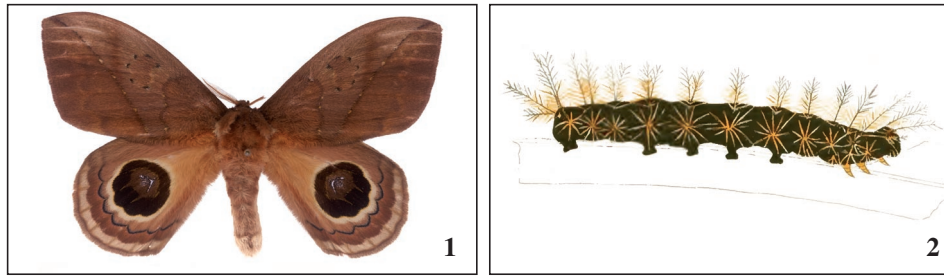
Automeris ophthalmica Moore, 1983, was described from a female, reared from a larva, in São Paulo, Brazil by JONES (1883: 25). This specimen has not been located (LEMAIRE, 2002). As the material belonging to Jones collection has been deposited in NHMUK, Lemaire stated that the name should be kept as unidentified, as the specimen could turn up among unsorted material in some collection or, until a larva (illustrated by Jones), was reared.

Abbreviations

NHMUK	The Natural History Museum, London, United Kingdom
PR	Paraná State, Brazil
SC	Santa Catarina State, Brazil
SP	São Paulo State, Brazil
VOB	Vitor O. Becker Collection, Reserva Serra Bonita, Camacan, Bahia, Brazil

Results

A male reared from a larva that fits exactly the description and illustration by JONES (1883: 26, pl. 7, fig. 3) matches the description and illustration of *Pseudautomeris coronis* (Schaus, 1913), by LEMAIRE (2002: 625, pl. 75, figs 5, 6) confirming his suspicion that the holotype of *Automeris ophthalmica* represents the female of the same species. Based in this information, the identity of the species is recognized and the synonymy stands as given below.



Figs 1-2.– *Automeris ophthalmica.* **1.** male reared from a larva collected in Guaraqueçaba, PR, Brazil. **2.** Larva (from Jones, 1883: pl. 7, fig. 3).

Pseudautomeris ophthalmica (Moore, 1883), **sp. rev.** (Figs 1, 2).
Automeris ophthalmica Moore, 1883, *in* Jones. *Proc. phil. Soc. Lpool,* **37**: 251, pl. 1, fig. 3. Holotype ♀, BRAZIL: SP, São Paulo, XII-1877 (larva), IV-1878 (adult) (Jones) (NHMUK?) [not traced].

=*Automeris coronis* Schaus, 1913. *Ent. News,* **24**: 4. Holotype ♂, BRAZIL: SC, Joinville, (USNM) [not examined], **syn. n.**

=*Automeris parametea* Bouvier, 1936. *Annls Sc. Naturelles, Zool.,* **19**: 475. Lectotype ♂, BRAZIL: [No further data], designated by LEMAIRE, 1973: 75) [lost], **syn. n.**

=*Automeris coronoides* Bouvier, 1936. *Annls Sc. Naturelles, Zool.,* **19**: 475. Lectotype ♂, BRAZIL: [No further data], designated by LEMAIRE, 1973: 75) (location unknown), **syn. n.**

Remarks: An adult male (VOB 723) (Fig. 1), reared from a wholly black caterpillar, with golden yellow scoli and setae, collected at Guaraqueçaba, PR, matching exactly the description and illustration of the larva of *P. ophthalmica* (Fig. 2) was obtained and the adult matches the description and illustration of *P. coronis* (Schaus), presented by LEMAIRE (2002: pl. 75, figs 5, 6). The caterpillar is almost identical to those of *Leucanella* Lemaire, 1969 species, as well illustrated by LEMAIRE (2002: pl. ES10, figs 1-4), except for the setae, wholly yellow in *P. ophthalmica,* whereas white on thorax and on the last two anal segments in *Leucanella* sp.

Despite the fact that the type material of *A. parametea* Bouvier, and of *A. coronoides* Bouvier, are lost or not located, it is very likely that the synonymy proposed by LEMAIRE (1973: 75), who knew the group better than anybody else, is correct.

Distribution: All specimens known were collected along the Atlantic Forest of southern and southeastern Brazil, from the mountains of Rio de Janeiro south to Santa Catarina.

Food plants and biology: JONES (1883: 26) stated that the larva was found feeding on a species of *Iris* (Iridaceae). The larva studied here was found feeding on the leaflets of "Tucum", a common thorny palm, *Bactris lindmanniana* Drude ex Lindm.(Arecaceae), in the region, in 7-XII-1970, pupated in 18-XII-1979 and emerged in 12-IV-1971.

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Gabriel Fornari, Reserva Serra Bonita, Camacan, Bahia, Brazil, prepared the images. Carlos G.

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Nuevas contribuciones para la tribu Cassymini con descripción del género *Xuea* Expósito, gen. n. y de la especie *Xuea hanae* Expósito, sp. n. de China (Lepidoptera: Geometridae, Ennominae, Cassymini)

A. Expósito-Hermosa

Resumen

Se describe *Xuea* Expósito, gen. n. y *hanae* Expósito, sp. n. de Sichuan, China. Se aportan imágenes del adulto, así como la genitalia del macho.
PALABRAS CLAVE: Lepidoptera, Geometridae, Ennominae, Cassymini, *Xuea,* nuevo género, *Xuea hanae,* nueva especie, Sichuan, China.

New contributions for the tribe Cassymini with description of the genus *Xuea* Expósito, gen. n. and the species *Xuea hanae* Expósito, sp. n. from China (Lepidoptera: Geometridae, Ennominae, Cassymini)

Abstract

Xuea Expósito, n. gen. and *Xuea hanae* Expósito, sp. n. are described from Sichuan, China. Images of the adult are provided, as well as the genitalia of the male.
KEY WORDS: Lepidoptera, Geometridae, Ennominae, Cassymini, *Xuea,* new genus, *Xuea hanae,* new especie, Sichuan, China.

Abreviaturas utilizadas

AEH: Colección Andrés Expósito Hermosa. Móstoles (Madrid), ESPAÑA

Sistemática

Xuea Expósito, gen. n.

Especie tipo: *Xuea hanae* Expósito que seguidamente se describe.

El género *Xuea* se caracteriza fundamentalmente por la presencia de un minúsculo uncus puntiagudo y proceso con forma de gancho romo (fig. 4) que lo diferencia de otros géneros de Cassymini con los que se ha comparado como, por ejemplo: *Auzeodes* Warren, 1893, *Danala* Walker, 1860, *Syngonorthus* Butler, 1892 cuya morfologia externa se asemeja más a *Xuea*. El resto de caracteres del nuevo género son los propios de la sp. n. *Xuea* sólo se le conoce de China.

Xuea hanae Expósito, sp. n. (Figs 1-4)

Holotipo ♂: CHINA: Damoshan a 3.800 m Mianning, Sichuan VII-2004 (Ying *et al*. leg.). Genitalia

macho preparación AEH 3349. (fig. 3). El holotipo se encuentra depositado en la colección del autor AEH en Móstoles, Madrid (España).

Descripción (Figs 1-2): La expansión alar del macho es de 40 mm. Cabeza, tórax y abdomen con predominio de la tonalidad marrón oscuro. Antenas simples o filiformes. Ambas alas con fondo alar marrón oscuro, más acentuado en la zona apical y submarginal, hasta el ángulo anal o tornus; rudimentarias líneas paralelas en la zona mediana; punto discal más oscuro en las alas anteriores y más reducido en las alas posteriores. Las alas anteriores con ápice puntiagudo; el termen de las alas es recto y la costa de las alas posteriores es más claro resaltando bastante con el fondo alar más oscuro. En el reverso de las alas se distingue el mismo diseño que en el anverso en las zonas en la zona apical y submarginal, hasta el ángulo anal o tornus, mientras que el resto del fondo alar es blanco grisáceo salpicado de pequeños trazos oscuros y en las trazo discal más marcado que en el anverso el cual es bastante más monótono.

Genitalia ♂ (Fig. 3-4): la estructura del cuerpo presenta el patrón de Cassymini. El uncus es triangular y un proceso con forma de gancho romo que podría confundirse con él (Fig. 4). Valvas con curvatura externa convexa en el centro de la costa y los conocidos procesos alargados; largo sacculus sin relieves apreciables. Compleja juxta con pequeño proceso digital en la zona central entre otros caracteres. El saccus es curvo y ancho en su zona central. Aedeagus robusto y curvo con un apreciable cornutus.

Hembra: Desconocida.

Distribución: Se considera, por el momento, como un endemismo de CHINA: Damoshan. Mianning, Sichuan.

Etimología: Se dedican este nuevo genero y nueva especie al Dr. Dayong Xue y a la Dra. Hongxiang Han respectivamente, y se les denomina *Xuea hanae*.

Agradecimientos

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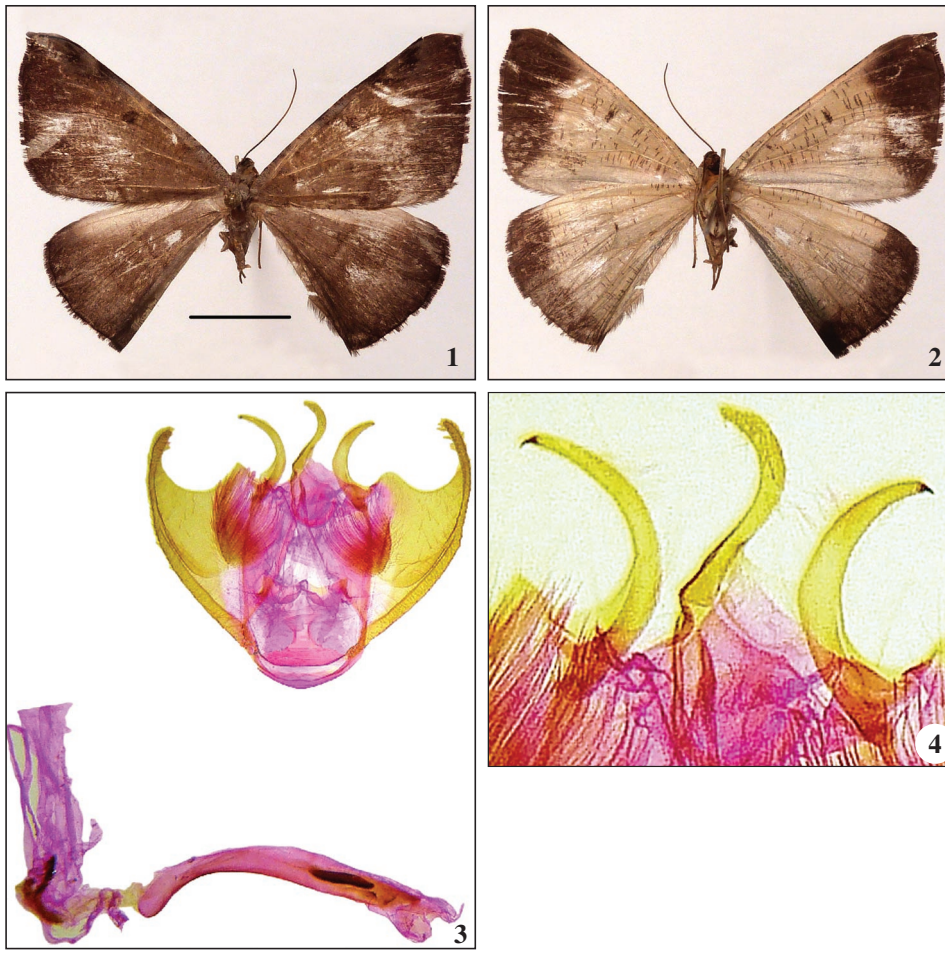

Figs 1-4.– 1-2. *Xuea hanae* Expósito, sp. n., holotipo ♂. **1.** Anverso. **2.** Reverso. **3.** Genitalia ♂ AEH 3349. **4.** Detalle de la genitalia macho a mayor aumento. (Trazo horizontal de 1 cm).

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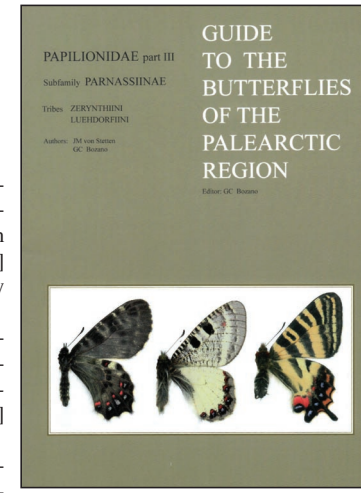

Tenemos en nuestras manos, una nueva publicación de la interesante serie sobre los Rhopalocera de la Región Paleártica; en esta ocasión se trata de la familia Papilionidae Latreille, [1802] 1803, *in* Buffon y más concretamente de la subfamilia Parnassiinae Duponchel, [1835] 1832, in Godart & Duponchel y las Tribus Zerynthiini Grote, 1898 y Luehdorfiini Chapman, 1895.

La subfamilia Parnassiinae, está incluida dentro de la familia Papilionoidae y en esta ocasión se tratan los géneros: *Zerynthia* Ochsenheimer, 1816, *Allancastria* Bryk, 1924, *Bhutanitis* Atkinson, 1873, *Sericinus* Westwood, 1851, *Leuhdorfia* Crüger, 1878 y *Archon* Hübner, [1822] 1816, así como todas las subespecies consideradas por los autores.

Se presentan fotografías a todo color de los adultos y de las principales subespecies consideradas como válidas en este trabajo e igualmente de todas las especies aparecen fotografías de la genitalia del macho y en algunas ocasiones dibujos de ésta aclaratorios, así como algún otro detalle anatómico que pueda permitir despejar dudas.

Es muy interesante el tratamiento del género *Zerynthia* Ochsenheimer, 1816, al igual que ocurre con las bellas especies del género *Bhutanitis* Atkinson, 1873.

No podemos terminar estas líneas sin felicitar a los autores y comprobar que la calidad no ha decaído en este nuevo fascículo de esta interesante serie, que sin duda alguna poco a poco se va considerando como un clásico y, por lo tanto, no puede faltar en ninguna biblioteca especializada, por otra parte, queremos felicitar a la Editorial por la excelente labor realizada y la calidad de la impresión de la serie.

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Note on the presence of *Clavigesta gerti* Larsen, 2010 in the Maltese Islands (Lepidoptera: Tortricidae)

A. Seguna, A. Catania, J. J. Borg & P. Sammut

Summary

The genus *Clavigestra* Obraztsov, 1946 and the species *Clavigesta gerti* Larsen, 2010 are recorded for the first time from the Maltese Islands.
KEY WORDS: Lepidoptera, Tortricidae, *Clavigestra gerti*, new records, Maltese Islands.

Nota sobre la presencia de *Clavigesta gerti* Larsen, 2010 en Malta (Lepidoptera: Tortricidae)

Resumen

El género *Clavigesta* Obraztsov, 1946 y la especie *Clavigesta gerti* Larsen, 2010 se registran por primera vez para Malta.
PALABRAS CLAVE: Lepidoptera, Tortricidae, *Clavigesta gerti*, nuevo registro, Malta.

Introduction

TREMATERRA & SAMMUT (2007) recorded no less than 68 species of Tortricidae from the Maltese Islands. SAMMUT (2020) increased their number to 73 species, adding *Cydia aldocataniae* Trematerra, 2019, *Cydia rymarczyki* Varenne & Nel, 2013, *Cydia blackmoreana* (Walsingham, 1903), *Aethes rubiginana* (Walsingham, 1903) and *Cnephasia heringi* Razowski, 1958.

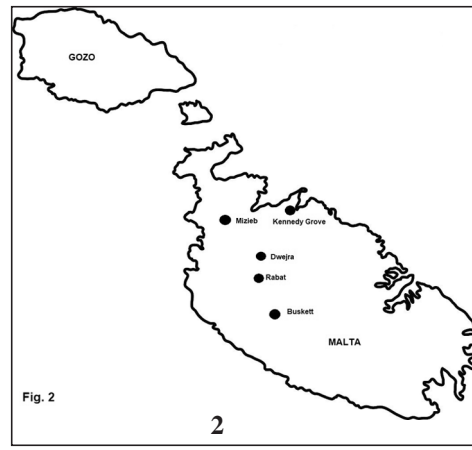
The genus *Clavigesta* Obraztsov, 1946 contains four species, all occurring in Europe and their larva bores inside the pine *Pinus* sp. needles. Two species, *Clavigesta tokei* Larsen and *Clavigesta gerti* Larsen have been described in 2010 (LARSEN, 2010), and these have a much wider European distribution. In the checklist by SAMMUT (2020), *Clavigesta* should be placed after *Rhyacionia* Hübner, [1825], and before *Cydia* Hübner, [1825].

Material examined: Malta, Dwejra l/o Rabat, (35º 54' 21"N; 14º 22' 52"E, 200 m.), 5 ♂♂, 19-X-2020, A. Catania leg.; 28 ♂♂, 1 ♀, 19-X-2021, leg P. Sammut, A. Catania, A. Seguna and J. J. Borg leg; Naxxar, (35º 54' 35"N; 14º 26' 29"E, 108 m.), 1 ♀, 23-IX-2021; 3 ♂♂, 1 ♀, 8-X-2021; 5 ♂♂, 10-X-2021; 2 ♂♂, 1 ♀, 12-X-2021; 3 ♂♂, 1 ♀, 14-X-2021; 2 ♂♂, 15-X-2021; 7 ♂♂, 16-X-2021; 5 ♂♂, 20-X-2021; 3 ♂♂, 22-X-2021. All specimens from Naxxar collected by A. Seguna.

The material examined was mostly collected using a 15W. Actinic light. However, a small percentage was attracted to 250W MV light. The collecting site at Naxxar is a residential area with some mature and fully grown *Pinus halepensis* Mill. planted for landscaping. On the other hand, the

Dwejra site is in open, karst countryside with a small wood of mature Pine trees. Unfortunately, when the population from Naxxar was discovered and identified, the flight period of the species was nearing its end so we could not verify if it occurred also in other places where pine trees are present, such as at Buskett, Miżieb, Kennedy Grove and various other localities. A detailed survey of these sites will be carried out in the future.

Clavigesta gerti is known to occur in Spain, the Balearic Islands, Corsica (LARSEN, 2010) and Sicily (K. Larsen com. pers.). As with the Type material, also here in Malta a very large proportion of the examined material consisted of male specimens, with a total of 63 specimens compared to five females. However, from two females collected from Naxxar, one of the authors (AS) obtained ova which hatched after about three weeks and at the time of writing they were still feeding of pine needles.



Figures 1-2.– 1a. MALTA, Naxxar, ♂, 10-X-2021, Seguna leg. **1b.** Dwejra, l/o Rabat, ♂, 19-X-2021, Sammut leg. **2.** Map of Malta showing localities mentioned in the text.

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Omia cyclopea (Graslin, [1837]) and *Coenobia rufa* (Haworth, 1809) in southern Italy with notes on their conservation (Lepidoptera: Noctuidae)

S. Scalercio & E. Bertaccini

Abstract

We recorded *Omia cyclopea* (Graslin, [1837]) and *Coenobia rufa* (Haworth, 1809) for the first time in southern Italy. These are extremely rare species in Italy and conservation actions are needed to prevent Italian populations of *C. rufa* from extinction, locally extinct yet.
KEY WORDS: Lepidoptera, Noctuidae, biodiversity, conservation, Italy

Omia cyclopea **(Graslin, [1837]) y** *Coenobia rufa* **(Haworth, 1809) en el sur de Italia con notas sobre su conservación (Lepidoptera: Noctuidae)**

Resumen

Registramos, por primera vez, a *Omia cyclopea* (Graslin, [1837]) y *Coenobia rufa* (Haworth, 1809) en el sur de Italia. Estas especies son extremadamente raras en Italia y son necesarias acciones de Conservación para prevenir la extinción de las poblaciones italianas de *C. rufa*, localmente extintas.
PALABRAS CLAVE: Lepidoptera, Noctuidae, biodiversidad, conservación, Italia.

Introduction

Knowledge on Italian fauna of Macrolepidoptera is increasingly growing due to the description of species new to the science (SCALERCIO *et al*., 2016), to the first record of species in the country (CABELLA & MAIOGLIO, 2013) and to the discovery of new populations of rare species (INFUSINO *et al*., 2017a). South regions are those providing most of discoveries because lesser studied in the past than northern regions, because the first territory where African migrant species appear in Italy, and because of their role as glacial refugia (MENCHETTI *et al*., 2021). The findings we reported here confirmed the trend of discoveries during recent years in southernmost Italian regions. In fact, we recorded as new for South Italy *Omia cyclopea* (Graslin, [1837]) and *Coenobia rufa* (Haworth, 1809), extremely rare in Italy (Fig. 1).

Results

Omia cyclopea (Graslin, [1837]) (Fig. 2)

Cleophana cyclopea Graslin, [1837] 1836. *Ann. Soc. ent. Fr*., **5**(14): 570, pl. 17, fig. B7
LT: Alfakar [Sierra de Alfacar], Granada, SPAIN

Material: Calabria, Morano Calabro, Monte Pollino (39.9016ºN; 16.1802ºE), 1950 m s.l.m., 1 ♂, 17-VI-2021, Bertaccini leg., in coll. Bertaccini.

Distribution: This is the first record for southern Italy and the easternmost for this species. It has been found during daytime while feeding on flowers (Fig. 2). *Omia cyclopea* is the smallest species in the genus *Omia* Hübner, [1821] including four species worldwide, which are well separated with the exception of the strictly related *O. cymbalariae* (Hübner, [1809]) and *O. banghaasi* Stauder, 1930 (RONKAY & RONKAY, 1995). It is an extremely rare species known from Spain, southern France, Corsica, Morocco and Algeria (ZILLI, 1986). In total, three specimens were collected in Italy so far. It was reported for the first time in Italy by a handwritten addition for the Piedmont region of GHILIANI (1852) to his catalogue. This specimen is likely lost, but one individual in the collection of the Museo Civico di Storia Naturale "E. Caffi", Bergamo and labelled "Italia" without other geographic information, could be those mentioned by Ghiliani (Fig. 3). Two additional specimens have been found in the Abruzzo region above the 1200 m of altitude (ZILLI, 1986).

Notes: *O. cyclopea* is a xerophilous species flying during daytime and visiting flowers of *Rosmarinus*, *Thymus*, *Lotus*, *Coronilla* and *Helianthemum*, the last being also the larval foodplant (RONKAY & RONKAY, 1995). It has also been found on the flowers of *Helychrysum* (GRASLIN, 1837). The specimen found on the Monte Pollino was feeding mainly on *Helianthemum oleandicum* (L.) DC. ssp. *incanum* (Willk.) G. Ló, but it visited also *Crepis lacera* Ten. (Fig. 2). It prefers sunny and dry grasslands, rocky slopes, and other similar habitats at medium and high altitude where it flies from May to the end of July (RONKAY & RONKAY, 1995), never found in Italy below 1200 m a.s.l. (ZILLI, 1986). Its habitat on the Pollino Massif perfectly matches that known for the species (Figs 3-4).

The finding of this species in a Natura 2000 site (SAC IT9310004 Rupi del Monte Pollino) included in the Pollino National Park, increased the importance of this European network of protected areas for the conservation of extremely rare invertebrates not included in the Annexes of the Habitat Directive 92/43/EEC. The compilation of regional or even local red lists of invertebrates should be a short-term solution to this problem.

Coenobia rufa (Haworth, 1809) (Fig. 6)
Phytometra rufa Haworth, 1809. *Lep. Brit*.: 260
LT: GREAT BRITAIN

Material: Romagna, Ravenna, Bardello, coastal pine woodlot of San Vitale, Scolo Rivalone, 2 ♂♂, 22-VIII-1984, Bertaccini leg.; idem, 1 ♀, 10-IX-1984, Bertaccini leg.; idem, 1 ♂, 21-VIII-1987, Bertaccini leg.; idem, 2 ♂♂ and 3 ♀♀, 27-VIII-1987, Bertaccini & Campri leg.; idem, 2 ♂♂ and 2 ♀♀, 23-VIII-1993, Bertaccini leg.; Bosco Gesuiti, San Fili, Cosenza, Calabria, 620m s.l.m.; Calabria, San Fili, Bosco Gesuiti (39.3715ºN; 16.1310ºE), 620 m s.l.m., 1 ♂, 14-IX-2015, Scalercio & Infusino leg. (Barcode, BOLD ID: LEP-SS-01117), in coll. Centro di Ricerca Foreste e Legno, Rende, Cosenza.

Distribution: This is the first record for southern Italy and one the most isolated European populations. It has been collected by an UV LED light trap (INFUSINO *et al*., 2017b). *Coenobia rufa* is the only species belonging to the genus *Coenobia* Stephens, 1850 (ZILLI *et al*., 2005). It is known from most of western and Central Europe with a small and isolated population in Romania (ZILLI *et al*., 2005). In Italy the north-eastern alpine region was covered in ZILLI *et al*. (2005), but no records are available for this area, whilst it was previously found in Romagna, Scolo Rivalone near Ravenna (FIUMI & CAMPORESI, 1985) and Tuscany, Lago di Burano near Orbetello (ZILLI, 1986) (Fig. 1). In total, 18 specimens of this species have been collected in Italy in three localities only.

Notes: *C. rufa* is a hygrophilous species with larvae feeding within the stem of *Juncus* sp.pl. (ZILLI *et al*., 2005). It flies from late July to August, in Italy found until mid-September. The specimen we found in Calabria is an erratic male because found in a chestnut woodlot for fruit production (Fig. 7), an unusual habitat for this species that lives in swamp, marsh, bog, and meadow. Likely nearby the collecting site there is the optimal habitat for this species that is not a good disperser. The most

abundant Italian population found in Romagna region, where it is not recorded from 1993, is likely extinct nowadays. We can suppose a negative effect of pesticides massively used against mosquitos at the beginning of '90, but the question deserves more accurate studies. *C. rufa* was not recorded also in the nearby Natura 2000 site named Bardello (site code: IT4070002) despite the presence of its habitat and with a recently studied lepidopterological fauna (BENDAZZI & PEZZI, 2019). Urgent conservation actions are needed to preserve Italian populations from extinction.

Calabrian specimen was erroneously identified as *Archanara neurica* (Hübner, [1808]) in INFUSINO *et al*. (2018). Successively, it was correctly identified thanks to barcoding analysis carried out according to the standard procedures of Canadian Centre for DNA Barcoding (http://boldsystem.org). Despite the isolation of the Calabrian population, results showed a great similarity of the barcode sequence with those of Central and North European populations (Fig. 8), probably resulting from a species distribution only recently fragmented.

Barcode sequence (658 bp): AACATTATATTTTATTTTTGGAATTTGAGCAGGAATAGTAGGA
ACCTCTTTAAGATTATTAATTCGAGCTGAATTAGGAAACCCTGGATCTTTAATTGGCGATGAT
CAAATTTATAATACTATTGTTACAGCTCATGCTTTTATTATAATTTTTTTTATAGTTATACCCATT
ATAATTGGTGGATTTGGAAACTGACTCGTACCTTTAATATTAGGGGCCCCAGATATAGCATTT
CCTCGAATAAATAATATAAGTTTTTGATTACTCCCTCCCTCATTAACTTTATTAATTTCAAGAA
GAATTGTAGAAAATGGTGCTGGAACAGGGTGAACAGTATACCCCCCACTTTCATCTAATATT
GCTCATGGGGGAAGATCCGTAGATTTAGCAATTTTTTCACTTCATTTAGCCGGTATTTCTTCT
ATTTTAGGAGCTATTAACTTTATTACAACAATCATTAACATACGACTAAATAATTTATCCTTTG
ATCAAATACCTTTATTTATTTGAGCTGTTGGAATTACTGCATTTTTATTATTATTATCACTACCA
GTCTTAGCTGGAGCTATTACAATATTATTAACAGATCGAAATCTAAATACATCTTTTTTTGATC
CTGCGGGAGGAGGGGATCCAATTTTATATCAACATTTATTT

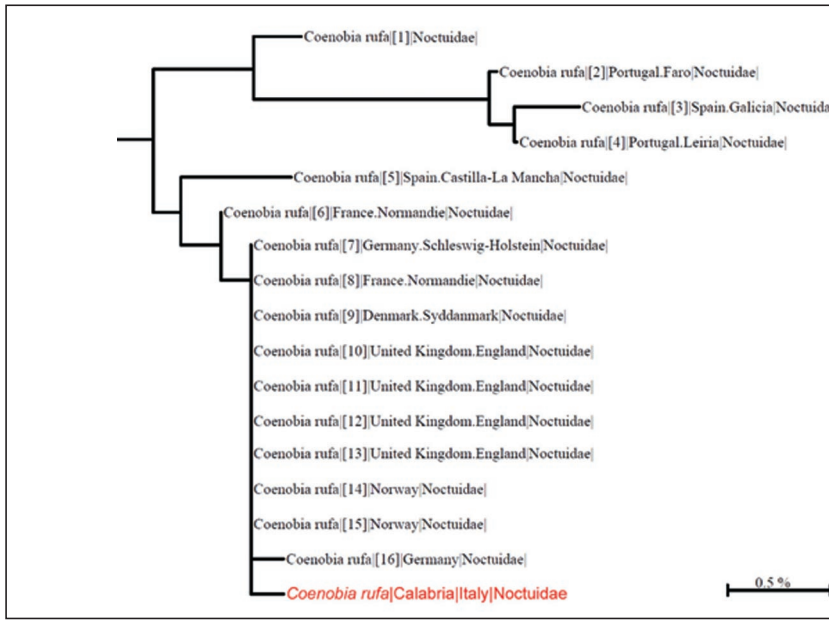

Fig. 8.– Neighbor joining trees (Kimura 2-parameter distance model for COI-5P marker) of *Coenobia rufa* built using sequences deposited in BOLD. In red the Calabrian specimen.

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Figures 1-7.– 1. Italian distribution of *Omia cyclopea* (yellow) and *Coenobia rufa* (white). Circles represent locality, the asterisk represents a generic regional record (from Google Earth). **2.** *Omia cyclopea* feeding on *Crepis lacera*, Monte Pollino, 17-VI-2021. **3.** Specimen from the Museo Civico di Storia Naturale "E. Caffi", Bergamo (Photo Paolo Pantini). **4.** Collecting site of *Omia cyclopea* on the Pollino Massif. **5.** A detail of the habitat of *Omia cyclopea* on the Pollino Massif. **6.** *Coenobia rufa*, Bosco Gesuiti, San Fili, Cosenza, 14- IX-2015, wingspan 22 mm. **7.** Collecting site of *Coenobia rufa* in Calabria, southern Italy.

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New species of Plutellidae from Iran (Lepidoptera: Yponomeutoidea)

W. Mey

Abstract

Three new species of Plutellidae are described from Iran: *Baerenschenkia lamasi* Mey, sp. n., *Deryaxenistis nekrutenkoi* Mey, sp. n., and *Paraxenistis ammolofon* Mey, sp. n. Adults and male and female genitalia are illustrated. The male genitalia of two lectotype specimens, deposited in the Natural History Museum, London were examined and illustrated: *Paraxenistis sphenospila* Meyrick, 1919 and *P. pentaula* (Meyrick, 1913). They are provisionally retained in *Paraxenstis* Meyrick, 1919.
KEY WORDS: Lepidoptera, Yponomeutoidea, Plutellidae, new species, Iran.

Nuevas especies de Plutellidae de Irán (Lepidoptera: Yponomeutoidea)

Resumen

Tres nuevas especies de Plutellidae se describen de Irán: *Baerenschenkia lamasi* Mey, sp. n., *Deryaxenistis nekrutenkoi* Mey, sp. n., y *Paraxenistis ammolofon* Mey, sp. n. Se ilustran los adultos, la genitalia del macho y de la hembra. La genitalia macho de dos lectotipos depositados en el Museo de Historia Natural de Londres, fueron examinados e ilustrados: *Paraxenistis sphenospila* Meyrick, 1919 y *P. pentaula* (Meyrick, 1913). Son provisionalmente retenidos en *Paraxenstis* Meyrick, 1919.
PALABRAS CLAVE: Lepidoptera, Yponomeutoidea, Plutellidae, nuevas especies, Irán.

Introduction

The genus *Paraxenistis* Meyrick, 1919 originally comprised three species: *P. macrostoma* Meyrick, 1919, *P. sphenospila* Meyrick, 1919, and *P. pentaula* (Meyrick, 1913). The latter was transferred from *Plutella* Schranck, 1802. The unifying features, which probably motivated Meyrick to combine the species into one genus, are the long frontal scaling of the head and the porrect and drooping labial palpi with long hair-like scales concealing the terminal segment. The species are small and exhibit an indistinct wing pattern. They were collected on the Indian subcontinent and in Sri Lanka. Later on, species with a similar, external appearance of the head and palpi were found to occur in southern Africa too (MEY, 2007). They were found to represent three different species and were preliminarily assigned to *Paraxenistis*. During a subsequent visit to the Natural History Museum in London, the type material of the genus from the E. Meyrick collection was found to be in a good state. The examination of the specimens revealed the surprising fact that the originally included species were not closely related to each other. Each of the them stands for a different evolutionary line and merits placement in a separate genus. The type species of *Paraxenistis* is *P. macrostema*. The genitalia of the male holotype were illustrated in MEY (2011: 186). The genitalia of the African species are clearly

different from *Paraxenistis* and also from the male genitalia of the remaining two species. In consequence, the genera *Baerenschenkia* Mey, 2011 and *Deryaxenistis* Mey, 2011 were established to accommodate the African species. At the time of introducing these new generic names the author was aware of a much wider range for these genera, which extends beyond Africa. In the distribution map of both genera given by MEY (2007) for *Paraxenistis*, two localities respectively in the Arabian Peninsula and in Iran were indicated. The material from the Iran was collected by participants of the "Österreichische Entomologische Expeditionen nach Persien und Afghanistan", nearly fifty years ago and was deposited since then in the Naturhistorisches Museum, Wien (NHMW). Examination of the material disclosed the presence of species of *Baerenschenkia* and *Deryaxenistis* in West Asia. They are described in the present article, making the names available for future studies and highlighting the biogeographic connections of these taxa between the dry biomes of Africa and West Asia. I take the opportunity to provide illustrations of the male genitalia of the unrevised species of *Paraxenistis*, which should facilitate the future placement of the species in appropriate genera.

Materials and methods

Adults examined included type specimens as well as non-type specimens from museums listed at the end of the chapter. All specimens from Iran are from the same dune area east of Bandar Abbas, Hormozgan Province, N 27º11'53'' E 54º22'8'' (see map of Fig. 1).

Pinned specimens and their associated slide-mounted genitalia, and other features were examined with dissecting and compound microscopes. Dissection of the genitalia was performed according to the procedure described by ROBINSON (1976). The genitalia were embedded in Euparal. Chlorazol Black was used for staining female genitalia. The cleared abdomens of some non-type specimens are on the corresponding pins in polyethylene vials with glycerin. Prior to embedding the cleared genitalia on microscope slides or into glycerin vials, they were drawn using a camera lucida attached to a Leica MZ12 compound microscope.

The terminology used in the descriptions of species largely follows MEY (2004). The treatment and sequence of the genera and species are arranged alphabetically.

Abbreviation of depositories of type material

NMNH - Museum of Natural History, London, Great Britain (formerly British Museum of Natural History (BMNH))
MfN - Museum für Naturkunde, Berlin, Germany
NHMW - Naturhistorisches Museum, Wien, Austria

Taxonomic account

Baerenschenkia Mey, 2011

Baerenschenkia Mey, 2011. *Esperiana Mem.*, **6**: 181-183, type species: *B. umtrunkula* Mey, 2011, by monotypy.

Type locality: NAMIBIA.

Remarks: The name of the genus was chosen in memory of the "Bärenschenke", the traditional pub for entomologists of the MfN, where they came together on Thursdays after work for informal exchange and entomological discussions. The tradition was coined by Gerardo Lamas, Yuri Nekrutenko and the author in summer 1987. The photo of Fig. 2 was taken 13 years later, when the trio met in the Bärenschenke again.

***Baerenschenkia lamasi* Mey, sp. n.** (Figs 3-4, 9-11)

Material examined: Holotype ♂, IRAN, South Iran, Dünen [= dunes], 17 m east of Bandar-Abbas, 26-IV-1974, Exped. Mus. Vind., genitalia slide Mey 18/05 (NHMW).

Paratypes: 1 ♀, South Iran, 30 km east of Bandar Abbas, 8-V-1974, Exped. Mus. Vind.; 2 ♂♂, 1 ♀, South Iran, 25 km south of Minab, 4-V-1974, Exped. Mus. Vind.

Diagnosis: The new species differs from African congeners by the form of the valva and by the arrangement and structure of the dorsal socii and the ventral, gnathos arms.

Description, male (Figs 3-4): Length of forewings 5.0-5.2 mm, wingspan 10.8-11.1 mm (n=5); head pale grey, with semi-erected, lamellar scales, protruding frontal between antennae; labial palpi including scale brush porrect, as long as 0.3 of forewings, basal segments each with small, black spot laterally, 2-3 similar spots on dorsal and ventral eye margin; ocelli black; proboscis long, pale brown; antennae 0.8 of forewing length, scale with pecten of linear scales, flagellar segments with two annuli of pale grey scales, ventral side with short cilia. Thorax and forewings pale grey, numerous small, slightly darker spots dispersed over the wing area, one fringe line present, hindwings pale grey, tips evenly rounded, legs white-grey, tarsal segments darker, epiphysis present, spurs 0.2.4.

Male genitalia (Figs 9-11): Pleura of segment VIII large, fused on dorsal side forming a pair of appendages (= retraction rods), distal margins rounded, sternum VIII membranous; segment IX ring-like, with sclerotised band from vinculum to dorsal apex of tegumen; tuba analis surrounded dorsally by medially fused socii with round tips and ventrally by a corresponding plate-like structure (? gnathos); vinculum broad, triangular, proximally extending into narrow process with rounded tip; valva compact, plate-like, distal margin excised causing dorsal and ventral corners; juxta a small, vertical band; phallus tubular, elongate, two times the length of valva, base enlarged, coecum penis present, apex acute, cornuti absent.

Distribution: South Iran, Hormozgan.

Etymology: It is a pleasure for me to name the new species in honour of my respected colleague and dear friend Dr. Gerardo Lamas, butterfly specialist from Peru and frequent visitor to the Lepidoptera collections of the MfN in the past.

Deryaxenistis Mey, 2011

Deryaxenistis Mey, 2011. *Esperiana Mem.*, **6**: 183-184, type species: *D. serrata* Mey, 2004, by original designation.

Type locality: NAMIBIA.

***Deryaxenistis nekrutenkoi* Mey, sp. n.** (Figs 5-6, 12-14)

Material examined: Holotype ♂, IRAN, South Iran, Dünen [= dunes], 17 m east of Bandar-Abbas, 24-IV-1974, Exped. Mus. Vind., genitalia slide Mey 19/05 (NHMW).

Paratypes: 1 ♀, same locality, 26-IV-1974, Exped. Mus. Vind., genitalia slide Mey 36/21 (MfN); 1 ♂, 1 ♀, South Iran, 22 km north of Bandar Abbas, 25-IV-1974 (♂), 10-V-1974 (♀), Exped. Mus. Vind; 1 ♂, South Iran, 30 km east of Bandar Abbas, 3-IV-1970, Exped. Mus. Vind.

Diagnosis: Species of *Deryaxenistis* can be distinguished by the lateral shape of valvae and gnathos. The new species resembles *D. serrata* in the presence of a serrate valva dorsal margin, but this serration occurs only over a much smaller distance. Vinculum of both species is of different size. It is short and round in *D. serrata*, and elongate and oval in *D. nekrutenkoi* sp. n.

Description, male (Figs 5-6): Length of forewings 3.5-4.1 mm, wingspan 8-9.4 mm (n=5); head pale grey, with semi-erected, lamellar scales, protruding frontally between antennae; labial palpi including scale brush porrect, as long as 0.1 of forewings; maxillary palpi not perceivable; ocelli grey-white; proboscis long, pale brown; antennae 0.6 of forewing length, scale with pecten of linear scales, flagellar segments with one ring of pale grey scales; tegulae with long, ventral scales; forewings pale grey, with some brown striae on costa, a triangular spot on arculus and one oblique, transversal line beyond cell, some darker scales dispersed over the wing area, two fringe lines present, underside of costal base with bundle of bristles; hindwings white-grey, tips acute; legs white-grey, tarsal segments darker, epiphysis present, spurs 0.2.4.

Male genitalia (Figs 12-13): Segment VIII with large pleura, distally rounded, fused on ventral side in one point, and separated on dorsal side by small membranous piece of tergum VIII; segment X membranous; tegumen of segment IX a narrow, somewhat undulating ribbon, terminating into a straight projection (? gnathos), with a small, single tooth on subapical dorsal margin just before blunt apex; vinculum large, oval in ventral view; short transtilla present; valva rod-shaped, directed dorsal, somewhat bent ventrally, valval apodeme short, dorsal margin serrated subapically; phallus shorter than valva, stout, base broad, apical part of triangular form in ventral view.

Female genitalia (Fig. 14): segment VII weakly seclerotised, ostium bursae in intersegmental membrane, at base of shallow antrum; round lamella postvaginalis on ventral side of segment VIII with four rows of denticules; oviscapt very long, apophyses anteriores less than half the length of apophyses posteriors, papillae analis small, indistinct.

Distribution: South Iran, Hormozgan

Etymology: The new species is named in memory of Y. P. Nekrutenko (1936-2010), specialist of butterflies from Kiev and frequent visitor to the MfN, where he reorganised parts of the butterfly collection and published a type catalogue. Obituaries were published by NUSS (2010) and VIVES MORENO (2011).

Paraxenistis Meyrick, 1919

Paraxenistis Meyrick, 1919. *Exot. Micr.*, **2**: 225, type species: *P. macrostoma* Meyrick, 1919, by original designation.

Type locality: INDIA.

Paraxenistis: Mey, 2007: 17-20; Mey, 2011: 183, 186.

Remarks: The species *Paraxenistis sphenospila* Meyrick, 1919 has some resemblance to the type species of the genus, but is clearly distinct in the male genitalia, especially concerning the architecture of segment IX and the curved phallus. *Paraxenistis pentaula* (Meyrick, 1913) is neither related to *P. macrostoma* nor to *P. sphenospila*. This Oriental species, described from Sri Lanka [Ceylon], has two peculiarities that are not present in *Paraxenistis*, *Deryaxenistis* and *Baerenschenkia*: anellus in form of a membranous cone and gnathos/arms of socii elongated and armed with a long pectinifer on dorsal margin. Illustrations of the male genitalia of these species are provided in this article for the first time. They may serve for future recognition. The two species are unrelated and must be excluded from *Paraxenistis* and transferred to other genera. This cannot be done in this article. Problematic are the many unrevised genera which were described and included in Plutellidae from the Oriental Region and Australasia (see MEYRICK, 1914). The establishment of new genera for the two species, therefore, runs the risk of introducing new names which become synonyms in future investigations of the family. For the time being, it seems to be pragmatic to retain the species in *Paraxenistis* and to wait until new taxonomic knowledge becomes available that allows a new approach to the problem.

***Paraxenistis ammolofon* Mey, sp. n.** (Figs 7-8, 15-20)

Material examined: Holotype ♂, IRAN, South Iran, Dünen [= dunes], 17 m east of Bandar-Abbas, 26-IV-1974, Exped. Mus. Vind., genitalia slide Mey 20/05 (NHMW).

Paratypes: 2 ♀♀, same data as holotype; 2 ♀♀, South Iran, 8 km east of Bandar Abbas, 8-IV-1972 and 23-IV-1974, genitalia slide Mey 37/21 (MfN); Exped. Mus. Vind.

Diagnosis: Concerning the male genitalia *P. ammolofon* sp. n. seems to be related to *P. sphenospila*. Both species share the compact form of the valva with sharp edges on apical corners, the dagger-like phallus and the thin, ribbon-like segment IX. The dorsal apex of segment IX is without a sclerotised process, a character, which is also present in other species of *Paraxenistis*.

Description, male (Figs 7-8): Length of forewings 3.2-4.2 mm, wingspan 7.5-10.1 mm (n=5); vertex with more or less developed wedge-shaped projecting tuft, length of labial palpi two times diameter of eye, straight, porrect, thickened with dense loosely appressed scales, attenuated anteriorly, terminal segment concealed in long scales of second; ocelli grey-white; proboscis long, pale brown;

maxillary palpi not perceivable; antennae 0.7 of forewing length, scale with pecten of linear scales, flagellar segments with one ring of pale grey scales; some dark-brown flagellomeres in basal and terminal half; tegulae with long, ventral scales; forewings pale grey, with indistinct patches of bark brown, yellow and white dispersed on the wing; two dark fringe lines present, underside of costal base with bundle of bristles; hindwings brown, tips acute; legs brown, tarsal segments darker, white-ringed on tips, epiphysis present, spurs 0.2.4. Sternum of abdominal segment II with venulae and connecting line (Fig. 20).

Male genitalia (Figs 15-17): Segment VIII with moderately broad pleura, fused on dorsal side in one point, and with pair of short, diverging processes; segment VIII ring-like, terminating apically in a knob-like process, situated below anal tube; vinculum large, triangular in ventral view; valva trapezoid, dorsal corner pointed and bent mediad; phallus stout, dagger-like, bulbus ejaculatorius large, coecum penis and cornuti absent.

Female genitalia (Figs 18-19): Tergum VII weakly sclerotised, with long, hair-like scales on distal margin, sternum VIII sclerotised, divided into elongate and rounded lobes, encompassing ostium bursae in intersegmental membrane; bursa with small signum in opposite position to base of ductus bursae; lamella postvaginalis absent on venter of segment VIII; oviscapt very long, apophyses anteriores less than half the length of apophyses posteriores, papillae analis small, indistinct.

Distribution: South Iran, Hormozgan.

Etymology: The specific name is the genitive plural of "*αμμόφος*", Greek, dune, referring to the dune environment of the type locality in southern Iran.

Paraxenistis sphenospila Meyrick, 1919 (Figs 21-22)

Paraxenistis sphenospila Meyrick, 1919. *Exot. Micr*., **2**: 225-226.

Type locality: SOUTH INDIA, Coimbatore, July (Fletcher), two specimens.

Material examined: Lectotype ♂, "Coimbatore/S. India/TBE. 31.7.[19]12" [handwritten with black ink on white card], "Paraxenistis/sphenospila/Meyrick, 3/3/E. Meyrick det./in Meyrick Coll.", cleared abdomen in glycerine vial, fab. W. Mey (BMNH).

Remarks: The lectotype designation has remained unpublished to date. The genitalia of the male lectotype are illustrated in Fig 21-22.

Paraxenistis pentaula (Meyrick, 1913) (Figs 23-24)

Plutella pentaula Meyrick, 1913. *Exot. Micr*., **1**: 152.

Type locality: CEYLON [Sri Lanka], Puttalam, Hambantota, November, April (Pole, Fletcher) two specimens.

Material examined: Lectotype ♂, "Puttalam,/Ceylon./Pole. 11.04" [printed on white card], cleared abdomen in glycerine vial, fab. W. Mey (BMNH).

Remarks: The lectotype designation has remained unpublished to date. The genitalia of the male lectotype are illustrated in Figs 22-23. Besides the type specimens two further females are present in the Meyrick collection, which were identified by E. Meyrick as probably belonging to *P. pentaula*. The specimens were collected in India, Punjab, Pirawala, 13-V-[19]19. The examination of one female revealed it to be congenerate with *Deryaxenistis*. It is an undescribed species demonstrating an unexpected, wider distribution of the genus in the Oriental Region.

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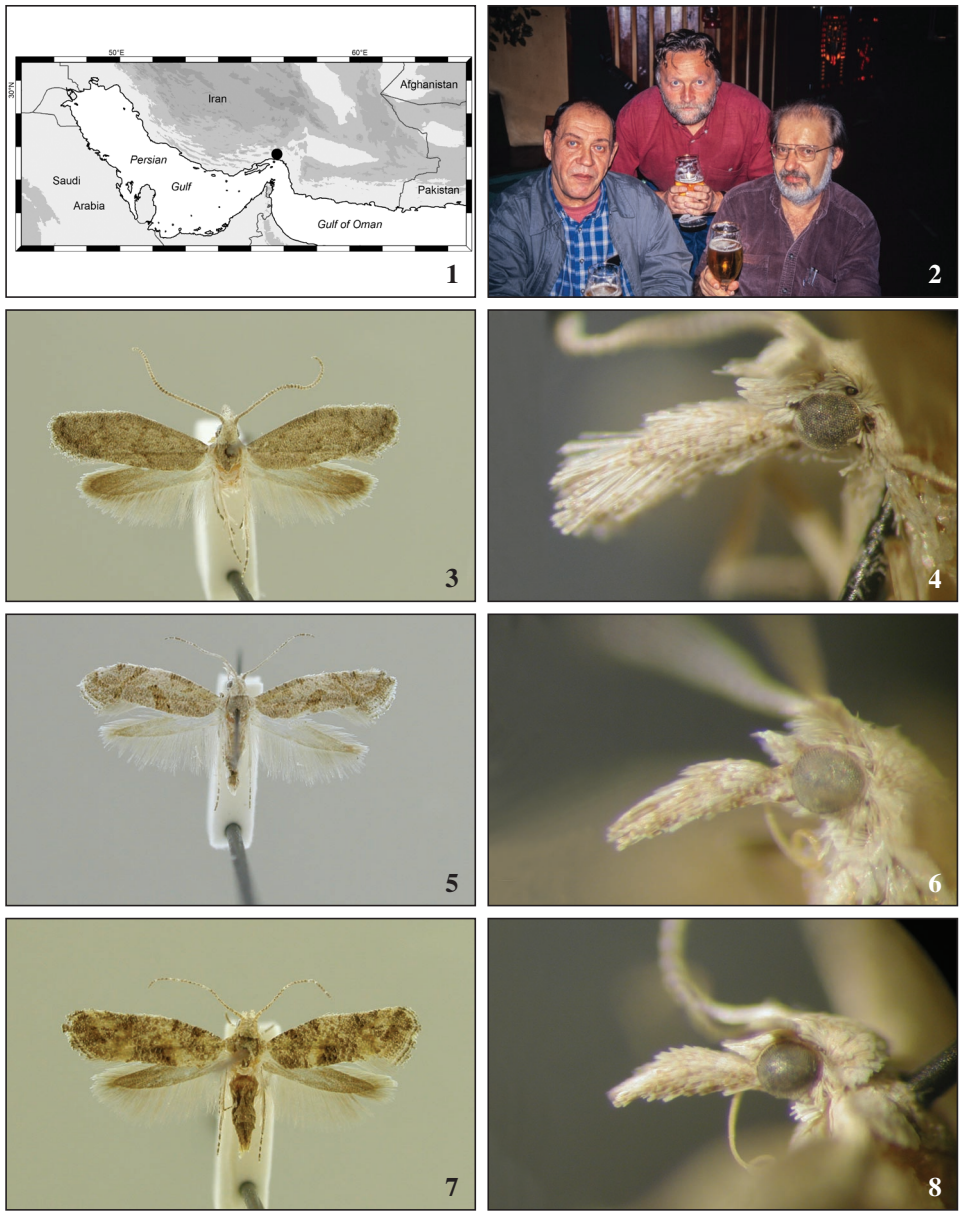
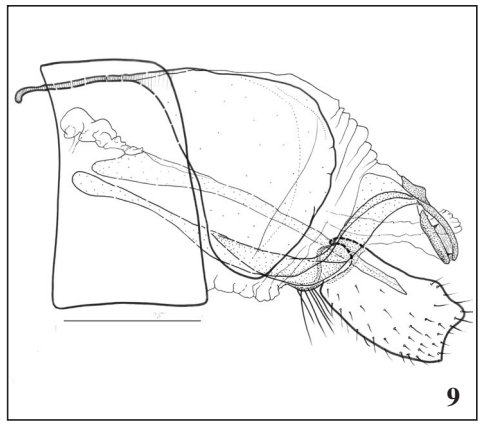
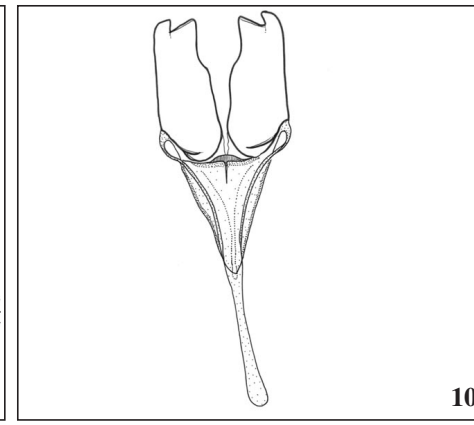
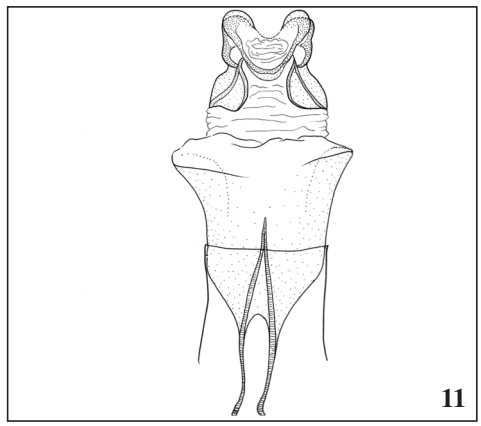
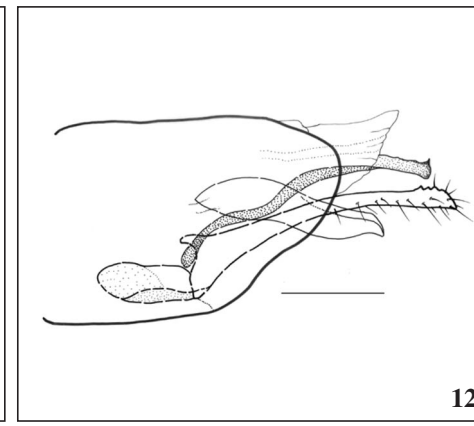


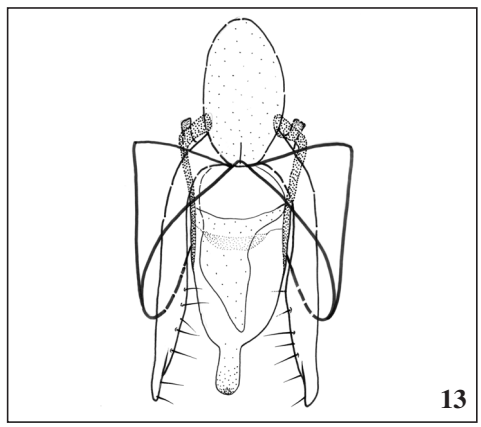
Figs 1-8.– 1. Map of southern Iran and adjacent regions. The black circle denotes the type locality of the described species east of Bandar Abbas. **2**. Meeting of Juri Nekrutenko, W. Mey and G. Lamas (from left to right) in the Bärenschenke in October 2000. **3-4**. Male of *Baerenschenkia lamasi* Mey, sp. n. **3**. Adult moth, **4**. Head in lateral aspect. **5-6**. Male of *Deryaxenistis nekrutenkoi* Mey, sp. n. **5**. Adult moth, **6**. Head in lateral aspect. **7-8**. Male of *Paraxenistis ammolofon* Mey, sp. n. **7**. Adult moth, **8**. Head in lateral aspect.

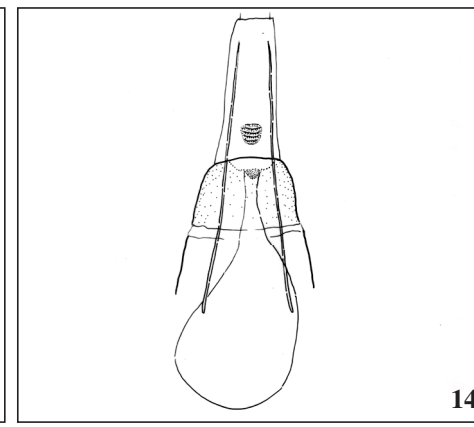




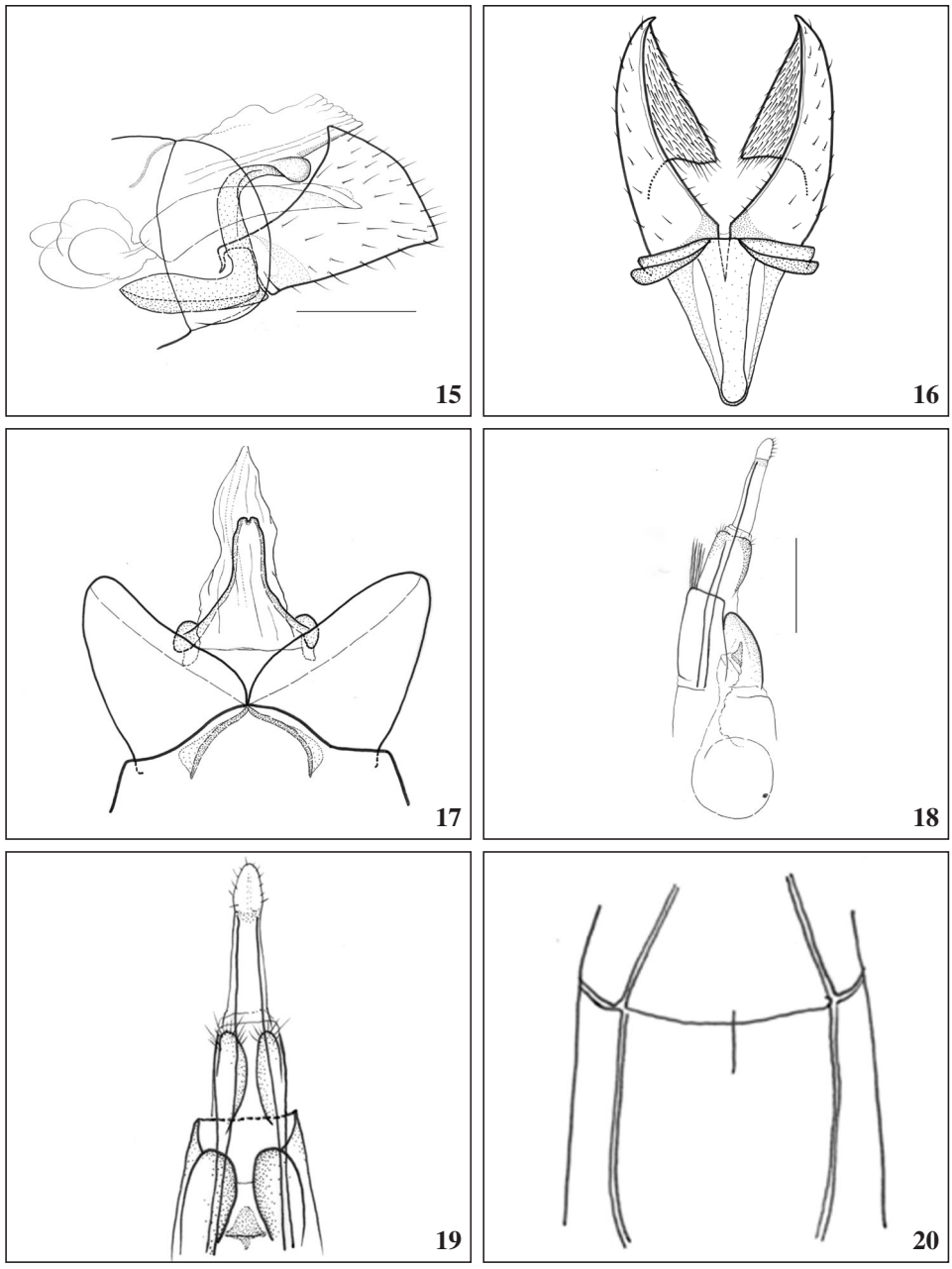




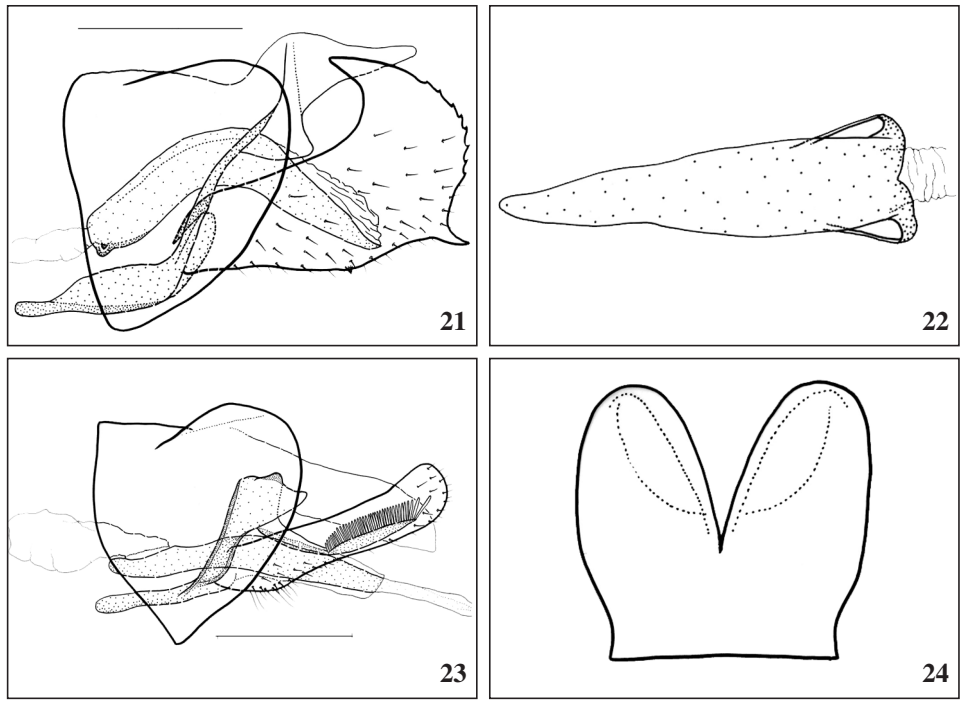




Figs 9-14.– 9-11. Male genitalia of *Baerenschenkia lamasi* Mey, sp. n. (scale bar: 0.5 mm). **9**. lateral. **10**. ventral. **11**. dorsal. **12-14**. Genitalia of *Deryaxenistis nekrutenkoi* Mey, sp. n. (scale bar: 0.5 mm). **12**. Male, lateral. **13**. Male, ventral. **14**. Female, ventral.



Figs 15-20.– 15-19. Genitalia of *Paraxenistis ammolofon* Mey, sp. n. (scale bar: 0.5 mm). **15**. Male, lateral. **16**. Male, ventral. **17**. Male, dorsal. **18**. Female, lateral. **19**. Female, ventral. **20**. Stenum II of *Paraxenistis ammolofon* Mey, sp. n., female.



Figs 21-24.– 21-22. Male genitalia, *Paraxenistis sphenospila* Meyrick, 1919, lectotype. **21**. lateral. **22**. phallus, ventral. **23-24**. Male genitalia, *Paraxenistis pentaula* (Meyrick, 1913), lectotype. **22**. lateral. **23**. pleura, ventral.

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New data on Pyraloidea from the Canary Islands, Spain 2 (Lepidoptera: Pyralidae, Crambidae)

P. Falck, O. Karsholt & F. Slamka

Abstract

We describe six new species of Pyraloidea from the Canary Islands, Spain: *Dioryctria mieella* Falck, Karsholt & Slamka, sp. n., *Euzophera mirumella* Falck, Karsholt & Slamka, sp. n., *Dalakia moyalis* Falck, Karsholt & Slamka, sp. n., *Peoria gigantesalis* Falck, Karsholt & Slamka sp. n. (Pyralidae: Phycitinae), *Metasia* (*Clasperia*) *baezi* Falck, Karsholt & Slamka, sp. n. (Crambidae: Spilomelinae) and *Cynaeda acutalis* Falck, Karsholt & Slamka, sp. n. (Crambidae: Odontiinae). Eight species are recorded as new to the fauna of the Canary Islands: *Achroia grisella* (Fabricius, 1794) (Pyralidae: Galleriinae), *Alophia combustella* (Herrich-Schäffer, 1855), *Epischnia prodromella* (Hübner, [1799]), *Epischnia illotella* Zeller, 1839, *Assara conicolella* (Constant, 1884), *Homoeosoma stenotea* Hampson, 1926 (Pyralidae: Phycitinae), *Loxostege sticticalis* (Linnaeus, 1761) and *Achyra nudalis* (Hübner, 1796) (Pyralidae: Pyraustinae). *Hypsopygia rubidalis* ([Denis & Schiffermüller], 1775) should be removed from the list of Lepidoptera found in the Canary Islands and replaced by *Hypsopygia costalis* (Fabricius, 1775) (Pyralidae: Pyralinae). We argue that *Pima tricolorella* Falck, Karsholt & Slamka, 2019 is a bona species. Photographs of adults of all species are shown. Photographs of the genitalia of new species are shown. Five of the six new species are Barcode and DNA analyses support the identification as new species.
KEY WORDS: Lepidoptera, Pyralidae, Crambidae, new species, new records DNA barcodes, Canary Islands, Spain.

Nuevos datos sobre los Pyraloidea de las Islas Canarias, España 2 (Lepidoptera: Pyralidae, Crambidae)

Resumen

Describimos seis nuevas especies de Pyraloidea de las Islas Canarias, España: *Dioryctria mieella* Falck, Karsholt & Slamka, sp. n., *Euzophera mirumella* Falck, Karsholt & Slamka, sp. n., *Dalakia moyalis* Falck, Karsholt & Slamka, sp. n., *Peoria gigantesalis* Falck, Karsholt & Slamka sp. n. (Pyralidae: Phycitinae), *Metasia* (*Clasperia*) *baezi* Falck, Karsholt & Slamka, sp. n. (Crambidae: Spilomelinae) and *Cynaeda acutalis* Falck, Karsholt & Slamka, sp. n. (Crambidae: Odontiinae). Se registran ocho especies como nuevas para la fauna de las Islas Canarias: *Achroia grisella* (Fabricius, 1794) (Pyralidae: Galleriinae), *Alophia combustella* (Herrich-Schäffer, 1855), *Epischnia prodromella* (Hübner, [1799]), *Epischnia illotella* Zeller, 1839, *Assara conicolella* (Constant, 1884), *Homoeosoma stenotea* Hampson, 1926 (Pyralidae: Phycitinae), *Loxostege sticticalis* (Linnaeus, 1761) y *Achyra nudalis* (Hübner, 1796) (Pyralidae: Pyraustinae). *Hypsopygia rubidalis* ([Denis & Schiffermüller], 1775) debería ser removida de la lista de Lepidoptera encontrados en las Islas Canarias y remplazada por *Hypsopygia costalis* (Fabricius, 1775) (Pyralidae: Pyralinae). Argumentamos que *Pima tricolorella* Falck, Karsholt & Slamka, 2019 es una buena especie. Se muestra fotografías de los adultos de todas las especies. Se muestran fotografías de la genitalia de las nuevas especies. Cinco de las seis nuevas especies con Barcode y los análisis de ADN respaldan la identificación como nuevas especies.
PALABRAS CLAVE: Lepidoptera, Pyralidae, Crambidae, nuevas especies, nuevos registros, ADN código de barras, Islas Canarias, España.

Introduction

In a previous paper (FALCK *et al.*, 2019) we dealt with the Pyraloidea fauna of the Canary Islands, presenting an overview of the literature and raising the number of species found in these islands from 132 to 152. Subsequent field work by the first author has resulted in the discovery of additional species of Pyraloidea, which are dealt with below.

During the preparation of our previous paper, we were aware of that not all species known to us from the Canary Islands could be identified. Based on ongoing research we have been able to identify some of these, whereas others proved to be undescribed; we can now describe six new species, mainly from material collected by the first author.

One species, *Pima tricolorella* Falck, Karsholt & Slamka, 2019, described by us in our previous paper (FALCK *et al*., 2019: 35) has since been given new status as a subspecies (LERAUT, 2021a, b). We disagree in this and provide additional information to confirm its status as a separate species.

Material and methods

Most of the specimens were attracted to an 8 watt. super actinic light. Genitalia were dissected following ROBINSON (1976). Whole specimens were photographed with a Canon EOS 700D camera equipped with a Canon EF 100 mm objective. The genitalia slides were photographed using a Soptop CX40T Trinocular microscope in conjunction with a Toup Tek P10500A-E3 / E3ISPM05000KPA-E3 / 5.0MP USB3 camera.

DNA samples were prepared from dried legs according to the prescribed standards and processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) to obtain the 658 base-pair long barcode fragment of the mitochondrial COI gene (cytochrome c oxidase I). Intra- and interspecific distances of DNA barcode fragment were calculated using analytic tools of BOLD with the Kimura 2-parameter model of nucleotide substitution. Genetic clusters are presented with their barcode index number (BIN; cf. RATMNASINGHAM & HERBERT, 2013).

We examined the morphology from all species and the DNA Barcode from new and cryptic species except *M. baezi*.

The sequence for the species treated below follows VIVES MORENO (2014).

Abbreviations used

FS	František Slamka, Bratislava, Slovakia
GP	Genitalia preparation
MB	Collection of Marcos Báez, La Laguna, Tenerife, Spain
PF	Collection of Per Falck, Neksø, Denmark
MNCN	Collection of Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain
NHMUK	Natural History Museum, London, United Kingdom
ZMUC	Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

Results

PYRALIDAE
GALLERIINAE

Achroia grisella (Fabricius, 1794) (Fig. 1)

Material examined: Spain, La Gomera, Arure, 830 m, 1 ♀, 24-X-12-XI-2021, leg. P. Falck, genitalia slide 3559PF (PF). **New to the Canary Islands**.

Distribution: Cosmopolitan (SLAMKA, 2006: 59).

Biology: The larva lives in webs and feeds on wax in hives and can be a pest there, occasionally also on vegetal detritus and dead insects (SLAMKA, 2006: 59).

Remarks: The species is probably a resident in the Canary Islands.

PYRALINAE

Hypsopygia costalis (Fabricius, 1775)

Correction. In our last paper (FALCK *et al*., 2019: 35) this species was erroneously recorded as *Hypsopygia rubidalis* ([Denis & Schiffermüller], 1775). *H. rubidalis* should be removed from the list of Lepidoptera found in the Canary Islands and replaced by *H. costalis.*

PHYCITINAE

Pima tricolorella Falck, Karsholt & Slamka, 2019, **sp. rev**.

The status of this species, described by us from Lanzarote and Fuerteventura in our earlier paper on Pyraloidea of the Canary Islands (FALCK *et al*., 2019: 35-37) was recently changed by LERAUT (2021a:184, 318; 2021b: 89) into a subspecies of *Pima aureliae* Leraut, 1914 from Tunisia. We disagree in this for the following reasons:

Adult: *P. tricolorella* differs from *P. aureliae* in the shape of the forewing, which is narrow, having the costa more rounded in the apical half and the termen oblique and in the nature of the white streak at the costa, which is well-developed only in the basal third.

Male genitalia: The two species are distinguished by the shape of the two large cornuti. Both species display one cornutus that is slender and pointed; the other cornutus is broad at the base, tapering towards the apex and ends in a strong spike in *P. tricolorella*, whilst in *P. aureliaea* this cornutus is broad at the base but is almost triangular tapering equally on both sides towards apex.

Female genitalia of *P. tricolorella* are difficult to compare with the published figures of *P. aureliae* (LERAUT 2014: 331, fig.122c; LERAUT 2021b: 89, fig. 2; SLAMKA 2019: 324, fig. 147b), because the difference between the female genitalia of the three specimens is quite large, especially in the left angle between the ductus bursae and the corpus bursae and in the sclerotized structures in corpus bursae. In our opinion the specimens don't belong to the same species. *P. tricolorella* is distinguished in the female genitalia by the relatively shorter anterior apophysis, the barrel-shaped antrum having the lateral edges well sclerotized and tergite VIII with a small u-shaped excavation posteriorly. In *P. aurelia* tergite VIII has a deep v-shaped incision posteriorly. Additionally, the left angle between the ductus bursae and the corpus bursae is greater than that figured in a paratype by P. Leraut, but smaller than in the Algerian specimen figured by G. Leraut.

Alophia combustella (Herrich-Schäffer, 1855) (Fig. 2)

Material examined: Spain, Gran Canaria, Barranco de Azuaje, 270 m, 1 ♂, 3 ♀♀, 8-20-VIII-2020, leg. P. Falck, genitalia slide 3528PF; Carreteria, 455 m, 1 ♂, 2 ♀♀, 8-20-VIII-2020, leg. P. Falck; Fontanales 1100 m, 1 ♂, 8-20-VIII-2020, leg. P. Falck; La Gomera, Hermigua, 250 m, 1 ♂, 1 ♀, 9-12-VIII-2021, leg. P. Falck; Tenerife, Arona, 670 m, 1 ♀, 21-V-3-VI-2019, leg. P. Falck; 8 km S Aguamansa, 1400 m, 1 ♀, 21-V-3-VI-2019, leg. P. Falck (all PF). **New to the Canary Islands.**

Distribution: From southern Europe and North Africa (Morocco, Algeria, Tunisia) to the Middle East and Russia (LERAUT, 2014: 119; SLAMKA, 2019: 87).

Biology: The larva lives in aphid (Aphidoidea) galls on leaves of *Pistacia lentiscus* L., P. *terebrinthus* L., and *P. atlantica* Desf. (LERAUT, 2014: 119; SLAMKA, 2019: 87).

Remarks: The species is a resident of the Canary Islands.

***Dioryctria mieella* Falck, Karsholt & Slamka, sp. n.** (Fig. 3)

Holotype ♂: SPAIN, Tenerife, Arona, 670 m, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3526PF, DNA sample Lepid Phyl 0938PF/CILEP0937-21 (MNCN).

Paratypes: SPAIN, La Gomera, Hermigua, 250 m, 1 ♀, 24-X-12-XI-2021, leg. P. Falck, genitalia slide 3560PF (PF); Tenerife, Güimar, 500 m, 1 ♂, 3-16-VIII-2021, leg. P. Falck, DNA sample Lepid Phyl 0937PF/CILEP0936-21 (PF).

Description: Male. Wingspan 22-23 mm. Head and neck light reddish-brown. Antenna about 2/3 length of forewing, light grey ringed with blackish grey, the first 1/3 pectinated, the rest of antenna distinctly serrate, scapus and flagellum light reddish brown with a few black scales edging sinus. Labial palps slightly upturned, segment 2 reddish brown, medially whitish, segment 3 brown with a whitish tip. Thorax and tegulae light reddish brown. Forewing narrow, elongate with rather pointed apex; ground colour light-reddish brown; basal streak white; ante-medial line white, zigzagging; post-medial line sinous, white, bordered by black scales medially in costal 2/3; discal spot distinct, white; medial part with two longitudinal black streaks combining the lines, upper black streak divided by the discal spot; marginal line black; fringes light reddish brown. Hindwing dark grey; fringes grey. Abdomen reddish grey.

Female: Externally similar to male, antenna filiform with short cilia.

Male genitalia (Figs 17, 17a): Uncus vertically oval, apically rounded with short setae; gnathos short and narrow, spicate, strongly sclerotized, bilaterally with small rounded projections on the posterior part of the short tegumen; valva long and slender, partially sclerotized, apex with long and thin spicate process about ⅗ of the length of valva; fibula (harpe) oblong, edges setose, situated above the sacculus; dorsal part of valva weakly sclerotized covered densely with long setae; juxta double-armed, U-shaped, apically weakly spicate and shortly setose; saccus long and narrow, well sclerotized. Phallus of moderately length, straight, apically with long spicate cornutus placed on the sclerotized structure and coated by the quantity of fine spines (part of vesica); additional short and thin cornuti (about 50) situated below the main cornutus.

Culcita (modified sternum VIII) (Fig. 17b) paired and bearing latero-ventral scale tufts.

Female genitalia (Fig. 23): Papillae anales short, densely covered by setae; posterior and anterior apophysis of the same length; segment VIII well sclerotized, square-shape, posteriorly with long setae; ostium rounded, strongly sclerotized, wrinkled, bilaterally with stronger sclerotized longitudinal folds; ductus bursae long, strongly sclerotized, in the central part longitudinally ribbed, inferiorly vertically S-shaped; corpus bursae oblong, generally membranous, posteriorly with the quantity of short spies situated in irregular arcs and clusters.

DNA barcodes: We obtained full length DNA barcode (658 bp) from one specimen and DNA barcode fragments of 654 bp from one specimen. The barcodes fall within Barcode Index Number (BIN) BOLD: AEM6898. The maximum intraspecific distance is 0.00%. The minimum p-distance to nearest neighbour *Dioryctria nivaliensis* Rebel, 1892 is 6.14%, and the minimum p-distance to *D. reniculelloides* Mutuura & Munroe, 1973 is 6.38%.

Diagnosis: Externally *D. mieella* only resembles a few reddish North American *Dioryctria*-species, e. g. *D. auranticella* (Grote, 1883) and *D. disclusa* Heinrich, 1953. It is distinguished by the narrow and pointed forewing and by the two longitudinal black streaks in the medial area. From all European species of *Dioryctria* it is distinguished by the red colour and shape of the forewing. In the male genitalia the long spicate process at the apex of the valva and small rounded harpe are characteristic. In the female genitalia, the large rounded ostium, and the S-shaped ductus bursae are characteristic.

Biology: Early stages unknown. The specimens were attracted to light.

Distribution: Only known from the islands of Tenerife and La Gomera, Spain.

Etymology: The species name is dedicated to the first author's youngest daughter Mie.

Remarks: *D. mieella* is probably endemic to the Canary Islands as it is the case with *D. nivaliensis*, these two species being each other's closest relatives according to their DNA barcodes.

Epischnia prodromella (Hübner, [1799]) (Fig. 4)

Material examined: Spain, Gran Canaria, Pie de la Cuesta, 500 m, 4 ♂♂, 4-23-III-2019, leg. P. Falck, genitalia slide 3538PF, DNA samples 0941PF/CILEP0940-21, 0942PF/CILEP0941-21; Ayacata, 1400 m, 1 ♂, 4-23-III-2019, leg. P. Falck (all PF). **New to the Canary Islands.**

Distribution: South- and Central Europe eastwards to Russia. North Africa (Morocco, Algeria, Tunisia), The Middle East and eastwards to Turkey and Iran (LERAUT, 2014: 315).

Biology: Larva hostplants are *Centaurea sp.* and *Knautia arvensis* (L.) Coult. (LERAUT, 2014: 315).

Remarks: The species is a resident of the Canary Islands.

Epischnia illotella Zeller, 1839 (Fig. 5)

Material examined: Spain, Gran Canaria, Pie de la Cuesta, 500 m, 3 ♂♂, 2 ♀♀, 11-24-VI-2018, leg. P. Falck, same data but 3 ♂♂, 1 ♀, 17-30-IX-2018, leg. P. Falck, same data but 3 ♀♀, 4-23-III-2019, leg. P. Falck, DNA sample 0946PF/CILEP0945-21; El Sao, 110 m, 1 ♀, 11-24-VI-2018, leg. P. Falck; Ayacata, 1400 m, 1 ♂, 1 ♀, 17-30-IX-2018, leg. P. Falck; Teror, 500 m, 1 ♀, 24-X-13-XI-2020, leg. P. Falck; Tenerife, Arona, 500 m, 2 ♂♂, 1-20-III-2017, leg. P. Falck, genitalia slide 2694PF, same data but 1 ♂, 1 ♀, 21-V-3-VI-2019, leg. P. Falck; Las Manchas, 1050 m, 1 ♂, 1-20-III-2017, leg. P. Falck; Erjos, 1000 m, 1 ♀, leg. P. Falck, genitalia slide 2553PF; Las Mercedes, 750 m, 2 ♀♀, 21-V-3-VI-2019, leg. P. Falck; 8 km N Vilaflor, 1700 m, 2 ♂♂, 21-V-3-VI-2019, leg. P. Falck, DNA sample 0945PF/CILEP0944-21 (all PF). **New to the Canary Islands.**

Distribution: In southern Europe from Portugal eastwards to Russia (LERAUT, 2014: 317).

Biology: The larva hostplants are *Inula montana* L., *Inula crithmoides* L. and *Asteriscus spinosus* (L.) Cass. (LERAUT, 2014: 317).

Remarks: The species is a resident of the Canary Islands.

Assara conicolella (Constant, 1884) (Fig. 6)

Material examined: Spain, Tenerife, Arona, 670 m, 1 ♂, 21-V-3-VI-2019, leg. P. Falck, genitalia slides 3314PF, 3570PF, DNA sample 0617PF/CILEP0616-20; Las Manchas, 1050 m, 1 ♂, 3-16-VIII-2021, leg. P. Falck (PF). **New to the Canary Islands.**

Distribution: The southern part of Portugal, Spain and France (LERAUT, 2014: 382).

Biology: The larva lives in shrivelled cones of *Pinus halepensis* Mill. (LERAUT, 2014: 382). *P. halepensis* is widespread in the Canary Islands at altitudes ranging from sea level to 1500 m (MUER *et al*., 2016: 87).

Remarks: The species is probably a resident of the Canary Islands. We obtained DNA barcode fragments of 580 bp from one specimen. The barcodes fall within Barcode Index Number (BIN) BOLD: AEE8286. The minimum intraspecific p-distance to European specimens of *A. conicolella* is 6.2% with Barcode Index Number (BIN): ADR6757. Despite the significant divergence in COI we consider the Canary Islands specimens to be conspecific with *A. conicolella,* because we did not observe any morphological differences in either the external features in or the genitalia.

***Euzophera mirumella* Falck, Karsholt & Slamka, sp. n.** (Fig. 7)

Holotype ♂: Spain, Gran Canaria, Pie de la Cuesta, 500 m, 11-24-VI-2018, leg. P. Falck (ZMUC).

Paratypes: Spain, Gran Canaria, Pie de la Cuesta, 500 m, 24 ♂♂, 4 ♀♀, 11-24-VI-2018, leg. P. Falck, genitalia slides 3356PF, 3557PF, 3562PF; Barranquillo Andrés, 700 m, 7 ♂♂, 3 ♀♀, 11-24-VI-2018, leg. P. Falck; La Gomera, Hermigua, 250 m, 1 ♂, 24-X-12-XI-2021, leg. P. Falck; La Palma, Las Toscas, 150 m, 2 ♂♂, 1 ♀, 17-23-I-2019, leg. P. Falck, DNA sample Lepid Phyl 0948PF/CILEP0947-21; Los Cancajos, 20 m, 2 ♂♂, 17-23-I-2019, leg. P. Falck, genitalia slide 3563PF; Tenerife, Los Gigantes, 50 m, 3 ♂♂, 8-22-XI-2016, leg. P. Falck, genitalia slide 2601PF; Tamaimo, 550 m, 3 ♂♂, 4 ♀♀, 8-22-XI-2016, leg. P. Falck, genitalia slide 2603PF; Playa Paraiso, 50 m, 1 ♂, 1-20-III-2017, leg. P. Falck; Las Mercedes, 750 m, 1 ♀, 18-XI-8-XII-2018, leg. P. Falck; Arona, 670 m, 1 ♂, 21-V-3-VI-2019, leg. P. Falck, DNA sample Lepid Phyl 0947PF/CILEP0946-21 (PF, MNCN).

Description: Male. Wingspan 19-30 mm. Head and neck with grey white-tipped scales. Antenna about 2/3 length of forewing, yellowish, ciliate-setose with very short ciliae; scapus whitish. Labial palps upturned, approximately 1.5 diameter of the eye, grey, mottled with light-tipped grey scales, more whitish medially. Thorax and tegulae with grey mottled scales. Forewing narrow, lanceolate with blunt apex; ground colour grey, mottled with black and white scales; ante-medial line slightly oblique, white, edged distally with black and towards dorsum reddish brown scales; discal spot indistinctly white, edged by black scales in lower half; post-medial line sinous, white, edged by black medially; marginal dots black; fringes with white-tipped grey scales. Hindwing grey; fringes grey. Abdomen greyish.

Female: Externally similar to male, but antenna filiform with short cilia, weakly ringed light grey / grey.

Male genitalia (Figs 18, 18a): Uncus robust, broad, moderately tapering towards apex with short setae; gnathos strongly sclerotized, short, pear-shaped; labides well sclerotized, apically rounded, with small depression in the middle; tegumen short; valva broad, corrugated and densely covered by long setae, costa well-sclerotized with few short setae, longer towards apex, apically with short, blunt projection; cucullus rounded; juxta well sclerotized, U-shaped, bilaterally oval enlarged; sacculus straight, broad; saccus sclerotized, short, U-shaped. Phallus short and wide, moderately tapering towards apex, apically with fine transverse sclerotization, vesica with quantity of fine spines. Culcita (modified sternum VIII) (Fig. 18b) simple, composed of a V-shaped and a N-shaped plate.

Female genitalia (Fig. 24): Papillae anales of moderate length, densely covered by long setae; posterior and anterior apophysis of the same length; segment VIII well sclerotized, square-shaped, covered by setae (mainly posteriorly); ventrally U-shaped, medially with broad vertical sclerotization, anteriorly double-armed; ostium broad, triangular and membranous; ductus bursae narrow, membranous; corpus bursae oval, membranous, posteriorly with a quantity (more than 100) of fine spines; ductus seminalis situated posteriorly.

DNA barcodes: We obtained full length DNA barcodes (658 bp) from two specimens, one from the island of La Palma and one from the island of Tenerife. The barcodes fall within Barcode Index Number (BIN) BOLD: AEN4203. The intraspecific p-distance is 2.00%. The minimum p-distance to nearest neighbour, an unidentified species from Gabon, Africa is 7.85%, with the Barcode Index Number (BIN) BOLD: ADJ4456. The minimum p-distance to *E. pinguis* (Haworth, 1811) is 9.68%, with the Barcode Index Number (BIN) BOLD: AAC0332.

Diagnosis: Based on the male and female genitalia this new species belongs to the genus *Euzophera* Zeller, 1867. Externally *E. mirumella* sp. n. is somewhat similar to *E. pinguis* (Haworth, 1811), but it is larger, its colour is light greyish (yellowish brown in *E. pinguis*), cross-lines on the forewings are smoother and hindwings are darker. The male genitalia are characteristic, particularly by shape of valva with an apical projection and labides and the short, pear-shaped gnathos; culcita has a different and characteristic shape. Female genitalia are characteristic by the combination of the shape of segment VIII, absence of typical signum and posteriorly situated ductus seminalis. Similar species were not found among the described species (cf. ROESLER, 1973; LERAUT, 2014; LEPIFORUM, 2008-2022).

Biology: Early stages unknown. The specimens were attracted to light during late October to June.

Distribution: Known from La Gomera, Gran Canaria, La Palma and Tenerife, Spain, at altitudes ranging from sea level to 750 m.

Etymology: The specific epithet is derived from the Latin *mirum* (= surprise) and reflects the surprise discovery a rather large and characteristic unknown species, in abundance, from several of the Canary Islands.

Remarks: A high intraspecific variation in COI between the specimens from separate islands of the Canary Islands, in this case La Palma and Tenerife, is quite common (FALCK *et al*., 2021). It has been observed in endemic species of several families e.g. Tineidae, Scythrididae, Cosmopterigidae,

Tortricidae (P. Falck, unpublished). *E. mirumella* sp. n. is not closely related to other Palaearctic *Euzophera*.

Homoeosoma stenotea Hampson, 1926 (Fig. 8)

Material examined: Spain, Lanzarote, Mojón Blanco, Orzola, 20 m, 4 ♂♂, 3 ♀♀, 21-X-10-XI-2019, leg. P. Falck, genitalia slides 3264PF, 3265PF, 3266PF, DNA samples Lepid Phyl 0619PF/CILEP0618-20, 0620PF/CILEP0619-20, 0621PF/CILEP0620-20 (all PF). **New to the Canary Islands.**

Distribution: South Africa, Lesotho, Zimbabwe, Mozambique, Madagascar (DE PRINS & DE PRINS, 2011-2022), Morocco (AUDEOUD & ROCH, 1938: 369)

Biology: The larvae is reported to live in the flower-head of *Senecio madagascariensis* Poir. (Asteraceae), eating it out (EGLI, 2017). *S. madagascariensis* is not know from the Canary Island, and the larva probably feeds on other *Senecio* species there.

Remarks: The genitalia of both sexes are described in detail and figured by BALINSKY (1991: 26-27).

***Dalakia moyalis* Falck, Karsholt & Slamka, sp. n.** (Fig. 9)

Holotype ♂: Spain, Gran Canaria, Barranco Moya, 80 m, 8-20-VIII-2020, leg. P. Falck, genitalia slide 3525PF (ZMUC).

Paratypes: Spain, Gran Canaria, Barranco Moya, 80 m, 2 ♂♂, 1 ♀, 8-20-VIII-2020, leg. P. Falck, genitalia slide 3548PF, DNA samples Lepid Phyl 0741PF/CILEP0740-20, 0742PF/CILEP0741-20 (PF, MNCN).

Description: Male. Wingspan 14-16 mm. Frons white, light reddish brown in the middle and laterally; neck tufts light reddish brown. Antenna about 2/3 length of forewing, yellowish white, the first 1/3 pectinate the rest distinctly serrate with cilia shorter than diameter of the antenna, scapus yellowish, reddish dorsally. Labial palps long (approx. 2.5 diameter of the eye) and straight, reddish brown, more whitish medially. Forewing narrow, elongate with blunt apex; ground colour yellowish ochre, mottled with reddish scales in dorsal and apical part, more intensively reddish below the cell and in basal part; fringes light grey. Hindwing greyish; fringes light grey. Abdomen segment 1-3 orange, other segments yellowish white. Female: Externally similar to male, but antenna filiform with short cilia.

Male genitalia (Figs 19, 19a): Uncus slightly bilobed, laterally subtriangular with edges sclerotized, sparsely covered by short setae; gnathos short, narrow, well sclerotized, from lateral view anvil-shaped, dorsally broadening and covered by fine spikes, ventrally pointed; tegumen well developed and sclerotized; transtilla missing; valva at the base broad, evenly tapered towards apex, along costa covered by long setae, along dorsum shorter setae; cucullus narrowing, apically blunt, parallel with costa, near the middle a sclerotized flap, pointed spike-like apically, ending near cucullus, edge weakly dentate; juxta oval, sclerotized; saccus U-shaped, narrow and short, well sclerotized. Phallus slender and straight, apical-dorsally with long, slender and well sclerotized process, it is longitudinally ribbed, dorsally with 3 small parallel projections; vesica with fine sclerotized wrinkled structures. Culcita (modified sternum VIII) (Fig. 19b) simple, in shape of arcuate sclerotized lamella with paired lateral U-shaped sclerotization.

Female genitalia (Fig. 25): Papillae anales (lateral view) strongly compressed (flattened), apically narrowing and covered by short setae; apophyses relatively short, anterior apophysis about 2/3 length of posterior apophysis; segment VIII well sclerotized; ostium area large and slightly sclerotized; ductus bursae narrow at base, broadening towards corpus bursae with fine sclerotization; ductus seminalis well developed and broad; corpus bursae oval, membranous; centrally an irregular, semioval and well sclerotized signum, covered with about 13 long and short spikes, laterally a smaller, irregular plate-like, sclerotized signum is present.

DNA barcodes: We obtained full length DNA barcodes (658 bp) from two specimens. The

barcodes fall within Barcode Index Number (BIN) BOLD: AEH1203. The maximum intraspecific distance is 0.92%. The p-distance to nearest neighbour is 4.17%, with the Barcode Index Number (BIN) BOLD: ACH1411, probably an undescribed species from Pakistan.

Diagnosis: Externally, *D. moyalis* resembles some probably undescribed species from Pakistan and Australia, but the shape of the male genitalia are unique.

Biology: Early stages unknown. The specimens were attracted to light.

Distribution: Only known from the type-locality Barranco Moya in the northern part of the island of Gran Canaria, Spain.

Etymology: The species is named after the town Moya, situated near the type-locality.

Remarks: The placement of this new species in the genus *Dalakia* Amsel, 1961 is provisional. It is based on morphological similarity of male genitalia with the type species of that genus, *Dalakia uniformella* Amsel, 1961.

The Anerastiini is in need of revision and there is no published overview of its genera and species. Externally *D. moyalis* is similar to species of *Hypsotropa* Zeller, 1848 or *Peoria* Ragonot, 1887, but the forewings are more pointed, and the venation on the hindwing shows an abnormal (for Anerastiini) character with a bifid group (veins M2+M3 and Cu1 are fused and Cu2 is separate), which is shared with the tribus Cabniini (cf. SLAMKA, 2019: 10, fig. 1c). Normally, the venation of the hindwings in Anerastiini is characterized by a trifid group (veins M2+M3 are fused and Cu1 and Cu2 are separate) or rarely a quadrifid group (all 4 veins are separate) (cf. SHAFFER, 1968). Although the genus *Dalakia* shows characters of the trifid group, due to similarity of genitalia we place the new species *moyalis* into genus *Dalakia*.

***Peoria gigantesalis* Falck, Karsholt & Slamka, sp. n.** (Fig. 10)

Holotype ♂: SPAIN, Tenerife, Los Gigantes, 50 m, 8-22-XI-2016, leg. P. Falck (ZMUC).

Paratypes: SPAIN, Tenerife, Los Gigantes, 50 m, 7 ♂♂, 1 ♀, 8-22-XI-2016, leg. P. Falck, genitalia slides 2545PF, 2547PF, 3574PF, DNA sample Lepid Phyl 0949PF/0948-21; Tamaimo, 550 m, 1 ♂, 1 ♀, 8-22-XI-2016, leg. P. Falck, genitalia slide 1958FS, DNA sample Lepid Phyl 0950PF/0949-21 (PF, MNCN).

Description: Male. Wingspan 14.5-20 mm. Frons straw-yellow with long thin scales, vertex straw-yellow, neck tufts straw-yellow with admixture of brownish scales laterally. Antenna about 2/3 length of forewing, ciliate-setose, above whitish and beneath yellowish. Labial palps long (approx. 1.5 diameter of the eye) and straight with light brown and straw-yellow scales, more whitish medially. Thorax and tegulae light yellowish, more brownish laterally. Forewing narrow, elongate, apex blunt; ground colour white with fine straw yellow longitudinal streaks, edged with brown scales, in the middle and towards apex the admixture with brown scales in the streaks are more intense; fringes greyish. Hindwing greyish; fringes light grey. Abdomen greyish.

Female: Externally similar to male, but antenna filiform with short cilia.

Male genitalia (Figs 20, 20a): Medial process of uncus with strong sclerotized T-shape projection in the middle; on the lateral parts of uncus a long, sclerotized spicate projection, at the base of the projection a minute well-sclerotized spike anteriorly; gnathos broad and strongly sclerotized, edge densely finely serrate, narrowing towards apex, apicolaterally with two spikes; tegumen short; valva short and broad, costa well sclerotized, sparsely covered with long setae, apex pointed and sclerotized; sacculus sclerotized, densely covered with short setae; juxta square, at its bottom and bilaterally more sclerotized, in the middle (inferiorly) with a triangular sclerotization; saccus short, U-shaped, strongly sclerotized. Phallus of a medium length, well-sclerotized, slightly bent; in the everted vesica two strongly sclerotized small oval plates, dorsally with 3-5 strong spikes, between them a cluster of fine cornuti. Culcita (modified sternum VIII) (Fig. 20b) simple, being a well sclerotized lamella with a paired lateral scleriotization.

Female genitalia (Figs 26, 26a): Papillae anales long and relatively slender (lateral view), setose. Apophyses relatively short, anterior apophysis about 2/3 the length of posterior apophysis. Segment

VIII well sclerotized, ventrally in the middle with deep U-shaped notch and bilaterally with a blunt protuberance; ostium short, broad, membranous; colliculum a well-sclerotized short ring; ductus bursae very short, merging with corpus bursae (modified ductus), laterally with a sclerotized, irregular and semioval plate of variable shape with 15-28 small thorns of various length: corpus bursae membranous without any structures on the surface.

DNA barcodes: We obtained full length DNA barcodes (658 bp) from two specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEN7864. The maximum intraspecific distance is 0.00%. The p-distance to nearest neighbour 4.81%, with the Barcode Index Number (BIN) BOLD: ADZ3170, probably an undescribed species from South Africa.

Diagnosis: Externally *P. gigantesalis* does not resemble any known species from Europe or Africa. The male and female genitalia are characteristic and unmistakable compared with the other European Anerastiini (cf. LERAUT, 2014).

Biology: Early stages unknown. The specimens were attracted to light.

Distribution: Only known from two localities in the north-western part of the island of Tenerife, Spain.

Etymology: The species is named after the town Los Gigantes, situated at north-west coast of the island of Tenerife, where most of the specimens were collected.

Remarks: This new species, according the morphological characters especially of the genitalia, belongs to the genus *Peoria*. In the male genitalia it is characteristic that the uncus consists of two, often bifid arms, which protrude along the tegumen; gnathos ends in a small median arm, the valva is simple, with or without costal tooth and saccus is broad. In the female genitalia the elongate papillae anales with oblique profile and a short weakly sclerotized ductus bursae are characteristic (LERAUT, 2014: 95).

P. gigantesalis sp. n. belongs, together with the previous species, *Dalakia moyalis* sp. n. in the tribe Anerastiini. We follow HORAK (2003: 89) in considering Peroiini as a synonym of Anerastiini.

CRAMBIDAE
SPILOMELINAE

Metasia (*Clasperia*) *baezi* Falck, Karsholt & Slamka, sp. n. (Fig. 11)

Holotype ♂: Spain, Gran Canaria, Pie de la Cuesta, 500 m, 11-24-VI-2018, leg. P. Falck (ZMUC).

Paratypes: Spain, Gran Canaria, 1.3 km N Mogan, 430 m, 1 ♂, 2-8-XI-2014, leg. B. Skule (ZMUC); Barranquillo Andrés, 700 m, 2 ♂♂, 1 ♀, 11-24-VI-2018, leg. P. Falck, genitalia slide 2734PF; Puerto Rico, 50 m, 5 ♂♂, 11-24-VI-2018, leg. P. Falck, same data but 8 ♂♂, 2 ♀♀, 17-30-IX-2018, leg. P. Falck, genitalia slide 3572PF; Pie de la Cuesta, 500 m, 5 ♂♂, 1 ♀, 17-30-IX-2018, leg. P. Falck, same data but 1 ♂, 24-X-13-XI-2020, leg. P. Falck; El Sao, 110 m, 2 ♂♂, 1 ♀, 17-30-IX-2018, leg. P. Falck; Fataga, 500 m, 3 ♂♂, 1 ♀, 21-VIII-4-IX-2020, leg. P. Falck; Barranco Moya, 80 m, 1 ♂, 8-20-VIII-2020, leg. P. Falck; Barranco Guayadeque, 700 m, 2 ♂♂, 2 ♀♀, 21-VIII-4-IX-2020, leg. P. Falck, genitalia slide 3573PF; Barranco de Azuaje, 270 m, 1 ♂, 8-20-VIII-2020, leg. P. Falck; Ayacata, 1400 m, 1 ♂, 21-VIII-4-IX-2020, leg. P. Falck; Agaeta, 180 m, 3 ♂♂, 24-X-13-XI-2020, leg. P. Falck; Playa del Cura, 15 m, 1 ♂, 9-22-VI-2021, leg. P. Falck; Tenerife, Barranco Badajoz, 2 ♂♂, 1 ♀, 24-VI-1995, leg. M. Báez, genitalia slide 5099OK (MB, ZMUC); El Medano, 10 m, 1 ♂, 18-XI-8-XII-2018, leg. P. Falck, same data but 4 ♂♂, 1 ♀, 21-V-3-VI-2019, leg. P. Falck; Arona, 670 m, 4 ♂♂, 3-16-VIII-2021, leg. P. Falck, genitalia slide 3555PF; Las Manchas, 1050 m, 1 ♂, 3-16-VIII-2021, leg. P. Falck, genitalia slide 3558PF; Güimar, 500 m, 2 ♂♂, 3-16-VIII-2021, leg. P. Falck (PF, MNCN).

Description: Male. Head grey-brown mottled with yellowish scales. Neck yellowish, mottled with a few brownish scales. Antenna about 2/3 length of forewing, brown, filiform, with short cilia (approximately fl diameter of antenna). Labial palps length approximately 1.5 of eye diameter, straight, brown, dorsally and medially mottled with yellowish scales, segment 3 very short. Thorax and tegulae

brown. Forewing relatively long and narrow, apex rounded and termen oblique; ground colour brown; antemedial line and post-medial line diffuse dark brown, not always visible; antemedial spot diffuse, small, dark brown; discal spot dark brown, medially a small diffuse yellowish spot; fringes greyish brown. Hindwing greyish brown with concolorous fringes. Abdomen greyish.

Female: Externally similar to male, but antenna with shorter ciliae.

Male genitalia (Figs 21, 21a): Uncus bilobed, lobes short, apically densely covered by short spines; tuba analis short, membranous; gnathos absent, tegumen short, weakly sclerotized; transtilla well developed, slightly sclerotized with long paired projections towards juxta; valva relatively wide (sparsely covered by setae), tapering towards apex, cucullus ± rounded, apically and dorsally with slight groove, a heavily sclerotized ridge parallel to costa not reaching costa; juxta rounded, well sclerotized, apico-bilaterally with arcuate folds or grooves; saccus well developed, long, strongly sclerotized, subtriangular. Phallus long and slender, apically with a sclerotized, often bilobed disc (plate) with or without minute teeth on the edge; cornuti absent.

Female genitalia (Fig. 27): Papillae anales short and quite broad, densely covered by ± short setae; posterior and anterior apophysis of the same length, robust and relatively long; sternum VIII well sclerotized, U-shaped; ostium bursae broad and finely sclerotized, ductus bursae broad, membranous, corpus bursae oval, membranous, without any spines; signum oval, weakly sclerotized with several very short spines, placed at the bottom of corpus bursae.

Diagnosis: The adult of *Metasia (Clasperia) baezi* is unique because of the shape of the almost uniform brown (except for the diffuse spots) forewing. In the male genitalia the sclerotized ridge parallel to costa and the sclerotized U-shaped fold (instead of clasper) are characteristic. In the female genitalia the long apophysis and the membraneous corpus bursae without spines are characteristic.

Biology: Early stages unknown. The specimens were attracted to light from June until the beginning of December.

Distribution: *M. baezi* is known from the islands of Gran Canaria and Tenerife at altitudes ranging from sea level to 1400 m. The species is probably an endemic species of the Canary Islands.

Etymology: The species name is dedicated to Marcos Báez of La Laguna, Tenerife who collected the first known specimens used for our study.

Remarks: According to external features it is similar to subgenus *Clasperia* Hartig, 1952 and *Aristidea* Slamka, 2013, but in the male genitalia is developed a ± sclerotized fold in shape of "U" or "V", which continues dorsally towards sacculus, instead of short clasper (harpe) (typical for subgenus *Clasperia*). In the female genitalia the oval, membranous corpus bursae without any spines is a typical character for other species of the subgenus *Clasperia.*

PYRAUSTINAE

Loxostege sticticalis (Linnaeus, 1761) (Fig. 12)

Material examined: Spain, Gran Canaria, Barranco de Azuaje, 270 m, 2 ♂♂, 1 ♀, 8-20-VIII-2020, leg. P. Falck; Carretería, 455 m, 1 ♀, 8-20-VIII-2020, leg. P. Falck (all PF). **New to the Canary Islands.**

Distribution: *L. sticticalis* is a well-known migrant and it is widely distributed throughout the Palaearctic and Nearctic regions (SLAMKA, 2013: 26).

Biology: The larva lives on various herbaceous plants, such as *Artemisia* sp., *Beta* sp., *Chenopodium* sp., *Trifolium* sp., etc. (SLAMKA, 2013: 26).

Remarks: Probably a migrant to the Canary Islands.

Achyra nudalis (Hübner, 1796) (Fig. 13)

Material examined: Spain, Gran Canaria, Pie de la Cuesta, 500 m, 1 ♀, 17-30-IX-2018, leg. P. Falck, same data but 3 ♂♂, 2 ♀♀, 21-VIII-4-IX-2020, leg. P. Falck; El Sao, 110 m, 1 ♂, 11-24-VI-2018, leg. P. Falck, same data but 3 ♂♂, 1 ♀, 21-VIII-4-IX-2020, leg. P. Falck; Puerto Rico, 50 m, 2 ♂♂, 17-

30-IX-2018, leg. P. Falck; Ayacata, 1400 m, 1 ♂, 1 ♀, 21-VIII-4-IX-2020, leg. P. Falck; Barranco Moya, 80 m, 1 ♂, 8-20-VIII-2020, leg. P. Falck (all PF). **New to the Canary Islands.**

Distribution: Southern Europe, Africa, Middle East, Turkey, Mongolia, Transcaucasia and India.

Biology: The larva feeds on leaves of *Champhorosma* sp., *Echium* sp., *Chenopodium* sp. and *Amaranthus* sp. (SLAMKA, 2013: 28).

Remarks: The species is a resident in the Canary Islands.

ODONTIINAE

Cynaeda acutalis Falck, Karsholt & Slamka, sp. n. (Figs 14, 15, 16)

Holotype ♂: Spain, Gran Canaria, Ayacata, 1400 m, 17-30-IX-2018, leg. P. Falck, genitalia slide 2810PF, DNA sample Lepid Phyl 0093PF/CILEP0093-19 (ZMUC).

Paratypes: Spain, Gran Canaria, Ayacata, 1400 m, 2 ♂♂, 2 ♀♀, 17-30-IX-2018, leg. P. Falck, genitalia slide 2806PF, DNA samples Lepid Phyl 0092PF/CILEP0092-19, 0094PF/CILEP0094-19, same data but 28 ♂♂, 2 ♀♀, 21-VIII-4-IX-2020, leg. P. Falck, genitalia slides 3461PF, 3577PF, 3578PF, DNA samples Lepid Phyl 0752PF/CILEP0751-20, 0753PF/CILEP0752-20, same data but 2 ♂♂, 1 ♀, 9-22-VI-2021, leg. P. Falck; Barranco de Guayadeque, 700 m, 5 ♂♂, 21-VIII-4-IX-2020, leg. P. Falck, DNA sample Lepid Phyl 0754PF/CILEP0753-20; 4 km N Pie de la Cuesta, 700 m, 1 ♂, 21-VIII-4-IX-2020, leg. P. Falck (PF, MNCN).

Description: Male. Wingspan 17-25 mm. Head and neck white, mottled with light yellowish brown towards middle. Antenna about 2/3 length of forewing, white, with long cilia (approximately 1.5 diameter of antenna). Labial palps straight (approximately 1.5 diameter of the eye) light yellowish brown laterally and white medially. Thorax and tegulae light yellowish brown. Forewing triangular with pointed apex, ground colour light yellowish brown, whitish medially to the postmedial line; at costa about 1/9 a diffuse brownish oblique antemedial line with a blackish scale tuft at dorsum; postmedial line zigzagging, bordered by blackish brown scales, sometimes forming two irregular dark brown spots distally, and interrupted by a white area distally to the cell; subterminal area white; fringe chequered blackish brown and white. Hindwing whitish often with an admixture of dark grey scales distally to the zigzagging postmedial line; fringe white.

Female: Externally similar to male, but antenna filiform with shorter ciliae.

Variation: The species can vary from specimens almost without blackish brown admixture of wings (Fig. 15) to very contrasting specimens (Fig. 16). It is also highly variable in size, a phenomenon seen in many species of Lepidoptera from the Canary Islands, probably depending on access to fresh food-plants.

Male genitalia (Figs 22, 22a): Uncus rounded, in shape of two paired arcuate lobes, densely haired (except of apical parts); gnathos strongly sclerotized, triangle-shaped, apex ± pointed; tegumen short; valva rather broad, cucullus rounded, densely haired, costa well sclerotized, short, moderately arcuate; sacculus moderately convex, weakly haired; vinculum strongly sclerotized; saccus short, triangular with rounded tip, well sclerotized; juxta A-shaped towards saccus, long (as long as phallus), narrow and moderately sclerotized. Phallus slender, moderately bent, without cornutus.

Female genitalia (Fig. 28): Papillae anales short and broad, sparsely setose; posterior apophysis slightly shorter than anterior apophysis; segment VIII narrow, well sclerotized and sparsely covered by short setae (mainly posteriorly), anteriorly with broad square sclerotized projection; antrum narrow, membranous, colliculum well sclerotized, short and narrow; ductus bursae long, membranous, broadening towards corpus bursae; corpus bursa oval, membranous, without signum.

DNA barcodes: We obtained full length DNA barcodes (658 bp) from six specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: ADV8645. The maximum intraspecific p-distance is 0.32% (mean 0.14%, n=6). The minimum p-distance to nearest neighbour *Cynaeda dentalis*

([Denis & Schiffermüller], 1775) is 3.09%, with the Barcode Index Number (BIN) BOLD: AAE7870. We obtained full length barcodes (658 bp) from three specimens of *C. dentalis* from the Canary Islands to compare their DNA with continental European specimens. The results corresponded 100%.

Diagnosis: *C. acutalis* resembles especially *C. dentalis*, which is also established in the Canary Islands, and *C. gigantea* Staudinger, 1880. It can be distinguished from *C. dentalis* by the pointed apex of the forewing, the dorsal part of the postmedial line is less zigzagging and often diffuse. Specimens with dark brown areas distally to the postmedial line are very characteristic. From *C. gigantea* it can be distinguished by the blurred wing pattern and by the lack of brownish stripes in the marginal area (between the veins). In the male genitalia *C. acutalis* sp. n. is similar to *C. dentalis.* It can be distinguished by the less broad valva, evenly curved costa (in *C. dentalis* costa is bent almost 90 medially), and the medial edges of the two uncus lobes are curved beneath apex. Both species lack cornutus in the phallus. From *C. gigantea* and *C. forsteri* de Lattin, 1951 it can be distinguished by the phallus without cornutus; in the phallus of *C. forsteri* is one small pointed cornutus, in *C. gigantea* two pointed cornuti. In the female genitalia *C. acutalis* can be distinguished by the lack of signum; in *C. dentalis* and *C. gigantea* a long narrow, serrated signum is present in corpus bursae. The female of *C. forsteri* is unknown.

Biology: Early stages and host-plant are unknown, but the larva probably feeds on an *Echium* species. There are several endemic *Echium* species in the Canary Islands (MUER *et al*., 2016: 741-761). The specimens were attracted to light from June until the end of September.

Distribution: Known only from scattered localities in central part of Gran Canaria at altitudes between 700 and 1400 m. In one locality (4 km N Pie de la Cuesta) *C. acutalis* occurred sympatric with *C. dentalis.*

Etymology: The species is named after the pointed apex of the forewing, from the Latin *acutus* (= acute).

Discussion

The Pyraloidea is an important and diverse group of Lepidoptera in the Canary Islands. More than 150 species of Pyraloidea are currently known from the islands, yet in our previous paper (FALCK *et al.,* 2019) we were able to increase the number of known species there by 15%. In the present paper we add another 14 additional species of this superfamily to the fauna of the Canary Islands.

Most of these species are members of the native fauna of the islands. The six newly described species can all appear to be endemic as they are neither known nor reasonably expected from elsewhere. Several species are shared with Europe and North Africa and one, *Homoesoma stenotea*, has an entirely African distribution. Only one species, *Loxostege sticticalis* is known to be migratory, and none of the species reported here can be traced back to importation from trade.

The Pyraloidea is a megadiverse superfamily of Lepidoptera, which is far from being revised at the global level. This is especially true for the subfamily Phycitinae which, according to LERAUT (2021a: 1, 5) includes 3452 described species in 641 genera. Nobody has a full overview of this subfamily, and several genera that contain species of economic importance have not yet been revised. We are well aware of these descriptions of new taxa should preferably, be made within taxonomic revisions, but it is also evident that such revisions will not be available for most groups of Pyraloidea within a foreseeable future and also not before many of the species have become extinct. With the declining interest from governments to support institutions dealing with insect taxonomy, and the problems with obtaining type material on loan from some of these institutions, it is becoming increasingly difficult to prepare revisions of diverse groups of insects. We have made serious efforts to check if the new species described here were already named and we feel confident that describing them, accompanied by illustrations of good quality and information on the DNA barcode, will make it possible for other researchers to recognise them.

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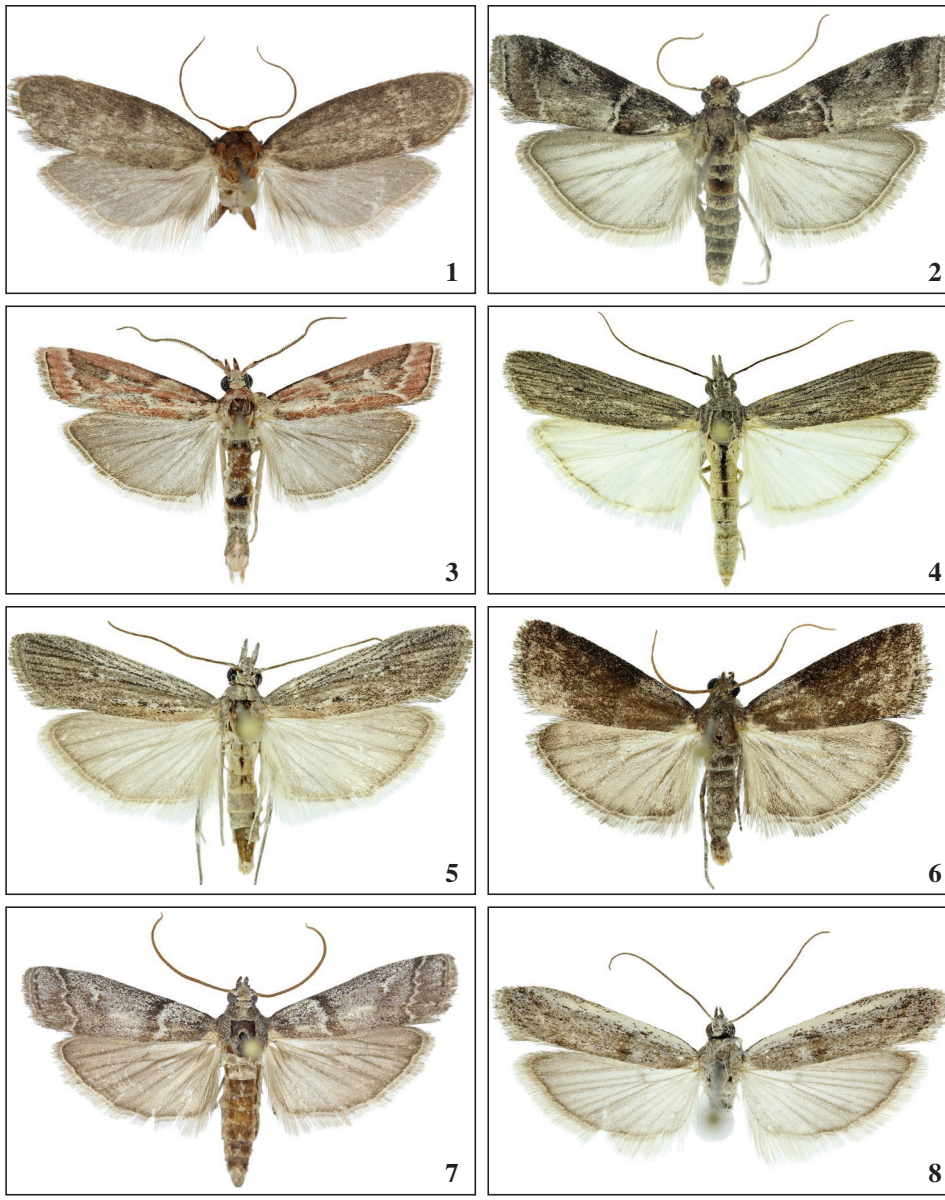
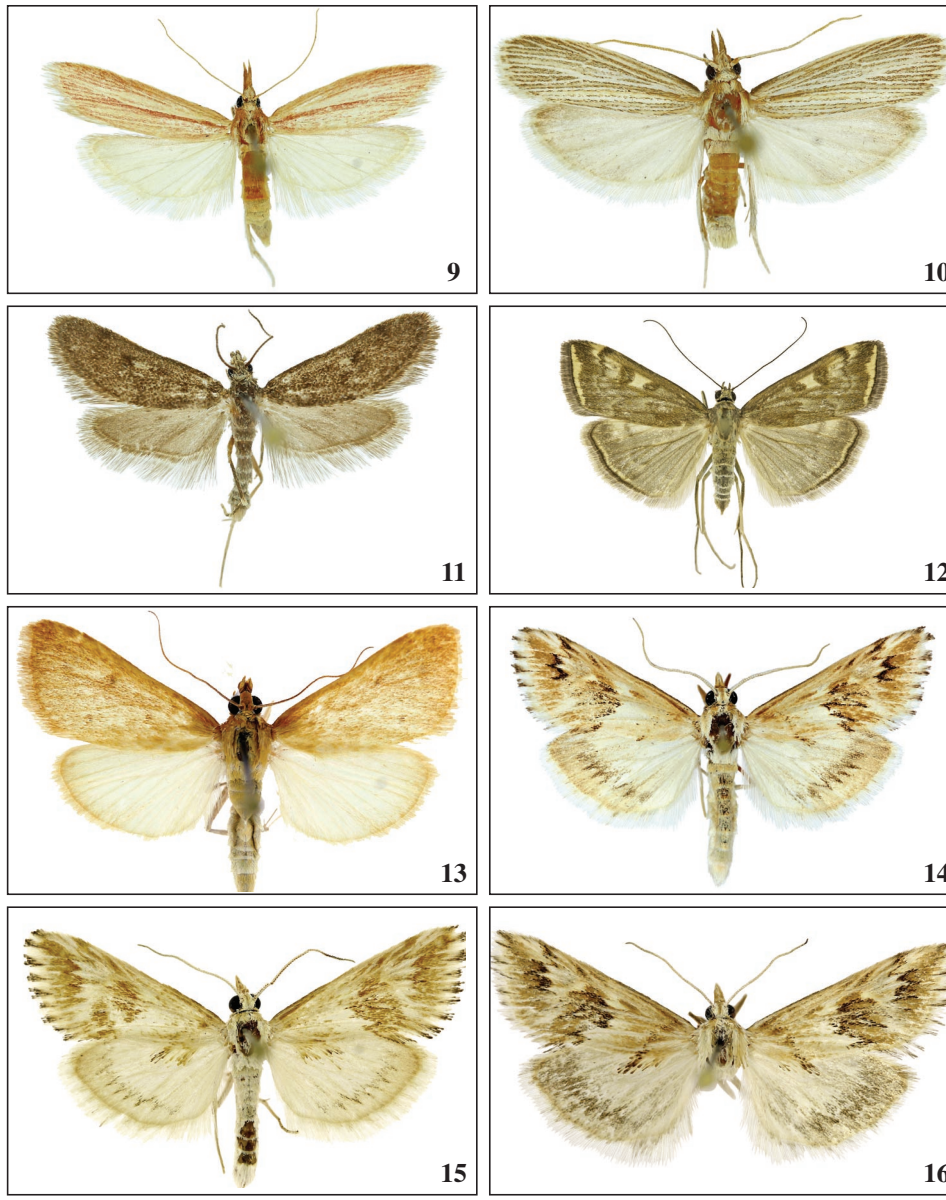
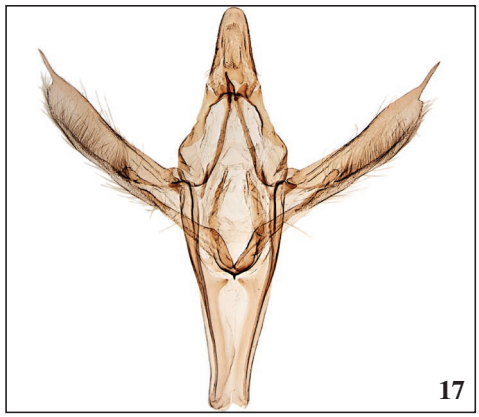


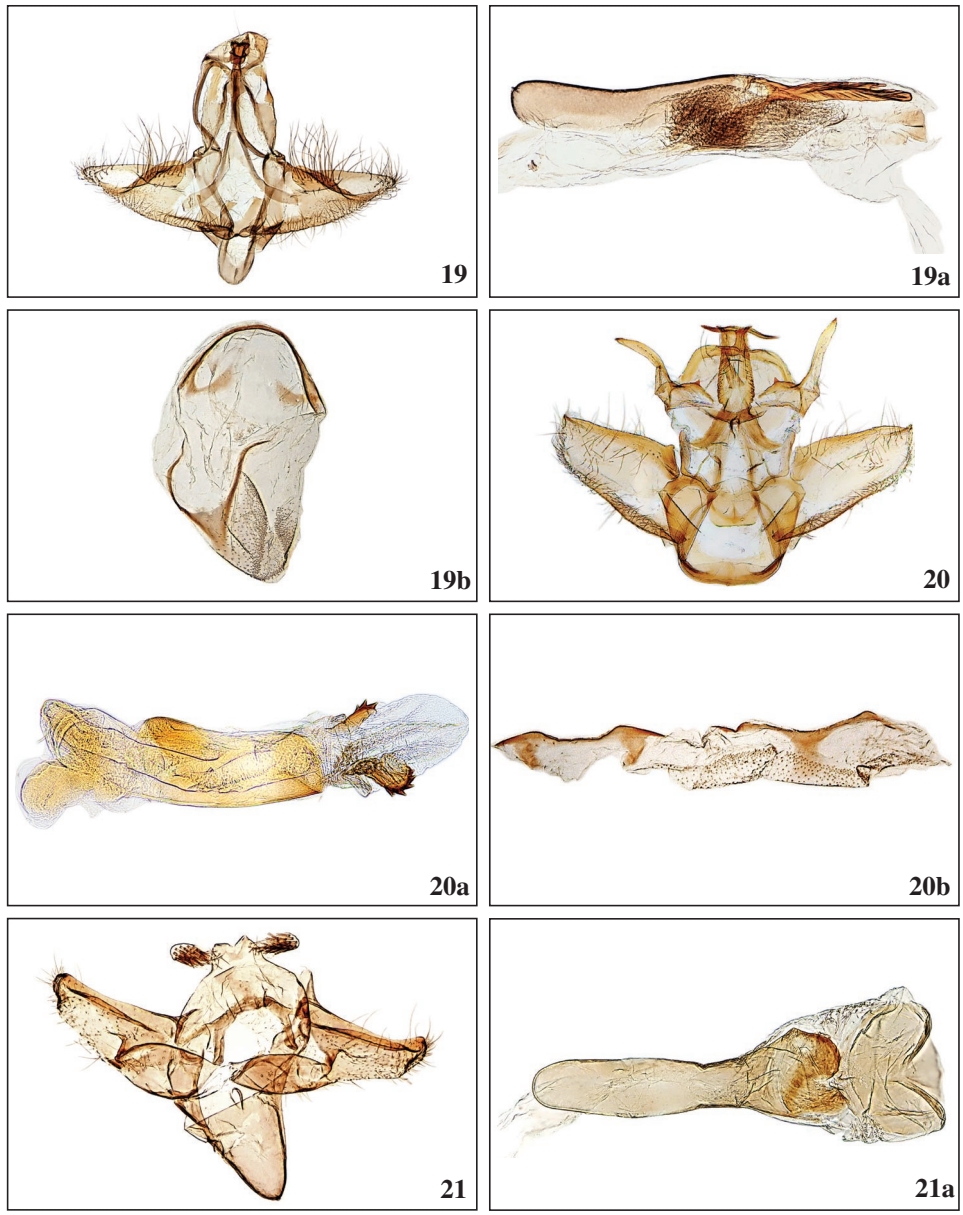
Figs 1-8.– 1. *Achroia grisella* (Fabricius, 1794), ♀, La Gomera, 20.5 mm. **2.** *Alophia combustella* (Herrich-Schäffer, 1855), ♀, Gran Canaria, 20.5 mm. **3.** *Dioryctria mieella* Falck, Karsholt & Slamka, sp. n., ♂, Tenerife, 23 mm. **4.** *Epischnia prodromella* (Hübner, [1799]), ♂, Gran Canaria, 28 mm. **5.** *Epischnia illotella* Zeller, 1839, ♀, Gran Canaria, 20 mm. **6.** *Assara conicolella* (Constant, 1884), ♂, Tenerife, 19.5 mm. **7.** *Euzophera mirumella* Falck, Karsholt & Slamka, sp. n., ♂, Gran Canaria, 29.5 mm. **8.** *Homoeosoma stenotea* Hampson, 1926, ♀, Lanzarote, 15 mm.



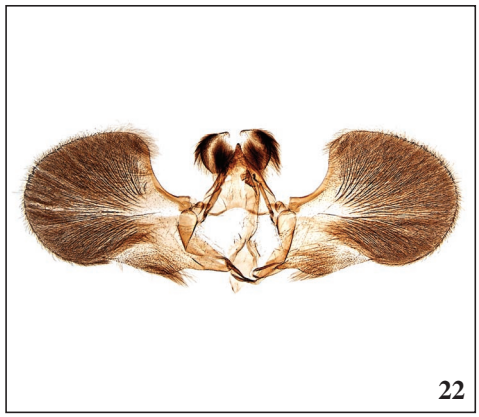
Figs 9-16.– 9. *Dalakia moyalis* Falck, Karsholt & Slamka, sp. n., ♀, Gran Canaria, 16 mm. **10.** *Peoria gigantesalis* Falck, Karsholt & Slamka, sp. n., ♂, Tenerife, 20 mm. **11.** *Metasia* (*Clasperia*) *baezi* Falck, Karsholt & Slamka, sp. n., ♂, Gran Canaria, 13.5 mm. **12.** *Loxostege sticticalis* (Linnaeus, 1761), ♀, Gran Canaria, 21 mm. **13.** *Achyra nudalis* (Hübner, 1796), ♂, Gran Canaria, 19 mm. **14.** *Cynaeda acutalis* Falck, Karsholt & Slamka, sp. n., ♂, Gran Canaria, 24 mm. **15.** *Cynaeda acutalis* Falck, Karsholt & Slamka, sp. n., ♂, Gran Canaria, 21 mm. **16.** *Cynaeda acutalis* Falck, Karsholt & Slamka, sp. n., ♀, Gran Canaria, 23 mm.

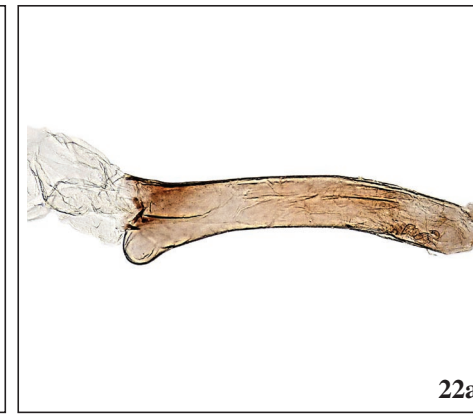


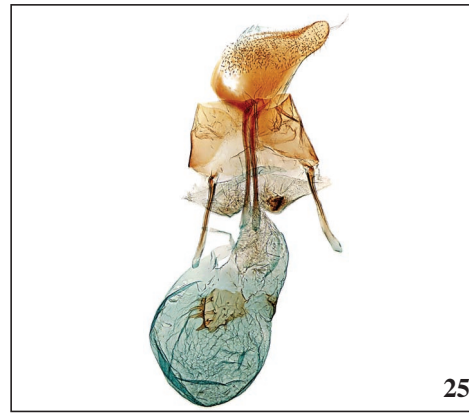
Figs 17-18b.– 17. *Dioryctria mieella* Falck, Karsholt & Slamka, sp. n., ♂, Tenerife, GP3526PF. **17a.** Phallus, Tenerife, GP3526PF. **17b.** Culcita, Tenerife, GP3526PF. **18.** *Euzophera mirumella* Falck, Karsholt & Slamka, sp. n., ♂, Gran Canaria, GP3562PF. **18a.** Phallus, Gran Canaria, GP3556PF. **18b.** Segment VIII (tergit and sternit), Gran Canaria, GP3562PF.



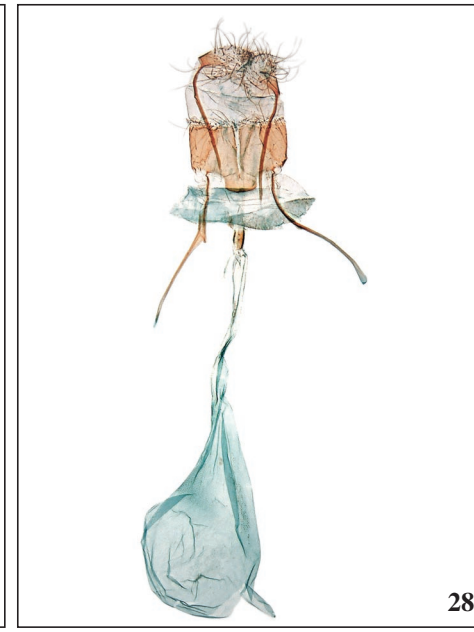
9Figs 19-21a.– 19. *Dalakia moyalis* Falck, Karsholt & Slamka, sp. n., ♂, Gran Canaria, GP3525PF. **19a.** Phallus, Gran Canaria, GP3525PF. **19b.** Segment VIII (tergit and sternit), Gran Canaria, GP3575PF. **20.** *Peoria gigantesalis* Falck, Karsholt & Slamka, sp. n., ♂, Tenerife, GP2545PF. **20a.** Phallus, Tenerife, GP2545PF. **20b.** Segment VIII (tergit and sternit), Tenerife, GP3574PF. **21.** *Metasia* (*Clasperia*) *baezi* Falck, Karsholt & Slamka, sp. n., ♂, Tenerife, GP3558PF. **21a.** Phallus, Tenerife, GP3558PF.







Figs 22-25.– 22. *Cynaeda acutalis* Karsholt & Slamka, sp. n., ♂, Gran Canaria, GP3578PF. **22a.** Phallus, Gran Canaria, GP3578PF. **23.** *Dioryctria mieella* Falck, Karsholt & Slamka, sp. n., ♀, La Gomera, GP3560PF. **24.** *Euzophera mirumella* Falck, Karsholt & Slamka, sp. n., ♀, Gran Canaria, GP3557PF. **25.** *Dalakia moyalis* Falck, Karsholt & Slamka, sp. n., ♀, Gran Canaria, GP3548PF.



Figs 26-28.– 26. *Peoria gigantesalis* Falck, Karsholt & Slamka, sp. n., ♀, Tenerife, GP2547PF. **26a.** *Peoria gigantesalis* Falck, Karsholt & Slamka, sp. n., ♀ (segment VIII unfolded), Tenerife, GP1958FS. **27.** *Metasia* (*Clasperia*) *baezi* Falck, Karsholt & Slamka, sp. n., ♀, Gran Canaria, GP3573PF. **28.** *Cynaeda acutalis* Falck, Karsholt & Slamka, sp. n., ♀, Gran Canaria, GP3461PF.

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The Tineoidea of Kyrgyzstan with the description of *Nemapogon kalliesi* Gaedike, sp. n. and a list of species from adjacent countries (Lepidoptera: Meessiidae, Tineidae)

R. Gaedike

Abstract

Nemapogon kalliesi Gaedike, sp. n., is described from Kyrgyzstan and new country records are presented for *Trichophaga ziniella* Zagulajev, 1960 and *Tinea bothniella* Svensson, 1953. Sixteen species are now known from Kyrgyzstan. A list is given of the taxa of Meessiidae and Tineidae of Kyrgyzstan and the adjacent countries Kazakhstan, Turkmenistan, Uzbekistan, and Tajikistan.
KEY WORDS: Lepidoptera, Tineoidea, Meessiidae, Tineidae, new species, Kyrgyzstan.

Los Tineoidea de Kirguizistán con la descripción de *Nemapogon kalliesi* Gaedike, sp. n. y una lista de especies de los países adyacentes (Lepidoptera: Meessiidae, Tineidae)

Resumen

Se describe *Nemapogon kalliesi* Gaedike, sp. n., de Kirguizistán y se presentan nuevos registros del país para *Trichophaga ziniella* Zagulajev, 1960 y *Tinea bothniella* Svensson, 1953. Ahora se conocen dieciséis especies de Kirguistán. Se ofrece una lista de los taxones de Meessiidae y Tineidae de Kirguizistán y de los países adyacentes Kazajistán, Turkmenistán, Uzbekistán y Tayikistán.
PALABRAS CLAVE: Lepidoptera, Tineoidea, Meessiidae, Tineidae, nueva especie, Kirguizistán.

Introduction

The kindness of my colleagues L. Kaila, W. Mey and O. Karsholt enabled me to study material from Kyrgyzstan. As result it was possible to describe a new species and to detect two new records for the country. Additionally, a list is presented of the species of these two families hitherto known from Kyrgyzstan (16 species) and the adjacent countries Kazakhstan (34 species), Turkmenistan (26 species), Uzbekistan (16 species) and Tajikistan (22 species).

In comparison with the other Central Asian countries, we know little about the Tineoidea fauna of these countries. Remarkable is the almost complete lack of members of the Meessiidae.

Abbreviations

FMNH	Finnish Museum of Natural History, Helsinki, Finland
RG	Reinhard Gaedike, Bonn, Germany

SDEI Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
ZMHB Museum für Naturkunde, Leibniz-Institut für Evolutions- und Biodiversitätsforschung, Berlin, Germany
ZMUC Zoological Museum, Copenhagen, Denmark

Taxonomy

MEESSIIDAE

Infurcitinea grisea Petersen, 1973
Infurcitinea grisea Petersen, 1973. *Beit. Ent.,* **23**(1/4): 61, figs 16-17
Examined material: GAEDIKE, 2013: 474.

TINEIDAE

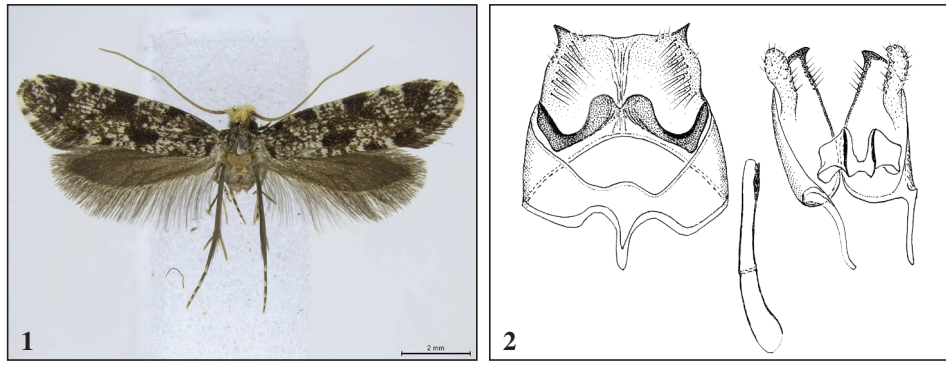
Hapsifera luridella Zeller, 1847
Hapsifera luridella Zeller, 1847. *Isis von Oken,* **40**: 33
Examined material: GAEDIKE, 2013: 472.

Nemapogon flavifrons Petersen, 1959
Nemapogon flavifrons Petersen, 1959. *Beitr. Ent.,* **9**(5/6): 565, fig. 9
Examined material: ZAGULAJEV, 1964: 278.

Nemapogon wieseri Gaedike, 2013
Nemapogon wieseri Gaedike, 2013. *Carinthia II,* **203/123**: 469, figs 1-3
Examined material: GAEDIKE, 2013: 470 [type locality].

***Nemapogon kalliesi* Gaedike, sp. n.** (figs 1-2)

Material examined: Holotype ♂, KYRGYZSTAN: Asia centr. Kirgistan 42.27N 78.32E, Terskei Alatau 1800 m, Teplokljutschenka, 7-9-VII-1994, leg. A. Kallies; ZMHB; Genitalia slide 10025 RG.



Figs 1-2.– *Nemapogon kalliesi* Gaedike, sp. n., holotype. **1.** Imago. **2.** male genitalia.

Description (fig. 1): wingspan 14 mm; head brush cream-coloured to light yellowish, labial palpus dark brown on outside, the inside and the pointed tip of apical segment cream-coloured; antenna light

grey-brown, scape dark brown; Thorax and tegulae dark brown, the forewing with same colouration, from base and from 1/2 of dorsum oblique to costa each with a broader band-shaped area mixed with white scales, a spot with white scales additionally on dorsum near apex; fringes with a darker basal half, fringes below apex with whitish area; hindwing dark grey-brown.

Genitalia ♂ (fig. 2): uncus truncated, laterally with pointed edges, gnathos arms bent before fi, apically rounded and connected together, tegumen and vinculum broad, saccus short, valva with short digitus, only a little protruding the pointed hook-shaped tip of valva, anellus broad, with two more strongly sclerotized rows in the middle, phallus as long as valva (without apodeme), subapically with a lateral narrow sclerotization.

Genitalia ♀: unknown.

Diagnosis: superficially distinguishable from the other members of the genus by the rather uniform dark brown colouration with only two broader band-shaped markings, mixed with white scales, but without any other pattern on forewing. The genitalia are characterized by the bent uncus with pointed tips, the apically rounded gnathos arms, which are connected together, and the pointed, hook-shaped tip of the valva.

Biology: unknown.

Distribution: Kyrgyzstan.

Etymology: the species is named in honour of the collector, Axel Kallies.

Myrmecozela lutosella gigantea (Christoph, 1873)
Tineola lutosella gigantea Christoph, 1873. *Horae Soc. Ent. Ross.,* **10**: 49

Examined material: 8 ♂♂, KYRGYZSTAN, Kirgizia, 30 km E of Naryn, 2500 m, 41º5'N, 76º20'E, 27-VII-1990, leg. L. Kaila and K. Mikkola; FMNH.

Edosa caerulipennis (Erschoff, 1874)
Tinea caerulipennis Erschoff, 1874. *Izv. Imp. Obshch. Lyub. Estest. Antrop. Etnogr. imp. Mosk. Univ.:* 97, pl. 6, fig. 108

Examined material: GAEDIKE, 2013: 474.

Additional material: 1 ♂, KYRGYZSTAN, Alajskij chrebet, 1-V-1980, leg. K. Cerny.

Ceratuncus kirghizstana (Zagulajev, 2002)
Fermocelina kirghizstana Zagulajev, 2002, *Ent. Obozr.,* **81**(2): 356, fig. 1

Examined material: ZAGULAJEV, 2002: 356 [type locality].

Trichophaga ziniella Zagulajev, 1960
Trichophaga ziniella Zagulajev, 1960. *Fn. SSSR: Lepi.,* **4**(3): 256, figs 227-228

Additional material: 2 ♂♂, 1 ♀, KYRGYZSTAN, Kirgizia, 30 km E of Naryn, 2500 m, 41º25'N, 76º20'E, 27-VII-1990, leg. L. Kaila and K. Mikkola; FMNH. **New country record.**

Tineola bisselliella (Hummel, 1823)
Tinea bisselliella Hummel, 1823. *Essais Ent.,* **3**: 3

Examined material: ZAGULAJEV, 1960: 222 (under the name *Tineola furciferella* Zagulajev, 1954).

Tinea pellionella Linnaeus, 1758
Tinea pellionella Linnaeus, 1758. *Systema Nat. (Ed. 10)*: 536

Examined material: GAEDIKE, 2013: 477.

Tinea bothniella Svensson, 1953
Tinea bothniella Svensson, 1953. *Opus. Ent.,* **18**: 225, figs 1C, E

Additional material: 1 ♀, KYRGYZSTAN, Transalayskij mts, Nura, 2900 m, 39º39'N, 73º52'E, 14-16-VII-1998, leg. M. Nuss; ZMUC. **New country record.**

Monopis weaverella (Scott, 1858)
Tinea weaverella Scott, 1858. *Zoologist,* **1858**: 5964
Examined material: ZAGULAJEV, 1960: 99 (under the name *Monopis rusticella* Hübner, [1813]).

Monopis imella (Hübner, [1813])
Tinea imella Hübner, [1813] 1796. *Samml. eur. Schmett.*: Abb. 347
Examined material: GAEDIKE, 2013: 479.
Additional material: 1 ♂, UZBEKISTAN, Namangan, coll. Staudinger; ZMHB.

Monopis christophi Petersen, 1957
Monopis christophi Petersen, 1957. *Beitr. Ent.,* **7**(1/2): 170, fig. 144
Examined material: GAEDIKE, 2013: 479.

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Distributional checklist of the Tineoidea for Kyrgyzstan (Kyrg.) and the adjacent countries: Kazakhstan (Kas.), Turkmenistan (Turk.), Uzbekistan (Uzb.), Tajikistan (Tad.).

Synonyms are listed when they were used in some of the sources.

Taxa	Kas.	Turk.	Uzb.	Kyrg.	Tad.
MEESSIIDAE					
Meneessia minutella (Petersen, 1959)			14; 16		24
Infurcitinea amseli Petersen, 1957			21		27
I. rumelicella (Rebel, 1903)			23; 27		
I. grisea Petersen, 1973			21; 22		25
TINEIDAE					
Hapsifera luridella Zeller, 1847	15	15; 22	15; 20	25	15
Hapsifera tadjikistana Gaedike, 2021					26
Pararhodobates syriaca (Lederer, 1857) [= *Tineola macropodiella* Erschoff, 1874]	15	15; 23; 27			15
Morophaga choragella ([Denis & Schiffermüller], 1775) [= *M. boleti* Fabricius, 1777]	13				
M. cremnarcha (Meyrick, 1932)					27
Nemapogon inconditella (Lucas, 1956) [= *N. heydeni* Petersen, 1957]	9; 22				
N. flavifrons Petersen, 1959	22	9; 11	9; 11; 27	9; 11	9
N. cloacella (Haworth, 1828)	9				
N. brandti Gaedike, 1986		22			
N. granella (Linnaeus, 1758)	9		27		
N. variatella (Clemens, 1859) [= *N. personella* Pierce & Metcalfe, 1934]	9; 22				
N. orientalis Petersen, 1961	22				
N. wieseri Gaedike, 2013				21	
***N. kalliesi* Gaedike, sp. n.**				27	
N. gerasimovi Zagulajev, 1961	6; 9	9; 11			11
N. meridionella Zagulajev, 1962		8; 9; 11			11
Neurothaumasia fasciata Petersen, 1959		5; 9; 11; 22	5; 9		5; 9; 11
Myrmecozela lutosella s. str. (Eversmann, 1844) [= *M. kasachstanica* Zagulajev, 1971; *M. saule* Zagulajev, 1971]	12; 15; 27			27	
M. lutosella gigantea (Christoph, 1873)			25	22; 25	
M. heptapotamica Zagulajev, 1971	12; 15				
Ateliotum hungaricellum Zeller, 1839	15				
Haplotinea ditella (Pierce & Metcalfe, 1938)	9	9; 11	9; 11		11
Cephimallota praetoriella (Christoph, 1872)	15; 27	15; 22			
C. longipennis (Erschoff, 1874)	15; 27		15; 27		
C. colonella (Erschoff, 1874)	15; 22		15; 20; 27		15
C. tunesiella (Zagulajev, 1966)	22; 25	15; 22			
C. repetekiella (Zagulajev, 1971)		12; 15; 22	20		15
C. erschoffi (Zagulajev, 1983)			17		
Edosa caerulipennis (Erschoff, 1874)	15			25	
Ceratuncus dzhungaricus Zagulajev, 1972	12; 15; 22				
C. kirghiztana Zagulajev, 2002 [described as *Fermocelina*]				19	
Reisserita leucella (Turati, 1926) [= *Cilicorneola balchanella* Zagulajev, 1956]		3; 4; 27	20; 27		

R. zelleri Zagulajev, 1992		18; 27				
Anomalotinea liguriella (Millière, 1879)		27				
A. distinctella (Zagulajev, 1960) [described as *Fermocelina*]			4; 10			10
Trichophaga ziniella Zagulajev, 1960		4; 10	4; 10; 22		27	10
T. bipartitella (Ragonot, 1892)		4	10; 27			10; 27
Tineola bisselliella (Hummel, 1823) [= *T. furciferella* Zagulajev, 1954]		27			4	
Tinea pellionella Linnaeus, 1758					25	7
T. translucens Meyrick, 1917 [= *T. leonhardi* Petersen, 1957]			4			
T. dubiella Stainton, 1859		22				
T. omichlopis (Meyrick, 1928) [= *Monopis nonimella* Zagulajev, 1955]		4; 22	1			
T. semifulvelloides Petersen, 1973		22				
T. turcmeniella Zagulajev, 1956			2; 4; 7			7
T. kasachica Gaedike, 2006		22				
T. bothniella Svensson, 1953						
[= *T. sibiriella* Zagulajev, 1960]		4			27	
T. columbariella Wocke, 1877			4; 7	7		7
T. trinotella Thunberg, 1794 [= *T. lapella* Hübner, [1799]]			10			10
Niditinea fuscella (Linnaeus, 1758) [= *Tinea fuscipunctella* Haworth, 1828]			4; 7			7
N. tugurialis (Meyrick, 1932)			4; 10			10
N. baryspilas (Meyrick, 1937) [= *Tinea unipunctella* Zagulajev, 1960]		22	4	20		
N. erschoffi Zagulajev, 1983				17		
Monopis weaverella (Scott, 1858)					4*	
M. monachella (Hübner, 1796)		4				
M. pallidella Zagulajev, 1955				4		
M. imella (Hübner, [1813])		22	4	4	25; 27	
M. christophi Petersen, 1957		27			25	

*Published under the name *Monopis rusticella* (Hübner, [1813]) [missidentification].

Sources, used for the compilation of the list: **1.** Zagulajev (1955); **2.** Zagulajev (1956a); **3.** Zagulajev (1956b); **4.** Zagulajev (1960); **5.** Zagulajev (1961a); **6.** Zagulajev (1961b); **7.** Zagulajev (1961c); **8.** Zagulajev (1962); **9.** Zagulajev (1964); **10.** Zagulajev (1965); **11.** Zagulajev (1968); **12.** Zagulajev (1971); **13.** Zagulajev (1973); **14.** Zagulajev (1974); **15.** Zagulajev (1975); **16.** Zagulajev (1979); **17.** Zagulajev (1983); **18.** Zagulajev (1992); **19.** Zagulajev (2002); **20.** Falkovitsch (1986); **21.** Gaedike (1997); **22.** Gaedike (2006); **23.** Gaedike (2010); **24.** Gaedike (2011); **25.** Gaedike (2013); **26.** Gaedike (2021); **27.** Studied material by G. Petersen and the author.

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Faunistic account on the Heterocera of Tirthan Valley, Great Himalayan National Park Conservation Area: a preliminary checklist (Insecta: Lepidoptera)

A. P. Singh, A. Chandra, K. De, V. P. Uniyal & R. Joshi

Abstract

The Present study represents 165 species belonging to 17 families, reported from Tirthan valley of Great Himalayan National Park Conservation Area. The study was conducted in April 2018 to July 2019. Family Erebidae and Geometridae was found dominated with 45 species each followed by Crambidae 30 species. With this addition of moth species, Great Himalayan National Park Conservation area is now home to 385 species of moths. The study was conducted for the first time in the Tirthan valley of Great Himalayan National Park Conservation Area.
KEY WORDS: Insecta, Lepidoptera, Heterocera, diversity, Greater Himalaya, India.

Informe faunístico sobre los Heterocera del Valle de Tirthan, Parque Nacional del Gran Himalaya área de conservación: una lista de comprobación preliminar (Insecta: Lepidoptera)

Resumen

El presente estudio representa 165 especies pertenecientes a 17 familias, registradas del Valle de Tirthan del Área de Conservación del Parque Nacional del Gran Himalaya, India. El estudio se llevó a cabo desde abril de 2018 hasta julio de 2019. Las familias Erebidae y Geometridae fueron dominantes con 45 especies cada una, seguidas por Crambidae 30 especies. Con esta adición de especies de Heterocera, el Área de Conservación del Parque Nacional del Gran Himalaya alberga ahora 385 especies. El estudio se realizó por primera vez en el Valle de Tirthan del Área de Conservación del Parque Nacional del Gran Himalaya.
PALABRAS CLAVE: Insecta, Lepidoptera, Heterocera, diversidad, Gran Himalaya, India.

Introduction

Insects are the most diverse animal group present on earth and show extreme level of adaptability probably in all kinds of habitats (HARRINGTON & STORK, 1995; LANDRES *et al*., 1988). Lepidoptera shows second highest diversity (BENTON, 1995) and act as indicators of healthy ecosystem and human activities (KOCHER & WILLIAMS, 2000). Majority of species are dull coloured with exceptions of few members of families like Zygaenidae and Choreutidae. Lepidoptera are also economically important as members of family Bombycidae produce expensive silk. Many of the moth species feed on both living and dead decaying plant material (FRIEDRICH, 1986; PORTER, 1997; ROBINSON *et al*., 2001; KENDRICK, 2002; SHARMA & RAMAMURTHY, 2010). According to Srivastava, 2002 Heterocera act as an integral part of the wildlife ecosystems, indicators of

environment, pollinate flowers and occupy a huge place in food web. Certain species are co-evolved with Lepidoptera pollinated flowers, these plants open their flower generally at night because of the nocturnal behaviour of many of the Heterocera, the structure of flowers are only feasible to specific species to suck nectar out of the long tubes due to the presence of long proboscis.

Heterocera are one of the main groups of insects which are well described taxonomically as well as by diversity and abundance (GHAZOUL, 2002). CHANDRA (2011) compiled data of Indian insects in which Heterocera are known through 13,359 species under 78 families. After that, many new taxa have been described and many checklists, catalogues, and books on Heterocera from India have been published (SINGH *et al*., 2014; KIRTI, 2015, 2016; CHANDRA *et al*., 2019; JOSHI *et al*., 2019; KIRTI *et al*., 2019) and it is hopeful that the number of species from India is more than that at present.

Previously very few studies have been documented the record of moth diversity from Himachal Pradesh. Various studies have documented the Heterocera from Kullu, Kangra, Dharamshala, Dharamshala (BUTLER, 1886; REV. HOCKING, 1888; MANI & SINGH, 1962; COTES & SWINHOE, 1887-1889), HAMPSON (1892-1896) in Fauna of British India, in general Himachal Pradesh (WALIA, 2005; ROSE & PATHANIA, 2004) and Chamba (SEKHON & SINGH, 2015). 17 species of Heterocera were previously reported from Great Himalayan National Park Conservation Area (UNIYAL & MATHUR, 1998). Recent inventory published by ZSI (CHANDRA *et al*., 2019), reported 237 species of Heterocera belonging to 16 families. However, the authors skipped exploring the Tirthan valley of the Great Himalayan National Park Conservation Area. With this particular aim, the study was conducted to document the moth diversity of Tirthan Valley of the conservation area.

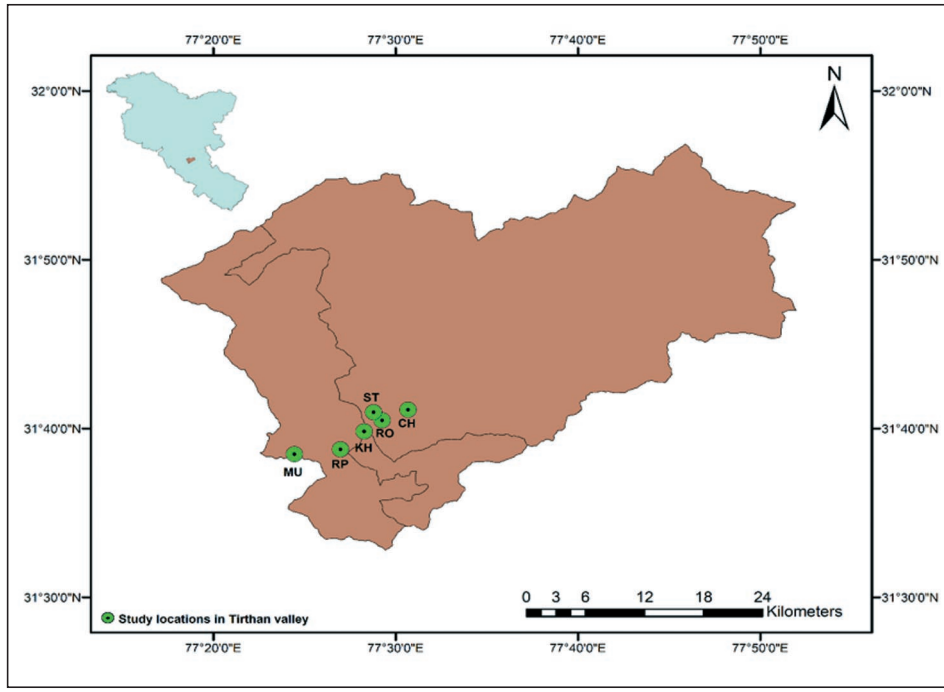

Figure 1.– Map represents the study locations in the Tirthan valley of Great Himalayan National Park Conservation Area.

Study Area

The study was performed in the Tirthan valley of Great Himalayan National Park Conservation Area (GHNPCA) located in the Kullu District of Himachal Pradesh. It was established in 1984 and was added in the UNESCO list of World Heritage Sites on 23 June 2014. The National Park is spread across four valleys which include Thirthan valley, Sainj valley, Parvati valley, and Jiva Nala. It includes a total area of 1,171 km^2 and an altitudinal range of between 1500 and 6000 m (Figure 1). The region is highly mountainous and covered with alpine, glacial, temperate, and subtropical forests. Seasons are broad: summer (Apr-Jun), rainy (Jul-Sep), and winter (Oct-Mar). The study was performed in six different locations of the valley (Table 1).

Methods

The consolidated information from Heterocera was compiled as a result of the surveys conducted in the area from April 2018- July 2019 as a part of the Department of Science and Technology under National mission for Sustaining the Himalayan Ecosystem (DST-NMSHE) research project. Light trapping was conducted in the six different regions of the valley. Mercury light trapping (160W) method was used to attract the species in different habitats of GHNPCA. No specimens were collected during these surveys and only photographs were taken by the author Amar Paul Singh. However, photographs of all the species are provided for better understanding of the wing coloration and wing maculation. Species were identified using various literature ROBINSON *et al*. (1994), KONONENKO & PINRATANA (2005), ZOLOTUHIN & PINRATANA (2005), SCHINTLMEISTER & PINRATANA (2007), PINRATANA & CERNY (2009), SONDHI & SONDHI (2016) and SHUBHALAXMI (2018) as well as web sources like https://www.inaturalist.org/, http://treenymph.org/wg-moths/.

Results

A total of 165 species belonging to 17 families were reported (Table 2). Family Erebidae and Geometridae was found dominated with 45 species, Crambidae 30 species and least number of species were found in Tortricidae, Uraniidae and Zygaenidae (Figure 2). 17 species similar to previous studies (CHANDRA *et al*., 2019) were found from Tirthan valley. A total of 147 species were reported for the first time from the conservation area. Photographs of the species were taken by Amar Paul Singh and the locality of each species is provided in Table 1.

Discussion

Due to its large latitude and high altitude, the Indian Himalayas are home to numerous biomes and habitats, which represent a central scene where different elements of biogeographic fauna are mixed. The introspection of the known diversity of Himalayan Lepidoptera is of immediate concern because of constant fluctuations in Global climate (SANYAL *et al*., 2018). A. G. Butler, a British entomologist described 227 species of Indian Rhopalocera in his seminal publication (1886) *"On the Lepidoptera Collection in India*", a large part of which is found in the Indian Himalayas like Darjeeling, Sikkim and the north-eastern part. Walia and Anju in 2005 conducted an exclusive study of Geometridae in Chandigarh and Himachal Pradesh, reporting 184 species. CHANDRA *et al*. (2019) reported 237 species of Heterocera under 178 genera belonging to 45 subfamilies of 16 families from the Sainj regions of Great Himalayan National Park Conservation area. Geometridae was found most dominated with 96 species followed by Erebidae 44 species and Noctuidae 41 species in their study. Whereas in Tirthan valley we concluded that the diversity of Erebidae is comparatively high. With this Great Himalayan National Park Conservation area is home to a total of 385 species of Heterrocera. Heterocera species like are a highly diverse and ecologically important group of insect species that play numerous key roles in particular ecosystems like herbivory, prey for birds and bats, pollination, and are

also potential indicators of ecosystem health and environmental fluctuations across a wide variety of landscapes (ERHARDT & THOMAS, 1991; KITCHING *et al*., 2000; SUMMERVILLE & CRIST, 2004). Great Himalayan National Park Conservation area representing such diversity of the Heterocera indicating a healthy ecosystem in terms of such factors.

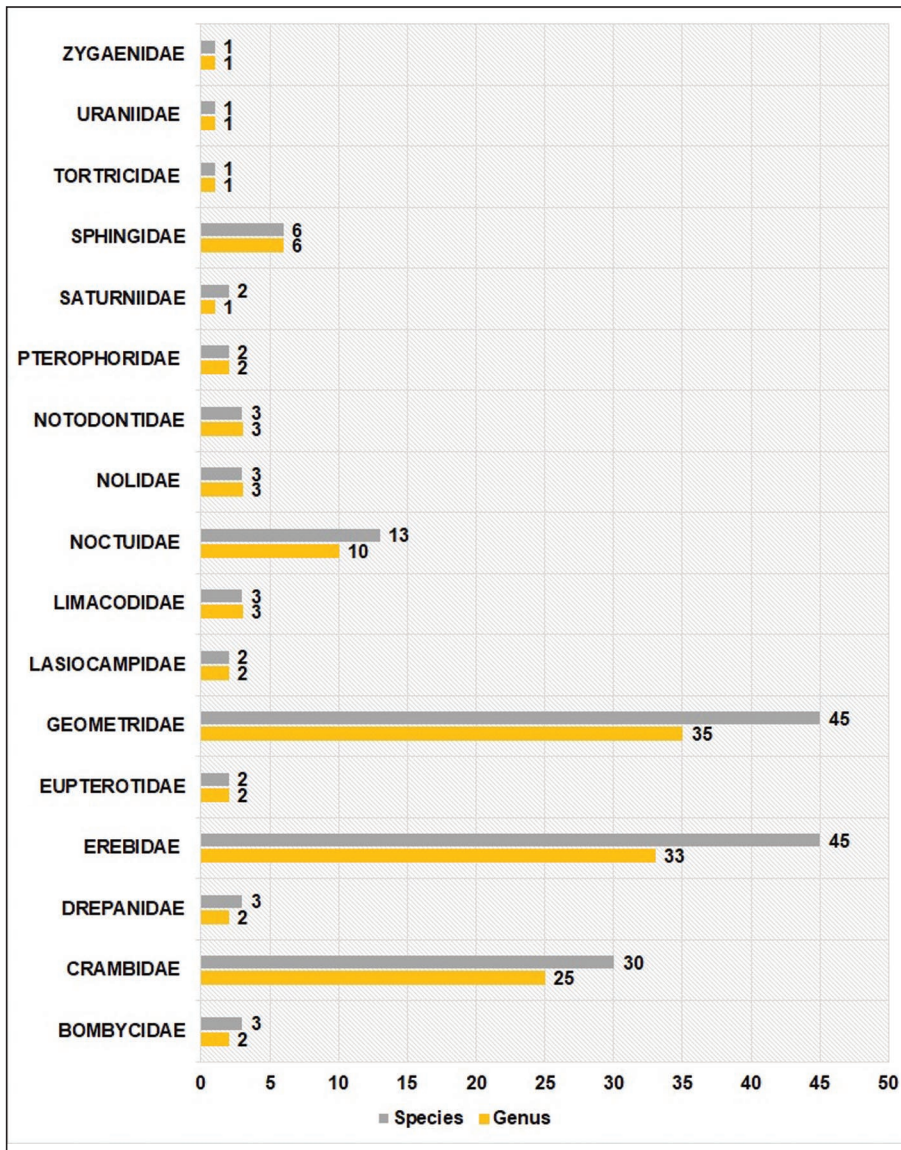

Figure 2.– Bar depicts the total number of genus and species of moths representing different families reported from Tirthan valley.

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Table 1.– Catalog of Heterocera of Tirthan valley, Great Himalayan National Park Conservation area. MU (Mungla), KH (Kharoncha), RP (Ropa), RO (Rola), CH (Cholocha), ST (Shilt).

Sr. No.	Species	Location	Photograph
	BOMBYCIDAE		
1	*Bombyx huttoni* (Westwood, 1847) *	MU	Plate 1
2	*Trilocha varians* (Walker, 1855)	MU	Plate 1
3	*Trilocha* sp.	KH	Plate 1
	CRAMBIDAE		
4	*Herpetogramma luctuosalis* (Guenée, 1854)	MU	Plate 1
5	*Omiodes indicata* (Fabricius, 1775)	KH	Plate 1
6	*Palpita warrenalis* (Swinhoe, 1894)	MU	Plate 1
7	*Scirpophaga incertulus* (Walker, 1863)	RP	Plate 1
8	*Chabula acamasalis* (Walker, 1859)	MU	Plate 1
9	*Eoophyla peribocalis* (Walker 1859)	KH	Plate 1
10	*Glyphodes bicolor* (Swainson, 1821)	MU	Plate 1
11	*Heliothela ophideresana* (Walker, 1863)	MU	Plate 2
12	*Herpetogramma bipunctalis,* (Zeller, 1872)	MU	Plate 2
13	*Nausinoe geometralis* (Guenée, 1854)	MU	Plate 2
14	*Parapoynx stagnalis* (Zeller, 1852)	MU	Plate 2
15	*Parotis marginata* (Hampson, 1893)	MU	Plate 2
16	*Patania violacealis* (Guillermet, 1996)	RP	Plate 2
17	*Talanga sexpunctalis* (Moore, 1887)	RP	Plate 2
18	*Endocrosis flavibasalis* (Moore, 1867)	MU	Plate 2
19	*Aethaloessa calidalis* (Guenée, 1854)	MU	Plate 2
20	*Cirrhochrista fumipalpis* (C. Felder, R. Felder & Rogenhofer, 1875)	KH	Plate 2
21	*Cnaphalocrocis poeyalis* (Boisduval, 1833)	MU	Plate 3
22	*Maruca vitrata* (Fabricius, 1787) *	MU	Plate 3
23	*Omiodes diemenalis* (Guenée, 1854)	KH	Plate 3
24	*Sameodes cancellalis* (Zeller, 1852)	KH	Plate 3
25	*Spoladera recurvalis* (Fabricius, 1775)	RP	Plate 3
26	*Hymenia perspectalis* (Hübner, 1796)	MU	Plate 3
27	*Palpita asiaticalis* (Inoue, 1994)	MU	Plate 3
28	*Pycnarmon cribrata* (Fabricius, 1794)	MU	Plate 3
29	*Agrotera scissalis* (Walker, 1866)	MU	Plate 3
30	*Cnaphalocrocis medinalis* (Guenée, 1854) *	MU	Plate 3
31	*Diaphania indica* (Saunders, 1851)	KH	Plate 4
32	*Cotachena pubescens* (Warren, 1892)	RP	Plate 4
33	*Palpita* sp.	RP	Plate 4
	DREPANIDADE		
34	*Tridrepana albonotata* (Moore, 1897) *	MU	Plate 4
35	*Deroca* sp.	RO	Plate 4
36	*Tridrepana* sp.	MU	Plate 4
	EREBIDAE		
37	*Aglaomorpha plagiata* (Walker, 1855)	MU	Plate 4
38	*Areas galactina* (Hoeven, 1840)	MU, RP	Plate 4
39	*Asota caricae* (Fabricius, 1775) *	MU, KH, RP	Plate 4
40	*Cyana puella* (Drury, 1773)	MU	Plate 4
41	*Cyana detrita* (Walker, 1854)	MU	Plate 5

42	*Cyana bianca* (Walker, 1856)	MU	Plate 5
43	*Cyana coccinea* (Moore, 1878)	MU	Plate 5
44	*Hulodes caranea* (Cramer, 1780)	RO	Plate 5
45	*Oruza divisa* (Walker, 1862)	MU, RO	Plate 5
46	*Callindra principalis* (Kollar, 1844)	MU, RO	Plate 5
47	*Creatonotos transiens* (Walker, 1855) *	MU, KH, RP	Plate 5
48	*Creatonotos gangis* (Linnaeus, 1763)	MU, KH, RP	Plate 5
49	*Olene inclusa* (Walker, 1856)	RO	Plate 5
50	*Somena scintillans* (Walker, 1856) *	MU	Plate 5
51	*Himala argentea* (Walker, 1855)	MU	Plate 6
52	*Juxtarctia multiguttata* (Walker, 1855)	MU	Plate 6
53	*Lyclene obsolete* (Moore, 1878)	MU	Plate 6
54	*Olepa ricini* (Fabricius, 1775)	MU	Plate 6
55	*Spirama retorta* (Clerck, 1764)	RO	Plate 6
56	*Spilarctia comma* (Walker, 1856) *	RP	Plate 6
57	*Syntomoides imaon* (Cramer, 1779)	MU, RO	Plate 6
58	*Brunia antica (*Walker, 1854)	MU	Plate 6
59	*Eressa confinis* (Walker, 1854)	MU, RP, KH	Plate 6
60	*Mangina argus* (Kollar, 1847)	RO	Plate 6
61	*Lymantria incerta* (Walker, 1855)	RP	Plate 7
62	*Grammodes geometrica* (Fabricius, 1775)	RP	Plate 7
63	*Trigonodes hyppasia* (Cramer, 1779)	KH	Plate 7
64	*Artaxa diagramma* (Boisduval, 1844)	MU	Plate 7
65	*Calliteara grotei* (Moore, 1859)	MU	Plate 7
66	*Euproctis chrysorrhoea* (Linnaeus, 1758)	MU	Plate 7
67	*Arctornis l-nigrum* (Müller, 1764)	KH	Plate 7
68	*Euproctis inconcisa* (Walker, 1865)	MU	Plate 7
69	*Mocis frugalis* (Fabricius, 1775)	MU	Plate 7
70	*Mocis undata* (Fabricius, 1775)	MU	Plate 7
71	*Hypena obacerralis* (Walker, 1859) *	MU	Plate 8
72	*Cladarctia quadriramosa* (Kollar, 1844)	MU	Plate 8
73	*Spilosoma impleta* (Walker, 1864)	MU	Plate 8
74	*Spilarctia* sp.	MU, RP	Plate 8
75	*Mocis* sp.	MU	Plate 8
76	*Lymantria* sp. 1.	MU	Plate 8
77	*Lymantria* sp. 2.	MU	Plate 8
78	*Spilosoma* sp.	MU	Plate 8
79	*Anomis* sp.	KH	Plate 8
80	*Laelia* sp.	KH	Plate 8
81	*Zueobata* sp.	MU	Plate 9
82	*Hypena* sp.	RP	Plate 9
	EUPTEROTIDAE		
83	*Ganisa plana* (Walker, 1855)	MU, KH	Plate 9
84	*Eupterote* sp.	MU	Plate 9
	GEOMETRIDAE		
85	*Agathia carissima* (Butler, 1878)	MU, KH, RO	Plate 9
86	*Agathia lycaenaria* (Kollar, 1844)	MU, KH	Plate 9
87	*Comibaena cassidara* (Guenée, 1857)	KH	Plate 9
88	*Pingasa ruginaria* (Guenée, 1857)	MU	Plate 9

89	*Problepsis vulgaris* (Butler, 1889)	KH	Plate 9
90	*Rhomborista monosticta* (Wehrli, 1924)	RP	Plate 9
91	*Thalassodes veraria* (Guenée, 1858)	RO	Plate 10
92	*Fascellina chromataria* (Walker, 1860)	RO	Plate 10
93	*Cleora alienaria* (Walker, 1860)	MU	Plate 10
94	*Corymica spatiosa* (Prout, 1925)	KH	Plate 10
95	*Hyposidra talaca* (Walker, 1860)	MU, KH, RP	Plate 10
96	*Ourapteryx sciticaudaria* (Walker, 1863)	KH	Plate 10
97	*Ourapteryx clara* (Butler, 1880)	KH	Plate 10
98	*Parapholodes fuliginea* (Hampson, 1891)	MU	Plate 10
99	*Hypomecis transcissa* (Walker, 1860)	RP	Plate 10
100	*Hypomecis cineracea* (Moore, 1888)	RP	Plate 10
101	*Chrysocraspeda olearia* (Guenée, 1857)	MU	Plate 11
102	*Timandra correspondens* (Hampson, 1895) *	MU, KH	Plate 11
103	*Anisodes absconditaria* (Walker, 1863)	RP	Plate 11
104	*Ectropis bhurmitra* (Walker, 1860)	RP	Plate 11
105	*Boarmia separata* (Walker, 1863)	RP	Plate 11
106	*Abraxas sylvata* (Scopoli, 1763) *	MU	Plate 11
107	*Alcis deversata* (Staudinger, 1892)	RP, ST	Plate 11
108	*Alcis repandata* (Linnaeus, 1758)	ST	Plate 11
109	*Pelagodes antiquadraria* (Inoue, 1976)	MU	Plate 11
110	*Semiothisa perfusaria* (Walker, 1866)	MU	Plate 11
111	*Electrophaes corylata* (Thunberg, 1792)	CH	Plate 12
112	*Ascotis selenaria* ([Denis & Schiffermüller], 1775)	MU	Plate 12
113	*Biston regalis* (Moore, 1888) *	MU	Plate 12
114	*Chiasmia emersaria* (Walker, 1861)	MU	Plate 12
115	*Comibaena albimarginata* (Warren, 1893)	MU	Plate 12
116	*Ecliptopera postpallida* (Prout, 1940) *	RO	Plate 12
117	*Ecliptopera relata* (Butler, 1880)	RO	Plate 12
118	*Iotaphora iridicolor* (Butler, 1880)	MU	Plate 12
119	*Eumelea ludovicata* (Guenée, 1858)	MU	Plate 12
120	*Comostola laesaria* (Walker, 1861)	MU	Plate 12
121	*Comostola maculate* (Moore, 1867)	MU	Plate 13
122	*Scopula* sp. 1.	MU	Plate 13
123	*Scopula* sp. 2	MU	Plate 13
124	*Maxates* sp.	MU	Plate 13
125	*Fascellina* sp.	KH	Plate 13
126	*Euphiya* sp.	KH	Plate 13
127	*Euithecia* sp.	MU	Plate 13
128	*Thyatira* sp.	KH	Plate 13
129	*Chorodna* sp.	MU	Plate 13
	LASIOCAMPIDAE		
130	*Gastropacha pardale* (Walker, 1855)	MU	Plate 13
131	*Trabala vishnou* (Lefebvre, 1827) *	MU	Plate 14
	LIMACODIDAE		
132	*Miresa argentifera* (Walker, 1855)	RP	Plate 14
133	*Parasa pastoralis* (Butler, 1855)	RP	Plate 14
134	*Thosea* sp.	MU	Plate 14

	NOCTUIDAE		
135	*Bastilla cramera* (Moore, 1885)	MU	Plate 14
136	*Oraesia emarginata* (Fabricius, 1794)	MU	Plate 14
137	*Calyptra thalictri* (Borkhausen, 1790)	MU	Plate 14
138	*Calyptra parva* (Banziger, 1979)	MU	Plate 14
139	*Chalciope mygdon* (Cramer, 1777)	MU	Plate 14
140	*Spodoptera litura* (Fabricius, 1775) *	MU	Plate 14
141	*Chrysodeixis chalcites* (Esper, 1789)	MU	Plate 15
142	*Thysanoplusia orichalcea* (Fabricius, 1775) *	MU	Plate 15
143	*Aegocera venulia* (Cramer, 1777)	RP, KH	Plate 15
144	*Batracharta* sp.	KH	Plate 15
145	*Xanthopastis* sp.	MU	Plate 15
146	*Thysanoplusia* sp. 1.	MU	Plate 15
147	*Thysanoplusia* sp. 2.	MU	Plate 15
	NOLIDAE		
148	*Carea angulata* (Fabricius, 1793)	MU	Plate 15
149	*Westermannia superba* (Hübner, 1823)	KH	Plate 15
150	*Tyana marina* (Warren, 1916)	RP	Plate 15
	NOTODONTIDAE		
151	*Phalera raya* (Moore, 1859)	MU	Plate 16
152	*Micromelalopha* sp.	MU	Plate 16
	PTEROPHORIDAE		
153	*Diacrotricha* sp.	MU	Plate 16
154	*Emmelina* sp.	KH	Plate 16
	SATURNIIDAE		
155	*Actias selene* (Hübner, [1807])	MU, KH	Plate 16
156	*Actias maenas* (Doubleday, 1847)	MU	Plate 16
	SPHINGIDAE		
157	*Acherontia lachesis* (Fabricius, 1798)	MU	Plate 16
158	*Agrius convolvuli* (Linnaeus, 1758)	MU	Plate 16
159	*Nephele hespera* (Fabricius, 1775)	MU	Plate 16
160	*Pergesa acteus* (Cramer, 1779)	RP	Plate 16
161	*Ambulyx substrigilis* (Westwood, 1847)	MU	Plate 17
162	*Theretra* sp.	KH	Plate 17
	TORTRICIDAE		
163	*Archips* sp.	RP	Plate 17
	URANIIDAE		
164	*Epiplema reticulata* (Moore, 1888)	MU	Plate 17
	ZYGAENIDAE		
165	*Campylotes histrionicus* (Westwood, 1839)	MU	Plate 17

PLATE 1


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PLATE 2


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PLATE 3


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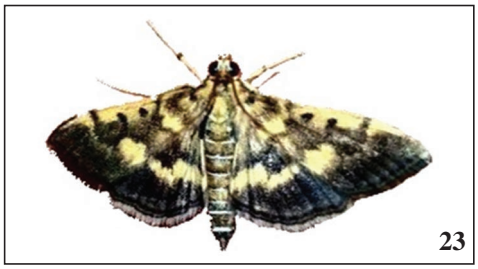
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PLATE 4


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PLATE 5


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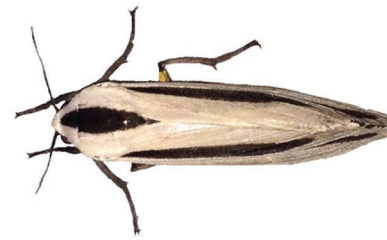
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PLATE 6

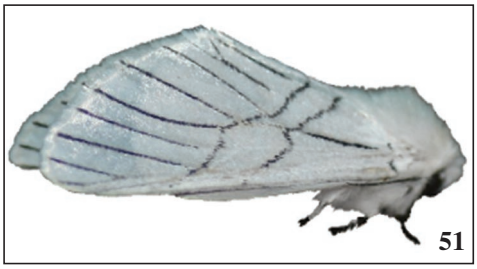
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PLATE 7


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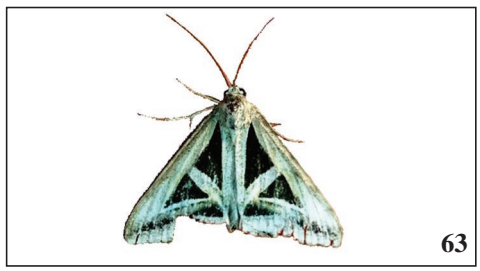
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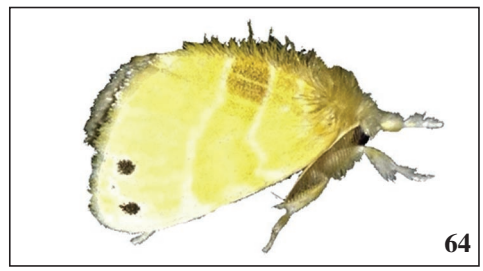
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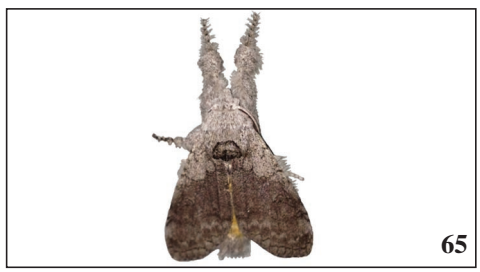
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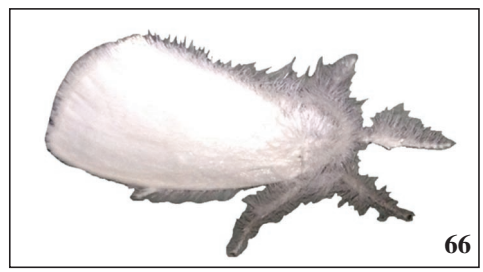
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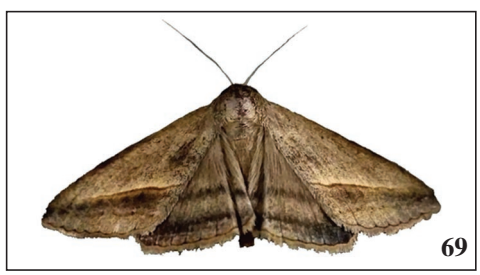
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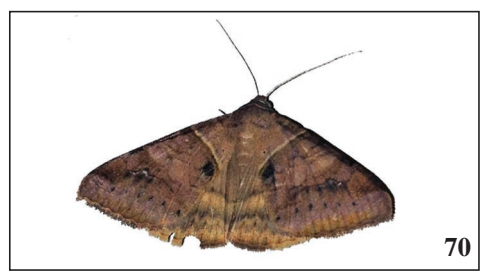
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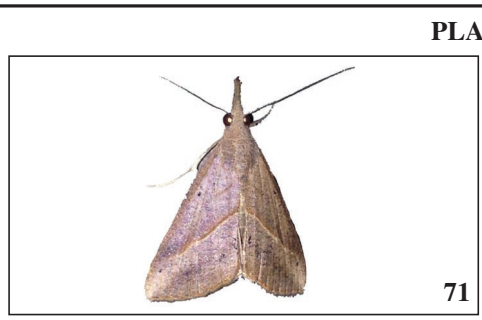
PLATE 8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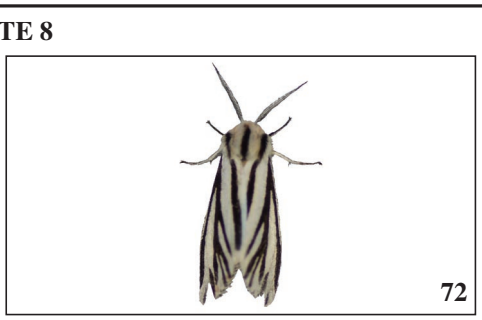
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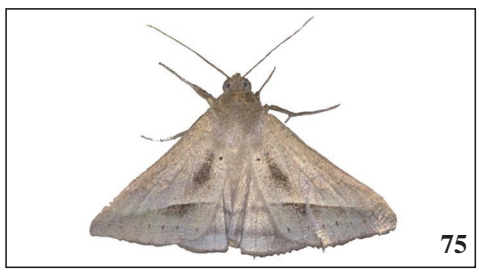
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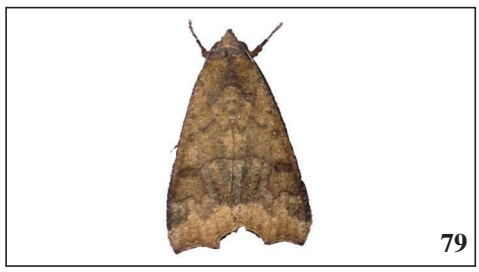
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PLATE 9


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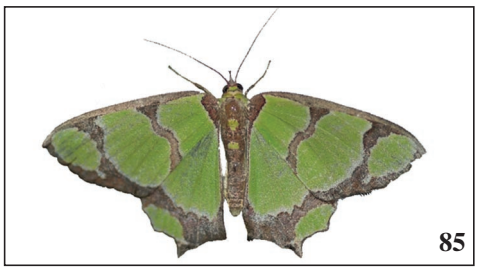
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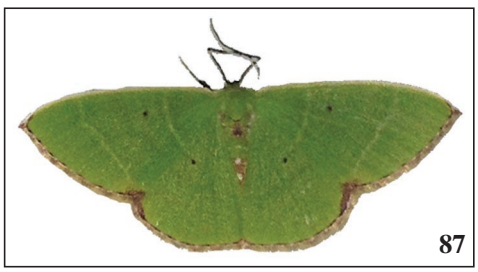
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PLATE 10


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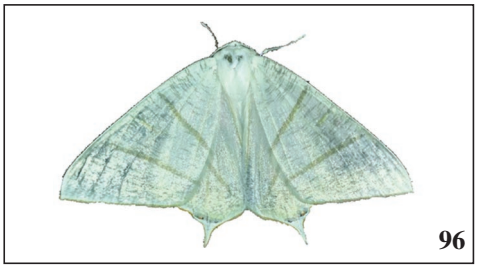
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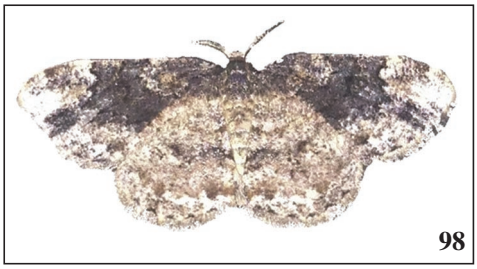
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PLATE 11

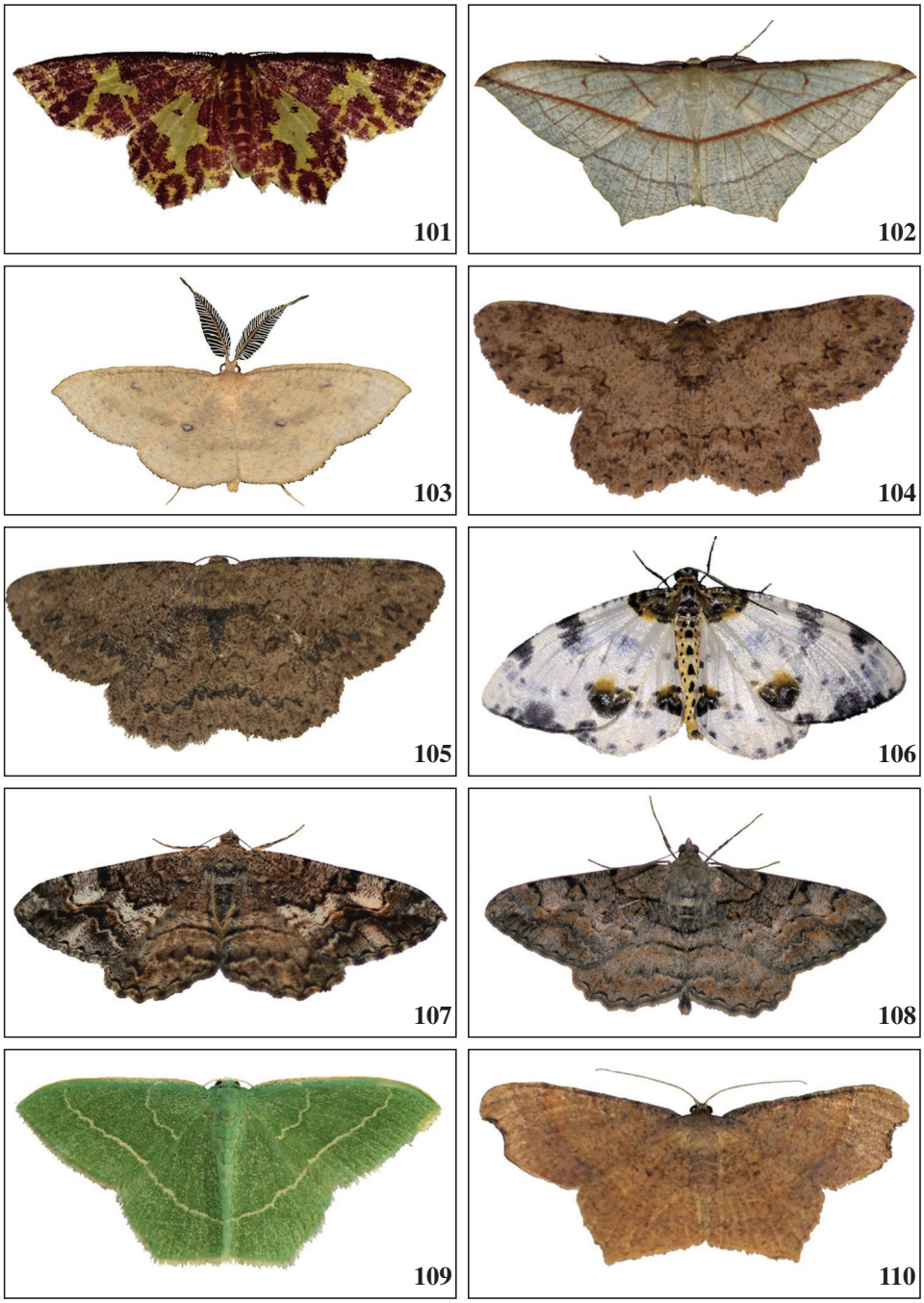

PLATE 12


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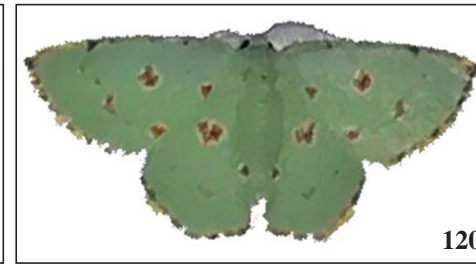
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PLATE 13

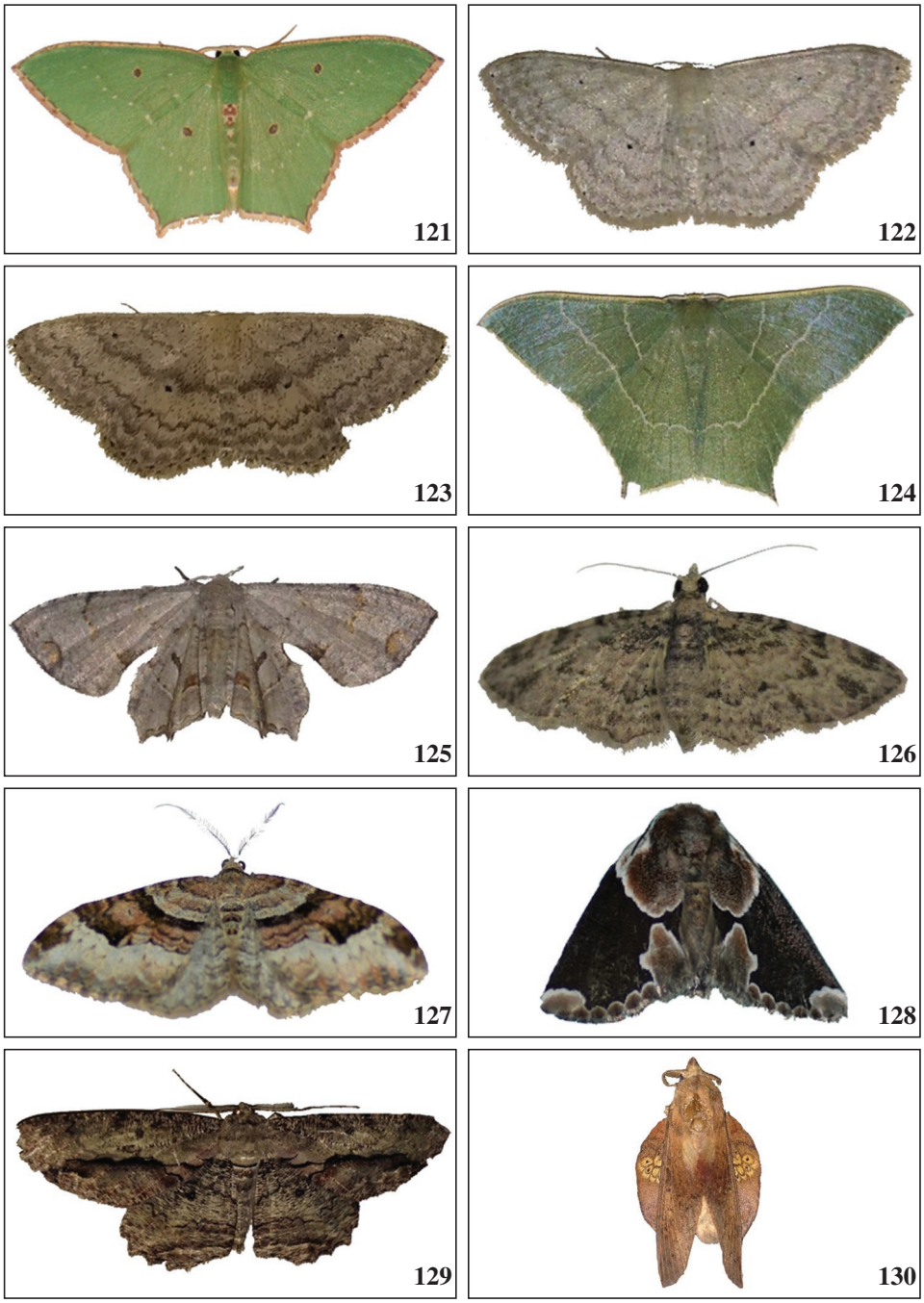

PLATE 14


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PLATE 15


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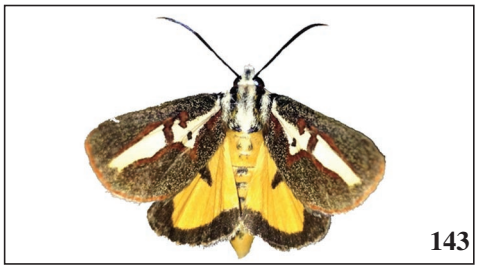
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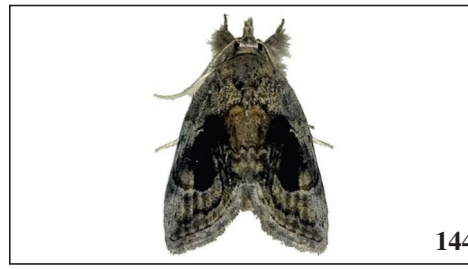
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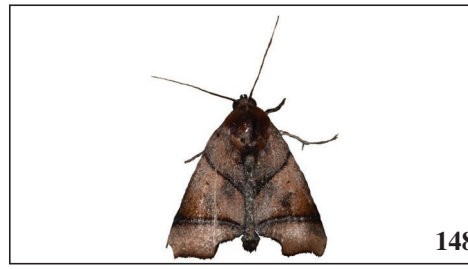
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PLATE 16


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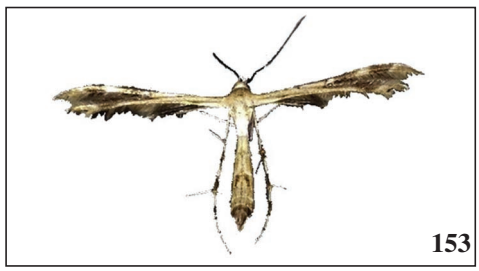
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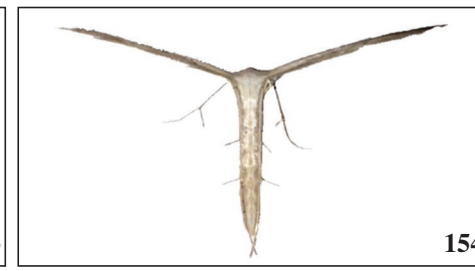
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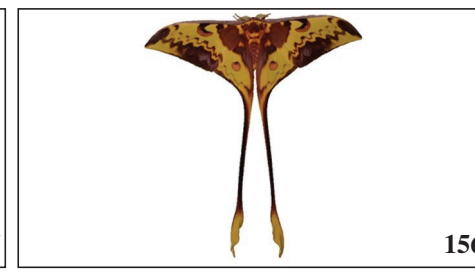
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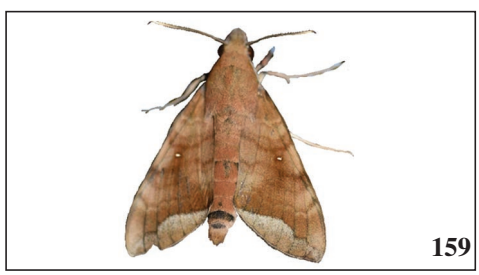
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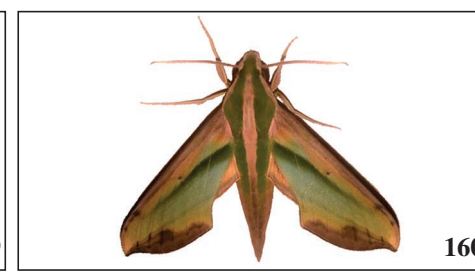
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PLATE 17


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New species of the Genus *Mirocossus* Schoorl, 1990 from Republic of Equatorial Guinea (Lepidoptera: Cossidae, Cossinae)

R. V. Yakovlev

Abstract

The article describes *Mirocossus chukovskyi* Yakovlev, sp. n. (Lepidoptera, Cossidae: Cossinae), distributed in the Bioko Island (Republic of Equatorial Guinea). The article discusses the endemism in the Mount Cameroon and Bioko montane forests Ecoregion; we suggest a significant difference in the entomofauna of the insular and continental portions of the ecoregion. The article has two illustrations.
KEY WORDS: Lepidoptera, Cossidae, Cossinae, biodiversity, species richness, taxonomy, new species, Equatorial Guinea.

Nueva especie del género *Mirocossus* Schoorl, 1990 de la República de Guinea Ecuatorial (Lepidoptera: Cossidae, Cossinae)

Resumen

El artículo describe a *Mirocossus chukovskyi* Yakovlev, sp. n. (Lepidoptera, Cossidae: Cossinae), distribuido en la isla de Bioko (República de Guinea Ecuatorial). El artículo discute el endemismo en la ecorregión de los bosques montanos del Monte Camerún y Bioko; se sugiere una diferencia significativa en la entomofauna de las porciones insulares y continentales de la ecorregión. El artículo tiene dos ilustraciones.
PALABRAS CLAVE: Lepidoptera, Cossidae, Cossinae, biodiversidad, riqueza de especies, taxonomía, nueva especie, Guinea Ecuatorial.

Introduction

The genus *Mirocossus* Schroorl, 1990 (Lepidoptera, Cossidae: Cossinae) was established for *Brachylia badiala* Fletcher, 1968 (by original designation and monotype) (type locality: [UGANDA], Ruwenzori Range, Mahoma River) (FLETCHER, 1968). Currently, according to the database of Afromoths (DE PRINS & DE PRINS, 2022) the genus has 10 registered species distributed in all the northern and Equatorial Afrotropical region (YAKOVLEV, 2011; YAKOVLEV & LENZ, 2013; YAKOVLEV & MURPHEY, 2013; YAKOVLEV & WITT, 2019) One species is known from the south of the Arabian Peninsula (YAKOVLEV, 2019). Thus, the genus *Mirocossus* is one of the few Cossidae genera, distributed in the south and south-west of the Arabian Peninsula and also widely spread in the Afro-tropics (YAKOVLEV & DUBATOLOV, 2013a, b). These genera include *Afrikanetz* Yakovlev, 2009 (type species - *Afrikanetz inkubu* Yakovlev, 2009), *Brachylia* Felder, 1874 (type species - *Brachylia terebroides* Felder, 1874), *Camellocossus* Yakovlev, 2009 (type species - *Cossus abyssinica* Hampson, 1910), *Aethalopteryx* Schoorl, 1990 (type species - *Phragmatoecia atrireta* Hampson, 1910),

Afroarabiella Yakovlev, 2008 (type species - *Cossus tahamae* Wiltshire, 1949), and *Meharia* Chrétien, 1915 (type species - *Meharia incurvariella* Chrétien, 1915). Their distribution is described in detail in a series of publications (WILTSHIRE, 1990; YAKOVLEV *et al.*, 2013; YAKOVLEV, 2014, 2019; HACKER, 2016).

Examining the materials in Natural History Museum, London (NHMUK) I found a new species of the genus *Mirocossus* Felder, 1874 from the Bioko Island (Republic of Equatorial Guinea), its description is given in this article.

Material and methods

The male genitalia were mounted in Euparal on slides following LAFONTAINE & MIKKOLA (1987). The slides were photographed using an Olympus DP74 camera attached to an Olympus SZX16 stereomicroscope at the Altai State University. The type material is deposited in the NHMUK. The images were processed using Corel Photo-Paint 2017 software.

Taxonomical part

Description of new species

***Mirocossus chukovskyi* Yakovlev sp. n.** (Figs 1-2)

Material Holotype (Fig. 1) 1 (&&), Fernando Póo, W. Cooper. BM 1926-337. Individual number NHMUK: 012832476, slide NHMUK: 010315507 (NHMUK).

Description: Male. Length of fore wing 15 mm. Antenna bipectinate, setae processes three times longer than antenna rod diameter. Fore wing apically acute, light brown at root, transverse dark-brown strokes on border between discal and postdiscal areas, wide light-grey portion postdiscally and submarginally, with thin grey wavy bands on light background. Hind wing brown with poorly noticeable transverse dark-brown strokes.

Male genitalia (Fig. 2): Uncus triangular, thin, apically strongly sclerotized; gnathos arms short, thick; gnathos large, covered with tiny spikes; valve wide, apically slightly narrowing, with toothed comb on costal margin of valve in distal third, apex membranous, semicircular (membranous part about 1/6 of valve in length); transtilla process hook-like, long, apically acute; juxta large with wide lobe-like lateral processes, diverged at blunt angle; saccus robust, semicircular; phallus equal to valve in length, thick, slightly curved in medium third, vesica aperture in dorso-apical position, in length about 1/3 of phallus, vesica without cornuti.

Female unknown.

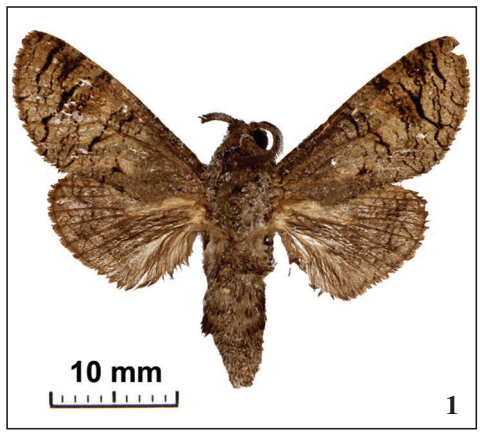
Diagnosis: Externally, the new species is most close to *M. haritonovi* Yakovlev, 2011 (type locality - Uganda, Fort Portal) and *M. mordkovitchi* Yakovlev, 2011 (type locality - "Ost Nigeria, Obudu Kattle Ranch") from which it differs in a series of characters: - in *M. haritonovi* Yakovlev, 2011 (YAKOVLEV, 2011: fig. 12) the valve is significantly more narrower, the comb on the costal margin of the valve is more expressed, the phallus is poorly extended apically; - in *M. mordkovitchi* Yakovlev, 2011 (YAKOVLEV, 2011: fig. 15) the saccus is slightly smaller, the phallus is slightly longer than valve.

Distribution: Equatorial Guinea (Bioko Island).

Etymology: The new species is named after the famous Russian children's poet, essayist, literary critic, and translator Korney I. Chukovsky (1882-1969). In one of his most popular children's poems, "Doktor Aybolit [Dr. Ouch, [it] hurts!]" there are lines "We live in Zanzibar, In the Kalahari and the Sahara, On Mount Fernando Po, Where Hippo Po walks Along the wide Limpopo", reading which for the first time, the author of the article (at the age of five) became interested in the geography and nature of Africa, to the study of which he later devoted his life.

Discussion: The new species is an endemic of the Mount Cameroon and Bioko montane forests

Ecoregion. In the recent years, the new species *Gumilevia timora* Yakovlev, 2011 was described from Bioko Island, and the new genus and species *Geraldocossus durrelli* Yakovlev & Sáfián, 2016 - from Mount Cameroon (YAKOVLEV, 2011; YAKOVLEV & SÁFIÁN, 2016). Currently, the lepidopteran biodiversity of this ecoregion is being actively studied, numerous new taxa have been described (HERBULOT, 1999; PRZYBYŁOWICZ, 2013; SÁFIÁN & TROPEK, 2016; PRZYBYŁOWICZ *et al*., 2019; SÁFIÁN *et al*., 2019; PARK & KARISH, 2021), for certain groups, the faunal lists have been published (SPEARMAN *et al*., 2000; KARISCH, 2001). It is extremely interesting that the center of species diversity of the family Alucitidae was found on Cameroon Mount (USTJUZHANIN *et al*., 2018, 2020), where our colleagues discovered over a quarter of Alucitidae species richness in Africa, wherein 16 (!) species of 22 are endemics. All the species were traditionally described in the genus *Alucita* Linnaeus, 1758 (type species: *Alucita hexadactyla* Linnaeus, 1758), but it is obvious that the species *A. longipenis* Ustjuzhanin & Kovtunovich, 2018 with its extremely long worm-like aedeagus, *A. bokwango* Ustjuzhanin & Kovtunovich, 2020 with its long acicular uncus and the clavately extended apices of the valves; *A. ludmila* Ustjuzhanin & Kovtunovich, 2018 with pronounced pubescence, the special pattern on the wings and the triangular valves, and the group of species with completely reduced valves (*A. fokami* Ustjuzhanin & Kovtunovich, 2018, *A. janeceki* Ustjuzhanin & Kovtunovich, 2018, *A. zuza* Ustjuzhanin & Kovtunovich, 2020, *A. deja* Ustjuzhanin & Kovtunovich, 2020) sharply differ morphologically from the typical European and Asian *Alucita*, Probably, they represent the genera new to science, also endemic for Mount Cameroon. Wherein, no endemic species of Alucitidae are known from Bioko. Thus, we now know significant differences in the fauna of Lepidoptera on the continental and insular parts of the Mount Cameroon and Bioko montane forests Ecoregion. Further study of the entomofauna (primarily, of the endemic taxa) of this richest region will raise the question of dividing the ecoregion into two parts: continental and insular.



Figures 1-2.– 1. *Mirocossus chukovskyi* Yakovlev sp. n. - holotype, adult male, Cote d'Ivoire, Marahoué Region, individual number NHMUK: 012832476 (NHMUK). **2**. *Mirocossus chukovskyi* Yakovlev sp. n. - holotype, male genitalia (slide NHMUK: 010315507).

Acknowledgments

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NOTICIAS GENERALES / *GENERAL NEWS*

SHILAP REVISTA DE LEPIDOPTEROLOGÍA* EN LOS ÍNDICES DE IMPACTO INTERNACIONALES 2021 / SHILAP REVISTA DE LEPIDOPTEROLOGIA *IN THE INTERNATIONAL IMPACT INDEXES 2021*.–** Según SCOPUS en su Índice SJR 2021 de *SCImago Journal Rank*, aparecemos con un **Indicador SJR: 0,262** FI, **Índice H: 13**, **Categoría: Ciencia Animal y Zoología: 334/416 (Q3), Ecología, Evolución, Comportamiento y Sistemática: 549/647 (Q3), Ciencia de los Insectos: 130/153 (Q3)**. Según CLARIVATE ANALYTICS en su Índice JCR 2021 de *Journal Citation Reports*, aparecemos con un **Índice de Impacto: 0,313, Categoría: 97/100 (Q4, Entomología)**, el **Influencia del artículo: 0,053**, el **Índice de inmediatez: 0,111**, el **Eigenfactor: 0,00016** y la **Categoría Eigenfactor: Ecología y Evolución. /** *According to SCOPUS in their Index SJR 2021 of* SCImago Journal Rank*, we appear with a* ***SJR Indicator: 0,262 *FI,* ***H Index: 13****,* ***Rank: Animal Science and Zoology 334/416 (Q3), Ecology, Evolution, Behavior and Systematic: 549/647 (Q3), Insect Science****:* ***130/153 (Q3)****. According to CLARIVATE ANALYTICS in their Index JCR 2021 of* Journal Citation Reports, *we appear with an* ***Impact Index: 0,313****,* ***Rank: 97/100 (Q4, Entomology)****,the* ***Article influence: 0,053****, the* ***Inmediacy Index: 0,111****, the* ***Eigenfactor: 0,00016****, and the* ***Eigenfactor Category: Ecology and Evolution*****.– DETALLES /** ***DETAILS*****:** SHILAP; Apartado de correos, 331; E-28010 Madrid; ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

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Notes on the identity of *Phalaena Attacus cassandra* Cramer, [1779] (Lepidoptera: Saturniidae, Arsenurinae)

V. O. Becker

Abstract

The identity of *Phalaena Attacus cassandra* Cramer, [1779] is established, based on a female reared from a caterpillar that matched the description and illustration by STOLL (1790), raising the following questions: Are *Attacus armida* and *Attacus cassandra* really the same species, or two different species, as supposed by CRAMER (1771 [1779]), when described the adults, and Stoll, when he described the caterpillars? If they are the same, are the caterpillars polymorphic? Illustrations of the larvae and adult provide evidence that support these questions.
KEY WORDS: Lepidoptera, Saturniidae, Arsenurinae, *Arsenura*, synonymy, immatures, fodd plants, distribution, Neotropical.

La identidad de *Phalaena Attacus cassandra* Cramer, [1779] (Lepidoptera: Saturniidae, Arsenurinae)

Resumen

La identidad de *Phalaena Attacus cassandra* Cramer, [1779] se establece en base de una hembra criada de una oruga idéntica a la de la descripción e ilustraciones presentadas por STOLL (1790), levantando las siguientes cuestiones: ¿son *Attacus armida* y *Attacus cassandra* realmente la misma especie, o son dos especies distintas, como supuso CRAMER (1771 [1779]) al describir los adultos y Stoll al describir las orugas? si acaso son la misma ¿son las orugas polimórficas? Se presentan ilustraciones de las orugas y de los adultos que ofrecen las evidencias que soportan estas cuestiones.
PALABRAS CLAVE: Lepidoptera, Saturniidae, Arsenurinae, *Arsenura*, sinonimia, orugas, plantas nutricias, distribución, Neotropical.

Introduction

CRAMER (1772 [1779]: 6-7, pl. 197, figs A, B), described two similar species of Saturniidae, from Surinam, based on specimens presumably reared from distinct caterpillars, described by STOLL (1790: 93-94, pl. 19, figs 1 A, B; 2 C, D): *Phalaena Attacus armida,* based on a male reared from a black caterpillar, and *Phalaena Attacus cassandra,* based on a female reared from a yellow caterpillar.

FABRICIUS (1781: 169), before the publication of Stoll's work, assuming that both names were junior homonyms, proposed *Bombyx erythrinae* Fabricius, 1781 as a replacement name, inspired by the illustrations and description by MERIAN (1705: pl. 11), who stated that the species was reared on *Erythrina fusca* (BECKER & STEARN, 1982:178), regarding *Phalaena Attacus cassandra* as a junior synonym of *Phalaena Attacus armida,* a synonymy accepted by all subsequent authors (BOUVIER (1931: 231), LEMAIRE (1976: 219, 1980: 26, 1996: 28), TRAVASSOS & NORONHA (1970: 107),

except for DRAUDT (1930: 792) and SCHLÜSSER (1936: 15), who regarded *Arsenura cassandra* as a good species, and *A. erythrinae* as a form of *A. armida*. A female, reared by the author, from a caterpillar that matches the description and illustration of *Phalaena Attacus cassandra,* raises doubts about this synonymy, as seen below.

Abbreviations

CPAC Centro de Pesquisa Agropecuária dos Cerrados, Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), Planaltina, DF, Brazil
USNM National Museum of Natural History, Washingotn, DC

Results

A female (CPAC 5580) (Fig. 2) reared by the author from a yellow caterpillar matching exactly the description and illustrations by STOLL (1791: 93, pl. 19, figs 2 C, 2 D), brings new evidence that *Arsenura cassandra* and *A. armida* might be distinct species.

Immatures (Figs 3-6): The larvae of *A. armida* (Figs 3-4) are banded black and yellow, or entirely black as given by STOLL (1791: pl. 19, figs 1, 1 A), presumably an extremely melanic form, or a larva with the body retracted hiding, almost totally, the yellow bands, with head, abdominal legs and last abdominal segment, red, whereas that of *A. cassandra* (Figs 5-6) are bright yellow with small dots and short, thin black lines scattered along the body, and with head, abdominal legs, and last segment of abdomen red, as in the former. The illustrations and description of the larvae by MERIAN (1705: 11), reproduced here (Fig. 7): "it is yellow with black stripes…", clearly indicates that the species belongs to *A. cassandra* (Cramer). These differences seems consistent throghout their development, as illustrated by Stoll. The proportion of black and yellow, of *A. armida* varies (as shown by the many images available on the internet), from almost totally black to nearly all yellow, banded with thin black rings.

Food plants: The caterpillars of *Arsenura* spp. are commonly found feeding on several species of Malvaceae [currently including the species formerly included in the Bombacaceae, Sterculiaceae and Tiliaceae), such as *Bombax, Guazuma, Luhea, Theobroma,* etc., but also on plants of other families, like Annonaceae (*Annona, Rollinia,* etc.) (SILVA *et al.,* 1968). No record for *A. cassandra* food plant was found in the literature. The larva studied here was found feeding of the leaves of *Guazuma ulmiflolia* Lam. (Malvaceae), at Planatlina, close to Brasília, DF, Brazil. *Erithrina fusca* Lour., as the food plant, mentioned by MERIAN (1705), is probably a mistake as neither *A. cassandra*, nor *A. armida* have been reared on Fabaceae. Such confusions occur throughout Merian's work. As Merian painted the illustrations separately, on individual pieces of paper, she either had lost her notes or had their associations wrong, mixing them up when, back in Holland, she assembled the plates. For these reason her work had been strongly criticized by early authors, as mentioned by STEARN (1982: 82): "Thus from these critical surveys of Merian's work by Guilding and Burmeister it was evident indeed that the larvae, pupae and perfect insects she portrayed together on a single plate were not necessarily connected with one another or with the associated plant. This does not mean that her work lacks scientific value."

Distribution: *Arsenua armida* is widely distributed throughout South America, from Colombia to Bolivia (LEMAIRE, 1980: 26, fig. 8).

Remarks: As the type material of both *Phalaena Attacus armida* and *P. A. cassandra* are lost, LEMAIRE (1980: 26) designated as neotypes a couple of specimens from Surinam, the type locality of both species. The female (Fig. 2), reared from a yellow caterpillar that matched exactly the description of the female of *A. cassandra* by Cramer (Fig. 1) and of the caterpillars by Stoll (Figs 5, 6) matches the description and illustrations of the female of *A. armida,* as described and illustrated by LEMAIRE (1980: pl. 1, fig. 2; pl. 2, fig. 2; pl. 4, fig. 2). This evidence: a distinct caterpillar, originally described as *P. A. cassandra*, resulting in a female that matches the females of *P. A. armida,* as

currently accepted, raises doubts about the status of the two names. Do they really represent the same species, or they are distinct species? If, distinct species, which name should be applied to what is currently considered *A. armida*? *Arsenura armida* is the most common of the species of the genus, and it's conspicuous, gregarious caterpillars are frequently found during day time on the trunk of the host plants (what is indicated by the many pictures posted in the internet). At night they move up to the canopy to feed. On the contrary, the caterpillars *A. cassandra* seems to be less common (a search in the internet and literature gave no results). It seems that some indigenous people regard the caterpillars of the former a delicacy. During a collecting trip to the Amazonian side of Ecuador, at the Misahualli lodge, it was observed a couple of native girls, very excited, shouting something like "tipuli culi, tipuli culi", picking the caterpillar they spotted on the trunk of a tree, that they took home ("very delicious", according to one of them). The natives of Mexico and Guatemala also regard the caterpillars, that they call "cholote", "cuecla", "zat", etc., as a delicacy (LANDERO-TORRES *et al.,* 2012).

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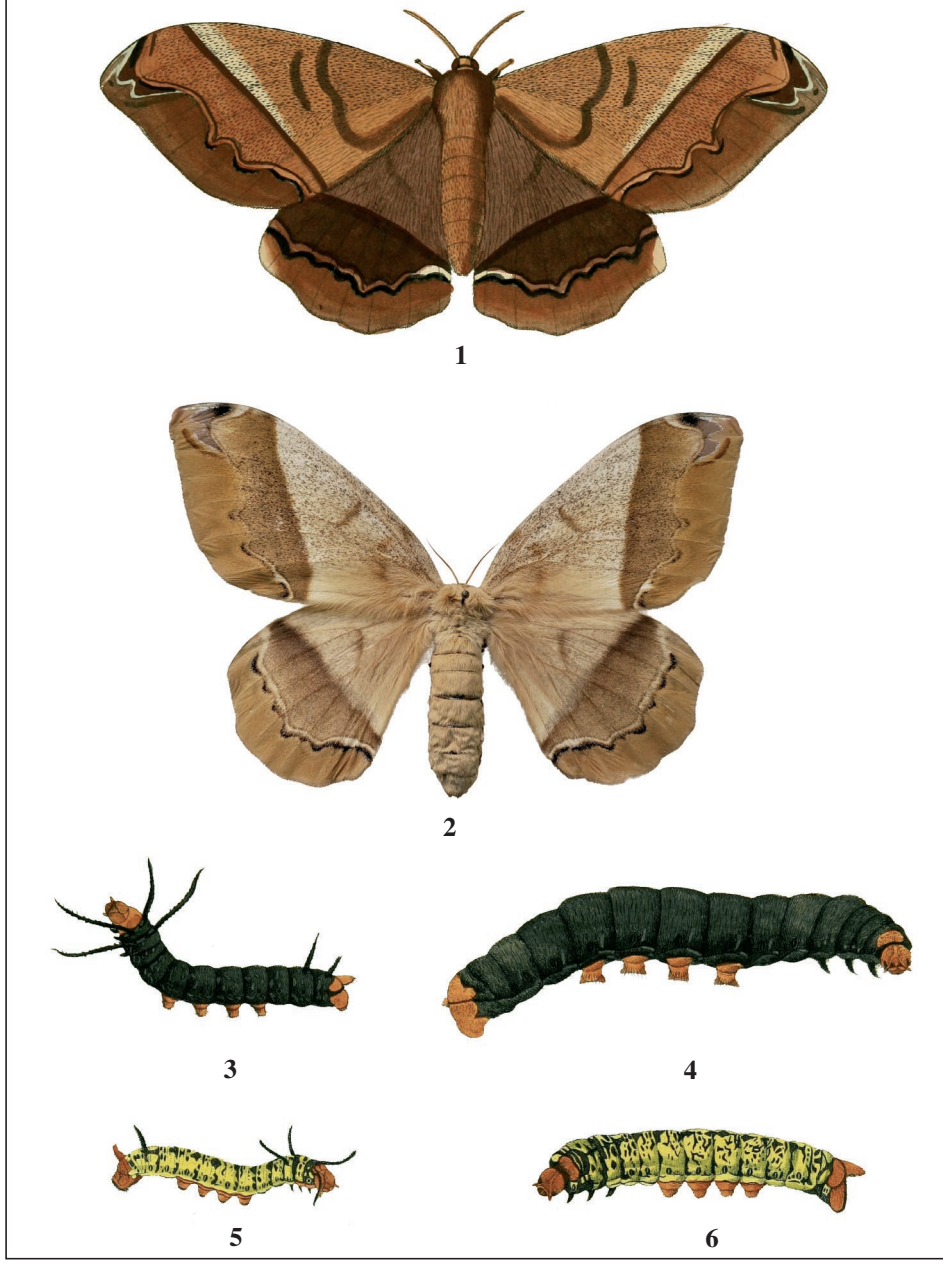

Figs 1-6.– *Arsenura cassandra* and *A. armida.* **1.** *A. cassandra,* female, Surinam (from Cramer, 1779, pl. 197 B). **2.** *A. cassandra,* female, reared from a larva collected in the DF, Brazil. **3-4.** *A. armida,* caterpillars (from Stoll, [1790], pl. 19 1A, B). **5-6.** *A. cassandra,* caterpillars (from Stoll, [1790], pl. 19 2 C, 2 D).

Fig. 7.– Merian's 1705: pl.11.

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Zygaena (*Zygaena*) *nevadensis gerrysila* **Efetov & Tarmann, a new subspecies from Calabria, Italy (Lepidoptera: Zygaenidae, Zygaeninae)**

K. A. Efetov & G. M. Tarmann

Abstract

A new subspecies, *Zygaena* (*Zygaena*) *nevadensis gerrysila* Efetov & Tarmann, subsp. n. is described from southern Italy (Calabria, La Sila).
KEY WORDS: Lepidoptera, Zygaenidae, Zygaeninae, *Zygaena*, *Z. nevadensis gerrysila*, new subspecies, La Sila, Calabria, Italy.

Zygaena (*Zygaena*) *nevadensis gerrysila* **Efetov & Tarmann, una nueva subespecie de Calabria, Italia (Lepidoptera: Zygaenidae, Zygaeninae)**

Resumen

Se describe una nueva subespecie *Zygaena* (*Zygaena*) *nevadensis gerrysila* Efetov & Tarmann, subsp. n. del sur de Italia (Calabria, La Sila).
PALABRAS CLAVE: Lepidoptera, Zygaenidae, Zygaeninae, *Zygaena*, *Z. nevadensis gerrysila*, nueva subespecie, La Sila, Calabria, Italia.

Introduction

This article is a continuation of a series of authors' publications devoted to the Zygaenidae of the Palaearctic and adjacent territories (CAN *et al*., 2019; CAN CENGIZ *et al*., 2018; EFETOV, 1996a, 1996b, 1997a, 1997b, 1998, 1999, 2001a, 2001b, 2006, 2010, 2018; EFETOV *et al*., 2004, 2006, 2011, 2014a, 2014b, 2014c, 2015a, 2015b, 2016, 2018, 2019a, 2019b; EFETOV & HAYASHI, 2008; EFETOV & KNYAZEV, 2014; EFETOV & SAVCHUK, 2009, 2013; EFETOV & TARMANN, 1999, 2013a, 2013b, 2014a, 2014b, 2016a, 2016b, 2017a, 2017b; KNYAZEV *et al*., 2015; RAZOV *et al*., 2012; SUBCHEV *et al*., 2016; VRENOZI *et al*., 2019).

Zygaena nevadensis Rambur, 1858, is the only *Zygaena* species that is distributed from North Africa (Morocco) throughout southern Europe as far as the Northern Caucasus. It has a disjunct distribution with several local populations. Its currently known range is Morocco, Portugal, Spain, south-eastern France, southern Italy, Serbia, Albania, Macedonia, Greece, Bulgaria, Romania, Turkey and the Northern Caucasus in Russia (EFETOV *et al*., 2011; EFETOV & SHCHUROV, 2007; COUTSIS *et al*., 2014; HOFMANN & TREMEWAN, 1996, 2017, 2020; MICEVSKI *et al*., 2018; NAHIRNIĆ & BESHKOV, 2018). This species was unknown from Italy until 2010. The old record of *Z. nevadensis* by ROCCI (1918: 144) from the outskirts of Genova at Quezzi has to be referred to *Z. romeo* Duponchel, 1835 (RACHELI, 1990: 42). BERTACCINI & FIUMI (1999) also included *Z. nevadensis* in their book on the bombycids and sphingids of Italy because they considered that

isolated locations for the species in Piemonte were possible. FREINA & WITT (2001) cite "Piemonte" for the species, but do not provide any provenance for this record. The careful examination of Witt's collection in Munich failed to prove that he had a specimen from Piemonte.

During our field work in Calabria in June 2010 K. A. Efetov, G. M. Tarmann and W. G. Tremewan collected two males of *Z. nevadensis* in the Sila Mountains (EFETOV *et al*., 2011). In 2011 further attempts by the same entomologists did not lead to any more successful results. However, in 2005, the Austrian neuropterologists H. and R. Rausch had already collected a single male by sweeping the vegetation also in La Sila but in another locality. This specimen was donated to Tiroler Landesmuseen, Ferdinandeum in Innsbruck and was determined in 2013 by G. M. Tarmann. In 2014, G. M. Tarmann and W. G. Tremewan revisited La Sila and found 8 additional males and 2 females in the locality discovered by H. and R. Rausch. With this series it became clear that this population represents an undescribed subspecies. In 2018 G. M. and M. Tarmann together with S. Scalercio and S. Greco collected three additional males and one female.

On the base of the above mentioned available material we describe here a new subspecies *Z. nevadensis gerrysila* Efetov & Tarmann, subsp. n.

Variability within the populations of *Zygaena nevadensis* is low and division into subspecies is often only supported by the isolation of the well-separated population groups that form slightly larger or smaller specimens with more or less fragmented streaks on the wings and a variable breadth of the hindwing margin. In this species there is no indication that its nowadays isolated populations that are spread over a territory from North Africa to the Caucasus (Fig. 8) have mixed with each other or with former relic populations during their migration into their present habitats in near history (see also HOFMANN & TREMEWAN, 2017).

***Zygaena* (*Zygaena*) *nevadensis gerrysila* Efetov & Tarmann, subsp. n.** (Figs 1, 2)

Material: Holotype ♂ (Fig. 1): ITALY, Calabria, Cosenza, La Sila Graeca, La Fossiata, 1315 m, 1-VI-2018; leg. G. M. & M. Tarmann, S. Scalercio & S. Greco (Coll. Sammlungs- und Forschungszentrum der Tiroler Landesmuseen, Ferdinandeum, Hall in Tirol, Austria). Paratypes 13 ♂♂ (Fig. 2), 3 ♀♀: ITALY, Calabria, Cosenza, La Sila Graeca, La Fossiata, 1315 m, 1-VI-2018, 2 ♂♂, 1 ♀, leg. G. M. & M. Tarmann, S. Scalercio & S. Greco, coll. Sammlungs- und Forschungszentrum der Tiroler Landesmuseen, Ferdinandeum, Hall in Tirol, Austria; Italy, Calabria, Cosenza, La Sila Graeca, La Fossiata, 2 km E, 1310-1360 m, 17-VI-2005, 1 ♂, leg. H. & R. Rausch, coll. Sammlungs- und Forschungszentrum der Tiroler Landesmuseen, Ferdinandeum, Hall in Tirol, Austria; Italy, Calabria, Cosenza, La Sila Graeca, La Fossiata, 2 km E, 1310-1360 m, 16-VI-2014, 3 ♂♂, leg. G. M. Tarmann & W. G. Tremewan, coll. Staatliches Museum für Naturkunde Stuttgart; Italy, Calabria, Cosenza, La Sila Graeca, La Fossiata, 2 km E, 1310-1360 m, 15-VI-2014, 2 ♀♀, leg. G. M. Tarmann & W. G. Tremwan, coll. Staatliches Museum für Naturkunde Stuttgart; Italy, Calabria, Cosenza, La Sila Graeca, La Fossiata, 2 km E, 1310-1360 m, 16-VI-2014, 4 ♂♂, leg. G. M. Tarmann & W. G. Tremewan, coll. Sammlungs- und Forschungszentrum der Tiroler Landesmuseen, Ferdinandeum, Hall in Tirol, Austria; Italy, Calabria, Cosenza, La Sila Graeca, La Fossiata, 2 km E, 1310-1360 m, 17-VI-2014, 1 ♂, leg. G. M. Tarmann, W. G. Tremewan & P. Brandmayr, coll. Sammlungs- und Forschungszentrum der Tiroler Landesmuseen, Ferdinandeum, Hall in Tirol, Austria; Italy, Calabria, Cosenza, Sorgente del Saluto, 3 km E Spineto, Lago Ampollino W, 1370-1390 m, 14-VI-2010, 1 ♂, leg. G. M. Tarmann, coll. Sammlungs- und Forschungszentrum der Tiroler Landesmuseen, Ferdinandeum, Hall in Tirol, Austria; Italy, Calabria, Cosenza, Sorgente del Saluto, 3 km E Spineto, Lago Ampollino W, 1370-1390 m, 14-VI-2010, 1 ♂, leg. K. A. Efetov, coll. K. A. Efetov, Crimean Federal University, Simferopol, Russia.

The holotype and the paratypes have been supplied with printed pin-labels on red paper: "HOLOTYPUS [or PARATYPUS] male [or female] *Zygaena nevadensis gerrysila* Efetov & Tarmann, 2022."

Description: Habitus of male and female similar. Length of body: male 9.1-9.2 mm, female 8.8 mm; length of forewing: male 9.2-10.0 mm, female 10.1 mm; breadth: male 3.1-3.2 mm, female

3.0 mm; length of hindwing: male 6.1-6.2 mm, female 7.2 mm; breadth: male 3.1-3.2 mm, female 3.1 mm; length of antenna: male 4.9-5.3 mm, female 6.0 mm. Head, thorax and abdomen black, covered with hair-like scales. Forewing black with three streaks, streak 3+5 narrower in the central part and can be even divided into separate spots 3 and 5. Hindwings red, with black margin, broader near apex.

Differential diagnosis: From the nominotypical subspecies *Z. nevadensis gerrysila* differs by its smaller size and darker, but more translucent black parts of the forewing. The dark margin of the hindwing is approximately as broad as in the nominotypical subspecies of central and southern Spain. The red colour of the forewing spots and the hindwing is darker than in *Z. nevadensis nevadensis* (Fig. 3). From all other subspecies (Figs 4-6) *Z. nevadensis gerrysila* differs especially in its smaller size and translucent appearance.

This subspecies is completely isolated on La Sila in southern Italy. The nearest population is *Z. nevadensis pelisterensis* Reiss, 1976, on the other side of the Ionian Sea on the Balkan Peninsula. Specimens of *Z. nevadensis pelisterensis* are significantly larger than those of *Z. nevadensis gerrysila*. This applies also for the nearest populations in the North in southern France, viz. *Z. nevadensis interrupta* Boursin, 1923, and *Z. nevadensis gallica* Oberthür, 1898.

Bionomics: Flight of imagines in June. Males fly very low over the ground and are difficult to spot. They rest low in the vegetation, mainly on grass. Females were found flying around various Fabaceae, but no oviposition could be observed. It seems clear that the larval host-plant is one of the Fabaceae species occurring in the habitats of this species, e. g. *Lathyrus* sp. or *Vicia* sp. (EFETOV *et. al*., 2011). The habitats are flowery and grassy areas on moist ground (Fig. 7).

Etymology: After the death of our friend Dr Gerald (Gerry) W. Tremewan in 2016 who wanted to be a co-author of this taxon we decided to name it in his memory. The word "gerrysila" consists of two parts: the name of our friend (Gerry) who collected a part of the type series in his 83rd year of life, and the name of the mountain La Sila. Moreover, the word "sila" in Russian language means "strength", so "gerrysila" can be translated also as "strength of Gerry".

Distribution: As far as is known *Z. nevadensis gerrysila* is endemic to La Sila in southern Italy (Fig. 8).

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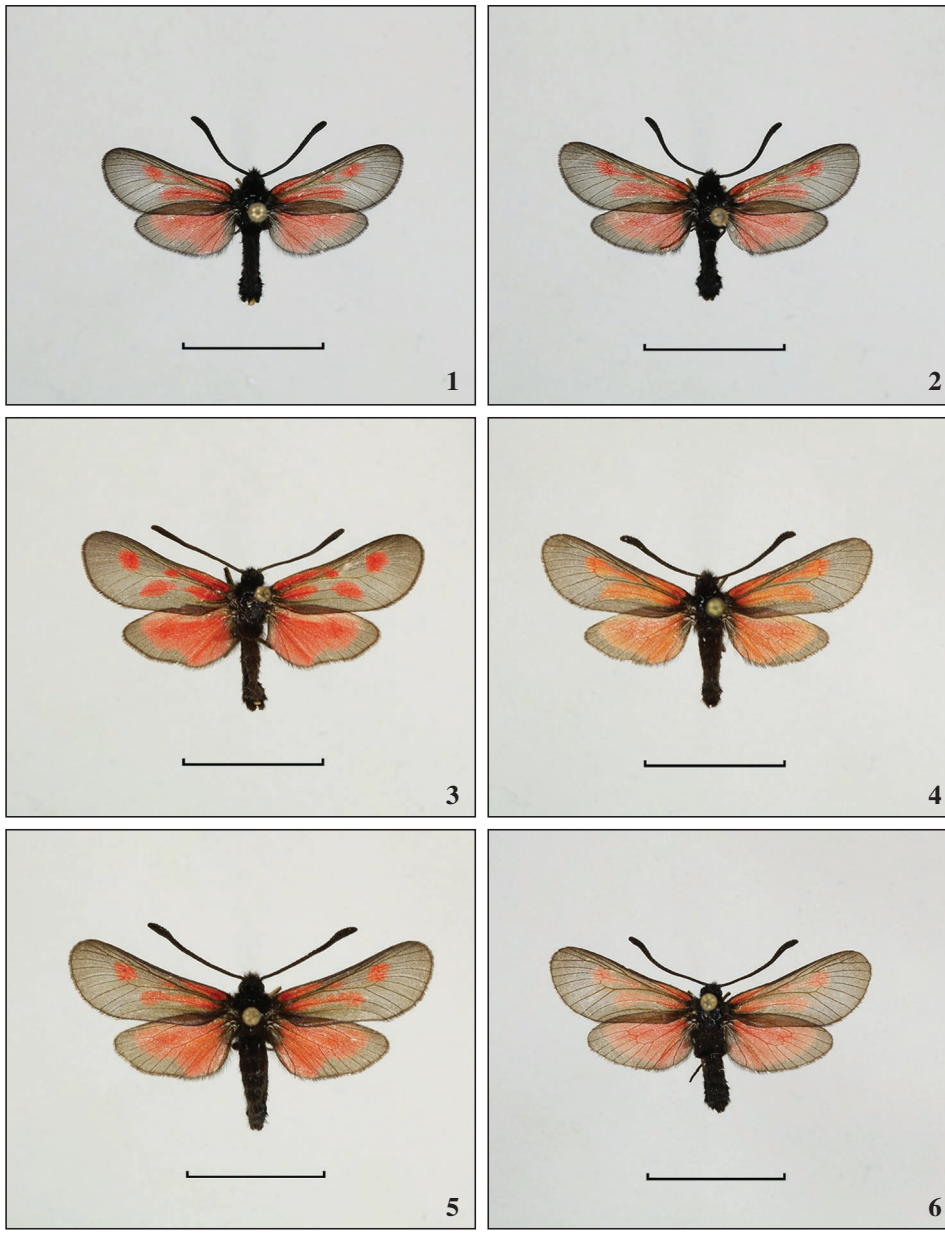
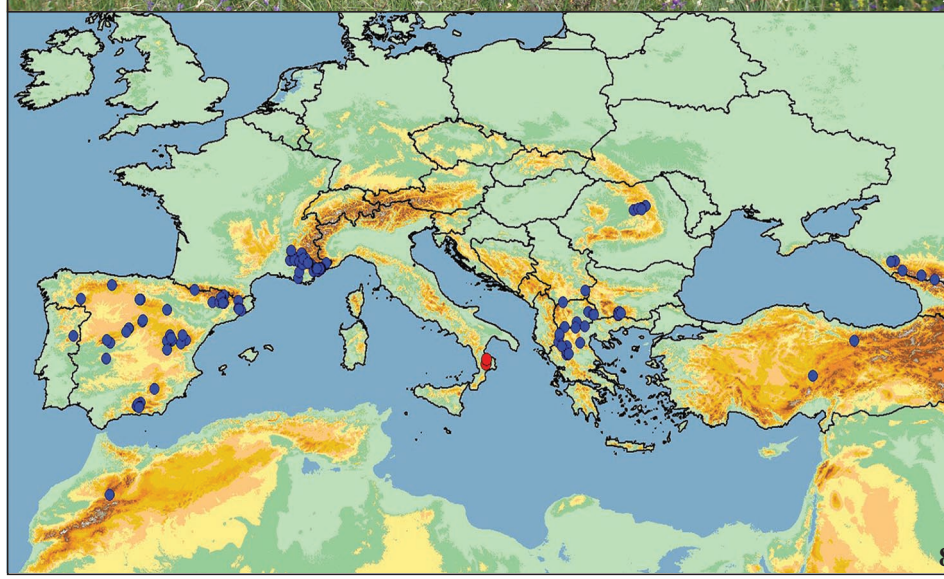


Figures 1-6.– 1-2. *Zygaena nevadensis gerrysila* Efetov & Tarmann, subsp. n. **1.** Holotype male. **2.** Paratype male with the same label data as holotype. **3.** *Zygaena nevadensis nevadensis* Rambur, 1858. Male specimen from southern Spain. **4.** *Zygaena nevadensis gallica* Oberthür, 1898. Male specimen from southern France (Var). **5.** *Zygaena nevadensis interrupta* Boursin, 1923. Male specimen from southern France (Alpes-Maritimes). **6.** *Zygaena nevadensis pelisterensis* Reiss, 1976. Male specimen from northern Greece. Scale - 10 mm.



Figures 7-8.– 7. Dr Silvia Greco and Dr Stefano Scalercio in the type-locality of *Zygaena nevadensis gerrysila* Efetov & Tarmann, subsp. n. (photo G. M. Tarmann, 1-VI-2018). **8.** Distribution map of *Zygaena nevadensis*. Red dots show distribution of *Zygaena nevadensis gerrysila* Efetov & Tarmann, subsp. n.

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New species of the Genus *Afrikanetz* Yakovlev, 2009 from Republic of Côte d'Ivoire (Lepidoptera: Cossidae, Cossinae)

R. V. Yakovlev

Abstract

The article describes *Afrikanetz schouteni* Yakovlev, sp. n., distributed in the Republic of Côte d'Ivoire. The article has two illustrations.
KEY WORDS: Lepidoptera, Cossidae, Cossinae, biodiversity, species richness, taxonomy, new species, Côte d'Ivori.

Nueva especie del género *Afrikanetz* Yakovlev, 2009 de la República de Costa de Marfil (Lepidoptera: Cossidae, Cossinae)

Resumen

El artículo describe *Afrikanetz schouteni* Yakovlev, sp. n., distribuido en la República de Costa de Marfil. El artículo tiene dos ilustraciones.
PALABRAS CLAVE: Lepidoptera, Cossidae, Cossinae, biodiversidad, riqueza de especies, taxonomía, nueva especie, Costa de Marfil.

Introduction

The genus *Afrikanetz* was established by YAKOVLEV (2009: 358) for *Afrikanetz inkubu* Yakovlev, 2009 (by original designation). That article described two more species of this genus (YAKOVLEV, 2009). Later MEY (2017), YAKOVLEV & WITT (2019), and YAKOVLEV (2021) described seven species from different parts of Africa (from Côte d'Ivoire to the Republic of South Africa). One species (*A. makumazan* Yakovlev, 2009) was found in the south-west of Saudi Arabia (Jedda). Thus, the genus *Afrikanetz* is one of the few Cossidae genera, distributed in the south and south-west of the Arabian Peninsula and also widely spread in the Afro-tropics (YAKOVLEV & DUBATOLOV, 2013a, b; YAKOVLEV, 2015). These genera include *Camellocossus* Yakovlev, 2009 (type species - *Cossus abyssinica* Hampson, 1910), *Aethalopteryx* Schoorl, 1990 (type species - *Phragmatoecia atrireta* Hampson, 1910), *Afroarabiella* Yakovlev, 2008 (type species - *Cossus tahamae* Wiltshire, 1949), and *Meharia* Chrétien, 1915 (type species - *Meharia incurvariella* Chrétien, 1915). Their distribution is described in detail in a series of publications (WILTSHIRE 1980a, b, 1982, 1983, 1986, 1990; BORTH *et al.,* 2011; YAKOVLEV *et al.,* 2013; YAKOVLEV, 2014; HACKER, 2016). The representatives of *Meharia* penetrate even deeper into Eurasia (through the Middle East and Central Asia, their habitat reaches the South Volga region) (KOMAROV & ZOLOTUHIN, 2005; ALIPANAH *et al.,* 2021).

Examining the materials in Natural History Museum, London (NHMUK) I found a new species of the genus *Afrikanetz* Yakovlev, 2009 from the Republic of Côte d'Ivoire, its description is given in this article.

Material and methods

The male genitalia were mounted in Euparal on slides following LAFONTAINE & MIKKOLA (1987). The slides were photographed using an Olympus DP74 camera attached to an Olympus SZX16 stereomicroscope at the Altai State University. The type of material is deposited in the NHMUK. The images were processed using Corel Photo-Paint 2017 software.

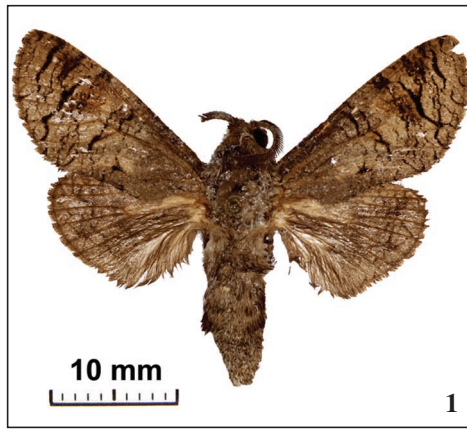
Taxonomical part

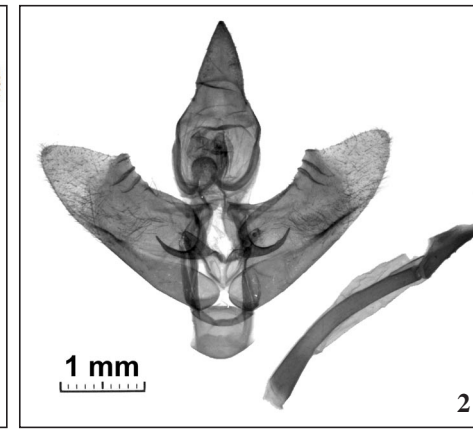
Afrikanetz schouteni **Yakovlev sp. n.** (Figs 1-2)

Material: Holotype 1 ♂ (Fig. 1), "Cote d'Ivoire [Marahoué Region, 230 km northwest of Abidjan], Bouaflé, R.T.A. Schouten & J. R. M. Buijsen"; "Bouïtha [6º40'N, 5º42'W], near Degbézéré, 15 km E Bouaflé, 7-II-1984, at light", individual number NHMUK: 012832473, slide NHMUK: 010315504 (NHMUK).

Description Male: Wingspan 34 mm, length of fore wing 16 mm. Antennae bipectinate, setae long, setae processes 2.5 times longer than antenna rod diameter. Fore wing grey-brown, dark, with thin transverse black wavy bands discally and postdiscally, light-brown portion with blurred margins postdiscally, tiny transverse black strokes throughout all wing area except for root area. Fringe brown unicolorous. Hind wing grey-brown with hardly noticeable black pattern of strokes, fringe brown.

Male genitalia (Fig. 2): Uncus of medium length, shaped as acute triangle; gnathos arms thick, long; gnathos robust, covered with tiny spikes; valve lanceolate, of medium length, membranous in apical third, apex narrow, lanceolate, crest-like process with three transverse strongly sclerotized ribs on costal margin of valve; transtilla process hook-like, acute, of medium length; juxta saddle-like, robust, with two lateral processes, diverged at an angle of 100º; saccus robust, trapezoidal; phallus equal to valve in length, thin, poorly curved along all length, with several small prongs on abdominal surface (in distal third), vesica aperture in dorso-apical position, about 1/3 of phallus in length, vesica without cornuti.





Figures 1-2.– 1. *Afrikanetz schouteni* Yakovlev, sp. n., holotype, adult male, Cote d'Ivoire, Marahoué Region, individual number NHMUK: 012832473 (NHMUK). **2**. *Afrikanetz schouteni* Yakovlev, sp. n., holotype, male genitalia (Slide NHMUK: 010315504).

Female unknown.

Diagnosis: The new species clearly differs in the relatively dark color and in the male genital structure details - the relatively short transtilla processes (Fig. 2). In this feature, the new species is similar to *A. dargei* Yakovlev, 2019 and *A. hoppei* Yakovlev, 2019, from which it differs in a series of characters:

- the lanceolate apex of the valve (in *A. dargei* Yakovlev, 2019 and *A. hoppei* Yakovlev, 2019, the apex of the valve is semicircular).
- the long triangular uncus (in *A. dargei* Yakovlev, 2019 and *A. hoppei* Yakovlev, 2019, the uncus is shorter and has a semicircular apex).
- the series of small prongs on the abdominal margin of the phallus (preapically) (in *A. dargei* Yakovlev, 2019 and *A. hoppei* Yakovlev, 2019 there are one or two prongs).
- the strongly diverged lateral processes of the juxta, at about 100º (in *A. dargei* Yakovlev, 2019 and *A. hoppei* Yakovlev, 2019, the lateral processes of the juxta are diverged at an acute angle).

Distribution: Côte d'Ivoire, Marahoué Region.

Habitat: The information about the habitat conditions of the new species is described in such detail in the excellent article of LEHMANN (2011) that it would be better to quote this paragraph verbatim. "Habitat of type locality: Bouïtha (ca. 6º40'N, 5º42'W; altitude 250 m, average annual rainfall 1350 mm) is a village located ca. 15 km south of Bouaflé, ca. 3 km from the village Degbézéré (south-central Côte d'Ivoire), and ca. 230 km northwest of Abidjan. The area is at a border line between the "Guineo-Congolian regional centre of endemism" and the "Guinea-Congolia/Sudania regional transition zone" sensu WHITE (1983). Bouïtha belongs also to an area where Guinean savanna penetrates the Upper Guinea rain forest zone in a region called "V-Baoulé." Despite this, Bouïtha is surrounded by semi-deciduous forests located in a forest-agricultural land mosaic. Characteristic species of those semi-deciduous forests that represent the northern limit of the forest zone in Côte d'Ivoire are *Aubrevillea kerstingii* (Harms) Pellegr. (Fabaceae) and *Khaya grandifoliola* C. DC. (Meliaceae). The former genus is endemic to the Guineo-Congolian Region, the latter species is an Upper Guinea endemic that represents a link from these semi-deciduous forests to the rain forest block of Upper Guinea. Additional species around Bouïtha include *Diospyros abyssinica* (Hiern) F. White (Ebenaceae), *Ricinodendron heudelotii* (Baill.) Pierre (Euphorbiaeceae), *Chrysophyllum giganteum* A. Chev. (Sapotaceae), *Celtis mildbraedii* Engl. (Cannabaeae), *Triplochiton scleroxylon* K. Schum. and *Nesogordonia papaverifera* (A. Chev.) Capuron (Malvaceae) (KOUAMÉ *et al*., 2004)".

Etymology: The new species is named after Rob Schouten, a well-known Dutch entomologist.

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NOTICIAS GENERALES / *GENERAL NEWS*

REVISORES 2020-2021 / *REFEREES 2020-2021*.– Los siguientes revisores colaboraron en la evaluación de los manuscritos durante el año 2020-2021. Expresamos nuestros más sinceros agradecimientos a estas personas por el tiempo y energía que dedicaron a sus evaluaciones, de las cuales dependen los estándares de calidad y la puntualidad de la revista SHILAP Revista de lepidopterología (SHILAP Revta. lepid.) / *The following referees collaborated on the evaluation of manuscripts during 2020-2021. We express our sincerest thanks to them for the time and energy devoted to their evaluations, since the standards of quality and timeliness of the journal SHILAP Revista de lepidopterologia (SHILAP Revta. lepid.) depend on them*: Dr. Kesran Akin (Turquía / *Turkey*); Prof. Dr. Vasilii V. Anikin (Rusia / *Russia*); Dr. Elias Araujo (Brasil / *Brazil*); Ing. Ernst Arenberger (Austria / *Austria*); Mr. Wilfried Arnscheid (Alemania / *Germany*); Mr. Jan E. F. 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New and interesting records of Lepidoptera in the Ural Mountains (Russia) (Lepidoptera: Papilionoidea, Noctuoidea)

S. A. Rybalkin, R. V. Yakovlev & B. Benedek

Abstract

We report new findings of rare and little studied Macrolepidoptera species of the Ural Mountains. The new localities of the rare species are revealed: *Euchloe ausonia* (Hübner, [1804[), *Boloria aquilonaris* (Stichel, 1908), *Oeneis jutta* (Hübner, [1806]), *Xestia lorezi* (Staudinger, 1891), *X. sincera* (Herrich-Schäffer, 1851), and *Coenophyla subrosea* (Stephens, 1829). For the first time, the following species are reported from the Urals: *Apamea schildei* (Staudinger, 1901), *Coranarta cordigera* (Thunberg, 1778), *Cardepia irrisoria* (Erschoff, 1874), *Polia vesperugo* (Eversmann, 1856), *Hadena corrupta* (Herz, 1898), and *Pseudohermonassa melancholica* (Lederer, 1853).
KEY WORDS: Lepidoptera, Papilionoidea, Noctuoidea, biodiversity, fauna, new records, Ural Mountains, Russia.

Nuevos e interesantes registros de Lepidoptera en los Montes Urales (Rusia) (Lepidoptera: Papilionoidea, Noctuoidea)

Resumen

Informamos de nuevos hallazgos de raras y poco estudiadas especies de Macrolepidoptera de los Montes Urales. Se descubren nuevas localidades de las raras especies: *Euchloe ausonia* (Hübner, [1804]), *Boloria aquilonaris* (Stichel, 1908), *Oeneis jutta* (Hübner, [1806]), *Xestia lorezi* (Staudinger, 1891), *X. sincera* (Herrich-Schäffer, 1851) y *Coenophyla subrosea* (Stephens, 1829). Por primera vez, se informa de las siguientes especies de los Urales: *Apamea schildei* (Staudinger, 1901), *Coranarta cordigera* (Thunberg, 1778), *Cardepia irrisoria* (Erschoff, 1874), *Polia vesperugo* (Eversmann, 1856), *Hadena corrupta* (Herz, 1898) y *Pseudohermonassa melancholica* (Lederer, 1853).
PALABRAS CLAVE: Lepidoptera, Papilionoidea, Noctuoidea, biodiversidad, fauna, nuevos registros, Urales, Rusia.

Introduction

Macrolepidoptera of the Ural Mountains are quite well studied. The known faunal data are summarized in the Catalogue of Lepidoptera of Russian Federation (ANIKIN *et al*., 2019). Unfortunately, our findings of Papilionoidea in the Polar and Southern Urals published previously by us (RYBALKIN, ZURILINA & YAKOVLEV, 2018), were not included into the catalog.

In 2019-2021, the first author of this message collected significant materials in the territory of the Urals (Sverdlovsk, Orenburg and Chelyabinsk Regions) (Figs 1-3), where we found rare species of Papilionoidea and Noctuoidea, new for the region.

Material and methods

The Papilionoidea were collected with a butterfly net, the Noctuoidea were attracted at light using self-ballasted (SB) mercury vapor lamps 250W.

The specimens were photographed with the digital camera Sony DSC-HX7V and Olympus Camedia 7070 digital camera, the images were processes in Adobe PhotoShop. The genital preparations were made according to the method of LAFONTAINE & MIKKOLA (1987). The photographs of micropreparations were taken using the Olympus DP70 photographic microscope, using the software DPController and DPManager. Images were adjusted and plates were prepared with the software Adobe Photoshop CS6.

Results

Euchloe ausonia (Hübner, [1804]) (Figs 4-5)

Material: Russia, Sverdlovsk Region, Karpinsk distr., Konzhakovskyi Kamen' Mt., 1160 m, 1 ♂, 10-VII-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

Rare species in Middle Ural found in a new locality in Sverdlovsk Region.

Boloria aquilonaris (Stichel, 1908) (Figs 6-8)

Material: Russia, Chelyabinsk Region, near Snezhinsk, sphagnum swamp, 10 ♂♂, 10 ♀♀, 5-23-VII-2019, 15-VI-10-VII-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

Rare species in the Southern Urals; endangered in a number of Russian regions; listed in the Red Books of Chelyabinsk, Ivanovo, Kaluga, Moscow, Nizhniy Novgorod, Novosibirsk, Tver', Tula, Vologda, Yaroslavl' Regions and Moscow city (TIKHOMIROV, 2007; BARSUKOVA & VOROB'EVA, 2010; MIMONOV & VOLKOVA, 2011; BOL'SHAKOV, 2013; MUKHANOV, 2014; VLASOV, 2015; SAMKOV, 2016a; GORBUNOV & LAGUNOV, 2017; SHMYTOVA, 2017; DUBATOLOV & KORSHUNOV, 2018a; SVIRIDOV, 2018). Found in large numbers near the town of Snezhinsk in a sphagnum bog. This is another finding of marsh species in the Southern Urals; previously, for the environs of upper Ufaley (Chelyabinsk Region) we had reported the marsh species *Erebia embla* (Thunberg, 1791) (RYBALKIN *et al*., 2018). The population from the Southern Urals belongs to the nominative subspecies.

Oeneis jutta (Hübner, [1806]) (Figs 9-12)

Material: Russia, Chelyabinsk Region, near Snezhinsk, sphagnum swamp, 10 ♂♂, 10 ♀♀, 12-30-VI-2019; 31-V-20-VI-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

Rare species in the Southern Urals; endangered in a number of Russian regions; listed in the Red Books of Chelyabinsk, Leningrad, Moscow, Nizhniy Novgorod, Novosibirsk, Sverdlovsk, Tomsk, and Tver' Regions (KOMAROV, 2013; KOSAREV & MUKHANOV, 2014; SAMKOV, 2016b; GORBUNOV, 2017, 2018; DUBATOLOV & KORSHUNOV, 2018b; LVOVSKY, 2018; NIKOLAEVA & SVIRIDOV, 2018). Found in large numbers near the town of Snezhinsk. The population from the Southern Urals belongs to the subspecies *O. jutta gigantea* Austaut, 1911 (type locality: l'Oural central, aux environs de Sojmonowsk [Karabash, Chelyabinsk reg., Russia]).

Apamea schildei (Staudinger, 1901) (Figs 13, 24-25)

Material: Russia, Sverdlovsk Region, Karpinsk distr., Konzhakovskyi Kamen' Mt., 1160 m, 3 ♂♂, 2 ♀♀, 10-14-VII-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk); Sverdlovsk Region, Karpinsk distr., 14 km N Kytlym, Konzhakovskyi Kamen' Mt., 59º37'N / 59º10'33"E, 1200 m, 1 ♂, 1 ♀, 16-VII-2020, leg. P. Gorbunov (coll. P. Gorbunov, Yekaterinburg).

New species for Asia and Middle Ural Region. Distributed in Northern Europe (Fennoscandia, Kola Peninsula, Karelia and Arkhangelsk Regions) (ZILLI *et al*., 2009).

Coranarta cordigera (Thunberg, 1778) (Figs 14-15)

Material: Russia, Chelyabinsk Region, near Snezhinsk, sphagnum swamp, 5 ♂♂, 3 ♀♀, 1-6-VI-2019, 27-V-10-VI-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

New species for Ural. Distributed in Northern and Central Europe and Western Siberia (ANIKIN *et al*., 2019; MALKIEWICZ & WIŚNIEWSKI, 2019).

Cardepia irrisoria (Erschoff, 1874) (Fig. 16)

Material: Russia, Chelyabinsk Region, near Snezhinsk, Ulybka gardens, 2 ♂♂, 08-V-2019, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk); Orenburg Region, 12 km S Kuvandyk, 2 ♂♂, 13-15-V-2016, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

New species for the Urals. Distributed in the Ukraine, South of the European part of Russia, Crimea, Western Siberia (Omsk Region), Tuva, Transbaikalia, Kazakhstan, Mongolia (KNYAZEV *et al*., 2016; ANIKIN *et al*., 2019).

Polia vesperugo (Eversmann, 1856) (Figs 17, 26-27)

Material: Russia, Sverdlovsk Region, Karpinsk distr., Konzhakovskyi Kamen' Mt., 1160 m, 3 ♂♂, 2 ♀♀, 10-14-VII-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

New species for Ural. Distributed in Fennoscandia and Siberia (ANIKIN *et al*., 2019; SAARENMAA, 2020).

Hadena corrupta (Herz, 1898) (Figs 18, 28)

Material: Russia, Chelyabinsk Region, Kyshtym distr., Egoza Mt., 1 ♂, 2 ♀♀, 30-VI-1-VII-2021, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk); Bashkortostan Republic, Uchaly distr., Nurali Mt. Range, 550 m, 54º48'N / 59º40'E, 2 ♀♀, 11-VII-2020, leg. P. Gorbunov (coll. P. Gorbunov, Yekaterinburg).

New species for the Urals. Siberia, Far East, Hokkaido, Korea, China, Mongolia, Central Asia (ANIKIN *et al*., 2016, 2019).

Xestia lorezi (Staudinger, 1891) (Fig. 19)

Material: Russia, Sverdlovsk Region, Karpinsk distr., Konzhakovskyi Kamen' Mt., 1160 m, 5 ♂♂, 10-14-VII-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

New species for the Urals. Distributed in Fennoscandia, Alps, Siberia, Far East, Northern Mongolia Yukon (ANIKIN *et al*., 2016, 2019). Reported for Northern Ural (ANIKIN *et al*., 2016) without information about localities.

Xestia sincera (Herrich-Schäffer, 1851) (Fig. 20)

Material: Russia, Sverdlovsk Region, Karpinsk distr., Konzhakovskyi Kamen' Mt., 1160 m, 5 ♂♂, 10-14-VII-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

Rare species in Middle Ural found in the new locality in Sverdlovsk Region. Distributed in Northern and Central Europe, Northern Ural, Siberia, Far East, Northern Mongolia, Korea, Japan (ANIKIN *et al*., 2016).

Pseudohermonassa melancholica (Lederer, 1853) (Fig. 20)

Material: Russia, Chelyabinsk Region, near Snezhinsk, Ulybka gardens, 18 ♂♂, 22-23-VII-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

New record for Ural. East-Palearctic species, distributed in Siberia, Far East, China, Japan (ANIKIN *et al*., 2016, 2019).

Coenophyla subrosea (Stephens, 1829) (Figs 21-22)

Material: Russia, Chelyabinsk Region, near Snezhinsk, sphagnum swamp, 16 ♂♂, 11 ♀♀, 4-5-VIII-2020, leg. S. Rybalkin (coll. S. Rybalkin, Snezhinsk).

New species for the Southern Urals. Distributed in Europe, Central Ural, Siberia, Far East, Japan, Korea, China (ANIKIN *et al*., 2016, 2019).

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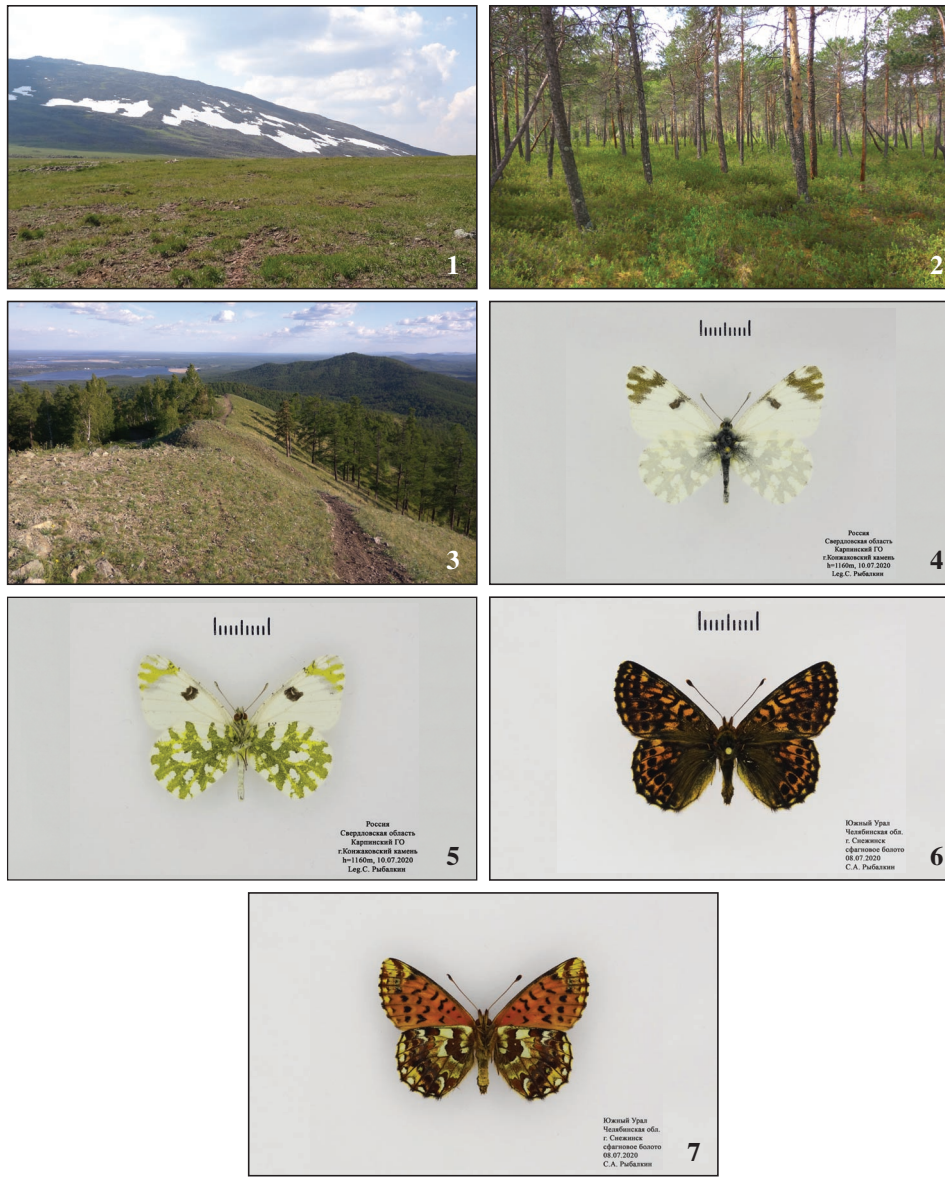

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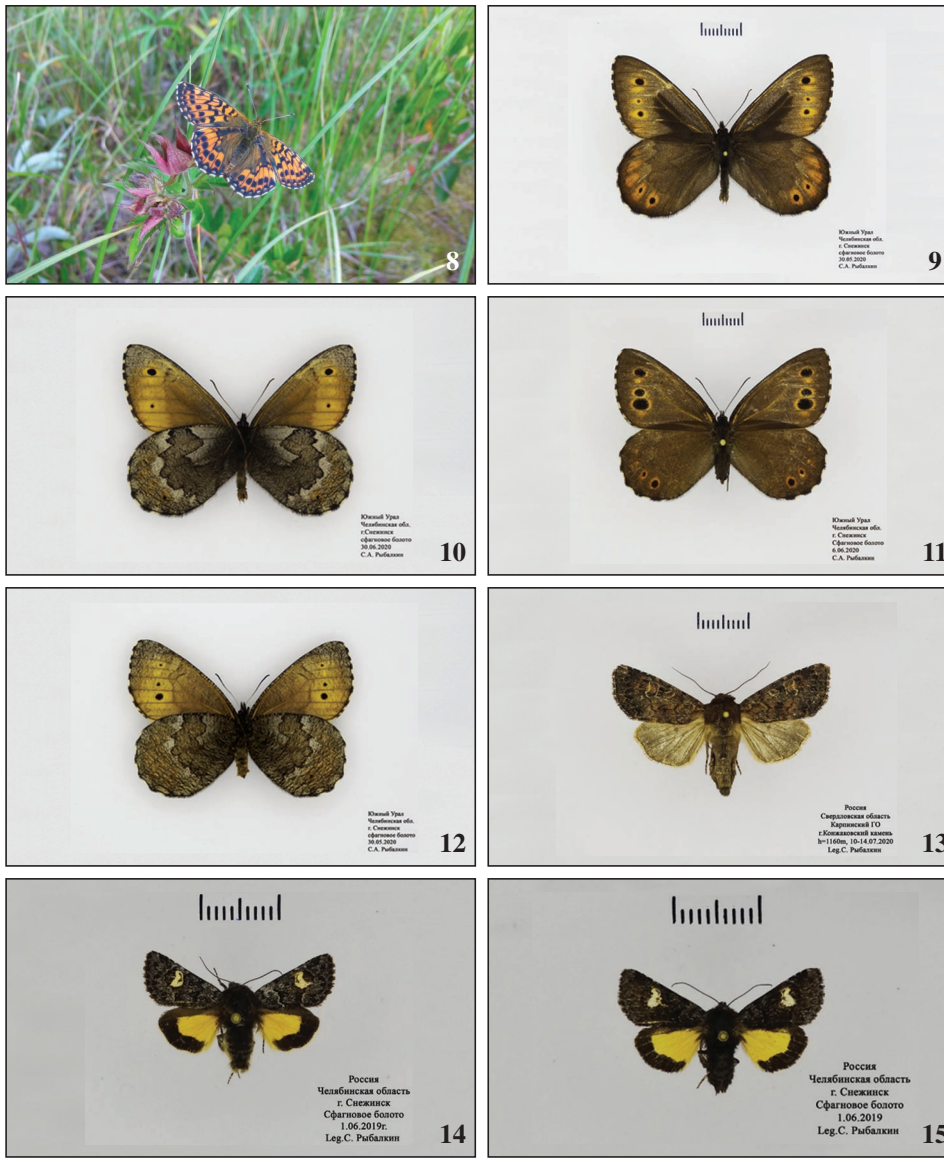

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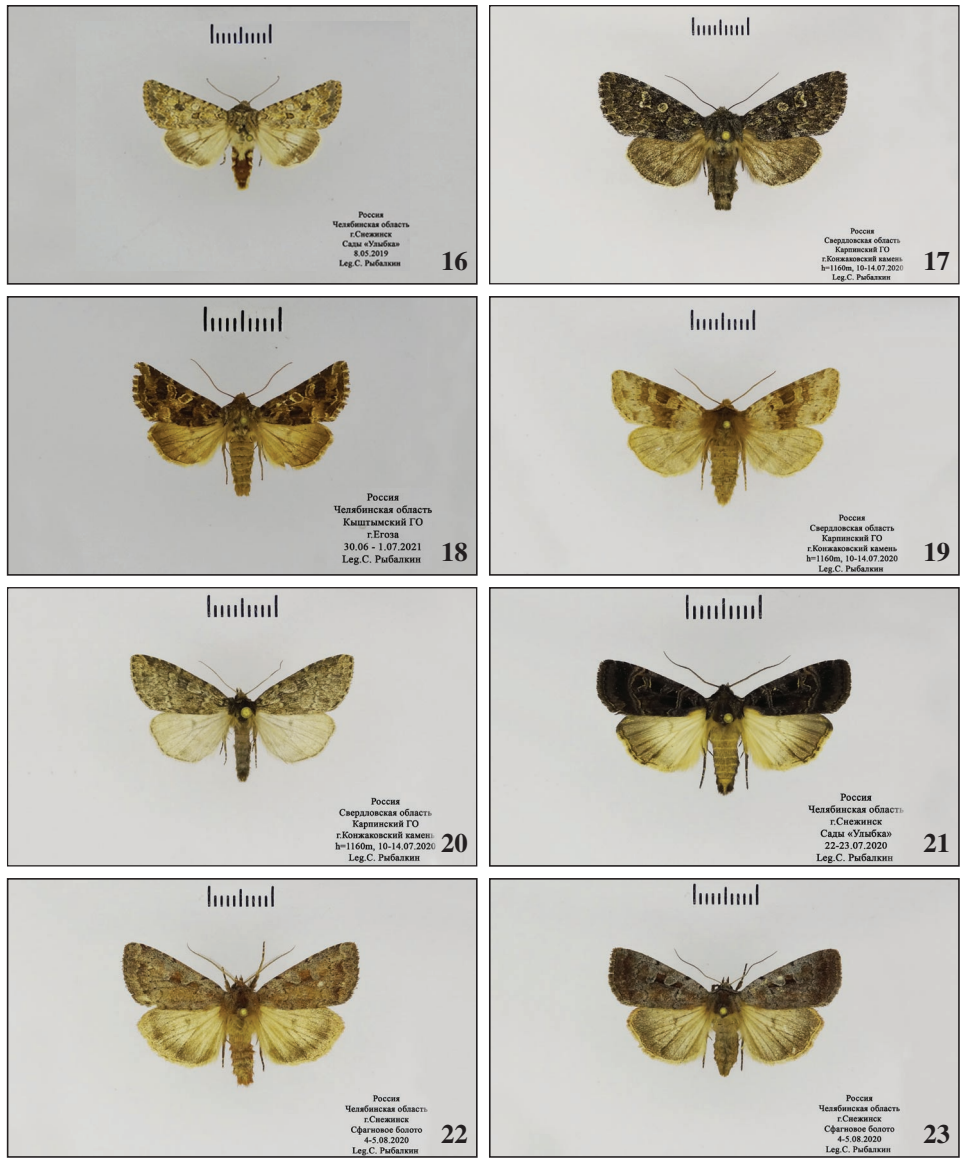

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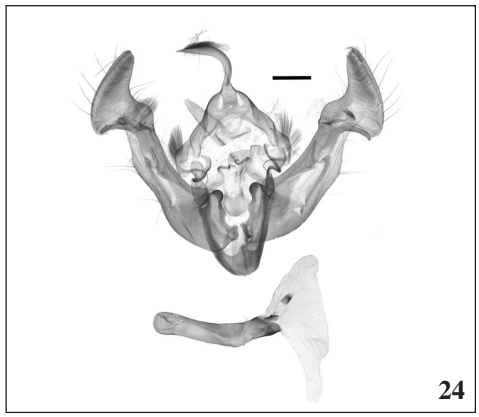

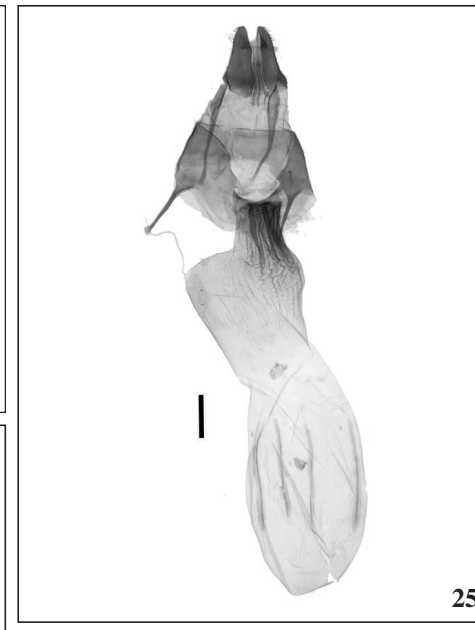

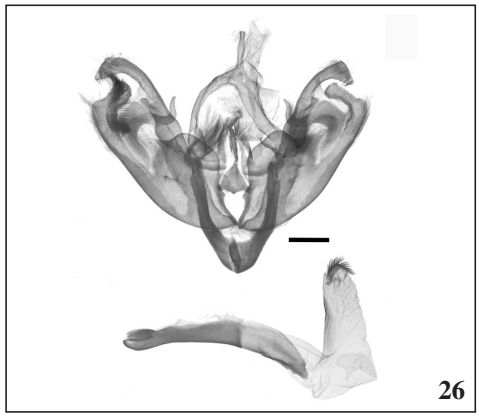

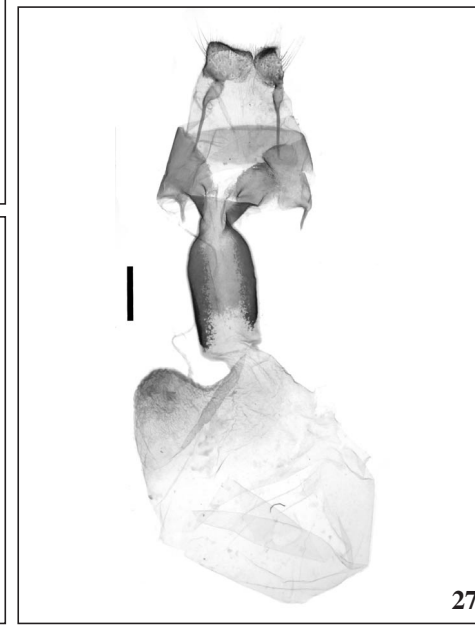

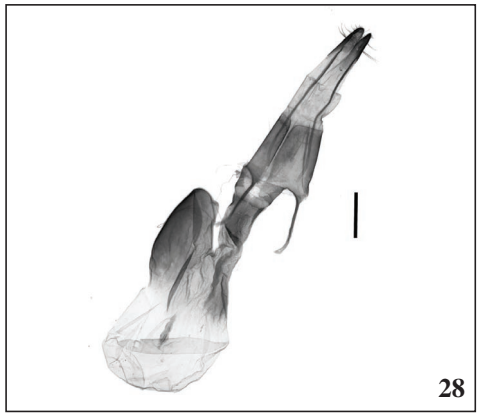

Figures 24-28.– 24. *Apamea schildei* (Staudinger, 1901), male genitalia (slide: TB-2113). **25.** *Apamea schildei* (Staudinger, 1901), female genitalia (slide: TB-2114). **26.** *Polia vesperugo* (Eversmann, 1856), male genitalia (slide: TB-2115). **27.** *Polia vesperugo* (Eversmann, 1856), female genitalia (slide: TB-2116). **28.** *Hadena corrupta* (Herz, 1898), female genitalia (slide: TB-2112).

REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

S.-Y. Lang
The Nymphalidae of China (Lepidoptera, Rhopalocera). Part III
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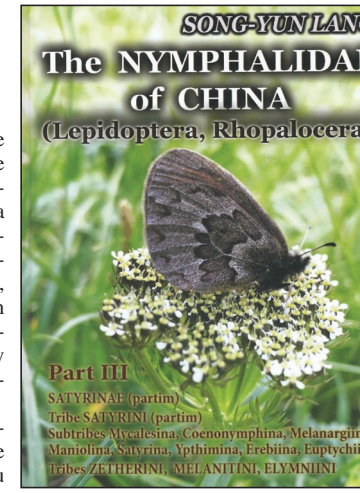

Tenemos en nuestras manos una nueva serie sobre los Nymphalidae de China, concretamente esta es la tercera parte. Se trata la segunda parte de la subfamilia Satyrinae, con la tribu Satyrini y cuatro subtribus: Mycalesina, (con dos géneros), Ceonymphina (con tres géneros), Melanargiina (con un género), Maniolina (con tres géneros), Satyrina (con nueve géneros), Ypthimina (con ocho géneros), Erebiina (con dos géneros) y Euptychiina (con un género), así como las tribus Zetherini (con cuatro géneros), Melanitini (con dos géneros) y Elymniini (con un género), que abarca un total de 288 especies y sus numerosas subespecies, estableciéndose 1 género y 6 subespecies nuevas, 2 nuevas combinaciones, 5 estatus nuevos y 11 nuevas sinonimias, que representan todas las especies que se encuentran en el tercer país más grande del mundo.

Después de unas primeras palabras de lo que significa esta publicación, aparecen los agradecimientos y una interesante introducción que abarca sobre cómo está compuesto este libro, acerca de las especies y su sistemática, sobre los mapas de distribución, terminología, nombres científicos, geografía y las diferentes colecciones consultadas, continuando con un lista de todas las especies y subespecies consideradas.

Ya dentro de la parte más importante del libro se nos presenta la familia, subfamilia y el género considerado con su información bibliográfica, la especie tipo, la descripción de la genitalia del macho y su distribución. De cada especie podemos ver los datos bibliográficos y las subespecies admitidas, su descripción, material estudiado, su distribución conocida, un mapa indicando con un círculo, donde se ha muestreado y, en algunos casos, notas adicionales. Todas las especies están excelentemente fotografiadas en 32 láminas a todo color, así como en 26 láminas podemos apreciar unas fotografías y dibujos muy detallados de la genitalia del macho, que permiten y facilitan la identificación de las especies consideradas, apoyadas por ocho láminas con fotografías de los adultos en vivo y principales paisajes de las zonas de captura. La obra finaliza con un índice y una extensa bibliografía, básica, para poder abarcar el ingente trabajo que ha supuesto esta obra.

No podemos terminar estas líneas, sin felicitar al autor, por tan minucioso trabajo y a la Editorial por continuar con la publicación de estas obras de referencia, por la excelente impresión del texto y fotografías de las genitalias, así como de las láminas en color, por lo que recomendamos esta obra, no sólo a los interesados en esta familia en particular, sino a todos los interesados en los Lepidoptera en general, donde esta obra no debería de faltar. El precio de este libro es de 127 euros más gastos de envío y los interesados lo pueden pedir a:

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Relationship between vegetation characteristics and Lepidoptera diversity in the Hyrcanian forest, Iran (Insecta: Lepidoptera)

G. Hajizadeh, H. Jalilvand, M. R. Kavosi & H. B. Varandi

Abstract

The patterns of diversity of Lepidoptera and its relationship with environmental characteristics in the Hyrcanian forests of northern Iran have not been investigated so far, while such studies are extremely effective in restoring forest biodiversity. This study aimed to assess the relationships between vegetation characteristics and the abundance and diversity of Lepidoptera in Darabkola forest, Sari district (Mazandaran province, northern Iran). Light trapping yielded a total of 474 exemplars representing 84 species and belonging to 16 families. 31 plant species belonged to 28 genera and 23 families were recorded of three distinct forests in the region. The total number of plant species and Fisher's α showed the significant difference. The regression analysis indicated that the Lepidoptera abundance was correlated with basal area, diameter at breast height and tree density, although a significant relationship was not observed between plant characteristics and Fisher's α of Lepidoptera. The lack of a significant relationship between plant diversity and the abundance and diversity of Lepidoptera represents the weak role of plant diversity in creating diversity patterns in forest ecosystems.
KEY WORDS: Insecta, Lepidoptera, conservation, richness, temperate forest, vegetation, Iran.

Relación entre las características de la vegetación y la diversidad de Lepidoptera en el bosque Hircaniano, Irán (Insecta: Lepidoptera)

Resumen

Los patrones de diversidad de los Lepidoptera y su relación con las características ambientales en los bosques Hircanianos del norte de Irán no se han investigado hasta ahora, mientras que estos estudios son sumamente eficaces para restaurar la biodiversidad forestal. Este estudio tenía como objetivo evaluar las relaciones entre las características de la vegetación y la abundancia y diversidad de Lepidoptera en el bosque Darabkola, distrito de Sari (provincia de Mazandaran, norte de Irán). Mediante trampas de luz se obtuvieron un total de 474 ejemplares que representaban 84 especies y pertenecían a 16 familias. Se registraron 31 especies de plantas pertenecientes a 28 géneros y 23 familias de tres bosques distintos de la región. El número total de especies de plantas y el α de Fisher mostraron la diferencia significativa. El análisis de regresión indicó que la abundancia de Lepidoptera estaba correlacionada con el área basal, el diámetro a la altura del pecho y la densidad de los árboles, aunque no se observó una relación significativa entre las características de las plantas y el α de Fisher de los Lepidoptera. La falta de una relación significativa entre la diversidad de plantas y la abundancia y diversidad de Lepidoptera representa el débil papel de la diversidad de plantas en la creación de patrones de diversidad en los ecosistemas forestales.
PALABRAS CLAVE: Insecta, Lepidoptera, conservación, riqueza, bosque templado, vegetación, Irán.

Introduction

Iran is categorized as a low-forest country, which covers only 8% of the total land area. During the

last century, the area of Iranian forests declined by two-thirds of the original land cover, from 19.5 to 13.4 million ha. Despite extensive destruction, the country is rich in phytodiversity due to its topographic diversity, geological and climatic variation. With 8 000 plant species belonging to 150 families, Iran is one of the significant endemism countries in this zone of the world. Out of 1,727 endemic species recorded in Iran, 432 and 21 species are vulnerable and endangered, respectively. The total number of endemic species in Hyrcanian region is 115 species (12.5 per million ha) (SAGHEB-TALEBI *et al.,* 2014). The Hyrcanian forest is one of the largest and oldest temperate intact ecosystems in the world (MÜLLER *et al.,* 2018). This ecosystem has a particular ecological and conservation value, this feature is more pronounced when we know that only one percent of the broadleaf forests of the northern hemisphere remains intact (SILANDER, 2001).

Lepidoptera with 158,000 described species is the second most diverse order among insect groups and this number will probably continue to 300,000-400,000 species (KRISTENSEN *et al.,* 2007). The number of moth species is at least ten to one compared to butterflies (AARVIK *et al.,* 2017). Lepidoptera play crucial ecological roles, such as pollinators, herbivores, detritivores, and prey for migratory birds, rodents, and bats in diverse terrestrial landscapes (CHOI, 2011). Some of these functions directly affect plant diversity patterns by influencing the food chain (SCHERBER *et al.,* 2010).

The richness of plant species affects the abundance and diversity of arthropods (EBELING *et al.,* 2018; TYLER, 2020). Increasing plant diversity leads to improved net primary productivity, food resources for herbivorous and increasing the total biomass in ecosystems (HOOPER *et al.,* 2005; BORER *et al.,* 2012). Although there is a positive correlation between plant diversity and the abundance and diversity of arthropod (SCHERBER *et al.,* 2010; BORER *et al.,* 2012) in ecological studies in low-diversity grassland (PEARSON & DYER, 2006) and in agriculture fields (COOK-PATTON *et al.,* 2011), negative relationships between vegetation characteristics and the diversity of arthropod taxa are common in the mentioned ecosystems (AXMACHER *et al.,* 2011). Note that the analysis of the relationship between moth diversity and environmental characteristics has been more focused on the tropical and Mediterranean regions (UHL *et al.,* 2016; MERCKX *et al.,* 2019; DELABYE *et al.,* 2020; RABL *et al.,* 2020), but few studies have been conducted in temperate or boreal ecosystems (HORVATH *et al.,* 2016; ZOU *et al.,* 2016; TYLER, 2020).

Nutritional exchanges between plants and insects play an important role in diversity patterns and herbivores distribution. In some complex forest ecosystems, a positive correlation has been reported between plant diversity and insects (ROOT *et al.,* 2017; DELABYE *et al.,* 2020). Plant diversity is correlated with species richness or community structure of insect herbivores because specific environmental parameters affect simultaneously the distribution of vegetation and insects that feed on plants along environmental gradients (AXMACHER *et al.,* 2009). On the other hand, most studies reported a weak (HAWKINS & PORTER, 2003; AXMACHER *et al.,* 2009) or even negative (CUEVAS-REYES *et al.,* 2003; AXMACHER *et al.,* 2004) correlations between the abundance and diversity of Lepidoptera with plant diversity in forest types. This lack of significant correlation may indicate that some moth families can have similar response to some environmental variables compared to other factors (BREHM *et al.,* 2003).

The patterns of diversity of Lepidoptera and its relationship with environmental factors in the Hyrcanian forests of northern Iran have not been investigated so far, while such studies are extremely effective in restoring forest biodiversity. Therefore, the main aim of the present study was to investigate the relationship between vegetation characteristics and the abundance and diversity of moths within different forest types in a temperate deciduous forest of northern Iran.

Material and Methods

Study area and forest types

The study area is located within the Darabkola forest of Sari (Mazandaran, northern Iran) (lat. 36º 28’ - 36º 33’ N, long. 53º 16’ - 53º 20’ W), along an altitudinal gradient ranging from 100 to 900 m a.s.l. The average slope of region is about 40%. The mean annual precipitation is 938.8 mm, which

occurs as mostly snow at high altitudes and mostly rain at lower latitudes. The mean annual temperature of site study is 31ºC. The region's climate is cold and humid based on the Emberger climograph. The main soil texture of the study area is loam silty and clay. The Darabkola forest, located within Hyrcanian forest, consists of natural temperate and uneven aged stands. The main tree species are chestnut-leaved oak (*Quercus castaneifolia* C. A. Mey.), hornbeam (*Carpinus betulus* L.), velvet maple (*Acer velutinum* Bioss), Caucasian alder (*Alnus subcordata* C. A. Mey.), lime-tree (*Tilia begonifolia* Stev.), Persian ironwood (*Parrotia persica* C. A. Mey.), elm (*Ulmus glabra* Huds), Norway maple (*Acer platanoides* L.), Caucasian persimmon (*Diospyros lotus* L.), Siberian elm (*Zelkova carpinifolia* Pall.), oriental beech (*Fagus orientalis* Lipsky), coliseum maple (*Acer cappadocicum* Gled.) and planted Brutia pine (*Pinus brutia* Ten.). Mixed coniferous and broad-leaved forest (MCBF) (less than 400 m), Persian ironwood-common hornbeam forest (PCF) (between 400 and 650 m) and beech forest (BF) (between 650 and 900 m) were selected for sampling the moth assemblages. Note that, forest types of the studied area are mainly including pure and mixed broad-leaved forests.

Vegetation survey

Three plots with a size of 20x20 m^2 were set within each of the three forests. Each plot divided into four sub-plots with equal sizes to survey the vegetation characteristics. All woody (trees and shrubs) species were recorded in each of the sub-plots. Herbaceous species were surveyed in four smaller plots with a size of 1x1 m^2 that were randomly selected inside each of the sub-plots. The vegetation characteristics included tree height (TH), tree canopy (TC), tree density (TD), diameter at breast height (DBH), basal area (BA), herbaceous richness (HR), tree richness (TR), Shannon diversity for herbaceous species (HH) and Shannon diversity for tree species (HT).

Lepidoptera sampling

Three light traps were installed inside each forest type (OXBROUGH *et al.,* 2012). Traps were made of the white sheet (2 m high x 1.5 m wide) and UV (20 W tube, Blacklight). The traps were set at 1.5 m above the ground, and the distances among them were at least 200 m (FERRO & ROMANOWSKI, 2012). To reduce the effects of spatial margins, the traps were at least 100 m away from the roads and forest edges. The traps were not installed in a straight line of sight to prevent light interference. Sampling nights were selected under pre-defined weather forecast parameters (minimum temperature 10ºC and maximum wind speed 20 km/h). Sampling was not performed on nights when it was likely to rain (MERCKX *et al.,* 2009). Furthermore, sampling was not approximately performed one week after rainy days. Sampling was carried out during the autumn of 2015 (October, November, and December), the spring of 2016 (April, May and June) and the summer of 2016 (July, August and September). The traps were installed on average once every one or two weeks (from sunset to midnight). Moths were collected same time in all three forests and ethyl acetate was used to kill moths.

Statistical analysis

The abundance of moth species collected during the sampling period was combined to enlarge the sample adequately for statistical analysis and prevent the effect of annual variations on the results. The correlation between overall plant species and Fisher's α index (α -diversity) was examined. This index is completely independent of sample size changes and has been widely used in the study of patterns of insect diversity (BREHM *et al.,* 2003; AXMACHER *et al.,* 2004, 2009; ZOU *et al.,* 2014). Multiple linear regression was used to evaluate the relationships between vegetation characteristics with moth abundance and richness. The abundance of moths and Fisher's α were considered as response variables. Modelling included vegetation parameters as independent variables. To understand the changes in vegetation with elevation, principal component analysis (PCA) was used based on the presence-absence of plant species. Diversity indices were computed using PAST software, version 15.2. All other data analysis was applied to the data using IBM SPSS Statistics 19.0.

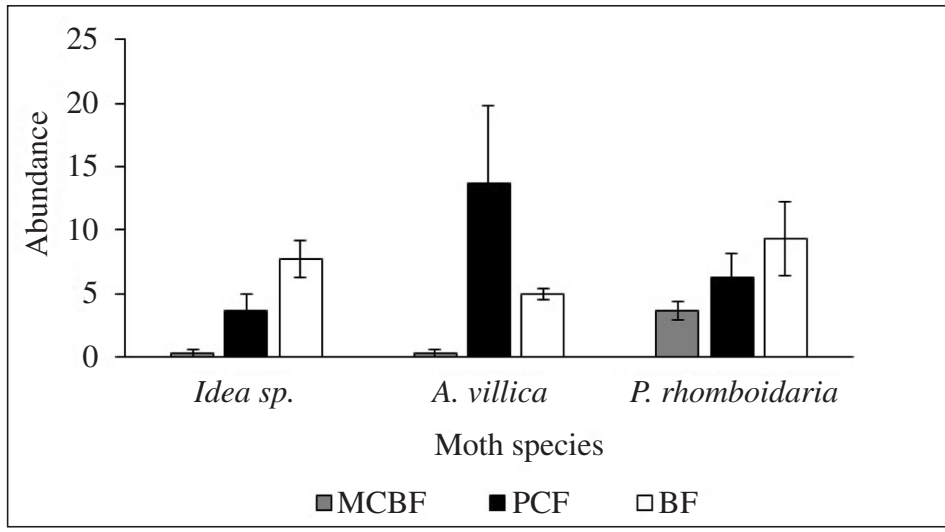

Fig. 1.– Mean abundance of the three most dominant species in three distinct forest types in Darabkola forest of Sari (Mazandaran, northern Iran). Note; Error bars indicate standard error of the mean; Abbreviations: *A. villica* = *Arctia villica*, *P. rhomboidaria* = *Peribatodes rhomboidaria*).

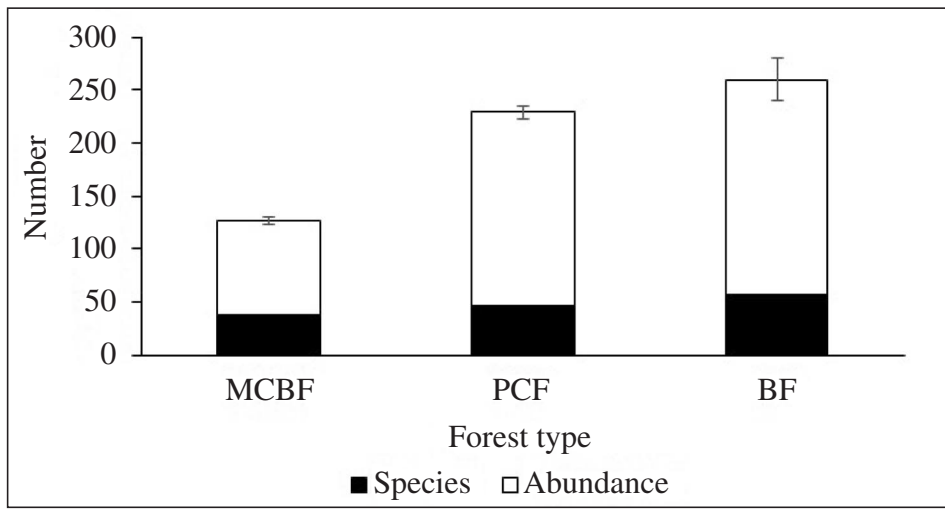

Fig. 2.– Total abundance and species diversity of species collected in three forests in the study area.

Results

Lepidoptera richness and abundance

474 specimens belonging to 84 species and 16 families were collected in light traps (Table 1).

Idaea sp. (20.22%), *Arctia villica* (L.) (13.73%), and *P. rhomboidaria* (12.8%) were dominant in MCBF, PCF and BF, respectively (Fig. 1). MCBF and BF had the lowest (37) and highest (57) species diversity, respectively (Fig. 2). Furthermore, the lowest (18.77%) and highest (42.82%) abundance were in MCBF and BF, respectively (Fig. 2). Geometridae family with 225 specimens (47.46 % of total) and 29 species (34.11 % of total) had the highest abundance and diversity of species. Moreover, the families of Arctiidae and Crambidae were in next ranks with 72 and 41 specimen, respectively. In contrast, only one species belongs to Heterogynidae, Nolidae and Tineidae families.

Vegetation composition

We recorded a total of 31 plant species belonging to 28 genera and 23 families in three forests (Tables 2-3). In fact, the woody (tree and shrub) layer was included of 16 species belonging to 15 genera and 12 families and the herb layer covered 15 species of 13 genera and 11 families (Fig. 3).

Table 2.– Average woody covering percent of different forest types in the Darabkola forest of Sari.

Woody species	**MCBF**	**PCF**	**BF**
Zelkova carpinifolia (Pallas)	3.19	-	-
Mespilus germanica L.	4.78	0.06	-
Ficus carica L.	0.06	-	-
Parrotia persica (Mey)	3.06	0.06	-
Quercus castaneifolia C. A. Mey	4	-	-
Acer velutinum Boiss	0.25	7.56	2.25
Alnus subcordata C. A. Mey	-	-	0.25
Diospyros lotus L.	-	2.29	7.56
Fagus orientalis L.	-	24.19	78.61
Acer cappadocicum Gled.	0.56	-	-
Pinus brutia Ten.	0.06	-	-
Juglans regia L.	0.06	-	-
Carpinus betulus L.	-	0.56	0.15
Crataegus rhipidophylla Gand.	7.25	4	0.06
Fraxinus excelsior L.	0.25	-	0.06
Epigaea repens L.	1.56	0.06	-

Table 3.– Average herbal covering percent of different types in Darabkola forest of Sari.

Herbal species	**MCBF**	**PCF**	**BF**
Galium odoratum (L.) Scop.	-	4	16.28
Viola alba Besser.	1	15.76	-
Primula hecterochroma Stapf	-	-	0.12
Ruscus hyrcanus Woron.	-	0.06	-
Mercurialis perennis L.	-	-	0.41
Pteris cretica L.	-	2.5	-
Cyclamen persicum Mill.	-	0.41	1.56
Euphorbia helioscopia L.	-	0.91	33.53
Carex sylvatica Huds.	1	11.79	4
Carex remota L.	0.06	2.78	0.25
Ruscus hyrcanus Woronow	-	25.62	-
Urtica dioica L.	-	0.25	1.66
Lamium album L.	-	3.06	-
Hypericum androsaemum L.	-	-	0.78
Oplismenus undulatifolius P. Beauv.	-	10.5	27.56

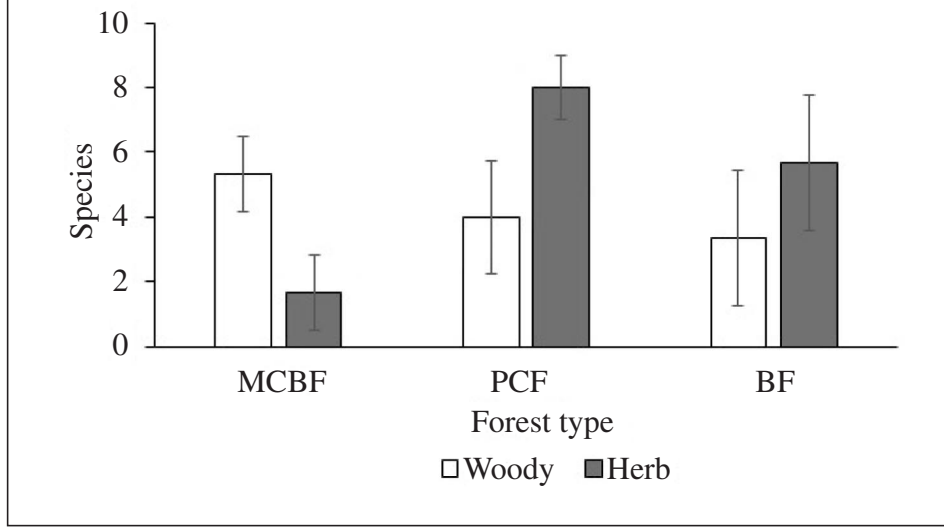

Fig. 3.– Average plant species diversity recorded on the three forest types (bars show standard deviation).

LEPIDOPTERA-PLANT RELATIONSHIPS

The total number of plant species with Fisher's α index had a significant correlation (Spearman's r = 0.87, P<0.01) (Fig. 4). Analysis of linear regression relationships showed a significant difference between the abundance of moths and some of the vegetation parameters (DBH, BA and TD) (Table 4). None of the vegetation parameters was significantly linked with Fisher's α (Table 5). Classification of plots based on PCA analysis in two main axes based on vegetation composition indicated three distinct clusters along elevation gradients (Fig. 5). The first cluster includes MCBF that covers an elevation range of less than 400 m. The second cluster consists of PCF deployed at an altitude of 400 to 650 m. Finally, the third one indicates the distribution of BF between 650-900m.

Table 4.– Results of stepwise linear regressions using species abundance (dependent variable) and vegetation parameters (independent variables).

Model	TH	TC	TD	DBH	BA	HR	TR	HH	HT
Adjusted R^2	-0.123	-0.132	0.432	0.565	0.573	0.036	-0.143	0.114	-0.049
F	0.122	0.067	7.088	11.405	11.723	1.298	0.001	2.034	0.629
Model p-value	0.288	0.085	0.000	0.373	0.022	0.068	0.071	0.07	0.014
ß	0.557	-0.351	-0.94	1.292	0.028	3.249	-0.142	16.469	-15.546
Std. Error of ß	1.594	1.356	0.353	0.383	0.008	2.852	5.536	11.547	19.598
t	0.35	-0.259	-2.662	3.377	3.424	1.139	-0.026	1.426	-0.793
p-value	0.737	0.803	**0.032***	**0.012***	**0.011***	0.292	0.98	0.197	0.454

* = significant at $p < 0.05$

Table 5.– Results of stepwise linear regressions using Fisher's α (dependent variable) and vegetation parameters (independent variables).

Model	TH	TC	TD	DBH	BA	HR	TR	HH	HT
Adjusted R2	-0.028	0.174	-0.143	-0.057	-0.057	-0.122	-0.083	-0.141	-0.109
F	0.758	2.689	0.000	0.568	0.571	0.133	0.387	0.012	0.212
Model p-value	0.004	0.029	0.000	0.001	0.000	0.000	0.006	0.000	0.002
ß	-0.262	0.369	0.001	-0.087	-0.002	-0.218	0.651	-0.28	1.802
Std. Error of ß	0.296	0.225	0.097	0.116	0.002	0.597	1.046	2.545	3.913
t	-0.886	1.64	0.008	-0.753	-0.756	-0.365	0.622	-0.11	0.461
p-value	0.405	0.145	0.994	0.476	0.475	0.726	0.553	0.916	0.659

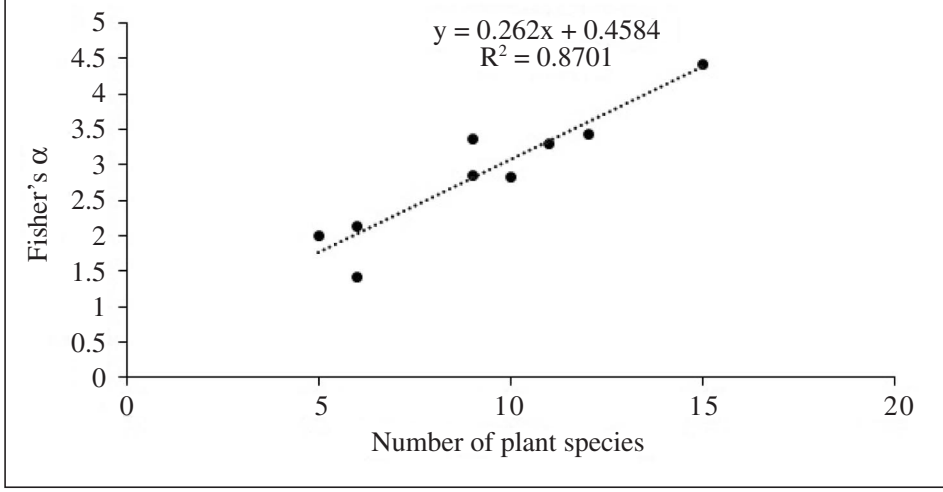

Fig. 4.– Relationship between the number of plant species and Fisher's α index.

Discussion

Lepidoptera abundance, richness and community composition in different forest types

We recorded 84 moth species belonging to 16 families within different forest types of the study area for the first time and it is necessary to be sampled in all other northern mountainous forests of Iran. Literature reviews indicate that not much information is available on moth fauna of this natural ecosystem, with the most important reason being lack of moth specialists of different families in Iranian educational departments.

However, our work is the first record of changes in the patterns of moth diversity with environmental gradients (e. g. vegetation characteristics) in the forests of Iran. Obviously, we declare that our finding cannot be generalized to all Hyrcanian forests, as this area with 130 woody (tree and shrub) species, elevation range up to 2800 m and 800 km length (SAGHEB-TALEBI *et al.,* 2014) had no similar species composition, where the distribution patterns from east to west will be affected by biotic and abiotic factors.

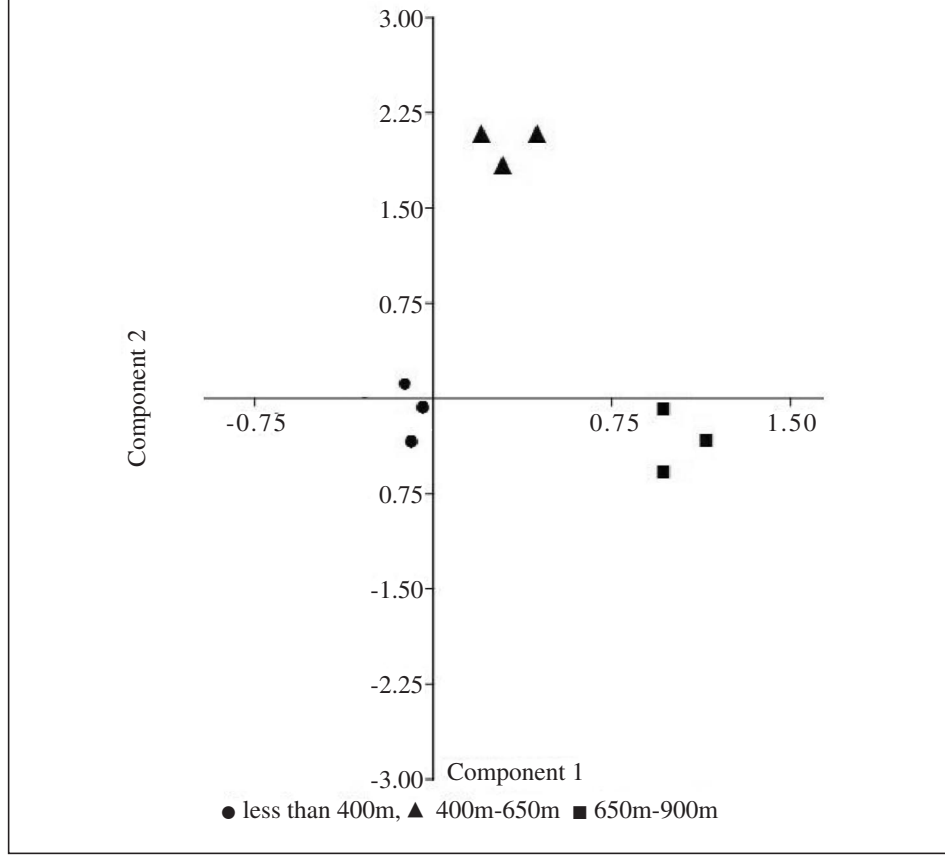

Fig. 5.– PCA ordination plot according to vegetation composition showing three distinct clusters of forest types. (Proportion variance explained for PC1 = 56.49% and for PC2 = 15.77%; eigenvalues for PC1 = 180.65 and PC2 = 50.44).

Note that since so far, no checklist of fauna of Darabkola forest and other areas of Hyrcanian forests has been reported, it is not possible to compare the fauna and percentage of species observed with other records. As discussed, most studies on moths in Iran have focused on describing new species or in some cases, providing checklists of some families. In a study, 38 species of Noctuidae belonging to 8 subfamilies of agroecosystems in Mashhad (Eastern Iran) were reported with their Shannon and dominance diversity indices calculated to be 3.11 and 0.85, respectively (RABIEH, 2018). *P. rhomboidaria* (11.8%) had the largest abundance in our study. ÖZDEMIR (2019) reported 26 species of Geometridae from humid coniferous forests that had the highest diversity compared to other habitats in the western part of the black sea region of Turkey with *P. rhomboidaria* (13.1%) being the dominant species in the area. There is a similarity of the dominant species presented by ÖZDEMIR (2019) with our results, which can be related to vegetation types and microclimate of the studied areas. The fauna structure of moths varied across the entire study area. Of these, a total of 45 species were observed exclusively in one of the types (MCBF, 15; PCF, 9 and BF, 21) while 39 common species were active

in all three forests. However, the majority of species that were exclusively observed in one forest had a low abundance (rare species) and may have not been collected in the sampling from other areas. For example, *Trichiura sp.* with 8 individuals has been presented exclusively in MCBF, which can be a good index for its limited presence only in the planted forests. In the current study, the highest moth diversity was observed in BF. The reasons for this difference may be related to changes in environmental conditions, forest management method, plant diversity and the preference for hosting moth species.

Relationship between moth-plant diversity

As discussed, the change of moth communities with structure and diversity of vegetation has been monitored in the grasslands and agriculture landscapes more than complex forest ecosystems. The dominant form of relationships between vegetation characteristics and the moth abundance and diversity is a negative correlation and, in some cases, a significant relationship has been reported (UNSICKER *et al.,* 2006; AXMACHER *et al.,* 2011). In complex forest ecosystems, most studies have been limited to tropical and Mediterranean regions and few studies conducted on the relationship between moth diversity and vegetation parameters in the temperate and boreal areas (TYLER, 2020). In the current study, DBH, BA and TD had a significant relationship with the abundance of moths. On the other hand, we observed a negative correlation between α-diversity of moths and vegetation characteristics which is in line with AXMACHER *et al.* (2004, 2009) and CUEVAS-REYES *et al.* (2003). Plots with more tree density probably have higher productivity level. In fact, the high density of woody plants not only improves soil moisture available and consequently a favorable microclimate for the taxon and their larvae, but also more litter is formed on the floor of the plots, ultimately leading to soil fertility, and increasing the available food for herbivores (MAGURA *et al.,* 2005). The occurrence of negative correlation between α-fisher and plant diversity refers to changes in the composition of tree species in different forest types (UNSICKER *et al.,* 2006) which is consistent with the differences in species composition of natural (PCF and BF) and plantation (MCBF) forests. In Cameroon tropical ecosystems, butterfly communities had a significant relationship with forest canopy and followed with plant diversity and canopy for moths. Also, a positive correlation has been observed between the richness of Lepidoptera and plants in forest ecosystems in some studies (NYAFWONO, 2015). Note that, all relationships between plant diversity and moth richness in tropical ecosystems had a significant correlation (DELABYE *et al.,* 2020) except for a study conducted by AXMACHER *et al.* (2004) in Kilimanjaro Mt., whose reasons attributed by authors to the young age of forest stands and geographical isolation of the study area.

The lack of a significant relationship between plant diversity and the abundance and diversity of moths represents the weak role of plant diversity in creating diversity patterns in forest ecosystems. These findings emphasize that other factors (e. g. elevation) is a more critical factor in changing the abundance and alpha diversity of moths. The variation in elevation is mainly related to changes in temperature and precipitation indicating the effect of these factors on the diversity of moths, which is consistent with other studies that are closely related to insect diversity patterns and non-living environmental factors compared to vegetation in a wide range of geographic scales (AXMACHER *et al.,* 2009). Finally, it is suggested that more research is needed to understand better insect diversity patterns in Iran's forest ecosystems and how they respond to environmental changes (such as elevational gradients and vegetation characteristics). The results of these studies can improve conservation of biodiversity of these ecosystems by identifying areas in need of more attention as some moth families can be good bioindicators for understanding environmental changes.

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Table 1.– Number of individuals for each moth species collected in three distinct forest types in Darabkola forest of Sari (Mazandaran, northern Iran).

Species	Family	MCBF	PCF	BF	Total
Abraxas sylvata (Scopoli, 1763)	Geometridae	0	0	2	2
Acronicta aceris (Linnaeus, 1758)	Noctuidae	1	0	0	1
Agrotera nemoralis (Scopoli, 1763)	Crambidae	0	0	1	1
Agrotis segetum ([Denis & Schiffermüller], 1775)	Noctuidae	1	0	0	1
ARCHIPINI	Tortricidae	1	0	0	1
Arctia villica (Linnaeus, 1758)	Arctiidae	1	25	24	50
BOARMIINI	Geometridae	0	2	1	3
Cabera exanthemata (Scopoli, 1763)	Geometridae	0	1	0	1
Catocala sp.	Erebidae	1	0	0	1
Chloroclystis v-ata (Haworth, 1809)	Geometridae	0	0	1	1
Conistra vaccinii (Linnaeus, 1761)	Noctuidae	0	0	2	2
Cosmia trapezina (Linnaeus, 1758)	Noctuidae	2	11	2	15
Cosmorhoe ocellata (Linnaeus, 1758)	Geometridae	0	0	2	2
Cossus cossus (Linnaeus, 1758)	Cossidae	2	0	0	2
CRAMBINAE	Crambidae	0	1	0	1
Craniophora ligustri ([Denis & Schiffermüller], 1775)	Noctuidae	1	0	0	1
Cyclophora linearia (Hübner, [1799])	Geometridae	1	1	1	3
Deltote pygarga (Hufnagel, 1766)	Noctuidae	0	4	3	7
Drymonia sp.	Notodontidae	4	1	0	5
Ectropis crepuscularia ([Denis & Schiffermüller], 1775)	Geometridae	0	1	1	2
Eilema sororcula (Hufnagel, 1766)	Arctiidae	0	0	2	2
Eilema sp.	Arctiidae	0	0	2	2
Endotricha flammealis ([Denis & Schiffermüller],1775)	Pyralidae	0	2	3	5
Ennomos quercinaria (Hufnagel, 1767)	Geometridae	1	4	8	13
Epirrhoe alternata (Müller, 1764)	Geometridae	0	0	1	1
Erannis defoliaria (Clerck, 1759)	Geometridae	0	3	9	12
Erannis sp.	Geometridae	0	0	1	1
Eudonia sp.	Crambidae	0	0	1	1
Euproctis sp.	Erebidae	0	1	3	4
Furcula sp.	Notodontidae	0	0	1	1
GEOMETRIDAE 1	Geometridae	0	1	0	1
GEOMETRIDAE 2	Geometridae	0	0	1	1
GEOMETRINAE 1	Geometridae	0	1	3	4
GEOMETRINAE 2	Geometridae	0	1	1	2
Habrosyne pyritoides (Hufnagl, 1766)	Drepanidae	0	2	3	5
Helicoverpa armigera (Hübner, [1808])	Noctuidae	0	0	1	1
Hemithea aestivaria (Hübner, [1789])	Geometridae	1	3	1	5
Heterogenea asella ([Denis & Schiffermüller], 1775)	Limacodidae	0	0	1	1
Heterogynis anella (Hübner, [1819])	Heterogynidae	0	1	0	1
Heterogynis asella ([Denis & Schiffermüller, 1775)	Limacodidae	0	0	1	1
Hyles livornica (Esper, 1804)	Sphingidae	1	0	0	1
Hypenodes sp.	Erebidae	1	0	0	1
Idaea aversata (Linnaeus, 1758)	Geometridae	0	1	1	2
Idaea degeneraria (Hübner, [1799])	Geometridae	2	7	1	10
Idaea sp.	Geometridae	18	0	3	21
Lamoria anella ([Denis & Schiffermüller], 1775)	Pyralidae	0	2	2	4

LARENTIINAE	Geometridae	0	0	1	1
LASIOCAMPIDAE	Lasiocampidae	0	0	1	1
Lithosia quadra (Linnaeus, 1758)	Arctiidae	2	6	10	18
Lymantira dispar (Linnaeus, 1758)	Erebidae	3	5	3	11
Macaria notate (Linnaeus, 1758)	Geometridae	3	10	5	18
Malacosoma neustria (Linnaeus, 1758)	Lasiocampidae	0	1	1	2
Meganola sp.	Nolidae	1	0	0	1
Mimas tiliae (Linnaeus 1758)	Sphingidae	1	0	0	1
Morophaga sp.	Tineidae	0	1	0	1
Nomophila noctuella ([Denis & Schiffermüller], 1775)	Crambidae	0	0	1	1
NOTODONTIDAE	Notodontidae	3	1	2	6
Notodontidae phoesia (Fabricius, 1777)	Notodontidae	1	0	0	1
OLETHREUTINI	Tortricidae	0	1	0	1
Operophtera brumata (Linnaeus, 1758)	Geometridae	0	5	8	13
Opisthograptis luteolata (Linnaeus, 1758)	Geometridae	0	0	3	3
Pandemis heparana ([Denis & Schiffermüller], 1775)	Tortricidae	2	1	0	3
Paracolax tristalis (Fabricius, 1794)	Erebidae	0	1	3	4
Peribatodes rhomboidaria ([Denis & Schiffermüller], 1775)	Geometridae	9	21	26	56
PHYCITINAE	Pyralidae	1	1	1	3
Phyllodesma tremulifolia (Hübner, [1810])	Lasiocampidae	1	0	0	1
Plusia festucae (Linnaeus, 1758)	Noctuidae	1	0	0	1
Polymixis latesco Fibiger, 2001	Noctuidae	0	0	2	2
Proteuchloris neriaria (Herrich-Schäffer, 1852)	Geometridae	0	2	0	2
Ptilodon capucina (Linnaeus, 1758)	Notodontidae	2	0	0	2
PYRAUSTINAE	Crambidae	1	11	23	35
Rivula sericealis (Scopoli, 1763)	Noctuidae	0	1	0	1
Schrankia costaestrigalis (Stephens, 1834)	Erebidae	1	2	1	4
Scoparia sp.	Erebidae	1	1	0	2
Scopula nigropunctata (Hufnagel, 1767)	Geometridae	1	15	3	19
Scopula sp.	Geometridae	0	1	0	1
Selenia tetralunaria (Hufnagel, 1767)	Geometridae	6	5	5	16
SPILOMENINI	Crambidae	0	1	1	2
Stauropus fagi (Linnaeus, 1758)	Notodontidae	0	1	2	3
Tephronia sp.	Geometridae	1	5	3	9
Thyatira hedemanni (Hedemann, 1894)	Drepanidae	1	6	5	12
TORTRICIDAE sp.	Tortricidae	0	1	2	3
Trichiura sp.	Lasiocampidae	8	0	0	8
Zeuzera pyrina (Linnaeus, 1761)	Cossidae	0	0	1	1

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Pseudosophronia exustellus (Zeller, 1847) a new species for the Maltese Islands (Lepidoptera: Gelechiidae)

A. Seguna, P. Sammut, A. Catania & J. J. Borg.

Abstract

The genus *Pseudosophronia* Corley, 2001 and the species *Pseudosophronia exustellus* (Zeller, 1847) are recorded for the first time from the Maltese Islands. Notes on the distribution and habitat are included.
KEY WORDS: Lepidoptera, Gelechiidae, *Pseudosophronia exustellus,* new record, Maltese Islands.

Pseudosophronia exustellus **(Zeller, 1847) una nueva especie para Malta (Lepidoptera: Gelechiidae)**

Resumen

El género *Pseudosophronia* Corley, 2001 y la especie *Pseudosophronia exustellus* (Zeller, 1847) son registrados por primera vez para Malta. Se incluyen notas sobre su distribución y hábitat.
PALABRAS CLAVE: Lepidoptera, Gelechiidae, *Pseudosophronia exustellus,* nuevo registro, Malta.

Introduction

The Genus *Pseudosophronia* Corley, 2001, comprises of two species: *Pseudosophronia exustellus* (Zeller, 1847) and *Pseudosophronia cosmella* (Constant, 1887). Up until now the family Gelechiidae in Malta includes 49 species, 48 in the subfamily Gelechiinae Stainton, 1854 and 1 in the subfamily Pexicopiinae Hodges, 1986 (SAMMUT, 2020).

Discussion

The checklist of European Gelechiidae covers 865 species, belonging to 109 genera, with three species records which require confirmation (HUEMER, 2020). In this checklist *Pseudosophronia constanti* (Nel, 1998) is synonymized with *Pseudosophronia exustellus* (Zeller, 1847) (HUEMER & KARSHOLT, 2020). Its distribution in the Mediterranean countries include Portugal, Spain, France, and Italy including Sicily (RATNASINGHAM *et al*., 2007). It is also recorded from Israel (BIDZILYA, 2019).

Material Studied

MALTA, Gozo Is., Marsalforn, Qbajjar area, 1 ♂, 25-V-2006 [at light], A. Seguna leg (in coll. Seguna); Rabat, Mtahleb, 1 ♂, 2 ♀♀, 19-VI-2012, A. Seguna leg (two in coll. Seguna and 1 ♀ in coll. Sammut).

The life history of this species is not yet known although it is mentioned that *Quercus ithaburensis* Decne, is a host plant for the larvae in Israel (BIDZILYA, 2019). However, this requires verification. Locally the larval host plant has not been identified. This species was recorded using a 160 w MV light. The biotope from where it was collected from Gozo is close to a rocky shore dominated by marsh grasses and xerophytic Mediterranean plants and that of Malta is a garrigue with a small grove of *Pinus halepensis* Mill.

Conclusion

To date this species is only known from these four specimens. Further investigations are encouraged to determine its local status. We propose the Maltese name "Bahrija żghira tal faxxi bojod".

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