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SHILAP

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New records of Lepidoptera hostplants from Portugal (Insecta: Lepidoptera)

J. Nunes

Abstract

141 new hostplants are added to 100 Lepidoptera species from mainland Portugal, as result of the author's fieldwork from 2010 to 2020. The majority of records are consistent with hostplant records from other European countries and confirm the wide range of polyphagy of some species.
KEY WORDS: Insecta, Lepidoptera, hostplant, Portugal.

Novos registos de plantas hospedeiras de Lepidoptera em Portugal (Insecta: Lepidoptera)

Resumo

141 novas plantas hospedeiras são adicionadas a 100 espécies de Lepidoptera em Portugal continental, como resultado do trabalho de campo do autor entre 2010 e 2020. A maioria dos registos é consistente com os registos de plantas hospedeiras em outros países europeus e confirmam a larga extensão de polifagia de algumas espécies.
PALAVRAS CHAVE: Insecta, Lepidoptera, planta hospedeira, Portugal.

Nuevos registros de plantas nutrícias de Lepidoptera en Portugal (Insecta: Lepidoptera)

Resumen

Se añaden 141 nuevas plantas nutricias a 100 especies de Lepidoptera de Portugal continental, como resultado del trabajo de campo del autor de 2010 a 2020. La mayoría de los registros son consistentes con los registros de plantas nutricias en otros países europeos y confirman la amplia gama de polifagia de algunas especies.
PALABRAS CLAVE: Insecta, Lepidoptera, planta nutricia, Portugal.

Introduction

Compared to other countries in Europe, Portuguese Lepidoptera, apart from leafminer species, lack published information about hostplants. This is easily noted on HOSTS database from Natural History Museum of London (ROBINSON *et al.*, 2010), where Portugal has far less records than for example the British Isles or Spain. In Portugal, the main contributions in recent years are CORLEY (2015), CORLEY *et al.* (2006, 2007, 2008, 2009, 2011, 2012a, 2012b, 2013, 2014, 2015, 2016, 2018a, 2018b, 2019), which provide an annual summary of interesting Lepidoptera records including some of author's work, and LAŠTŮVKA & LAŠTŮVKA (2014, 2015), focused mainly on leafminer families from all Iberian Peninsula, not only from Portugal.

A reasonable hypothesis is that most species feed on the same plants in Portugal as in other parts of Europe, but this should never be assumed to be the case. Based on what is recorded from HOSTS database (ROBINSON *et al.*, 2010) and LANGMAID *et al.* (2018), this article confirms the hypothesis for a number of species, but in some cases there are differences which might be attributed to the unavailability of some plants and availability of others, related or not. This paper also adds to the range of hostplants known for some polyphagous species.

The records obtained are the result of the author's fieldwork from 2010 to 2020 with some intensification in the most recent years.

Material and Methods

No particular technique was used for the collection of larval stages of Lepidoptera. In the field the author conducted direct searches for larvae, without any particular group of species in mind, in suitable habitats. The main study area is Valongo municipality, where the author lives.

After collection, larvae were reared on the hostplants on which they were found, when possible. Apart from species with very characteristic larvae, all species were identified only after emergence from the pupa, by comparison with available illustrations or, if necessary, by dissection of genitalia.

Hostplants were identified also by comparison with available illustrations mostly from portal FLORA-ON (2014), where possible.

The order and nomenclature of families and species follows CORLEY (2015). The nomenclature of plant names follows the EURO+MED PLANTBASE (2006). Bibliographic data from outside Portugal are added to each species entry.

Abbreviations and symbols

conf.: confirmed by
det.: determined by
MC: Martin Corley
*: not previously recorded hostplant

Provinces:

BA: Beira Alta
BAL: Baixo Alentejo
BB: Beira Baixa
BL: Beira Litoral
DL: Douro Litoral
E: Estremadura
M: Minho
TM: Trás-os-Montes

Results and discussion

This work adds 141 new hostplants for 100 Lepidoptera species from mainland Portugal. An interesting behaviour was noted in *Lacanobia oleracea* (Linnaeus, 1758) and *Peridroma saucia* (Hübner, [1808]), where the female moth lays her eggs not on low-growing plants, but on the underside of leaves of taller plants on which the larvae do not feed. In both cases, recorded below, young larvae were fed with *Rumex* sp. as they did not feed on the plants where the eggs were laid.

List of families and species

INCURVARIIDAE

Crinopteryx familiella Peyerimhoff, 1871

*DL: Couce, Valongo. Larva on *Cistus psilosepalus* Sweet, 22-I-2020, not reared (Fig. 1).

Bibliographic records: *Cistus salviifolius* L. (CORLEY, 2015; ROBINSON *et al.,* 2010) and *Cistus ladanifer* L. (CORLEY, 2015). It is also suggested to feed on other *Cistus* species by CORLEY (2015) but not particularly recorded for *C. psilosepalus* Sweet.

BUCCULATRICIDAE

Bucculatrix ulmella Zeller, 1848

DL: Couce, Valongo. Free-living larvae on *Quercus robur* L. and *Quercus suber* L., 18-XI-2019.

Bibliographic records: *Quercus* sp. (LANGMAID *et al.,* 2018 ; ROBINSON *et al.,* 2010) and *Carpinus* sp. (LANGMAID *et al.,* 2018).

Bucculatrix cidarella (Zeller, 1839)

TM: França, Bragança. Free-living larva on *Alnus glutinosa* (L.) Gaertn., 03-X-2015.

Bibliographic records: *Alnus glutinosa* (L.) and *Myrica* sp. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010).

GRACILLARIIDAE

Micrurapteryx kollariella (Zeller, 1839)

*DL: Couce, Valongo. Larva on *Cytisus striatus* (Hill.) Rothm., 25-VI-2018. DL: Quintarrei, Valongo. Larva on *Adenocarpus complicatus* (L.) J. Gay, 27-III-2020.

Bibliographic records: *Cytisus scoparius* (L.) Link and *Genista* sp. (ROBINSON *et al.,* 2010). It is already recorded on *Adenocarpus complicatus* (L.) J. Gay by LAŠTŮVKA & LAŠTŮVKA (2015) in Spain, where is also suggested to feed on related genera of *Cytisus* and *Genista*.

Euspilapteryx auroguttella Stephens, 1835

*DL: Quintarrei, Valongo. Larva on *Hypericum humifusum* L., 30-III-2020.

Bibliographic records: Several *Hypericum* sp. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010) but not particularly on *Hypericum humifusum* L.

BEDELLIIDAE

Bedellia somnulentella (Zeller, 1847)

DL: Susão, Valongo. Larva on *Calystegia sepium* (L.) R. Br., 21-VII-2015.

Bibliographic records: *Convolvulus* sp., *Calystegia* sp. and *Ipomoea* sp. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010).

CARCINIDAE

Carcina quercana (Fabricius, 1775)

DL: Crestuma, Vila Nova de Gaia. Larva on *Quercus robur* L., 10-XII-2014.

Bibliographic records: *Quercus* sp., *Fagus* sp. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010) and *Castanea sativa* (ROBINSON *et al.,* 2010). Both references suggest polyphagy on other species of trees and shrubs.

GELECHIIDAE

Aproaerema anthyllidella (Hübner, [1813])

*DL: Susão, Valongo. Larva on *Lotus pedunculatus* Cav., 29-VIII-2016.

Bibliographic records: Mainly recorded on *Anthyllis* sp., *Medicago* sp., *Trifolium* sp. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010) and *Ononis* sp. (LANGMAID *et al.,* 2018). Also recorded on *Onobrychis* sp. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010). LANGMAID *et al.* (2018) also suggests feeding on other Fabaceae species.

Dichomeris acuminatus (Staudinger, 1876)

*DL: Susão, Valongo. Larva on *Lotus pedunculatus* Cav., 02-IV-2016.

Bibliographic records: Several Fabaceae genera (ROBINSON *et al.,* 2010) and suggested to feed on *Trifolium* sp. and *Medicago* sp. (LANGMAID *et al.,* 2018).

Dichomeris limbipunctellus (Staudinger, 1859)

E: Mata Nacional dos Medos, Almada. Larva on *Cistus salviifolius* L., 25-VI-2016.

Bibliographic records: *Cistus salviifolius* L. and *Cistus crispus* L. (ROBINSON *et al.,* 2010).

Acompsia schmidtiellus (Heyden, 1848)

*BA: Famalicão, Guarda. Larva on *Mentha suaveolens* Ehrh., 26-V-2019 (Fig. 2).

Bibliographic records: *Origanum* sp. (LANGMAID *et al.,* 2018). Already recorded on *Clinopodium vulgare* L. in Portugal in CORLEY (2015).

Aristotelia brizella (Treitschke, 1833)

*E: Lagoa de Albufeira, Sesimbra. Larva on seeds of *Armeria pungens* (Link) Hoffmanns. & Link, 03-II-2018.

Bibliographic records: *Armeria* sp. and *Limonium* sp. (ROBINSON *et al.,* 2010). *Armeria maritima* (Mill.) Willd (LANGMAID *et al.,* 2018) and *Limonium vulgare* Mill. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010).

MOMPHIDAE

Mompha subbistrigella (Haworth, 1828)

*DL: Madalena, Vila Nova de Gaia. Larva on *Epilobium* cf *obscurum* Schreb., 06-VIII-2017, det. MC.

Bibliographic records: *Epilobium montanum* L. and *Epilobium tetragonum* L. (LANGMAID *et al.,* 2018).

PTEROPHORIDAE

Crombrugghia laetus (Zeller, 1847)

BB: Serra da Malcata, Penamacor. Larva on *Andryala integrifolia* L., 26-VII-2018.

Bibliographic records: *Andryala integrifolia* L. (ROBINSON *et al.,* 2010).

Merrifieldia malacodactylus (Zeller, 1847)

*TM: Vale da Porca, Macedo de Cavaleiros. Larva on *Lavandula pedunculata* (Mill.) Cav., 23-IV-2016, det. MC.

Bibliographic records: No records on both followed references.

CHOREUTIDAE

Tebenna micalis (Mann, 1857)

DL: Quintarrei, Valongo. Larva on *Cirsium vulgare* (Savi) Ten., 31-VII-2014.

Bibliographic records: *Cirsium* sp., *Onopordum* sp., *Helichrysum* sp., *Arctotheca* sp. (ROBINSON *et al.,* 2010) and *Pulicaria dysenterica* (L.) Bernh. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010).

TORTRICIDAE

Ditula angustiorana (Haworth, 1811)

DL: Crestuma, Vila Nova de Gaia. Larva on *Laurus nobilis* L., 15-I-2015. *DL: Susão, Valongo. Larva on *Adenocarpus complicatus* (L.) J. Gay, 07-III-2015. *DL: Susão, Valongo. Larva on *Salix* sp., 22-IV-2018. *DL: Couce, Valongo. Larva on *Erica australis* L., 08-I-2020.

Bibliographic records: Both followed references indicate high range of polyphagy.

Archips podana (Scopoli, 1763)

*DL: Couce, Valongo. Larva on *Quercus robur* L., 09-XI-2014. *DL: Susão, Valongo. Larva on *Prunus domestica* L., 05-VII-2015. *BA: Joana Martins, Vouzela. Larva on *Betula pubescens* Ehrh., 24-VII-2015.

Bibliographic records: Both followed references indicate high range of polyphagy.

Archips rosana (Linnaeus, 1758)

*TM: França, Bragança. Larva on *Sorbus aucuparia* L., 20-VI-2015. *TM: Minas de Santo Adrião, Vimioso. Larva on *Fraxinus angustifolia* Vahl, 19-V-2018.

Bibliographic records: Both followed references indicate high range of polyphagy.

Argyrotaenia ljungiana (Thunberg, 1797)

*DL: Madalena, Vila Nova de Gaia. Larva on *Chenopodium* sp., 13-VIII-2017.

Bibliographic records: Both followed references indicate high range of polyphagy.

Cacoecimorpha pronubana (Hübner, [1799])

*DL: Susão, Valongo. Larva on *Vinca* sp., 29-XII-2013. DL: Susão, Valongo. Larva on *Rubus* sp., 15-V-2014. DL: Susão, Valongo. Larva on *Citrus* sp., 18-V-2014. DL: Bonfim, Porto. Larva on *Dianthus* sp. (ornamental), 03-IX-2014. DL: Francelos, Vila Nova de Gaia. Larva on *Rosa* sp. (ornamental), 07-I-2015. DL: Susão, Valongo. Larva on *Malus pumila* Mill., 25-VII-2016. *DL: Susão, Valongo. Larva on *Hypericum* sp., 07-V-2017. *BA: Vilar de Amargo, Figueira de Castelo Rodrigo. Larva on *Salix* sp., 12-V-2019.

Bibliographic records: Both followed references indicate high range of polyphagy.

Clepsis rurinana (Linnaeus, 1758)

*DL: Couce, Valongo. Larva on *Potentilla* sp., 24-III-2019, conf. MC.

Bibliographic records: Both followed references indicate polyphagy.

Acleris variegana ([Denis & Schiffermüller], 1775)

DL: Susão, Valongo. Larva on *Prunus domestica* L., 19-IV-2015.

Bibliographic records: Both followed references indicate polyphagy mainly on Rosaceae.

Celypha lacunana ([Denis & Schiffermüller], 1775)

*DL: Gemunde, Maia. Larva on *Urtica dioica* L., 14-VII-2018.

Bibliographic records: Both followed references indicate polyphagy, but neither particularly mentions *Urtica dioica* L.

Spilonota ocellana ([Denis & Schiffermüller], 1775)

*TM: Vale da Porca, Macedo de Cavaleiros. Larva on *Alnus glutinosa* (L.) Gaertn., 23-IV-2016.

Bibliographic records: Both followed references indicate high range of polyphagy, but neither particularly mentions *Alnus glutinosa* (L.) Gaertn.

Acroclita subsequana (Herrich-Schäffer, 1851)

*BL: Furadouro, Condeixa-a-Nova. Larva on *Euphorbia characias* L., 23-XII-2016.

Bibliographic records: *Euphorbia paralias* L. and *E. portlandica* L. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010), *E. pubescens* L. and *E. hirsuta* L. (ROBINSON *et al.,* 2010).

Epinotia immundana (Fischer von Röslerstamm, 1839)

DL: Serra do Marão, Amarante. Larva on *Betula pubescens* Ehrh., 15-VI-2019, conf. MC.

Bibliographic records: *Alnus* sp., *Betula* sp. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010) and *Rosa* sp. (LANGMAID *et al.,* 2018).

Crocidosema plebejana Zeller, 1847

DL: Susão, Valongo. Larva on seeds of *Malva* sp., 11-VII-2016.

Bibliographic records: Several Malvaceae species (ROBINSON *et al.,* 2010) and in the seeds of *Malva arborea* (L.) Webb & Berthel. and *Alcea rosea* L. (LANGMAID *et al.,* 2018).

Notocelia incarnatana (Hübner, [1800])

TM: Minas de Santo Adrião, Vimioso. Larva on *Rosa* sp., 19-V-2018.

Bibliographic records: *Rosa* sp. and *Rosa spinosissima* L. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010).

Grapholita janthinana (Duponchel, 1843)

BL: Ansião. Larva on fruits of *Crataegus monogyna* Jacq., 22-VII-2017, det. MC.

Bibliographic records: Fruits of *Crataegus monogyna* Jacq. (LANGMAID *et al.,* 2018).

PYRALIDAE

Etiella zinckenella (Treitschke, 1832)

*BAL: Praia do Malhão, Vila Nova de Milfontes. Larva on seeds of *Erophaca baetica* (L.) Boiss., 12-V-2017.

Bibliographic records: Both followed references indicate high range of polyphagy mainly on Fabaceae. Neither particularly mentions *Erophaca baetica* (L.) Boiss.

Acrobasis consociella (Hübner, [1813])

DL: Couce, Valongo. Larva on *Quercus robur* L., 31-III-2019, det. MC.

Bibliographic records: *Quercus* sp. (LANGMAID *et al.,* 2018; ROBINSON *et al.,* 2010).

Acrobasis glaucella Staudinger, 1859

DL: Susão, Valongo. Larva on *Quercus suber* L., 02-IV-2016, det. MC. *TM: Azibo, Macedo de Cavaleiros. Larva on *Quercus rotundifolia* Lam., 25-IV-2016, det. MC.

Bibliographic records: *Quercus suber* L. (ROBINSON *et al.,* 2010).

CRAMBIDAE

Udea ferrugalis (Hübner, 1796)

DL: Susão, Valongo. Larva on *Mentha* sp., 14-VIII-2015.

Bibliographic records: Both followed references indicate polyphagy mainly on herbaceous plants. Already recorded on *Mentha* sp. (LANGMAID *et al.,* 2018).

Evergestis marocana (D. Lucas, 1956)

*BAL: Praia do Malhão, Vila Nova de Milfontes. Larva on *Iberis procumbens* Lange, 12-V-2017 (Fig. 3).

Bibliographic records: No records on both followed references. Already recorded on *Iberis ciliata* subsp. *welwitschii* (Boiss.) Moreno in Spain (HUERTAS-DIONISIO, 2014).

DREPANIDAE

Watsonalla uncinula (Borkhausen, 1790)

DL: Quintarrei, Valongo. Larva on *Quercus suber* L., 28-I-2018 (Fig. 4).

Bibliographic records: *Quercus* sp. (ROBINSON *et al.,* 2010).

Drepana curvatula (Borkhausen, 1790)

DL: Couce, Valongo. Larva on *Alnus glutinosa* (L.) Gaertn., 12-X-2014.

Bibliographic records: *Alnus* sp., *Betula* sp. and *Corylus avellana* L. (ROBINSON *et al.,* 2010).

LASIOCAMPIDAE

Malacosoma alpicola Staudinger, 1870

*TM: Vale da Porca, Macedo de Cavaleiros. Larva on *Halimium* sp., 23-IV-2016.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Lasiocampa trifolii ([Denis & Schiffermüller], 1775)

*DL: Quintarrei, Valongo. Larva on *Erica umbellata* L., 14-IV-2014.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Lasiocampa quercus (Linnaeus, 1758)

*BL: Furadouro, Condeixa-a-Nova. Larva on *Rhamnus alaternus* L., 30-XII-2015, not reared.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

SATURNIIDAE

Saturnia pavonia (Linnaeus, 1758)

DL: Quintarrei, Valongo. Larva on *Erica umbellata* L., 14-IV-2014. *DL: Couce, Valongo. Larva on *Genista tridentata* L. and *Halimium lasianthum* (Lam.) Spach, 22-III-2020, not reared.

Bibliographic records: Polyphagous (ROBINSON *et al.,* (2010).

GEOMETRIDAE

Cyclophora puppillaria (Hübner, [1799])

*DL: Susão, Valongo. Larva on *Quercus suber* L., 14-VI-2015. *E: Costa da Caparica, Almada. Larva on *Myrtus communis* L., 17-VI-2016. *DL: Quintarrei, Valongo. Larva on *Cistus salviifolius* L., 09-II-2020.

Bibliographic records: *Quercus ilex* L. (ROBINSON *et al.,* 2010).

Rhodometra sacraria (Linnaeus, 1767)

DL: Susão, Valongo. Larva on *Rumex* sp., 14-X-2015.

Bibliographic records: *Rumex* sp., *Polygonum* sp. and *Emex* sp. (ROBINSON *et al.,* 2010).

Larentia clavaria (Haworth, 1809)

TM: Bobal, Mondim de Basto. Larva on *Malva tournefortiana* L., 04-VI-2017.

Bibliographic records: *Lavatera* sp., *Malva* sp., *Althaea* sp. and *Alcea* sp. (ROBINSON *et al.,* 2010).

Gymnoscelis rufifasciata (Haworth, 1809)

*DL: Quintarrei, Valongo. Larva on flowers of *Erica umbellata* L., 17-V-2014. *DL: Susão, Valongo. Larva on flowers of *Digitalis purpurea* L., 17-VI-2016.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Chesias isabella Schawerda, 1915

*BA: Lagoa Comprida, Seia. Larva on *Cytisus* sp., 16-VII-2016.

Bibliographic records: No records in ROBINSON *et al.* (2010).

Lomaspilis marginata (Linnaeus, 1758)

DL: Francelos, Vila Nova de Gaia. Larva on *Salix babylonica* L., 27-VI-2014.

Bibliographic records: *Populus* sp., *Salix* sp, *Corylus* sp. and *Betula* sp. (ROBINSON *et al.,* 2010).

Stegania trimaculata (de Villers, 1789)

*TM: Valpaços. Larva on *Populus nigra* L., 15-VIII-2016.

Bibliographic records: No records in ROBINSON *et al.* (2010).

Macaria alternata ([Denis & Schiffermüller], 1775)

*M: Castro Laboreiro, Melgaço. Larva on *Frangula alnus* Mill., 08-VIII-2015.

Bibliographic records: No records in ROBINSON *et al.* (2010).

Opisthograptis luteolata (Linnaeus, 1758)

BAL: Cercal, Santiago do Cacém. Larva on *Prunus domestica* L., 14-V-2017.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Biston betularia (Linnaeus, 1758)

M: Castro Laboreiro, Melgaço. Larva on *Frangula alnus* Mill., 08-VIII-2015.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Chemerina caliginearia (Rambur, 1833)

*TM: Vale da Porca, Macedo de Cavaleiros. Larva on *Halimium* sp., 23-IV-2016.

Bibliographic records: No records in ROBINSON *et al.* (2010). Already recorded in Portugal on *Cistus salviifolius* L. in CORLEY (2015).

Peribatodes rhomboidaria ([Denis & Schiffermüller], 1775)

*DL: Couce, Valongo. Larva on *Cytisus striatus* (Hill) Rothm., 09-VIII-2014.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Peribatodes ilicaria (Geyer, [1833])

*TM: Minas de Santo Adrião, Vimioso. Larva on *Quercus rotundifolia* Lam., 21-V-2018.

Bibliographic records: *Quercus ilex* L. and *Quercus suber* L. (ROBINSON *et al.,* 2010).

Selidosema taeniolaria (Hübner, [1813])
*BA: Trinta, Guarda. Larva on *Cytisus* sp., 25-V-2019.
Bibliographic records: *Santolina chamaecyparissus* L. (ROBINSON *et al.,* 2010).

Hypomecis punctinalis (Scopoli, 1763)
DL: Susão, Valongo. Larva on *Malus pumila* Mill., 24-V-2015.
Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Ectropis crepuscularia ([Denis & Schiffermüller], 1775)
DL: Francelos, Vila Nova de Gaia. Larva on *Salix babylonica* L., 30-VII-2015. DL: Serra do Marão, Amarante. Larva on *Salix* sp., 15-VI-2019.
Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Cabera exanthemata (Scopoli, 1763)
DL: Susão, Valongo. Larva on *Salix* sp., 26-VI-2014.
Bibliographic records: *Alnus glutinosa* (L.) Gaertn, *Populus tremula* L. and *Salix* sp. (ROBINSON *et al.,* 2010).

NOTODONTIDAE

Thaumetopoea herculeana (Rambur, 1840)
DL: Quintarrei, Valongo. Larva on *Cistus psilosepalus* Sweet, 09-III-2014, not reared.
Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Furcula bifida (Brahm, 1787)
DL: Susão, Valongo. Larva on *Salix* sp., 04-VIII-2016.
Bibliographic records: *Salix* sp. and *Populus* sp. (ROBINSON *et al.,* 2010). Already recorded for Portugal on *Salix* sp. by an old record in MENDES (1902).

Harpyia milhauseri (Fabricius, 1775)
*M: Castro Laboreiro, Melgaço. Larva on *Quercus robur* L., 08-VIII-2015.
Bibliographic records: *Quercus ilex* L. and *Quercus suber* L. (ROBINSON *et al.,* 2010).

Drymonia querna ([Denis & Schiffermüller], 1775)
*DL: Susão, Valongo. Larva on *Quercus suber* L., 09-X-2015.
Bibliographic records: No records (ROBINSON *et al.*, 2010).

Notodonta ziczac (Linnaeus, 1758)
DL: Nevogilde, Porto. Larva on *Populus alba* L. 06-VII-2015.
Bibliographic records: *Populus* sp. and *Salix* sp. (ROBINSON *et al.,* 2010).

Phalera bucephala (Linnaeus, 1758)
M: Lindoso, Ponte da Barca. Larva on *Betula pubescens* Ehrh., 08-VIII-2015.
Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

EREBIDAE

Scoliopteryx libatrix (Linnaeus, 1758)
DL: Francelos, Vila Nova de Gaia. Larva on *Salix babylonica* L., 26-VI-2014.
Bibliographic records: Polyphagous mainly on Salicaceae (ROBINSON *et al.,* 2010).

Lymantria dispar (Linnaeus, 1758)

DL: Gemunde, Maia. Larva on *Malus pumila* Mill., 09-VII-2014, not reared.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Euproctis similis (Fuessly, 1775)

*DL: Leça do Balio, Matosinhos. Larva on *Quercus suber* L., 29-XII-2010, not reared. *DL: Couce, Valongo. Larva on *Quercus robur* L., 26-IV-2015, not reared.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Artimelia latreillii (Godart, 1823)

*DL: Couce, Valongo. Larva on *Cistus salviifolius* L., 11-V-2014. *TM: Vale da Porca, Macedo de Cavaleiros. Larva on *Prunus persica* (L.) Batsch, 05-VI-2016. *BA: Faia Brava, Figueira de Castelo Rodrigo. Larva on *Daphne gnidium* L., 03-VI-2018.

Bibliographic records: No records in ROBINSON *et al.* (2010).

Phragmatobia fuliginosa (Linnaeus, 1758)

DL: Susão, Valongo. Larva on *Plantago lanceolata* L., 19-I-2014. *TM: Bobal, Mondim de Basto. Larva on *Omphalodes nitida* (Willd.) Hoffmanns. & Link., 04-VI-2017.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Hyphoraia dejeani (Godart, 1822)

*TM: Bobal, Mondim de Basto. Larva on *Rumex* sp., 08-V-2018.

Bibliographic records: No records in ROBINSON *et al.*(2010).

NOCTUIDAE

Thysanoplusia orichalcea (Fabricius, 1775)

DL: Susão, Valongo. Larva on *Brassica rapa* (L.) L, 16-I-2016. *DL: Susão, Valongo. Larva on *Erodium moschatum* (L.) L'Hér., 09-X-2019.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Ctenoplusia limbirena (Guenée, 1852)

DL: Campanhã, Porto. Larva on *Mentha* sp., 28-VII-2016. *DL: Susão, Valongo. Larva on *Erodium moschatum* (L.) L'Hér., 18-X-2019.

Bibliographic records: Polyphagous (ROBINSON *et al,.* 2010).

Chrysodeixis chalcites (Esper, 1789)

*DL: Leça do Balio, Matosinhos. Larva on *Pelargonium* sp. (ornamental), 05-X-2010. DL: Susão, Valongo. Larva on *Mentha* sp., 26-X-2013.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Autographa gamma (Linnaeus, 1758)

*DL: Susão, Valongo. Larva on *Erodium moschatum* (L.) L'Hér., 16-XI-2015. *DL: Gemunde, Maia. Larva on *Calystegia sepium* (L.) R. Br., 14-VII-2018.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Aedia leucomelas (Linnaeus, 1758)

*DL: Águas Santas, Maia. Larva on *Calystegia sepium* (L.) R. Br., 07-X-2017, not reared.

Bibliographic records: *Convolvulus* sp. and *Ipomoea* sp. (ROBINSON *et al.,* 2010).

Colocasia coryli (Linnaeus, 1758)

*DL: Couce, Valongo. Larva on *Pyrus cordata* Desv., 12-X-2014. DL: Árvore, Vila do Conde. Larva on *Quercus robur* L., 30-IV-2015.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Moma alpium (Osbeck, 1778)

DL: Couce, Valongo. Larva on *Quercus robur* L., 01-VI-2015.

Bibliographic records: *Betula* sp., *Fagus* sp., *Quercus* sp. and *Sorbus aucuparia* L. (ROBINSON *et al.,* 2010).

Acronicta tridens ([Denis & Schiffermüller], 1775)

DL: Castêlo da Maia, Maia. Larva on *Prunus persica* (L.) Batsch, 29-VI-2014.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Acronicta psi (Linnaeus, 1758)

DL: Couce, Valongo. Larva on *Pyrus cordata* Desv., 12-X-2014.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Acronicta rumicis (Linnaeus, 1758)

DL: Francelos, Vila Nova de Gaia. Larva on *Salix babylonica* L., 08-VIII-2014. *DL: Susão, Valongo. Larva on *Pyrus communis* L., 19-VII-2015.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Acronicta megacephala ([Denis & Schiffermüller], 1775)

TM: Carvalho, Alijó. Larva on *Populus nigra* L., 29-IX-2018.

Bibliographic records: *Alnus incana* (L.) Moench, *Populus* sp. and *Salix* sp. (ROBINSON *et al.,* 2010).

Amphipyra pyramidea (Linnaeus, 1758)

*TM: Azibo, Macedo de Cavaleiros. Larva on *Prunus avium* (L.) L., 24-IV-2016.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Allophyes alfaroi Agenjo, 1951

*TM: Penelas, Vila Real. Larva on *Crataegus monogyna* Jacq., 29-III-2015.

Bibliographic records: *Prunus* sp. (ROBINSON *et al.,* 2010).

Heliothis peltigera ([Denis & Schiffermüller], 1775)

*DL: Francelos, Vila Nova de Gaia. Larva on *Osteospermum* sp. (ornamental), 03-VII-2014. *BL: Tocha, Cantanhede. Larva on *Dittrichia viscosa* (L.) Greuter, 15-V-2017.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Helicoverpa armigera (Hübner, [1808])

DL: Francelos, Vila Nova de Gaia. Larva on *Solanum lycopersicum* L., 03-IX-2014.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Spodoptera exigua (Hübner, [1808])

*DL: Susão, Valongo. Larva on *Rumex* sp., 24-VIII-2018.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Phlogophora meticulosa (Linnaeus, 1758)

*DL: Susão, Valongo. Larva on *Rumex* sp., 26-I-2014. *DL: Susão, Valongo. Larva on *Malva* sp., 22-II-2014. *DL: Susão, Valongo. Larva on *Trifolium repens* L., 23-XI-2015.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Aporophyla nigra (Haworth, 1809)

*DL: Quintarrei, Valongo. Larva on *Simethis mattiazzii* (Vand.) Sacc., 14-IV-2014. *DL: Quintarrei, Valongo. Larva on *Dittrichia viscosa* (L.) Greuter, 30-III-2020, not reared.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Polymixis lichenea (Hübner, [1813])

*DL: Susão, Valongo. Larva on *Fumaria* sp., 14-I-2015.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Orthosia cerasi (Fabricius, 1775)

DL: Susão, Valongo. Larva on *Salix* sp., 06-IV-2015.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Orthosia gothica (Linnaeus, 1758)

*TM: Azibo, Macedo de Cavaleiros. Larva on *Ulmus minor* Mill., 18-V-2016.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Lacanobia oleracea (Linnaeus, 1758)

DL: Susão, Valongo. Eggs on *Vitis vinifera* L., fed with *Rumex* sp., 11-IX-2015. DL: Susão, Valongo. Larva on *Rumex* sp., 22-XI-2014.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Hecatera weissi (Draudt, 1934)

*BAL: Cercal, Santiago do Cacém. Larva on *Crepis* sp., 15-V-2017 (Fig. 5).

Bibliographic records: No records in ROBINSON *et al.* (2010). Already recorded in Portugal on *Galactites tomentosus* Moench in CORLEY (2015).

Hadena perplexa ([Denis & Schiffermüller], 1775)

DL: Susão, Valongo. Larva on flowers and developing seeds of *Silene latifolia* Poir., 06-V-2019 (Fig. 6).

Bibliographic records: *Silene* sp. (ROBINSON *et al.,* 2010).

Peridroma saucia (Hübner, [1808])

DL: Susão, Valongo. Eggs on *Citrus* sp., fed with *Rumex* sp., 31-V-2014. *TM: França, Bragança. Larva on *Genista* sp., 20-VI-2015.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Noctua pronuba Linnaeus, 1758

*DL: Susão, Valongo. Larva on *Fumaria* sp., 14-I-2015. *DL: Couce, Valongo. Larva on *Laphangium luteoalbum* (L.) Tzvelev, 13-XI-2016.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Noctua comes Hübner, [1813]

*DL: Campanhã, Porto. Larva on *Buxus sempervirens* L., 29-III-2014. *DL: Mindelo, Vila do Conde. Larva on *Cistus salviifolius* L., 17-II-2015.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Xestia xanthographa ([Denis & Schiffermüller], 1775)

DL: Susão, Valongo. Larva on *Rumex* sp., XII-2014. *DL: Susão, Valongo. Larva on *Dactylis glomerata* L., 26-XII-2016.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

Xestia c-nigrum (Linnaeus, 1758)

*DL: Susão, Valongo. Larva on *Erodium moschatum* (L.) L'Hér., 08-XI-2015. *DL: Susão, Valongo. Larva on *Dactylis glomerata* L., 22-II-2016.

Bibliographic records: Polyphagous (ROBINSON *et al.,* 2010).

NOLIDAE

Pseudoips prasinana (Linnaeus, 1758)

DL: Couce, Valongo. Larva on *Quercus robur* L., 18-XI-2019, not reared.

Bibliographic records: *Quercus* sp. and *Betula* sp. (ROBINSON *et al.,* 2010).

Most of the records confirm what is already recorded for other countries and the range of polyphagy of some species (e.g *Cacoecimorpha pronubana* (Hübner, [1799]) and *Phlogophora meticulosa* (Linnaeus, 1758)) and some tribes in particular (e.g. Archipini and Noctuini). Of relevant interest, are the records of *Acompsia schmidtiellus* (Heyden, 1848) on *Mentha suaveolens* Ehrh., as it is a completely new hostplant for that species, and *Furcula bifida* (Brahm, 1787) on *Salix* sp., as it confirms a previous old record by MENDES (1902).

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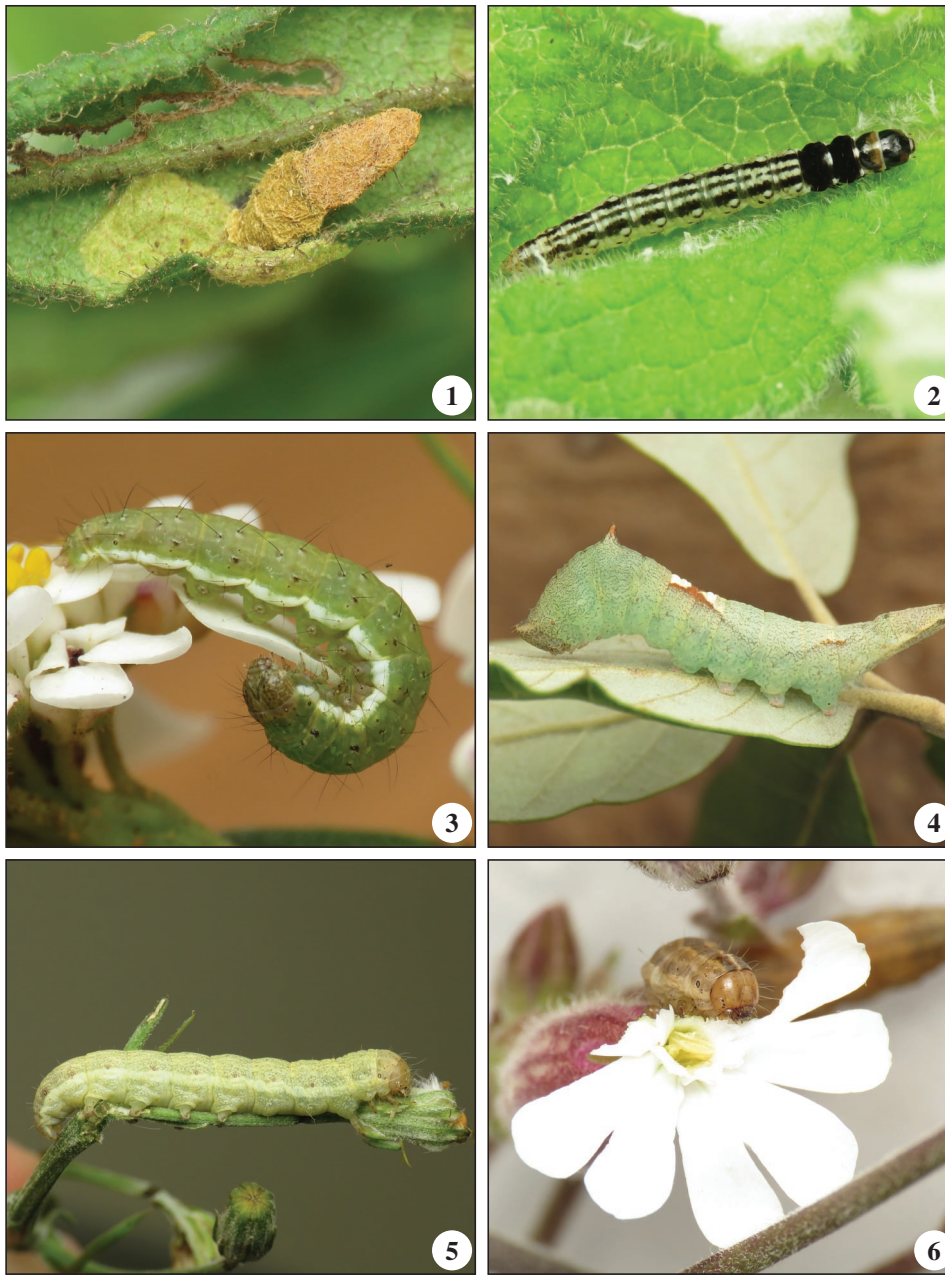

Figures 1-6.– 1. *Crinopteryx familiella* Peyerimhoff, 1871. **2.** *Acompsia schmidtiellus* (Heyden, 1848). **3.** *Evergestis marocana* (D. Lucas, 1956). **4.** *Watsonalla uncinula* (Borkhausen, 1790). **5.** *Hecatera weissi* (Draudt, 1934). **6.** *Hadena perplexa* ([Denis & Schiffermüller], 1775).

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

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 Investigation 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 genus *Thrombialis* Park, gen. n. and a new species of *Furcalis* Park, 2018 from Uganda (Lepidoptera: Lecithoceridae)

K.-T. Park & J.-M. Koo

Abstract

A new genus, *Thrombialis* Park, gen. n., with type species, *T. sylvestrana* Park & Koo, sp. n., and a new species of *Furcalis* Park, *Furcalis mpangensis* Park & Koo, sp. n., are described from Uganda. Adults and male and female genitalia of the new species are illustrated.
KEY WORDS: Lepidoptera, Lecithoceridae, new genus, new species, taxonomy, Uganda.

Un nuevo género *Thrombialis* Park, gen. n. y una nueva especie de *Furcalis* Park, 2018 de Uganda (Lepidoptera: Lecithoceridae)

Resumen

Se describen de Uganda un nuevo género *Thrombialis* Park, gen. n., con la especie tipo *T. sylvestrana* Park & Koo, sp. n., y una nueva especie de *Furcalis* Park, *Furcalis mpangensis* Park & Koo, sp. n. Se ilustran el adulto y la genitalia macho y hembra de la nueva especie.
PALABRAS CLAVE: Lepidoptera, Lecithoceridae, nuevo género, nueva especie, taxonomía, Uganda.

Introduction

The diversity of Lecithoceridae (Lepidoptera: Gelechioidea) in the Afrotropical and Madagascan regions is enumerated less than 130 species, according to Afromoths, the online database of Afrotropical moth species (Lepidoptera) by J. and W. De Prins. However, the real existence in these areas can be predicted more than ten times, because many unknown species are continuously being reported by recent works (PARK, 2018a, b, c; PARK *et al.*, 2019a, b, c, d, e, f).

The new genus *Thrombialis* Park, gen. n. is defined by the specialized antenna with basal segment extremely elongated, with dimorphism in both sexes, and the labial palpus with also dimorphism: atypically broadened second segment with rough scales (Figs 1E, F) in male, but simply thickened in female (Fig. 1H). It is related to the Afrotropical genus *Furcalis* Park, 2018, with similar shape and color pattern of wings, but it is differentiated from the latter by the hind wing with M_2 absent, and the specialized antenna and labial palpus as noted above. It is also strongly supported by the COI sequence (Fig. 3).

The new species, *Furcalis mpangensis* Park & Koo, sp. n. is the 2nd species known from Uganda. Little differences between this new species and *F. hemigastra* (Meyrick, 1931) in the venation of the hindwing is observed, but it is grouped into a same clade by the result of COI sequence.

Material and methods

Material examined is based on the loan specimens from the Museum für Naturkunde (MfN), Berlin, Germany, which were collected by W. Mey in 2014 from Uganda, and the Naturhistorisk Museum of Oslo (NHMO), Oslo, Norway, collected by L. Aarvik from Malawi in 2004. Additional specimens were provided by the Royal Museum for Central Africa (RMCA), Tervuren, Belgium. Preparation of the genitalia and the wing slide followed PARK *et al.* (2019a). The genitalia slide numbers are abbreviated as "gen. slide no.". The wingspan was measured from the apex of the left wing to the apex of the right wing. DNA extraction, PCR, and sequence alignment followed PARK *et al*. (2019a). The colour standard of adults followed KORNERUP & WANSCHER (1978). Abbreviations of type depositories are as follows:

NIBR	The National Institute of Biological Resources, Incheon, Korea.
NHMO	Naturhistorisk Museum of Oslo, Oslo, Norway.
MfN	Museum für Naturkunde, Berlin, Germany.
RMCA	Royal Museum for Central Africa, Tervuren, Belgium.

Taxonomic accounts

Genus *Thrombialis* Park, gen. n.

http://zoobank.org/900E8D01-1C89-45C4-A97F-BC36199DDD21

Type species: *Thrombialis sylvestrana* Park & Koo, sp. n.

Thrombialis Park, gen. n. of the subfamily Lecithocerinae has a similar wing venation with the Palaearctic genus *Eurodachtha* Gozmány, 1978, by having all veins free, excepting R_4 and R_5 stalked on the forewing, and the hindwing with M_2 absent. It is one of the genera in Lecithocerinae as well as *Eurodachtha* which has spinous zones on abdominal tergites. However, *Thrombialis* Park has definitely distinguishable characters from *Eurodachtha*: 1) antenna with basal segment extremely elongated, longer than the 2nd segment of labial palpus, with dimorphism in flagellum of both sexes: male with broadened basal 1/5, angled, burrowed on inner surface (Figs 1D, D'), while that of the female simply serrate (Fig. 1G); 2) labial palpus also with dimorphism: male characterized by atypically broadened second segment with rough scales (Figs 1E, F); 3rd segment shorter than 2nd segment, while 2nd segment of female just thickened (Fig. 1H); 3rd very slender, longer than 2nd segment. The new genus is related to the Afrotropical genus *Furcalis* Park, 2018, with similar shape and color pattern of wings, sharing the modified character of the abdominal segments with a bundle of long hair-pencils, arising from between VI and VII. However, it is no doubtable to separate it from *Furcalis* Park because the M_2 on the hind wing is definitely absent and the specialized antenna and labial palpus as noted above, and it is also strongly supported by the result of COI sequence (Fig. 3). The generic name is derived from the Greek, *θρομβός* (= lump, swelling) with Latin suffix added to noun roots, *-alis*.

Thrombialis sylvestrana Park & Koo, sp. n. (Figs 1A-I; 2A-F)

http://zoobank.org/FC4D2EA7-7D79-4593-8277-41F8A7273DCD

Type. Holotype: ♂, [UGANDA], Mpigi, Mpanga Forest, 0º12'24.51"N 32º18'05.66"E, 27-30-IV-2019, K.-T. Park, J.-M. Koo, J. D. Kim, deposited in NIBR.

Paratypes: 86 ♂♂, 23 ♀♀, same locality as holotype, 27-30-IV / 1-5-V-2019, K.-T. Park, J.-M. Koo, J. D. Kim; gen. slide no. -7285(♂), CIS-7321(♀), -7433(♀); COI barcode CBNU148, -150, -153, -154, deposited in NIBR. 12 ♂♂, 6 ♀♀, [UGANDA], Mpigi, Mpanga Forest, 25-30-XI-2014, L. F. leg. W. Mey; COI Barcode CBNU009; 6 ♂♂, 1 ♀, [UGANDA], Kibale Nat. Park, Biol. Field Station, 19-24-XI-2014, LF leg. W. Mey; gen. slide no. CIS-7011(♂), -7023(♀); COI barcode CBNU041; wing slide no. CIS-7020, in MfN. 1 ♂, [UGANDA], Kasese Distr., Kibale National Park, 36N TF 05826208, 1500 m,

19-24-X-2014, Leif Aarvik and Knud Larsen; gen. slide no. CIS-7132, in NHMO. 1 ♂, [DR Congo], Belge, P. N. A. [Parc National Albert = Virunga National Park], 4-V-1958, P. Vanschuytbroeck VS-377; Massif Ruwenzori Grotte Ibatama 1,610 m [Lumfère = Lumiére (light)]; gen. slide no. CIS-7297, in RMCA.

Description. Adult (Figs 1A-I). Male and female. Wingspan 20.0-20.5 mm. Head: Head yellowish brown dorsally, with short, orange-white erect scales along upper margin of compound eyes. Antenna longer than forewing; basal segment extremely elongated, longer than width of head, dilated distally, yellowish brown dorsally, orange white laterally and ventrally; flagellum orange white, with dark-brown annulations, dimorphism in both sexes: basal 7-8th segments broadened, dilated distally, sunken on inner surface, prominently expanded on outer surface in the male (Figs 1D, D'), but the female simply serrate (Fig. 1G). Labial palpus also dimorphism: male second segment characterized by agglomerated rough scales, more or less atypical, hollowed on inner surface, black medially and remains yellowish-brown mixed with orange-white scales (Fig. 1E), dark brown on outer surface (Fig. 1F), 3rd segment of male strongly recurved, slender, shorter than 2nd segment, but 2nd segment of female simply thickened with rough scales and 3rd segment very slender, longer than 2nd segment, porrected, sharply pointed apically (Fig. 1H). Thorax and tegula dark yellowish brown. Hind tibia dark brown with three orange-white bands; broad one at near base, narrower ones at middle and before apex. Forewing ground color dark yellowish brown uniformly, slightly dilated distally; costa slightly concave beyond middle, then oblique from beyond 1/5; apex obtuse; termen slightly oblique; fringe concolorous with orange-white basal line; venation (Fig. 1I) with R_1 arising from near middle of discal cell; distance between origins of R_1 and R_2 more than 4 times than that of R_2 and R_3; R_3 nearly parallel to R_2; R_4 and R_5 stalked for basal 3/5, R_5 reaching termen; M_1 remote from R_{4+5} at base; M_2 remote from M_1 at base and closer to M_3; M_3, CuA_1, and CuA_2 free; 1A+2A narrowly long-forked in basal 1/4; discal cell about 3/5 length of wing, closed. Hindwing ground color slightly paler than forewing, with broad white expansion along costa in basal half, slightly broader than forewing; costa nearly straight; apex produced; fringe concolorous with ground color; venation with M_1 nearly connate with Rs at base; M_2 absent; M_3 and CuA_1 stalked for basal 3/5; cell opened. Abdomen (Fig. 2D): Dark brown dorsally; spinous zones on tergites broadly developed; abdominal sternite VII with a bundle of long hair-pencils and converted Y-shaped sclerite; sternite VIII deeply emarginate medially, strong bristles along posterior margin.

Male genitalia (Figs 2A-C): Basal lobe of uncus poorly developed, with semi-ovate dorsal plate, bearing setae. Median process of gnathos abruptly narrowed beyond half, strongly bent pre-apically, sharply pointed apically. Costal bar connecting tegumen and valva broad, triangularly angled medially. Valva with basal part as long as cucullus; ventral margin nearly straight, with a bundle of short setae at apex, followed by a deep emargination at base of cucullus; cucullus broadened, as wide as valva, densely setose on surface, with broadly rounded apex. Juxta relatively short, broader posteriorly, weakly sclerotized. Vinculum broad, rounded apically. Saccus broadly developed, with nearly flat anterior margin. Aedeagus slightly bent in basal 1/3, with a small spine apically; cornuti consisting several long strings, about 1/2 length of aedeagus, often these strings removed.

Female genitalia *(*Figs 2E, F): Abdominal sternite with broad, semi-ovate plates latero-anteriorly. Apophyses anteriores short, less than half length of apophyses posteriores. Antrum triangular, weakly sclerotized. Ductus bursae shorter than corpus bursae, slightly wrinkled; ductus seminalis very narrow, arising from before middle. Corpus bursae ovate; signum small, transversally elongated, with dense spines.

Distribution: Uganda (Mpigi), DR Congo (Lumfère).

Etymology: The species name is derived from the Latin, *sylvestr* (= Forest), with a Latin suffix, -*ana.*

Genus *Furcalis* Park, 2018
Furcalis Park, 2018. *Zootaxa*, **4415**: 573
Type species: *Furcalis triodonta* Park, 2018. *Zootaxa*, **4415**: 574, figs 27, 28, 30a-b
Type Locality: Cameroon

Genus *Furcalis* Park, 2018 is related to *Homaloxestis* Meyrick, 1910, sharing similar wing venation, but it can be distinguished by the forewing venation with R_3 free on the forewing, and the male genitalia with uniquely specialized valva, and the abdominal segments with a bundle of long hair-pencils, arising from between VI and VII. Three species of the genus have been known: two species are from Cameroon and one species, *F. hemigastra* (Meyrick, 1931) from Uganda.

***Furcalis mpangensis* Park & Koo, sp. n. (**Figs 4A-D; 5A-F)
http://zoobank.org/D1A050C6-6A4B-4781-B1CB-5349922667A2

Type: Holotype: ♂, [UGANDA], Mpigi, Mpanga Forest, 0º12'24.51"N 32º18'05.66"E, 1-5-V-2019, leg. K.-T. Park, J.-M. Koo, J. D. Kim; gen. slide no. CIS-7427, in NIBR.

Paratypes: 4 ♂♂, 1 ♀, same data as holotype, 27-30-IV-2019, leg. K.-T. Park, J.-M. Koo, J. D. Kim; gen. slide no. CIS-7428, COI barcode CBNU157; gen. slide no. CIS-7425 (♂), -7429 (♂), 7428(♀); 1 ♂, same data as holotype, 1-5-V-2019, leg. K.-T. Park, J.-M. Koo, J. D. Kim; COI barcode CBNU149, in NIBR. 2 ♂ (%%), [UGANDA], Kibale National Park, 19-24-XI-2014, leg. Mey; gen. slide no. CIS-7065; wing slide no. CIS-7066, in MfN. 2 ♂♂, [UGANDA], western, Budongo Forest, 3000 ft, 17-18-VII-2000, leg. D. J. L. Agassiz, in NHMUK.

Diagnosis: This new species is characterized by the male genitalia uniquely modified valva with a long, specialized linear, comb-like row along ventral margin from median expansion of valva to broadened distal part of cucullus.

Description: Adult (Figs 4A-D). Male and female. Wingspan 11.0-12.0 mm. Head: Grayish brown centrally on vertex, with light-orange erect scales laterally, arising from upper margin of compound eyes. Antenna longer than forewing, about 1.2 times; basal segment elongated, slightly dilated toward apex; flagellum, pale yellow, without annulations in basal 2/3, then with dark-brown annulations beyond. Second segment of labial palpus thickened, gradually dilated toward apex; dark brown on outer surface, pale yellow on inner surface; 3rd segment strongly upturned, slender, shorter than 2nd segment, dark brown on outer surface, pale yellow on inner surface. Thorax and tegula grayish yellow dorsally. Fore and mid-tibia with rough scales ventrally, dark brown all around; hind tibia yellowish white dorsally, with rough scales ventrally. Forewing ground color pale grayish-orange, scattered with yellowish-brown scales, slightly dilated distally; costa gently arched in basal 1/3, nearly straight medially, then oblique from beyond 1/5; apex obtuse; termen slightly oblique, sparsely with dark-brown scales along margin; fringe dark brown; venation (Fig. 4D) with R_1 arising from near middle of discal cell; R_2 from near upper corner of cell; distance between R_1 and R_2 at base about three times length than that of R_2 and R_3; R_3 free; R_4 and R_5 stalked for about basal 1/2; R_5 reaching termen; M_2 remote from M_1 at base and closer to M_3; M_3 free; CuA_1 and CuA_2 slightly stalked at base, arising from near lower corner of discal cell; A1+A2 well-developed; cell closed. Hindwing pale grayish orange, scattered with dark yellowish-brown scales, more distally; apex sharply produced; fringe concolorous with ground color; venation with M_2 well-developed; M_3 and CuA_1 stalked for basal half; CuA_2 arising from near 2/3 of discal cell; cell weakly closed. Abdomen (Fig. 5E): Spinous zones absent on dorsal surface; abdominal segment VII forming a specially modified, Y-shaped structure with a dark brown, long hair-pencils, as long as segment VIII; segment VIII large, emarginate at middle on caudal margin.

Male genitalia (Figs 5A-D): Basal lobes of uncus small, ovate. Median process of gnathos broad basally and gently arched beyond half, sharply pointed apically. Costal bar connecting tegumen and valva broad, not angled medially. Valva with characteristically modified, with distinctly developed median expansion on ventral margin; cucullus with specifically broadened rice paddle-like distal part and with a long, specialized linear comb-like row along ventral margin, from median expansion of valva to broadened distal part. Juxta small, concaved on caudal margin, with weakly sclerotized, semi-ovate latero-caudal lobes. Vinculum broad, rounded apically. Saccus rounded anteriorly. Aedeagus slender, slightly bent medially, sharply produced apically.

Female genitalia (Fig. 5F): Abdominal sternite VIII with pouches at both sides. Antrum cup-

shaped, membranous. Ductus bursae narrow long, about twice of corpus bursae; ductus seminalis arising from near distal end. Corpus bursae large, ovate; signum elliptical, with dense conic spines.

Distribution: Uganda, DR Congo.

Etymology: The species name is derived from the type locality, Mpanga Forest, Mpigi, Uganda.

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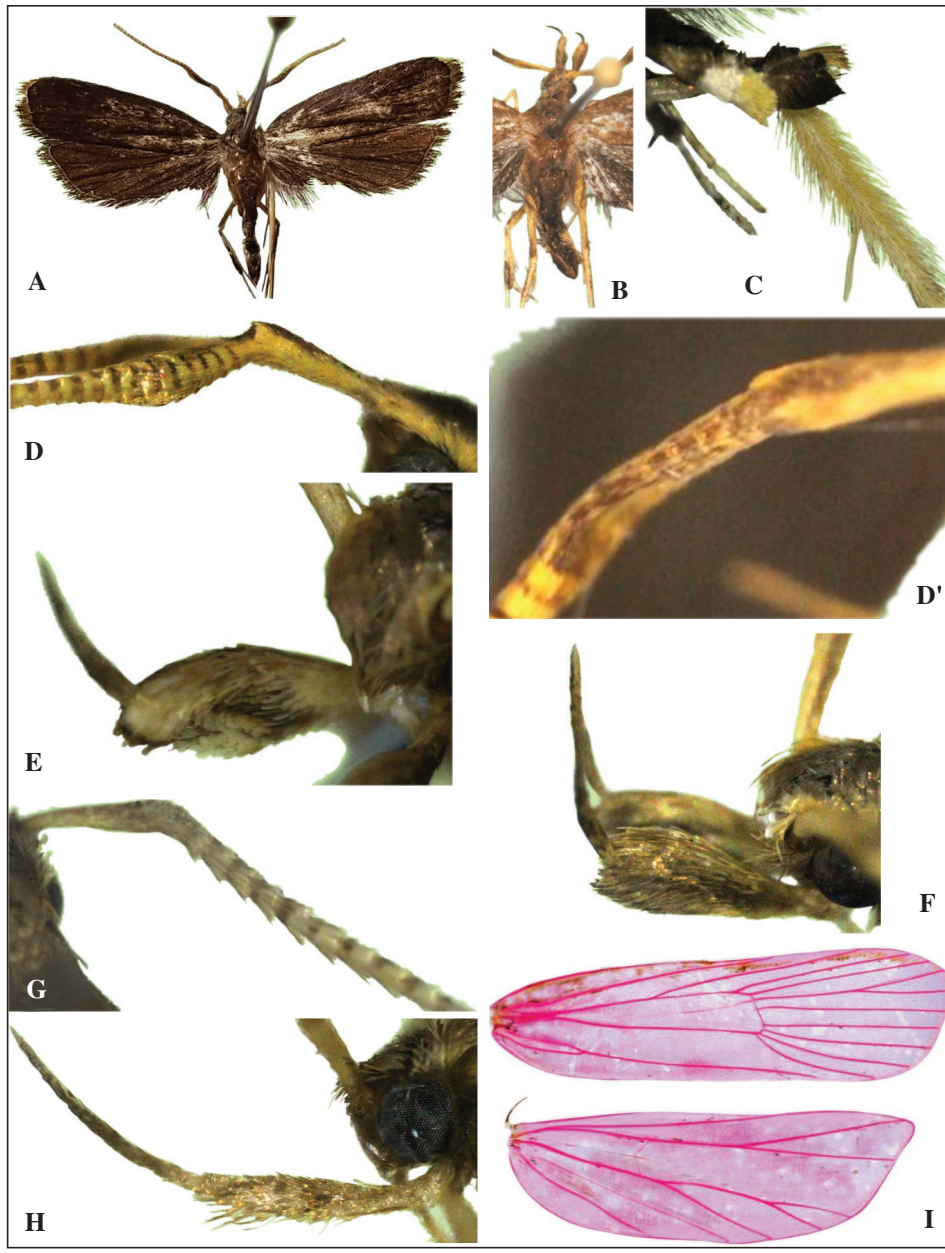


Figure 1.– Adult of *Thrombialis sylvestrana* Park & Koo, sp. n. **A.** adult, paratype; **B.** dorsal view of thorax & abdomen; **C.** ventral view of abdominal segment V-VIII with hind tibia; **D.-D'.** basal part of antenna of male; **E.** labial palpus of male, inner margin; **F.** ditto, outer margin; **G.** antenna of female; **H.** labial palpus of female; **I.** venation, male.

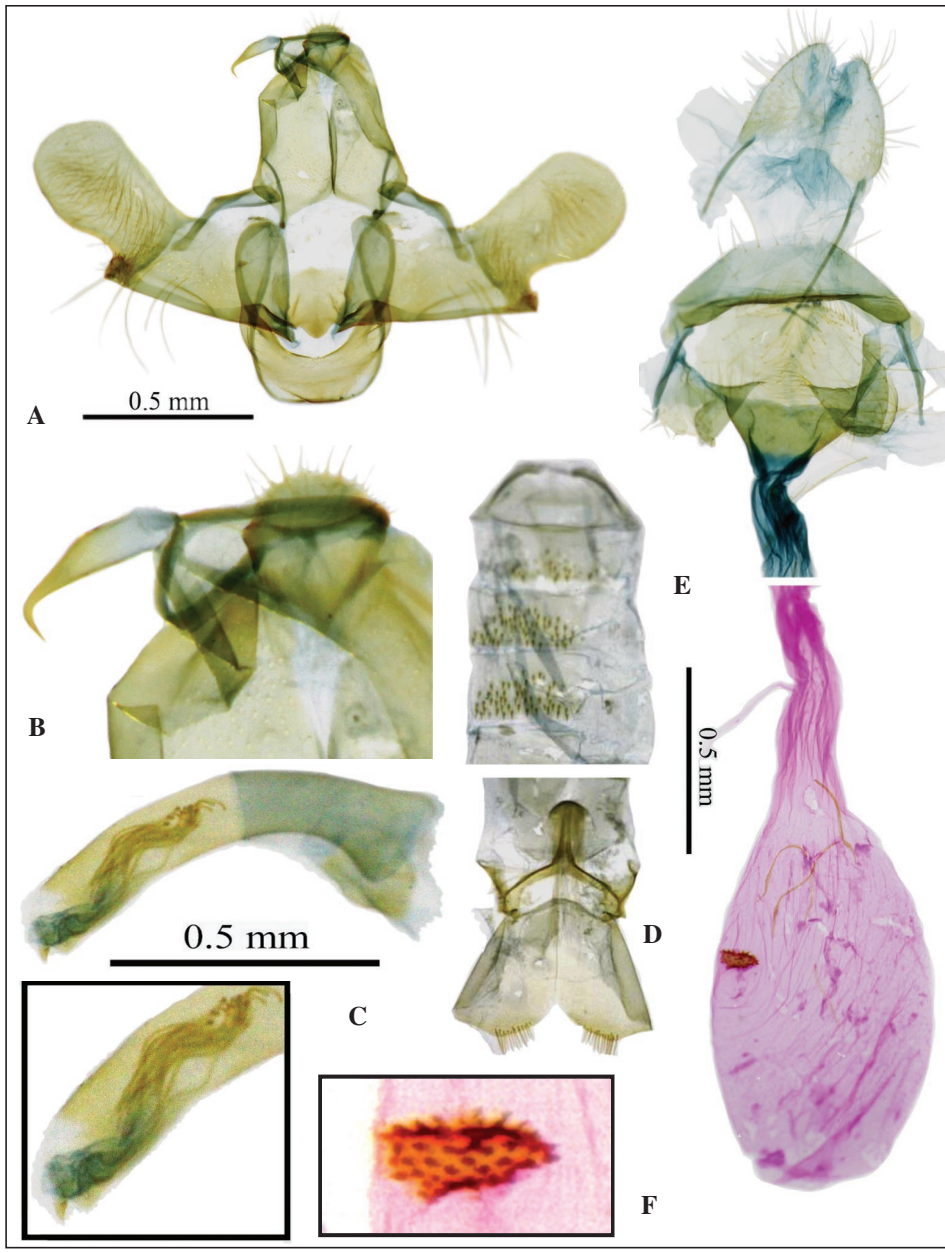
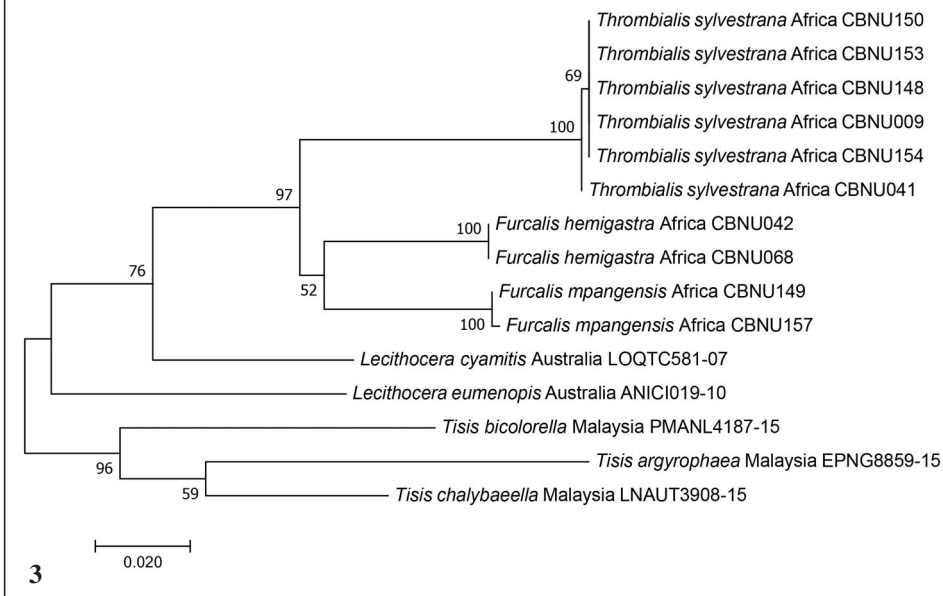
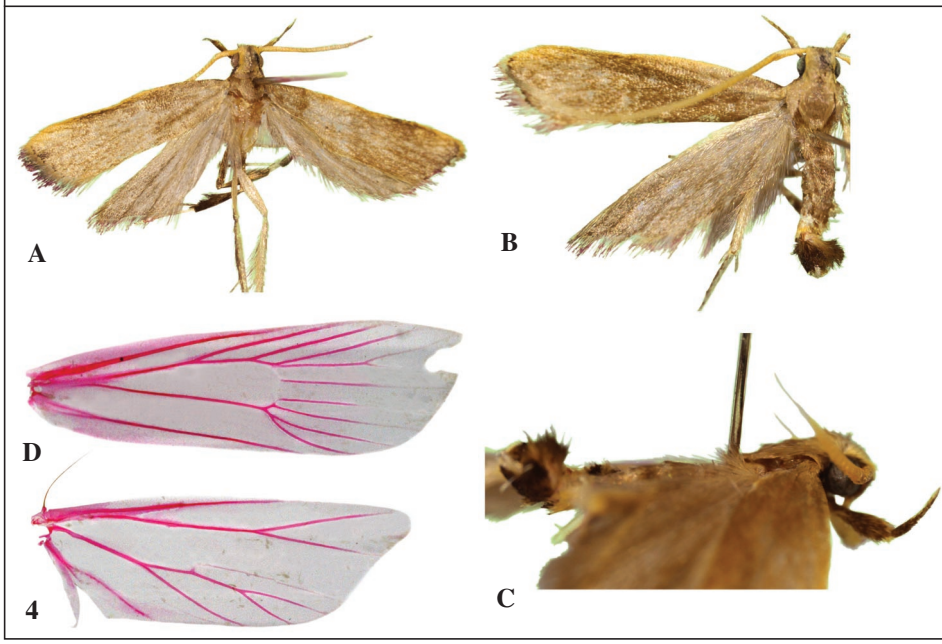


Figure 2.– Genitalia of *Thrombialis sylvestrana* Park & Koo, sp. n. **A.** male genitalia, paratype, gen. slide no. CIS-7132; **B.** ditto, close-up basal lobes of uncus and gnathos; **C.** aedeagus of other paratype, gen. Slide no CIS-7297; **D.** abdomen, with segments VII-VIII; **E.** female genitalia, gen. slide no. CIS-7321; **F.** ductus bursae and corpus bursae, with close-up signum, gen. slide no. CIS-7433.





Figures 3-4.– 3. A maximum likelihood tree based on the COI sequences of two new species, with related genera. **4.** *Furcalis mpangensis* Park & Koo, sp. n. **A.** male, paratype; **B.** left wing & abdomen of a paratype; **C.** ditto, lateral view; **D.** venation.

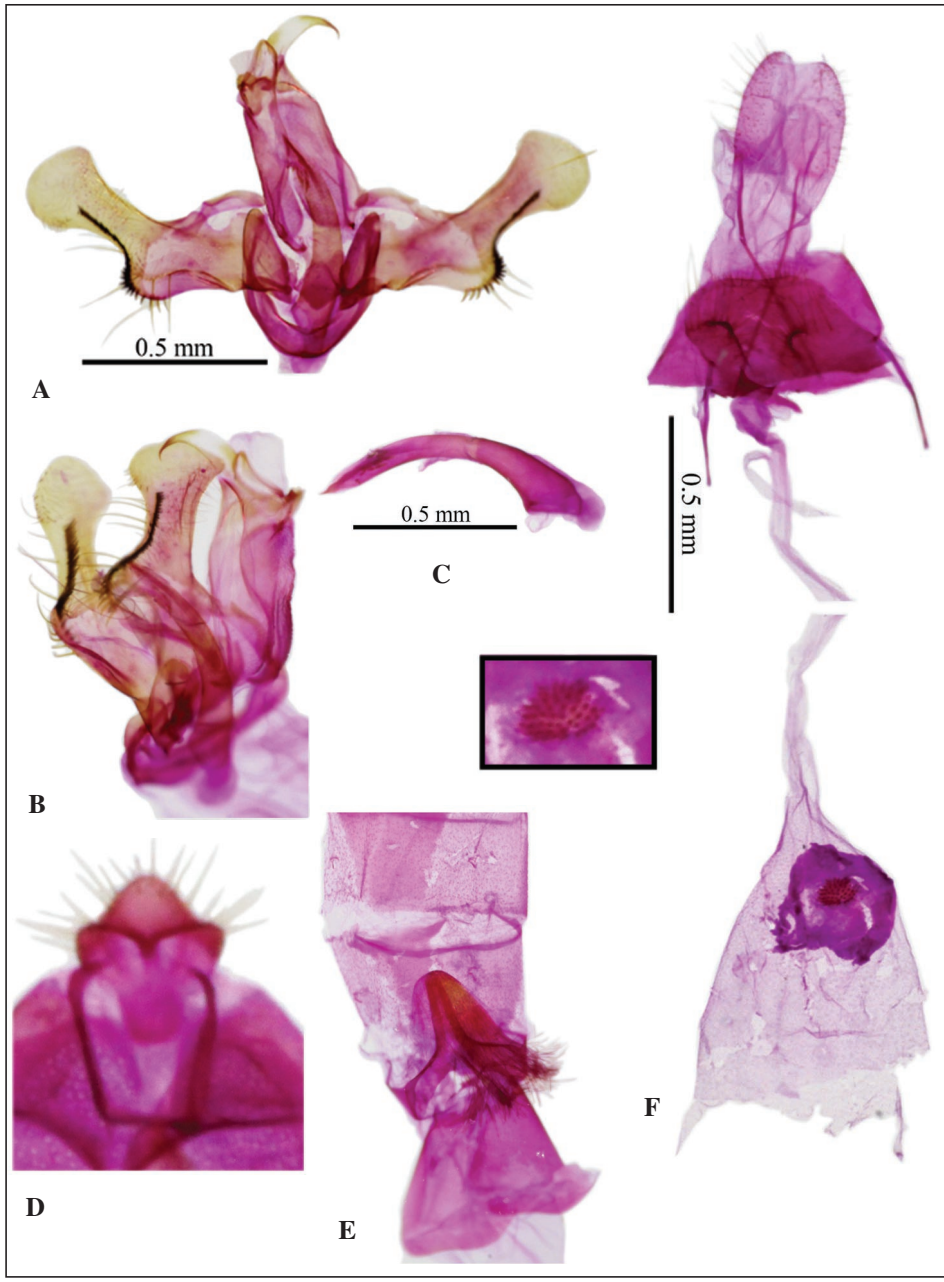


Figure 5.– Genitalia of *Furcalis mpangensis* Park & Koo, sp. n. **A.** male genitalia, paratype, gen. slide no. CIS-7425; **B.** ditto, lateral view; **C.** ditto, aedeagus; **D.** close-up basal lobes of uncus, dorsal view, gen. slide no. CIS-7429; **E.** abdominal segments VII-VIII; **F.** female genitalia, with close-up signum, gen. slide no. CIS-7428.

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Distribution, abundance and habitat selection of *Eriogaster catax* (Linnaeus, 1758) in Álava (Spain) (Lepidoptera: Lasiocampidae)

F. de Juana & O. Aedo

Abstract

The presence of *Eriogaster catax* has been confirmed in 49 locations in the province of Álava and in three locations within the Condado de Treviño in the province of Burgos, corresponding to 27 UTM squares of 10 x 10 km. This brings the total number of known squares for Spain to 72, which represent a 53% increase with respect to the previous knowledge in this country. This species is widely distributed in the study area, occupying both the supratemperate and supramediterranean ecosystem layers. Nevertheless, density levels appear to be very low. With regard to habitat, this species exhibits a clear preference for gall-oak groves and their degradation stages, located mainly on the lower sections of mountain slopes and always on basic substrates. In every case, the species chosen for egg-laying were *Crataegus monogyna* or *Prunus spinosa*, in similar proportions.
KEY WORDS: Lepidoptera, Lasiocampidae, *Eriogaster catax*, Álava, Spain.

Distribución, abundancia y selección de hábitat de *Eriogaster catax* (Linnaeus, 1758) en Álava (España) (Lepidoptera: Lasiocampidae)

Resumen

Se ha constatado la presencia de *Eriogaster catax* en 49 localidades en la provincia de Álava y tres del Condado de Treviño en la provincia de Burgos, correspondientes a 27 cuadrículas UTM de 10 x 10 km. Esto eleva hasta 72 el número de cuadrículas conocidas para España, lo que supone un incremento del 53% respecto de lo previamente conocido. La especie está ampliamente distribuida en el territorio estudiado, ocupando los pisos supratemplado y supramediterráneo. Sus densidades parecen sin embargo muy bajas. En cuanto al habitat, se observa una marcada preferencia por el quejigal subcantábrico y sus etapas de degradación, formaciones que ocupan preferentemente las partes bajas de las laderas, siempre sobre sustratos básicos. En todos los casos las especies elegidas para hacer las puestas fueron *Crataegus monogyna* o *Prunus spinosa*, en proporciones parecidas.
PALABRAS CLAVE: Lepidoptera, Lasiocampidae, *Eriogaster catax*, Álava, España.

Introduction

Eriogaster catax (Linnaeus, 1758), a widely-distributed species in Europe and Western Asia (DE FREINA, 1996), was included in the Berne Convention (Annex II) and in the Habitats Directive (Annexes II and IV) due to severe population declines recorded in some Central European areas. BOLZ (1998), for instance, stated that this species had disappeared from most of the federal states of Germany during the final decades of the last century. The most recent appraisal of this species, made during the period 2007-2012, pointed to an unfavourable state of conservation in most EU member states (EIONET, 2014). In Spain, *E. catax* is listed as a species of special interest in the National Catalogue of

Threatened Species, in the Red Book of Spanish Invertebrates (VERDÚ & GALANTE, 2006) and is also included as a species of special interest in the List of Specially Protected Wild Species.

With regard to its distribution in Spain ROMO *et al.* (2012) mention a total of 36 localities corresponding to the provinces of Álava, Barcelona, Cantabria, Gerona, Huesca, La Rioja, Lérida, Navarra, Palencia and Zaragoza. JUBETE (2019) presents a map that reflects the presence of this species in a total of 47 UTM squares of 10 x 10 km, including a number of squares in the provinces of Leon and Asturias, but considers that the level of information available is still clearly insufficient. For the province of Álava, two records have been published, specifically for the Opakua mountain pass (GÓMEZ DE AIZPÚRUA, 1988) and the Salburua wetlands (DE JUANA *et al.*, 2019).

Material and methods

This study covers the province of Álava, including the Condado de Treviño, a territory located within the province of Álava but belonging administratively to the province of Burgos. This territory, measuring 3,317 km^2, is located in the north of the Iberian Peninsula and sits between the Euro-Siberian and Mediterranean regions (fig. 1).

Between 2015 and 2017, the authors gathered data on the presence of *E. catax* in ten locations in the province of Álava, including observations both of larvae and imagos. Throughout the spring of 2018, the study area was prospected unsystematically in search of the silk nests built by caterpillars during their initial development stages. This methodology has been much more effective for locating this lepidopteran than attracting imagos using light traps. In those cases where the caterpillars had already abandoned the refuge, the egg batch was searched inside, enabling a positive identification with no margin for error (MURRIA, 2006). The geographical position, the height above the ground and the host plant were recorded for each of the nests found. In 2019, the field work concluded with a visit to the areas least prospected in 2018.

In order to analyze the possible influence of climate on the distribution of this species in the study area, the following variables were used: annual mean temperature, mean temperature for the month of April, annual precipitation, annual ombrothermic index and the ombrothermic index of the warmest two-month period (July-August). The values for these variables corresponding to the centroid of each UTM square of 10 x 10 km and to each location with a confirmed presence of *E. catax* were obtained from WorldClim (www.worldclim.org/). With the aim of explaining the presence/absence of the species in each square in accordance with the different climatic variables, linear discriminant analyses (VENABLES & RIPLEY, 2002) were carried out by means of the MASS R package. In these analyses, those squares with centroids beyond the scope of this study were discarded. The classification developed by RIVAS-MARTÍNEZ & LOIDI (1999) was followed for the bioclimactic characterization of the squares.

The habitat preferences of this species were analyzed using the vegetation map of the Autonomous Community of the Basque Country at a scale of 1:10,000 (year 2013), available in the Spatial Data Infrastructure of the Basque Country (www.geo.euskadi.eus). The geographical information system used was Quantum GIS.

Results

The presence of *E. catax* was confirmed in 49 localities in the province of Álava and in three localities in the Condado de Treviño (Burgos), corresponding to 27 UTM squares of 10 x 10 km (fig. 2). In total, 274 egg-batches and caterpillar nests were recorded, details of which are given below (datum ETRS89): ÁLAVA: Aberásturi, Vitoria, 641 m [UTM 30TWN3035] 30-IV-2018, 1 nest on *Prunus spinosa* L. (F. de Juana). Abecia, Urcabustaiz, 676 m [UTM 30TWN0550] 6-V-2018, 1 nest on *P. spinosa* (F. de Juana). Acebedo, Valdegovía, 702 m [UTM 30TVN8545] 19-V-2018, 1 nest on *Crataegus monogyna* Jack. (O. Aedo). Alegría, Alegría, 585 m [UTM 30TWN4043] 11-V-2018, 3 nests on *C. monogyna* (O. Aedo). Apodaca, Cigoitia, 560 m [UTM 30TWN2050] 4-VI-2016, 1 nest on *C. monogyna* (O. Aedo); 15-IV-2017, 6 nests on *C. monogyna* (O. Aedo). Ali, Vitoria, 525 m [UTM 30TWN2040] 6-V-2018, 1 nest on *C. monogyna* (F. de Juana). Aperregui, Zuya, 818 m [UTM 30TWN1050] 20-VI-2018, 1 nest on *P. spinosa*, empty (F. de Juana). Araya, Asparrena, 600 m [UTM

30TWN5545] 1-V-2018, 1 nest on *P. spinosa* (O. Aedo). Argómaniz, Elburgo, 627 m [UTM 30TWN3846] 27-IV-2019, 1 nest on *C. monogyna* (F. de Juana); 12-V-2019, 1 nest on *C. monogyna* (O. Aedo). Basabe, Valdegovía, 749 m [UTM 30TVN8545] 13-V-2018, 1 nest on *C. monogyna* (O. Aedo). Vicuña, San Millán, 686 m [UTM 30TWN5444] 4-V-2019, 1 nest on *P. spinosa* y 1 on *C. monogyna* (O. Aedo). Vitoriano, Zuya, 700 m [UTM 30TWN1050] 16-IV-2017, 2 nests on *C. monogyna* (O. Aedo). Bujanda, Campezo, 609 m, 30TWN4520] 12-V-2018, 1 nest on *C. monogyna* (O. Aedo). Castillo, Vitoria, 753 m [UTM 30TWN2535] 11-V-2018, 1 nest on *C. monogyna* (F. de Juana). Dallo, Barrundia, 598 m [UTM 30TWN4045] 1-V-2018, 4 nests on *P. spinosa* (O. Aedo). Eguino, Asparrena, 627 m [UTM 30TWN5545] 05-V-2018, 3 nests on *C. monogyna* (O. Aedo). Esquível, Vitoria, 716 m [UTM 30TWN2035] 29-IV-2018, 2 nests on *C. monogyna* and 2 on *P. spinosa* (F. de Juana). Etura, Barrundia, 650 m [UTM 30TWN4045] 28-IV-2018, 13 nests on *P. spinosa* and 2 on *C. monogyna* (O. Aedo). Echávarri-Viña, Cigoitia, 575 m [UTM 30TWN2353] 1-V-2019, 1 nest on *P. spinosa* and 2 on *C. monogyna* (O. Aedo). Galarreta, San Millán, 707 m [UTM 30TWN5050] 05-V-2018, 1 nest on *P. spinosa* and 1 on *C. monogyna* (O. Aedo). Guevara, Barrundia, 690 m [UTM 30TWN4045] 28-IV-2018, 2 nests on *C. monogyna* and 1 sobre *P. spinosa* (O. Aedo). Guillarte, Cuartango, 720 m [UTM 30TWN0045] 20-V-2018, 1 nest on *C. monogyna* (O. Aedo). Heredia, Barrundia, 620 m [UTM 30TWN4545] 28-IV-2018, 2 nests on *P. spinosa* and 1 on *C. monogyna* (O. Aedo). Ilarduya, Asparrena, 638 m [UTM 30TWN5545] 05-V-2018, 2 nests on *C. monogyna* and 1 on *P. spinosa* (O. Aedo). Contrasta, Valle de Arana, 771 m [UTM 30TWN5535] 12-V-2018, 2 nests on *C. monogyna* (O. Aedo); 02-VI-2018, 2 nests on *C. monogyna* (O. Aedo). Lagrán, Lagrán, 770 m [UTM 30TWN3015] 13-V-2018, 1 nest on *P. spinosa*, empty (F. de Juana). Letona, Cigoitia, 555 m [UTM 30TWN2050] 15-IV-2017, 1 nest on *C. monogyna* (O. Aedo). Lubiano, Vitoria, 528 m [UTM 30TWN0345] 1-V-2018, 1 nest on *P. spinosa* and 1 on *C. monogyna* (F. de Juana). Maturana, Barrundia, 632 m [UTM 30TWN3850] 12-V-2019, 2 nests on *P. spinosa* (O. Aedo). Mioma, Valdegovía, 789 m [UTM 30TVN9045] 13-V-2018, 1 nest on *C. monogyna* (O. Aedo). Monasterioguren, Vitoria, 659 m [UTM 30TWN3035] 30-IV-2018, 4 nests on *P. spinosa* and 1 on *C. monogyna* (F. de Juana). Montoria, Peñacerrada, 1,008 m [UTM 30TWN2015] 11-V-2018, 1 nest on *C. monogyna* (F. de Juana). Munain, San Millán, 627 m [UTM 30TWN5343] 4-V-2019, 2 nests on *C. monogyna* (O. Aedo). Musitu, Arraya-Maeztu, 850 m [UTM 30TWN4535] 23-IV-2017, 8 nests on *C. monogyna* (O. Aedo). Narbaiza, San Millán, 695 m [UTM 30TWN4545] 1-V-2018, 3 nests on *P. spinosa* and 2 on *C. monogyna* (O. Aedo). Ondategui, Cigoitia, 600 m [UTM 30TWN2055] 28-IV-2019, 4 nests on *P. spinosa* and 2 on *C. monogyna* (O. Aedo). Ondona, Urkabustaiz, 740 m [UTM 30TWN0555] 27-V-2018, 1 nest on *P. spinosa* (O. Aedo). Opacua, Salvatierra, 827 m [UTM 30TWN5045] 06-V-2018, 3 nests on *C. monogyna* (O. Aedo). Oteo, Campezo, 795 m [UTM 30TWN5229] 1-V-2019, 2 nests on *C. monogyna* (O. Aedo). Peñacerrada, 792 m [UTM 30TWN2422] 28-IV-2019, 3 nests on *P. spinosa* (F. de Juana). Pipaón, Lagrán, 871 m [UTM 30TWN2515] 13-V-2018, 1 nest on *C. monogyna* (F. de Juana). Retana, Vitoria, 547 m [UTM 30TWN2545] 1-V-2018, 1 nest on *P. spinosa* (O. Aedo). Subijana de Álava, Vitoria, 552 m [UTM 30TWN1540] 2-V-2018, 5 nests on *C. monogyna* (F. de Juana); 4-IV-2019, 4 nests on *C. monogyna* (F. de Juana). Urbina, Legutiano, 535 m [UTM 30TWN3055] 22-IV-2017, 4 nests on *C. monogyna* and 1 on *P. spinosa* (O. Aedo). Valluerca, Valdegovía, 807 m [UTM 30TVN8550] 20-V-2018, 6 nests on *C. monogyna* (O. Aedo). Zaitegui, Cigoitia, 660 m [UTM 30TWN1555] 15-IV-2017, 8 nests on *P. spinosa* and 2 on *C. monogyna* (O. Aedo); 17-IV-2017, 5 nests on *P. spinosa* and 5 on *C. monogyna* (O. Aedo); 31-XII-2017, 5 egg-batches on *C. monogyna* (O. Aedo); 11-III-2018, 1 egg-batch on *C. monogyna* (O. Aedo); 25-III-2018, 1 egg-batch on *P. spinosa* and 1 on *C. monogyna* (O. Aedo); 20-IV-2018, 1 nest on *P. spinosa* and 1 on *C. monogyna* (O. Aedo); 21-IV-2018, 21 nests on *P. spinosa* and 12 on *C. monogyna* (O. Aedo); 28-IV-2018, 1 nest on *P. spinosa* and 1 on *C. monogyna* (O. Aedo); 29-IV-2018, 5 nests on *P. spinosa* and 2 on *C. monogyna* (O. Aedo); 04-V-2018, 6 nests on *C. monogyna* and 5 on *P. spinosa* (O. Aedo); 07-XII-2018, 5 egg-batches on *C. monogyna* (O. Aedo); 28-IV-2019, 14 nests on *P. spinosa* and 13 on *C. monogyna* (O. Aedo); 11-I-2020, 2 failed egg-batches from the previous year on *C. monogyna* (O. Aedo). Zarate, Zuya, 700 m [UTM 30TWN1656] 16-IV-2017, 2 nests on *P. spinosa* and 1 on *C. monogyna* (O. Aedo). Cestafe, Cigoitia, 670 m [UTM 30TWN2055] 16-IV-2017, 3 nests on *P. spinosa* and 1 on *C. monogyna* (O. Aedo). Zuazo de Vitoria, Vitoria, 588 m [UTM 30TWN2040] 13-V-2016, 1 empty nest on *C. monogyna* (Y. Monasterio); 8-IV-2017, 1 nest on *P. spinosa* and 1 on *C. monogyna* (O.

Aedo); 17-IV-2017, 2 nests on *C. monogyna* (O. Aedo); 21-IV-2018, 2 nests on *C. monogyna* (O. Aedo). Zumelzu, Vitoria, 708 m [UTM 30TWN5135] 7-V-2018, 3 nests on *C. monogyna* and 2 on *P. spinosa*, one of them empty (F. de Juana). BURGOS: Albaina, Condado de Treviño, 632 m [UTM 30TWN3025] 13-V-2018, 1 nest on *P. spinosa* (F. de Juana). Araico, Condado de Treviño, 714 m [UTM 30TWN1525] 26-V-2018, 1 empty nest on *C. monogyna* (F. de Juana). Moraza, Condado de Treviño, 742 m [UTM 30TWN2020] 11-V-2018, 1 nest on *C. monogyna* (F. de Juana) (Table I).

Table I.– Total number of egg-batches and nests per locality and year.

Locality	Province	2016	2017	2018	2019	Total
Aberásturi	Álava			1		1
Abecia	Álava			1		1
Acebedo	Álava			1		1
Alegría	Álava				3	3
Ali	Álava			1		1
Aperregui	Álava			1		1
Apodaca	Álava	1	6			7
Araya	Álava			1		1
Argómaniz	Álava				2	2
Basabe	Álava			1		1
Bujanda	Álava			1		1
Castillo	Álava			1		1
Cestafe	Álava		4			4
Contrasta	Álava			4		4
Dallo	Álava			4		4
Eguino	Álava			3		3
Esquível	Álava			4		4
Etura	Álava			15		15
Echávarri-Viña	Álava				3	3
Galarreta	Álava			2		2
Guevara	Álava			3		3
Guillarte	Álava			1		1
Heredia	Álava			3		3
Ilarduya	Álava			3		3
Lagrán	Álava			1		1
Letona	Álava			1		1
Lubiano	Álava			2		2
Maturana	Álava				2	2
Mioma	Álava			1		1
Monasterioguren	Álava			5		5
Montoria	Álava			1		1
Munain	Álava				2	2
Musitu	Álava		8			8
Narbaiza	Álava			5		5
Ondategui	Álava				6	6
Ondona	Álava			1		1
Opacua	Álava			3		3
Oteo	Álava				2	2
Peñacerrada	Álava				3	3
Pipaon	Álava			1		1
Retana	Álava			1		1
Subijana de Álava	Álava			5	4	9
Urbina	Álava		5			5
Valluerca	Álava			6		6
Vicuña	Álava				2	2

Vitoriano	Álava		2			2
Zaitegui	Álava		20	63	34	117
Zuazo de Vitoria	Álava	1	4	2		7
Zumelzu	Álava			5		5
Albaina	Burgos			1		1
Araico	Burgos			1		1
Moraza	Burgos			1		1
TOTAL		**2**	**49**	**157**	**66**	**274**

In order to compare the relative abundance of the species in each location, a 1-km radius buffer was created around each nest, adding those that were at a distance of less than 2 km, and the surface area of the resulting polygons was obtained. The abundance index presented in table II was calculated by dividing the number of nests in each clump by the surface area in km^2. In those locations visited over a period of several years, only the 2018 results were considered. Figure 3 shows the territorial distribution of the clumps and their classification according to abundance index intervals.

Table II.– Abundance index (Ia) according to clumps, shown in descending order.

Location	**Nests**	**Surface area (km^2)**	**Ia**
Zaitegui-Zarate	66	8.60	7.68
Etura-Guevara-Maturana	20	11.24	1.78
Musitu	8	5.35	1.49
Valluerca	6	4.50	1.33
Dallo	4	3.18	1.26
Esquível-Zuazo	8	6.53	1.22
Monasterioguren	5	4.27	1.17
Ondategui-Letona-Apodaca-Echávarri-Viña	16	14.13	1.13
Subijana-Zumelzu	10	9.00	1.11
Eguino-Ilarduya	6	6.28	0.96
Urbina	5	5.29	0.95
Heredia-Narbaiza	8	8.66	0.92
Contrasta	4	4.37	0.92
Cestafe	4	4.59	0.87
Peñacerrada	3	3.51	0.85
Munain-Vicuña-Opacua	7	10.75	0.65
Oteo	2	3.27	0.61
Alegría	3	5.18	0.58
Galarreta	2	3.66	0.55
Vitoriano	2	4.06	0.49
Argómaniz	2	4.71	0.42
Lubiano	2	5.13	0.39
Acebedo	2	5.55	0.36
Aberásturi	1	3.09	0.32
Abecia	1	3.09	0.32
Albaina	1	3.09	0.32
Ali	1	3.09	0.32
Araya	1	3.09	0.32
Araico	1	3.09	0.32
Badaya	1	3.09	0.32
Bujanda	1	3.09	0.32
Castillo	1	3.09	0.32
Guillarte	1	3.09	0.32

Lagrán	1	3.09	0.32
Mioma	1	3.09	0.32
Montoria	1	3.09	0.32
Moraza	1	3.09	0.32
Ondona	1	3.09	0.32
Pipaón	1	3.09	0.32
Retana	1	3.09	0.32

The altitudinal range of the egg-batches and nests found in this study vary from 524 m in Subijana de Álava to 1.008 m in Puerto de Rivas, while the great majority (75.9%) were found at between 580 and 720 m.

In the discriminant analysis carried out in order to determine the influence of climate on the distribution of this species, the function with the greatest discriminant power was 22.8798 - 1.825 * T - 0.799 * Ios2, where T is the annual mean temperature and Ios2 the ombrothermic index of the warmest two-month period, calculated as the quotient between the sum of mean monthly precipitations for July and August and the sum of the mean monthly temperatures for the same months. This function correctly classified 30 of the 32 squares included in the analysis (93.75%). The incorrectly-classified squares were, specifically, 30TVN93 and 30TWN03. Despite the fact that the presence of *E. catax* in these squares had been predicted by the discriminant function, we were not able to confirm this.

In order to study the preferences of this species regarding habitat, each of the nests was assigned the vegetation unit corresponding to their location according to the botanical cartography used (see the chapter on material and methods). In those locations visited over a period of several years, only those nests found in 2018 were considered. The results obtained are shown in table III.

Table III.– Distribution of nests according to vegetation units.

Vegetation	**Nests**	**%**
Scrubland and gall-oak groves	69	32.55
Juniper heaths-pastures with *Aphyllanthes monspeliensis*	50	23.58
Rough grass meadows of *Brachypodium pinnatum* or other mesophilic pastures	24	11.32
Cereal, potato and beet croplands	12	5.66
Subhumid montane holm oak groves	7	3.30
Juvenile or degraded stage of acidofilic oak or mixed woodlands	7	3.30
Scrubland with *Erica vagans* and *Brachypodium pinnatum*	7	3.30
Atlantic meadows and crop-fields	6	2.83
Subhumid montane holm oak groves / Scrubland and gall-oak groves	5	2.36
Pinus sylvestris woodlands	4	1.89
Forestry plantations	4	1.89
Moorland pastures complex	3	1.42
Brier or bramble patches	2	0.94
Ash-elm woods	1	0.47
Gall-oak woods with boxwood	2	0.94
Calcicolous gall-oak woods-common oak woods	2	0.94
Clay-loam erosion vegetation	2	0.94
Moorland pastures complex / Juniper heaths-pastures with *Aphyllanthes monspeliensis*	1	0.47
Calcicolous eutrophic beech woods / Brier or bramble patches	1	0.47
Calcicolous eutrophic beech woods / Sub-Cantabrian gall-oak groves	1	0.47
Forestry plantations (*Pinus nigra*) / Scrubland and gall-oak groves	1	0.47
Atlantic meadows and crop-fields / Scrubland with *Erica vagans* and *Brachypodium pinnatum*	1	0.47
Total	**212**	

Discussion

The data obtained in this study increase to 72 the number of UTM squares of 10 x 10 km in which the presence of *E. catax* in Spain has been confirmed. This represents a 53% increase with regard to the previous figure (JUBETE, 2019). The first records for the province of Burgos are also presented. These results confirm that there is still a lack of knowledge concerning the real distribution of this species in our country.

In Álava, *E. catax* has been recorded in most of the central part of this province, including the Condado de Treviño (Burgos), but this is not the case in the Atlantic watershed (northern area), in the lower parts of the basins of the Zadorra and Bayas rivers (south-east area) or in the Rioja Alavesa (southern area). According to ROMO *et al.* (2014), the distribution of this species in the Iberian Peninsula is determined by climate. In the model developed by those authors, the annual mean precipitation, the mean temperature of driest quarter and the mean temperature of coldest quarter were selected as the most significant variables. BOLZ (1998) considered that the air temperatures in the month of April are a determining factor as this is the moment of eclosion and the first larval stages, confirming that in those areas of Bavaria where this species was found the mean temperatures for this month varied between 7.5 and 9º C. In those areas where nests were observed in Álava, the mean temperature for the month of April varied over a slightly broader range, namely, between 6.2 and 9.3º C.

The discriminant function we obtained reveals that the annual mean temperature (T) and the ombrothermic index of the warmest two-month period (Ios2) provide a satisfactory explanation of the distribution of *E. catax* in Álava. These two variables correspond directly with those used by RIVAS-MARTÍNEZ & LOIDI (1999) in their bioclimatic classification (positive annual temperature and duration in months of summer drought), so that each square can be assigned a thermotype in accordance with the value of the aforementioned variables (Figure 4). The data gathered in this study confirm the presence of this species in 19 of the 20 squares situated at the supratemperate level (95.0%) and in 5 of the 7 located at the supramediterranean level (71.4%), while it has not been recorded at either the mesotemperate or the mesomediterranean levels. The discriminant function we have calculated predicts the presence of this species in all the squares of the supratemperate level and in 6 of the supramediterranean level (85.7%), and an absence in any square on the mesotemperate and mesomediterranean levels.

The extreme values of T and Ios2 for those locations with a confirmed presence of *E. catax* in Álava are 10.3-11.8º C and 1.9-2.9, respectively. We have used the values corresponding to the 95% confidence interval of each one of these variables (11.00 ± 0.74º C and 2.46 ± 0.56) to obtain the potential distribution area by means of the BIOCLIM algorithm (NIX, 1986) (fig. 5). Annual mean temperatures in excess of the upper limit would explain the absence of this species in the Atlantic watershed of the study area. A summertime aridity index under the lower limit would be, in turn, the reason for its absence in those areas near the River Ebro (to the south-east) and the Rioja alavesa. *E. catax* would also avoid areas of higher altitude, above 1000 m approximately.

Bearing in mind the high detectability of *E. catax* nests and the thoroughness of the surveys performed, the data deriving from this study indicate very low population densities for a lepidopteran. In comparison, AMBRUS *et al.* (2010) found at a location in western Hungary 924 nests along a 1.678 m-long and 10 m-wide transect, estimating a total of more than 250,000 egg-batches in an area of 4.6 km^2. Although relatively rare in number, in Álava, this species seems to be more abundant in the upper basin of the River Zadorra, where those clumps with the highest abundance indices are located, but with no statistical significance.

With regard to the plants on which the egg-batches were located, on 153 occasions (55.8%), the chosen species was *Crataegus monogyna* and on 121 occasions (44.2%), *Prunus spinosa,* of a total of 274 cases. It is well known that the preferences of *E. catax* in this regard vary from one area to another (KADEJ *et al.*, 2018). In Aragón, for example, of 13 nests discovered by MURRIA (2006), 12 were found on *Crataegus monogyna* L. and only one on *Prunus spinosa* Jacq. On the other hand, in Hungary, SÁFIÁN *et al.* (2010) observed a clear preference for the second of the aforementioned species, and

SITAR *et al.* (2019) demonstrated that this preference was statistically significant in Romania. The observations made by KADEJ *et al.*(2018) in Poland were similar, where some females also laid eggs on *Pyrus* sp. In Spain, *Dorycnium pentaphyllum* Scop.*, Quercus cerrioides* Willk. & Costa and *Ulmus campestris* L. have also been cited as food for caterpillars in their last stages of development (GARCÍA-PÉREZ *et al.*, 2009), and in addition to these species we add *Quercus faginea* Lam.

According to MURRIA (2006), the most frequent habitat of *E. catax* in the pre-pyrenean area of the province of Huesca are supra-mediterranean gall-oak groves with replanted or natural woods of *Pinus sylvestris* L. and *Pinus nigra* J. F. Arnold. GARCÍA-PÉREZ *et al.* (2009) believe, on the other hand, that the ideal habitat of this species in the north of the Iberian Peninsula are hedgerows in mid-montane areas, in which *Prunus spinosa* and *Crataegus monogyna* are very common. In Álava, the larval refuges we found were located mainly in woods (49.06%), in scrubland (27.83%), but also in areas with a predominance of herbaceous vegetation (14.15%) and even on land transformed into meadows and cropland (8.96%). It might be thought that the only requirement of this species is the presence of the shrub species on which it lays its eggs, which grow widely both in forest clearings and fringes, in scrubland and in hedgerows growing between pastures and agricultural land. However, in 69.34% of cases, the vegetation unit corresponding to the location in which nests were found was scrubland with gall-oak groves or one of their degradation stages (juniper heaths, rough grass meadows and moorland pastures), corresponding to the series *Pulmonario longifoliae-Quercetum fagineae* Loidi & Herrera 1990, which seems to show that *E. catax* shares to a large extent the ecological preferences of these plant communities. These entail formations that inhabit the foot of hillsides, in an intermediate position between the valley floor oak groves and the mountainside beech woods, in every case on basic substrates such as clayey loams and argillaceous limestone (ASEGINOLAZA *et al.*, 1989).

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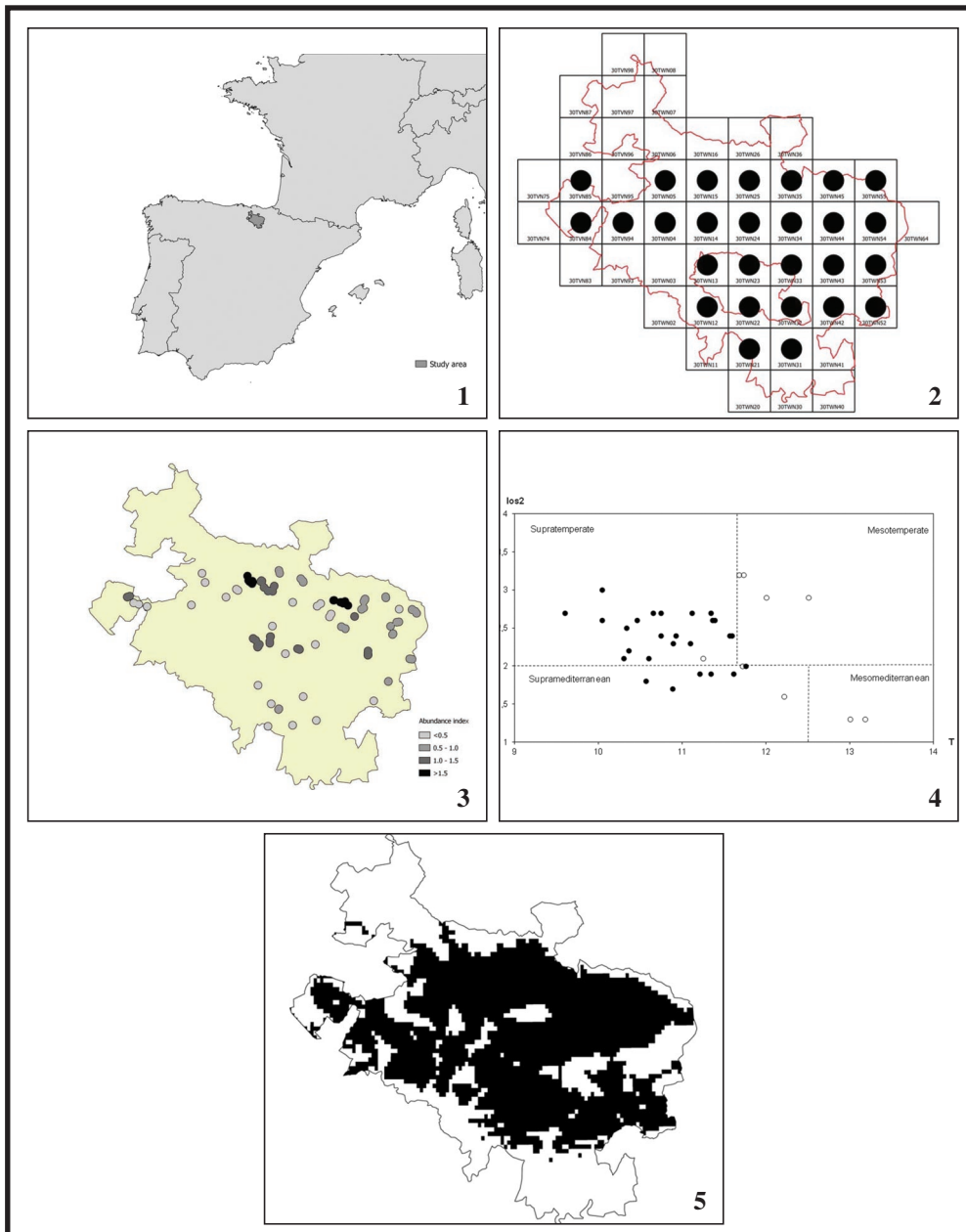

Figs 1-5.– 1. Location of the study area. **2.** Known distribution of *E. catax* in the study area according to UTM squares of 10 x 10 km. **3.** Classification of the clumps of nests according to their abundance index. **4.** Bioclimatic classification of the UTM squares with sides of 10 x 10 km. The solid black circles represent those squares in which the presence of *E. catax* was recorded. The blank circles indicate those in which this species was not found. **5.** Potential distribution of *E. catax* in the study area.

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New species of Politzariellinae from Cameroon with check list of the *Politzariella* Yakovlev, 2011 species (Lepidoptera: Cossidae)

R. V. Yakovlev & Gy. M. László

Abstract

The present paper contains the description of a new species, *Politzariella smithi* Yakovlev & László, sp. n. collected in northern Cameroon. Check list and distribution map of the species of the genus *Politzariella* Yakovlev, 2011 is provided, with 3 figures.
KEY WORDS: Lepidoptera, Cossiidae, Politzariellinae, taxonomy, Cameroon.

Nueva especie de Politzariellinae de Camerún con lista de las especies de *Politzariella* Yakovlev, 2011 (Lepidoptera: Cossidae)

Resumen

El presente trabajo contiene la descripción de una nueva especie *Politzariella smithi* Yakovlev & László, sp. n. recogida en el norte de Camerún. Se proporciona una lista y mapa de distribución de las especies del género *Politzariella* Yakovlev, 2011, con tres figuras.
PALABRAS CLAVE: Lepidoptera, Cossiidae, Politzariellinae, taxonomía, Camerún.

Introduction

Cossidae are a family of primitive Ditrysia Lepidoptera, including over 1200 valid species (SCHOORL, 1990; VAN NIEUKERKEN *et al*., 2011). A special element of the African fauna is the endemic subfamily Politzariellinae Yakovlev, 2011, including three genera: *Politzariella* Yakovlev, 2011 (type species (by monotypy) - *Politzariella pantherina* Yakovlev, 2011), *Holcoceroides* Strand, 1913 (type species (by monotypy) - *Holcoceroides ferrugineotincta* Strand, 1913) (YAKOVLEV, 2011) and *Geraldocossus* Yakovlev & Sáfián, 2016 (type species (by monotypy) - *Geraldocossus durrelli* Yakovlev & Sáfián, 2016) (YAKOVLEV, 2011; YAKOVLEV & SÁFIÁN, 2016; YAKOVLEV & WITT, 2016; YAKOVLEV *et al*., 2019).

The genus *Politzariella* Yakovlev, 2011 includes four species: *P. pantherina* Yakovlev, 2011 (type locality - Ober Volta [Burkina Faso], Bobo Dioulasso), *P. fontainei* Yakovlev & Witt, 2016 (type locality - [Congo] Uele, Paulis [Isiro], [2º46'00" N/ 27º37'00" E]), *P. edita* Yakovlev, Müller, Kravchenko & Petrányi, 2019 (type locality - Guinea Konakri, Macenta Prefecture, Ziama Forest, Mt. Nimba), and *P. frici* Yakovlev & Sáfián, 2019 (type locality - Zambia, Mwinilunga district, North-Western Province, Chiwoma riverine forest). All species of the genus are known only from their type localities (Fig. 1).

During the examination of the materials deposited in the museum of the African Natural History

Research Trust (Leominster, G.B.) a single male specimen of peculiar, dark habitus belonging to the genus *Politzariella* collected recently in Cameroon has been found. On the grounds of both external and genitalia morphology, the specimen displays notable differences compared with its congeners, representing a species new to science. The description of the new species is given in this paper.

Material and methods

The collected material is deposited in the collection of the African Natural History Research Trust, Leominster (ANHRT). The genitalia were dissected and stained with Eosin red and mounted in Euparal on microscope slides applying standard methods of preparation (LAFONTAINE & MIKKOLA, 1987). The adults were photographed using a Nikon D90 SLR camera equipped with Nikon AF Micro 60 mm lens. The genitalia preparations were photographed using a Canon EOS 700D SLR camera mounted on a Wild M7A Stereomicroscope.

Taxonomic part

DESCRIPTION OF THE NEW SPECIES

Politzariella smithi Yakovlev & László, sp. n. (Figs 2-3)

Material: Holotype ♂, CAMEROON, North Region, Wack (La Falaise), 07º40'16.5"N, 13º33'18.4"E, 900 m, 2-21-X-2018, General coll., Safian, Sz., Simonics, G. leg., ANHRT 2018.36. Specimen unique number: ANHRTUK 00057992. Genitalia slide number: LG 5194 (prepared by Gy. M. László) (coll. ANHRT).

Description: Length of forewing 11.5 mm. Antenna short, half as long as forewing, filiform with flattened segments. Forewing dark greyish brown, with a slightly paler postdiscal area, fringe uniform dark brown. Transverse lines deleted. Hindwing graphite grey without pattern, fringe dark grey.

Male genitalia: Uncus bifid, heavily sclerotized very broad at base, with two short, apically broadly rounded triangular arms; medial incision of uncus wide, semicircular. Gnathos reduced, its arms short and robust, strongly curved, with tapered sclerotized apices, rather hook-shaped, medially unfused; tegumen robust, trapezoidal; valva short, rectangular, apically truncate, costal margin with a small, but well expressed, triangular digitus erected medially projecting towards the medial plate of valva; sclerotized harpe on costal edge (in middle third), distal margin conspicuously straight, ventral margin slightly rounded, sacculus narrow, without processes; juxta heavily sclerotized, rather elongated, very characteristic in shape (see Fig. 3); saccus narrow, medium long, apically semicircular; phallus tubular, straight, narrow, its length as that of valva, vesica aperture in dorso-apical position, vesica without cornuti.

Female unknown.

Etymology: The new species is dedicated to Mr. Richard Smith, founder and director of the African Natural History Research Trust, whose efforts in maintaining a research institute and museum, as well as organizing extensive entomological surveys in numerous Sub-Saharan countries making an immense contribution to the knowledge of the taxonomy, biogeography and phylogeny of Afrotropical insects.

Diagnosis: The new species differs from the known representatives of the genus by the following characters: - from *P. pantherina* and *P. fontainei* it differs by the lack of mottled pattern of spots on the forewing; - from *P. frici* by the narrower forewing and the straight outer margin of the valva (in *P. frici,* the forewing is wider and shorter, the valva is narrower apically); - though being very closely related to *P. edita*, from which the new species differs by its blackish brown forewing (in *P. edita,* the forewing is ochreous with a brown field postdiscally), and by the even costal edge of the valva (in *P. edita,* the costal edge of the valva bears a semicircular process in its distal third).

Species content of the genus *Politzariella* Yakovlev, 2011

Politzariella Yakovlev, 2011

Neue Ent. Nachr., **66**: 47
Type species: *Politzariella pantherina* Yakovlev, 2011 (by monotypy).

Politzariella edita Yakovlev, Müller, Kravchenko & Petrányi, 2019
Politzariella edita Yakovlev, Müller, Kravchenko & Petrányi, 2019. *In* Yakovlev, Müller, Kravchenko, Petrányi & Sáfián.- *Russian Ent. J.*, **28**(3): 313
Type locality: Guinea Conakry, Macenta Prefecture, Ziama Forest, Mt. Nimba
Type material (holotype, male) in coll. G. Müller, Freising / later Zoologische Staatssammlung, Munich.
Distribution: Guinea Conakry.

Politzariella fontainei Yakovlev & Witt, 2016
Politzariella fontainei Yakovlev & Witt, 2016. *Biol. Bull. Bogdan Chmel. Mel. State Ped. Univ.*, **6**(3): 156
Type locality: [Congo] Uele, Paulis [Isiro], [2º46'00" N/27º37'00" E].
Type material (holotype, male) in Museum Royal of Central Africa, Tervuren.
Distribution: Northern-East Congo.

Politzariella frici Yakovlev & Sáfián, 2019
Politzariella frici Yakovlev & Sáfián, 2019. *In* Yakovlev, Müller, Kravchenko, Petrányi & Sáfián.- *Russian Ent. J.*, **28**(3): 315
Type locality: Zambia, Mwinilunga district, North-Western Province, Chiwoma riverine forest.
Type material (holotype, male) in Zoologische Staatssammlung, Munich.
Distribution: Zambia, Mwinilunga district.

Politzariella pantherina Yakovlev, 2011
Politzariella pantherina Yakovlev, 2011. *Neue Ent. Nachr.*, **66**: 47
Type locality: [Burkina Faso] Ober Volta, Bobo Dioulasso.
Type material (holotype, male) in Zoologische Staatssammlung, Munich.
Distribution: Burkina Faso.

***Politzariella smithi* Yakovlev & László, sp. n.**

Type locality: Cameroon, North Region, Wack (La Falaise), 07º40'16.5"N, 13º13'18.4"E.
Type material (holotype, male) in African Natural History Research Trust, Leominster.
Distribution: Cameroon, North Region.

Discussion

The genus *Politzariella* Yakovlev, 2011 is currently consisting of five species distributed in the Afrotropical region (from Cameroon to Zambia) and together with the following Cossidae genera - *Holcoceroides* Strand, 1913 (type species *Holcoceroides ferrugineotincta* Strand, 1913) (YAKOVLEV, 2011), *Geraldocossus* Yakovlev & Sáfián, 2016 (type species *Geraldocossus durrelli* Yakovlev & Sáfián, 2016), *Gumilevia* Yakovlev, 2011 (type species *Gumilevia zhiraph* Yakovlev, 2011), *Assegaj* Yakovlev, 2006 (type species *Assegaj clenchi* Yakovlev, 2006), *Mirocossus* Schoorl, 1990 (type species *Brachylia badiala* Fletcher, 1968), *Acosma* Yakovlev, 2011 (type species *Acosma gurkoi* Yakovlev, 2011) - forms the core of the Cossidae fauna in the tropical Africa.

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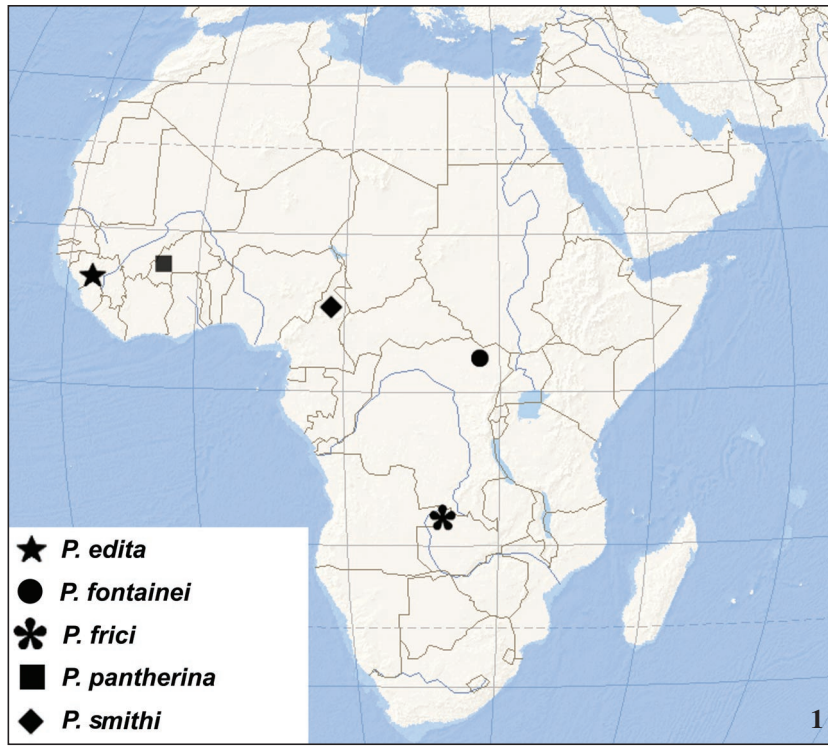

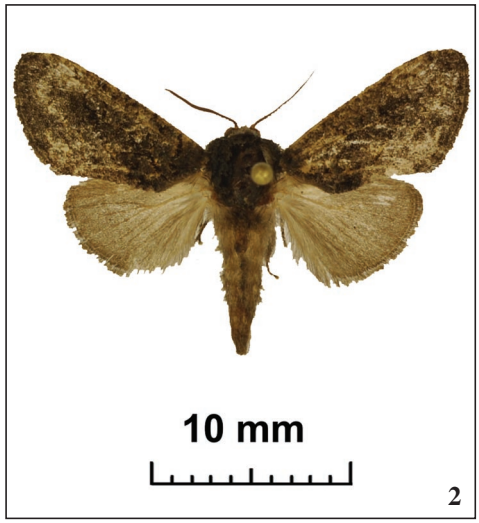

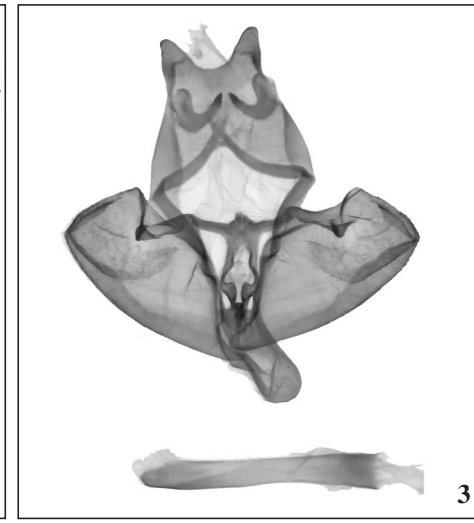

Figures 1-3.– 1. Distribution map of Genus *Politzariella* Yakovlev, 2011. **2.** *Politzariella smithi* Yakovlev & László, sp. n., holotype. **3.** *Politzariella smithi* Yakovlev & László, sp. n., male genitalia (slide number: ANHRT-5194).

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Libro:

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Internet:

DE PRINS, J. & DE PRINS, W., 2011.- *Global taxonomic database of Gracillariidae (Lepidoptera).* Disponible en http://www.gracillariidae.net (accedido el 14 de diciembre de 2011).

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The New World Ocnonemidinae genus *Neogalea* Hampson, 1906 (Lepidoptera: Noctuidae)

V. O. Becker

Abstract

The genus *Neogalea* Hampson, 1906 is reviewed, including three species. *N. sunia* (Guenée, 1852) with Pan-American distribution, *N. caracara* Troubridge, 2020 known from the Florida Keys and Brazil and a new one restricted to a specific region of Brazil: *Neogalea sororcula* Becker, sp. n. (Semiarid or Caatinga biome). A key to species, diagnosis, descriptions, and illustrations for the three species are presented.
KEY WORDS: Lepidoptera, Noctuidae, *Neogalea*, taxonomy, diagnosis, distribution, Brazil.

El género *Neogalea* Hampson, 1906 de Onconemidinae del Nuevo Mundo (Lepidoptera: Noctuidae)

Resumen

Se revisa el género *Neogalea* Hampson, 1906, incluyendo tres especies: *N. sunia* (Guenée, 1852) con distribución Panamericana, *N. caracara* Troubridge, 2020 conocida de los Caicos de la Florida y de Brasil, y una nueva *N. sororcula* Becker, sp. n., restringida a la región semiárida de la Caatinga en Brasil. Se presenta una clave para las especies, diagnosis, distribuciones e ilustraciones de las tres especies.
PALABRAS CLAVE: Lepidoptera, Noctuidae, *Neogalea*, taxonomía, diagnosis, distribución, Brasil.

Introduction

Neogalea Hampson, 1906, has been regarded as a monotypic genus since it was proposed to accommodate *N. braziliensis* Hampson, 1906. TODD (1972: 260) synonymized *N. braziliensis* under *N. esula* (Druce, 1889), and HAYES (1975: 173), described *N. esula longfieldae* Hayes, 1975*,* a form from the Galapagos Archipelago. POOLE (1989: 681), treated all these names, in the Cuculliinae, as synonyms of *N. sunia* (Guenée, 1852). A second species: *N. caracara* Troubridge, 2020 was just described, based on a single male from the Florida Keys and is here recorded for Brazil for first time. *Neogalea sunia* is a common species throughout the neotropical region, whose caterpillars feed on *Lantana* species, and for this reason has been introduced into several countries as a biological control agent (ZHANG, 1994: 333). The genus was listed in the Oncocnemidini by FRANCLEMONT & TODD (1983: 146), next to *Catabena* Walker, 1865, and by TROUBRIDGE (2008: 59) (as Oncocnemidinae) between *Catabenoides* Poole, 2002 and *Calophasia* Stephens, 1829.

Materials and methods

This review is based on 88 specimens (including nine genitalia slides), 32 in VOB, 56 HTC, and

on the type-material in NHMUK. Synoptic collections representing the Noctuidae species in VOB were taken to the last institution and to USNM and compared with their collections in previous years. The global coronavirus quarantines prevented travel or borrowing specimens during the preparation of this manuscript, but it was possible to examine images of the USNM specimens, including seven genitalia slides. The holotype of the new species is provisionally deposited in VOB, and will be transferred, together with the collection, to a Brazilian institution in the future. Genitalia were prepared following the methods described by ROBINSON (1976). Terms for morphological characters follow HODGES (1971).

Abbreviations

CNC	Canadian National Collection, Ottawa, Canada
FW	Forewing
G. s.	genitalia slide
HTC	Hubert Thöny Collection, Camacan, Bahia, Brazil
HW	Hind wing
NHMUK	Natural History Museum, United Kingdom
MNHN	Muséum Nationale d'Histoire Naturelle, Paris, France
USNM	National Museum of Natural History, Smithsonian Institution, Washington, USA
VOB	Vitor O. Becker collection, Serra Bonita Reserve, Camacan, Bahia, Brazil

Results

The large series of specimens studied revealed that three species belong to *Neogalea,* one of them new. All species are described, and diagnosis, and illustrations of both adults and genitalia are presented allowing the identification of the species.

Neogalea Hampson, 1905
TS: *Neogalea braziliensis* Hampson, 1905. *Cat. Lep. Phal.,* **6**: 8

Diagnosis: Medium size; FW 12-16 mm (28-36 mm wingspan), gray to dark gray, ante- and postmedial bands indistinct, ill-defined; HW translucent white, margins narrowly fringed gray. Abdomen with a pad with long bristles at 2nd sternite. Male genitalia symmetrical; uncus long, evenly curved, apex sharp; sacculus broad, 2/3 as long as valva, sacculus process long, tapering distad, strongly bent towards costa. Aedeagus as long as valva; vesica with a small sac with pouch of small cornuti near base, rows of long, thin spines distad. Female genitalia with ostium wide, ductus bursae short, with sclerotized area before corpus bursae; corpus bursae globose or elongate, signum present or absent; appendix bursae large; both corpus and appendix bursae wrinkled.

Distribution: New World Tropics, from southern United States, to southern Brazil and Argentina.

Remarks: TODD (1972: 260) regarded *Neogalea* Hampson, 1906 as distinct to *Catabena* Walker, 1865 on the base of the corona, formed by a multiple row of long, thin bristles, whereas in *Catabena* (where he included all the species currently in *Catabenoides* Poole, 2002), it is formed by a single row of stronger bristles along the apical margin.

There is a lineage of species that are externally similar to *Neogalea* in Central America and the Caribbean which are near *Neogalea* and *Catabenoides* but differ from both in male genitalia. The sacculus processes are long, straight, pointing to the apex of valva, whereas in *Neogalea* they are angled towards costa (examples include USNM ENT 01276341, 01343384, 01343385, and VOB 14210, 72842, 121899, 129151). Thus, any critical identifications of *Neogalea* from south of the United States should include examination of male genitalia.

Key to species: male genitalia

1. Valva strongly constricted .....*caracara*
Valva with margins parallel.....2

2. Sacculus process single .....*sunia*
Sacculus process branched .....*sororcula*

Neogalea sunia (Guenée, 1852) (Figs. 2, 6, 7, 11)
Xylomyges sunia Guenée, 1852. *Hist. nat. Ins., Noct*., **1**: 149
Holotype ♂, [US VIRGIN ISLANDS]: St. Thomas, [no further data] (MNHN) [image examined].
= *Neogalea braziliensis* Hampson, 1905. *Cat. Lep. Phal.,* **6**: 8
Holotype ♀, BRAZIL, Rio de Janeiro, Rio de Janeiro (NHMUK) [examined]
= *Xylina esula* Druce, 1889. *Biol. Cent. Amer. Lep.-Het.*, **1**: 297, pl. 28, fig. 1
Holotype ♂, MEXICO, Tabasco, Teapa (NHMUK) [examined].
= *Neogalea esula longfieldae* Hayes, 1975. *Proc. Calif. Acad. Sci.,* **40**(7): 173
Holotype ♂, ECUADOR, Galápagos Archipelago, Isabela Island, Tagus Cove, 150 ft, 3-VIII-1924 (Collenette) (NHMUK) [examined].

Diagnosis: Sexes similar (Fig. 2). FW 13-15 mm (30-35 mm wingspan), gray; veins marked dark gray; mixed with white scales; antemedial band indistinct, postmedial ill-defined, serrate, slightly visible from M3 to dorsum. HW translucent white, thin, gray margin, broadening towards apex, veins gray towards margins. Abdomen gray, whitish ventrally. Male genitalia (Fig. 6): Sacculus process long, tapering distad, bent in a straight angle towards mid costa; aedeagus (Fig. 7) as long as valva, vesica with row of long, thin spines. Female genitalia (Fig. 11): Ostium bursae wide; ductus bursae with short membranous base, sclerotized distad; corpus bursae globose, signa indistinct; appendix bursae half the size of corpus bursae; both corpus and appendix bursae finely wrinkled.

Material studied: 61 ♂♂ (5 g. s.), 24 ♀♀ (1 g. s.). MEXICO, Chiapas, Villas las Rosas, 1300 m, 1 ♂, 27-VI-1981 (Becker 43347) (VOB); San Luis Potosi, Cerro Potosi, 2800 m, 1 ♂ (g. s. 5563), 26-VI-1997 (Becker 110281) (VOB); Ciudad Maiz, 1200 m, 1 ♂, 24-VI-1997 (Becker 110135); Tamaulipas, San Fernando, 50 m, 1 ♂, 1 ♀, 28-VI-1997 (Becker 110454) (VOB); Gómez Farias, 1200 m, 1 ♂, 2 ♀♀, 29-31-VII-1988, 26-V-1997 (Becker 69241, 108952) (VOB); CUBA: Santiago, Gran Piedra, 1200 m, 1 ♂, 1 ♀, 20-VII-1980 (Becker 72841) (VOB); BRITISH VIRGIN ISLANDS, Guana Island, 80 m, 4 ♂♂ (g. s. 5595), 9-23-VII-1987, X-1989 (Becker & Miller 66610, 70709); US VIRGIN ISLANDS, St. Thomas, 300 m, 1 ♂ (g. s. 5562), 25-30-VII-1987 (Becker 66997) (VOB); ECUADOR: Loja, Catamayo, 1300 m, 1 ♀ (g. s. 5564), 20-XII-1992 (Becker 102614) (VOB); BRAZIL: Bahia, Camacan, 15º23'S - 39º33'W, 800 m, 6 ♂♂ (g. s. 5565), 21-30-IX-1991, 9-20-IV-2005, VI, VIII-2010, II-2012 (Becker 83593, 136287, 145870, 146654, 148636) (VOB); Porto Seguro, 16º27'S - 39º03'W, 40 m, 1 ♀ (g. s. 5566), 6-8-X-2008 (Becker 140962) (VOB); Ceará, Pacatuba, 250 m, 1 ♀, 6-IV-19914 (Becker 91566) (VOB); Espirito Santo, Santa Leopoldina, 650 m, 25 ♂♂, 11 ♀♀, 10-25-XI, 8-20-XII-1996, 10-25-I, 15-IV, 10-VI-10-VII, 20-VIII, 15-X-1997, 2-29-IV-1998, 1-19-V; 1-31-XI-1999, 1-3-III-2000 (Thöny) (HTC); Minas Gerais, Sete Lagoas, 720 m, 20-V-1974 (Becker 2886) (VOB); Poté, 500 m, 2 ♂♂, 1 ♀, 15-XI-1985, 30-IV-1996,15-II-1997 (Thöny) (HTC); Paraná, Curitiba, 920 m, 1 ♂, 25-X-1975 (Becker 3394) (VOB); Tijucas do Sul, Castelhanos, 500 m, 7 ♂♂, 7 ♀♀, 2-29-V-1999 (Thöny) (HTC); Rio de Janeiro, Arraial do Cabo, 50 m, 3 ♂♂, 29-I-1985 (Becker 55406) (VOB); Santa Catarina, São Bento do Sul, 800 m, 2 ♂♂, 2-9-VII-1998 (Thöny) (HTC); USA HAWAII, Oahu, Honolulu, 1 ♂, 16-28-II-1992 (Becker & Miller) (VOB).

Distribution: Widely distributed throughout the New World tropics, from southern USA, south to Argentina and southern Brazil. Specimens in USNM indicate it is widespread in Southern California, Arizona, and Texas, and occasionally collected in Florida. It has been intentionally introduced into Australia, Hawaii, New Caledonia, and South Africa as a biological control of weedy *Lantana* species (ZHANG, 1994: 333). The South African introduction was apparently not successful (BAARS, 2003).

Remarks: A common species, occurring in all kinds of biomes, from sea level up to 2800 m, especially in open, disturbed areas, where *Lantana* species grow as invasive, pioneer plants. COMSTOCK & DAMMERS (1935) and REINERT *et al*. (2009) described the biology of *sunia* in California and Texas, respectively. BADO *et al*. (2004) described the morphology of all development stages (including six instars), biological traits and damage in Argentina. Male genitalia (Fig. 5) of specimens from St. Thomas, the type locality of *sunia,* from Mexico, Ecuador and from Brazil are consistently similar. Similar to *sororcula* and *caracara,* easily distinguished from those by the shape of genitalia: sacculus process a single, long, curved rod in *sunia* whereas forked in *sororcula;* valva strongly constricted, with large sacculus in *caracara.*

Hampson treated this species in three different places, once in the Cuculliinae, as *Neogalea braziliensis* Hampson, 1906: 7, and twice in the Acronyctinae: *esula* Druce in *Catabena* Walker (HAMPSON, 1909: 234), and *sunia* Guenée, in *Xylomyges* Guenée, 1852 [= *Spodoptera* Guenée, 1852] as the senior synonym of *albula* (Walker, 1857) (HAMPSON, 1909: 274). TODD (1972: 260) synonymized *braziliensis* under *esula* and treated both as *Neogalea.* POOLE (1989: 681) established the synonymy as treated above.

The wings have been figured multiple times including BARNES & MCDUNNOUGH (1913: pl. 9), HAYES (1975), HOLLOWAY (1977), BECKER & MILLER (2002) and BADO *et al*. (2004) but the genitalia have evidently never been figured.

***Neogalea sororcula* Becker, sp. n.** (Figs. 1, 4, 5, 12)

Material examined: Holotype 1 ♂, Brazil, Bahia, 9 km W of Boa Nova, 14º36'S - 40º26'W, 750 m, 4-XII-2013, g. s. 5567 (Becker 150604) (VOB). Paratypes: 1 ♀, g. s. 5568, same data as holotype (VOB); 1 ♂, Idem, Jussiape, 700 m, 1-30-XI-1997 (Thöny) (HTC).

Diagnosis: Sexes similar. FW dark gray; darker between ante- and postmedial bands; HW translucent white, slightly dusted gray around apex. Male genitalia symmetrical, sacculus process forked distad, as sharp pointed, asymmetrical Y. Female genitalia: Female genitalia with sclerotized area before corpus bursae larger than in *sunia*; corpus bursae oblong.

Description: Sexes similar. Male 12 mm (28 mm wingspan); female (Fig. 1) 14 mm (33 mm wingspan). Dark gray. Labial palpi with whitish scales below; frons black, vertex whitish, thin black line across; antenna black, some white scales on basal third. Thorax dark gray dorsally, white ventrally. Legs gray, hind tarsi black. Patagia with thin, black line below; tegula dark gray. FW with veins and lines between veins, black; area basad to postmedial band darker; ante- and postmedial bands indistinct, postmedial, above dorsum edged whitish outside; two small, elongate, white dots in the middle: one at middle of cell, the other just outside; area on tornus, distad of postmedial band, whitish. HW translucent white, termen edged with thin, gray line, widening towards apex. Abdomen dorsally light gray, banded with thin, white lines whitish underside.

Male genitalia (Fig. 4): Uncus thin, long, curved rod, basal 2/3 with same diameter throughout, tapering distad to a sharp tip; sacculus process forked, longer branch crossing valva reaching mid costa; juxta subsquare, wider towards base. Aedeagus (Fig. 5) slightly shorter than valva, bent ventrad; vesica with a lateral, long sac with thin, long spine at tip; two pockets of strong cornuti at base; multiple long bristles to apex.

Female genitalia (Fig. 12): Ostium bursae, conical; ductus bursae short, membranous at base, strong, widely sclerotized at distal third towards corpus bursae; corpus bursae large, elongate; signum absent; appendix bursae smaller than corpus bursae.

Distribution: Brazil, Bahia, in the Caatinga biome or semiarid region

Etymology: From the Latin *soror* = sister; diminutive [the little sister]; feminine.

Remarks: Similar to *C. sunia*; slightly smaller, darker. Easily distinguished by male genitalia, with sacculus process branched into an asymmetrical, Y-shape structure (a single process in *sunia*).

Neogalea caracara Troubridge, 2020 (Figs 3, 8-10)
Neogalea caracara Troubridge, 2020. *Insecta mundi,* **789**: 32
Holotype ♂, USA, Florida, Munroe Co., Florida Keys, Dagny Johnson State Park, 11-III-2012 (CNC) [not examined].

Material studied three specimens (two g. s.). BRAZIL: Rondonia, Cacaulândia, Rancho Grande, 350 m, 2 ♂♂, 1 ♀, 1-20-XI-1999, g. s. 5569, 5570 (Thöny) (VOB, HTC).

Diagnosis: Sexes similar. Male FW 17 mm (38 mm wingspan); female FW 18 mm (wingspan). Gray; veins marked dark gray; mixed with white scales; antemedial band indistinct, postmedial ill-defined, serrate, slightly visible from M3 to dorsum. HW translucent white, narrowly bordered gray, broadening towards apex, veins dark towards margins. Abdomen gray, whitish ventrally. Male genitalia: valva strongly constricted at distal third; aedeagus slightly shorter than valva. Female genitalia: Ostium bursae wide, nearly square; corpus bursae elongate; signa present.

Description male (Fig. 3): 17 mm (38 mm wingspan); female 18 mm (40 mm wingspan). Gray. Labial palpi whitish below; frons black, white line above, below antenna; vertex gray; antenna fuscous, mixed with white scales at basal half. Thorax dorsally mixed with white, black, and fuscous scales; patagia with four horizontal, thin lines, the outside ones black. FW veins and lines between veins dashed dark gray; mixed with white scales; antemedial band indistinct, postmedial ill-defined, serrate, slightly visible from M3 to dorsum, white outside; diffuse fuscous patch on tornus; termen edged with thin lunules between veins; cilia gray, interrupted white on veins. HW translucent white, narrowly bordered gray at apex, veins dark towards margins. Abdomen gray, whitish ventrally.

Male genitalia (Fig. 8): Uncus long, curved, basal third flattened dorso-ventrally, distal two thirds a curved rod, densely covered with long bristles, apex blunt; valva strongly constricted at distal third; sacculus large, ventral margin evenly round, distal end tapering to a curved, sharp pointed hook; cucullus oblong, ventral margin with a thin, long, curved, sharp pointed process; corona a multiple row of thin, long spines; ampulla triangular; juxta trapezoidal, wider basal; saccus converging to a sharp process in the middle. Aedeagus (Fig. 9) twice as long as thick, straight; vesica with a group of cornuti near base, multiple, long spines distad.

Female genitalia (Fig. 10): Ostium wide, square, slightly sclerotized; pair of lateral, rounded knobs at junction with ductus bursae; ductus bursae narrow, wrinkled; corpus twice as long as wide; wrinkled; signa a pair of opposite, long, narrow, minutely spined, with ridge along middle; appendix bursae globose, a sclerotized band towards connection with corpus bursae.

Distribution: Southern USA (Florida Keys) and Brazil (Amazon region).

Remarks: Externally almost identical to *sunia*, slightly larger and paler. Genitalia much different, especially the constricted valva with large sacculus, as shown by the illustrations. The species was described from a single male specimen. The records from Brazil expands it is distribution widely and brings information about its female. This manuscript was ready and under review for publication, including the description of this species as new, when the author received Troubridge's publication.

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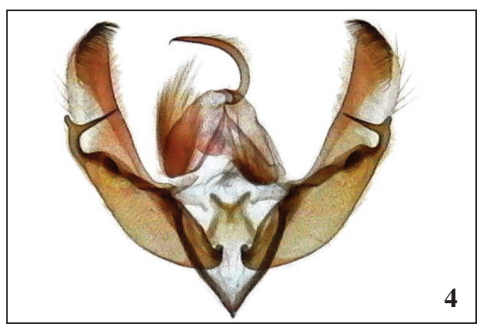
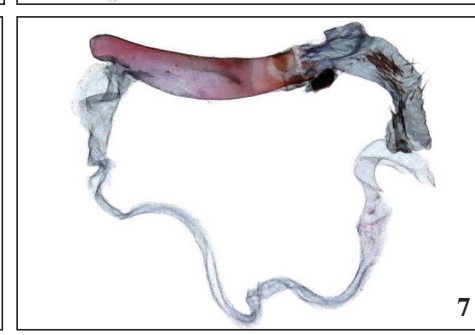
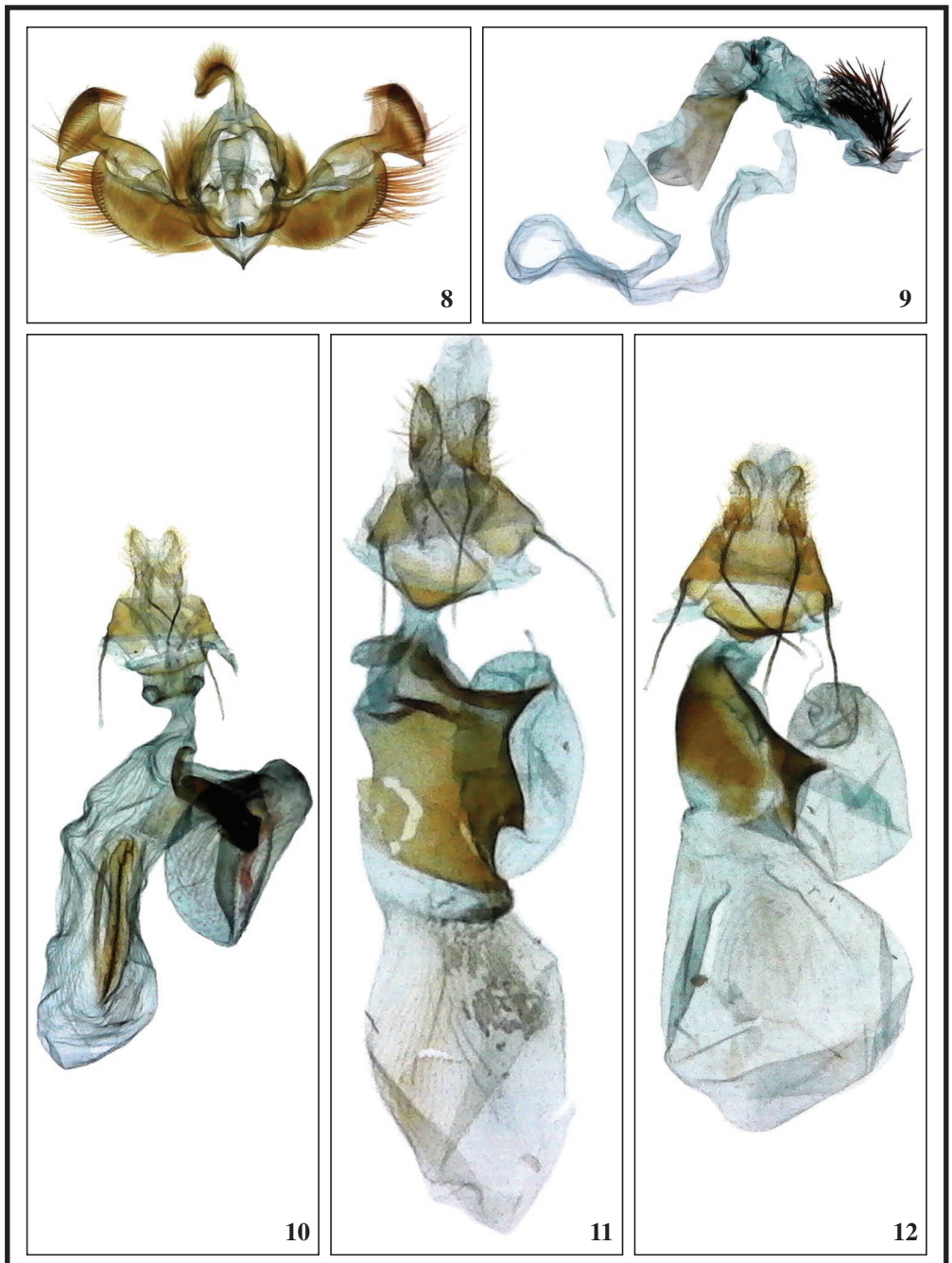




Figs 1-7.– Adults of *Neogalea.* **1.** *N. sororcula* Becker, sp. n., paratype ♀. **2.** *N. sunia* (Gn.). **3.** *N. caracara* Troubridge, ♂, Brazil. **4-12.–** Genitalia of *Neogalea.* **4.** *N. sororcula* Becker, sp. n., holotype ♂. **5.** *N. sororcula,* aedeagus. **6**. *N. sunia* (Gn.) ♂. **7.** *N. sunia* (Gn.), aedeagus.



Figs 8-13.– Genitalia of *Neogalea.* **8.** *N. caracara* Troubridge, ♂, Brazil. **9.** *N. caracara* Troubridge, aedeagus. **10.** *N. caracara* Troubridge, ♀. **11.** *N. sunia* (Gn.), ♀. **12.** *N. sororcula* Becker, sp. n., paratype ♀.

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Ypsolopha milfontensis Corley & Ferreira, a new species from the Portuguese coast (Lepidoptera: Ypsolophidae)

M. F. V. Corley & S. Ferreira

Abstract

Ypsolopha milfontensis Corley & Ferreira, sp. n. is described from the coast of south-west Portugal where its hostplant is *Ephedra fragilis* Desf. It is closely related to *Ypsolopha instabilella* (Mann, 1866), but with some differences externally, in male and female genitalia and a significant difference in DNA barcode.
KEY WORDS: Lepidoptera, Ypsolophidae, new species, *Ypsolopha*, *Ephedra*, Portugal.

Ypsolopha milfontensis **Corley & Ferreira, uma espécie nova da costa portuguesa (Lepidoptera: Ypsolophidae)**

Resumo

Ypsolopha milfontensis Corley & Ferreira, sp. n. é descrita da costa sudoeste de Portugal, onde a planta hospedeira é *Ephedra fragilis* Desf. É uma espécie próxima de *Ypsolopha instabilella* (Mann, 1866), apresentando diferenças na morfologia externa, na genitália do macho e da fêmea e no código de barras de ADN.
PALABRAS CHAVE: Lepidoptera, Ypsolophidae, espécie nova, *Ypsolopha*, *Ephedra*, Portugal.

Ypsolopha milfontensis **Corley & Ferreira, una nueva especie de la costa portuguesa (Lepidoptera: Ypsolophidae)**

Resumen

Ypsolopha milfontensis Corley & Ferreira, sp. n. se describe de la costa sudoeste portuguesa, donde la planta huésped es *Ephedra fragilis* Desf. Es una especie próxima de *Ypsolopha instabilella* (Mann, 1866), presentando diferencias en la morfología externa, en la genitalia del macho y de la hembra y en el código de barras genético ADN.
PALABRAS CLAVE: Lepidoptera, Ypsolophidae, nueva especie, *Ypsolopha*, *Ephedra*, Portugal.

Introduction

The Portuguese Lepidoptera fauna has approximately half as many species as that of Spain. While this might be expected due to smaller area and more restricted altitude and latitude together with correspondingly less diverse climate and habitats, there are still gaps in the knowledge of the Portuguese fauna due to a lack of fieldwork in some areas and habitats. We recognised that one such gap was the fauna associated with the shrub *Ephedra* Tourn. ex L. *Ephedra* is a member of the

Gnetopsida, a small class within the Gymnospermae (more familiarly including trees and shrubs such as *Pinus* and *Juniperus*). In Spain there are at least six species of Lepidoptera which feed exclusively on species of *Ephedra* (ROBINSON *et al*., 2010). As far as we were aware, no-one had ever examined *Ephedra* in Portugal for Lepidoptera, and no *Ephedra*-feeding species had been recorded.

On a field trip to south-west Portugal in May 2019 we made a special effort to find *Ephedra fragilis* Desf., the only Portuguese species of the genus, which we understood was locally abundant along the coast between Sines and Odeceixe. On 27-V-2019 we visited a number of sites along the coast between Vila Nova de Milfontes and Cabo Sardão without finding any *Ephedra*. Night time field work was further inland, but we had left a single UV light trap near our base at Vila Nova de Milfontes between sand dunes and a car park. On returning to base in the small hours we checked this light and found a single *Ypsolopha* which we could not identify.

The genus *Ypsolopha* Latreille, 1796 shows great diversity of forewing shape, coloration, and markings, often allowing easy identification in the field where the fauna is well-known. There are a number of species feeding on *Ephedra* in southern Europe, North Africa, the Middle East and on into Central Asia as well as in North America. As the specimen collected was not recognised, MC concluded it was likely to be one of the *Ephedra*-feeding species with which he was not familiar. In expectation that there must be *Ephedra* nearby, MC went searching for it the following morning and soon found one stand of the plant about 200 metres from the UV light. That night, we left a UV light by the *Ephedra* plants. On our return to the light late that night we found four more *Ypsolopha* on the plant near the trap, but none in the trap. SF noticed that there were small brown larvae feeding on the *Ephedra* stems, and we collected nine of these. In spite of further searching northwards towards and beyond Sines on 28 May we found no more *Ephedra*.

The larvae collected from *Ephedra* continued to feed and all pupated. Nine adults emerged between 20 June and 3 July 2019. From their external appearance they were provisionally identified as *Y. instabilella* (Mann, 1866), a species already known to be present in Spain (VIVES MORENO, 2014) which has a wide distribution from southern Spain, south France, Switzerland, Croatia (type locality), Ukraine, Turkey, Israel (GERSHENSON *et al*., 2002) and on into central Asia, where it is recorded from Uzbekistan, Tajikistan, and Kyrgyzstan.

Legs were taken from the specimens captured in Portugal and placed in alcohol for subsequent DNA sequencing. Genitalia dissection of one male showed slight differences from male genitalia of a Spanish specimen illustrated on the Lepiforum website, but at this early stage it was not clear if these were significant.

When barcodes were obtained, these showed over 4% difference from barcodes of *Y. instabilella* on BOLD from Spain and Croatia. This led to the supposition that the species was not *Y. instabilella*, but an undescribed species. A further male and two females were dissected and compared closely with the male and female genitalia photographs of *Y. instabilella* on Lepiforum e. V. (2020). We conclude that the differences in genitalia are sufficient to justify the description of a new species, supported by differences in DNA barcode and external morphology.

Abbreviations

GP	Genitalia preparation
INV*****	InBIO Barcoding Initiative sample code
NHMUK	Natural History Museum, London, England
P*****	Martin Corley collection number of specimens
SU18/***	Jan Šumpich collection number of specimens

Materials

Ypsolopha instabilella. All material examined as photos. SPAIN, Almería, Sierra de Alhamilla, 37º 00’ 02” N, 02º 09’ 88” W; Nijar env. 560 m, 1 ♂, 30-IV-2008, J. Šumpich leg. 18/308; Mojacar, 4-

V-2008, J. Šumpich leg. 18/309; Sierra de Alhamilla, Huebro, 1 ♀, 700-800 m, 29-IV-2008, J. Šumpich leg. 18/310; GRANADA, Valle de Lecrín, Padul, 941 m, 2 ♀♀, 09-VI-2018, GP Friedmar Graf; TERUEL, Albarracín env. 1100 m, 1 ♀, 7-VIII-2010, J. Šumpich leg. 18/311. CROATIA, PIROVAC, env. 33 m, Tijesno-Ivinj, 43º 47' 27" N, 15º 37' 31" E, 6-12-VIII-2007, J. Šumpich leg. 18/307; Manušiči, 35 km S. E. of Split, 250 m, 43º 24' 16" N, 16º 50' 26" E, 1 ♀, 3-7-VIII-2008, J. Šumpich leg. 18/339. SWITZERLAND, VALAIS, Venthône, 1 ♂, 6-IV-2011, leg. Hermann Gerber, GP Wolfgang Wittland (photo Rudolf Bryner).

The specimens of *Ypsolopha milfontensis* Corley & Ferreira, sp. n. are listed under that species.

Methods

Morphological examination: genitalia preparations were made following standard techniques (ROBINSON, 1976).

Genomic DNA was extracted from leg tissue (Table 1) using EasySpin Genomic DNA Tissue Kit (Citomed, Lisboa, Portugal) following manufacturer's protocol, except for the lysis period which was extended to enhance extraction success. The cytochrome c oxidase I (COI) barcoding fragment was amplified as two overlapping fragments using two sets of primers. For the first fragment, primers LepF (HEBERT *et al*., 2004) and MlepR (HAJIBABAEI *et al*., 2006) were used, while primers LepR (HEBERT *et al*., 2004) and MlepF (HAJIBABAEI *et al*., 2006) were used to amplify the second fragment. Both PCR reactions had 10 µL of final volume, containing 5 µL of Multiplex PCR Master Mix (QIAGEN, Hilden, Germany), 0.4µM of each primer, and 1-2µL of DNA. PCR amplification was carried out on a T100 Thermal Cycler (BioRad, Hercules, CA, USA) using the following conditions: initial denaturation at 95ºC for 15 min; 5 cycles at 95ºC for 30 s, 47ºC for 45 s, 72ºC for 45 s; then 40 cycles at 95ºC for 30 s, 51ºC for 45 s, 72ºC for 45 s; and a final elongation step at 60ºC for 10 min. The barcodes were sequenced in an Illumina Miseq platform, following the approach described by SHOKRALLA *et al*. (2015).

Table 1.– Specimens of *Ypsolopha* sequenced in the present work. [Code = InBIO Barcoding Initiative sample code; Date = date of collection; Locality = collecting locality; Lat = latitude; Long = longitude; BOLD = BOLD Process ID for cytochrome c oxidase I (COI) DNA barcodes access. (http://www.boldsystems.org).

Taxa	Code	Date	Locality	Lat	Long	BOLD
Ypsolopha milfontensis	INV08683	7/05/2019	Vila Nova de Milfontes	37.7235	-8.7890	IBILP1700-20
Ypsolopha milfontensis	INV08836	28/05/2019	Vila Nova de Milfontes	37.7235	-8.7890	IBILP1732-20
Ypsolopha milfontensis	INV08837	28/05/2019	Vila Nova de Milfontes	37.7235	-8.7890	IBILP1733-20
Ypsolopha milfontensis	INV08838	28/05/2019	Vila Nova de Milfontes	37.7235	-8.7890	IBILP1734-20
Ypsolopha milfontensis	INV08839	28/05/2019	Vila Nova de Milfontes	37.7235	-8.7890	IBILP1735-20
Ypsolopha alpella	INV09730	15/09/2019	Serra do Larouco	41.8816	-7.7286	IBILP2897-20
Ypsolopha alpella	INV09768	17/09/2019	Gondesende	41.8464	-6.8794	IBILP2907-20
Ypsolopha rhinolophi	INV09890	20/09/2019	Guadramil	41.9212	-6.5747	IBILP2951-20

We used OBITools (available from https://git.metabarcoding.org/obitools/obitools) for general sequence processing. Geneious v.6.1.5 (available from http://www.geneious.com/) was used for final sequence assembly. The sequence obtained was blasted against GenBank and BOLD databases. The average divergence (uncorrected p-distance) between the sequence of Portuguese specimens and sequences available in GenBank and BOLD was calculated in MEGA v.5.2.1 (TAMURA *et al*., 2011).

Results

The molecular results of the specimens from Vila Nova de Milfontes exhibited distinct

haplotypes of the partial COI gene sequence with *Y. instabilella* being the closest related species (uncorrected p-distance 4.7%) followed by *Y. alpella* ([Denis & Schiffermüller], 1775) and *Y. scabrella* (Linnaeus, 1758) with sequences available with over 8.7% and 9.0% divergence, respectively (Table 1).

Ypsolopha milfontensis Corley & Ferreira, sp. n.

Material examined: Holotype ♀ (Fig. 1), "P11795 | PORTUGAL | Vila Nova de Milfontes | Baixo Alentejo | 27-V-2019 | M. Corley & S. Ferreira" "Holotype ♀ | *Ypsolopha milfontensis* | Corley & Ferreira" "GP ♀ | CORLEY | 5770" "INV08683". The specimen will be placed in NHMUK. Paratypes: P11801 Portugal, Baixo Alentejo, Vila Nova de Milfontes, 1 ♀, 28-V-2019, M. Corley & S. Ferreira, INV08837; P11802, INV08839, 1 ♂, same data; P11887, 1 ♂, 1 ♀, same locality, ex. *Ephedra fragilis*, 20-VI-2019, M. Corley & S. Ferreira; P11888, same data but 21-VI-2019, GP MD02820; P11893, P11894, same data 2 ♂♂, but 25-VI-2019; P11895, same data 1 ♀, but 26-VI-2019; P11896 same data and date, GP MD02818, P11897, not dissected; P11903 same data 2 ♂♂, but 3-VII-2019 GP MD02819, P11904, same data and date, not dissected.

Two further male specimens in poor condition were collected at the type locality on 28-V-2019. Barcodes were obtained from these (INV08836, INV08838) and they have been retained by MC, but they have not been set and mounted as museum specimens and they are not included in the paratype series.

Description (Figs 1-4): Males and females similar. Wingspan 15-20.5 mm. Head and labial palp pale grey-buff, scales paler-tipped, labial palp segment 2 with long tuft of forward projecting scales, segment 3 short, slender, just projecting from upper side at about one-third of tuft length, often invisible. Antenna grey-buff. Thorax grey-buff. Forewing elongate, apex falcate, acute; light brownish buff with scattered individual brown scales, particularly towards dorsum; basic markings consist of a few blackish or dark brown dots close to costa in basal one-third, a dark grey spot at two-fifths which makes a small bump on the costal edge and a few brown dots on costa towards apex; a black dot at end of cell and another in fold at one-third, the latter preceded by an oblique whitish streak crossing fold, edged chestnut-brown proximally; terminal fringe short beneath apex, becoming longer to tornus, with at least two darker fringe lines. Additional forewing markings often present, see below under Variation. Hindwing grey, darker towards costa; fringe grey at base, light brownish buff distally. Abdomen light grey.

Variation. Sometimes one or more of the basic elements of the wing pattern may be missing, most notably the dark spot and bump on costa at one-third, but also the blackish dots at end of cell and in fold. However, variation mainly consists of additional elements of pattern which are highly individual. Weak lighter or darker longitudinal streaks may be present, the brown edging to whitish fold mark can be extended across wing, sometimes forming a complete fascia extending to blackish spot on costa at one-third; dorsal margin may have a row of brown spots, dorsal area beneath fold can be more or less infilled blackish; one specimen has a black streak along costa from base to one-fifth extending beneath costa to beyond half with additional black lines from middle of base, two overlapping lines below cell in mid-wing and another from beyond end of cell to termen beneath apex; fringe lines more or less suffused blackish, additional lines sometimes present.

Male genitalia (Figs 9-10): Uncus a small rounded protuberance between narrow elongate pointed socii, separated by less than half their length; gnathos rounded, scobinate, on long arms; valva twice as long as wide, costal margin straight and thickened to beyond middle, slightly concave at two-thirds to three-quarters length, apex very broadly rounded, ventral margin hardly thickened, with slight nearly constant curvature, inner surface of valva with a large field of elongate scales; vinculum broad, rounded, saccus one-quarter length of valva; aedeagus 0.85 times length of valva, ductus ejaculatorius at one-quarter of its length, caecum more slender than distal part which is slightly curved, a single long cornutus present.

Female genitalia (Fig. 12): Papillae analis elongate, pointed; posterior apophysis twice as long

as free part of anterior apophysis; segment VIII weakly sclerotised; ostium with short lateral margins, antrum sclerotised, cylindrical, twice as long as wide; ductus bursae with a curve in anterior half, slightly expanded and sclerotised towards corpus bursae, but not ringed, about twice as long as free part of anterior apophysis; corpus bursae elongate ovoid, signum large, flask-shaped, slightly widened posteriorly, with a deep transverse fold across widest part and another just posterior to narrowest part.

Diagnosis: Externally most similar to *Y. instabilella* (Mann, 1866) (figs 5-8). *Y. instabilella* is on average slightly larger with wingspan 18-22.5 mm compared with 15-20.5 mm in *Y. milfontensis*. The majority of specimens of the new species were reared from larvae which were obliged to feed on *Ephedra* in increasingly suboptimal condition, which may have led to specimens being smaller, but the wild caught specimens were also smaller than the majority of *Y. instabilella*. Both species show considerable variation in wing markings, but there is a tendency for the ground colour of both fore and hindwings to be darker and greyer in *Y. instabilella*, however the differences are rather less than appears when comparing figures 1-4 with figures 5-8, as the photos were not taken under identical conditions. Most specimens of *Y. instabilella* have forewing veins clearly delineated black. In *Y. milfontensis* the veins are not well-marked or occasionally marked brown. The dark spot and bump on costa at one-third which is present in some *Y. milfontensis* has not been seen in *Y. instabilella*. There are clear differences in male and female genitalia. In male genitalia (fig. 11) *Y. instabilella* differs in shape of valva, which has very slight concavity on costal margin immediately beyond middle, less broad apex, curvature of ventral margin most marked at one-third, field of scales on ventral surface absent; vinculum narrower, not rounded, saccus longer, two-fifths length of valva; aedeagus straight. In female genitalia (figs 13-14) *Y. instabilella* differs mainly in length of ductus bursae which is 3.5 times as long as free part of anterior apophysis and has a series of papillose rings close to corpus bursae; corpus bursae more rounded; signum flask-shaped, but with narrower neck than in *Y. milfontensis* and without a fold in the neck.

Early stages: Larvae were found at night lightly attached to the stems with silk while feeding on the epidermis of the stems. They were not visible by day, so presumably descend into the interior of the *Ephedra* bushes by day. The plants form a very dense mass of stems. Full grown larva about 10 mm long, tapering to both ends, slightly contracted between segments, without prolegs on segment 12; head dull fuscous with small black dots, body dull fuscous, with a dull creamy white dorsal line, sometimes interrupted and a dull pale lateral line; each segment with dorsal line slightly expanded in middle, a pair of obliquely placed black dots near dorsal line, three lateral dots forming an equilateral triangle above lateral line and 2 to 4 dots below lateral line; underside and legs pale coloured; dark brown V-shaped (angle at front) marks on dorsal surface of segments 6-10; head and body have a wrinkled appearance due to a network of fine purplish-fuscous lines; head and body with dark hairs, shortest on head.

Bionomics: Adult moths were collected at end of May in varying condition. At the same time larvae were found that were no more than 5 mm long and others that were almost full grown (≈10 mm). This suggests the possibility that the species is continuous brooded, but with only one sampling this is speculative. The hostplant, *Ephedra fragilis* is evergreen and the local climate without severe winter cold would certainly allow continuous development.

Distribution: At present known only from a single site at Vila Nova de Milfontes, Beja, Portugal, in contrast with *Y. instabilella* which has a wide distribution from southern Spain, into central Asia.

Etymology: The species name *milfontensis* is a latinised adjective in genitive case derived from the type locality Vila Nova de Milfontes.

Discussion: With the present work the number of Portuguese *Ypsolopha* species is raised to seven. Five species were known to occur in Portugal in 2015: *Y. alpella* ([Denis & Schiffermüller], 1775), *Y. lucella* (Fabricius, 1775), *Y. persicella* (Fabricius, 1787), *Y. scabrella* (Linnaeus, 1761) and *Y. ustella* (Clerck, 1759) (CORLEY, 2015). The existence of a sixth species in the country was unveiled by bats and described in 2019: *Ypsolopha rhinolophi* Corley, 2019 (CORLEY *et al*., 2019).

CORLEY (2015) listed 20 Lepidoptera species endemic to Portugal. Since then, three of those species have been found in Spain: *Depressaria cinderella* Corley, 2002 (BUCHNER & ŠUMPICH, 2018), *Agnoea nonscriptella* Corley, 2014 (LAŠTŮVKA & LAŠTŮVKA, 2020) and *Isotrias penedana* Trematerra, 2013 (CORLEY & FERREIRA, 2017); *Elachista occidentella* Traugott-Olsen 1992 has been relegated to synonymy with *Elachista hispanica* Traugott-Olsen, 1992 (KAILA, 2015). Six newly described endemic species have been added: *Ekboarmia miniaria* Skou, Stüning & Sihvonen, 2016, *Chrysoclista soniae* Corley, 2017, *Megacraspedus occidentellus* Huemer & Karsholt, 2018, *Afriberina salemae* Skou & Sihvonen, 2019, *Mondeguina atlanticella* Corley & Rosete, 2020 and *Heterogynis cynetis* de Freina, Monasterio, Escobés, Hinojosa & Vila, 2020 (SKOU *et al*., 2016; CORLEY, 2017; HUEMER & KARSHOLT, 2018; MÜLLER *et al*., 2019; CORLEY *et al*., 2020; FREINA *et al*., 2020). With the new *Ypsolopha* described in this paper the number of Portuguese endemic Lepidoptera species increases to 23.

The Iberian Peninsula is considered to have been a refugium for warmth-loving species during the Pleistocene glaciations, but within this area there would have been local areas that were particularly sheltered from colder conditions (WEISS & FERRAND, 2007). If sufficiently isolated these had the potential to evolve into new species which in turn could remain as local endemics if for one reason or another, they did not greatly expand their range during the ensuing interglacial period. In Portugal, one such area is the south-west coast, including part of Alentejo and the western Algarve. The Geometridae *Ekboarmia miniaria* and *Afriberina salemae* occupy this area, as does *Ypsolopha milfontensis* Corley & Ferreira, sp. n. (SKOU *et al*., 2016; SKOU & SIHVONEN, 2019).

If we are correct in our impression that *Ephedra fragilis* has suffered a major reduction in population in recent years, then the continued existence of *Ypsolopha milfontensis* is threatened by the disappearance of its hostplant. The plant is listed as Vulnerable in the Portuguese Red List (CARAPETO *et al*., 2020). The species is nowadays particularly scarce and localised, existing in small areas, some with less than 10 individuals (Paula Canha, pers. comm., 2018) and is currently threatened by habitat destruction due to urban pressure (CARAPETO *et al*., 2020). Further investigation of the current distribution of *Ephedra fragilis* and whether *Y. milfontensis* occurs anywhere else is urgently needed.

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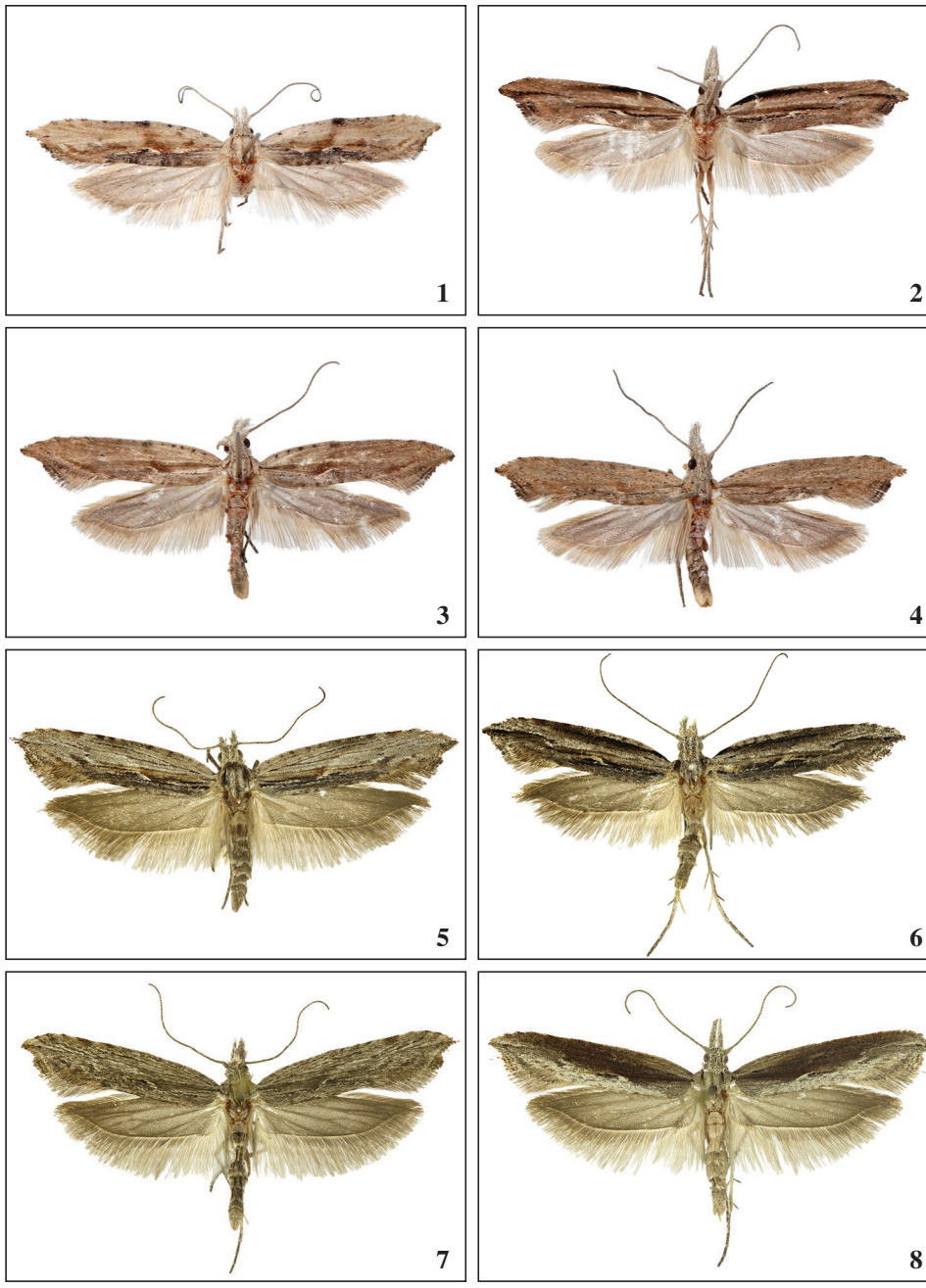
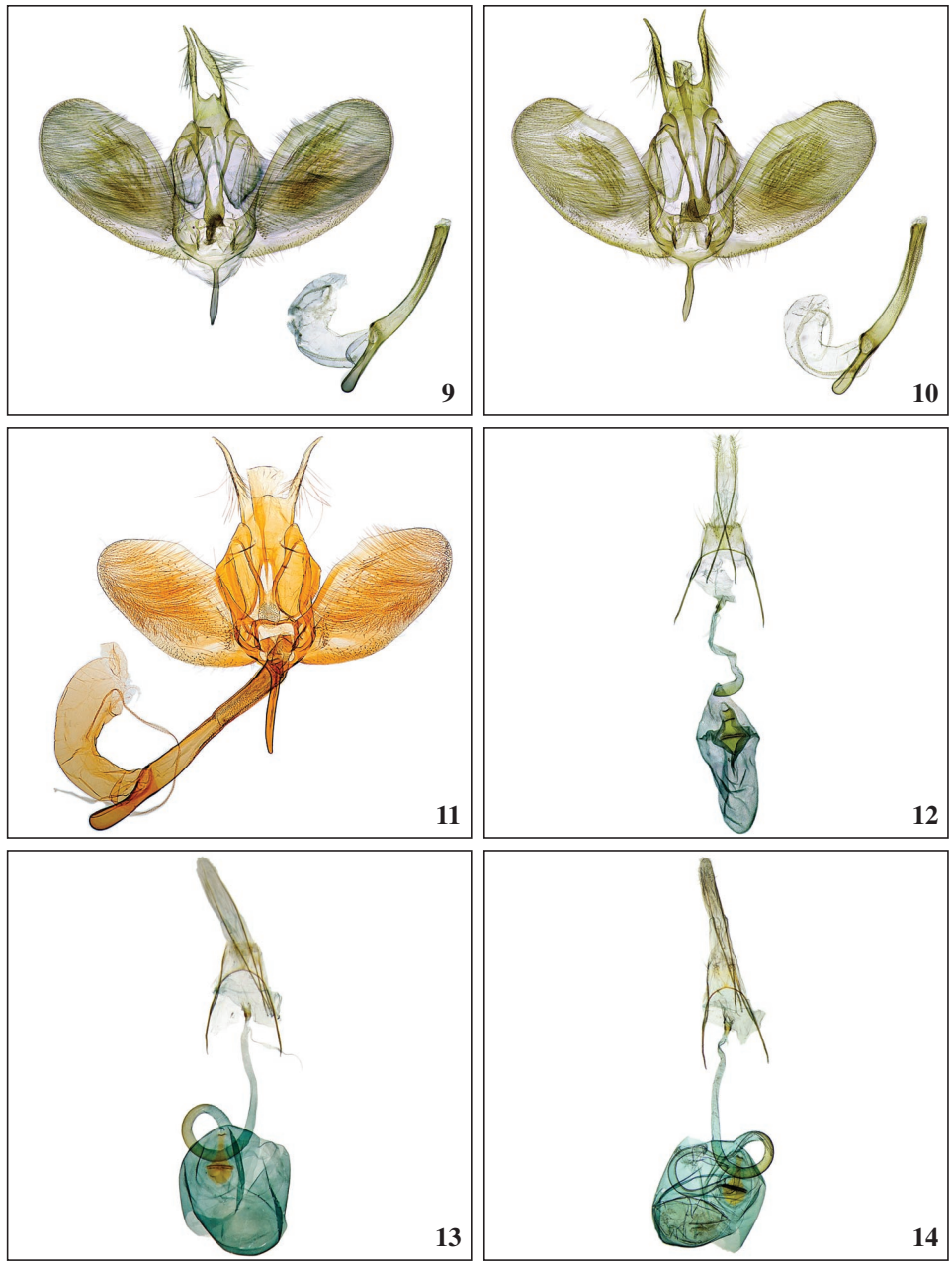


Figs 1-8.–1-4. Adults *Ypsolopha milfontensis* Corley & Ferreira, sp. n. **5-8.** *Ypsolopha instabilella* (Mann).



Figs 9-14.– 9-10. Male genitalia *Ypsolopha milfontensis* Corley & Ferreira, sp. n. **11.** Male genitalia *Ypsolopha instabilella* (Mann). **12.** Female genitalia *Ypsolopha milfontensis* Corley & Ferreira sp. n., **13-14.** *Ypsolopha instabilella* (Mann).

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Contribution to the knowledge of the Croatian Pyraloidea fauna. Species reported from Biokovo Natural Park (Insecta: Lepidoptera)

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Abstract

Little is known on the occurrence of Pyraloidea species from Croatian mountains and there is no species list from Mountain of Biokovo. We provide new data on Pyraloidea species recorded from Biokovo Natural Park. The species list contains information on date and locality of species recorded during field surveys conducted by the first author between 2016 and 2019 and the second author between 1985 and 2018. During these field surveys, 71 Pyraloidea species were recorded. The list was complemented with six species known only from literature data. Altogether we report 77 Pyraloidea species, 54 belonging to the family Crambidae and 23 belonging to the family Pyralidae. This represents about 20,5% of the overall Croatian Pyraloidea fauna.

Some interesting species that have been previously known only from historic literature are reported from Biokovo Mountain, for example, *Catoptria acutangulella* (Herrich-Schäffer, 1847), a montane specie that has not been recorded in Croatia since 1896 and Biokovo Mountain since 1850 (the results have been published elsewhere). The species *Mecyna trinalis* ([Denis & Schiffermüller], 1775) has been recorded for the first time in Dalmatia. The species *Udea numeralis* (Hübner, [1796]), *Evergestis limbata* (Linnaeus, 1767) and *Hypsopygia fulvocilialis* (Duponchel, 1834) have been reported for the first time from Dalmatia in almost 150 years and the species *Selagia spadicella* (Hübner, [1796]), *Agriphila inquinatella* ([Denis & Schiffermüller], 1775) and *Agriphila straminella* ([Denis & Schiffermüller], 1775) have been reported for the first time in almost 100 years. Also, 15 species have been reported for the first time from Dalmatia in decades, like *Dolicharthria bruguieralis* (Duponchel, 1833), a species that has not been reported in almost 85 years.

This paper deepens the knowledge on the distribution of Pyraloidea species occurring in Biokovo Natural Park and reconfirms the occurrence of many species that have not been reported from Croatia in decades.
KEY WORDS: Insecta, Lepidoptera, Pyraloidea, *Catoptria acutangulella, Mecyna trinalis, Udea numeralis*, *Evergestis limbata*, *Hypsopygia fulvocilialis,* Biokovo, Croatia.

Contribución al conocimiento de la fauna de Pyraloidea de Croacia. Especies registradas del Parque Natural de Biokovo (Insecta: Lepidoptera)

Resumen

Poco se conoce sobre la ocurrencia de especies de Pyraloidea de las montañas croatas y no hay lista de especies de las Montañas de Biokovo. Proporcionamos nuevos datos sobre las especies de Pyraloidea registradas del Parque Natural de Biokovo. La lista de especies contiene la información sobre la fecha y localidad de las especies registradas durante las salidas al campo dirigidas por el primer autor entre 2016 y 2019 y del segundo autor entre 1985 y 2018. Durante estas salidas al campo, se registraron 71 especies de Pyraloidea. La lista fue complementada con seis especies conocidas solamente de los datos de la literatura. En general informamos sobre 77 especies de Pyraloidea, 54 pertenecen a la familia Crambidae y 23 pertenecen a la familia Pyralidae. Esto representa aproximadamente el 20,5 % de las fauna de Pyraloidea croata.

Se registran algunas especies interesantes que han sido previamente conocidas por la literatura histórica sobre las montañas de Biokovo, por ejemplo, *Catoptria acutangulella* (Herrich-Schäffer, 1847), una especie de montaña que no ha sido registrada en Croacia desde 1896 y de la montaña de Biokovo desde 1850 (los resultados han sido publicados en otro lugar). La especie *Mecyna trinalis* ([Denis & Schiffermüller], 1775) ha sido registrada por primera vez en Dalmacia. Las especies *Udea numeralis* (Hübner, [1796]), *Evergestis limbata* (Linnaeus, 1767) y *Hypsopygia fulvocilialis* (Duponchel, 1834) han sido registradas, por primera vez, para Dalmacia en casi 150 años y las especies *Selagia spadicella* (Hübner, [1796]), *Agriphila inquinatella* ([Denis & Schiffermüller], 1775) y *Agriphila straminella* ([Denis & Schiffermüller], 1775) han sido registradas, por primera vez, en casi 100 años. También 15 especies han sido registradas, por primera vez, de Dalmacia en décadas, de la misma manera que *Dolicharthria bruguieralis* (Duponchel, 1833), una especie que no ha sido registrada en casi 85 años.

Este trabajo es uno de los más profundos sobre el conocimientos de la distribución de las especies de Pyraloidea que se encuentran en el Parque Natural de Biokovo y reconfirman la presencia de muchas especies que no habían sido registradas de Croacia en décadas.

PALABRAS CLAVE: Insecta, Lepidoptera, Pyraloidea, *Catoptria acutangulella, Mecyna trinalis, Udea numeralis*, *Evergestis limbata*, *Hypsopygia fulvocilialis,* Biokovo, Croacia.

Introduction

The superfamily Pyraloidea is the third largest of the order Lepidoptera. The superfamily comprises approximately 15.576 described species worldwide, about 9.655 species belonging to the family Crambidae and about 5.921 species to the family Pyralidae (NIEUKERKEN *et al*., 2011). Some 850 species can be found in Europe (KARSHOLT & RAZOWSKI, 1996).

The Croatian Pyraloidea fauna is represented by 377 species, 207 taxa from the family Crambidae and 170 taxa from the family Pyralidae (GUMHALTER, 2019a). This number was updated shortly after the first checklist of Pyraloidea species in Croatia was presented in 2019 (GUMHALTER, 2019b). Besides this important work, only sporadic studies have been carried out. Since no systematic research on Pyraloidea in Croatia was conducted, little is known on the occurrence of species from mountains in Croatia.

The majority of the papers published on Lepidoptera from Dalmatia does not cover Pyraloidea species from the area of Biokovo (STAUDINGER, 1870, 1879; WOCKE, 1871; REBEL, 1891, 1903, 1904, 1919; GALVAGNI, 1902, 1909; GINZBERGER, 1916; KLIMESCH, 1942, etc.). During our research, only three published papers that include Pyraloidea species from Mountain of Biokovo were discovered (MANN, 1869; NEUSTETTER, 1956; PLANT & SLAMKA, 2016). However, the Pyraloidea fauna of other mountains in Croatia is also poorly studied, as most of the recent studies were devoted to Rhopalocera or Macrolepidoptera in general (KUČINIĆ *et al*., 1995; MIHOCI *et al*., 2007, 2011; TVRTKOVIČ *et al*., 2012, 2015; KOREN & LAUŠ, 2013; KOREN *et al*., 2015, etc.). Yet, the Croatian mountains have great potential in floral and faunal biodiversity, as well as in endemism. This can be seen in the example of Rhopalocera. The number of recorded Rhopalocera species from Mountain of Velebit counts 153 (TVRTKOVIČ *et al*., 2015) and from Mountain of Dinara 130 species (TVRTKOVIČ *et al*., 2012). On Mountain of Biokovo 102 species were recorded (MIHOCI *et al*., 2011). Besides these well-known huge areas, smaller mountains have also been surveyed. For instance, on Mountain of Klek 84 butterfly species were recorded (GUMHALTER, 2015) and on Mountain of Kozjak 87 species (KOREN *et al*., 2019), but other areas were surveyed as well. Analog to butterfly fauna, same could be expected for the moth fauna from Croatian mountains.

Our study primarily aims at improving the knowledge of Pyraloidea occurring on Mountain of Biokovo, but in Croatia as well. Throughout a recent faunal survey on Pyraloidea in Biokovo Natural Park, we have conducted own field trips and reviewed published records on these species in Croatia. In this paper, we present these new data retrieved for Biokovo Natural Park.

Materials and methods

The materials in this study were collected during field surveys conducted by the first author between 2016 and 2019 and by the second author between 1985 and 2018.

The first author carried out research on Pyraloidea fauna from Mountain of Biokovo at irregular intervals between July 2016 and September 2019. The first author collected moths on several localities at different altitudes between 550 and 1762 meters above sea level. All specimens were caught with a UV light and deposited in the private collection of the first author (coll. Gumhalter). The determination of all species was conducted according to SLAMKA (2006, 2008, 2013, 2019).

The second author conducted several field trips between 1985 and 2018 and collected about 600 specimens of Pyraloidea in different localities in South Croatia, including Biokovo Natural Park. Until now only the results of his research from the Neretva Valley were published (GUMHALTER *et al*., 2018). The specimens were also caught with a UV light and deposited in the second author's collection in the Croatian Natural History Museum in Zagreb (coll. Lepidoptera Kučinić). To improve the knowledge on Pyraloidea on Mountain of Biokovo all specimens from the Kučinić collection were extracted and carefully examined. The determination of species was also conducted according to SLAMKA (2006, 2008, 2013, 2019).

To give a more complete species list from Biokovo Natural Park all Pyraloidea species from both, field investigations and the collection Kučinić, were drawn together and presented in this paper. In the attempt to complete the species list with literature data a total of 200 published historic and recent papers were reviewed, out of which only three could be considered. The systematic presentation in the species list follows Fauna Europaea (NUSS *et al*., 2011). Date and locality are provided for all specimens. As for the specimens from the collection Kučinić, the exact locality is given as it is written on the original label on Croatian. The species reported only from literature also contain a reference to the published source including the synonym under which it was published there.

Results and discussion

The mountainous karst area of Central Croatia lies between the Mediterranean and Eurosibirian-Northamerican biogeographic zone. 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 (Eurosiberian) and Mediterranean faunal elements (TVRTKOVIČ *et al*., 2015).

Biokovo is a karst mountain range that is a part of the Dinaric karst. TIŠLJAR *et al*. (2002) state the Dinaric karst is approximately 700 km long and 80-210 km wide and stretches from the Julian Alps along the border between Italy and Slovenia, passes through the Croatian coast and islands, western and southern Bosnia and Herzegovina, and ends in southeastern Montenegro and northwestern Albania. Because of its proximity to the Adriatic Sea, there are areas with Continental, Montane and Mediterranean climate, and vegetation (MIHOCI *et al*., 2011). Therefore, certain habitat characteristics of Mountain of Biokovo cannot be found elsewhere in the Dinaric karst.

Biokovo was proclaimed a Natural Park in 1981 and covers an area of 196 km^2. Its position on the Adriatic Sea, at the border between the Continental and Mediterranean climate and its isolation from surrounding mountains, has resulted in a high degree of endemism on Mountain of Biokovo (ŠOLIČ, 1983).

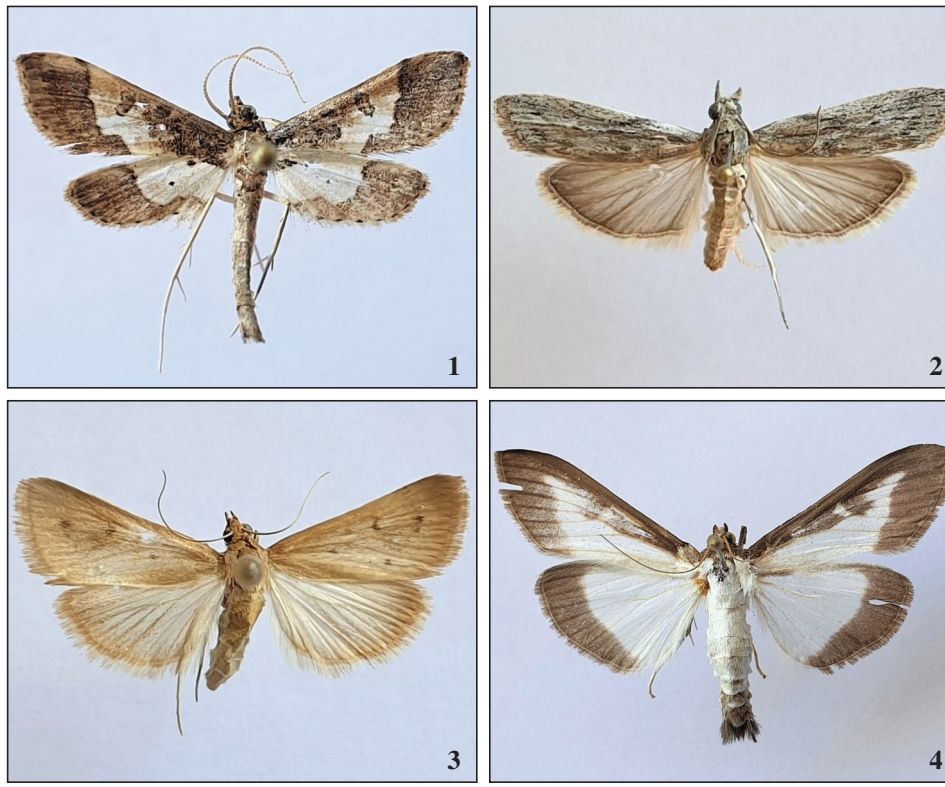
Throughout a recent faunal survey on Pyraloidea from Mountain of Biokovo, the first author reviewed published records species and conducted own field investigations. Wanting to get more data on the occurrence of Pyraloidea in Biokovo Natural Park, all specimens from the second author's collection that originate from the same area were extracted and the results implemented in the species list that is given in Appendix 1.

Altogether, 77 species are recorded from the area of Mountain of Biokovo, out of which 54 species belong to the family Crambidae and 23 species to the family Pyralidae. The listing contains 26 species that were collected only during the first author's field investigations and 18 species that originate exclusively from the second author's collection. Both authors have reported the remaining 27 species. All species that have been reported by the first author are named with "coll. Gumhalter" and by the second author with "coll. Kučinić". Only 12 species were mentioned in one of the relevant literature sources for the area of Mountain of Biokovo, out of which six were not recorded during the conducted

field trips: *Catoptria languidellus* (Zeller, 1863), *Nascia cilialis* (Hübner, 1796), *Udea lutealis* (Hübner, [1809]), *Hypsotropa limbella* (Zeller, 1848), *Phycita cryptica* (Plant & Slamka, 2016) and *Synaphe bombycalis* ([Denis & Schiffermuller], 1775). These species contain a literature reference.

The recorded species number comprises approximately 20,5 % of the total 377 species reported from Croatia. On one hand, it is evident that this largely contributes to the knowledge of the Croatian Pyraloidea fauna of Mountain of Biokovo and Croatia, on the other hand, it is seen that more studies have to be undertaken and that the Pyraloidea fauna of Mountain of Biokovo has to be studied in more detail.

The Pyraloidea fauna of Mountain of Biokovo is probably much richer and could maybe include some endemic species, as it is the case with butterflies. For instance, in 2007 the endemic butterfly species *Proterebia afra dalmata* (Godart, [1824]) was reported from Biokovo Natural Park (MIHOCI & ŠAŠIĆ, 2007).



Figures 1-4.– 1. *Hydriris ornatalis* collected in Biokovo Natural Park. **2.** The species *Amphithrix sublineatella.* **3.** *Achyra nudalis* collected in Biokovo Natural Park. **4.** The box tree moth *C. perspectalis*, an invasive species on box tree *Buxus* spp. in Europe.

Throughout this survey several interesting species have been recorded, some of them being previously known only from historic literature like *Catoptria acutangulella*, a montane moth that has not been recorded in Croatia since 1896 and Mountain of Biokovo since 1850 (the results have been published elsewhere) or *Mecyna trinalis*, a moth that has been recorded for the first time in Dalmatia.

Three species have been reported for the first time in Dalmatia in almost 150 years: *Udea numeralis*, *Evergestis limbata* and *Hypsopygia fulvocilialis.* Three species have been reported for the first time in almost 100 years: *Selagia spadicella*, *Agriphila inquinatella* and *Agriphila straminella*. Altogether 15 species have been reported for the first time from Dalmatia in decades: *Hydriris ornatalis* (Duponchel, 1832), *Euchromius ocellea* (Haworth, 1811), *Dolicharthria bruguieralis* (Duponchel, 1833), *Amphithrix sublineatella* (Staudinger, 1859), *Eurrhypis pollinalis* ([Denis & Schiffermüller], 1775), *Ancylolomia palpella* ([Denis & Schiffermüller], 1775), *Catoptria mytilella* (Hübner, [1805]), *Dioryctria abietella* ([Denis & Schiffermüller], 1775), *Myelois circumvoluta* (Fourcroy, 1785), *Paracorsia repandalis* ([Denis & Schiffermüller], 1775), *Pyrausta cingulata* (Linnaeus, 1758), *Udea olivalis* ([Denis & Schiffermüller], 1775), *Achyra nudalis* (Hübner, 1796), *Anania testacealis* (Zeller, 1847) and *Ecpyrrhorrhoe rubiginalis* (Hübner, 1796). The above-mentioned species probably have not been reported earlier from this area due to the lack of research on Pyraloidea fauna from Croatian mountains. These species are discussed later in this paper. Of interest is the finding of the box tree moth *Cydalima perspectalis* (Walker, 1859) from the highest parts of Mountain of Biokovo. Besides this, while reviewing the literature, we came across the interesting species *Phycita cryptica* (Plant & Slamka, 2016), mentioned from the area of Biokovo Natural Park.

Catoptria acutangulella, a montane species belonging to the family Crambidae, has been rediscovered for Croatia after more than a century (the results have been published elsewhere). The species has not been reported for Croatia since 1896 (ABAFI-AIGNER *et al*., 1896) and Biokovo since 1850 (MANN, 1869). However, several specimens of *C. acutangulella* were collected during field surveys conducted by the first author in 2019, as well as during the second author's field trips conducted between 1992 and 1995. Both authors collected their specimens on one of the highest parts of Mountain of Biokovo, at an altitude of approximately 1600 meters above sea level. Since the results from the later surveys have not been published previously, the findings stayed undiscovered until the examination of the collection Kučinić from CNHM in Zagreb in 2019.

These findings represent the first and only records of *C. acutangulella* in Croatia after almost 125 years and for Mountain of Biokovo after almost 170 years. This recent discovery confirms that *C. acutangulella* is still present in the fauna of Croatia and that it is presumably a permanent resident on Mountain of Biokovo. Also, these findings indicate that no habitat change has happened at the highest parts of Mountain of Biokovo, where the moths were collected. In general, montane species depend on specific types of vegetation and climate conditions. Therefore, climate change and global warming could be a threat to species such as *C. acutangulella.* The recent findings of *C. acutangulella* on Mountain of Biokovo represent an important contribution to the knowledge of this species' distribution in Croatia, and to the Croatian Pyraloidea fauna in general.

The species *Udea numeralis* was only reported by ABAFI-AIGNER *et al*. (1896), MANN (1857, 1869), CARNELUTTI (1994) and in the book from SLAMKA (2013), until one specimen was collected by the second author on July, 26th, 1995 from an altitude of approximately 1450 meters above sea level. This finding reconfirms the species' occurrence after almost 100 years in Croatia and after almost 150 years in Dalmatia.

The only records from Dalmatia for the species *Evergestis limbata* are from GERMAR (1817) and MANN (1869). There is only one recent record, which originates (HABELER, 2003) from island Krk. Several specimens of this species were collected by the second author in 1994 and 1995. Also, the first author collected one specimen in 2019 at an altitude of approximately 1600 meters above sea level. These recent findings are the first ones for Dalmatia after almost 150 years.

The species *Hypsopygia fulvocilialis* has been mentioned several times in the historic literature (MANN, 1869; GEIGER, 1873; REBEL, 1903, 1904, 1914; PROHASKA, 1922; SLAMKA, 2006), with the records from island Krk (HABELER, 2003) being the most recent ones. The second author collected many specimens between 1989 and 2017 in Biokovo Natural Park. His findings represent the first ones for Dalmatia after almost 145 years.

Mecyna trinalis was reported only by REBEL (1904, 1910) and in the book by SLAMKA (2013). The second author collected a single specimen in 1995 from the highest parts of Mountain of Biokovo

at an altitude of approximately 1600 meters above sea level. These records represent the first ones for Dalmatia at all and Croatia after almost 85 years.

One specimen of *Selagia spadicella* was collected by the first author in 2019 at an altitude of approximately 270 meters above sea level. Since the only records of this species are from historic literature (MANN, 1857, 1869; ABAFI-AIGNER *et al*., 1896; REBEL, 1910; SCHAWERDA, 1921), this recent finding reconfirms its occurrence in Dalmatia and represents the first records of *S. spadicella* after almost 100 years.

Besides the historic records of *Agriphila inquinatella* (MANN, 1857, 1867, 1869; ABAFI-AIGNER *et al*., 1896, 1903; REBEL, 1904, 1912; SCHAWERDA, 1921; KOČA, 1925; SLAMKA, 2008) there is only one record from island Krk (HABELER, 2003) and one from Continental Croatia from 2009 (FAZEKAS, 2009). The findings from the first author's field surveys in 2018 are the first ones for Dalmatia after almost 100 years.

Agriphila straminella has been recently recorded only from island Krk (HABELER, 2003), therefore the findings from the second author's field investigations from 1991, 1992 and 1995 represent the first findings from Dalmatia after almost 100 years. Previously it was reported by MANN (1857, 1867, 1869), ABAFI-AIGNER *et al*. (1896), REBEL (1904) and SCHAWERDA (1921). SLAMKA (2008) refers in his book to the same records.

The finding of *Hydriris ornatalis* (Fig. 1), a moth mentioned in recent papers only from island Krk (HABELER, 2003; FAUSTER, 2014), is interesting. One single specimen was collected by the first author on 21st August 2019 at an altitude of approximately 570 meters above sea-level, close to the entrance to Biokovo Natural Park. This finding represents the first record from Dalmatia since 1936 and therefore reconfirms the southern-most distribution point of *H. ornatalis* in Croatia.

According to Fauna Europaea the species is distributed in Europe in Portugal, Spain, Gibraltar, Balearic and Canary Islands, France, Switzerland, Corsica, Malta, Italy, Sicily, Sardinia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Kriti (Crete) and Greece. FAUSTER (2014) reports it from Austria but states that it is possible that his collected specimen was imported from a warmer country since it was caught close to a highway that connects the Adriatic Sea with North Europe and serves as a holiday route. SLAMKA (2013) states that *H. ornatalis* is observed in coastal areas and that it is native to tropics and subtropics. Also, the species could be considered as an occasional pest in economic plants.

The species is mentioned several times in the literature (REBEL, 1904; KLIMESCH, 1942; SLAMKA, 2013; ŠAŠIĆ-KLJAJO *et al*., 2016; PLANT & JAKŠIČ, 2018), but all of these records are either from historic literature sources or the papers refer one to another. Besides the papers (HABELER, 2003; FAUSTER, 2014), no recent records of *H. ornatalis* in Croatia are known. Except for the findings from island Krk, the species' only other known locality in Croatia is Zaton in south Dalmatia. However, these records are almost 85 years old. Therefore, this recent finding largely contributes to our knowledge of the Croatian Pyraloidea fauna by giving new recent information on the distribution range of *H. ornatalis* in Croatia.

Two specimens of the species *Euchromius ocellea* were collected by the first author on May 28th and May 31st, 2019 on a locality close to the entrance to Biokovo Natural Park, at an altitude of approximately 570 meters above sea level. Although the moth has been previously mentioned several times in the literature from coastal Croatia (MANN, 1869; STAUDINGER, 1870; REBEL, 189,; 1914; ABAFI-AIGNER, 1903; KLIMESCH, 1942), the only recent findings are from Krk (HABELER, 2003; GOMBOC & KLENOVČEK, 2013), an island that lies in the Bay of Kvarner in the northern Adriatic Sea. Other literature sources refer to one of these papers (SLAMKA, 2008; ŠAŠIĆ-KLJAJO *et al*., 2016; PLANT & JAKŠIČ, 2018). The findings from Mountain of Biokovo are of interest, as they reconfirm the species' distribution in the southern parts of the Croatian coast. As it is the case with *H. ornatalis*, the last records from Dalmatia are almost 85 years old.

According to SLAMKA (2008) the species is rare in Central Europe and it occurs on dry to fresh, but warm habitats. *E. ocellea* seems to be a migratory species, which established temporary populations in localities far outside its main distribution area from time to time (SCHOUTEN, 1988). As reported

by SLAMKA (2008) the species has a cosmopolitan distribution in the Tropics and Subtropics, North Africa, Asia Minor, large part of Asia, North America, Hawaii, and Australia. In Europe, it is distributed in South Europe (including the Canary and Madeira Islands and as an immigrant in Central Europe (Denmark, southern Sweden, and southern Norway, also Netherlands, England, southern Scotland and Ireland).

The species *Denticera divisella* has been mentioned several times in the historic literature (WOCKE, 1871; ROTHSCHILD, 1914; KLIMESCH, 1942; CARNELUTTI, 1994) and only HABELER (2003) mentioned it from island Krk. One single specimen was collected by the first author in 2018. This finding is the only recent finding of *D. divisella* in Dalmatia since 1936 (KLIMESCH, 1942).

Amphithrix sublineatella (Fig. 2) was reported from Croatia only by REBEL (1891, 1919) and KLIMESCH (1942) in the past, and recently by HABELER (2003). A single specimen was collected by the first author at an altitude of 570 meters above sea level in 2019. With this finding, the species occurrence in Dalmatia is reconfirmed or the first time since 1936.

Eurrhypis pollinalis has been reconfirmed for the Dalmatian fauna after almost 85 years. It has previously been mentioned several times in the literature (MANN, 1857, 1867; REBEL, 1891, 1904; ABAFI-AIGNER *et al*., 1896, 1910; KOČA, 1925; CARNELUTTI, 1994; HABELER, 2003; SLAMKA, 2006; ŠAŠIĆ-KLJAJO *et al*., 2016) until three specimens have been caught in 2019.

The species *Ancylolomia palpella* has been reported several times in historic literature (MANN, 1869; WOCKE, 1871; REBEL, 1903; PROHASKA, 1922; KOČA, 1925; SLAMKA 2008), and recently only by HABELER (2003) from island Krk. The last record of this species from Dalmatia is from Knin from 1936 (CARNELUTTI, 1994).

Catoptria mytilella has been reported by MANN (1869), ABAFI-AIGNER *et al*. (1896), REBEL (1904; 1912; 1913b), SCHAWERDA (1921) and SLAMKA (2008). The species was recently reported from island Krk (HABELER, 2003) and the last time from Dalmatia by HAFNER (1936) from Knin (CARNELUTTI 1994).

Both species, *Dioryctria abietella* and *Myelois circumvoluta* have been recently reported only by KOREN (2018) from Continental Croatia and HABELER (2003) from island Krk. Besides these records, *D. abietella* has been previously recorded a few times (REBEL, 1891; SCHAWERDA, 1921; CARNELUTTI 1994) and *M. circumvoluta* several times (MANN, 1857, 1869; REBEL, 1904, 1913b, 1914, 1919; KOČA, 1925; KLIMESCH, 1942; SLAMKA, 2006). *D. abietella* has been recorded many times by both authors, and these records represent the first ones for Dalmatia after 1936 (CARNELUTTI, 1994). One specimen of *M. circumvoluta* was collected by the first author in 2019. This record is the only recent record for Dalmatia after 1936 (KLIMESCH, 1942).

There are only a few records of *Paracorsia repandalis* in the historic literature (MANN, 1857; SCHAWERDA, 1921; KLIMESCH, 1942; SLAMKA, 2013). KOREN (2018) mentioned the species from Continental Croatia and HABELER (2003) from island Krk. The first author recorded it in 2019 and these records represent the first ones after almost 85 years.

The species *Dolicharthria bruguieralis* has been mentioned many times in the historic literature (MANN, 1857, 1869; ABAFI-AIGNER *et al*., 1896; REBEL, 1929; KLIMESCH, 1942; NEUSTETTER, 1956; CARNELUTTI, 1994; SLAMKA, 2013; ŠAŠIĆ-KLJAJO *et al*., 2016; PLANT & JAKŠIČ, 2018). Nonetheless, there are no recent records of this species. The last records from Croatia are from 1956 (NEUSTETTER, 1956) and originate from the area of Rijeka, a city in Bay of Kvarner. The last records from Dalmatia are from 1936 and originate from Zaton near Dubrovnik (KLIMESCH, 1942).

Throughout this survey, one specimen has been collected on May 31st, 2019 at an altitude of approximately 270 meters above sea-level and therefore represents the first recent findings for Croatia after more than 60 years and the first ones for Dalmatia after more than 80 years.

Pyrausta cingulata has been mentioned several times in the literature (GERMAR, 1817; MANN, 1857, 1867, 1869; ABAFI-AIGNER *et al*., 1896; REBEL, 1904, 1914; SCHAWERDA, 1921; PROHASKA, 1922; KOČA, 1925; CARNELUTTI, 1994; SLAMKA, 2013). Although it was recently

reported by HABLER (2003) and KOREN (2015) from Croatia, these records originate from island Krk and Istria. The two specimens collected in 2018 and 2019 represent the first ones from Dalmatia after more than 80 years.

The species *Udea olivalis* has been mentioned by MANN (1857) from the area around Rijeka (Bay of Kvarner) and 1867 from the area around Josipdol (north-western Croatia), by ABAFI-AIGNER *et al*. (1896) also from Josipdol, by REBEL (1904) (but he is referring only to the findings of Mann), by SCHAWERDA (1921) from the area around Senj (upper Adriatic Sea) and in the book by SLAMKA (2013), who is referring to all these old findings. The second author has caught three specimens in 1995. These findings represent the first ones for Croatia after almost 75 years and the first ones for Dalmatia at all, widening the distribution of *U. olivalis* in Croatia very much to the south.

The species *Achyra nudalis* (Fig. 3) has been previously mentioned often in the historic literature (MANN, 1869; REBEL, 1913a, 1914; ROTHSCHILD, 1914; ZERNY, 1920; PROHASKA, 1922; KLIMESCH, 1942; CARNELUTTI, 1994; SLAMKA, 2013). Recent records originate from island Krk (HABELER, 2003) and the last record from Dalmatia (NEUSTETTER, 1956).

Anania testacealis has been reported from Croatia (MANN, 1857; REBEL, 1891; GALVAGNI, 1902; PROHASKA, 1922; KLIMESCH, 1942; CARNELUTTI, 1994; SLAMKA, 2013). Recently is has been mentioned only from Krk Island (HABELER, 2003). The last record from Dalmatia (NEUSTETTER, 1956), therefore the new records from the second author from the 1990's re-confirms its occurrence in the Pyraloidea fauna of Dalmatia.

The species *Ecpyrrhorrhoe rubiginalis* has been previously mentioned often in the literature, but all these records either originate from historic literature sources (MANN, 1857, 1867, 1869; ABAFI-AIGNER *et al*., 1896; REBEL, 1904, 1910; SCHAWERDA, 1916, 1920, 1921; KOČA, 1925; CARNELUTTI, 1994; SLAMKA, 2013) or other parts of Croatia (HABELER, 2003; KOREN, 2018). Two specimens were collected by the second author in 1995. Since the last report of this species from Dalmatia (DANIEL *et al*., 1951), these recent findings represent the first ones after almost 45 years.

Another interesting finding is the box tree moth *Cydalima perspectalis* (Fig. 4) from the family Crambidae. This invasive species on box tree *Buxus* spp. in Europe, has been spreading and establishing across Europe since it was introduced from East Asia to Germany in 2006 (KRÜGER, 2008). *C. perspectalis* can cause serious damage in private and public gardens, as well as in forests, trees and shrubs. Infestation symptoms include feeding damage on the leaves of the shoot edges by the larvae, which can leave only leaf skeletons and the epidermis behind them. Larvae can also attack the bark (LEUTHARDT & BAUR, 2013). Heavy infestation leads to dry plants and their defoliation, which combined with the subsequent attack of the bark results in the death of the plant.

In 2012 the species was reported for the first time in Croatia (KOREN & ČRNE, 2012) from where it rapidly spread across the whole country. The species was collected several times in Biokovo Natural Park during the first author's field investigations. The finding of *C. perspectalis* itself is no surprise, as it is today widely distributed across Croatia. However, the finding of the box tree moth on the highest parts of Mountain of Biokovo, where one single adult was collected in 2019, is interesting.

C. perspectalis has been recorded in Europe exclusively on *Buxus* spp. The box tree moth feeds on all the widely used ornamental box species and cultivars in Europe (LEUTHARDT & BAUR, 2013), but it has also invaded several natural *Buxus* populations in Central Europe (KENIS *et al*., 2013). On the highest parts of Mountain of Biokovo, at an altitude of approximately 1600 meters above sea-level, no *Buxus* species could be found. Since this area is out of range of the species' host plants it is highly probable that the collected specimen was a wanderer, as adult moths have a wingspan between 30 and 45 mm (SLAMKA, 2013) and are good flyers. The moth must have travelled significantly uphill from the lower coastal parts of Biokovo Natural Park, where host plants are abundant. A similar situation was reported (PLANT *et al*., 2019) where a single adult was witnessed at the top end of an Alpine valley in the Savoy Department of south-east France, within sight of Mont Blanc. Like at the top of Mountain of Biokovo there is also no *Buxus* for several kilometers and such information provide additional support for the notion that the moth is capable of dispersal.

While searching through the available literature we came across a paper (PLANT & SLAMKA,

2016) in which a new species from the area of Biokovo Natural Park was mentioned. The authors state that during separate research by both of them it became apparent that there was considerable confusion and uncertainty concerning the taxon *Phycita metzneri*. This confusion was compounded by their discovery of many misidentifications of *Phycita* specimens in various collections, so a re-examination of the material from the Zeller collection was undertaken. This re-examination has shown that *P. metzneri* (Zeller, 1846) is a synonym of *P. poteriella* (Zeller, 1846) and that specimens labelled or determined as *P. metzneri* in various literature sources or collections have been incorrectly identified and they belong to either *P. poteriella*, *P. torrenti*, *P. strigata*, *P. coronatella* or the newly described species *P. cryptica* (Plant & Slamka, 2016). The holotype of *P. cryptica* is described from Bulgaria. According to PLANT & SLAMKA (2016), one of the many examined paratypes was collected in Gornje Igrane, a locality on the direct border to Biokovo Natural Park. Apart from that, the species described paratypes originate from Bulgaria, Croatia (island Krk, and in Dalmatia Igrane and Gornje Igrane), Albania, Greece, and Spain.

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Appendix 1.– List of all recorded Pyraloidea species collected in Biokovo Natural Park, including date and locality.

PYRALIDAE

Agriphila brioniellus (Zerny, 1914)

Šuma uz cestu, 570 m.a.s.l., 27-VIII-2018 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018, two specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019 (coll. Gumhalter).

Agriphila dalmatinellus (Hampson, 1900)

Livada, 1000 m.a.s.l., 06-IX-2018 (coll. Gumhalter).

Agriphila inquinatella ([Denis & Schiffermüller], 1775)

Šuma uz cestu, 750 m.a.s.l., 05-IX-2018, three specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018 (coll. Gumhalter).

Agriphila straminella ([Denis & Schiffermüller], 1775)

Kapelica, 890 m.a.s.l., 17-VII-1991, two specimens (coll. Kučinić); Vošac, 25-VII-1992 (coll. Kučinić); Gornje Igrane, 25-VII-1995 (coll. Kučinić); Lađena, 1200 m.a.s.l., 27-VII-1995 (coll. Kučinić).

Agriphila tolli (Bleszyński, 1952)

Šuma uz cestu, 570 m.a.s.l., 10-IX-2017 (coll. Kučinić); Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Agriphila tristella ([Denis & Schiffermüller], 1775)

Lađena, 1200 m.a.s.l., 05-IX-2018, nine specimens (coll. Gumhalter); Livada, 1000 m.a.s.l., 06-IX-2018, three specimens (coll. Gumhalter).

Ancylolomia palpella ([Denis & Schiffermüller], 1775)

Stara škola, 270 m.a.s.l., 30-VII-2018, two specimens (coll. Gumhalter).

Catoptria acutangulella (Herrich-Schäffer, 1847)

Vošac, 1421 m.a.s.l., 25-VII-1992, six specimens (coll. Kučinić); Vrh Biokova, 26-VII-1992 (coll. Kučinić); Trajna ploha, 1450 m.a.s.l., 23-VII-1994 (coll. Kučinić); Lađena, 1270 m.a.s.l., 24-VII-1995, two specimens (coll. Kučinić); Podno sv. Jure, 1594 m.a.s.l., 26-VII-1995, five specimens (coll. Kučinić); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, fifteen specimens (coll. Gumhalter).

Literature: Biokovo (MANN, 1869).

Catoptria falsella ([Denis & Schiffermüller], 1775)

Kapelica, 890 m.a.s.l., 17-VII-1991 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 21-VII-1994 (coll. Kučinić); Gornje Igrane, 25-VII-1995 (coll. Kučinić); Trajna ploha,1450 m.a.s.l., 26-VII-1995 (coll. Kučinić); Lađena, 1200 m.a.s.l., 27-VII-1995 (coll. Kučinić); Selo Srida, 30-VII-2017, (coll. Kučinić); Zagvozd, 01-VIII-2017 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 10-IX-2017 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 27-VIII-2018, three specimens (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018 (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 05-IX-2018, two specimens (coll. Gumhalter); Livada, 1000 m.a.s.l., 06-IX-2018 (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019, nine specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, nine specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, eight specimens (coll. Gumhalter).

Catoptria languidellus (Zeller, 1863)

Literature: Biokovo (MANN, 1869).

Catoptria mytilella (Hübner, [1805])

Lađena, 1270 m.a.s.l., 25-VII1995 (coll. Kučinić); Makarska, 25-VII-1995 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 10-IX-2017 (coll. Kučinić); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2019, eleven specimens (coll. Gumhalter).

Chrysocrambus linetella (Fabricius, 1781)
Lađena, 1270 m.a.s.l., 17-VI-1991 (coll. Kučinić).

Crambus perlella (Scopoli, 1763)
Lađena, 1270 m.a.s.l., 24-VII-1995 (coll. Kučinić).
Literature: Biokovo (MANN, 1869, *Crambus perlella* var. *warringtonella*, *Crambus perlella* var. *monochromella*).

Euchromius ocellea (Haworth, 1811)
Šuma uz cestu, 570 m.a.s.l., 28-V-2019 (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 31-V-2019 (coll. Gumhalter).

Pediasia contaminella (Hübner, 1796)
Vrh Biokova, 26-VII-1992 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 27-VIII-2018, four specimens (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018, two specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 05-IX-2018, six specimens (coll. Gumhalter); Livada, 1000 m.a.s.l., 06-IX-2018, three specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019, five specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, five specimens (coll. Gumhalter).

Xanthocrambus saxonellus (Zincken, 1821)
Šuma uz cestu, 750 m.a.s.l., 05-IX-2018 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018, two specimens (coll. Gumhalter); Livada, 1000 m.a.s.l., 06-IX-2018 (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, three specimens (coll. Gumhalter).

Evergestis limbata (Linnaeus, 1767)
Trajna ploha, 1450 m.a.s.l., 23-VII-1994 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 31-VII-1994 (coll. Kučinić); Makarska, 25-VII-1995 (coll. Kučinić); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter).

Hydriris ornatalis (Duponchel, 1832)
Šuma uz cestu, 570 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Eurrhypis pollinalis ([Denis & Schiffermüller], 1775)
Trajna ploha, 1450 m.a.s.l., 31-V-2019, three specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019, two specimens (coll. Gumhalter).

Cynaeda dentalis ([Denis & Schiffermüller], 1775)
Gornje Igrane, 25-VII-1995 (coll. Kučinić).

Achyra nudalis (Hübner, 1796)
Gornje Igrane, 25-VII-1995 (coll. Kučinić); Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).
Literature: Podgora (NEUSTETTER, 1956).

Anania terrealis (Tretischke, 1829)
Kapelica, 890 m.a.s.l., 17-VII-1991, two specimens (coll. Kučinić); Lađena, 1270 m.a.s.l., 23-VII-1993 (coll. Kučinić); Makarska, 25-VII-1993 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 21-VII-1994 (coll. Kučinić); Kotišina, 30-V-1995, six specimens (coll. Kučinić); Gornje Igrane, 25-VII-1995, two specimens (coll. Kučinić).

Anania testacealis (Zeller, 1847)
Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).
Literature: Podgora (NEUSTETTER, 1956).

Anania verbascalis ([Denis & Schiffermüller], 1775)
Lađena, 1270 m.a.s.l., 24-VII-1995 (coll. Kučinić).

Ecpyrrhorrhoe diffusalis (Guenée, 1854)

Biokovo, 1594 m.a.s.l., 24-VII-1994 (coll. Kučinić); Stara škola, 270 m.a.s.l., 26-VIII-2018, two specimens (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 27-VIII-2018 (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018, two specimens (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 05-IX-2018 (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019 (coll. Gumhalter).

Ecpyrrhorrhoe rubiginalis (Hübner, 1796)

Makarska, 25-VII-1995 (coll. Kučinić); Gornje Igrane, 25-VII-1995 (coll. Kučinić).

Nascia cilialis (Hübner, 1796)

Literature: Biokovo Podgora (NEUSTETTER, 1956).

Paracorsia repandalis ([Denis & Schiffermüller], 1775)

Lađena, 1200 m.a.s.l., 19-VIII-2019, eight specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, three specimens (coll. Gumhalter).

Paratalanta hyalinalis (Hübner, 1796)

Kotišina, 20-VII-1994 (coll. Kučinić).

Pyrausta aurata (Scopoli, 1763)

Vrh Biokova, 25-VII-1995 (coll. Kučinić); Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Pyrausta castalis (Treitschke, 1829)

Lađena, 1270 m.a.s.l., 24-VII-1995 (coll. Kučinić); Grabovac, 01-VIII-2017 (coll. Kučinić); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018 (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 27-VIII-2018, two specimens (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 05-IX-2018 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018 (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019, eight specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, twelve specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, six specimens (coll. Gumhalter).

Pyrausta cingulata (Linnaeus, 1758)

Stara škola, 270 m.a.s.l., 30-VII-2018 (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter).

Pyrausta despicata (Scopoli, 1763)

Lađena, 1270 m.a.s.l., 28-V-1995 (coll. Kučinić); Kotišina, 30-V-1995 (coll. Kučinić); Lađena, 1270 m.a.s.l., 24-VII-1995, twp specimens (coll. Kučinić); Gornje Igrane, 2 5-VII-1995 (coll. Kučinić); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter).

Literature: Podgora (NEUSTETTER, 1956, *Pyrausta cespitalis* var. *intermedialis*).

Pyrausta purpuralis (Linnaeus, 1758)

Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Pyrausta sanguinalis (Linnaeus, 1767)

Kapelica, 890 m.a.s.l., 17-VII-1991 (coll. Kučinić); Kotišina, 30-V-1995, two specimens (coll. Kučinić); Šuma uz cestu, 750 m.a.s.l., 05-IX-2018 (coll. Gumhalter); Stara škola, 270 m.a.s.l. 06-IX-2018 (coll. Gumhalter).

Sitochroa verticalis (Linnaeus, 1758)

Stara škola, 270 m.a.s.l., 30-VII-2018 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Uresiphita gilvata (Fabricius, 1794)

Vošac, 20-VII-1994 (coll. Kučinić); Lađena, 1270 m.a.s.l., 24-VII-1995 (coll. Kučinić); Lađena, 1200 m.a.s.l., 27-VII-1995 (coll. Kučinić); Selo Srida, 10-IX-2017, two specimens (coll. Kučinić); Stara škola, 270 m.a.s.l., 06-IX-2018 (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter).

Eudonia lacustrata (Panzer, 1804)

Kapelica, 890 m.a.s.l., 17-VII-1991, two specimens (coll. Kučinić); Lađena, 1270 m.a.s.l. 25-VII-1995 (coll. Kučinić); Gornje Igrane, 25-VII-1995, three specimens (coll. Kučinić); Trajna ploha, 1450 m.a.s.l., 26-VII-1995, two specimens (coll. Kučinić).

Eudonia mercurella (Linnaeus, 1758)

Kapelica, 850 m.a.s.l., 17-VII-1991, five specimens (coll. Kučinić); Vošac, 25-VII-1992, two specimens (coll. Kučinić); Makarska, 25-VII-1993, three specimens (coll. Kučinić); Lađena, 1270 m.a.s.l., 24-VII-1995, two specimens (coll. Kučinić); Gornje Igrane, 25-VII-1995, four specimens (coll. Kučinić); Trajna ploha,1450 m.a.s.l., 26-VII-1995 (coll. Kučinić).

Cydalima perspectalis (Walker, 1859)

Stara škola, 270 m.a.s.l., 06-IX-2018 (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 31-V-2019 (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter).

Dolicharthria bruguieralis (Duponchel, 1833)

Stara škola, 270 m.a.s.l., 31-V-2019 (coll. Gumhalter).

Dolicharthria punctalis ([Denis & Schiffermüller], 1775)

Kotišina, 30-V-1995 (coll. Kučinić); Stara škola, 270 m.a.s.l., 30-VII-2018 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, two specimens (coll. Gumhalter).

Mecyna trinalis ([Denis & Schiffermüller], 1775)

Podno sv. Jure, 1594 m.a.s.l., 26-VII-1995 (coll. Kučinić).

Metasia carnealis (Treitschke, 1829)

Lađena, 1200 m.a.s.l., 19-VIII-2019, three specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, two specimens (coll. Gumhalter).

Metasia ophialis (Treitschke, 1829)

Kotišina, 30-V-1995 (coll. Kučinić); Stara škola, 270 m.a.s.l., 21-VIII-2019, six specimens (coll. Gumhalter).

Metasia suppandalis (Hübner, [1823])

Stara škola, 270 m.a.s.l., 21-VIII-2019, two specimens (coll. Gumhalter).

Nomophila noctuella ([Denis & Schiffermüller], 1775)

Vošac, 25-VII-1992 (coll. Kučinić); Gornje Igrane, 25-VII-1995 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 27-VIII-2018, six specimens (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018, five specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 05-IX-2018, two specimens (coll. Gumhalter); Livada, 1000 m.a.s.l., 06-IX-2018, two specimens (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 06-IX-2018 (coll. Gumhalter); Trajna ploha, 1400 m.a.s.l., 06-IX-2018 (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 31-V-2019 (coll. Gumhalter); Trajna ploha, 1450 m.a.s.l., 28-V-2019 (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019, two specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, three specimens (coll. Gumhalter).

Palpita vitrealis (Rossi, 1794)

Makarska, 25-VII-1995 (coll. Kučinić); Stara škola, 270 m.a.s.l., 06-IX-2018, three specimens (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 31-V-2019 (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Pleuroptya crocealis (Duponchel, 1834)

Gornje Igrane, 25-VII-1995 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 31-V-2019 (coll. Gumhalter).

Pleuroptya ruralis (Scopoli, 1763)

Stara škola, 270 m.a.s.l., 05-IX-2018 (coll. Gumhalter).

Udea ferrugalis (Hübner, 1796)

Kapelica, 890 m.a.s.l., 17-VII-1991 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 26-VII-1992, two specimens (coll. Kučinić); Vošac, 20-VII-1994 (coll. Kučinić); Kotišina, 30-V-1995, three specimens (coll. Kučinić); Lađena, 1270 m.a.s.l., 24-VII-1995 (coll. Kučinić); Lađena, 1270 m.a.s.l., 25-VII-1995 (coll. Kučinić); Zagvozd, 25-IX-20IV (coll. Kučinić); Zagvozd, 01-VIII-2017, two specimens (coll. Kučinić); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018, six specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 05-IX-2018, two specimens (coll. Gumhalter); Livada, 1000 m.a.s.l., 06-IX-2018 (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 06-IX-2018, two specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019, two specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, three specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, three specimens (coll. Gumhalter).

Udea lutealis (Hübner, [1809])

Literature: Biokovo (MANN, 1869, *Botys nebulalis*)

Udea numeralis (Hübner, 1796)

Trajna ploha, 1450 m.a.s.l., 26-VII-1995 (coll. Kučinić).

Udea olivalis ([Denis & Schiffermüller], 1775)

Trajna ploha, 1450 m.a.s.l., 26-VII-1995 (coll. Kučinić); Gornje Igrane, 25-VII-1995 (coll. Kučinić); Blizu vrha, 1594 m.a.s.l., 26-VIII-1995 (coll. Kučinić).

PYRALIDAE

Lamoria anella ([Denis & Schiffermüller], 1775)

Kapelica, 890 m.a.s.l. 17-VII-1991, two specimens (coll. Kučinić); Makarska, 25-VII-1995 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 27-VIII-2018, six specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 26-VIII-2018, eight specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018, nine specimens (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 06-IX-2018, four specimens (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018, three specimens (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 31-V-2019, six specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, five specimens (coll. Gumhalter).

Epidauria transversariella (Zeller, 1848)

Kapelica, 890 m.a.s.l., 17-VII-1991 (coll. Kučinić); Biokovo podno sv. Jure, 1590 m.a.s.l., 24-VII-1994, three specimens (coll. Kučinić); Gornje Igrane, 25-VII-1995, three specimens (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 31-VII-1994 (coll. Kučinić); Stara škola, 270 m.a.s.l., 30-VII-2018, two specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019 (coll. Gumhalter).

Hypsotropa limbella (Zeller, 1848)

Literature: Podgora (NEUSTETTER, 1956).

Acrobasis fallouella (Ragonot, 1871)

Kapelica, 890 m.a.s.l., 10-VII-1989 (coll. Kučinić).

Acrobasis glaucella (Staudinger, 1859)

Gornje Igrane, 25-VII-1995 (coll. Kučinić).

Amphithrix sublineatella (Staudinger, 1859)

Šuma uz cestu, 570 m.a.s.l., 21-VIII-2019, (coll. Gumhalter).

Denticera divisella (Duponochel, 1842)

Šuma uz cestu, 570 m.a.s.l., 10-IX-2018 (coll. Gumhalter).

Dioryctria abietella ([Denis & Schiffermüller], 1775)

Šuma uz cestu, 570 m.a.s.l., 12-VI-1989, two specimens (coll. Kučinić); Vošac, 25-VII-1992 (coll. Kučinić);

Kotišina, 20-VII-1994 (coll. Kučinić); Lađena, 1270 m.a.s.l., 24-VII-1995 (coll. Kučinić); Makarska, 25-VII-1995 (coll. Kučinić); Stara škola, 270 m.a.s.l., 30-VII-2018, Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018 (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Epischnia prodromella (Hübner, [1799])

Kapelica, 890 m.a.s.l., 17-VII-1991 (coll. Kučinić); Makarska, 25-VII-1995 (coll. Kučinić); Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Etiella zinckenella (Treitschke, 1832)

Kotišina, 30-V-1995, two specimens (coll. Kučinić).

Myelois circumvoluta (Fourcroy, 1785)

Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter).

Oncocera semirubella (Scopoli, 1763)

Grabovac, 01-VIII-2017 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 27-VIII-2018, six specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018, four specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, two specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, three specimens (coll. Gumhalter).

Oxybia transversella (Duponchel, 1836)

Selo Srida, 30-VII-2017, two specimens (coll. Kučinić); Selo Srida, 10-IX-2017, two specimens (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 10-IX-2018 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 26-VIII-2018, seven specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018, five specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, six specimens (coll. Gumhalter).

Pempelia palumbella ([Denis & Schiffermüller], 1775)

Šuma uz cestu, 570 m.a.s.l., 16-VI-1989 (coll. Kučinić); Vošac, 25-VII-1992 (coll. Kučinić); Lađena, 1270 m.a.s.l., 24-VII-1995 (coll. Kučinić); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018, three specimens (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 31-V-2019, two specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019, four specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Phycita cryptica Plant & Slamka, 2016

Literature: Gornje Igrane (PLANT & SLAMKA, 2016).

Selagia spadicella (Hübner, 1796)

Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Endotricha flammealis ([Denis & Schiffermüller], 1775)

Kapelica, 890 m.a.s.l., 10-VII-1989, two specimens (coll. Kučinić); Gornje Igrane, 25-VII-1995, eight specimens (coll. Kučinić); Lađena, 1200 m.a.s.l., 27-VII-1995 (coll. Kučinić); Šuma uz cestu, 570 m.a.s.l., 21-VII-1999 (coll. Kučinić); Selo Srida, 30-VII-2017, two specimens (coll. Kučinić); Grabovac, 01-VIII-2017 (coll. Kučinić); Zagvozd, 01-VIII-2017, three specimens (coll. Kučinić); Stara škola, 270 m.a.s.l., 26-VIII-2018, three specimens (coll. Gumhalter); Šuma uz cestu, 750 m.a.s.l., 27-VIII-2018, two specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018, five specimens (coll. Gumhalter); Šuma uz cestu, 570 m.a.s.l., 31-V-2019, three specimens (coll. Gumhalter); Lađena, 1200 m.a.s.l., 19-VIII-2019, two specimens (coll. Gumhalter); Blizu vrha, 1600 m.a.s.l., 20-VIII-2019, five specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, six specimens (coll. Gumhalter).

Hypsopygia costalis (Fabricius, 1775)

Stara škola, 270 m.a.s.l., 21-VIII-2019 (coll. Gumhalter).

Hypsopygia fulvocilialis (Duponchel, 1834)

Kapelica, 890 m.a.s.l., 10-VII-1989, four specimens (coll. Kučinić); Kapelica, 890 m.a.s.l. 17-VII-1991 (coll. Kučinić); Ispod sv. Jure, 1594 m.a.s.l., 24-VII-1994 (coll. Kučinić); Gornje Igrane 25-VII-1995, three specimens (coll. Kučinić); Grabovac, 01-VIII-2017 (coll. Kučinić).

Pyralis regalis ([Denis & Schiffermüller], 1775)

Zagvozd, 01-VIII-2017 (coll. Kučinić); Stara škola, 270 m.a.s.l., 30-VII-2018 (coll. Gumhalter); Stara škola, 270 m.a.s.l., 21-VIII-2019, two specimens (coll. Gumhalter).

Stemmatophora brunnealis (Treitschke, 1829)

Stara škola, 270 m.a.s.l., 26-VIII-2018, two specimens (coll. Gumhalter); Stara škola, 270 m.a.s.l., 06-IX-2018, eight specimens (coll. Gumhalter).

Literature: Podgora (NEUSTETTER, 1956).

Synaphe bombycalis ([Denis & Schiffermuller], 1775)

Literature: Podgora (NEUSTETTER, 1956).

Synaphe punctalis (Fabricius, 1775)

Vrha Biokova, 26-VII-1992 (coll. Kučinić); Kotišina, 20-VII-1994 (coll. Kučinić).

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    HIGGINS, L. O., 1975.- *The Classification of European Butterflies*: 320 pp. Collins, London.

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Annotated list of the butterflies, skippers, and burnets from Portugal in the collection of the National Natural History Museum (Museum Bocage) in Lisbon, Portugal, prior to the March 1978 fire (Lepidoptera: Papilionoidea, Zygaenoidea)

M. Rosália Mendes, Luis F. Mendes, A. Bivar-de-Sousa & J. Almeida-Fernandes (†)

Abstract

An annotated list concerning most of the representatives of superfamilies Papilionoidea and Zygaenoidea (Lepidoptera) from Portugal deposited in the National Natural History Museum (Museum Bocage) in Lisbon, Portugal the 28th March 1978, when it was almost completely consumed by the fire, is presented. It is based in a non-published study held by the former co-author when she achieved a scientific probation under the orientation of the fourth co-author (†). The "Querci' Collection", also destroyed by this disaster, is excluded as it has been previously studied and the results published; further, most of the specimens of genera like to *Melitaea* Fabricius, 1807 (Nymphalidae) could not be identified due to inexistence of specialized bibliography. Samples concerning 1272 specimens included in 79 species are reported. The district and circumscription, as well as the UTM 10 X 10 kilometres coordinates of each one of the collecting localities are reported and the present-day conservation status of each one of the species / subspecies in Portugal is referred. For each species, data on the host plants of the caterpillars are provided.
KEY WORDS: Lepidoptera, Papilionoidea, Zygaenoidea, Museum Bocage, 1978 fire, Portugal.

Lista anotada de las mariposas diurnas y zigaenas de Portugal en la colección del Museo Nacional de Historia Natural (Museo Bocage) antes del incendio de 1978 (Lepidoptera: Papilionoidea, Zygaenoidea)

Resumen

Se presenta una lista detallada de la mayoría de los Lepidoptera de Portugal de las superfamilies Papilionoidea y Zygaenoidea que se encontraban en depósito en el Museo Nacional de Historia Natural (Museo Bocage), en Lisboa, Portugal, en el momento del incendio de la noche del 28 marzo de 1978, que destruyó la casi totalidad de esta Institución. Se toma como base el trabajo jamás publicado, presentado por la primera coautora en 1972, como resultado de un periodo de prueba científico orientado por el cuarto coautor (†). Se excluyen los datos referentes a la "Colección Querci", también destruida pero ya antes estudiada en su grande mayoría, los ejemplares de los géneros similares a *Melitaea* Fabricius, 1807 (Nymphalidae), no han podido ser identificados. Se citan los registros de 1.272 ejemplares pertenecientes a 79 especies. Para cada localidad de captura se señala el distrito, el concejo y las coordenadas UTM 10 X 10 kilómetros y se señala el actual estatus de conservación en el país de cada una de las especies / subespecies. Se presentan las plantas nutricias de las orugas para cada especie referida.
PALABRAS CLAVES: Lepidoptera, Papilionoidea, Zygaenoidea, Museo Bocage, incendio 1978, Portugal.

Lista anotada das borboletas diurnas e das ziguenas de Portugal da coleção do Museu Nacional de História Natural (Museu Bocage) antes do incêndio de 1978
(Lepidoptera: Papilionoidea, Zygaenoidea)

Resumo

Apresenta-se uma lista anotada da maioria dos Lepidoptera de Portugal das superfamílias Papilionoidea e Zygaenoidea que se encontravam em depósito no Museu Nacional de História Natural (Museu Bocage), em Lisboa, Portugal, aquando do incêndio que destruiu quase completamente esta instituição na noite de 28 de março de 1978. É baseada num trabalho nunca publicado, apresentado pela primeira coautora sénior em 1972 como resultado de um estágio científico orientado pelo quarto coautor (†). Excluem-se os dados referentes à "Coleção Querci", também destruída, mas já antes estudada; na sua maioria, os espécimes de géneros afins de *Melitaea* Fabricius, 1807 (Nymphalidae), não puderam ser identificados. São referidos os registos de 1272 exemplares pertencentes a 79 espécies. Para cada localidade de captura é referido o distrito, o concelho e as coordenadas UTM 10 X 10 quilómetros, e é assinalada o atual estatuto de conservação em Portugal de cada uma das espécies / subespécies. São apontadas as plantas-hospedeiras das larvas para cada espécie referida.

PALAVRAS CHAVES: Lepidoptera, Papilionoidea, Zygaenoidea, Museu Bocage, Incêndio 1978, Portugal.

Introduction

The collections deposited in the ancient Museu Nacional de História Natural - Zoologia (Museu Bocage - MB), were in their huge majority reduced to ashes the night of the 28th March 1978, when a violent fire almost completely destroyed also its zoological Library, the Geological and Mineralogical Museum, the associated laboratories, the researchers and docents cabinets and most of the areas of the Faculty of Sciences building located in the "Escola Politécnica" (then associated institutions), as those that were occupied by the Chemical, Physics and Mathematics Departments. The rare non-destroyed remains belong to the today Museu Nacional de História Natural e da Ciência, re-structured and re-born in the very same building.

Among the lost zoological collections, are those correspondents to the whole content of the entomological collection - the surviving non-burned insect samples are sporadic. In what the lepidopterans are concerned, all the existing material disappeared, including abundant never studied samples from quite diverse origins (many tropical), one big series from the Brazilian Amazonia (many boxes with some thousands of specimens yet in paper envelopes), all the "Querci Collection" (a completely identified reference collection of the European Lepidopterological fauna) and the never identified whole collection of the butterflies from Portugal. The aim of the present note, held ca half a century ago before the fire by the former co-author, then yet single to provide the result of the study of the lost collection concerning the Portuguese representatives of superfamilies Papilionoidea and Zygaenoidea (the Hesperiidae were, further, treated as the representatives of a superfamily as their own, the Hesperioidea, today considered under the morphologically and genetically points of view, as part of the Papilionoidea - HEIKKILÄ *et al.*, 2012). Some species of Melitaeini (Nymphalidae, Nymphalinae) were excluded, as that time their identification remained impossible due to the lack of specialized bibliography. A total of 1272 specimens belonging to 79 species were studied. A list of the main contributions relatives to cresonimy, collecting localities and host-plants for the Portuguese butterflies, skippers and burnets was also presented concerning the papers published in the first six decades of the 20th century, namely by: FERREIRA-DE-SOUSA (1929a, 1929b); MENDES-DE-AZEVEDO (1902, 1904, 1909, 1912, 1913a, 1913b, 1934); CARNEIRO-MENDES (1950); MONTEIRO (1956, 1957, 1959); NOBRE & BRAGA, (1942); QUERCI (1931, 1932); SEABRA (1939); SILVA-CRUZ (1935); SILVA-CRUZ & GONÇALVES (1943, 1945, 1950); SILVA-CRUZ & WATTISON (1929, 1931); VIELLEDENT (1905); WATTISON (1928); and ZERKOKITZ (1946). More detailed bibliographic lists and caterpillars' hostplants were presented only much later, due to

MARAVALHAS (2003) and to CORLEY (2015), integrating, then, also the more recent publications, held from the 1970 on.

Material and methods

The studied material from Alburitel and Vila Nova de Ourém was collected by J. A. Quartau during 1966 and the samples collected in Carrazede (Paialvo, Tomar) and Cumeira (Juncal, Porto de Mós) were obtained the 1970 by the third co-author. There is no information about the collectors of the great majority of the samples though part of them, dating from the decades around 1950, were certainly gathered by the last co-author, at that time Naturalist of the MB where he was the responsible by the entomological collection. He was, further, the leader of the first Entomological Scientific Training held in the seventies, including those of the two first co-authors.

The original spelling of the capture localities is maintained, according to what was registered in the labels; for each species, the samples will be sequenced by alphabetical order, first the district (the Administrative Province, in capitals), after the Circumscription, the locality and, at last, the collecting date; when there is no collecting date specimens are noted as nd and when sexes were not determined as ex. Otherwise, some species were identified as part of genera today considered as not valid or with today non-accepted identifications, and then the taxonomic corrections will be presented according to MARAVALHAS (2003) and CORLEY (2015). A list of the UTM 10 X 10 kilometres coordinates of the reported localities is presented (Table I). For each species the abundance and occurrence in Portugal is noted according to MARAVALHAS (2003), as well as its conservation status species / subspecies will be marked with * when menaced and with ** when very rare and / or almost extinct in the country. The status of *Euchloe tagis* was revised according to MARABUTO (2008).

Taxonomy

PAPILIONOIDEA
HESPERIIDAE
PYRGINAE

Carcharodus baeticus (Rambur, 1839) **

Material examined: ESTREMADURA, Campos de Alcobaça, 1 ex., VIII-1948, det. sub *Erynni*s.

The Southern Marbled Skipper is extinction-menaced in Portugal. Very localized, this skipper is known in the Lisbon area and in the Algarve, though its occurrence in the east, close to the Spanish border, is possible - mainly in the Baixo Alentejo province. The main menaces relatives to its survival in the country are the fires as well as the environmental degradation due to several other causes. Caterpillars are known on *Marrubium* and *Ballota* (Fabaceae).

Spialia sertorius (Hoffmanseg, 1804)

Material examined: RIBATEJO, Carrazede, Paialvo, 2 ex., VII-1970, det. as *Hesperia sao*.

Red Under-wing Skipper remains common and dispersed along Portugal. Caterpillars feed on *Rubus*, *Sanguisorba* and *Potentilla* (Rosaceae).

Pyrgus onopordi (Rambur, 1839)

Material examined: TRÁS-OS-MONTES and ALTO DOURO, Vidago, 1 ♂, 16-VIII-1878, det. sub *Hesperia*.

A scattered taxon, the Rosy Grizzled Skipper remains frequent in Portugal, where its range is disjoint: it flies along dry barren lands, north from the Mondego valley and in the central and south of the Setúbal Peninsula, (it disappeared, however, from the most urbanized littoral areas due to the modifications induced to the environment and to the inherent changes in the local flora). At the

European level, its populations become progressively more rarefied. Caterpillars occur on species of *Malva* and of *Malope* (Malvacea).

HESPERIINAE

Thymelicus lineola (Ochsenheimer, 1808) *

Material examined: Baixo Alentejo, Telhada, Almodovar, 1 ♂, 29-VI-1932. Ribatejo, Carrazede, Paialvo, 1 ♀, VII-1970. Trás-os-Montes and Alto Douro, Serra do Reboredo, Moncorvo, 2 ♂♂, 27-VI-1942.

The Essex Skipper seems to be moderately menaced, especially due to the environmental degradation, though its presence remains known all along the country. Caterpillars occur on several Gramineae (Poaceae).

Thymelicus acteon (Rottenburg, 1775) *

Material examined: Ribatejo, Carrazede, Paialvo, 3 ♂♂, 4 ♀♀, VII-1970.

The species is moderately menaced in Portugal, where it is far from frequent, though distributed all along the country. The species is vulnerable along most of the European countries from where it is known. Caterpillars occur on Poaceae, mainly on *Bromus*.

PAPILIONIDAE
PARNASSIINAE

Zerynthia rumina (Linnaeus, 1758) *

Material examined: Beira Alta, Pinhel, 1 ex., 1881; Serra do Caramulo, 1 ♂, 2 ♀♀, 1890. Beira Litoral, Arredores de Coimbra, 1 ex., 1880. Estremadura, Lisboa, 1 ♀, 26-V-1879; Tapada, 2 ♂♂, 2 ♀♀, 10-III-188; 2 ♂♂, 27-III-1882; 1 ex., 24-II-1883; 1 ♀, 12-IV-1883. Trás-os-Montes and Alto Douro, Serra do Reboredo, 1 ex., 1890.

The Southern Festoon is moderately menaced in Portugal, particularly due to the progressive degradation of the natural vegetation of the barren lands and of the trail margins. Moreover, the caterpillars monophagy, as they feed exclusively on *Aristolochia longa* L.(Aristolochiaceae).

PAPILIONINAE

Papilio machaon Linnaeus, 1758

Material examined: Algarve, Ribeira de Quarteira, nd., 1 ♀. Alto Alentejo, Évora, 1 ♂, 1 ♀, IV-1955; 1 ex, nd. Beira Alta, Margens do Rio Dão, 1 ex., 1890. Estremadura, Campos de Alcobaça, 1 ♀, 1948; Lisboa, 1 ♂, 1 ♀, 19-V-1879; 1 ♀, II-1967. Ribatejo, Alburitel, 2 ♂♂, 30-VIII-1966; 1 ♂, 02-IX-1966; Vila Nova de Ourém, 2 ♂♂, 03-IX-1966.

The Swallowtail remains common along Portugal, even in uncultivated plots and in gardens around villages and towns. Caterpillars occur on *Ruta* (Rutaceae) and *Foeniculum* and on carrots (Apiaceae).

Iphiclides feisthamelii (Duponchel, 1832)

Material examined: Beira Alta, Margens do Vouga (Beira Alta), 2 ♀♀, 1895, nd., 4 ♂♂, 2 ♀♀, 2 exs.; Serra do Caramulo, nd., 1 ♂. Beira Baixa, Vale da Pereira, 1 ♂, 12-VI-1933; 2 ♂♂, 13-VI-1933. Beira Litoral, Buçaco, nd., 1 ex.; Coimbra, nd., 1 ♂. Estremadura, Sanguinhal, 1 ♂, VIII-1947. Ribatejo, Alburitel, 1 ♂, 02-IX-1966, Carrazede, Paialvo, 1 ♂, VII-1970. Trás-os-Montes and Alto Douro, Bragança, nd., 2 ex., nd. - all det. as *I. podalirius*.

The Southern Swallowtail is yet a common species along the country, easy to spot even in the big towns where it flies all over the year except for the coldest months. However, the strict dependence of

its caterpillars from fruit-trees (originally the blackthorn, today the plum-tree, peach-tree and pear-tree) and the increasing use of pesticides in these trees are potential menaces to its future in Portugal. Caterpillars occur on several Rosaceae, as *Crataegus*, *Prunus spinosa* L. and several cultivated trees as peach *Prunus persica* (L.) Stokes and pear-trees (*Pyrus communis* L.).

PIERIDAE
DISMORPHIINAE

Leptidia sinapis (Linnaeus, 1758)

Material examined: BEIRA LITORAL, Buçaco, 1 ♀, 30-VIII-1878. RIBATEJO, Abrantes, 1 ex., 09-VI-1933. TRÁS-OS-MONTES and ALTO DOURO, Vidago, 1 ♂, 1 ♀, 16-VIII- 1878; 1 ♀, 25-VIII-1878; 1 ♀, 28-VIII-1878; 1 ex., 02-IX-1879.

The Wood White is dispersed, but not menaced in the country. Caterpillars occur on *Lathyrus*, *Lotus* and *Vicia faba* (L.) (Fabaceae).

PIERINAE

Anthocaris cardamines (Linnaeus, 1758)

Material examined: ESTREMADURA, Tapada da Ajuda, 3 ♀♀, 12-IV-1883; 3 ♀♀, 7-III-1887.

The Orange remains known in Portugal from its northern half (northwards from Estremadura Province) and in Monchique; it is more common inland due to the urbanization and intensive agriculture particularly performed in the littoral areas. Caterpillars occur on Brassicaceae as *Cardamine*, *Sinapis* and *Sisymbrium*.

Euchloe tagis (Hübner, [1804]) **

Material examined: ALTO ALENTEJO, Herdade de Font'Alva, Barbacena, 1 ex., 09-VI-1936. ESTREMADURA, Alfeite, 1 ♂, 07-III-1883, 1 ♀, 12-III-1883, 1 ♂, 14-III-1884, 1 ♂, 23-III-1887; 1 ♀, 01-IV-1887, 1 ♂, 17-IV-1887, 1 ♀, 19-IV-1887. MINHO, Gerez, nd., 2 ♂♂ (?).

The first specimens of the Portuguese Dappled White, *E. tagis*, were collected by the German botanist Count of Hoffmanseg, who stayed in Portugal from 1797 to 1799 and performed local studies on the Portuguese flora and fauna as reported by Hübner (in QUERCI, 1931). They were obtained in the "Southern bank of the Tagus River, front of Lisbon, in sandy flowered meadows among vineyards, close to Almada, Cacilhas and Cova da Piedade". These specimens were later sent to Hübner, who in 1804 describes *Papilio tagis*. It is possible to see, so, that in the beginning of the XIX century the species range extended over a wider area at the Tagus southern bank; its presence in the Alto Alentejo (a sample from Barbacena) dates from the thirties of the XX century.

The correction of the identification of the 2 ♂♂ from the Gerez Mountains was rectified by the third co-author before the 1978 fire. The real presence of this species in the northern Portugal could never be confirmed by other captures, though it seems quite improbable that a typically calcicolous and almost monophagy species (caterpillars in Portugal in Brassicaceae - species of *Iberis* and *Biscutella* only) was found in a granitic area, suggesting so, a mislabelled sample.

E. tagis shall be nowadays restricted to the Estremadura' top of the Arrábida Mountain but it is still found in Alto Alentejo and Beira Litoral (MARABUTO, 2008); it seems progressively menaced of extinction in Portugal due to the ongoing reduction of its range, caused mainly by fires.

Euchloe belemia (Esper, 1800)

Material examined: ALTO ALENTEJO, Herdade de Font'Alva, Barbacena, 1 ♂, 09-VI-1936. ESTREMADURA, Queluz, 1 ♂, 25-V-1877; Tapada, 1 ♂, 24-III-1883. MINHO, Gerez, nd., 2 ♂♂.

The Green Striated White is common along Portugal, with the only exception of its northernmost area. Caterpillars occur on *Iberis* and *Sisymbrium* among other Brassicaceae.

Aporia crataegi (Linnaeus, 1758) *

Material examined: MINHO, Serra do Gerez, nd., 2 ex.

The Black Veined White is considered as moderately vulnerable in Portugal due to its reduced range in the country (north and northeast country, and eastern Algarve). Caterpillars feed on *Crataegus*, *Prunus spinosa* L. and several fruit-bearer trees (Rosaceae).

Pieris brassicae (Linnaeus, 1758)

Material examined: ALTO ALENTEJO, Évora, 4 ♀♀, IV-1955. BEIRA LITORAL, Coimbra, 1 ♀, 1878. ESTREMADURA, Tapada da Ajuda, 2 ♂♂, 1887. RIBATEJO, Abrantes, 1 ♂, 09-VI-1933; 1 ♀, 1950. Alburitel, 1 ♂, 28-VIII-1966.

The Large White is one of the commonest butterfly species in Portugal, being often quite abundant particularly where the caterpillars' hostplants grow (especially cultivated cruciferous like the cabbages and turnips (*Brassica*, Brassicaceae) to which they may cause economical damages.

Pieris rapae (Linnaeus, 1758)

Material examined: BAIXO ALENTEJO, Telhada, Almodovar, 1 ♂, 29-VI-1932; Serra d'Aire, Almodovar, 1 ♂, 30-VI-1932; Vascão, 2 ♂♂, 2 ♀♀, 02-VII-1932. BEIRA ALTA, Cabeçudo, Cernache do Bonjardim, 1 ♂, 28-VIII-1963; Fagilde, 1 ♂, 1 ♀, 17-VI-1933; 1 ♀, 17-VII-1933; Margens do Vouga (Beira Alta), 2 ♀♀, 1886; Serra da Estrela, 2 ♂♂, 1 ♀, 1871. BEIRA LITORAL, Coimbra, 1 ♀, 1878; nd., 2 ♂♂, Praia de Mira, margens da Lagoa, 1 ♂, VII-1950. ESTREMADURA, Belém, 1 ♂, VIII-1883; Lisboa, nd., 1 ♀; Peniche, 1 ♀, 06-IX-1941. MINHO, Caldelas, 1 ♂, VIII-1932. Gerez, 1 ♀, 16-IX-1941. RIBATEJO, Abrantes, 1 ♂, 09-VI-1933; Alburitel, 1 ♀, 21-X-1966; Carrazede, Paialvo, 6 ♂♂, 3 ♀♀, VII-1970. TRÁS-OS-MONTES and ALTO DOURO, Serra do Reboredo, Moncorvo, 1 ♂, 27-VI-1942.

Like the previous species, the Small White is very common where caterpillars have abundant cultivated cruciferous, namely again cabbages and turnips. Caterpillars occur on the same hostplants than those of *P. brassicae* (L.) and on Resedaceae, though they seem even polyphagous; it may cause damages to the cultivated plants.

Pieris napi (Linnaeus, 1758)

Material examined: BEIRA ALTA, Beira Alta, no locality, nd., 1 ♂; Margens do Vouga, Beira Alta, 1 ♂, 1890. BEIRA LITORAL, Buçaco, 1 ♂, 22-VIII-1879; 1 ♂, 26-VIII-1879; 1 ♂, 03-VIII-1881, nd., 1 ♀; Arredores de Coimbra, 1 ♂, I-1880, nd.; 1 ♂. ESTREMADURA, Tapada da Ajuda, Lisboa, 1 ♂, 1887. TRÁS-OS-MONTES and ALTO DOURO, Serra do Reboredo, Moncorvo, 1 ♂, 27-VI-1942.

As it was assigned relatively to the two previous species, the Green-veined White is quite common and with the same diet, though it flies exclusively northwards from the Tagus River valley and in the Monchique area, in Algarve. The caterpillars occur on *Brassica*, *Sinapsis* and *Iberis* (Brassicaceae).

Pontia daplidice (Linnaeus, 1758)

Material examined: ALGARVE, Serra de Monchique, 1 ♀, X-1951. ALTO ALENTEJO, Herdade Font'Alva, Barbacena, 1 ♂, 09-VI-1936. BEIRA ALTA, Serra do Caramulo, 1 ♂, VIII-1880; Beira Alta, margens do Vouga, 8 ♂♂, 4 ♀♀, 1885; Beira Alta, no locality, nd., 2 ♀♀. BEIRA LITORAL, Praia de Mira, pinhal, 1 ♂, VII-1950; Id, Praia de Mira, margens da Lagoa, 1 ♀, VII-1950. ESTREMADURA, Alfeite, 1 ♂, VIII-1883; Almarinho, Algueirão, 1 ♀, 17-VI-1938; Belém, 1 ♂, 18-VIII-1883; Berlengas, 1 ♀, VIII-1932; Engenho, Marinha Grande, 1 ♀, VI-1938; Tapada da Ajuda, 3 ♂♂, 2 ♀♀, 1887; Sanguinhal, 1 ♂, 06-VIII-1947. TRÁS-OS-MONTES and ALTO DOURO, Horta da Vilariça, 1 ♀, IX-1940; Vidago, 1 ♂, 14-VIII-1878.

The Bath White is common in Portugal, where it remains known all along the country. Caterpillars are known to occur on *Reseda* (Resedaceae) and on several Brassicaceae genera (*Sinapis*, *Cardamine*, *Sisymbrium*).

COLIADINAE

Colias croceus (Geoffroy, 1785)

Material examined: Algarve, Barranco do Velho, 2 ♂♂, 1 ♀, 01-VII-1932; 1 ♀, X-1932; 1 ♂, X-1952; Km 3 da estrada da Praia do Castelejo, Vila do Bispo, barranco, 1 ♀, 14-X-1958. Alto Alentejo, Évora, 1 ♂, IV-1955. Baixo Alentejo, Vila do Campo, Milfontes, 1 ♀, 06-VIII-1941. Beira Litoral, Buçaco, 1 ♂, 18-VIII-1879; Valega, 1 ♀, 15-VIII-1950 (?). Estremadura, Campos de Alcobaça, 1 ♀, VIII-1948; Queluz, 1 ♂, 25-V-1877; Lagoa Azul, Linhó, 1 ♀, 15-VI-1938. Ribatejo, Abrantes, 1 ♂, 09-VI-1933; Alburitel, 1 ♀, 8-VIII-1966. Trás-os-Montes and Alto Douro, Horta da Vilariça, 1 ♂, 1 ♀, IX-1940.

Common all along Portugal, the Clouded Yellow is known as migratory. Caterpillars are known to occur on several Leguminosae as *Trifolium*, *Medicago* and *Lotus*.

Gonepteryx cleopatra (Linnaeus, 1767) *

Material examined: Baixo Alentejo, Vila Nova de Milfontes, bosque, 3 ♂♂, 07-VII-1941; 1 ♂, 09-VIII-1941; Id, canal, 1 ♂, 1 ♀, 07-VIII-1941. Beira Litoral, Coimbra, nd., 2 ♂♂, 1 ♀. Estremadura, Lagoa Azul, Linhó, 3 ♂♂, 15-VI-1938.

The Cleopatra occurs along the country except for reduced areas in the Minho and Trás-os-Montes. The crescent destruction of the natural biotopes, especially of open areas inside forest, and the increasing eucalyptation seem to be the main factors responsible by its progressive rarefaction and to its recent status of vulnerable. Caterpillars are monophagous on *Rhamnus alaternus* L. (Rhamnaceae).

Gonepteryx rhamni (Linnaeus, 1758)

Material examined: Beira Alta, Margens do Rio Dão, nd., 1 ♂; Serra do Caramulo, margens do Vouga, 1 ♂, 1890. Estremadura, Engenho, Marinha Grande, 1 ♀, VI-1938.

The Brimstone is not uncommon in Portugal, except for Alto and Baixo Alentejo. The monophagous caterpillars occur on the *Frangula alnus* Mill. (Rhamnaceae).

LYCAENIDAE
RIODININAE

Hamearis lucina (Linnaeus, 1758) **

Material examined: Trás-os-Montes and Alto Douro, Serra do Reboredo, nd., 2 ♂♂.

The Duke of Burgundy Fritillary is in danger of extinction in Portugal, being evident the decline of its populations along the remaining Europe where it is known; its range is quite localized in the country (isolated spots in Trás-os-Montes and Minho) being its populations scarce and strictly dependent of the presence of appropriate biotopes. Its caterpillars are monophagous on *Primula* spp. (Primulaceae).

LYCAENINAE

Lycaena phlaeas (Linnaeus, 1761)

Material examined: Algarve, Barranco do Velho, 2 ex., 01-VII-1932. Baixo Alentejo, Aljustrel, 1 ex., 25-VI-1932; 2 ex., 28-VI-1932; Almodovar, mata, 7 ex., 28-VI-1932; Sines, 2 ex., 03-VIII-1966; Vascão, 2 ex., 02-VII-1932; Vila Verde de Ficalho, 2 ex., 13-VII-1963. Beira Alta, 1 ex., Guarda, nd., Beira Alta, no locality, 6 ex., 1886; nd., 3 ex. Beira Litoral, Buçaco, 2 ex., 12-VIII-1878; 1 ex., 1886. Coimbra, nd., 2 ex. Estremadura, Almarinho, Algueirão, 1 ex., 17-VI-1938; Lisboa, nd., 2 ex. Sanguinhal, 1 ex., VIII-1947; Setúbal, 2 ex., 30-V-1958; Serra de Sintra, 1 ex., 03-VI-1970: Tróia, 2 ex., 14-VII-1941. Ribatejo, Cumeira, Juncal, 1 ex., VII-1970. Trás-os-Montes and Alto Douro, Serra do Reboredo, Moncorvo, 6 exs., 27-VI-1942.

The Small Copper is known all along the Palearctic and Nearctic Regions and is quite common in

Portugal. It flies also in the Madeira Island. Caterpillars are known on *Rumex acetosa* L. and *R. acetosella* L. (Polygonaceae).

Lycaena tityrus (Poda, 1761) *

Material examined: BEIRA ALTA, Beira Alta, margens do Vouga, 13 ex., 1886; Beira Alta, no locality, 19 ex., 1886. All the specimens, det. sub *Heodes*.

The Sooty Copper seems to be vulnerable in Portugal, particularly due to the natural biotopes' degradation caused by the progressively rich soils. It flies along most of the Palearctic Region, from the Iberian Peninsula to central Asia, but in Portugal it is restricted to the north and central-north area and to part of the Sado River basin. Caterpillars occur on *Rumex* genera (Polygonaceae).

Lycaena alciphron (Rottenburg, 1775)

Material examined: BEIRA ALTA, Fagilde, 1 ex., 17-VI-1933; Beira Alta, no locality, nd., 1 ex. BEIRA LITORAL, Buçaco, nd., 2 ex. ESTREMADURA, Lisboa, nd., 1 ex. All the specimens det. sub *Heodes*.

The Purple-shot Copper seems not rare in Portugal though most of the populations known in the lower areas are in a quite evident decline due to eucalyptation, intensive agriculture and urbanism. In Portugal, is known in several spots (more frequently, in the higher areas) one in the northern third of the country (except for the extreme north-western), one in the central-east and a third, small population in the Serra de Monchique. Like the preceding species, the caterpillars feed on *Rumex acetosa* L. and *R. acetosella* L. (Polygonaceae).

THECLINAE

Tomares ballus (Fabricius, 1787) **

Material examined: BAIXO ALENTEJO, Beja, nd., 1 ♂, 1 ♀.

The Provence Hairstreak is in extinction risk in Portugal, being today present in the Algarve and in a corridor from Trás-os-Montes to Estremadura and Alto Alentejo (areas with Mediterranean influence). Remaining European populations (Southern France and Spain) are also menaced. The progressive decreasing of its populations is connected with the degradation of the natural biotopes. Caterpillars occur, associated with ants, on *Astragalus lusitanicus* Lam., *Trifolium cherlri* L., *Lotus hispidus* Desf. ex DC in Lam & DC and *Onobrychis* spp. and other Fabaceae.

Laeosopis roboris (Esper, 1793)

Material examined: BEIRA BAIXA, Vale da Pereira, 2 ex., 13-VI-1933. BEIRA LITORAL, Coimbra, nd., 2 ex. RIBATEJO, Carrazede, Paialvo, VII-1970, 5 ex. PROV. ?: No locality, 1 ♀, 18-V-1970 (?).

The Spanish Purple Hairstreak is a common species in Portugal, absent only from its most north-western littoral area, north-west from the Mondego River. Its caterpillars are associated *Fraxinus angustifolia* Vahl. (Oleaceae), but not assisted by ants. Its range extends to the south-western France.

One isolated female labelled *Agrodiaetus damon* ([Dennis & Schiffermüller], 1775]) "Lisboa ?" (Estremadura), 18-V-1870 is considered to belong, really, to the present species; obtained by Cândido Mendes, it was assigned by SILVA-CRUZ & GONÇALVES (1950) as *Lycaena damon*. *Agrodiaetus damon* is known from Central Europe; it is discontinuously reported from the Iberian Peninsula till the Madrid latitude and clearly eastwards from this town (ARCE-CRESPO *et al*., 2004, reports Cuenca), being typical from steppes, exposed slopes and dry meadows. We are quite sure that the identification of this Portuguese sample, do not correspond to reality. Indeed, all the specimens a posteriori studied and eventually similar were correctly identified as *Laesopis roboris*.

Callophrys rubi (Linnaeus, 1758)

Material examined: BEIRA LITORAL, Coimbra, nd., 1 ex. ESTREMADURA, Alfeite, nd., 1 ex. RIBATEJO, Azambuja, nd., 1 ex. PROV. ?: Caldas, nd., 1 ex.

The Green Hairstreak is common and dispersed all along the country. The caterpillars are

polyphagous and known to occur on Fabaceae, among others, on *Echinospartum*, *Dorycnium*, *Medicago*, *Genista* and *Cytisus* genera.

Satyrium esculi (Hübner, [1804])

Material examined: Beira Alta, Beira Alta, margens do Vouga, 2 ex., 1890; Beira Alta, no locality, 2 ex., 03-VI-1960. Beira Litoral, Coimbra, nd., 3 ex. Luso, 1 ex., 02-VII-1879; nd., 1 ex.; Praia de Mira, margens da Lagoa, 1 ex., VII-1950. Estremadura, Alfeite, VI-1883, 2 ex.; Almarinho, Algueirão, 2 ex., 17-VI-1938; Serra de Sintra, nd., 1 ex. Ribatejo, Abrantes, 1 ex., 09-VI-1933.

The False Ilex Hairstreak, dispersed along the continental Portugal, seems represented by stable populations which remain relatively abundant despite the impact of the forest fires and the implementation of monocultures. Caterpillars, assisted by *Camponotus* ants, occur on *Quercus coccifera* L. and *Q. rotundifolia* Lam. (Fagaceae).

POLYOMMATINAE

Lampides boeticus (Linnaeus, 1767)

Material examined: Beira Alta, Beira Alta, margens do Vouga, 2 ♂♂, 1 ♀, 1890; Beira Alta, no locality, nd., 1 ♂, 2 ♀♀. Beira Litoral, Coimbra, nd., 1 ♂; Valega, 1 ♂, 15-VI-1850 (?). Estremadura, Cumeira, Juncal, 1 ♀, VII-1970. Ribatejo, Carrazede, Paialvo, 2 ♂♂, 2 ♀♀, VII-1970.

The Pea Blue is eventually the most cosmopolitan among the species known to fly in Portugal. It is polyvoltine (probably with three annual generations) opposite to the condition in many other Lycaenidae. The species is common and quite dispersed along the country. The caterpillars are strongly polyphagous; accompanied by ants, they occur inside pods of several Fabaceae, namely on *Adenocarpus*, *Colutea*, *Pisum*, *Lupinus* and *Genista* genera and they may attack pea plantations if not treated.

Leptotes pirithous (Linnaeus, 1767)

Material examined: Algarve, Barranco do Velho, 4 ♂♂, 01-VII-1932; Ribeira de Quarteira, nd., 2 ♂♂; Trajecto da casa Pinhal do Corvo, 1 ♂, 1 ♀, IX-1966. Baixo Alentejo, Vascão, 1 ♂, 02-VII-1932. Beira Alta, Beira Alta, margens do Vouga, 3 ♀♀, 1890; Serra da Estrela, nd., 1 ♂. Beira Alta, no locality, nd., 1 ♂, 1 ♀. Beira Baixa, Cabeçudo, Cernache de Bonjardim, 1 ♀, 28-VIII-1963. Beira Litoral, Coimbra, nd., 2 ♂♂, 1 ♀. Luso, 1 ♂, 09-VIII-1878. Estremadura, Alfeite, 1 ♂, IX-1878; Lisboa, nd., 2 ♂♂; Cumeira, Juncal, 1 ♀, VII-1970. Trás-os-Montes and Alto Douro, Horta da Vilariça, 1 ♂, IX-1940. All identified sub *Syntarucus*.

The Common Zebra Blue is a polyvoltine species very common and widely distributed along Portugal, where it is not rare even in urban parks and gardens in the big towns. Caterpillars occur on several Fabaceae like *Astragalus*, *Medicago*, *Melilotus* and *Ulex* genera.

Zizeeria knisna (Trimen, 1862) **

Material examined: Algarve, Trajecto da casa Pinhal do Corvo, 1 ex., IX-1966. Estremadura, Lisboa, 1 ex., VIII-1883. Ribatejo, Carrazede, Paialvo, 1 ex., VII-1970.

Despite its huge range in the tropical savanna of the Old World, the African Grass Blue is uncommon in Portugal, where its presence depends of the existence of damp areas and valleys of unpolluted brooks. Caterpillars feed on *Trifolium*, *Medicago* (Fabaceae) and *Oxalis* (Oxalidaceae).

Cupido minimus (Fuessly, 1775) **

Material examined: Trás-os-Montes and Alto Douro, Bragança, nd., 1 ex.

The Little Blue is quite rare in Portugal being irregularly distributed and localized (area of Lisbon, parts of the Estrela Mountain and parts of the Gerez and Montesinho), but its cartography needs to be completed. Its progressive rarity shall be the result of the forest fires, of the decline of the forests and of

the expansion of agriculture. Caterpillars occur inside the flowers and very young pods of *Anthylis vulneraria* L. and *Astragalus* spp. (Fabaceae).

Celastrina argiolus (Linnaeus, 1759)

Material examined: Baixo Alentejo, Vascão, 1 ♀, 02-VII-1932. Beira Alta, Beira Alta, margens do Vouga, 7 ♂♂, 3 ♀♀, 1890; Beira Alta, no locality, 2 ♂♂, 1886; nd., 2 ♂♂. Beira Litoral, Coimbra, nd., 2 ♂♂, 1 ♀. Estremadura, Alfeite, 1 ♂, VIII-1877. Trás-os-Montes and Alto Douro, Horta da Vilariça, 1 ♂, IX-1940; Serra do Reboredo, Moncorvo, 1 ♂, 27-VI-1942.

The Holly Blue is common along the country, though it seems to be progressively less frequent in many areas, especially due to the environmental degradation (fires, eucalyptation, pollution, agriculture expansion). Caterpillars are quite polyphagous being known especially on *Hedera* (Hederaceae), *Arctium* (Astraceae), *Ilex* (Aquifoliaceae) and *Genista* (Fabaceae).

Glaucopsyche melanops (Boisduval, 1828)

Material examined: Estremadura, Caneças, 1 ♂, 31-V-1870. Trás-os-Montes and Alto Douro, Bragança, nd., 1 ♂; Serra do Reboredo, nd., 1 ♂.

The Black-eyed Blue flies all along Portugal and despite its only annual generation and even considering the progressive urbanization and the environmental degradation is still relatively frequent, especially in the north and central country. The caterpillars, accompanied by ants, occur on several Fabaceae, namely *Dorycnium*, *Cytisus*, *Lotus*, *Ulex* and *Trifolium* genera.

Plebejus argus (Linnaeus, 1758)

Material examined: Beira Alta, Beira Alta, margens do Vouga, 10 ♂♂, 1890; Serra do Caramulo, nd., 1 ♂; Serra da Estrela, nd., 1 ♂; Beira Alta, no locality, 1 ♂, 1886; Id, nd., 5 ♂♂, 3 ♀♀. Beira Litoral, Luso, 2 ♂♂, 26-VII-1878; Buçaco, nd., 1 ♂, 1 ♀. Estremadura, Lisboa, nd., 6 ♂♂, 5 ♀♀.

Common mainly northwards from the Tagus River basin, the Silver-studded Blue is known also in the Algarve, where it is however, clearly less abundant. Caterpillars are polyphagous and occur on association with ants on quite diverse hostplants, like *Cistus libanotis* (Cistaceae), *Halimium*, *Trifolium*, *Astragalus*, *Ulex* and *Coronilla* genera (Fabaceae).

Aricia cramera (Eschscholtz, 1775)

Material examined: Algarve, Barranco do Velho, 1 ex., 01-VII-1932. Baixo Alentejo, Almodovar, Ribeira de Oeiras, Rocha da Moura, 1 ex., 27-VI-1932; Almodovar, mata, 1 ex., 28-VI-1932; Sines, 1 ex., 03-VIII-1966; Vascão, 4 ex., 02-VII-1932; Vila Verde de Ficalho, 1 ex., 13-VII-1963. Beira Alta, Oliveira de Frades, nd., 2 ex.; Beira Alta, no locality, 6 ex., 1886; nd., 3 ex. Estremadura, Belém, VIII-1883, 1 ex. Cumeira, Juncal, 2 ex., VII-1970; Serra de Sintra, 1 ex., 03-VI-1960. Minho, Vizela, nd., 2 ex. Ribatejo, Carrazede, Paialvo, 4 ex., VII-1970. Trás-os-Montes and Alto Douro, Horta da Vilariça, 1 ex., IX-1940.

Common in several areas of Portugal, the Spanish Brown Argus flies from north to south of the country. It is, however, more and more affected by fires, urbanization and pollution. Caterpillars occur, among other hostplants, on *Helianthemum* (Cistaceae), *Erodium* and *Geranium* genera (Geraniaceae).

Polyommatus icarus (Rottenburg, 1775)

Material examined: Algarve, Barranco do Velho, 7 ♂♂, 2 ♀♀, 01-VII-1932; Ribeira de Quarteira, nd., 1 ♀; Vila Real de Santo António, dunes, 1 ♀, 30-V-1934. Alto Alentejo, Évora, nd., 2 ♂♂. Baixo Alentejo, Serra d'Aire, Almodovar, 1 ♂, 30-VI-1932. Beira Alta, Beira Alta, margens do Vouga, 15 ♂♂, 1890; Serra da Estrela, nd., 1 ♂. Beira Litoral, Buçaco, 1 ♂, 30-VIII-1879. Estremadura, Almarinho, Algueirão, 1 ♀, 17-VI-1938; Cumeira, Juncal, 2 ♂♂, VII-1970; Lisboa, nd., 2 ♂♂. Ribatejo, Alburitel, 1 ♂, 2 ♀♀, 02-IX-1966; Carrazede, Paialvo, 13 ♂♂, 6 ♀♀, VII-1970.

The Common Blue is still relatively common along the country. Caterpillars occur on several Fabaceae, as *Trifolium*, *Lotus*, *Medicago* and *Ononis* genera.

Polyommatus bellargus (Rottenburg, 1775) *

Material examined: Beira Alta, Beira Alta, margens do Vouga, 1 ♂, 1890; Margens do Vouga, nd., 1 ♂. Estremadura, Campos de Alcobaça, 1 ♂, VIII-1948. Ribatejo, Azambuja, nd., 2 ♂♂. All the samples were identified under *Lysandra*.

Not so widely distributed along Portugal like the previous one and quite dispersed (it lacks in the north-western and north-eastern country and in the western portion of Baixo Alentejo), the Adonis Blue is moderately menaced, particularly due to the monocultures increasing, to the implementation of the intensive agriculture and to the subsequent use of pesticides. Caterpillars occur on *Trifolium*, *Hippocrepis* and *Coronilla* genera (Fabaceae).

NYMPHALIDAE
SATYRINAE

Pararge aegeria (Linnaeus, 1758)

Material examined: Baixo Alentejo, Telhada, Almodovar, 1 ♂, 29-VI-1932; Vila Nova de Milfontes, canal, 2 ♂♂, 1 ♀, 07-VIII-1941. Beira Alta, Caldelas, 1 ♂, VIII-1932; Pinhel, 1 ♂, 1881; Beira Alta, no locality, nd., 1 ♂. Beira Litoral, Coimbra, nd., 1 ♂. Estremadura, Cumeira, Juncal, 7 ♂♂, VII-1970. Ribatejo, Alburitel, 1 ♀, 02-IX-1966. Trás-os-Montes and Alto Douro, Horta da Vilariça, 1 ♂, IX-1940.

The Speckled Wood is very abundant and dispersed along the country; it flies in the continent Portugal and in the marginal low areas of the Madeira Island. Caterpillars occur on Poaceae, as those of genera *Agropyrum*, *Piptatherum*, *Poa* and *Triticum*.

Lasiommata megera (Linnaeus, 1767)

Material examined: Algarve, Monchique, Picota, 3 ♂♂, 05-X-1951. Baixo Alentejo, Vascão, 1 ♀, 02-VII-1932. Beira Alta, Serra da Estrela, 1 ♂, 1881; nd., 1 ♂. Beira Litoral, Coimbra, nd., 1 ex. Minho, Gerez, 1 ♂, 16-X-1941. Ribatejo, Carrazede, Paialvo, 8 ♂♂, VII-1970.

The Wall Brown is common in Portugal, where it flies all along the country. Caterpillars are known on several genera of Poaceae, like *Aegilops*, *Brachipodium*, *Dactylis*, *Poa* and *Stipa*.

Lasiommata maera (Linnaeus, 1758)

Material examined: Beira Alta, Pinhel, 1 ♂, 1881; Beira Alta, no locality, nd., 4 ♂♂, 2 ♀♀. Estremadura, Lisboa, nd., 1 ♂, 1 ♀.

Tough with a somewhat more restrict range in Portugal than the previous species (it flies today in the northernmost third of the territory and in the Lisbon-Setúbal- Grândola area), the Large Wall Brown in not menaced. Like all the representatives of the subfamily, the caterpillars feed on gramineae, being known to occur, among others, on species of *Glyceria*, *Festuca*, *Lolium*, *Poa* and *Triticum*.

Coenonympha arcania (Linnaeus, 1761) *

Material examined: Beira Alta, Beira Alta, margens do Vouga, 7 ♂♂, 1886.

The Pearly Heath is vulnerable in Portugal particularly due to the environmental degradation; its range in the country is restricted to the northern area. Its reported capture at the Vouga riverbanks will correspond to its southernmost limit in the country. Caterpillars occur on *Melica* and *Poa*.

Coenonympha dorus (Esper, 1782)

Material examined: Algarve, Barranco do Velho, 1 ♂, 1 ♀, 01-VII-1932. Beira Alta, Beira Alta, margens do Vouga, 2 ♂♂, 1 ♀, 1886; Serra da Estrela, 1 ♂, 1881; Beira Alta, no locality, nd., 1 ♀. Beira Litoral, Coimbra, nd., 1 ♂, 1 ♀. Estremadura, Alfeite, 1 ♂, VI-1889; Lisboa, nd., 1 ♂.

The Dusky Heath is abundant in the north and central country is not so common in the south, and is not menaced in Portugal, though remains stressed because of the implementation of the monocultures and as result of the forest fires, particularly due to the destruction of the xerothermic bushes and

meadows. Caterpillar's hostplants are herbs of genera *Agrotis*, *Brachypodium*, *Festuca*, *Carex* and *Stipa*.

Coenonympha pamphilus (Linnaeus, 1758)

Material examined: ALGARVE, Barranco do Velho, 1 ex., 01-VII-1932. BAIXO ALENTEJO, Almodovar, mata, 1 ♀, 28-VI-1932, 1 ex.; Vascão, 1 ex., 02-VII-1932. BEIRA ALTA, Serra do Caramulo, 3 ex., 1885; Serra da Estrela, nd., 1 ex.; Beira Alta, margens do Vouga, 37 ex., 1886; 1890, 1 ex.; Beira Alta, no locality, nd., 5 ex. Fagilde, 1 ex., 16-VI-1933; Guarda, nd., 1 ex. BEIRA BAIXA, Vale da Pereira, 1 ex., 12-VI-1933. BEIRA LITORAL, Coimbra, nd., 2 ex. RIBATEJO, Carrazede, Paialvo, VII-1970, 2 ex.

As it happens with the previous species, the Small Heath is dispersed by the country along areas with herbaceous xerothermic vegetation; however, the ecological pressure of the monocultures and the forest fires contribute to its clear rarefaction or its extinction in several areas. Caterpillars are reported to occur on *Poa annua* L., *Nardus stricta* L. and *Cynosurus cristatus* L. (Poaceae).

Pyronia tithonus (Linnaeus, 1767)

Material examined: ALGARVE, Barranco do Velho, 3 ♂♂, 01-VII-1932. BAIXO ALENTEJO, Vila Nova de Milfontes, bosque, 1 ♂, 07-VII-1941. BEIRA ALTA, Serra da Estrela, 1 ♂, 1 ♀, 1881; Id, nd., 1 ♀; Beira Alta, margens do Vouga, 16 ♂♂, 1♀, 1886; Beira Alta, no locality, nd., 3 ♂♂. BEIRA BAIXA, Cabeçudo, Cernache de Bonjardim, 1 ♂, 1 ♀, 28-VIII-1963. BEIRA LITORAL, Coimbra, nd., 1 ♀. ESTREMADURA, Cumeira, Juncal, 5 ♂♂, VII-1970. RIBATEJO, Carrazede, Paialvo, 1 ♂, VII-1970. TRÁS-OS-MONTES and ALTO DOURO, Serra do Reboredo, Moncorvo, 1 ♂, 25-VI-1942.

The Spanish Gatekeeper or Hedge Brown is common especially northwards from the Tagus basin, and is usually more visible along blackberry thickets and on the dry and not very close forest margins. It is not yet vulnerable though the forest monocultures, particularly the eucalyptation, clearly contribute to the decline of its populations. Caterpillars occur on several Gramineae species of *Brachypodium*, *Festuca*, *Milium* and *Poa* genera.

Pyronia cecilia (Vallantin, 1894)

Material examined: ALGARVE, Barranco do Velho, 3 ♂♂, 01-VII-1932; Chão Cavalar, 1 ♂, 2 ♀♀, 02-IX-1966. ALTO ALENTEJO, Herdade de Font'Alva, Barbacena, 2 ♂♂, 09-VI-1936. BAIXO ALENTEJO, Beja, nd., 2 ♀♀; Lopitos, Moura, 1 ♂, 11-VII-1963; Vila Nova de Milfontes, farol, 1 ♀, 08-VII-1941. BEIRA ALTA, Serra da Estrela, 1 ♀, 1881; Id, nd., 1 ♂; Beira Alta, margens do Vouga, 1 ♂, 1886; Beira Alta, no locality, nd., 1 ♂. BEIRA BAIXA, Vale da Pereira, 1 ♂, 12-VI-1933. BEIRA LITORAL, Coimbra, nd., 1 ♀. DOURO LITORAL, Arouca, 1 ♀, 01-IX-1967. ESTREMADURA, Bombarral, Estrada das Barreiras, 2 ♀♀, 05-VIII-1947; Campos de Alcobaça, 1 ♀, VIII-1948; Cumeira, Juncal, 1 ♂, VII-1970. RIBATEJO, Alburitel, 3 ♀♀, 28-VIII-1966; Carrazede, Paialvo, 9 ♂♂, 4 ♀♀, VII-1970. PROV. ?: No locality, 1 ♂, 1 ♀, 21-VI-1970.

The Southern Gatekeeper is common and widely distributed along Portugal. Caterpillars are known on *Brachypodium*, *Deschampsia* and may occur also on wheat (*Triticum*).

Pyronia bathseba (Fabricius, 1793)

Material examined: BEIRA LITORAL, Coimbra, 1 ♂, 1878; nd., 2 ♀♀. ESTREMADURA, Tróia, 2 ♀♀, 14-VII-1941; 1 ♀, 21-VI-1970. TRÁS-OS-MONTES and ALTO DOURO, Horta da Vilariça, 1 ♂, 1 ♀, IX-1940.

This Gatekeeper, with a Mediterranean range, seems to occur without problems along most of the country (it lacks in the north-western littoral); it is, however, restricted in Europe to Portugal, Spain and southern France. Caterpillars occur on several Poaceae.

Maniola jurtina (Linnaeus, 1758)

Material examined: ALGARVE, Chão Cavalar, 2 ♀♀, 02-IX-1966. ALTO ALENTEJO, Herdade de

Font'Alva, 8 ♂♂, 2 ♀♀, 09-VI-1936. BAIXO ALENTEJO, Almodôvar, 1 ♂, 28-VI-1932; Telhada, Almodôvar, 1 ♀, 29-VI-1932; Vila Verde de Ficalho, 1 ♂, 13-VII-1963. BEIRA ALTA, Fagilde, 1 ♂, 16-VI-1933; Serra do Caramulo, margens do Vouga, 2 ♂♂, 1890; Serra da Estrela, 2 ♂♂, 1881; nd., 1 ♂; Beira Alta, margens do Vouga, 4 ♂♂, 3 ♀♀, 1886; Beira Alta, no locality, nd., 1 ♀. BEIRA BAIXA, Vale da Pereira, 1 ♂, 13-VI-1933. BEIRA LITORAL, Coimbra, 1 ♀, 1878; nd., 4 ♀♀. ESTREMADURA, Engenho, Marinha Grande, 1 ♀, VI-1938; Lagoa Azul, 1 ♀, Linhó, 15-VI-1938; 1 ♀, 16-VI-1938; Ribeira da Marateca, 1 ♀, 03-VI-1964. RIBATEJO, Abrantes, 1 ♂, 09-VI-1933; Alburitel, 1 ♀, 28-VIII-1966; 1 ♀, 02-IX-1966; Carrazede, Paialvo, 1 ♂, 21-VI-1970; 2 ♂♂, 1 ♀, VII-1970. TRÁS-OS-MONTES and ALTO DOURO, Horta da Vilariça, 1 ♂, IX-1940; Serra de Bornes, 1 ♂, 07-VIII-1961; Serra do Reboredo, Moncorvo, 2 ♂♂, 1 ♀, 27-VI-1942. PROV. ?: Santa Clara, 2 ♀♀, 22-V-1971; Id., 2 ♀♀, 26-V-1971.

The Meadow Brown is common along the country, even in peri-urban areas; causes of this range are certainly the caterpillars' polyphagia (Poaceae) and the bivoltine cycle. Caterpillars are known on *Brachypodium*, *Elymus*, *Poa* and *Stypa* genera among other herbs.

Hyponephele lycaon (Rottenburg, 1775) *

Material examined: BEIRA ALTA, Serra do Caramulo, margens do Vouga, 1 ♀, 1890; Serra da Estrela, 2 ♂♂, 5 ♀♀, 1881.

The Dusky Meadow Brown seems to be vulnerable in Portugal, where its range, though not completely known, shall be reduced and localized (an interior strip between the Estrela Mountain, the Gerez and Bragança), with an isolated (?) population in the Estremadura calcareous massif. Caterpillars feed on species of *Bromus*, *Festuca* and *Stypa* genera (Poaceae).

Melanargia lachesis (Hübner, 1790)

Material examined: BEIRA ALTA, Fagilde, 4 ♂♂, 16-VI-1933; 2 ♂♂, 17-VI-1933. ESTREMADURA, Cumeira, Juncal, 1 ♂, VII-1970. RIBATEJO, Abrantes, 1 ♂, 09-VI-1933. TRÁS-OS-MONTES and ALTO DOURO, Serra do Reboredo, Moncorvo, 12 ♂♂, 1 ♀, 27-VI-1942 + (det. as *M. lachesis* var. *geresiana*). BEIRA ALTA, Fagilde, 1 ♂, 1 ♀, 16-VI-1933; 1 ♂, 17-VI-1933. RIBATEJO, Abrantes, 1 ♀, 09-VI-1933; Carrazede, Paialvo, 3 ♂♂, 1 ♀, VII-1970. TRÁS-OS-MONTES and ALTO DOURO, Serra do Reboredo, Moncorvo, 2 ♂♂, 10 ♀♀, 27-VI-1942.

The Iberian Marbled White, one of the marbled whites, is widely distributed in Portugal and quite common along most of the country (except for the southern Alentejo and Algarve). Caterpillars are known to occur on several Gramineae species of *Brachypodium*, *Bromus*, *Dactylis*, *Festuca* and *Poa* genera.

Melanargis ines (Hoffmansegg, 1804)

Material examined: ESTREMADURA, Tróia, 1 ♂, 13-V-1941.

The Spanish Marbled White is known as sparsely distributed along central and southern Portugal and in the xerothermic Douro; despite not menaced, some populations are in decline due to urbanization, others due to the rural fires. Caterpillars are known to occur on species of genera *Brachypodium*, *Bromus* and *Stypa* (Poaceae).

Satyrus actaea (Esper, 1781) *

Material examined: BEIRA ALTA, Serra da Estrela, 2 ♂♂, 2 ♀♀, 1881. PROV. ?: No locality, nd., 1 ♂.

The Black Satyr is vulnerable mainly due to the rural fires, occurring only in high altitude. Caterpillars occur only on *Brachypodium phoenicoides* (L.) Roem. & Schult., *Bromus unioloides* Kunth and *Festuca iberica* (Hackel) K. Richt. (Poaceae).

Hipparchia alcyone ([Denis & Schiffermüller], 1775)

Material examined: BEIRA ALTA, Margens do Rio Dão, 3 ex., 1890; Beira Alta, margens do Vouga, 29 ex., 1886; Serra do Caramulo, margens do Vouga, 1 ex., 1890; Serra da Estrela, 4 ex., 1881; Beira

Alta, no locality, nd., 2 ex. Beira Baixa, Vale da Pereira, 1 ex., 13-VI-1933. Beira Litoral, Buçaco, 2 ♂♂, 1 ♀, 18-VII-1878; nd., 2 ex.

The Rock Grayling is known from the northern half of Portugal only, though it may be locally quite common. The caterpillars are known to feed on some Poaceae as *Arrhenaterum elatius* (L.) P. Beauv. ex J. Presl. & C., Presl., *Brachypodium pinnatum* (L.) Beauv. and a few species of *Festuca* (*F. ampla* Hack., *F. paniculata* (L.) Schinz & Thell. and *F. ovina* L.).

Hipparchia semele (Linnaeus, 1758)

Material examined: Beira Litoral, Buçaco, 1 ♂, II-1878. Trás-os-Montes and Alto Douro, Serra do Reboredo, Moncorvo, 1 ♂, 1 ♀, 27-VI-1942.

The Common Grayling is frequent in the northern half of Portugal and rare southwards from the Tagus River; the littoral areas urbanization and the eucalyptation are the main menaces to the stability of some of its populations. Caterpillars occur on gramineae of genera *Arrhenaterum*, *Brachypodium*, *Deschampsia*, *Festuca* and *Poa*, though it may also occur on wheat (*Triticum aestivum* L.).

Hipparchia statilinus (Hufnagel, 1766)

Material examined: Algarve, Chão Cavalar, 1 ♀, 02-IX-1966. Beira Alta, Beira Alta, margens do Vouga, 6 ♂♂, 6 ♀♀, 1886; Margens do Vouga, 1 ♂, 3 ♀♀, 1886; 1 ♀, 1887; Serra do Caramulo, 1 ♀, 1890; Serra da Estrela, 2 ♂♂, 3 ♀♀, 1881; nd., 1 ♂. Beira Baixa, Cabeçuco, Cernache de Bonjardim, 1 ♀, 28-VIII-1963. Beira Litoral, Buçaco, nd., 2 ♂♂; Valega, 1 ♀, 15-VIII-1950 (?). Estremadura, Bombarral, estrada das Barreiras, 1 ♂, 1 ♀, 05-VIII-1947. Trás-os-Montes and Alto Douro, Serra de Bornes, 1 ♂, 07-VIII-1961.

The Tree Grayling flies especially in areas with quercin forests and is more common northwards from the Tagus River. The eucalyptation, once it replaces areas originally covered by *Quercu*s species, led some populations to extinction. Caterpillars occur on several Poaceae, as on species of *Avenula*, *Bromus*, *Brachypodium*, and *Festuca* genera.

Hipparchia fidia (Linnaeus, 1767)

Material examined: Beira Alta, Beira Alta, margens do Vouga, 1 ♂, 2 ♀♀, 1886. Beira Litoral, Buçaco, 2 ♀♀, 01-VIII-1878; Coimbra, nd., 1 ♂, 1 ♀. Estremadura, Bombarral, estrada das Barreiras, 1 ♂, 05-VIII-1947; Mafra, 1 ♂, 25-VII-1965. Trás-os-Montes E Alto Douro, Serra do Reboredo, Moncorvo, 1 ♂, 27-VI-1942. All the specimens were identified sub *Pseudotergumia*.

The Striped Grayling flies along most of Portugal (not in the inner areas of Alto and Baixo Alentejo) and, despite it is the genus species with a wider range in the country is never abundant. As it happens with other Satyrinae, its populations are progressively less common due to the habitat destruction, particularly associated to forest fires and eucalyptation. Caterpillars occur on species of *Brachypodium*, *Cynodon*, *Festuca*, *Piptatherum*, *Poa* and *Stipa* genera (Poaceae).

Brintisia circe (Fabricius, 1775)

Material examined: Trás-os-Montes and Alto Douro, Serra do Reboredo, Moncorvo, 2 ♀♀, 27-VI-1942.

The Great Banded Grayling associated to clearings of open oak woods with Poaceae. The stability of its populations depends so, from a correct environmental management, avoiding forest fires, eucalypt plantations and other extensive cultures. Caterpillars occur on distinct gramineae, as species of genera *Anthoxantum*, *Arrhenaterum*, *Brachypodium*, *Bromus* and *Festuca*.

CHARAXINAE

Charaxes jasius (Linnaeus, 1767)

Material examined: Algarve, Picota, Serra de Monchique, 1 ♂, 05-X-1951. Estremadura, Alfeite, 1 ♀, 29-IV-1880; 1 ♀, VI-1883; 1 ♂, 04-V-1884; nd., 1 ♂, 1 ♀. Minho, Serra do Gerez, nd., 1 ♂, 1 ♀.

The Strawberry-tree Butterfly, which caterpillars are completely dependent of this plant (they are monophagous on the strawberry tree (*Arbutus unedo* L., Ericaceae), occurring along most of Portugal mainly in its western part. The largest among the Portuguese (and European) butterflies is, however, much more common in the south, where the host-plant woods cover wider extensions. It is not menaced, but the forest fires and growing urbanization, especially in areas where it was common led to the decline of part of its populations.

NYMPHALINAE

Vanessa atalanta (Linnaeus, 1758)

Material examined: Beira Alta, Serra do Caramulo, margens do Vouga, 1 ex., 1890. Beira Litoral, Coimbra, 1 ex., 19-VII-1871; 1 ex., 23-VII-1871; nd., 1 ex.; Luso, 1 ♂, 1 ♀, 23-IX-1879; 2 ♀♀, 24-IX-1879. Estremadura, Lisboa, 1 ♀, 17-XI-1871; 1 ♂, 15-X-1877; 1 ♀, 16-X-1877; 1 ex., 17-X-1877; 1 ex., 19-X-1877.

Known on the Palearctic and Nearctic Regions, the Red Admiral is very common in Portugal along the continent, as well as in the Madeira and Azores Archipelagous. It is often visible even in the urban gardens in the big towns. Caterpillars occur on species of *Parietaria* and *Urtica* genera (Urticaceae).

Vanessa cardui (Linnaeus, 1758)

Material examined: Baixo Alentejo, Vila Nova de Milfontes, bosque, 1 ex., 07-VII-1941; 1 ex., 08-VII-1941; Id, paiol, 1 ex., 08-VII-1941; Vila do Campo, Milfontes, 1 ex., 06-VIII-1941. Beira Alta, Serra do Caramulo, margens do Vouga, 4 ex., 1890; Serra da Estrela, 1 ♂, 1881; Beira Alta, no locality, nd., 1 ex. Estremadura, Engenho, Marinha Grande, 2 ex., VI-1938; Sintra, nd., 1 ex.; Tapada, 1 ♀, 24-II-1883; 1 ex., VII-1885. Ribatejo, Abrantes, 1 ex., 09-VI-1933. Trás-os-Montes and Alto Douro, Horta da Vilariça, 2 ex., IX-1940; Serra do Reboredo, Moncorvo, 5 ex., 27-VI-1942.

The Painted Lady, cosmopolite, is quite common along the country. The caterpillars are polyphagous, occurring several low plants, as species of the genera *Arctium*, *Carduus*, *Onopordum* (Asteraceae), *Malva* (Malvaceae), and *Urtica* (Urticaceae).

Inachis io (Linnaeus, 1758) *

Material examined: Beira Alta, Guarda, 1 ex., 09-VI-1881; 1 ♀, 11-VI-1881.

Moderately menaced, the Peacock Butterfly though never common in Portugal, is more frequent northwards from the Mondego River valley and the Serra da Estrela (the southern registrations concern migrants). The extensive agriculture and the concomitant increase of the use of pesticides are certainly responsible by the decline of the populations of this univoltine species. The caterpillars occur on species of *Urtica* genera (Urticaceae).

Aglais urticae (Linnaeus, 1758) *

Material examined: Beira Alta, Serra da Estrela, 1 ex., 1881. PROV.?: Douro, 1 ♂, 1 ♀, 02-V-1880; 1 ♀, 03-V-1880; 1 ♂, 04-V-1880; 2 ♂♂, 05-V-1880, 2 ex., 06-V-1880; 2 ex., nd.

The Small Tortoiseshell is vulnerable in Portugal; restricted in the country to the central-northern and northern areas, it is bivoltine. Where it occurs, mainly in the inland high areas, its populations may be abundant. Like in the preceding species, the caterpillars feed on nettles, especially on *Urtica dioica* L. (Urticaceae).

Polygonia c-album (Linnaeus, 1758) *

Material examined: Beira Alta, Beira Alta, margens do Vouga, 3 ex., 1890; Margens do Vouga, nd., 2 ex.; Beira Alta, no locality, nd., 1 ♂. Beira Litoral, Coimbra, nd., 1 ex. Estremadura, Lisboa,

nd., 1 ex. TRÁS-OS-MONTES and ALTO DOURO, Bragança, nd., 1 ex. Vidago, 1 ♂, 16-VIII-1878; PROV. ?: Beira, nd., 1 ex.

Though vulnerable, the Comma seems to remain relatively common locally and is known in the northern half of Portugal. The polyphagous caterpillars occur on a variety of hostplants, among others *Urtica* (Urticaceae), *Prunus spinosa* L. (Rosaceae), *Ulmus* (Ulmaceae), *Populus* (Salicaceae), *Corylus avelana* L. (Corylaceae) and *Humulus lupulus* L. (Moraceae).

Nymphalis antiopa (Linnaeus, 1758) *

Material examined: BEIRA ALTA, Serra do Caramulo, 1 ex., 1888; nd., 1 ex.; Beira Alta, no locality, 1 ex., nd.

Considered as vulnerable in Portugal, the Camberwell Beauty is scarce and occurs only in the northern part of the country; its rarity may be related to its life cycle (univoltine), to the caterpillars food-regimen and to the environmental degradation. Caterpillars occur on species of the genera *Salix* and *Populus* (Salicaceae), *Betula* (Betulaceae), and *Ulmus* (Ulmaceae).

Nymphalis polychloros (Linnaeus, 1758) *

Material examined: ALTO ALENTEJO, Évora, nd., 1 ♂. BEIRA ALTA, Beira Alta, no locality, 1 ex., 1890. BEIRA LITORAL, Entre Coimbra e a Lousã, nd., 1 ♀. ESTREMADURA, Ajuda, 1 ♀, VII-1883; nd., 1 ♂. Lisboa, Jardim Botânico, 1 ♀, 18-VI-1962; 1 ex., 20-VI-1964. RIBATEJO, Bemposta, 1 ♀, V-1887.

The Large Tortoiseshell is vulnerable in Portugal, especially due to the habitat loss, particularly by the expansion of the eucalypt along wide areas and by the increasing use of pesticides in the orchards of several fruit-trees (cherry, ginger, plums) where caterpillars may feed. The species is somewhat more common in the northern part of the country because of its preference by hilly areas. Besides the orchards, the caterpillars occur also on the species of the genera *Ulmus* (Ulmaceae), *Salix* and *Populus* (Salicaceae) and *Celtis* (Cannabaceae).

Euphydryas aurinia (Rottenburg, 1775)

Material examined: BEIRA ALTA, Serra do Caramulo, 1 ♂, 1888, 1 ex. Lagos - Beira, 1 ♀, 05-V-1881; 1 ♂, 09-V-1881. BEIRA LITORAL, Buçaco, nd., 1ex. PROV.?: Caldas, 1 ♀, nd.

This Marsh Fritillary is not menaced in Portugal, being known all along the continent. The polyphagous caterpillars are known to occur on species of *Lonicera*, *Succisa* (Caprifoliaceae), *Plantago lanceolata* L. (Plantaginaceae) and *Scabiosa* (Dipsacaceae).

Melitaea cinxia (Linnaeus, 1758) *

Material examined: TRÁS-OS-MONTES and ALTO DOURO, Bragança, nd., 1 ♂.

Vulnerable, the Glanville Fritillary is restricted in Portugal to the northern and central-northern areas, what corresponds to its Southern range limit; the environmental alterations resulting from the forest fires and from the expansion of the cultivated areas and simultaneous increase of the pesticide use, shall be the main reasons of the progressive decline of its populations in Portugal, as well as all along remaining Europe. Caterpillars occur on species of the genera *Plantago* (Plantaginaceae), *Hieracium*, *Centaurea* (Asteraceae) and *Veronica officinalis* L. (Scrophulariaceae).

Melitaea phoebe ([Dennis & Schiffermüller], 1775)

Material examined: BEIRA ALTA, Beira Alta, no locality, 2 ♂♂, 1885 1 ex.; nd., 1 ♀. TRÁS-OS-MONTES and ALTO DOURO, Bragança, 1 ♀, 1 ex., nd.

The Knapweed Fritillary is not specially menaced along Portugal, though its presence mainly in dry meadows in hilly areas (central and north part of the country and western littoral from the Lisbon region to the Southern Alentejo) suffers with the progressive eucalyptation and, as it happens with all

the remaining species, with the cumulative habitat destruction caused by fire. Caterpillars are known on a wide variety of hostplants, as species of the genera *Centaurea* (Asteraceae), *Plantago* (Plantaginaceae), *Digitalis* (Scrophulariaceae) and *Cistus* (Cistaceae).

Melitaea trivia ([Dennis & Schiffermüller], 1775) *

Material examined: Beira Alta, Caramulo, 1 ♀, 23-VII-1885.

The vulnerable Lesser Spotted Fritillary, the smaller of the *Melitea* species, is vulnerable and restricted to the central-northern and north-eastern part of the country; its progressive rarity is related not only with its reduced range in Portugal, but also to the decreasing area of non-plotted soils, to the forest fires and to reforestation mainly by exotic species. Caterpillars occur on species of the genera *Verbascum*, *Linaria* (Scrophulariaceae) and *Plantago*, (Plantaginaceae).

Melitaea didyma (Esper, 1778) *

Material examined: Beira Baixa, Vale da Pereira, 1 ♂, 13-VI-1933. Estremadura, Lisboa, nd., 1 ♀, 1 ex. Trás-os-Montes and Alto Douro, Vidago, 1 ♂, 1 ♀, 16-VIII-1878.

Vulnerable in Portugal, the Spotted Fritillary seems to be uncommon and restricted from medium to high altitude areas along the interior central and northern country (it extends, however, to the Arrábida Mountain and there is an isolated spot in the Algarve); the decline of its populations seems especially the result of the annual forest fires, of the eucalyptation and to the increasing area occupied by the monocultures. Caterpillars occur on several herbaceous, like species of the genera *Linaria* (Scrophulariaceae), *Plantago* (Plantaginaceae) and *Digitalis* (Scrophulariaceae).

LIMENETIDINAE

Limenitis reducta Staudinger, 1901*

Material examined: Beira Alta, Margens do Rio Dão, 2 ♂♂; nd. Serra do Caramulo, margens do Vouga, 19 ♂♂, 1 ♀, 1890.

Vulnerable in Portugal, the Southern White Admiral is known in forest habitats, mainly on the gallery-forests of the central-north and north of the country. Pollution, forest fires, increasing of monocultures and the resulting habitat loss are certainly the causes of the decline of its populations in the country. Caterpillars occur on *Lonicera* (Caprifoliaceae) only.

HELICONIINAE

Argynnis paphia (Linnaeus, 1758) *

Material examined: Beira Alta, Beira Alta, margens do Vouga, 13 ex., 1885; Margens do Vouga, 1 ex., 1890; 3 ex., nd.; Serra do Caramulo, margens do Vouga, 1 ex., 1890. Minho, Gerez, 2 ex., 1883; 2 ex., nd.

The Silver-Washed Fritillary, known in Portugal northwards from the Douro River only, is considered as vulnerable in the country especially due to habitat destruction and to its monophagy - indeed, the caterpillars feed exclusively on *Viola* sp. (Violaceae).

Argynnis pandora ([Dennis & Schiffermüller], 1775)

Material examined: Beira Alta, Beira Alta, no locality, 1 ♂, 1890; 1 ♂, nd. Beira Litoral, Buçaco, 2 ♂♂, 17-VII-1878; 1 ♂, 25-VII-1878; Coimbra, nd, 1 ♂. Estremadura, Campos de Alcobaça, 1 ♂, VIII-1948. Trás-os-Montes and Alto Douro, Serra do Reboredo, Moncorvo, 1 ♂, 27-VI-1942. All the specimens were identified sub *Pandorina*.

The Cardinal is known from the Tagus River basin northwards and in the Algarve, being frequent inland and rare elsewhere. Like the preceding species, caterpillars occur exclusively on *Viola* sp. (Violaceae).

Argynnis aglaja (Linnaeus, 1758) **

Material examined: MINHO, Gerez, 1 ♂, 1883; 1 ♂, nd.

Orophile and univoltine, the Dark Green Fritillary is strongly menaced of extinction in Portugal, particularly due to its reduced range in the country (only the northern area, throughout Gerez and Trás-os-Montes) and to the environmental degradation mainly due of forest fires, the knock-out of the natural forest and the destruction of the surrounding meadows. Further, the caterpillars are monophagic on *Viola tricolor* (Violaceae).

Argynnis adippe ([Dennis & Schiffermüller], 1775) *

Material examined: BEIRA ALTA, Beira Alta, margens do Vouga, 5 ex., 1890; Beira Alta, no locality, 8 ex., 1885. BEIRA LITORAL, Buçaco, 1 ♂, 17-VII-1878; 1 ♂, 25-VII-1878; 1 ♂, 15-VII-1879; Coimbra, nd., 3 ♀♀. MINHO, Caldas de Vizela e arrabaldes, nd., 1 ♀. TRÁS-OS-MONTES and ALTO DOURO, Serra do Reboredo, Moncorvo, 1 ex., 27-VI-1942.

The High Brown Fritillary is known only from the northernmost third of Portugal and by an isolated population in Monchique (known only from the 200 m de altitude on); moreover, the species is univoltine and monophagous on genera *Viola* (Violaceae).

Issoria lathonia (Linnaeus, 1758)

Material examined: BEIRA ALTA, Fagilde, 1 ex., 16-VI-1933; Serra do Caramulo, 1 ex., 1888: Serra da Estrela, 1 ♂, 1881: Beira Alta, no locality, 1 ♂, 2 ♀♀, 1885; 2 ex, 1890, 2ex.; nd., 1 ♀. BEIRA BAIXA, Castelo Branco, 10-VI-1933, 1ex. BEIRA LITORAL, Buçaco, 1 ♂, 27-VII-1878; 1 ♂, 05-VIII-1881. ESTREMADURA, Lisboa, nd., 1ex. TRÁS-OS-MONTES and ALTO DOURO, Bragança, nd., 1 ♂, 2 ex.; Serra do Reboredo, Moncorvo, 4 ex., 27-VI-1942; PROV.?: Beira, nd., 1 ♀. All the specimens identified sub *Argynnis*.

Disperse and frequent in the country northern half and along Algarve, the Queen of Spain Fritillary is a trivoltine species that occurs mainly in wastelands where the caterpillars feed exclusively on genera *Viola* (Violaceae)

Boloria selene ([Dennis & Schiffermüller], 1775) *

Material examined: BEIRA ALTA, Serra do Caramulo, 2 ex., 1888; Beira Alta, no locality, 1 ex., 1890.

Vulnerable in Portugal, the Small Pearl-bordered Fritillary is known in the country exclusively north from the Mondego River valley, being its populations always above the 200 m altitude. The species is especially menaced by the forest fires, by the introduction of exotic forest trees, by the implementation of agriculture as well as by other causes that imply the biotope modification. Caterpillars feed species of the genera *Viola* (Violaceae) and *Fragaria* (Rosaceae).

ZYGAENOIDEA
ZYGAENIDAE

Zygaena (Agrumenia) fausta (Linnaeus, 1767)

Material examined: BEIRA LITORAL, Coimbra, 2 ex., 1878, det. sub *Zygaena*.

The Auspicious Burnet or Chalk Burnet' caterpillars feed on species of the genera *Coronilla* (Fabaceae).

Zygaena (Zygaena) trifolii (Esper, 1783)

Material examined: BEIRA ALTA, Beira Alta, margens do Vouga, 29 ex., 1885; Vouzela, nd., 1 ex. Beira Alta, no locality, 2 ex, nd. ESTREMADURA, Próximo de Vale de Gatos, 1 ex., IV-1966; Serra de Sintra, 2 ex., 03-VI-1960 - all det. sub *Zygaena*.

The caterpillars of the Five-Spot Burnet are known on *Lotus* (Fabaceae).

Discussion

Among the 79 taxa represented in the disappeared studied series that was the aim of the present contribution, 29, so, ca. 36% concerned species which Portuguese populations are reported as subjected to some degree of menace.

Indeed, seven among the studied species, are currently considered rare or even extinct in Portugal: they concern one Hesperiidae, one Pieridae, four Lycaenidae and one Nymphalidae, namely *Carcharodus baeticus*, *Euchloe tagis*, *Hamearis lucina*, *Tomares ballus*, *Zizeeria knisna*. *Cupido minimus* and *Argynnis aglaja*; otherwise, twenty two further species are reported, also according to MARAVALHAS (2003) as menaced: these are the cases of two Hesperiidae, one Papilionidae, two Pieridae, three Lycaenidae and fifteen Nymphalidae, namely *Thymelicus lineola*, *Thymelicus action*, *Zerynthia rumina*, *Aporia crataegi*, *Gonepteryx cleopatra*, *Lycaena tityrus*, *Polyommatus bellargus*, *Coenonympha arcania*, *Hyponephele lycaon*, *Satyrus actaea*, *Inachis io*, *Aglais urticae*, *Polygonia c-album*, *Nymphalis antiopa*, *Nymphalis polychloros*, *Melitaea cinxia*, *Melitaea trivia*, *Melitaea didyma*, *Limenitis reducta*, *Argynnis paphia*, *Argynnis adippe, Boloria selene*. Part of them have in Portugal their southern (those common to Europe and many also to Asia - the Euro-Siberian taxa) or northern (those common to Northern Africa and/or to Southern-Europe - the Mediterranean taxa) and are known as with declining populations also in the remaining countries from where they are known in Europe, such as *Carcharodus baeticus*, *Euchloe tagis*, *Hamearis lucina* and *Tomares ballus* as well as of *Zizeeria knisna*, this one quite common, however, along the Afrotropical and Madagascan Regions.

The extensive fires that affected Monchique area, in Algarve, may compromise the real previously known range of some species in the southern Portugal: These are the cases, eventually among others, of the local scarce known samples of *Anthocaris cardamines*, *Lycaena alciphron* and *Argynnis adippe*, this last one known in the southern Portugal by an isolated population exactly from the Monchique mountain. The same must be considered about the lepidopterofauna of several other areas in Central and Northern Portugal relatively to the extended areas burned in the last decade, especially but not only in what those in the provinces of Minho, Trás-os-Montes and Beiras; indeed, the fires in protected areas have a substantial pressure in the insects populations - as they have in all the components of the ecosystem - since they affect areas with a suddenly disrupted equilibrium. Further, the large extensions of monocultures of economical important trees like the pine (*Pinus pinaster* Ait.) and the eucalyptus, usually covering the areas where the great fires occur, and also of the expansion of infesting plants like the acacias and, in the littoral dunes, *Carpobrotus* among others, clearly contribute to the modifications on butterflies' populations and to the reduction of the number of species ranges in our country. The same must be said relatively to the increasing urbanization in coastal areas, the use and overuse of pesticides and the general climatic changes.

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Table I.– Alphabetically ordered list of the collecting localities of the studied samples, irrespective district, circumscription and UTM 10 X10 kilometres coordinates.

Locality	District	Circumscription	UTM
Abrantes	Santarém	Abrantes	29SND66
Ajuda - see Lisboa	—-	—-	—-
Alburitel	Santarém	Tomar	29SND48
Alfeite	Setúbal	Almada	29SMC87
Almarinho (Algueirão)	Lisboa	Sintra	29SMC79
Almodovar, Ribeira de Oeiras, Rocha da Moura	Lisboa	Sintra	29SNB??
Almodovar, mata	Beja	Almodôvar	29SNB85
Arouca	Aveiro	Arouca	29TNF63
Azambuja	Santarém	Azambuja	29SND12
Barranco do Velho	Faro	Loulé	29SNB92
Beira	?	?	?
Beira Alta	?	?	?
Beja	Beja	Beja	20SPC00
Belém - see Lisboa	—-	—-	—-
Bemposta			29SMD80
Berlengas	Leiria	Peniche	29SNM56
Bombarral, estrada das Barreiras	Leiria	Bombarral	29SMD84
Bragança	Bragança	Bragança	29TPG83
Buçaco	Aveiro	Mealhada	29TNE56
Cabeçudo (Cernache do Bonjardim)	Castelo Branco	Sertã	29TNE44
Caldas	?	?	?
Caldelas	Braga	Amares	29TNG51
Campos de Alcobaça	Leiria	Alcobaça	29SND07
Caneças	Lisboa	Loures	29SNC89
Caramulo	Viseu	Tondela	29TNE79
Carrazede	Santarém	Tomar	29SND47
Castelo Branco	Castelo Branco	Castelo Branco	29SPE20
Chão Cavalar (Algarve)	Faro	?	?
Coimbra	Coimbra	Coimbra	29TNE45
Coimbra à Lousã	Coimbra	?	?
Cumeira	Leiria	Porto de Mós	29SND08
Douro	?	?	?
Engenho (Marinha Grande)	Leiria	Marinha Grande	29SNE00
Évora	Évora	Évora	29SNC96
Fagilde	Viseu	Mangualde	29TPE09
Gerez	Braga	Terras do Bouro	29TNG62
Guarda	Guarda	Guarda	29TPE48
Herdade de Font'Alva (Barbacena)	Portalegre	Elvas	29SPD41
Horta da Vilariça	Bragança	Mogadouro	?
Lagoa Azul / Linhó	Lisboa	Sintra	29SMC69
Lagos (Beira)	?	?	?
Lisboa	Lisboa	Lisboa	29SMC88
Lopitos (Moura)	Beja	Moura	29SDC32
Luso	Aveiro	Mealhada	29TNE57
Mafra	Lisboa	Mafra	29SMD71
Margens do Rio Dão	?	?	?

Margens do Vouga (Beira Alta)	?	?	?
Oliveira de Frades	Viseu	Oliveira de Frades	29TNF60
Peniche	Leiria	Peniche	29SMD65
Picota (Serra de Monchique)	Faro	Monchique	29SNB43
Pinhal do Corvo (Algarve)	Faro	?	?
Pinhel	Guarda	Pinhel	29TPF61
Praia do Castelejo (Vila do Bispo)	Faro	Vila do Bispo	29SNB00
Praia de Mira (margens da Lagoa)	Aveiro	Mira	29TNE27
Praia de Mira (pinhal)	Aveiro	Mira	29TNE27
Queluz	Lisboa	Sintra	29SMC79
Ribeira da Marateca	Setúbal	Palmela	29SNC47
Ribeira de Quarteira	Faro	Loulé	29SNB70
Sanguinhal	Leiria	Bombarral	29SMD84
Santa Clara	?	?	?
Serra d'Aire (Almodovar)	Beja	Almodôvar	29SNB84
Serra de Bornes	Bragança	Macedo de Cavaleiro	?
Serra do Caramulo	Viseu	Tondela	29TNE96
Serra do Caramulo, margens do Vouga	Viseu	Tondela	29TNF07
Serra da Estrela	Guarda	?	?
Serra do Gerez - see Gerez	—-	—-	—-
Serra de Monchique	Faro	Monchique	29SNB33
Serra do Reboredo (Moncorvo)	Bragança	Torre de Moncorvo	?
Serra de Sintra	Sintra	Sintra	29SMC69
Setúbal	Setúbal	Setúbal	29SNC06
Sines	Setúbal	Sines	29SNC01
Tapada (da Ajuda) - see Lisboa	—-	—-	—-
Telhada (Almodovar)	Beja	Almodôvar	29SNB85
Troia	Setúbal	Grândola	29SNC06
Vale de Gatos	Setúbal	Seixal	29SNC97
Vale da Pereira	Castelo Branco	Castelo Branco	29SPE20
Valega	Aveiro	Ovar	29TNF32
Vascão (rio)	Beja	Mértola	?
Vidago	Bragança	Chaves	29TPG11
Vila de Campo (Milfontes)	Beja	Odemira	29SNB27
Vila Nova de Milfontes	Beja	Odemira	29SNB17
Vila Nova de Ourém	Santarém	Ourém	29SND39
Vila Real de Santo António	Faro	Vila Real de Santo Antonio	29SPB41
Vila Verde de Ficalho	Beja	Serpa	29SPC40
Vizela	Braga	Vizela	29TNF57
Vouzela	Viseu	Vouzela	29SNF70

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Digestive system formation during metamorphosis of *Carposina sasakii* Matsumura, 1900 (Lepidoptera: Carposinidae)

Q. Xue, D. Feng, L. Men, Y. Zhang, A. Deng, J. Li, Y. Peng, R. Ma & Z. Zhang

Abstract

The purpose of this study is to investigate the adaptive mechanism of morphological and structural changes to habits, during the metamorphosis development of *Carposina sasakii* Matsumura, 1900. Traditional dissection, paraffin section, and scanning electron microscopy techniques were used to study the morphological structure and cytohistology of the digestive system in different developmental stages of *C. sasakii* by classical comparative morphology study. In order to adapt to the change of feeding habits from solid in the larva stage to liquid in the adult stage, the digestive tract of *C. sasakii* reconstructed in the pupal stage. The crop of the foregut transformed from a spherical shape in the larval stage to an enlarged lateral, accessory, bag-like structure beyond middle of pupal stage and in the adult stage. The hindgut transformed from a columnar structure in the larval stage to a dilated rectal sac at the end of the hindgut in the adult stage. The morphological changes of the digestive tract provided the basis for the *C. sasakii* to adapt to the changes of food habits and environment. In addition, the present study provides a basis for better understanding of pupal reconstruction of digestive tract. It also lays the foundation for the nutritional physiology and co-evolution between *C. sasakii* at different stages and its host plant, while providing morphological data for the toxicological and pathological research of this significant agricultural pest.
KEY WORDS: Lepidoptera, Carposinidae, *Carposina sasakii*, digestive system, pupa, development, morphology, feeding, China.

Formación del sistema digestivo durante la metamorphosis de *Carposina sasakii* Matsumura, 1900 (Lepidoptera: Carposinidae)

Resumen

El propósito de este estudio es investigar el mecanismo adaptativo de hábitos de los cambios morfológicos y estructurales, durante el desarrollo de la metamorfosis de *Carposina sasakii* Matsumura, 1900. Fue usada la disección tradicional con parafina y el escaneado con microscopio electrónico, para el estudio de la estructura morfológica y citológica del sistema digestivo en diferentes estados del desarrollo de *C. sasakii* para el clásico estudio morfológico comparativo. En orden de adaptar el cambio de los hábitos alimenticios del sólido, en el estadio de larva, al líquido, en el estadio de adulto, el tracto digestivo de *C. sasakii* se reconstruye en el estadio pupal. El buche, a continuación del esófago, se transformó de una forma esférica en la etapa larval a una estructura lateral, accesoria, como una bolsa expandida más allá del estadio de pupa y el estadio adulto. El intestino se transformó de una estructura columnar en el estadio larval a un saco rectal dilatado al final del intestino en el estadio adulto. Los cambios morfológicos del tracto digestivo proporcionaron la base para que *C. sasakii* se adaptara a los cambios de hábitos en la comida y ambientales. Además, el estudio actual, proporciona una base para el mejor conocimiento de la reconstrucción del tracto digestivo de la pupa. También proporciona los cimientos para la fisiología nutritiva y la coevolución entre *C. sasakii* en sus diferentes etapas y su planta nutricia, mientras

que se proporcionan los datos morfológicos para la investigación toxicológica y patológica de esta importante plaga agrícola.
PALABRAS CLAVE: Lepidoptera, Carposinidae, *Carposina sasakii*, sistema digestivo, pupa, metamorfosis, morfología, alimentación, China.

Introduction

Insects are an animal group with high diversity and wide geographical distribution. Metamorphosis plays a crucial role in the development life cycle of insects, and apoptosis, and tissue and organ remodeling exists in the process of metamorphosis (HONG *et al.*, 2016). This transformation during metamorphosis allows insect to exhibit different morphological characteristics and living habits at different stages of individual development (ZENG & FENG, 2014), including digestive system development (CHAUTHANI & CALLAHAN, 1967; ROWLAND & GOODMAN, 2016). Metamorphosis provides the possibility for insects to improve the utilization of environmental resources, expand their populations, and escape from disadvantageous living environments (ZENG & FENG, 2014). As a typical complete metamorphosis insect, *Carposina sasakii* Matsumura, 1900 after long-term adaptation to environmental conditions and co-evolution with its host plant, forms special feeding habits throughout the course of its life cycle.

Carposina sasakii Matsumura, 1900 is a serious fruit-boring pest and harmful to many fruit trees, including apple, jujube, and pear (KIM *et al.*, 2001; LI *et al.*, 2018). The larvae of *C. sasakii* use their chewing mouthparts to tunnel into fruit to feed and grow. After maturation, *C. sasakii* larvae emerge from fruits to cocoon and pupate. *C. sasakii* then emerge from their cocoons as fully developed adults and use a siphoning mouthpart to feed on liquid food (HENSON, 1929; JUDY & GILBERT, 1970). There were significant differences in the morphology and function of organs between adults and larvae of *C. sasakii*, especially the digestive tract, the main site of digestion and absorption (GULLAN & CRANSTON, 2000; PAUCHET *et al.*, 2008). In the effort to combat the agricultural impact of this insect, it is of great importance to study the morphological structure of its digestive system at different developmental stages, as *C. sasakii* adapts to the surrounding environment. It is also significant to study changes in the digestive tract to better understand tissue reconstruction during metamorphosis. The digestive tract morphology of *C. sasakii* larvae has been studied before (XIONG *et al.*, 2011), but morphological differences in the digestive tract during metamorphosis have yet to be reported as to date.

To better understand morphological differences in the digestive tract of *C. sasakii* during metamorphosis, the basic structure and characteristics of digestive tract histocytology during metamorphosis stage were obtained by traditional dissection, paraffin section, and scanning electron microscopy techniques in the present study. Morphological differences of the digestive tract were compared between different developmental stages of *C. sasakii* during metamorphosis, and the formation process of the digestive tract before, after, and during the pupal stage were revealed. In particular, there are no published data on the structural and functional properties of the digestive system of the *C. sasakii* adult, and it is common belief that the moth does not eat solid foods. In the present study, the digestive system of *C. sasakii* during the larva-pupa and pupa-adult transition stages were structurally and functionally characterized, and the remodeling process of this organ during metamorphosis was investigated. The morphofunctional properties, differences, adaption of the digestive system between larval and adult stages were analyzed as well. The feeding habits of the adult moth and the morphofunctional features of its digestive system demonstrate that *C. sasakii*, at variance with most information reported in literature, uses suction to consume liquid food which has an impact on its lifespan (NORRIS, 1934; HAMILTON & JOHANSSON, 1955). The present study lays the foundation for the nutritional physiology and co-evolution between *C. sasakii* and its host plant at different stages and provides morphological data for toxicological and pathological research against this significant agricultural pest. This study opens up the possibility of manipulating the moth's feeding

substrate to improve its performances in mass-rearing research procedures. Our results could help us better understand the process of digestive tract reconstruction adapted to habits, also provide an important basis for further studies of autophagy, apoptosis, and tissue remodeling in the pupal stage of holometabolous insects.

Materials and Methods

Insects

The laboratory population of *C. sasakii* used in this study was established in 2012. Infectious fruits were collected from apple orchards of the Pomology Institute, Shanxi Academy of Agriculture Sciences (37.35ºN, 112.50ºE) in Taigu County, Shanxi Province, China. The laboratory population was continuously reared for over 30 generations. The larvae of *C. sasakii* were reared on apples (*Malus pumila* Mill.) in an incubator (SPX-250B-G, Shanghai Boxun, China) at 25.5 ± 0.5ºC, 75.0 ± 5.0% RH, and a photoperiod of 15:9 (L: D). When 5th instar larvae matured and emerged from fruits, they are placed in a plastic container (400 ml) with fine sand and 10% water content to pupate. After emergence, the adults were placed in a glass cylinder with top and bottom openings (40 cm in diameter and 50 cm in height) for oviposition. The bottom of the glass container was covered with shaved filter paper for egg collection, and the top of the glass container was covered with gauze. An absorbent cotton ball soaked with 10% honey water was suspended inside the glass container for adult complementary nutrition (LI *et al.*, 2019).

Methodology

Anatomical characteristics of the digestive system. Digestive tracts from larvae, 1st day pupae, 3rd day pupae, 5th day pupae, 7th day pupae, 9th day pupae, and adults were dissected in distilled water (mean pupal stage of *C. sasakii* is 9.57 days according to ZHANG *et al.* (2018)). After being cold-anaesthetized for 30 minutes at -20ºC, the cuticle was carefully cut forward from the end of the posterior dorsal midline with ophthalmic scissors, the subcutaneous fat-body was then gently removed by ophthalmic anatomical forceps, and finally, the digestive tract was gradually and gently removed. The morphological characteristics of the digestive system were obtained by stereomicroscope Leica M205 C connected to a Leica DFC450 digital camera.

Paraffin sections: The digestive tract was dissected in distilled water and fixed with Carnoy's solution (ethanol: chloroform: glacial acetic acid, 6: 3: 1). Each digestive tract was dehydrated in gradient concentrations of ethanol successively (50%, 70%, 80%, 90%, 95%, and 100% ethanol) for 15 minutes per concentration and cleared in xylene for 30 minutes. Then, they were embedded in paraffin and cut into thin 6-10 μm serial sections in order to get as far as more anatomical characters. Hereafter, previously processed slides were dewaxed by xylene, successively dehydrated for 15 minutes in each gradient concentration of ethanol (100%, 95%, 90%, 80%, and 70%), and stained with hematoxylin. The slices were then dehydrated in 70%, 80%, and 90% ethanol and stained with eosin. The slides were completely prepared after dehydration in ethanol, transparency in xylene, and mounting by Canada balsam (YANG, 2006; LU *et al.*, 2009). Histological and morphological characteristics of the digestive tract at different developmental stages of *C. sasakii* were obtained by Leica DM500 microscope.

Scanning electron microscopy (SEM). After dissection in distilled water, the digestive tracts of *C. sasakii* were cleaned in phosphoric acid buffer solution (Na_2HPO_4-NaH_2PO_4, 0.1 mol/L, pH 7.4) and fixed in 2.5% glutaraldehyde at 4ºC for 4 hours. They were then dehydrated for 20 minutes in each concentration of ethanol in a graded series of 30%, 50%, 70%, 80%, and 90% and then twice for 20 minutes in 100% ethanol. The dehydrated digestive tracts were treated with acetone for 30 minutes.

Then, the samples were dried in a CO_2 critical point dryer, fastened by electric adhesive tape, and sputter-coated with gold. Finally, the processed samples were examined under JSM-6490LV scanning electron microscopy with an acceleration voltage of 10 kv.

Data analysis. Graphpad Prism 7 (Graphpad Software, San Diego, CA, USA) was used for one-way analysis of variance (Fisher's protected least significant difference) in the morphological characteristics of the midgut cells.

Results

Schematic anatomical morphology of the digestive system of *C. sasakii*

The digestive system of *C. sasakii* consists of the digestive tract and salivary glands, which are involved in digestion. The salivary glands are a pair of tubular glands that are connected to the mandible, convoluted on both sides of the digestive tract, and longer than the digestive tract (Fig. 1).

The digestive tract of larval *C. sasakii* is tubular and clearly composed of three parts: the foregut, midgut, and hindgut. The foregut is a tubule starting from the pharynx in the head capsule and ending in the bulge region. The midgut is located between the foregut and hindgut, and the Malpighian tubes serve as a landmark for the boundary between the midgut and hindgut. The hindgut ends to the anus. The ratio of the length of the foregut, midgut, and hindgut in the larval stage is 1:3:2, whereas the ratio of the width of the foregut, midgut, and hindgut is 2:6:3 (Fig. 1).

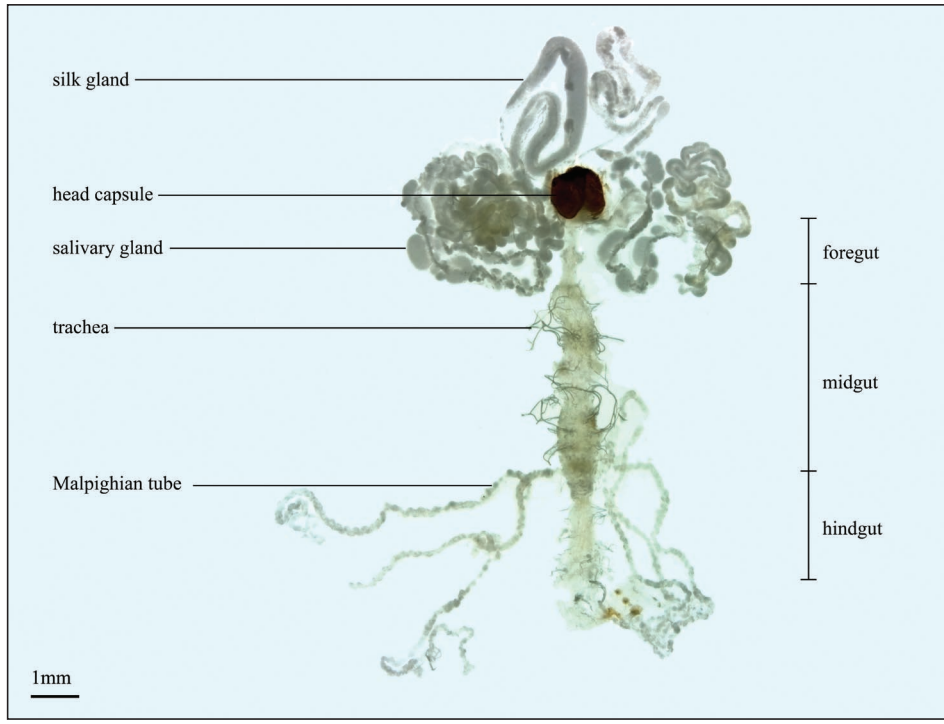

Figure 1.– Schematic morphology of the digestive system of the 5th instar (mature) *C. sasakii* larvae, showing the divisions.

Anatomical morphology of the foregut

Foregut morphology of larvae: The foregut accounts for 1/6 of the total length of the digestive tract and is thinner and shorter than other parts of the digestive tract. The esophagus, with a width of approximately 1/3 of that of the midgut, extends from pharynx. The crop of larvae is an expanded spherical structure inferior to the esophagus with good extensibility, and it is slightly wider than the esophagus and narrower than the midgut (Fig. 1). The intestinal wall of the foregut is thin, membranous, and has no obvious cellular structure (Fig. 2A). The cardiac valve at the end of the foregut extends into the foregut in a funnel-like shape. The cells of the cardiac valve are cuboidal, closely arranged, and have nuclei accounting for 1/4-1/3 of the total cell volume (Fig. 2B). Gastric caeca are not observed in 5th instar larva (Figs 1, 2A, 3).

Foregut morphology of pupa: There are no obvious morphological differences of the foregut between the first 3 days in the pupa stage and larval stage (Figs 4B, 4C, 4D). However, the esophagus changes from a tubular structure in larvae to a longer, narrower, and slenderer capillary structure with a clearly enlarged, lateral accessory bag-like crop (full of contents) from 5th day in the pupa stage (Fig. 4E). The wall of the crop is still thin and membranous at this stage, and its contents increase by the 9th day of pupation (Figs 2C, 4G). No obvious cellular structure is observed in the crop as well (Fig. 2C).

Foregut morphology of adult: The length of the foregut is about 1/4 of the length of the adult digestive tract. The esophagus becomes narrower and longer than that of larvae, and the width of the esophagus is about 1/8 of that of the midgut (Fig. 4H). The crop of the adult is an enlarged, lateral accessory bag-like structure connected with the foregut near the midgut (Fig. 4H). There is no obvious cellular structure or contents within the crop (Fig. 2D).

Anatomical morphology of the midgut

Midgut morphology of larvae: The midgut of the larva is tubular and is 1/2 of the total length of the digestive tract. It is wider and longer than the foregut (Fig. 1). The intestinal wall of the midgut consists of monolayer cells arranged linearly, and the inner surface is smooth (Fig. 5A). There are many types of cells in the midgut, of which columnar cells are the most basic. Columnar cells are the main constituent cells of the intestinal wall of the midgut, and they are nearly rectangular and closely arranged. The lumen side of the intestinal wall also contains microvilli specialized from columnar cells . In the midgut of 4th instar larvae, cells are closely arranged, and microvilli have a length of about 1/3 of the length of columnar cells and are orderly arranged. A large number of round granules can be observed in the intestinal lumen near the bowel wall of the midgut (Fig. 5B). After 5th instar larvae mature, columnar cells of the midgut are more loosely arranged compared to 4th instar larvae, and intestinal wall cells are more irregular in shape with no obvious microvilli (Fig. 5C). Regenerative cells with less cytoplasm are located at the base of the intestinal wall cell layer in 5th instar larvae (Fig. 5D). Goblet cells are interspersed between columnar cells in the intestinal wall and invaginate to form a cup cavity and cup neck. Goblet cells lack cytoplasm compared to other midgut cells, their nuclei are located under the cup cavity, and their microvilli are specialized from the cup cavity (Fig. 5E). There are significant differences in cell length between columnar (0.0248 ± 0.0008 mm), goblet (0.0135 ± 0.0010 mm), and regenerative cells (0.0095 ±0.0013 mm) (P<0.05). The width of regenerative cells (0.0083 ± 0.0013 mm) is significantly lesser than that of columnar (0.0164 ± 0.0008 mm) and goblet cells (0.0135 ± 0.0013 mm) (P<0.05). Meanwhile, the nuclear length in columnar cells (0.0100 ± 0.0004 mm) is significantly greater than that of regenerative (0.0050 ± 0.0004 mm) and goblet cells (0.0037 ± 0.0004 mm) (P<0.05). However, the nuclear width of goblet cells (0.0036 ± 0.0005 mm) is

significantly lesser than that of columnar (0.0067 ± 0.0004 mm) and regenerative cells (0.0055 ± 0.0007 mm) (P<0.05). (Table 1).

Table 1.– Differentiation of cells in the larval midgut.

	columnar cells (Mean ± SE)	**goblet cells (Mean ± SE)**	**regenerative cells (Mean ± SE)**
length of cell (mm)	0.0248 ± 0.0008 a	0.0135 ± 0.0010 b	0.0095 ± 0.0013 c
width of cell (mm)	0.0164 ± 0.0008 a	0.0135 ± 0.0013 a	0.0083 ± 0.0013 b
length of nuclear (mm)	0.0100 ± 0.0004 a	0.0037 ± 0.0004 b	0.0050 ± 0.0004 b
width of nuclear (mm)	0.0067 ± 0.0004 a	0.0036 ± 0.0005 b	0.0055 ± 0.0007 a
Note: Means within a row followed by different letters are significantly different (Fisher's LSD test: P<0.05).			

Midgut morphology of the pupa: Intestinal cells of the midgut are arranged irregularly in the pupal stage, and no obvious microvilli are observed along the intestinal wall. The contents of the midgut gradually reduce with the development in the pupal stage. By the 5th day of pupation, the contents of the midgut cavity are gradually emptied (Figs 5F, 5G, 5H, 5I).

Midgut morphology of the adult: Intestinal cells of the midgut are arranged irregularly in the adult stage. There are no obvious microvilli, and empty cavities appear within intestinal wall cells compared to the larval stage midgut. The midgut length is about 1/4 of that of the whole alimentary canal, and its width is about 8 times of that of the foregut (Fig. 4H). The proportion of the midgut in the whole alimentary canal is smaller than the proportion in the larval stage.

There are non-cellular membrane-like structures in the intestinal cavity of the midgut, which is clearly divided into two compartments: intramembranous and extramembranous (Fig. 5A).

There are 3 moniliform Malpighian tubes on each side of the alimentary canal at the end of the midgut. Each is a thick, short common tube protruding out of each side at the end of the midgut and bifurcated at the base, one of which bifurcates again (Fig. 1). The terminals of the Malpighian tubes connect with the hindgut to form the cryptonephridium in the laval stage (Figs 1, 6). The ends of Malpighian tubes in adults are free in haemocoele, which is different from the structure of cryptonephridium in larvae (Figs 4A, 4B, 4H, 6). The walls of Malpighian tubes are composed of a single layer of cells, with large nuclei accounting for most of the cells' volume (Fig. 5J) (ÖZYURT *et al.*, 2017; GONÇALVES *et al.*, 2018). From the 3rd to the 9th day of pupation, contents are observed in the lumen of Malpighian tubes (Figs 4D, 4E, 4F, 4G).

Anatomical morphology of the hindgut

Hindgut morphology of the larva: The hindgut is tubular and slightly narrower than the midgut. The hindgut has a length of about 1/3 of that of the digestive tract and is constricted anteriorly by 1/3 (Fig. 1). The circular muscles of the hindgut arrange in an orderly manner (Fig. 6), which is different from the midgut. Cells of the hindgut wall are flat and orderly arranged. Intestinal cavity cells in the posterior hindgut fold inwards into 6-7 rectal pads, each rectal pad possessing 3 to 5 cells. The intestinal endometrium of the hindgut is thin and lacks cellular structure (Fig. 7A).

Hindgut morphology of the pupa: The shape of the hindgut within the first 3 days of pupation is similar to that of 5th instar larvae (Figs 4B, 4C, 4D). And on the 5th day of pupation, the anterior 3/4 portion of the hindgut transforms into a slenderer, tubular, and membranous structure, the length of hindgut is nearly as long as the midgut. The expanded rectal sac appears in the posterior hindgut, and a small amount of chyme can be observed in it (Fig. 4E). At the 9th day of pupation, the rectal sac of the posterior hindgut becomes extremely enlarged: the width is about 3 times of that of the midgut, and a large amount of chyme is visible within it (Fig. 4G).

Hindgut morphology of the adult: The hindgut makes up half of the length of the digestive tract in

the adult stage, and the proportion is larger than that in the larval stage. The anterior 3/4 portion of the hindgut transforms into a thin tube that is longer than the adult midgut and has a width that is 3/8 of that of the adult midgut (Fig. 4H). The posterior 1/4 portion of the hindgut is specialized into an expanded rectal sac near the anus, its width is slightly narrower than the midgut, and no obvious content is observed within it (Figs 4H, 7B). The posterior end of the rectal sac is connected with the anus through a tubular structure (Fig. 4H).

Discussion

During the process of metamorphosis, the organs and tissues of holometabolous insects are transformed (HONG *et al.*, 2016), including the digestive tract. Larval *C. sasakii* has chewing mouthparts to feed on solid food, whereas adults have siphoning mouthparts to feed on liquid food. Feeding habits are quite different between larvae and adults. Correspondingly, before and after the pupal stage, morphological characteristics of the digestive tract in the larval and adult stages are quite different as well. Our results indicate that changes in the shape of the digestive tract and its shrinking size are adaptations to the change in food type. Differences in the morphology of the digestive tract between larvae and adults could provide strong evidence for adaptive evolution in insects to different types of food. This result is in line with previous research, as the digestive tract, the main site of ingestion and digestion in the insect body, adapts to an insect's feeding habits in the long-term evolutionary process (GULLAN & CRANSTON, 2000).

The foregut is where food that has not yet entered the midgut is stored in larvae. The foregut of adults transforms into a capillary structure after reconstruction during the pupal stage, and an enlarged lateral accessory sac develops in the posterior foregut. Anatomy morphology analysis reveals large amount of contents in the crop at the late pupal stage, but no obvious contents are observed in the adult crop. Formation of the crop during the pupal stage may be related to the storage of cocoonase during adult emergence (KAFATOS & WILLIAMS, 1964; KAFATOS *et al.*, 1967; WANG *et al.*, 2005). Enlarged lateral sacs in the posterior foregut are also present in the adult stage. It is inferred that the crop of adult *C. sasakii* is related to wing expansion after emergence (JUDY & GILBERT, 1969). However, no gastric caecum is observed at the junction of the foregut and midgut, and this result is different from that of XIONG *et al.* (2011). The gastric caecum commonly present in solid feeders and absent in most insects is considered to be of evolutionary importance in avoiding the accumulation of noxious wastes in the anterior midgut (TERRA, 1990). Gastric caecumis always absent in the predatory group and semi-predatory species of Hemiptera (ELSON, 1937). No differences were noted between sexes or between various nymphal instars of *Zonocerus variegatus* (Linnaeus, 1758) (AKPAN & OKORIE, 2003), whereas gastric caeca have been observed in mosquito larvae though not in adults (VOLKSMANN & PETERS, 1989). Thus, the presence or absence of gastric caeca may be closely related to research taxon and developmental stage, though more taxa need to be further studied. The morphology of the adult foregut is not only different from that of 5th instar *C. sasakii* larvae, but also the length of the foregut compared to that of the whole digestive tract is greater in adults than in larvae.

The midgut is an important location for digestion and absorption (TONG *et al.*, 2013; TERRA *et al.*, 2019). With the metamorphosis and development of *C. sasakii*, the change in the proportion of the adult midgut that makes up the digestive tract decreases, and it indicates that the function of the digestive tract has changed to a certain extent. HUANG *et al.* (2006) also found similar results in the silkworm. This change adapts to the biological characteristics of larval feeding to satisfy the rapid growth of the larval body and of adult feeding to ensure reproduction (O'BRIEN *et al.*, 2002; O'BRIEN *et al.*, 2004). For the histological characteristics of the midgut, it was found that its contents decrease gradually with the development of the pupal stage, showing a tendency of emptying into the hindgut. This phenomenon indicates that metabolic activity in the body remains active during the pupal stage, when the insect is apparently immobile. Food is further digested with the development of pupae. This phenomenon can also be found in the tobacco hornworm, *Manduca sexta* (Linnaeus,

1763), by magnetic resonance microscopy (HALLOCK, 2008). There are a large number of round cellular masses in the intestinal cavity of 4th instar larvae, called yellow bodies (WIGGLESWORTH, 1972). The presence of condensed heterochromatin in yellow bodies is an important indicator of apoptosis and autophagy (THUMMEL, 2001; TETTAMANTI *et al.*, 2006). The autophagy of yellow body cells provides essential nutrients, such as peptides, lipids, and free sugars, for the development of immobile pupae (TSUJIMOTO & SHIMIZU, 2005). The microvilli of 5th instar larvae are less developed than those of 4th instar larvae, which may be the result of cell apoptosis (FERNÁNDEZ-SEGURA *et al.*, 1990; KONDO *et al.*, 1997; HÄCKER, 2000).

In addition to excreting metabolic wastes, the insect hindgut serves an important function in reabsorbing metabolic water and other nutrients from residues (TREHERNE, 1967). The rectal pads of the hindgut play a vital role in the absorption of metabolic water and inorganic salts (PHILLIPS, 1970). The hindgut of the adult transforms into a membranous structure, and an inflated rectal sac begins to form and contains contents by the 5th day of pupation. The volume of the rectal sac gradually increases with pupal development, indicating that pupal metabolic wastes may accumulate in the hindgut from digestion and cause it to expand adaptively to form a rectal sac. A similar result has been reported in *Bombyx mori* (Linnaeus, 1758) as well (IZZETOĞLU & ÖBER, 2011). However, the volume of the rectal sac in adults is obviously smaller than that of 9th day pupae, suggesting that pupal metabolites may be excreted after adult emergence. The adult rectal sac, a membranous structure, is expandable and can conform to certain morphologies according to digestive needs. Therefore, the size of the rectal sac decreases after adult emergence.

The Malpighian tube is not part of the digestive system, but it is closely related to the insect digestive system, both anatomically and functionally, during development. The Malpighian tube is an important excretory organ involved in the formation of urine. It also significantly contributes to the retention or reabsorption of essential components (WIGGLESWORTH, 1972). In particular, the posterior end of the Malpighian tube adheres to the hindgut to form a rectal complex, called the cryptonephridium, in larval *C. sasakii* that disappears by the adult stage. This phenomenon is also found in several other lepidopteran insects (RIGONI *et al.*, 2004; KOLOSOV & O'DONNELL, 2019). The cryptonephridium efficiently maintains salt balance and reabsorbs metabolic water in larvae (RAMSAY, 1976; REYNOLDS & BELLWARD, 1989). However, the ends of the Malpighian tube dissociate in the adult stage of *C. sasakii*, indicating that the cryptonephridium degenerates in the pupal stage. Similar results have been found in Apidae (Hymenoptera) (SILVA-DE-MORAES RLM, 1976) and Tenebrionidae (Coleoptera) (BYERS, 1971) insects.

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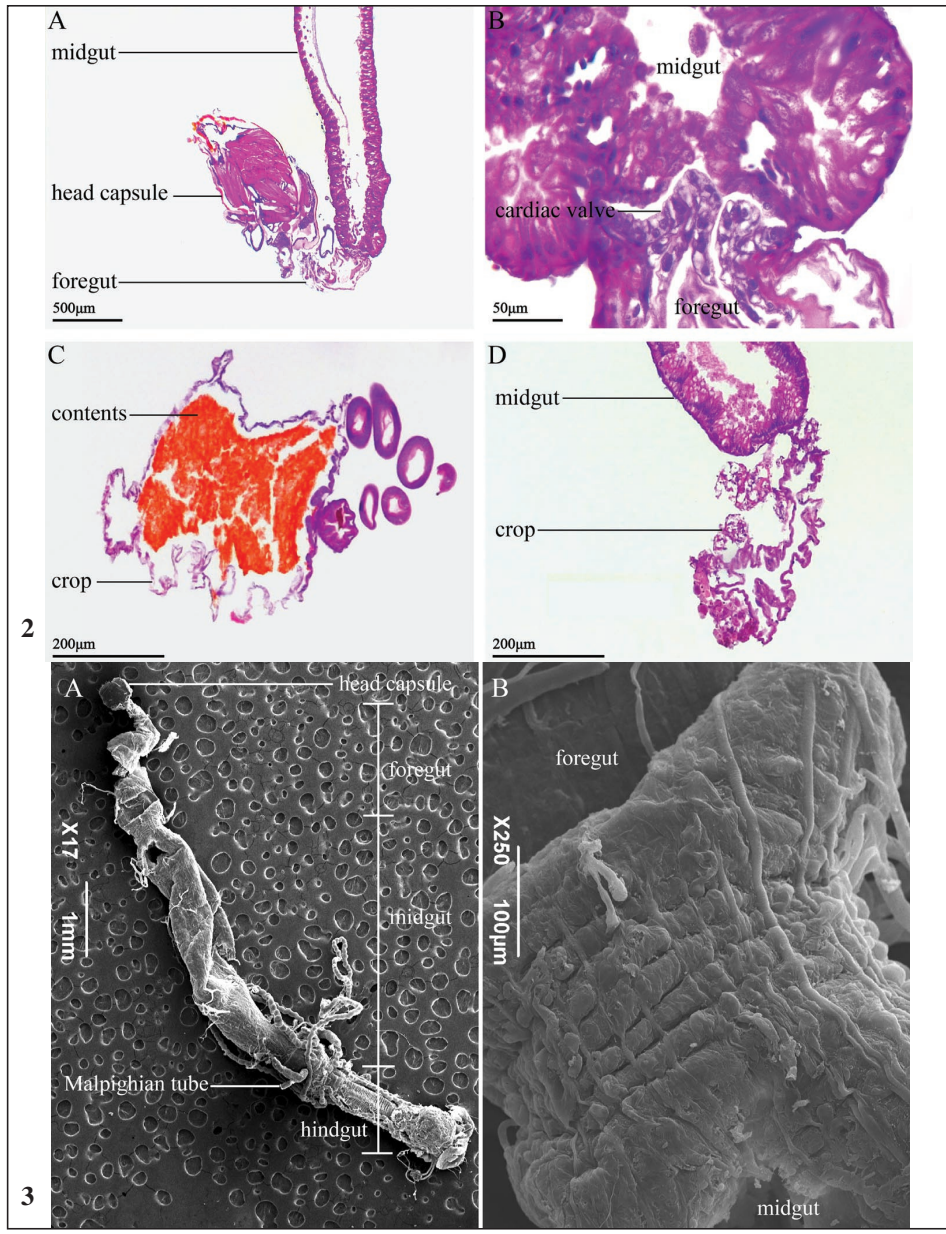


Figures 2-3.– 2. Histological sections of the foregut of *C. sasakii*. (A) General morphology of the foregut and midgut in 5th instar larvae; (B) Cardiac valve of 5th instar larvae; (C) Crop containing contents of 9th day pupae; (D) Crop of adults. **3.** SEM micrographs of the boundary between the foregut and midgut of 5th instar *C. sasakii* larvae. There is no gastric caecum. (A) General morphology of that digestive tract in 5th instar larvae; (B) The boundary between the foregut and midgut in 5th instar larvae.

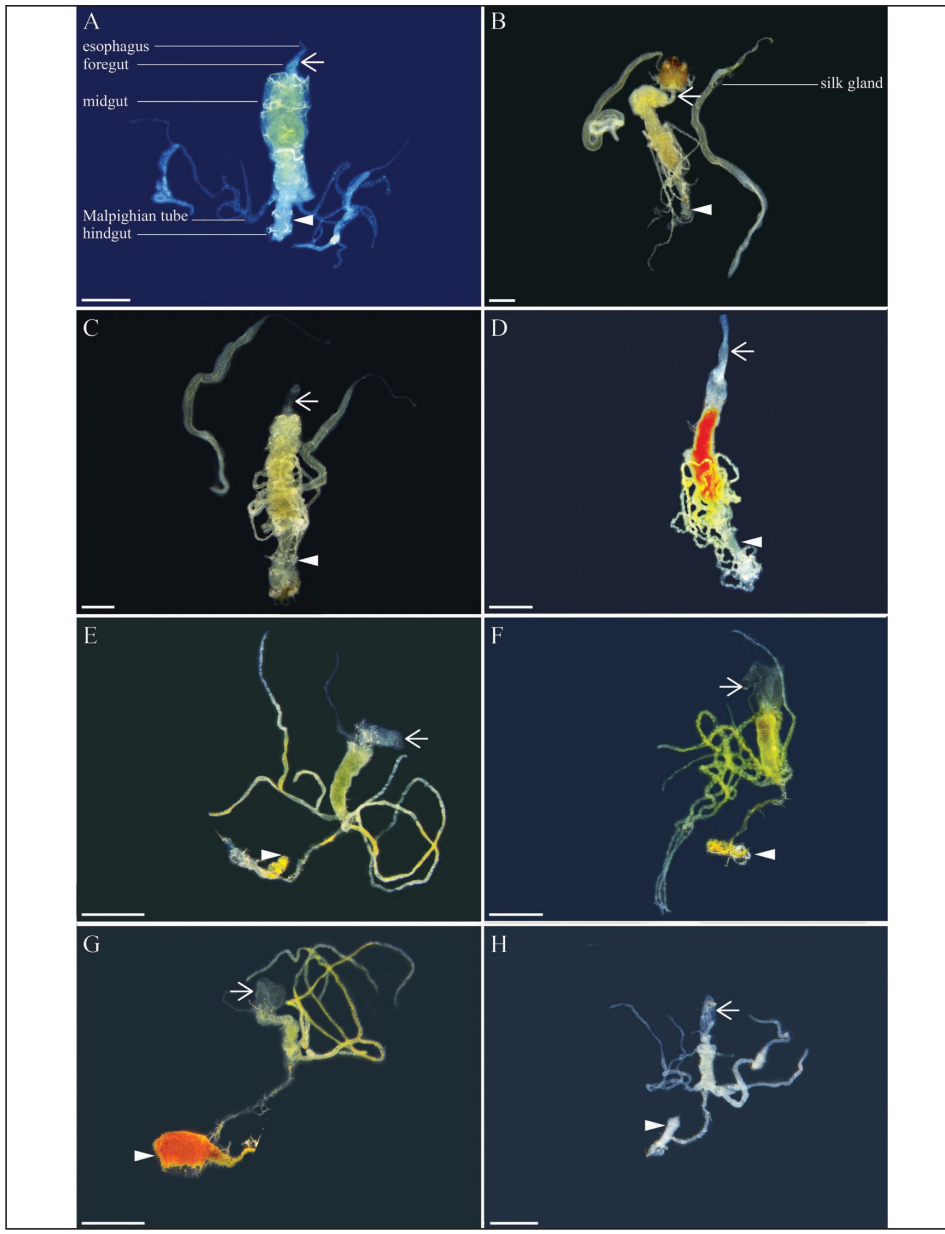
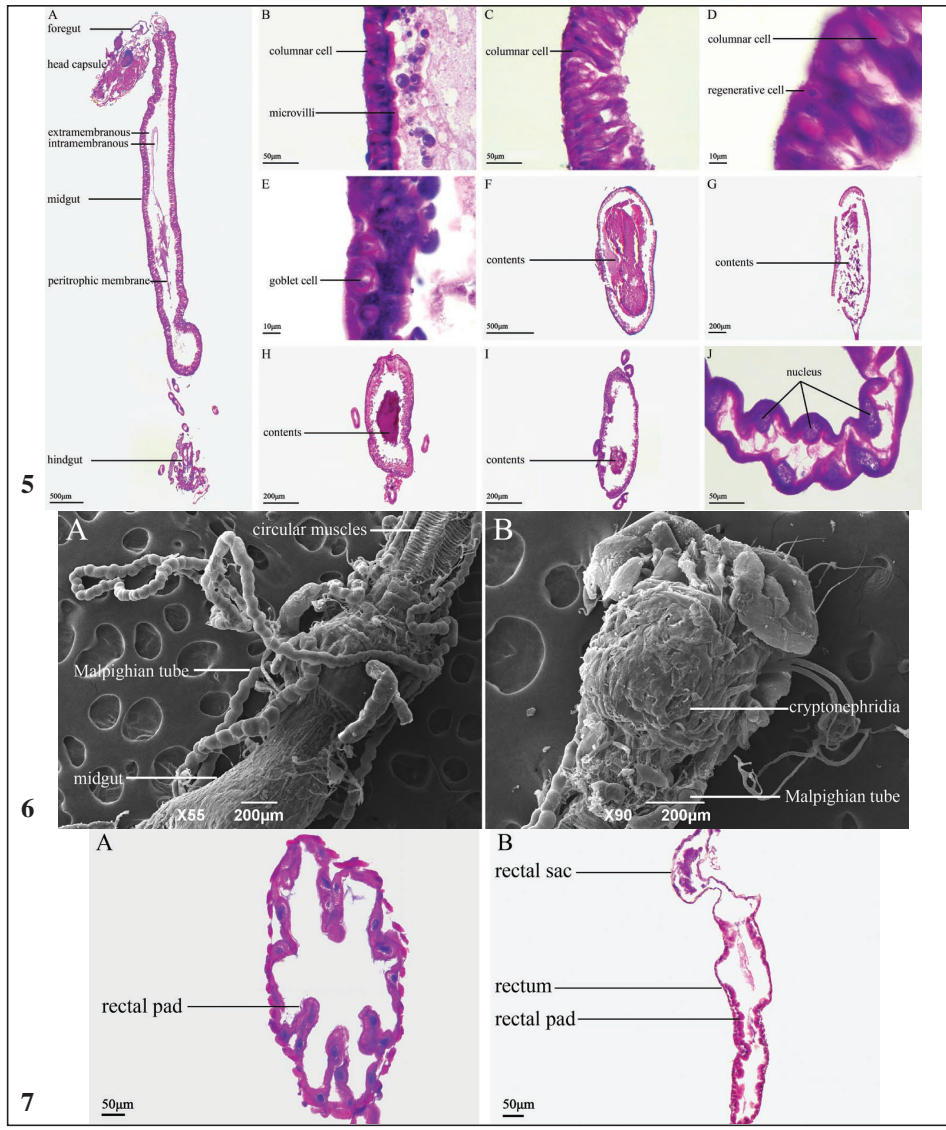


Figure 4.– Morphology of the digestive tract at different developmental stages of *C. sasakii*. (A) Digestive tract of 4th instar larvae; (B) Digestive tract of 5th instar larvae; (C). Digestive tract of 1st day pupa; (D) Digestive tract of 3rd day pupa; (E) Digestive tract of 5th day pupa; (F) Digestive tract of 7th day pupa; (G) Digestive tract of 9th day pupa; (H) Digestive tract of adult moths. Scales = 1.0 mm. The arrow points to the location of the crop, and the small triangle points to the location of the rectal sac.



Figures 5-7.– 5. Morphological analysis of the midgut. (A) General view of the larval alimentary canal subdivided into the foregut, midgut, and hindgut; (B) Columnar cells and microvilli specialized from the inner columnar cell membrane of 4th instar larvae; (C) Columnar cells and no obvious microvilli specialized from the inner columnar cell membrane of 5th instar larvae; (D) Columnar and regenerative cells of 5th instar larvae; (E) Goblet cells of 4th instar larvae; (F) Midgut of 3rd day pupae; (G) Midgut of 5th day pupae; (H) Midgut of 7th day pupae; (I) Midgut of 9th day pupae; (J) Malpighian tube of 5th instar larvae. **6.** SEM micrographs of the Malpighian tube in *C. sasakii*. The cryptonephridium of mature *C. sasakii* larvae is revealed. (A) Malpighian tube location of 5th instar larvae; (B) Cryptonephridium of 5th instar larvae. **7.** Histological sections of the hindgut. (A) Rectal pad of 5th instar larvae; (B) Adult hindgut.

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New species of Alucitidae from Republic of South Africa (Lepidoptera: Alucitidae)

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

Abstract

According to the materials examined in the collections of the Natural History Museum in Pretoria (Republic of South Africa) and collections of the authors, we describe two new species of Alucitidae from Republic of South Africa: *Alucita hendriki* Kovtunovich & Ustjuzhanin, sp. n. and *Alucita armstrongi* Kovtunovich & Ustjuzhanin, sp. n. The data on their distribution and phenology are provided.
KEY WORDS: Lepidoptera, Alucitidae, new species, Republic of South Africa.

Nuevas especies de Alucitidae de la República de Suráfrica (Lepidoptera: Alucitidae)

Resumen

Describimos dos nuevas especies de Alucitidae de acuerdo con el material examinado en las colecciones del Museo de Historia Natural en Pretoria (República de Suráfrica) y de las colecciones de los autores de la República de Suráfrica: *Alucita hendriki* Kovtunovich & Ustjuzhanin, sp. n. and *Alucita armstrongi* Kovtunovich & Ustjuzhanin, sp. n. Se proporcionan datos sobre su distribución y fenología.
PALABRAS CLAVE: Lepidoptera, Alucitidae, nuevas especies, República de Suráfrica.

Introduction

Many-plumed moths of Republic of South Africa include 29 species (USTJUZHANIN & KOVTUNOVICH, 2017; KOVTUNOVICH *et al*., 2019; USTJUZHANIN *et al*. [in press]). Examining the materials from the collections of our expeditions and the Transvaal Museum in Pretoria (TMSA), we have discovered two more species new to science. Thus, the fauna of Alucitidae in the Republic of South Africa, currently has 31 species. The holotypes are deposited in the Zoological museum of St. Petersburg (ZISP), the paratypes - in the Transvaal Museum (TMSA) and the Collection by P. Ustjuzhanin and V. Kovtunovich (CUK).

Abbreviations

CUK - Collection by P. Ustjuzhanin and V. Kovtunovich, Novosibirsk and Moscow, Russia
TMSA - Ditsong Museum of Natural History (formerly Transvaal Museum), Pretoria, South Africa
ZISP - Zoological Institute of Russian Academy of Science, St. Petersburg, Russia

***Alucita hendriki* Kovtunovich & Ustjuzhanin, sp. n.** (Figs 1-2)

Type material: Holotype male, (ZISP 1924), Republic South Africa, KwaZulu Natal, Vernon Crookes N. R., 30º16' S, 30º37' E, 340 m, 19-20-III-2010, V. Kovtunovich & A. Sochivko leg.

Paratype: 1 ♂, (CUK), South Africa, Mpumalanga, Lows Creek Lodge, 25º40' S, 31º16' E, 470 m, 12-14-II-2019, V. Kovtunovich & P. Udovichenko leg.

Description: Head with tousled tufts of light-yellow hairs. Thorax and tegulae white, interspersed with brown scales. Labial palpi 1,5 times longer than longitudinal eye diameter, bent up, third segment sharpened and darkened with black scales. Antennae yellowish-brown, slightly serrated. Wingspan 20 mm. Fore wings ochre yellow. Six rectangular light-brown portions of scales on first lobe. Light-brown band on fore wing medially. Fore wing lobes apically lightened, basally darkened with dense brownish scales. Hind wings noticeably lighter than fore wings, with alternating light-brown and whitish portions of scales throughout lobes. Legs pale yellow.

Male genitalia: Uncus straight, of uniform width, slightly widened and sharpened only distally. Gnathos narrow, long, equal to uncus in length, apically sharpened. Gnathos arms short, slightly arched. Valves short, wide, apically bluntly rounded. Anellus arms thin, long. Saccus short, with even outer edge. Aedeagus robust, with ribbon-like cornutus basally, clusters of small spiky cornuti distally.

Female: unknown.

Diagnosis: In the male genitalia, by the shape of the valves and aedeagus, the new species resembles to *Alucita crococyma* Meyrick,1937, but differs in the widened apex of the uncus in *A. crococyma* the apex is even, in the new species it is sharp. The gnathos shape also differs in *A. crococyma* it is wide, equal to the basal part of the uncus, while in *A. hendriki* the gnathos is twice narrower than the basal part of the uncus. The new species is also distinguished in its colour of the wings.

Distribution: Republic South Africa: KwaZulu Natal, Mpumalanga.

Flight period: March.

Etymology: The species is named after Dr. Hendrik Sithole, Invertebrate research manager, Scientific service SANP, Kimberley (Republic of South Africa).

***Alucita armstrongi* Kovtunovich & Ustjuzhanin, sp. n.** (Figs 3-5)

Type material: Holotype, ♂, (ZISP 1925), Republic South Africa, KwaZulu Natal, Vernon Crookes N. R., 30º16' S, 30º37' E, 340 m, 01-03-III-2010, V. Kovtunovich & A. Sochivko leg.

Paratypes: 1 ♂, (CUK 319), Republic South Africa, KwaZulu Natal, Vernon Crookes N. R., 30º16' S, 30º37' E, 340 m, 11-14-III-2010, V. Kovtunovich & A. Sochivko leg.; 1 ♂, (CUK 320), South Africa, KwaZulu Natal, Vernon Crookes N. R., 30º16' S, 30º37' E, 340 m, 19-20-III-2010, V. Kovtunovich & A. Sochivko leg.; 1 ♂, Republic South Africa, KwaZulu Natal, Fernklif, 27-XII-2007, V. Kovtunovich & P. Ustjuzhanin leg.; 1 ♀, (TMSA 15332), [RSA], Mariepskop, 15-24-III-1963, Potgieter & E. v. Son leg.; 1 ♂, (TMSA), [RSA], Entabeni Forest, 12-17-I-1971, R. Jones leg.

Description: Head, thorax and tegulae brown, interspersed with light scales. Labial palpi twice longer then longitudinal eye diameter, bent up, third segment sharpened and darkened with black scales. Antennae light brown. Wingspan 18-20 mm. Wings brown grey. On first lobe, rectangular light-brown portions of scales alternating with dark brown. Dark brown arched bands traced on wing basally and distally. Hind wings noticeably lighter than fore wings, with alternating short brown and long whitish portions of scales. Lobes of all wings apically ending with small dark spots of scales. Third tergite of abdomen brightly white. Legs light brown.

Male genitalia: Uncus straight, relatively short, of uniform width, distally with rounded apex. Gnathos robust, equal to uncus in length and width, apically rounded bluntly. Gnathos arms narrow, ribbon-like. Valves short, shaped as elongated triangle, apically sharp. Anellus arms wide, distally more widened and bent at right angle. Saccus with rounded outer edge. Aedeagus robust, longer than the entire genital structure, with ribbon-like cornuti distally, clusters of thin spiky cornuti apically.

Female genitalia: Papillae anales narrow. Posterior apophyses straight, narrow; anterior apophyses slightly curved. Antrum short, smoothly passing into tubulate ductus. Bursa copulatrix oval, with two large crest-shaped signa. Ductus seminalis short, passing from upper part of bursa copulatrix.

Diagnosis: In the male genitalia, by the shape of the uncus and valves, the new species resembles to *Alucita bakingili* Ustjuzhanin & Kovtunovich, 2020, from which it differs in the shape of the gnathos, anellus arms and aedeagus. In the wings colour, the new species is also similar to *A. bakingili,* but is much larger in size.

Distribution: Republic South Africa: KwaZulu Natal, Mpumalanga, Limpopo.

Flight period: December, January, March.

Etymology: The species is named after Adrian John Armstrong (Biodiversity Research & Assessment Division at Ezemvelo KZN Wildlife, Republic of South Africa).

Acknowledgments

The authors are grateful to Dr. Hendrik Sithole (Invertebrate research manager, Scientific service SANP, Kimberley) and Adrian John Armstrong (Biodiversity Research & Assessment Division at Ezemvelo KZN Wildlife) for their constant assistance in the study of Alucitidae and Pterophoridae in natural reserves and national parks of RSA. We express our gratitude to the colleagues-entomologists who took part in collecting the specimens on South Africa: Pavel Udovichenko, Andrey Sochivko (Moscow, Russia) for the materials provided for examination, and to Sergey Reshetnikov (Novosibirsk, Russia) for the photo of the adult. We are also indebted to late Dr. Martin Krüger (†), the curator of TMSA (Pretoria, RSA), who suddenly died two years ago, for the possibility to work with the museum collections.

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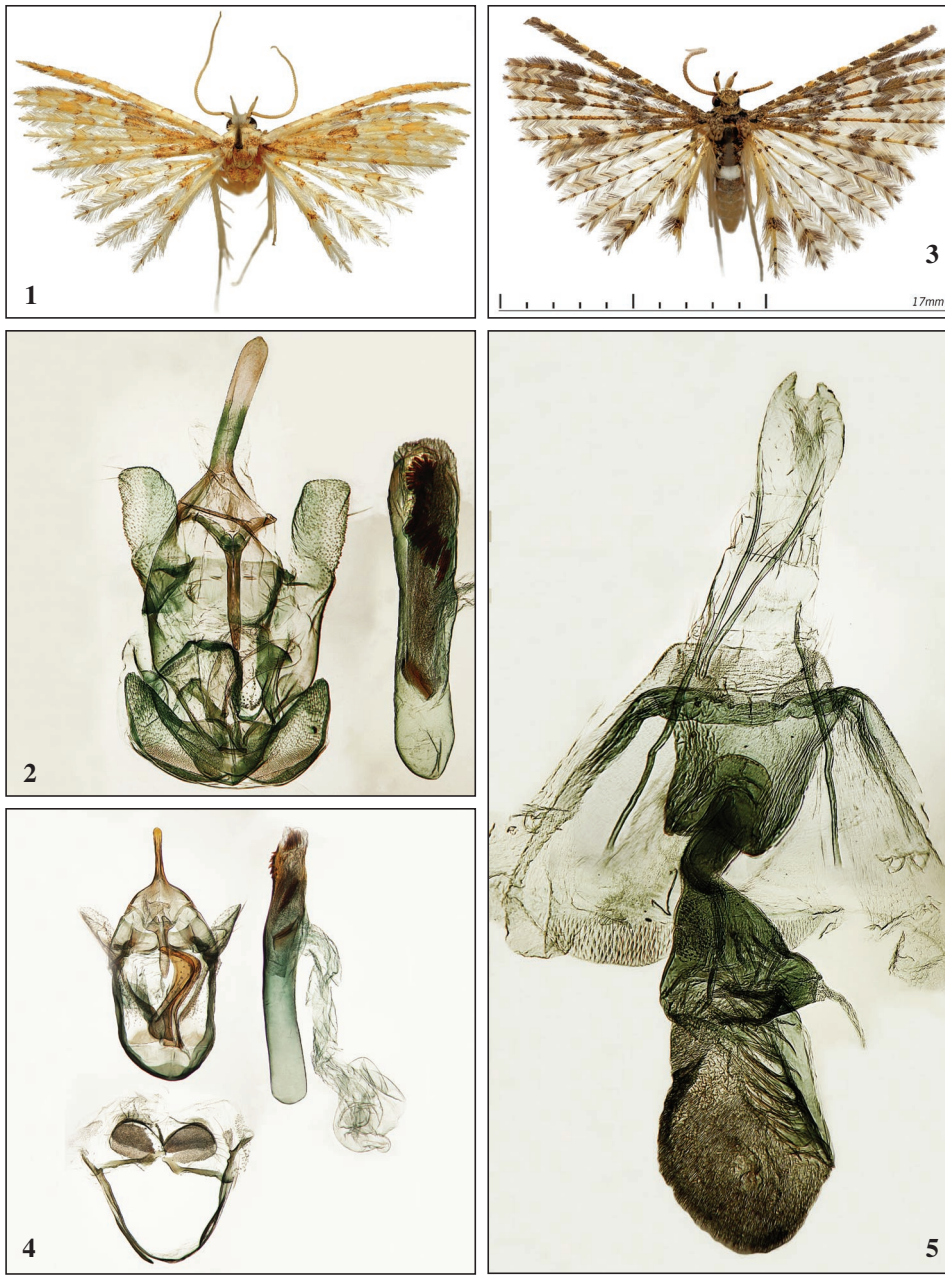

Figs 1-5.– 1-2. *Alucita hendriki* Kovtunovich & Ustjuzhanin, sp. n. **1.** Adult (Holotype, ZISP); **2.** Male genitalia (Holotype, ZISP, 1924). **3-5.** *Alucita armstrongi* Ustjuzhanin & Kovtunovich, sp. n. **3.** Adult (Holotype, ZISP); **4.** Male genitalia (Holotype, ZISP, 1925); **5.** Female genitalia (Paratype, TMSA, 15332).

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Lithosiini and Arctiini of Daghestan (NE Caucasus) (Lepidoptera: Erebidae, Arctiinae)

V. V. Dubatolov, A. N. Poltavsky & E. V. Ilyina

Abstract

16 species of Lithosiini and 25 species of Arctiini (Erebidae: Arctiinae) are recorded from Daghestan, North-East Caucasus. Nine Lithosiini species and one Arctiini species (*Katha depressa* (Esper, 1787), *Manulea pygmaeola* (Doubleday, 1848), *M. lurideola* (Zincken, 1817.), *Cybosia mesomella* (Linnaeus, 1758), *Eilema caniolum* (Hübner, [1808]), *Atolmis rubricollis* (Linnaeus, 1758), *Pelosia muscerda* (Hufnagel, 1766), *Setina roscida* ([Denis & Schiffermüller], 1775), *Thumatha senex* (Hübner, [1808]), *Epatolmis caesarea* (Goeze, 1781) were formerly not known from Daghestan territory. Localities, typical biotopes and imago flight period are provided for all species.
KEY WORDS: Lepidoptera, Erebidae, Arctiinae, Arctiini, Lithosiini, Caucasus, Daghestan, Russia.

Lithosiini y Arctiini de Daguestán (NE Cáucaso)
(Lepidoptera: Erebidae, Arctiinae)

Resumen

Se registran 16 especies de Lithosiini y 25 especies de Arctiini (Erebidae: Arctiinae) de Daguestán, noreste del Cáucaso. Nueve especies de Lithosiini y una especie de Arctiini (*Katha depressa* (Esper, 1787), *Manulea pygmaeola* (Doubleday, 1848), *M. lurideola* (Zincken, 1817.), *Cybosia mesomella* (Linnaeus, 1758), *Eilema caniolum* (Hübner, [1808]), *Atolmis rubricollis* (Linnaeus, 1758), *Pelosia muscerda* (Hufnagel, 1766), *Setina roscida* ([Denis & Schiffermüller], 1775), *Thumatha senex* (Hübner, [1808]), *Epatolmis caesarea* (Goeze, 1781) formalmente eran desconocidas del territorio de Daguestán. Se proporcionan para todas las especies localidades, biotopos típicos y periodo de vuelo de los imagos.
PALABRAS CLAVE: Lepidoptera, Erebidae, Arctiinae, Arctiini, Lithosiini, Cáucaso, Daguestán, Rusia.

Introduction

The first collector of Arctiinae of Daghestan (North-Eastern Caucasus) was A. Becker, a professional supplier of herbaria and entomological collections to Russian and foreign museums (NEKRUTENKO, 1990), who visited this region three times in 1868 (Derbent), 1872 (Derbent, Madschalis, Kasumkent, Akhty) and 1880 (Akhty). He published his collections (BECKER, 1869, 1873, 1881) and among a variety of butterfly and moth groups, reported one species of lichen-moths and five species of tiger-moths (the modern names are given): *Manulea palliatella* (Scopoli, 1763), *Spiris striata* (Linnaeus, 1758), *Utetheisa pulchella* (Linnaeus, 1758), *Rhyparia purpurata* (Linnaeus, 1758), *Callimorpha dominula* (Linnaeus, 1758), *Eucharia festiva* (Hufnagel, 1766).

At the same time H. Christoph, along with studying the Lepidoptera of Krasnovodsk and Northern Iran, summarized the materials available to Grand Duke Nicholas Mikhailovich Romanoff from Daghestan (Derbent, Kurush, Magaramkent, Akhty) and reported for Daghestan 4 species of

lichen-moths and 6 species of tiger-moths (CHRISTOPH, 1877). Seven years later, a large report on the butterflies of the Caucasus was published by ROMANOFF (1884), in which he reported for Daghestan 6 species of Lithosiini and 12 species of Arctiini.

During the 20th-40th of the XXth century M. A. Rjabov actively collected moths of the subfamily Arctiinae in Daghestan. His collections were the first comprehensive as including almost all species to date known from this territory and covering almost the entire territory of the republic. During these years small collecting of moths, including tiger-moths, in Daghestan was carried out by other specialists of the Zoological Institute, for example, A. N. Kirichenko. A special mention should be made of the 1939 expedition to Daghestan of the staff of the Zoological Museum of the Kiev State University, in which L. A. Sheljuzhko took part. Unfortunately, the collections of Arctiinae in this expedition were poor and included just two species: *Spiris striata* (L.) and *Phragmatobia fuliginosa* (Linnaeus, 1758). These specimens were examined by V. V. Dubatolov in the 80th-90th of the XXth century, with additional findings of *Rhyparioides metelkana* (Lederer, 1861) (DUBATOLOV, 1996) and descriptions of *Ocnogyna armena daghestana* Dubatolov, 1996 (DUBATOLOV, 1996) and *Chelis reticulata transcaucasica* Dubatolov, 1988 (DUBATOLOV, 1988); the type series of the latter includes specimens from Daghestan also. Since 1992, the Fall Webworm (*Hyphantria cunea* (Drury, 1773)) began to be registered in Daghestan, but probably it had penetrated to this territory earlier. Materials from the Caucasus were published by V. V. Dubatolov both on Lithosiini (DUBATOLOV *et al*., 1993) and on Arctiini (DUBATOLOV, 1991, 1994, 1996, 2008, 2010, 2019).

Since the 1990s collecting of Lepidoptera in Daghestan was actively continued, including Arctiini and Lithosiini. Occasional collecting was carried out by V. N. Kovtunovich and E. V. Nikolayeva (Moscow). But the most thorough research in recent years was carried out by E. V. Ilyina and A. N. Poltavsky. Since 1998, they have studied the species composition of Daghestan's Heterocera in all vertical zones from plains to high mountain areas by collecting moths by light. The main results of the research were published in a number of papers: on Noctuoidea (ILYINA, 2012; ILYINA & POLTAVSKY, 2014), on Pyraloidea (POLTAVSKY & ILYINA, 2016), on Geometridae (POLTAVSKY & ILYINA, 2018); and also in additions on mentioned groups of Lepidoptera (POLTAVSKY & ILYINA, 2016; POLTAVSKY & ILYINA, 2019).

Material and methods

Simultaneously with studying Noctuidae, Pyralidae and Geometridae, other families of Lepidoptera, including Arctiinae, were collected and identified. A small number of Arctiinae species were collected on the territory of Daghestan in 2001-2003, and the main bulk in 2014-2019: totally: 29 species, 371 specimens in 64 locations; this took 111 nights of light-catching. During the same period 154 species 1398 specimens of Pyralidae; 429 species, 3834 specimens of Noctuidae; 171 species, 781 specimens of Geometridae were collected. Thus, the Arctiinae in Daghestan are significantly inferior to other taxa of Heterocera both in species diversity and abundance. Totally 36 species of Arctiinae are indicated for the territory of Daghestan (DUBATOLOV, 2019).

After examination of the collection of Arctiinae of the Zoological Institute of the Russian Academy of Sciences and other scientific collections (mainly collections of the late XIXth - mid XXth century), the general list of the family Arctiidae of Daghestan was expanded to 41 species (from 110 localities). The following complete list of Arctiinae of the Daghestan Republic by old and modern collectors is published for the first time. The number and sexes of specimens and their collecting localities are provided for each species. The data from institution collections specified collector names, not specified - our original catches. This material keeping in the private collection

of A. N. Poltavsky (Rostov-on-Don, Russia). The species list follows the system of Arctiinae on the catalogue of DUBATOLOV (2010, 2019).

Nature's Conditions of Daghestan

The territory of the Daghestan Republic covers 50.3 square kilometers, located on the eastern part of the North Caucasus along the west coast of the Caspian Sea. It extends from the north to the south for 435 km and in its maximum width in the southern part from the west to the east for 250 km (Fig. 1).

Figure 1.– Location of Daghestan republic in Eurasia.

The southern half of the Republic is a mountainous area with contrasting nature conditions. The northern half is occupied by very monotonous plain lowlands. Some parts of this plain lay under the sea level (-28 m).

The Caspian Lowland consists of ancient and present river alluviums. There is no fresh water on large areas. There are 1,200 km^2 of saline and salt marshes, and about the same areas of sandy deserts. In the eastern part of the Lowland there are the stable sands. In the western part there are unstable sandy barkhans. The greatest rivers of Daghestan are Kuma, Terek, Sulak in the north and Samur in the south (POLTAVSKY & ILYINA, 2002).

The vegetation in the lowlands is rather variable: psammophytes on sands, dry polyherb steppes with *Artemisia* and *Salsola* complexes. In the Samur River wetlands there are grassy meadows and tugay forests.

The Coastal Lowland spreads like a narrow ribbon to the south from the city of Makhachkala. The Foothills arise to the west and southwest of it. This zone is 20-40 km wide. It spreads from the western to the southern boundaries of Daghestan with altitudes of 150-800 m a.s.l. The Foothills ranges consist of soft rocks, which results in a smooth erosion relief. Semidesert landscapes reach

400 m a.s.l. in the Foothills and then replaced by steppes up to 800 m a.s.l. The steep windward slopes of the Foothills are covered with a tangled low-woods (Fig. 2).

Above the Foothills there is a zone of Front mountain-ranges with oak and beech forests. The tops of the ranges are covered by subalpine meadows. In different regions of the Republic they occupies different heights: 500-600 m a.s.l. in Tabasaran and Kaitag Districts, 800-1500 m a.s.l. on the northern slopes of Salatau Range and the eastern slopes of Gymrin Range. The Front ranges zone surrounds the Central mountain area of Daghestan. This is the great mountain area including many separated ranges, plateaus and deep depressions. Some mountain peaks there are rather high - up to 2959 m a.s.l. The southern slopes of the Andisky, Salatau and Gymrin Ranges are xerophytous with specific plant formations such as: shibljak (bushes) and frigana (bushes and herbs). There are some woods but only on the northern slopes of the Andisky Koisu Valley, the Arakmeer Range and near the Gunib Plateau, at an altitude of 1500 m a.s.l. and higher. On the more gentle slopes, the forests were cut down, the soil tilled and used for agriculture or used like mesophytous meadows. The subalpic zone in this area begins from the heights of 2000-2200 m a.s.l. (POLTAVSKY & ILYINA, 2002).

The Daghestan Highland covers southwest part of the Republic and includes the Bokovoy (Lateral) and Vodorazdelny (Watershed) mountain ranges with the elevation of 3500-4400 m (a.s.l.). The Bokovoy mountain range is cut by river valleys into a few separate ranges: Bogosky, Nukatl, Samursky and others. The Highland Daghestan is characterized by relatively high precipitation, but at the same time valleys of large rivers (especially Samur) are dry. The main zonal elements in this area are the mountain steppes. The forest zone is distinct enough in the basins of the Avarsky and Andisky Koisu Rivers and reaches the elevations of 2200-2400 m a.s.l. In the base of the forest zone there are broad-leaves and pine woods, in the mid-forest zone there are only pine woods and up in the 2000 m a.s.l. range there are birch woods and ash-trees. Actually only 7% of the Daghestan territory is covered by forests.

The sub-alpine zone in the high mountain area covers the wide territories between 1770-1900 and 2500-2600 m a.s.l. The great part of subalpine meadows has some signs of steppes. In the western part of the area rhododendron associations (*Rhododendron caucasicum* Pall) are widespread. The alpine zone begins from the elevations of approximately 2500-2600 m a.s.l. and extends up to the everlasting snows (POLTAVSKY & ILYINA, 2002).

Locations of Arctiinae collecting in Daghestan

Lowland Daghestan

Papas - station in Kayakent district; Tushilovka and Kirov (Kirov's name) - villages in Kizlijar district; Tiulenij - island in Kizlijar bay of Caspian sea; Kizlijar - town, district center; Turali - settlement to the south from Makhachkala; Sulak - village in urban district of Makhachkala; Karaman-2 - settlement in southern suburb of Makhachkala; Magaramkent - village, district center of Magaramkent district; Samur wildlife area - in Magaramkent district, cordon; Gazardkam-Kazmalyar and Primorsky - village and settlement in Magaramkent district; Curve gorge and Almalo - settlement and village in Kumtorkale district; Agrakhansky wildlife area, Agrakhan Bay and Agrakhan Peninsula in Babayurt district; Berikey - village in Derbent district; Terekli-mekteb - village, district center of Nogay district, 22 m a.s.l.; Leninaul - village in Nogay district; Yuzhno-Sukhokumsk - town in Nogay district; Terskaya - biostation in Babayurt district; Adiel-Yangiyurt (5 m a.s.l.) and Germenchik (-1 m a.s.l.) - villages in Babayurt district; Shamkhal - settlement in urban district of Makhachkala (-1 m a.s.l.); Beligy - station in Derbent district on Rubas river; Caspiysk and Izberbash - town and settlement in Karabudahkent district.

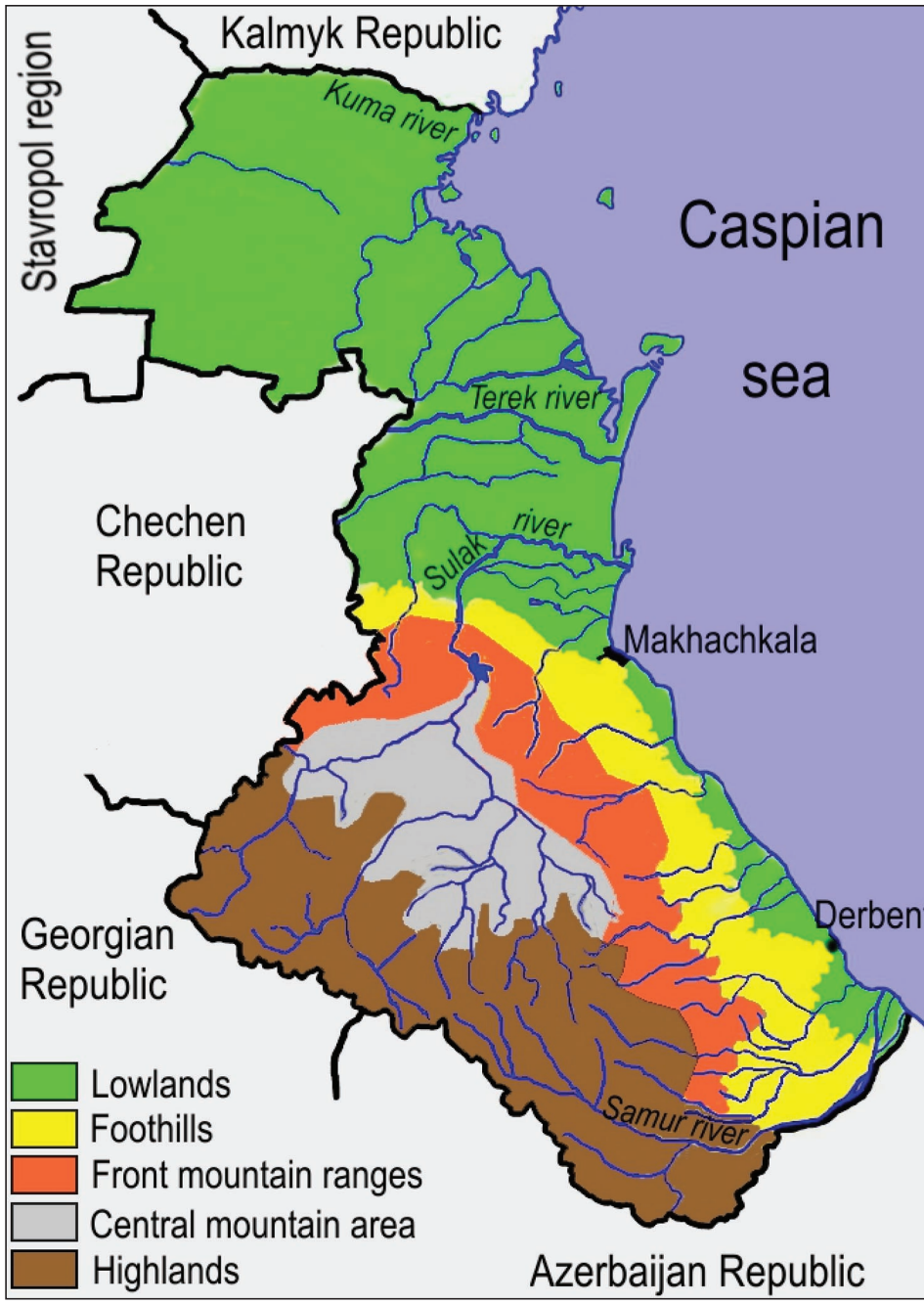

Figure 2.– Vertical zones of the Daghestan territory.

FOOTHILL DAGHESTAN

Makhachkala (till 1921 - Petrovsk-port) - town, the capital of Daghestan; Ak-gjol - the lake in Makhachkala vicinity; Kanabur - the ridge southern from Makhachkala; Eminkhyur - village in Suleyman-Stalsky district; Kumtorkale - station and district center, 300 m a.s.l.; Gubden (500 m a.s.l.) and Gurbuki (500 m a.s.l.) - villages in Karabudahkent district; Gubden gorge (900 m a.s.l.) - 20 km NW from Gubden; Sarykum - barkhan in Kumtorkale district, 200-250 m a.s.l.; Shura-Ozen - river in Kumtorkale district, 200-250 m a.s.l.; Talgi - village 8 km S Makhachkala, 150 m a.s.l.; Tarki - settlement on Tarki-tau mount, southern vicinity of Makhachkala; Derbent - town, district center; Rubas - river in Derbent district; Karabudahkent - village, district center, 240 m a.s.l.; Sergokala - village, district center 500, m a.s.l.; Vanashi-makhi - village in Sergokala district; Agatch-aul - village in Karabudahkent district; Talginsky gorge in Buynaksk district; Kaptchugai - village in Buynaksk district; in Buynaksk pass - on Narat-tiube ridge; Chirkey (409 m a.s.l.) Arkas (50 m a.s.l.) - villages in Buynaksk district; Khasaviurt - town, district center (121 m a.s.l.); Kiziliurt - town, district center (115 m a.s.l.).

FRONT MOUNTAIN RANGES OF DAGHESTAN

Termenlik - camp site in Buynaksk district on Gymrin ridge, 1200 m a.s.l.; Upper Kazanishche (800-1000 m a.s.l.), Lower Ishkarty (862 m a.s.l.) and Chirkey (409 m a.s.l.) - villages in Buynaksk district; Dylym (800-1500 m a.s.l.), Dubki (860 m a.s.l.), Gertma (1200 m a.s.l.) and Akhsu (1500 m a.s.l.) - villages in Kazbek district; Mezhgyul - village in Khiv district, 800 m a.s.l.; Samur ridge in Magaramkent district; Barshamay (800 m a.s.l.), Madschalis (400 m a.s.l.) and Karatsan (505 m a.s.l.) - villages in Kaytagh district; Ersi (800 m a.s.l.) and Khapil (677 m a.s.l.) - villages in Tabasaran district, Meusisha - village in Dakhadaev district, 1439 m a.s.l.; Ukjuz-tau - mount in the south of Buynaksk district.

CENTRAL MOUNTAIN AREA OF DAGHESTAN

Gunib plateau (1700 m a.s.l.) and Gunib village (1500 m a.s.l.) in Gunib district; Levashi - village, district center (1269 m a.s.l.); Tsudakhar (1100 m a.s.l.) and Khadjalmakhi (1100 m a.s.l) - villages in Levashi district; Sogratl (1573 m a.s.l.), Salty (1500-1700 m a.s.l.) and Keger (1600 m a.s.l.) - villages in Gunib district; Harakhi (1500 m a.s.l.) and Uzdalroso (1700 m a.s.l.) - villages in Khunzakh district; Chirkata (425 m a.s.l.), Danukh (1500 m a.s.l.), Araderikh (1700 m a.s.l.), Ingishi (1700 m a.s.l.) - village in Gumbet district; Balakhani - village in Untsukul district, (1700 m a.s.l.).

HIGHLAND DAGHESTAN

Achty - village, district center (1200 m a.s.l.); Ussuch-tschaj - village, district center (847 m a.s.l.); Tokhota (1900 m a.s.l.), Salda, gorge of the river Dzhurmut (1800 m a.s.l.), Tchoroda (2058 m a.s.l.), Tshada-Kolob (Tshada-Kala) (1327 m a.s.l.) - villages in Tljarata district; Karata (1500 m a.s.l.) and Lologonitl (2000 m a.s.l) - villages in Akhvakh district, Boghoss ridge; Kufa (1500 m a.s.l.), Rutul (1300 m a.s.l.), Hnyukh (2100 m a.s.l.), Dzhinykh (2216 m a.s.l.) and Kala (1500 m a.s.l.) - villages in Rutul district; Itsari (1500-1700 m a.s.l.) and Urtsaki (1500 m a.s.l.) - villages in Dakhaday district; Tpigh (1500 m a.s.l.), Misi (1817 m a.s.l.), Tsirkhe (1500 m a.s.l), Burshag (2000 m a.s.l.), Chirag (2000 m a.s.l.) and Shari (1700 m a.s.l.) - villages in Aghul district; Kurush - village in Dokuzpary district, 2500 m a.s.l.; Upper Gakvari (2000 m a.s.l.), Ashia (2100 m a.s.l.), Tindi (1600 m a.s.l.), Aknada (1733 m a.s.l.) and Agvali (800 m a.s.l.) - villages in Tshamada district; Tidib - village in Shamyl district, 1327 m a.s.l.

Abbreviations

ZIN - Zoological Institute of the Academy of Sciences of Russia (St. Petersburg)
GDNMR - collection of the Grand Duke Nicholas Romanoff; ZMKSU - Zoological Museum of Kiev's State University (Kiev)

SZMN - Siberian Zoological Museum of the Institute of Animal Systematics and Ecology of the Siberian Branch of the Russian Academy of Sciences (Novosibirsk)
ZMMU - Zoological Museum of the Moscow State University (Moscow); m a.s.l. - meters above the sea level.

Family Erebidae Leach, [1815]
Subfamily Arctiinae Leach, [1815]
Tribe Lithosiini Billberg, 1820

Katha depressa (Esper, 1787)

Material: Derbent, 1 ♂ (ZIN: GDNMR); Agatch-aul, 1 ♂, 28-VIII-1940 (ZIN: coll. M. Rjabov); Samur wildlife area, 1 ♂, 1 ♀, 4-VII-2019.

A trans-Palaearctic forest species. It is quite rare in the Caucasus but besides Daghestan, is known from Krasnodar Region, including the Black Sea coast. It lives on the piedmont plain and in the foothills, in forests. Imago are active in late June - the first half of July, as well as in August and early September. In Daghestan moth specimens were caught by the light at oak/hornbeam forest (Samur wildlife area).

Wittia sororcula (Hufnagel, 1766)

[*Lithosia*] *sororcula*, ROMANOFF, 1884: 85 (Derbent)

Material: Beligy, 1 ♂, 25-IV-1926 (ZIN: coll. M. Rjabov); Tarki, 1 ♂, 26-V-1933, 1 ♀, 9-VI-1946 (ZIN: coll. M. Rjabov); Sergokala (Deshi Agar), 1 ♂, V-1946 (ZIN: coll. M. Rjabov); Derbent, 1 ♀ (ZIN: GDNMR - Romaroff); Urtsaki, 3 ♂♂, 29-30-VI-2003 (ZIN: E. Ilyina); Tsirkhe, 1 ♂, 10-VII-2003 (ZIN: E. Ilyina); Primorsky, 3 ♂♂, 16-21-V-1992 (SZMN: Kovtunovitch); Khasaviurt, 1 ♂, 13-V-1992 (SZMN: Kovtunovitch); Dylym, 1 ♂, 24-VII-2013; Samur wildlife area, 4 ♂♂, 4 ♀♀, 24-VII-2019.

An amphi-Palaearctic subboreal forest species, with a range gap between Lake Baikal (Irkutsk region) and the Zeya River in the Amur region. It is common almost everywhere on the northern slope of the Caucasus; up to 1500 m a.s.l. Imagines are active from May (sometimes from late April) to late June; rarely from July to the end of August. In Daghestan it was caught by the light in oak-hornbeam forest (Samur wildlife area, Dylym).

Manulea complana (Linnaeus, 1758)

Lithosia complana, CHRISTOPH, 1877: 205 (Derbent); ROMANOFF, 1884: 84 (Derbent)

Material: Makhachkala, 1 ♂, 16-X-1925; larva 26-V-1933, cocoon 28-V-1933, imago 1 ♂, 14-VI-1933; 1 ♂, 19-VI-1933 (ZIN: coll. M. Rjabov); Kumtorkale, 2 ♂♂, 26-IX-1926, 1 ♂, 7-X-1940 (ZIN: coll. M. Rjabov); Ak-gjol, 2 ♀♀, 22-IX-1933 (ZIN: coll. M. Rjabov); Tarki, 1 ♀, 18-IX-1939; larva on oak, 24-V-1940, imago 1 ♀, 12-XI-1940; 1 ♂, 23-VII-1946 (ZIN: coll. M. Rjabov); Kaptchugai, 1 ♀, 5-IX-1937 (ZIN: coll. M. Rjabov); Upper Kazanishche, 1 ex., 25-VI-1999; Urtsaki, 1 ♂, 29-30-VI-2003 (ZIN: E. Ilyina); Rutul, 1 ♀, 7-10-VII-2004 (ZIN: E. Ilyina); Gubden gorge, 1 ♂, 3 ♀♀, 18-19-VII-2006 (SZMN: E. Nikolaeva, D. Morgun); Barshamay, 6 ♀♀, 29-VI-2010; Samur wildlife area, 1 ex., 24-VII-2019.

A west-central Palaearctic (or transpalaearctic if an old find in Korea (BRYK, 1948, as *Eilema angustiala*) has a correct label) meadow-steppe species. In the Caucasus it is quite numerous and found everywhere, up to an altitude of 1500 m a.s.l. Males are well diagnosed by the presence of a bundle of androconial scales below the fore wings in the middle of the costal edge. However, a dark longitudinal stroke from below the hind wings along the costal edge at some southern instances of *M. complana* may disappear, making the species easy to confuse with the similar *M. pseudocomplana* (Daniel, 1939) (DANIEL, 1939), whose males completely lack the bundle of androconial scales below the front wings. Imagines are active from mid-June to mid-October, probably in two generations. Moths were caught by light in a variety of biotopes: scaffolding forests, shrub slopes of gorges with herbs diversity (Gubden).

Manulea palliatella (Scopoli, 1763)

Lithosia unita, BECKER, 1869: 193 (Derbent)

[*Lithosia*] *unita* var. *palleola* (Hübner, [1827]), ROMANOFF, 1884: 84 (Derbent)

Material: Khadjalmakhi, 1 ♂, 25-IX-1932, 1 ♀, 26-IX-1932, 1 ♂, 1 ♀, 27-IX-1932 (ZIN: coll. M. Rjabov); Akhty, 1 ♀, 28-VIII-1933 (ZIN: coll. M. Rjabov); Kaptchugai, 1 ♀ + 1 ex. lost belly, 17-VIII-1937, 1 ♀, 16-VIII-1940, 2 ex. lost belly,18-VIII-1940, 1 ex. Lost belly, 21-VIII-1940 (ZIN: coll. M. Rjabov); Derbent, 1 ♂ + 1 ♀ (ZIN: coll. Acad. Petrop); river Rubas, steppe, 1 ♂ + 1 ♀, 17-VIII (ZIN: coll. M. Rjabov); Levashi, 3 ♂♂, 28-VII-1940 (ZIN: coll. M. Rjabov); Tarki, 2 ♂♂, 25-VIII-1940, 1 ♂, 19-IX-1947 (ZIN: coll. M. Rjabov).

A west-central Palaearctic semidesertic and steppe species. In the Caucasus it is found almost everywhere in arid places. Imagines are active from the second half of July till the end of September; developing in one generation.

Manulea pygmaeola (Doubleday, 1848)

Material: Germenchik, 1 ♂, 27-V-1921 (ZIN: coll. M. Rjabov); Derbent, 1 ♂, 11-VII-1928; 1 ♂, 11-VI-1931 (ZIN: coll. M. Rjabov); Makhachkala, 2 ♂♂, 19-VI-1933, 1 ex., 10-VII-1933 (ZIN: coll. M. Rjabov), 1 ♂, 28-VI-1940 (ZIN); Kaptchugai, 1 ♂, 1 ♀, 2-3-VI-1932, 1 ♂, 3-VI-1932, 1 ♂ + 1 ♀, 5-VI-1937, 1 ♂, 5-IX-1937, 1 ex., 17-VIII-1940, 2 ♀♀, 18-VIII-1940 (ZIN); Upper Kazanishche, 1 ♂, 1 ♀, 17-VI-1941 (ZIN: coll. M. Rjabov); Buynaksk, 1 ♂, 7-IX-1939 (ZIN: coll. M. Rjabov); Tarki, 1 ♂, 24-VIII-1937, 1 ♂, 11-IX-1939 (ZIN), 2 ♂♂, 5-6-VI-1940, 1 ♂, 18-VIII-1940, 1 ♂, 9-VI-1946, 1 ♂, 31-V-1941; 1 ♂, 22-VII-1944 (ZIN: coll. M. Rjabov); Agatch-aul, 2 ♂♂, 1 ex., 28-VIII-1940 (ZIN: coll. M. Rjabov); Levashi, 3 ♂♂, 28-29-VII-1940 (ZIN: coll. M. Rjabov); Beligy, 3 ♀♀, 19-VIII (ZIN: coll. M. Rjabov); Barshamay, 2 ♂♂, 29-VI-2010; 1 ♂, Salda, 17-VII-2019.

A west-central Palaearctic meadow-steppe species, in Southern Siberia penetrating east to the Yenisei River. It is found everywhere in the Caucasus. Imagines are active from late May to mid-September developing probably in two generations. In Salda moth was caught to the light on the river bank with diverse herbs next to a mountain mixed forest area.

Note. Some specimens in ZIN collection were wrongly determined as *Eilema lutarella* (L.)

Manulea lutarella (Linnaeus, 1758)

[*Lithosia*] *lutarella*, CHRISTOPH, 1877: 205 (Kurusch)

Material: Gunib, northern slope, 1 ♂, 12-VII, 1 ♂, 25-VII (ZIN: coll. M. Rjabov).

A trans-Palaearctic meadow species. In the Caucasus it is rare and so far known only from Stavropol Region, Kabardino-Balkaria and Daghestan. Imagines are active in the second and third decades of July, as well as in the first half of August.

Manulea (Nuea) lurideola (Zincken, 1817)

Material: 1 ♂, Salty, 7-VIII-1890 (ZIN: GDNMR), 1 ♂, 28-VII-1893 (ZIN: Mlokosevich); Arkas, 1 ♂, 18-VI-1941 (ZIN: coll. M. Rjabov); Misi, 1 ♀, 12-13-VII-2006 (SZMN: E. Nikolaeva, D. Morgun,); Dylym, 1 ♂, 24-VII-2013; Salda, 1 ♂, 17-VII-2019.

A west central Palaearctic meadow species distributed east to Lake Baikal. In the Caucasus it is known almost from everywhere except for Osetia. Imagines are active from mid-June until the end of August. In Salda moth was caught to the light on the river bank with diverse herbs next to a mountain mixed forest area.

Cybosia mesomella (Linnaeus, 1758)

Material: Ukjuz-tau, 4 ♂♂, 6-VII-1940 (ZIN: coll. M. Rjabov).

A west-central Palaearctic forest species, in South Siberia spread east to Lake Baikal. It is found in both the east and west Caucasus (DUBATOLOV *et al*., 1993). Imagines are active from late May to early July.

Eilema caniolum (Hübner, [1808])

Material: Derbent, 1 ♂, 31-VII-1910 (ZIN: K. Satunini); Levashi, larva in cocoon VII-1926, imago 1 ♀, 3-VIII-1926 (ZIN); Makhachkala, 1 ♀, 26-VIII-1946 (ZIN: coll. M. Rjabov).

A western Palaearctic species. In Russia, it is reliably known from the vicinity of Taganrog, North-West Caucasus (Black Sea coast) and North-East Caucasus (Daghestan) (DUBATOLOV *et al*., 1993; DUBATOLOV, 2008, 2019). In the Catalogue of Lepidoptera of Russia (SINEV, 2019) region #15 (North Ural) is incorrectly indicated instead of region #14 (East Caucasus). The species is easily distinguished from the externally similar species of the genus *Manulea* Wallengren, 1863 by simple oval valves without any processes, which is not very typical for the members of the Lithosiina subtribe. Imagines are active in June-August.

Atolmis rubricollis (Linnaeus, 1758)

Material: Tarki, 1 ♀, 9-VI-1946 (ZIN: coll. M. Rjabov); Barshamay, 1 ex., 29-VI-2010; Kufa, 6 ex., 20-VII-2017.

A trans-Palaearctic forest species. In the Caucasus it is very rare recorded only in Teberda (Karachai-Cherkessia) and Daghestan. Imagines are active in June-July. In Kufa lichen-moths were caught by light on the northern slope on a herb meadow.

Pelosia muscerda (Hufnagel, 1766)

Lithosia muscerda, CHRISTOPH, 1877: 205 (Derbent); ROMANOFF, 1884: 84 (Derbent)

Material: Makhachkala, larvae on vine tree, 1 ♀, 19-VI-1933, 1 ♂, 14-IX-1940 (ZIN: coll. M. Rjabov); Kaptchugai, 1 ♀, 18-VIII-1940 (ZIN: coll. M. Rjabov); Kumtorkale, 2 ex., 18-VI-2019.

A trans-Palaearctic forest species. In the Caucasus it is common both in Krasnodar Region and Daghestan. Imagines are active from the late May to the early July, then from August to the first half of September. Probably two generations take place during summer.

Pelosia obtusa (Herrich-Schäffer, 1847)

Paida obtusa, ROMANOFF, 1884: 83 (Derbent)

Material: Kaptchugai, 6 ♂♂, 7 ♀♀, 21-22-VIII-1940 (ZIN: coll. M. Rjabov); Tarki, 1 ♂, 15-VII-1947 (ZIN: coll. M. Rjabov).

A trans-Palaearctic subboreal species which prefers moderate arid areas. This species is rarely caught by light-trapping. In the Caucasus it was known from Krasnodar, 1 ♂, 1-11-VIII-2016, A. N. Streltsov leg., and from three locations in Daghestan. Imagines are active from mid July to the end of August they occur near water.

Lithosia quadra (Linnaeus, 1758)

Lithosia quadra quadra, DUBATOLOV *et al*., 2016: 180 (Tarki, Ak-gjol, Derbent, 8 km S Makhachkala, Talgi, Kapchugai, Arkas)

Material: Derbent, 1 ♀, 1-IX-1933 (ZIN), 3 ♀♀, 28-VIII-1974 (SZMN); Ak-gjol, 1 ♂, 4-X-1939 (ZIN); Kaptchugai, 1 ♀, 22-VIII-1940 (ZIN: coll. M. Rjabov); Arkas, 1 ♂, 18-VI-1941 (ZIN: coll. M. Rjabov); Tarki, 1 ♀, 23-VII-1946 (ZIN: coll. M. Rjabov); Rutul, 2 ♀♀, VI-1992 (ZIN: E. Ilyina); Karata, 1 ex., 8-VIII-2002; Mezhgyul, 1 ex., 17-VI-2003; Burshag, 1 ♂, 10-11-VII-2003 (ZIN: Z. Musaeveà); Tpigh, 3 ♂♂, 8-VII-2003 (ZIN: E. Ilyina); Gertma, 1 ♀, 28-VII-2003 (ZIN: E. Ilyina); Talgi, 1 ♂, 1 ♀, 24-VI-2004 (Museum Witt: coll. Kostjuk, Tikhonov); Hnyukh, 3 ♂♂, 10-VII-2004 (ZIN: E. Ilyina); plateau Gunib, 2 ex., 18-VII-2015, Salda, 1 ex., 18-VIII-2015, 2 ex., 17-VIII-2017; Sarykum, 1 ex., 9-IX-2017; Karaman-2, 1 ex., 12-VII-2017; Kufa, 4 ex., 20-VII-2017; Termenlik, 1 ex., 4-VII-2018.

An amphi-Palaearctic nemoral forest species found throughout the north Caucasus (DUBATOLOV *et al*., 2016). Imagines are active from June to early October. The species develops probably in two generations or more. Moths are caught in grasslands of various types (mesophytic meadows, steppes) with presence of woody vegetation.

Setina aurata (Ménétriès, 1832)

Setina irrorella, CHRISTOPH, 1877: 205 (Kurusch); ROMANOFF, 1884: 84 (Balakhani)

Material: Daghestan, 1 ♂, VIII-1887 (ZIN); Salty, 1 ♂, 7-VIII-1890, 1 ♂, 22-VIII-1892 (ZIN); Akhty, 1 ♂, 6-IX-1926 (ZIN: coll. M. Rjabov); Levashi, 1 ♂, 28-VII-1940 (ZIN: coll. M. Rjabov); Kaptchugai, 1 ♂, 17-VI-1945 (ZIN); Gunib, 1 ♂, 21-VIII-1987 (SZMN: Sergeev); Chirag, 1 ♂, 14-VII-2003 (ZIN: E. Ilyina); Misi, 1 ♂, 12-13-VII-2006 (SZMN: E. Nikolaeva, D. Morgun); Sulak, 1 ex., 26-VII-1999; Upper Kazanishche, 1 ex., 25-VI-1999; Tokhota 2 ♂♂, 10-20-VII-2001; Kala, 1 ex., 10-VII-2010; Vanashi-makhi, 1 ♂, 5-VIII-2015; Rutul, 1 ex., 10-VII-2017; Itsari, 1 ex., 3-VII-2019; Salda, 1 ♂, 25-VII-2014, 3 ♂♂, 17-VII-2019.

A mountain Minor-Asia-Caucasian endemics. It occurs in the upper forest belt and subalpine meadows at the elevations of 1500-2500 m a.s.l. Imagines are active from mid-June till early September. Moths were caught in meadows of various types (mesophytic, steppefied) and in forest edges.

Setina roscida ([Denis & Schiffermüller], 1775)

Material: Kumtorkale, imago on *Celtis*, *Astragalus*, 3 ♂♂, 1-IX-1945 (ZIN: coll. M. Rjabov); Rutul, on *Spirea*, 1 ♀, 31-VIII-1924 (ZIN).

A trans-Palaearctic meadow and steppe species. In the Caucasus it was noted in Adygea (Sohrai), on Mount Mashuk in the Stavropol region, in Lars (North Ossetia) and in Daghestan. Prefers open slopes. Imago active in late May - early June and late August - early September; in high mountains area - in July.

**Thumatha senex* (Hübner, [1808])

Material: Kaptchugai, 2 ♂♂, 1 ♀, 20-VI-1940 (ZIN: coll. M. Rjabov); Makhachkala, 1 ♂, 26-VIII-1946 (ZIN: coll. M. Rjabov); Tarki, 1 ex., 20-VIII-1937 (ZIN: coll. M. Rjabov); Derbent, 24-VIII (ZIN: GDNMR).

A west-central Palaearctic southern-forest species. It is distributed east to Argun river basin in eastern Transbaikalia. Due to the small size and weakly sclerotized wings, it is infrequent in collections. In the Caucasus it was for the first time reported from Teberda (Karachay-Cherkessia) (DUBATOLOV, 2019) and Daghestan. Moths fly in late June - the first half of July and late August.

Tribe Arctiini Leach, [1815]

Callimorpha dominula (Linnaeus, 1758)

Callimorpha dominula rossica Kolenati, 1846

Callimorpha donna, BECKER, 1873: 256 (Madschalis)

Callimorpha dominula var. *rossica*, CHRISTOPH, 1877: 205 (Petrowsk; Tarki; Akhty); ROMANOFF, 1884: 86 (Akhty)

Callimorpha dominula, Dubatolov, 2010: 85, map 6

Material: Daghestan, 1 ♂, VI-1902 (Sheljuzhko, ZMKSU); Upper Kazanishche, 11 ♂♂, 9 ♀♀, 15-VI-1946 (ZIN: coll. M. Rjabov); Lologonitl, 1 ♂ (Moscow: coll. E. Nikolaeva); Khapil, 1 ♂, 28-VI-2006 (ZIN: Kurbanova); Meusisha, 1 ex., 5-VII-1994; Rutul, 1 ♂, 10-VII-1995, 1 ♂, 25-VII-1997; Kosob, 1 ♂, 8-VII-1999; Shari, 1 ex., 10-VIII-2000; Gunib, 1 ex., 4-VII-2002; Salda, 1 ex., 26-VII-2014; Dylym, 2 ex., 15-VII-2017; Termenlik, 1 ex., 4-VII-2018.

A west-Palaearctic species, not reported east of the Urals. In the mountains of the Caucasus it is common and represented by the local subspecies *C. dominula rossica* Kolenati, 1846 which has the hind wings yellow (typical form of the subspecies) or pink (f. *teberdina* Sheljuzhko, 1934). This subspecies, in addition to the Caucasus, also lives in eastern Turkey. It prefers the forest belt. Imagines are active from late May to early August. Moths were caught in mesophytic high herbage, more often near small rivers.

Euplagia quadripunctaria (Poda, 1761)

Euplagia quadripunctaria, DUBATOLOV, 2010: 86, map 16

Material: Keger, 1 ex., 6-VII-2002; Karata, 1 ex., 10-VIII-2002; Kanabur, 1 ex., 10-VIII-2003;

Rutul, 1 ex., 15-VII-2004; Makhachkala, 1 ex., 17-VII-2006 (Moscow: coll. E. Nicolaeva); Khapil, 1 ♀, 31-VII-2007, 2 ♂♂, 14-17-VIII-2007 (ZIN: Kurbanova); Salda, 1 ex., 18-VIII-2015; Karatsan, 1 ex., 31-VII-2010; Samur wildlife area, 1 ex., 12-VII-2018.

A west-Palaearctic species also not penetrating east of the Ural. It is found throughout the Caucasus. The species inhabits meadow mountain slopes, gorges, glades and forest swamps. Imagines are active from early July till early September. The moths were found among wood vegetation in daylight on trunks; in Keger, Karata, Salda - in pine forest, in Kanabur - in oak forest, in the Samur wildlife area - in oak- hornbeam forest, in Rutul - in a juniper belt and pine forest.

Cymbalophota rivularis (Ménétriès, 1832)

Euprepia Rivularis, CHRISTOPH, 1877: 205 (Derbent); ROMANOFF, 1884: 88 (Derbent)

Cymbalophora rivularis, DUBATOLOV, 1996: 41 (Daghestan); DUBATOLOV, 2010: 7, 88, map 26

Material: Derbent, 1 ♂, 15-X-1875 (ZIN: GDNMR - Komaroff), 1 ♂, 1-IX-1928 (ZIN: Samoilov); Beligy, ex larva, 1 ♀, 13-XI-1926 (ZIN: M. Rjabov); Kumtorkale, 1 ♂, 30-IX-1926 (ZIN: M. Rjabov); Tarki, 3 ♂♂, 24-IX-1933, 6 ♂♂, 5-X-1937, 24 ♂♂, 18-IX-1939, 1 ♂, 11-VIII-1941, 1 ♀, 20-VIII-1941, 2 ♀♀, 23-25-VIII-1941 (ZIN: M. Rjabov, ZMKSU, SZMN); ex larva (on *Phlomis*) ex pupa 1 ♀, 6-IX-1933 (larva V-1933), 3 ♀♀, 15-VIII-20-VIII-1940, 1 ♀, 5-IX-1940 (larva V-1940), 1 ♂, 10-VIII-1941, 2 ♀♀, 11-14-VIII-1941, 10-IX-941 (larva V-1941, pupa 18-VIII-1941) (ZIN: M. Rjabov); Kaptchugai, 4 ♂♂, 10-IX-1937 (ZIN: M. Rjabov; ZMMU: Tsvetaev), 1 ♂, 2-X-1937, 2 ♂♂, 2-X-1940 (ZIN); Ak-gjol, 10 ♂♂, 10-IX-1939, 2 ♂♂, 2 ♀♀, 17-IX-1939, 5 ♂♂, 8-27-IX-1940, 1 ♂, 13-IX-1947 (ZIN: M. Rjabov, SZMN); Kurush, 1 ex., 19-VIII-1990; Khapil, 1 ♂, 25-IX-2007 (ZIN: Kurbanova); Burshag, 1 ex., 23-VII-2007; Salda, 1 ex., 17-VIII-2017; Sarykum, 3 ex., 16-30-IX-2017.

A Mediterranean-Caucasian species. Although its main range covers the eastern part of the North Caucasus, Transcaucasia, north-western Iran and eastern Turkey, local populations are known from Central Italy, Northern Macedonia, Northern Greece, Southeastern Bulgaria and from the Black Sea coast of Ukraine (Kherson). It lives in arid shrub areas. A tiger-moth with late-summer and autumn activity, flying from mid-August to mid-October or even later. M. A. Rjabov noted the feeding of caterpillars on *Phlomis*. In the Daghestan tiger-moths were caught on sections of stepped meadows.

Tyria jacobaeae (Linnaeus, 1758)

Euchelia jacobaeae, CHRISTOPH, 1877: 205 (Derbent); ROMANOFF, 1884: 85 (Derbent)

Tyria jacobaeae, DUBATOLOV, 2010: 88, map 27

Material: Beligy, 1 ♂, 26-VII-1933 (ZIN: M. Rjabov); Tchoroda, 22-VI-1889 (ZIN: GDNMR); Tshada-Kolob, 2 ♂♂, 12-V-1902 (ZMKSU: Galkin); Ersi, 1 ex., 23-VII-2010; Curve gorge, 2 ex., 1-V-2016).

A west-central Palaearctic species. It is found in Siberia east to the Yenisei River; everywhere in the Caucasus. It prefers open stepped areas. Imagines are active from May to late July; higher in the mountains occurring on later dates. Larvae feed on *Senecio*. In the Curve Gorge, these tiger-moths were caught on ruderal vegetation in the seaside zone surrounded by loch growths.

Lacydes spectabilis (Tauscher, 1806)

Lacydes spectabilis, DUBATOLOV, 2010: 89, map 31

Material: Khasaviurt, 1 ♂, 25-VIII-1928 (ZIN: M. Rjabov); Tarki, 1 ♂, 6-IX-1948 (ZIN: M. Rjabov).

A central Palaearctic species preferring semiarid habitats. It is known from eastern Ukraine (Lugansk region), eastern European Russia, steppes of South-Western Siberia, and across inland Asia from Eastern Turkey through Iran, Afghanistan, North-West Pakistan, entire Central Asia and Kazakhstan to North-West China (Xinjiang) and Western Mongolia. In the Caucasus it is known only from the Stavropol Region (the valley of Kuma and Budyonovsk), as well as from Daghestan, where it is also found in semiarid places. Tiger-moths with late summer and autumn activity, flying from the second half of August to the end of September. Caterpillars develop in spring and early summer. The pupas have a summer diapause (aestivation).

Spiris striata (Linnaeus, 1758)
Emydia grammica, BECKER, 1869: 193 (Derbent)
Emydia striata, ROMANOFF, 1884: 85 (Derbent)
Spiris striata, DUBATOLOV, 2010: 89, map 33

Material: Derbent, 1 ♂, V-1878, 1 ♂, VI-1878 (ZIN: Romanoff); Beligy, 1 ♂, 2-IX-1939 (ZMKSU: Sheljuzhko); Tushilovka, 1 ♂, 28-V-1925 (ZIN); Samur wildlife area, 1 ex., 3-V-1986; Buynaksk pass, 2 ♂♂, 7-VI-1992 (SZMN: Kovtunovitch); Papas, 1 ex., 28-V-2002; Talginsky gorge, 1 ex., 29-V-2005; Kirov, 1 ♂, 10-VIII-2007 (ZIN); Eminkhyur, 19-V-2016 (1 ex.); Turali, 1 ex., 28-V-2016; Sarykum, 1 ex., 20-V-2005, 1 ex., 4-VI-2016; Gubden, 1 ex., 18-VI-2017; Upper Gakvari, 1 ex., 10-VII-2000; 1 ex., 25-VI-2017.

A subtrans-Palaearctic, penetrating into Central Yakutia and Eastern Transbaikalia. Prefers forest steppes and steppes. It is found throughout the Caucasus. Imagines are active from May until early September, probably in two generations. The second generation does not seem to develop every year. Tiger-moths were caught in meadows of various types (mesophytic, stepped, sandy).

Utetheisa pulchella (Linnaeus, 1758)
Callimorpha pulchra, BECKER, 1869: 193 (Derbent)
Deiopeia Pulchella, ROMANOFF, 1884: 85 (Derbent)

Material: Kaptchugai, 1 ♀, 5-IX-1937 (ZIN: coll. M. Rjabov); Makhachkala, 1 ex., 20-VII-2007; Karaman-2, 1 ex., 10-VII-2010; Samur wildlife area (ILYINA *et al*., 2014).

A Paleotropical species common in Africa, southern Eurasia east to Burma (Myanmar); in the XXth century it also entered the West Indies. In East Asia, Australia and Oceania two very similar species of this genus occur with quite different male genitalia: *U. pulchelloides* Hampson, 1907 and *U. lotrix* (Cramer, 1779). Besides, the latter has no red spot in the tornal angle of forewings; it occurs also in Africa and south-western Asia, including southern Iran. *U. pulchella* is very rare at the Caucasus, but recently is caught all over the northern slope. Although these tiger-moths have been collected since late June, they are more likely to be seen in late summer and early autumn. In Daghestan this species is found near the sea coast in the shrub steppe.

Arctia caja (Linnaeus, 1758)
Arctia caja ossetica Dubatolov, 1996
Arctia caja, DUBATOLOV, 2010: 90, map 37

Material: Daghstan, 1 ♂, VIII-1887 (ZIN); Akhty, 1 ♂, 29-VII-1933 (ZMKSU: Tkachukov); Gertma, 1 ex., 8-VIII-1999, 1 ♂, 10-VII-2005 (ZIN: E. Ilyina); Meusisha, 1 ex., 10-VIII-1999; Shari, 1 ex., 10-VIII-2000; Hnyukh, 1 ♂, 10-VII-2004 (ZIN: E. Ilyina); Misi, 1 ♂, 13-14-VII-2006 (SZMN: E. Nikolaeva, D. Morgun); Chirag, 4 ♂♂, 14-15-VII-2006 (SZMN: E. Nikolaeva, D. Morgun); Salda, 1 ex., 18-VIII-2015; Makhachkala, 1 ♀, 28-VIII-2016.

A trans-Palaearctic species. On the territory of Daghestan it is represented by the North Caucasian subspecies *A. caja ossetica* Dubatolov, 1996; which differs from the nominative one by orange rather than red (as in the nominotypical subspecies) hindwings. Imagines are active from mid-July until the end of August. Inhabits mesophytic high herbage at rivers.

Epicallia villica (Linnaeus, 1758)
Arctia villica, CHRISTOPH, 1877: 205 (Derbent); ROMANOFF, 1884: 87 (Kourouche)
Epicallia villica, DUBATOLOV, 2010: 91, map 43

Material: Daghestan, 1 ♂, VI-1902 (ZMKSU: Sheljuzhko); Terekli-mekteb, 1 ♂, 19-V-1925 (ZIN: Kirichenko); Gertma, 1 ♂, 20-21-VI-2004 (ZIN: E. Ilyina); Makhachkala, 2 ♂♂, 2-18-VI-1908, (ZMKSU: Kaljuzhny); Agatch-aul, 1 ♂, 30-V-1992 (SZMN : Kovtunovitch); Danukh, 1 ♂, 20-IV-2004 (ZIN: E. Ilyina); Derbent, 1 ♂, 2-VII-1925 (ZIN: Kirichenko); Rutul, 1 ♂, 15-VI-1992 (ZIN: Pekarsky); Samur wildlife area, 2 ex., 22-26-V-2015; 1 ex., 1-VI-2019; Lower Ishkarty, 1 ex., 24-V-2019; Mezhgyul, 2 ex., 17-VI-2003; Talgi, 1 ex., 7-VI-1987, 1 ex., 8-V-2012; Terskaya, 1 ex., 10-V-1996; Barshamay, 1 ex., 29-VI-2010; Adiel-Yangiyurt, 1 ex., 12-VI-2011; Harakhi, 1 ex., 10-VI-2002; Gunib,

1 ex., 10-VII-2002; Ersi, 1 ex., 23-VII-2010; Chirkata, 1 ex., 1-VI-2004; Sergokala, 1 ex., 18-VI-2011; Uzdalroso, 1 ex., 5-VII-1982.

A west-Palaearctic species, which penetrates into the southwest West Siberian lowlands. It is found throughout the Caucasus. Imagines are active from the late April to the late July; higher in the mountains the flight takes place later. Inhabit various biotopes: grasslands, shrubs and wood thickets.

Hyphoraia aulica (Linnaeus, 1758)

Hyphoraia aulica, Dubatolov, 2010: 91, map 44

Hyphoraia aulica testudinarioides (Sovinsky, 1905)

Material: Mezhgyul, 2 ex., 17-23-VI-2003.

A trans-Palaearctic species. Rare across the North Caucasus found at 800-1300 m above sea level. The subspecies *H. aulica testudinarioides* (Sovinsky, 1905) differs from nominotypical subspecies by longitudinally extended light spots anteriorly the anal vein on the fore wings; it inhabits the Caucasus, Transcaucasia and eastern Asia Minor there is a subspecies. Imagines are active from mid-June to early July (in Stavropol they start flying even from early May). Inhabits the forest zone of foothills and stepped meadows of Daghestan.

Parasemia plantaginis (Linnaeus, 1758)

Parasemia plantaginis, DUBATOLOV, 2010: 91, map 45

Parasemia plantaginis caucasica Ménétriès, 1832

Material: Kurush, 1 ♂, 2 ♀♀, 19-VII-1886, 1 ♂, 20-VII-1886 (ZIN, GDNMR: Christoph); Ukjuz-tau, 1 ♂, 1 ♀, 8-VII-1940 (ZIN: M. Rjabov); Burshag, 1 ex., 1-VII-2003; Rutul, 1 ex., 15-VII-2004; Hnyukh, 1 ex., 1-VII-2004; Dzhinykh, 1 ex., 6-VII-2008; Gubden, 1 ex., 18-VI-2017.

A trans-Holarctic species of the Palaearctic origin (DUBATOLOV, 2004). In the Caucasus, Transcaucasus and northeast Turkey there is an endemic subspecies *P. plantaginis caucasica* Ménétriès, 1832 with bright red hindwings. In captivity it is easily to mate even with specimens of the Yakutian subspecies *P. plantaginis nycticans* (Ménétriès, 1859). These tiger-moths are found in mountain meadows up to 2,500 m above sea level, flying in June-August.

Eucharia festiva (Hufnagel, 1766)

Arctia hebe, BECKER, 1881: 206 (Achty)

Eucharia festiva, DUBATOLOV, 2010: 91, map 47

Material: Kaptchugai, 1 ♂, 1-V-1938, 1 ♂, 24-IV-1941 (ZIN: M. Rjabov); Ukjuz-tau, 1 ♂, 2-VI-1945 (ZIN: M. Rjabov); Leninaul, 1 ex., 22-V-1999, Karabudahkent, 200 ex., 12-IV-2001; Dubki, 1 ex., 5-6-VII-2001; Chirkey, 1 ex., 15-IV-2012; Makhachkala, 1 ♀, 28-VI-2016.

A west-central-Palaearctic species penetrating east to Transbaikalia and Southern China. On the northern slope of the Caucasus there is a boundary between the nominative subspecies and *E. festiva nivea* (O. Bang-Haas, 1927), whose females have the middle part of their front wings considerably darkened. *E. festiva festiva* is more common in the foothills and low mountains, but rises as far as the subglacial moraines at 2,500 m a.s.l. Imagines are active in the foothills from mid-April to early June, and higher in the mountains in July-August. In Daghestan these tiger-moths inhabit dry foothills, slopes with *Artemisia* sp. and thick herbage, are active in a daylight, flying or sitting on the ground among plants.

Chelis maculosa (Gerning, 1780)

Chelis maculosa, DUBATOLOV, 2010: 97, map 93

Chelis maculosa honesta (Tauscher, 1806) (= *mannerheimi* Duponchel, 1836)

Chelis maculosa mannerheimi, DUBATOLOV, 1988: 89 (Terekli-mekteb)

Material: Terekli-mekteb, 1 ex., 31-V-1928 (ZIN: M. Rjabov); Hnyukh, 1 ♂, 11-VII-2004 (ZIN: E. Ilyina); Kirov, 5 ♂♂, VIII-2006, 2 ♂♂, 10-VII-2007 (ZIN); Sarykum, 1 ♂, 8-IX-2017; Yuzhno-Sukhokumsk, 1 ex., 27-V-2008.

A west-central-Palaearctic species, distributed from the steppes of South and Central Europe to

the south of the West Siberian lowlands and North-West China (NW Xinjiang). It inhabits the North-Caucasus Plain, in the foothills of the Caucasus, in Daghestan also found in the low mountains. Imagines are active from late May to mid-July; rarely they can be observed also from August until mid-September. In Daghestan the species is found in steppes and semi-deserts on the plain and on steppefied meadows in the mountains.

Chelis reticulata (Christoph, 1887)
Chelis reticulata, DUBATOLOV, 2010: 97, map 94
Chelis reticulata transcaucasica Dubatolov, 1988
Chelis reticulata transcaucasica, DUBATOLOV, 1988: 92 (Akhty)
Chelis reticulata, DUBATOLOV, 1996: 58 (South Daghestan)

Material: Akhty, 2 ♂♂, 1-VIII-1933 (ZIN: M. Rjabov); Rutul, 1 ♂, 7-10-VII-2004 (ZIN: E. Ilyina); Hnyukh, 1 ♂, 11-VII-2004 (ZIN: E. Ilyina); Misi, 1 ♂, 13-14-VII-2006 (SZMN: E. Nikolaeva, D. Morgun).

In Daghestan, the Caucasus subspecies of the Anterior Asian *Ch. reticulata* Chr. is known. It is distinguished from *Ch. maculosa honesta* by the dark border triangular spots of the forewing broken by light veins. The apical process of valve in this subspecies is markedly shorter than in *Ch. maculosa honesta*, and often with a wider base. The species is found clearly higher in mountains than the previous one, at elevations of 1000-2100 m a.s.l. It flies from mid-June to early August; inhabit xerophytic mountain slopes.

Diacrisia sannio (Linnaeus, 1758)
Chelis reticulata, DUBATOLOV, 2010: 98, map 99
Diacrisia sannio caucasica Schaposchnikoff, 1904
Nemeophila russula, CHRISTOPH, 1877: 205 (Makhramkent); ROMANOFF, 1884: 86 (Makhramkent)

Material: Salty, 1 ♂, 28-VII-1893 (ZIN: Mlokosevich), 1 ♂, 24-VI-1889 (ZIN: GDNMR); Berikey (ZMKSU); Tarki-tau, 1 ♂, 29-V-1926 (ZIN: M. Rjabov); Derbent, 1 ♀, 1-IX-1931 (ZIN: M. Rjabov); Kaptchugai, 2 ♀♀, 7-18-VIII-1937 (ZIN: M. Rjabov); Ukjuz-tau, 1 ♂, 1 ♀, 6-VII-1940, 1 ♂, 7-VII-1940 (ZIN: M. Rjabov); Rutul, 1 ♂, 23-VII-1997, 3 ♂♂, 7-10-VII-2004 (ZIN: E. Ilyina); plateau Gunib, 1 ex., 18-VII-2002; Tpigh, 1 ♀, 8-VII-2003 (ZIN: E. Ilyina); Urtsaki, 1 ♂, 29-30-VI-2003 (ZIN: E. Ilyina); Mezhgyul, 1 ex., 17-VI-2003 (ZIN: E. Ilyina); Ingishi, 1 ex., 27-VI-2003 (ZIN: E. Ilyina); Tsirkhe, 12-VII-2003 (ZIN: E. Ilyina); Burshag, 2 ♂♂, 10-11-VII-2003 (ZIN: Magonedibaeva, Musaeva), 1 ex., 18-VII-2015; Chirag, 1 ♂, 15-VII-2006 (SZMN: E. Nikolaeva, D. Morgun); Salda, 1 ex., 25-VII-2014, 1 ex., 19-VII-2019; Itsari, 1 ex., 3-VII-2019; 1 ex., 29-VI-2017.

A temperate trans-Palaearctic species. It is represented in Daghestan by the Caucasus-transcaucus subspecies *D. sannio caucasica* Schaposchnikoff, 1904. In the Caucasus it is everywhere common in the mountains meadows rising above 2,000 m a.s.l. Imagines are active from late May to early September, developing possibly in two generations. In Daghestan the species is found in meadows of various types.

Rhyparioides metelkana (Lederer, 1861)
Rhyparioides metelkana, DUBATOLOV, 1996: 61 (Derbent), 2010: 36, 98, map 103

Material: Derbent, 1 ex., 27-VI-1928 (ZIN: M. Rjabov); Upper Kazanishche, 1 ex., 25-VI-1999; Akhsu, 1 ex., 7-VII-2001, 1 ex., 25-VII-2003; Gunib, 1 ex., 12-VII-2002; 1 ex., 25-VII-2003; Talginsky gorge, 1 ex., 29-VI-2017; Tsirkhe, 1 ex., 10-VII-2003 (1 ex.).

An amphi-Palaearctic species with strongly disjunctive range in Europe and Western Siberia. While in eastern Asia the species occurs continuously from middle part of the Amur River basin south to the Chinese provinces of Hunan and Zhejiang, as well as the islands of Ryukyu (Japan), in Europe all known habitats are strongly isolated: the Ardennes, the vicinities of Berlin (HAEGER, 1973), Eastern Poland (MALKIEWICZ, 2002), Western Belarus (Brest Region), Hungary, Romania, Ukraine: Rovno

(Dubno district), Kherson and Chernigov (Bobrovitsy district) Regions. In European Russia the species was recorded from Voronezh and Rostov Regions (Taganrog and Nedvigovka), Astrakhan Region (the Volga delta) (KÖNIG, 1985), as well as in Daghestan. In Siberia the only known population lives in the south-western part of the Novosibirsk region near Lake Krotovaya Lyaga 13 km west of Karasuk Town (DUBATOLOV, 1985); however, in 2018 one male specimen was surprisingly collected in Omsk city (KNYAZEV *et al*., 2019) and in June 2020 the species was found at lake Chany. The species is recorded for the first time for several locations in Daghestan. Although in East Asia *R. metelkana* Led. is a mesophilic meadow species, then in Europe and Western Siberia it is confined to hygrophytic meadows at water bodies. Imagines are active from late June to late July in high herbage of Daghestan mountains.

Rhyparia purpurata (Linnaeus, 1758)

Chelonia purpurea, BECKER, 1869: 193 (Derbent); DUBATOLOV, 2010: 98, map 105

Material: Salty, 1 ♀, 23-VII-1893 (ZIN); Berikey, 1 ♀, 8-VI-1905 (ZMKSU); Derbent, 1 ♀, 29-VII-1906 (ZMKSU: Xenzhopolsky); Tarki, larva V-1933, imago 1 ♀, VI-1933 (ZIN: M. Rjabov); Akhty, 2 ♂♂, 20-22-VII-1939 (ZMKSU); Levashi, 1 ♂, 28-VII-1940 (ZIN: M. Rjabov); Ukjuz-tau, 2 ♂♂, 6-7-VII-1940 (ZIN: M. Rjabov); Tindi, 1 ♂, 19-VII-1975 (SZMN: Nikolaev), 1 ♂, 1-31-VIII-2004 (ZIN: E. Ilyina); Gunib, 1 ex., 11-VII-1999; Rutul, 1 ex., 20-VI-2001; Karata, 1 ex., 1-VIII-2002; Ingishi, 1 ex., 27-VI-2003 (ZIN: E. Ilyina); Burshag, 1 ♂, 10-VII-2003 (Khaibulaev); Hnyukh, 4 ♂♂, 10-11-VII-2004 (ZIN: E. Ilyina); Ashia, 2 ♂♂, 20-30-VII-2004 (ZIN: E. Ilyina); Aknada, 1 ♂, 28-VII-2004 (ZIN: E. Ilyina); Sogratl, 1 ex., 19-VII-2004.

A trans-Palaearctic species. In the Caucasus it is widespread everywhere, but not very often. It prefers stepped meadows up to 2000-2500 m a.s.l. Imagines are fly from late May to early August.

Ocnogyna loewii (Zeller, 1846)

Ocnogyna loewii var. *armena*, ROMANOFF, 1884: 88-89 (les plaines de Schamkhor [plain at Shamkhalà])

Ocnogyna loewii, SCHETKIN, 1975: 134 (Beligy)

Ocnogyna armena daghestana, DUBATOLOV, 1996: 63, 71, 72-73: Fig. 1c, 75: Fig. 2i (Daghestan, Derbent)

Ocnogyna loewii armena, DUBATOLOV, 2010: 63, 105, map 147

Material: Derbent, 1 ♂, 16-X-1910 (ZMKSU: Xenzhopolsky), 1 ♂, 21-X-1931 (ZIN: M. Rjabov, coll. M. Rjabov); Beligy, ex larva 1 ♂, 13-XI-1926 (ZIN: M. Rjabov); Makhachkala, 1 ♂, 20-X-1943 (ZIN: M. Rjabov).

An east-mediterranean and south-western Asian species. *O. loewii daghestana* Dubatolov, 1996 was described as characterized by an expansion of the dark spotty pattern on the front wings. However, several males with a less expanded black forewing pattern have been found from Daghestan; so, this subspecies was synonymized with Transcaucasian subspecies *O. loewii armena* Stgr. (DUBATOLOV, 2010). These tiger-moths inhabit rocky foothills, flying late in autumn, in the second and third decades of October. The larvae live in spring in nests on grass or shrub vegetation.

Watsonarctia deserta (Esper, 1784)

Watsonarctia deserta, DUBATOLOV, 2010: 105, map 144

Material: Levashi, 1 ♂, 4-VII-1926 (ZIN: M. Rjabov); Tarki, 1 ♂, 29-V-1932 (ZIN: M. Rjabov); Ukjuz-tau, 2 ♂♂, 6-VII-1940 (ZIN: M. Rjabov); Arkas, 5 ♂♂, 19-VI-1941 (ZIN: M. Rjabov); Ingishi, 1 ♂, 27-VI-2003 (ZIN: E. Ilyina).

A west-central-Palaearctic species distributed to the west from the Baikal area and Central Mongolia. It is found almost throughout the Caucasus except for the west (Krasnodar Territory, Georgia). Imagines are active from late May to early July on steppefied meadows in the mountains of Daghestan.

Diaphora mendica (Clerck, 1759)
[*Spilosoma*] *mendica*, ROMANOFF, 1884: 89 (Derbent)
Diaphora mendica, DUBATOLOV, 2010: 102, map 125

Material: Derbent. 1 ♂ (ZIN: GDNMR); Tarki, 1 ♂, 29-V-1936, 5 ♂♂, 6-V-1938, 1 ♂, 12-V-1945 (ZIN: M. Rjabov); Primorsky, 1 ♂, 14-15-V-1992 (ZIN: Zagulaev); Khasaviurt, 4 ♂♂, 13-V-1992 (SZMN: Kovtunovitch); Rutul, 1 ex., 23-VII-1997, Araderikh, 2 ♂♂, 25-VI-2003 (ZIN: E. Ilyina); Ingishi, 1 ex., 27-VI-2003 (ZIN: E. Ilyina); Mezhgyul, 2 ♂♂, 17-19-VI-2003 (ZIN: E. Ilyina); Urtsaki, 1 ♂, 29-30-VI-2003 (ZIN: E. Ilyina); 1 ♂, 29-30-VI-2003 (ZIN: E. Ilyina); Hnyukh, 1 ♂, 11-VII-2004 (ZIN: E. Ilyina); Gertma, 2 ♂♂, 20-21-VI-2004 (ZIN: E. Ilyina); plateau Gunib, 6 ex., 18-VII-2015; Samur wildlife area, 1 ex., 22-V-2015, 1 ex., 10-V-2018; Agrakhansky wildlife area, 1 ex., 30-IV-2018.

A west-central-Palaearctic species. It is distributed to the west of the Baikal area. It is also found throughout the Caucasus, including Daghestan. All collected material refers to f. *rustica* (Hübner, 1790), whose males have a light white wing colour, although some males from the Caucasus, including Daghestan, have a light brown but still pale wing colour. Imagines are active from mid-April till early November, developing in several generations (probably three). In Daghestan it is found in a variety of biotopes, including west-lands (Agrakhan Bay).

Hyphantria cunea (Drury, 1773)
Hyphantria cunea, DUBATOLOV, 2010: 45, 101, map 124

Material: Primorsky, 1 ♂, 26-29-V-1992 (ZIN: Zagulaev); Khasaviurt, 1 ♂, 13-V-1992 (SZMN: Kovtunovitch); Makhachkala, 5 ♂♂, 4 ♀♀, 17-18-VII-2006 (SZMN: E. Ilyina, Nikolaev); Karaman-2, 1 ex., 29-IV-2015, 4 ex., 2-25-V-2016, 1 ex., 30-VIII-2017, 1 ex., 11-V-2018.

A North American species, which in 1949 penetrated the territory of Western Europe, then began to spread to the east and by now reached the Volga region, Kazakhstan and Central Asia. Independently, it settled also in eastern Asia (Japan, northeast China, southern Mongolia). The first reliable record of the Fall Webworm Moth from the territory of Daghestan date back to 1992. But by this time the species was met almost all over the flat-foothills territory of the Republic, as it was found both in Khasaviurt and in Samur wildlife area. In the North Caucasus, it was identified in 1978 in Stavropol, and in the 1980s the species already settled in Transcaucasia in Georgia and Azerbaijan (IZHEVSKY, 2002). Presumably it could penetrate Daghestan in these years. The Fall Webworm Moth is found in almost all districts of Daghestan. It develops apparently in two or three generations. Imagines are active in May, July and late August.

**Epatolmis caesarea* (Goeze, 1781)
Phalaena luctifera [Denis & Schiffermüler], 1775, *nomen nudum*

Material: Sarykum, 1 ex, 24-V-2014; Kufa 1 ex., 20-VII-2017; Agrakhan Peninsula, 1 ex., 7-VI-2014; Kumtorkale, 1 ex., 1-VII-2018; Samur ridge, 2 ex., 15-VII-2018.

A trans-Palaearctic meadow and steppe local species. It has been repeatedly collected in Rostov Region (Rostov-na-Donu, 1 ♂, 11-V-1924, M. Rjabov, ZIN), including in 1993-2018 (coll. of A. N. Poltavsky, Rostov-on-Don), but has never been reported from Caucasus. It is rare in Daghestan, inhabit the foothills plain, foothills and low hills. Imagines are active from early May till late July.

Spilosoma lubricipedum (Linnaeus, 1758)
[*Spilosoma*] *nenthastri*, ROMANOFF, 1884: 89 (Derbent)

Material: Primorsky, 1 ♂, 16-V-1992 (SZMN: Kovtunovitch); Chirag, 2 ♂♂, 9-VII-2003 (ZIN: Sukhorukova); Khapil, 1 ♂, 29-VII-2007, 1 ♂, 7-VIII-2007 (ZIN: Kurbanova); Karaman-2, 2 ex., 9-21-V-2014; Samur wildlife area, 1 ex., 25-V-2018, 2 ♂♂, 30-V-2019; 4 ♂♂, 1 ♀, 6-24-VII-2019.

A trans-Palaearctic mesophylic meadow species. In the Caucasus it is not uncommon, occurring from foothills to mountain meadows up to elevations of ca 2000 m a.s.l. It differs well from the following species by longer processes of males antennae (although some specimens from the West Caucasus have slightly shortened antenna processes): short front processes are at least twice as long as

the thickness of the shaft of the antennal segments. The wings are wider than those of the following species the hind wings are often with black dots that some specimens may miss. Imagines are active from May till the end of August, developing apparently in two generations.

Spilosoma urticae (Esper, 1789)

[*Spilosoma*] *urticae*, ROMANOFF, 1884: 89 (Derbent); DUBATOLOV, 2010: 102, map 130

Material: Derbent, 1 ♂, V-1878 (ZIN: GDNMR - Komaroff) - 1 ♀, no date (ZIN); Makhachkala, 1 ♂, 26-VII-1926 (ZIN: M. Rjabov), 1 ex., 20-V-2014; Akhty, 1 ♂, 21-VII-1939 (ZMKSU: Sheljuzhko); Agrakhan Bay, 4 ex., 18-VII-1987; Mezhgyul, 1 ♂, 17-VI-2003 (E. Ilyina); Vanashi-makhi, 2 ex., 5-VIII-2015; Samur wildlife area, 2 ex., 9-VII-2015; Tiulenij, 1 ex., 1-VI-2015; Tidib, 1 ♂, 26-VI-2008; Almalo, 1 ex., 19-V-2019.

A trans-Palaearctic xerophylic species. In the Caucasus it is found everywhere except for high mountains. It differs from the previous species by short processes of male antennae; with the front ones not longer than the antenna shaft. The number of black spots on the front wings varies greatly from total absence to numerous. There are no black dots on the hind wings, unlike in the previous species; very rarely traces of a discal black dot may appear. Imagines are active from mid-May till early August.

Phragmatobia fuliginosa (Linnaeus, 1758)

Spilosoma fuliginosa var. *fervida*, CHRISTOPH, 1877: 206 (Derbent, Akhty); ROMANOFF, 1884: 89 (Derbent, Akhty)

Phragmatobia fuliginosa, DUBATOLOV, 2010: 104, map 141

Material: Derbent, 1 ♂, 24-IV-1926, 1 ♂, 23-VI-1928, 1 ♂, 30-VIII-1931 (ZIN: M. Rjabov); Berikey, 2 ♂♂, 3 ♀♀, 10-14-VIII-1905 (ZMKSU: Maginenko); Kaptchugai, 1 ♂, 17-VIII-1937 (ZIN: M. Rjabov); Beligy, 2 ♂♂, 17-18-VII-1939 (ZMKSU: Sheljuzhko); Akhty, 7 ex., 19-20-VII-1939 (ZMKSU: Sheljuzhko); Tarki, larva on Fabaceae, 1 ♀, 14-VI-1940 (ZIN: M. Rjabov); Berikey, 1 ex., 3-VII-1999; Karabudahkent, 1 ♂, 24-VI-2000 (ZIN: E. Ilyina); Mezhgyul, 1 ex., 17-VI-2003 (E. Ilyina); Tsirkhe, 1 ♀, 10-VII-2003 (ZIN: M. Rjabov); Tindi, 1 ♂, 30-VII-2004, 1 ♂, 1-31-VIII-2004 (ZIN: E. Ilyina); Agvali, 3 ex., 10-VII-2005; Khapil, 1 ♂, 19-VII-2007, 2 ♂♂, 23-VIII-2007 (ZIN: Kurbanova); Gurbuki, 1 ex., 20-VI-2010; Tsudakhar, 1 ex., 16-VII-2014; Gazardkam-Kazmalyar, 1 ex., 19-VII-2014; Karaman-2, 1 ex., 1-V-2014; Samur wildlife area, 1 ex., 22-V-2015; Shura-Ozen, 2 ex., 5-VII-2017; Primorsky, 1 ♂, 4-VII-2018 (SZMN: Grebenshikov).

A trans-Holarctic species of Palaearctic origin (DUBATOLOV, 2004). It is common throughout the Caucasus except for the highlands. It is more common in foothills and in man-affected places. Imagines are active from late April to late August, developing in at least two generations.

Discussion

The results of collecting of Arctiinae of Daghestan for many years are presented in the statistical Table 1. More common species are: *Manulea pygmaeola, Diacrisia sannio, Phragmatobia fuliginosa, Epicallia villica, Cymbalophora rivularis, Lithosia quadra* - more than two dozen catching points for each. At the same time, *Hyphantria cunea* is more common on the lowland part of Daghestan than others, *Cybosia mesomella* in the foothills, *Callimorpha dominula* in the Front mountain ranges, *Epicallia villica* in the Central mountain area, *Lithosia quadra* in the highlands. Two species can additionally be found in Daghestan: *Manulea pseudocomplana* (DANIEL, 1939) is known in Russia from North-Western Caucasus and Low Volga territory (in Saratov Region) (DUBATOLOV, 2019), as well as from Azerbaijan (Nusnus, 2 ♂♂, 30-VII-2-VIII-1935, Rjabov leg., ZIN); *Somatrichia parasita* (Hübner, 1790) is known in Russia from Crimea and Low Volga territory; also from the West Caucasus (Abkhasia) and Azerbaijan (HAJIYEVA, 2013).

Most species of Arctiinae are scarce as representing in collections by single, less frequently 2-4 specimens for one night of catching. The exception is *Hyphantria cunea*, which is numerous during the period of mass flight of imago. In the plain part of Daghestan there was also locally mass flights of *Eucharia festiva*.

Table 1.– Arctiidae species distribution in altitude belts of Daghestan.

Species name	Locations number	Altitude belt				
		LOW	FOOT	FRON	CENT	HIGH
Katha depressa	2	1	1			
Wittia sororcula	9	2	4	1		2
Manulea complana	11	2	5	2		2
Manulea lurideola	5		1	1	1	2
Manulea lutarella	2			1	1	
Manulea palliatella	7	1	3		2	1
Manulea pygmaeola	12	3	5	2	1	1
Cybosia mesomella	1			1		
Eilema caniolum	3	1	1		1	
Atolmis rubricollis	3		1	1		1
Pelosia muscerda	3	1	2			
Pelosia obtusa	2		2			
Lithosia quadra	19	1	7	3	1	7
Setina aurata	15	1	2	1	3	8
Setina roscida	2					2
Thumatha senex	4	1	3			
Callimorpha dominula	11			5	1	5
Euplagia quadripunctaria	9	2	1	2	1	3
Cymbalophora rivularis	11	1	6	1		3
Tyria jacobaeae	5	2		1		2
Lacydes spectabilis	2		2			
Spiris striata	13	6	6			1
Utetheisa pulchella	3	2	1			
Arctia caja	9	1		2		6
Epicallia villica	20	5	4	5	5	1
Hyphoraia aulica	1			1		
Parasemia plantaginis	7		1	1		5
Eucharia festiva	7	3	2	2		
Chelis maculosa	5	3	1			1
Chelis reticulata	4					4
Diacrisia sannio	18	1	4	2	3	8
Rhyparioides metelkana	6		2	2	1	1
Rhyparia purpurata	17	1	2	1	5	8
Ocnogyna loewii	3	2	1			
Watsonarctia deserta	5		2	1	2	
Diaphora mendica	14	3	3	2	3	3
Hyphantria cunea	10	6	4			
Epatolmis caesarea	5	1	2	1		1
Spilosoma lubricipedum	5	3		1		1
Spilosoma urticae	10	4	3	1		2
Phragmatobia fuliginosa	18	7	4	2	1	4
Altogether species	41	28	25	15	14	28

Symbols: LOW - lowland, FOOT - foothill, FRON - front mountain ranges, CENT - central mountain area, HIGH - highland.

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Un género y tres nuevas especies para España, con otras interesantes informaciones lepidopterológicas para la fauna española. Descripción de la hembra de *Agnoea revillai* Gastón & Vives, 2020 y creación de un nuevo género *Paramegacraspedus* Gastón & Vives, gen. n. (Insecta: Lepidoptera)

J. Gastón & A. Vives Moreno

Resumen

Se describe un género nuevo *Paramegacraspedus* Gastón & Vives, gen. n. (Gelechiidae). Se citan, por primera vez para la fauna de España: *Bucculatrix ratisbonensis* (Stainton, 1861) (Bucculatricidae), *Coleophora sattleri* Baldizzone, 1995 (Coleophoridae) y *Anacampsis trifoliella* (Constant, 1890) (Gelechiidae). Se describe la hembra de *Agnoea revillai* Gastón & Vives, 2020 (Lypusidae). Se confirma la presencia de *Megacraspedus dolosellus* (Zeller, 1839) en España.
PALABRAS CLAVE: Insecta, Lepidoptera, nuevo género, nuevas citas, España.

A genus and three new species for Spain with other additional interesting lepidopterology information for the Spanish fauna. Description of the females of *Agnoea revillai* Gastón & Vives, 2020 and creation of a new genus *Paramegacraspedus* Gastón & Vives, gen. n. (Insecta: Lepidoptera)

Abstract

A new genus *Paramegacraspedus* Gastón & Vives, gen. n. (Gelechiidae) is described. For the first time for the fauna of Spain: *Bucculatrix ratisbonensis* (Stainton, 1861) (Bucculatricidae), *Coleophora sattleri* Baldizzone, 1995 (Coleophoridae) y *Anacampsis trifoliella* (Constant, 1890) (Gelechiidae) are mentioned. The female of *Agnoea revillai* Gastón & Vives, 2020 (Lypusidae) is described. The presence of *Megacraspedus dolosellus* (Zeller 1839) is confirmed for Spain.
KEY WORDS: Insecta, Lepidoptera, new genus, new mentions, Spain.

Introducción

Como continuación a los trabajos iniciados sobre la fauna de Lepidoptera de España (GASTÓN & VIVES MORENO, 2020a, 2020b; VIVES MORENO & GASTÓN, 2019, 2020), en el presente trabajo se proporcionan nuevos datos que amplían y enriquecen la biodiversidad de la fauna de España. Al igual que las otras ocasiones, el material estudiado procede de colecciones particulares y de los fondos del Museo Nacional de Ciencias Naturales de Madrid, España (MNCN) abarcando en

este caso varias familias como Bucculatricidae, Lypusidae, Depressariidae, Coleophoridae y Gelechiidae.

En nuestro anterior trabajo (VIVES MORENO & GASTÓN, 2020), en la descripción del Gelechiidae *Megacraspedus sinevi* Vives & Gastón 2020, ya manteníamos las dudas sobre la inclusión de la nueva especie en dicho género, ahora, proponemos separarla definitivamente del género *Megacraspedus* Zeller, 1839 y crear uno nuevo.

Material y métodos

El material utilizado para el estudio se ha obtenido mediante muestreos nocturnos y diurnos, con trampas de luz actínica distribuidas en los biotopos apropiados y disponiendo de las autorizaciones de las diferentes regiones afectadas. Para su identificación nos hemos basado en el examen comparativo de los caracteres morfológicos externos y, sobre todo, en el análisis de la estructura genital de los ejemplares. La preparación de los órganos genitales se ha efectuado siguiendo a ROBINSON (1976), con modificaciones. Se han utilizado los microscopios Leica DMLB, Leica MZAPO, NIKON Eclipse E400 y las cámaras digital Leica DFC550, NIKON D3100 y SONY α100 DSLR-A100K con objetivo AF 100 MACRO 1:2,8 (32), e igualmente para el retoque fotográfico, el programa de Adobe Photoshop ©.

Abreviaturas

AV	Antonio Vives
BR	Bent W. Rasmussen
comb. n.	combinación nueva
gen. n.	género nuevo
JG	Javier Gastón
LT	Locus typicus
MNCN	Museo Nacional de Ciencias Naturales, Madrid, España
prep. gen.	preparación de genitalia

Resultados

BUCCULATRICIDAE

Bucculatrix ratisbonensis Stainton, 1861 (fig. 1)
Bucculatrix ratisbonensis Stainton, 1861. *Weekly Intel.,* **9**: 168
LT: Ratisbon [Regensburg], ALEMANIA

Material estudiado: ESPAÑA, Teruel, Tramacastilla, a 1.265 m, 1 ♂, 19-VI-1993, J. Gastón leg., prep. gen. 8410JG (fig. 7).

Biología: Las larvas se alimentan de Asteraceae, concretamente de *Artemisa campestris* L. (STAINTON, 1861) y *Artemisia absinthium* L. (SEKSYAEVA, 1981).

Distribución: Según nuestros datos la especie se distribuye por el centro de Europa desde Francia e Italia, hasta la Rusia europea y Escandinavia, por lo tanto resulta **nueva para España**.

Detalles: Siguiendo a VIVES MORENO (2014), debería de colocarse detrás de *Bucculatrix artemisiella* Herrich-Schäffer, 1855.

LYPUSIDAE

Agnoea (Agnoea) revillai Gastón & Vives, 2020
Agnoea (Agnoea) revillai Gastón & Vives, 2020, *SHILAP Revta. lepid*., **48**(191): 545-564

LT: El Ribero, Burgos, ESPAÑA

Material estudiado: 1 ♀, ESPAÑA, Burgos, El Ribero, 750 m, 22-VI-2020, J. Gastón leg., prep. gen. 8454JG.

Descripción de la hembra (fig. 2): Envergadura, 12 mm (n=1). No difiere del macho, por lo que nos remitimos a su descripción (VIVES MORENO & GASTÓN, 2020a). La única diferencia en su morfología externa con el macho (aparte de su menor tamaño), es la ausencia de las de dos manchas oculares casi negras alineadas en la zona discal y postdiscal de sus alas delanteras.

Genitalia de la hembra (fig. 10): Papilas anales bien desarrolladas y moderadamente esclerotizadas. Apófisis posteriores largas, superando el margen anterior del octavo segmento. Apófisis anteriores cortas, aproximadamente 1/3 de la longitud de las posteriores. Ostium y antrum membranosos, este último con forma de embudo alargado. Ductus bursae cilíndrico, estrecho, membranoso y de moderada longitud. Bursa membranosa esférica con un signum romboidal cubierto de cortas y gruesas espinas tanto en sus caras como en los bordes, muy esclerotizado y ubicado en la parte superior de la bursa.

Biología: Desconocida.

Distribución: Sólo conocida de la localidad tipo en España.

DEPRESSARIIDAE

Rosetea rosetella (Corley, 2018) (fig. 3)

Cacochroa rosetella Corley, 2018. *SHILAP Revta. lepid*., **46**(181): 76, figs 1-3

LT: 2 Km. East of Ansião, Beira Litoral, PORTUGAL

Material estudiado: ESPAÑA, Burgos, Herrera, Ircío, 500 m, 1 ♀, 19-VIII-2018, J. Gastón leg. y coll., prep. gen. 8459JG (fig. 11); el cornutus del aedeagus del macho se encuentra alojado en el cuello superior de la bursa, (fig. 11b).

Biología: Se desconocen sus estados larvarios y las plantas que sustentan a las mismas.

Distribución: La especie tiene una distribución circummediterránea occidental (CORLEY & FERREIRA, 2019), que comprende Croacia, España, Francia, Grecia, Italia, Portugal y Argelia. Ya era conocida de Huelva, y ahora del norte de Burgos, por lo que sería la segunda cita para España, lo que nos hace pensar que pueda tener una amplia distribución por la Península Ibérica.

Detalles: Siguiendo a VIVES MORENO (2014), tanto el género como la especie, debería de colocarse detrás del género *Cacochroa* Heinemann, 1870.

COLEOPHORIDAE

Coleophora sattleri Baldizzone, 1995

Coleophora sattleri Baldizzone, 1995. *SHILAP Revta. lepid*., **23**(89): 43, figs 2-3, 6-8

LT: Pic du Midi de Bigorre, FRANCIA

Material estudiado: ESPAÑA, Madrid, Cercedilla, 1 ♂, 28-VII-1957, R. Agenjo leg., prep. gen. 57656BR (fig. 8).

Biología: La larva se alimenta de *Arenaria montana* L. (Caryophyllaceae) (BALDIZZONE & CORLEY, 2013).

Distribución: Según nuestros datos la especie se distribuye por Francia (BALDIZZONE, 1995), Portugal (BALDIZZONE & CORLEY, 2013), por lo tanto, resulta **nueva para España**.

GELECHIIDAE

Anacampsis trifoliella (Constant, 1890) (fig. 4)

Tachyptilia trifoliella Constant, 1890. *Bull. Soc. ent. Fr.,* (6) **10**: 7, pl. 1, fig. 4

LT: Alpes du Dauphiné, FRANCIA

Material estudiado: ESPAÑA, La Rioja, Castroviejo, a 950 m, 1 ♀, 16-VII-2017, J. Gastón leg., prep. gen. 8423JG (fig. 12).

Biología: Las larvas se alimentan de *Trifolium repens* L. (Leguminosae).

Distribución: Según nuestros datos la especie se distribuye por Francia y Suiza, por lo tanto, resulta **nueva para España**.

Detalles: CONSTANT *in* LABOULBÈNE (1889: CXXV), hace una primera descripción de la especie y posteriormente (CONSTANT, 1890: 7-8), realiza una segunda más detallada, fecha que se considera como válida. Siguiendo a VIVES MORENO (2014), debería de colocarse detrás *Anacampsis hirsutella* Constant, 1885.

Megacraspedus dolosellus (Zeller, 1839) (fig. 5)
Ypsolophus (Megacraspedus) dolosellus Zeller, 1839. *Isis,* **1839**: 190
LT: Viena, AUSTRIA

= *Ypsolophus separatellus* Fischer von Röslerstamm, 1843. *Abbild. Schmett*.: 300, 302, pl. 100, figs 1a-d
LT: Viena, AUSTRIA

= *Megacraspedus incertellus* Rebel, 1930. *Verhandl. zool.-bot. Ges. Wien*, **80**: (14)
LT: Alibotusch-Gebirge, BULGARIA

Material estudiado: ESPAÑA, Burgos, Herrera, Ircío, a 500 m, 1 ♂, 23-VII-1993, J. Gastón leg., prep. gen. 7669JG (fig. 9).

Biología: Las larvas se alimentan de diferentes especies de Poaceae como: *Cynodon dactylon* (L.) Pers., *Elymus repens* (L.) Gould, *Lolium perenne* L., *Poa annua* L. y *Triticum aestivum* L.

Distribución: Según nuestros datos la especie se distribuye por Europa llegando hasta el Asia Central. HUEMER & KARSHOLT (2018) consideran que está ausente de la Península Ibérica; con esta cita, confirmamos su presencia en España, si bien ya había sido citada de Cuenca y Teruel (SEEBOLD, 1898: 316) y Granada (CARADJA, 1920: 117).

Género *Paramegacraspedus* Gastón & Vives, gen. n.
Especie tipo: *Megacraspedus sinevi* Vives & Gastón, 2020

Diagnosis: Especie de pequeño tamaño. Cabeza bien desarrollada. Palpos labiales bien desarrollados, ligeramente curvado en tercer segmento hacia la parte superior. Antenas filiformes recubiertas de pequeñas cerdas. Tórax y tégulas recubiertas de escamas del mismo color que la cabeza. Abdomen recubierto de las mismas escamas que el tórax. Alas anteriores con el margen costal acusadamente convexo y el ápex sumamente apuntado. Margen externo angulado, tanto que se confunde con el margen interno. El color de fondo de las alas anteriores es uniforme o con leves máculas negras poco perceptibles. Las fimbrias están muy desarrolladas y son de color gris claro. Las alas posteriores son de color ocre-grisáceo uniforme y sus fimbrias del mismo color que las de las alas anteriores.

Genitalia del macho (fig. 13): Uncus cilíndrico, medianamente alargado, con el extremo redondeado. Gnathos muy esclerotizado, con forma de gancho. Tegumen potente, rectangular. Valvas alargadas y delgadas, casi rectangulares con un proceso costal situado en su base. Sacculus presente en forma de lóbulo. Saccus triangular y muy potente, con cresta esclerotizada central. Aedeagus (fig. 13a) corto, cilíndrico, con un coecum penis muy ensanchado, de forma globular y con una pequeña banda de espinas exteriores (fig. 13b) que separan la parte globular de la cilíndrica.

Genitalia de la hembra: Desconocida.

Detalles: Siguiendo a VIVES MORENO (2014), tanto el género como la especie, debería de colocarse detrás del género *Megacraspedus* Zeller, 1839.

Etimología: Se adopta en nombre de *Paramegacraspedus* Gastón & Vives, gen. n., por tratarse de un género situado "junto a" o "al margen de" *Megacraspedus* Zeller, 1839.

Paramegacraspedus sinevi (Vives & Gastón, 2020), **comb. n.** (fig. 6)
Megacraspedus sinevi Vives & Gastón, 2020. *SHILAP Revta. lepid.,* **48**(192): 721, figs 5, 11
LT: Castrobarto, Burgos, ESPAÑA

Material estudiado: ESPAÑA, Burgos, Castrobarto, 770 m, 1 ♂, 27-VI-2020, J. Gastón leg., prep. gen. 8245JG.

Hembra: Desconocida.

Biología: Desconocida.

Distribución: Sólo conocida de la localidad tipo.

Agradecimientos

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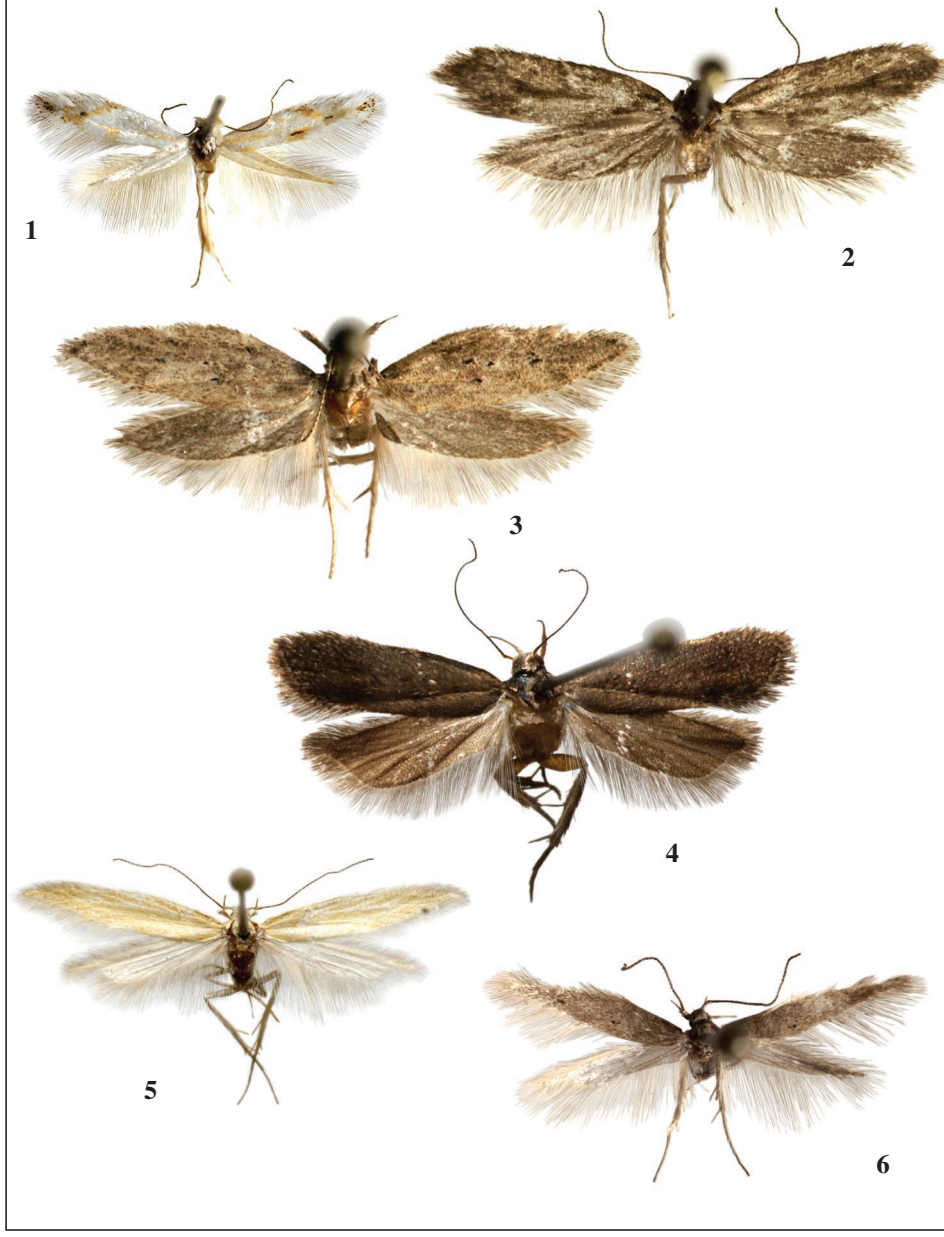
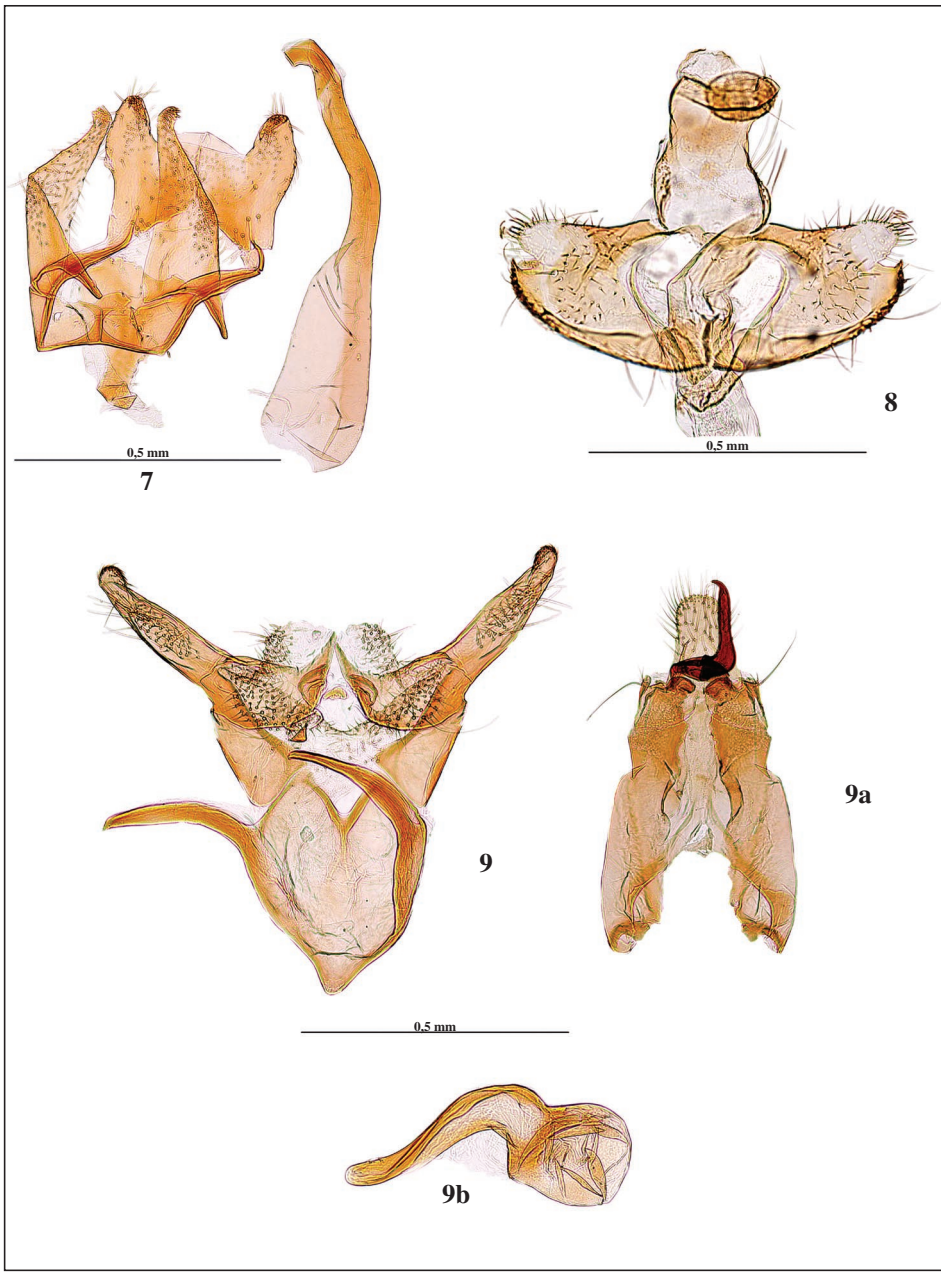
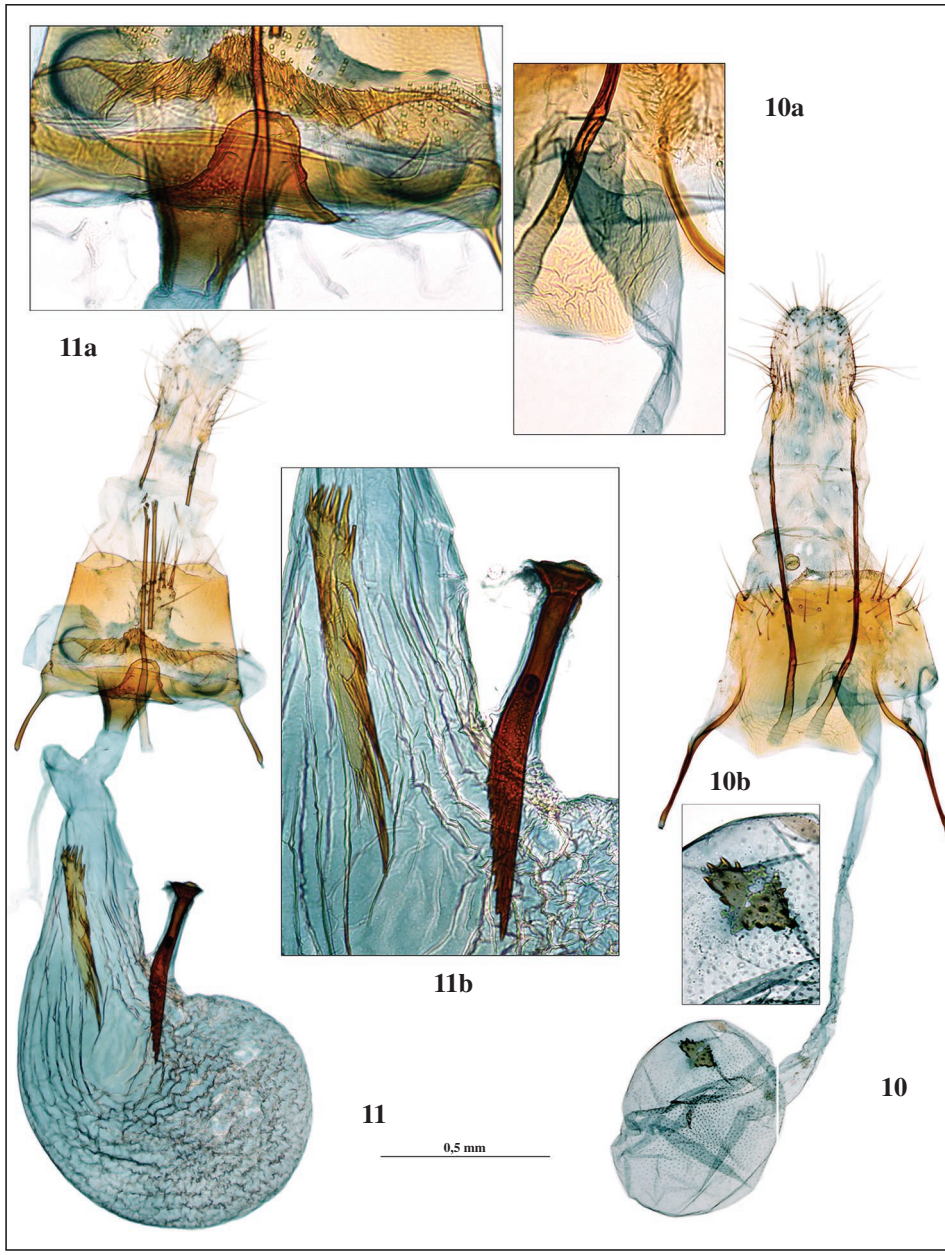


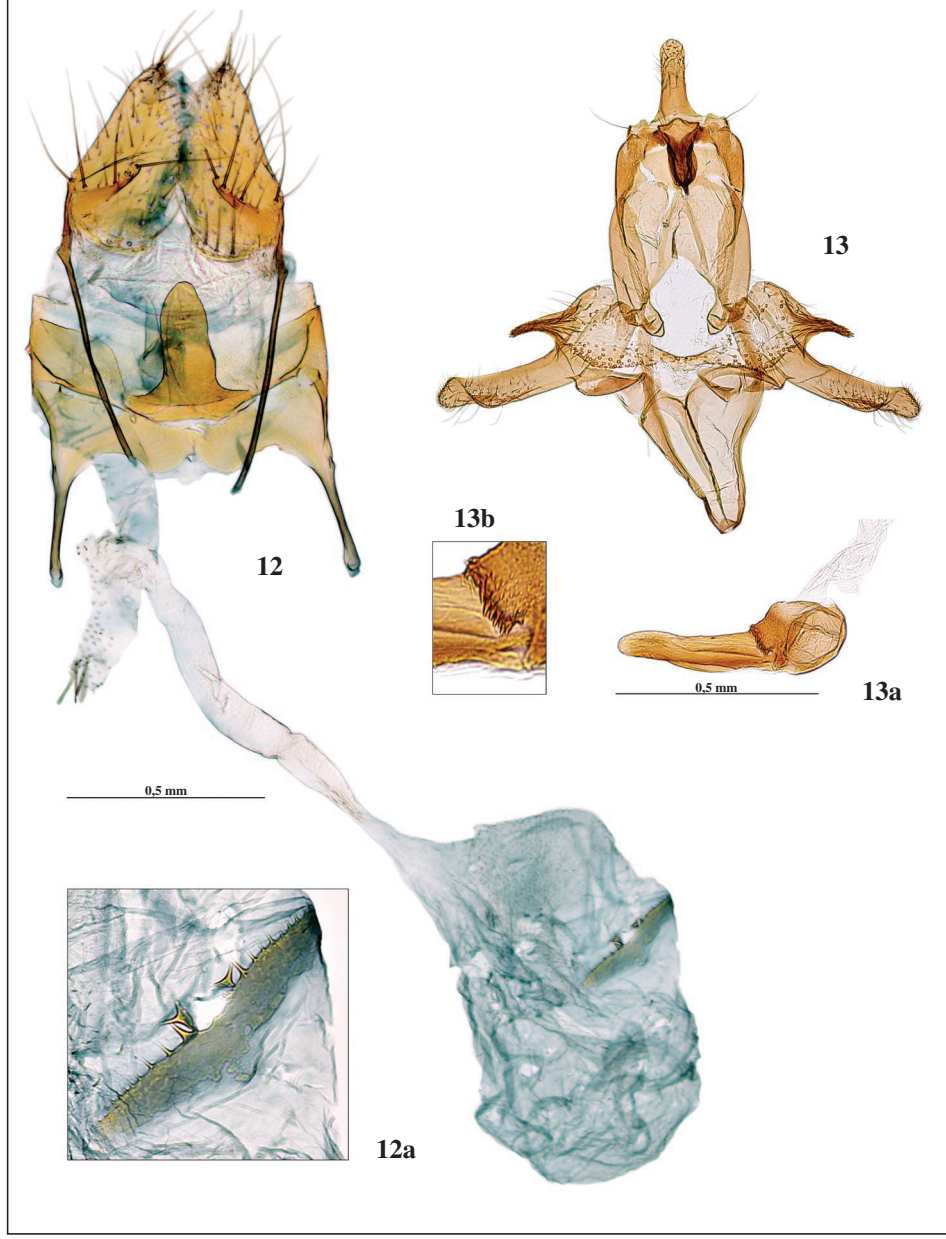
Figs 1-6.– Adultos: **1.** *Bucculatrix ratisbonensis* Stainton, 1861, ♂. **2.** *Agnoea (Agnoea) revillai* Gastón & Vives, 2020, ♀. **3.** *Rosetea rosetella* (Corley, 2018), ♀. **4.** *Anacampsis trifoliella* (Constant, 1890), ♀. **5.** *Megacraspedus dolosellus* (Zeller, 1839), ♂. **6.** *Paramegacraspedus sinevi* (Vives & Gastón, 2020), comb. n., ♂.



Figs 7-9.– Genitalia macho: **7.** *Bucculatrix ratisbonensis* Stainton, 1861, prep. gen. 8410JG. **8.** *Coleophora sattleri* Baldizzone, 1995, prep. gen. 57656BR. **9.** *Megacraspedus dolosellus* (Zeller, 1839), prep. gen. 7669JG. **9a.** Idem, Uncus, tegumen y gnathos. **9b.** Idem, aedeagus.



Figs 10-11.– Genitalia hembra: **10.** *Agnoea (Agnoea) revillai* Gastón & Vives, 2020, prep. gen. 8454JG. **10a.** Idem, detalle del ostium y antrum. **10b.** Idem, detalle del signum. **11.** *Rosetea rosetella* (Corley, 2018), prep. gen. 8459JG. **11a.** Idem, detalle del ostium y antrum. **11b.** Idem, detalle del signum (presencia de un cornutus del aedeagus en el interior de la bursa).



Figs 12-13.– Genitalia hembra: **12.** *Anacampsis trifoliella* (Constant, 1890), prep. gen. 8423JG. **12a.** Idem, detalle del signum. Genitalia macho: **13.** *Paramegacraspedus sinevi* (Vives & Gastón, 2020), comb. n., prep. gen. 8245JG. **13a.** Idem, aedeagus. **13b.** Idem, detalle del mismo.

NOTICIAS GENERALES / *GENERAL NEWS*

SHILAP REVISTA DE LEPIDOPTEROLOGÍA* EN LOS ÍNDICES DE IMPACTO INTERNACIONALES 2019 / SHILAP REVISTA DE LEPIDOPTEROLOGIA *IN THE INTERNATIONAL IMPACT INDEXES 2019*.–** Según SCOPUS (ELSEVIER) en su Índice SJR 2020 de *SCImago Journal Rank*, aparecemos con un **Indicador SJR de 0,401** FI, **Índice H: 10**, **Categoría: 78/145 (Q3, Ciencia de los Insectos)**. Según WEB OF SCIENCES (CLARIVATE ANALYTICS) en su Índice JCR 2019 de *Journal Citation Reports*, aparecemos con un **Índice de Impacto de 0,491** FI, **Categoría: 90/101 (Q4, Entomología)**, el **Índice de Inmediatez de 0,135**, el **Eigenfactor de 0,00033** y la **Categoría Eigenfactor: Ecología y Evolución. /** *According to SCOPUS (ELSEVIER) in their Index SJR 2019 of* SCImago Journal Rank*, we appear with a* ***SJR Indicator of 0,401 *FI,* ***H Index: 10***, ***Rank: 78/145 (Q3, Insect Science)****. According to WEB OF SCIENCE (CLARIVATE ANALYTICS) in their Index JCR 2019 of* Journal Citation Reports, *we appear with an* ***Impact Index of 0,491*** *FI,* ***Rank: 90/101 (Q4, Entomology)****, the* ***Inmediacy Index of 0,135****, the* ***Eigenfactor of 0,00033*** *and the* ***Eigenfactor Category: Ecology and Evolution*****.– DETALLES /** ***DETAILS*****:** SHILAP; Apartado de correos, 331; E-28010 Madrid; ESPAÑA / *SPAIN* (E-mail: avives1954@outlook.es).

CORRECCIÓN / ***CORRECTIONS*****.–** En J. Gastón & A. Vives Moreno, 2020, *SHILAP Revta. lepid.,* **48**(190): 307-324, se cita a *Oxypteryx parahelotella* (Nel, 1995) y *Caryocolum mazeli* Huemer & Nel, 2005, como nuevas para España, cuando ya se habían citado anteriormente por E. Requena & J. J. Pérez De-Gregorio, 2017, *Butll. Soc. Cat. Lep.,* **108**: 121-128.– **DETALLES /** ***DETAILS*****:** Javier Gastón; Amboto, 7-4º-Dcha.; E-48993 Getxo (Vizcaya); ESPAÑA / *SPAIN*. E-mail: fjgaston@yahoo.es.

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REVISIÓN DE PUBLICACIONES
BOOK REVIEWS

A. Steven Corbet & H. H. Pendlebury
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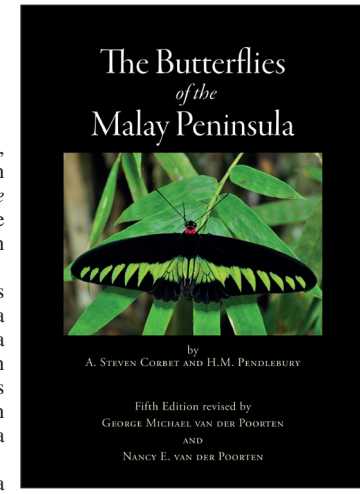
Formato 26 x 19'70 cm
Mainland Press Pte. Ltd., Singapore, 2020
ISBN: 978-983-44886-3-5



Nos encontramos ante la quinta edición de esta obra, ya clásica, sobre los Lepidoptera de Malasia, las anteriores ediciones fueron en 1934, 1956, 1978 y 1992 que bajo la supervisión de la *Malaysian Nature Society*, pretenden hacer una obra disponible al público en general de carácter científico, sobre la historia natural de esta interesante región con una biodiversidad en flora y fauna excepcional.

Esta obra comienza con una Introducción sobre los diferentes conceptos de morfología, anatomía, ciclos biológicos, sobre la nomenclatura y clasificación, sobre la distribución biogeográfica y la situación de la zona de estudio. Un interesante capítulo sobre el origen de las especies y la historia de los Lepidoptera, seguido de las más prestigiosos investigadores de su fauna comenzando por los clásicos en el siglo XVIII como Clerck, Cramer, Fabricius, etc. y finalizando en la época actual donde la investigación no se detiene.

A partir del capítulo once, ya entramos en la parte principal de la obra comenzando por los Papilionidae y terminando con los Hesperiidae, agrupándose en sus respectivas familias y tribus, con sus correspondientes y útiles claves dicotómicas.

De cada especie nos dan el nombre científico y común; sobre sus principales datos morfológicos y distribución, en el caso de encontrarnos con subespecies, son tratadas igualmente con la misma dedicación y profesionalidad, todas las especies y subespecies, se encuentran fotografiadas en 132 planchas a todo color.

Es importante destacar los diferentes apéndices de que dispone la obra; en el A. nos presenta la lista de todas las especie y subespecies, en el B. las especie eliminadas y sus razones, en el C. las especies cuestionadas, en el D. notas sobre los endemismos, en el E. notas taxonómicas y distribución, en el F. sobre el censo de las especies y subespecies presentes en Malasia, en el G. sobre las plantas nutricias, seguido de un índice y de la bibliografía más destacada. Es importante destacar que entre las páginas 468 y 492, están los dibujos de los andropigios de las especies consideradas y seguidas de seis planchas con fotos de los estados inmaduros.

No podemos terminar estas palabras sin felicitar a los autores por este excelente trabajo y a la Editorial por la calidad de la impresión, por lo que recomendamos esta obre vivamente, para todos aquellos interesados por los Lepidoptera de esta región zoogeográfica.

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Theresimima ampellophaga (Bayle-Barelle, 1808) rediscovered in the Republic of North Macedonia by using sex attractant traps (Lepidoptera: Zygaenidae)

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Abstract

Theresimima ampellophaga (Bayle-Barelle, 1808) was known from only three sites in North Macedonia and has never been considered as a pest of grapevine in this territory. The last time it was recorded in North Macedonia about 80 years ago. Traps baited with synthetic sex attractant EFETOV-2 (racemic mixture of (2*R*)-butyl 2-dodecenoate and (2*S*)-butyl 2-dodecenoate) were set at two localities near Ohrid Lake at Trebenishta village and between Ljubanishta village and Sveti Naum Monastery in 2016, in Vardar river valley near Demir Kapija in 2017 and near Dojran Lake in 2018. In North Macedonia sex attractants were used for the detection of this species for the first time. We recorded *Th. ampellophaga* in traps at all four monitored localities.
KEY WORDS: Lepidoptera, Zygaenidae, *Theresimima ampellophaga*, monitoring, EFETOV-2, sex attractant, North Macedonia.

Theresimima ampellophaga **(Bayle-Barelle, 1808) redescubierta en la República Macedonia del Norte usando trampas con atrayente sexual (Lepidoptera: Zygaenidae)**

Resumen

Theresimima ampellophaga (Bayle-Barelle, 1808) era conocida de solo tres sitios en Macedonia del Norte y nunca ha sido considerada como plaga de las viñas en este territorio. Últimamente fue registrada en Macedonia del Norte después de 80 años. Trampas cebo con atrayente sexual sintético EFETOV-2 (mezcla racémica de (2*R*)-butil 2-dodecenoato y (2*S*)-butil 2-dodecenoato) fue puesta en dos localidades cerca del Lago Ohrid en el pueblo de Trebenishta y entre pueblo de Ljubanishta y el Monasterio de Sveti Naum en 2016, en valle de río Vardar cerca de Demir Kapija en 2017 y cerca del Lago Dojran en 2018. En Macedonia del Norte los atrayentes sexuales fueron usados para la detección de esta especie por primera vez. *Th. ampellophaga* fue registrada en todas las trampas en las cuatro localidades monitoreadas.
PALABRAS CLAVE: Lepidoptera, Zygaenidae, *Theresimima ampellophaga*, monitoreo, EFETOV-2, atrayente sexual, Macedonia del Norte.

Introduction

Sex pheromones and sex attractants are fast becoming a key instrument in detection, monitoring and studying the seasonal activity of Lepidoptera, including Zygaenidae species (CAN *et al*., 2019; EFETOV *et al*., 2011, 2014a, 2015, 2016, 2018a, 2019; NAHIRNIĆ *et al*., 2015; RAZOV *et al*., 2017; SUBCHEV *et al*., 2012, 2013, 2016; TOSHOVA *et al*., 2017). Based on the recent classification, the

Zygaenidae family is represented by five subfamilies: Inouelinae Efetov & Tarmann, 2017, Procridinae Boisduval, 1828, Chalcosiinae Walker, 1865, Callizygaeninae Alberti, 1954, and Zygaeninae Latreille, 1809 (EFETOV & TARMANN, 2017). Zygaenidae include approximately 30 pest species from subfamilies Procridinae, Chalcosiinae and Zygaeninae (TARMANN, 2003), and one of the most known among them is *Theresimima ampellophaga* (Bayle-Barelle, 1808) (Procridinae). *Theresimima ampellophaga* is a Ponto-Mediterranean species. Its main host-plant is *Vitis vinifera* L. and occasionally *Parthenocissus* spp. (EFETOV, 1990; TARMANN, 1998). In some regions it is reported as a pest species in vineyards, however in the Balkans outbreaks were reported only sporadically (e.g. DIMIĆ *et al*., 1996; HARIZANOV *et al*., 1994; MACELJSKI, 2002).

Grape and wine production in North Macedonia contributes to around 17-20% of the agricultural Gross Domestic Product and wine production in North Macedonia has large export trade relevance (ANONYMOUS, 2007). Vineyards are covering 5% of a total agricultural area in the country (ANONYMOUS, 2018). Areas of vineyards are reducing, from being 38759 ha in 1981 (VOJNOSKI *et al*., 2009), ca. 29000 in 1997 (ANONYMOUS, 2008), 22665 ha in 2007 (ANONYMOUS, 2008) to 23703 ha in 2017 (ANONYMOUS, 2018). There are three vine-growing regions in North Macedonia: Povardarie region with 83% of production, Pelagonia - Polog region covering 13% of production and Pchinja - Osogovo region covering 4% of production (ANONYMOUS, 2007).

All data considering *Th. ampellophaga* in North Macedonia are faunistic while observations of damages in vineyards caused by this species are unknown to us. It was reported from only three localities in North Macedonia: Drenovo (ALBERTI, 1922), Mt. Galichica (DRENOWSKY, 1930) and Ohrid (THURNER, 1938-1941).

Monitoring with usage of sex attractants or sex pheromones provides information on the presence, abundance and seasonal activity of species and thus it enables us to make a decision whether species should be considered as a pest in a specific area and year. The main component of the sex pheromone of *Th. ampellophaga* was identified as (2*R*)-butyl (7*Z*)-tetradecenoate (SUBCHEV *et al*., 1998). The presence of this species was established by using synthetic sex pheromone in Albania (VRENOZI *et al*., 2019), Bulgaria (MUMUN *et al*., 2018; NAHIRNIĆ-BESHKOVA *et al*., 2021; SUBCHEV *et al*., 1998, 2008b; TOSHOVA & SUBCHEV, 2002; TOSHOVA *et al*., 2017), Croatia (RAZOV *et al*., 2017), France (DROUET & LAMBERT, 2010; RYMARCZYK & DROUET, 2006), Greece (SUBCHEV *et al*., 2006), Hungary (SUBCHEV *et al*., 2004; TOSHOVA & SUBCHEV, 2005; TOSHOVA *et al*., 2007; VOIGT *et al*., 2000), Italy (SUBCHEV *et al*., 2008b), Romania (SUBCHEV *et al*., 2008a), Russia (SUBCHEV *et al*., 2008b), Serbia (NAHIRNIĆ *et al*., 2015) and Turkey (CAN *et al*., 2010; CAN CENGIZ *et al*., 2012). *Theresimima ampellophaga* was attracted to the opposite enantiomer (2*S*)-butyl (7*Z*)-tetradecenoate in Turkey (EFETOV *et al*., 2010). Synthetic sex attractant EFETOV-2 (racemic mixture of (2*R*)-butyl 2-dodecenoate and (2*S*)-butyl 2-dodecenoate) was successfully used for attracting males of *Th. ampellophaga* in Albania (VRENOZI *et al*., 2019), Greece (TARMANN *et al*., 2019) and Russia (EFETOV *et al*., 2018b), while EFETOV-S-2 ((2*R*)-butyl 2-dodecenoate) attracted *Th. ampellophaga* in Russia (EFETOV *et al*., 2018b) and Turkey (CAN CENGIZ *et al*., 2018).

The aim of our investigation was to confirm the presence of *Th. ampellophaga* in already known areas in North Macedonia and to discover new ones as well as to determine its seasonal flight.

Material and methods

Sex attractant EFETOV-2 (racemic mixture of (2*R*)-butyl 2-dodecenoate and (2*S*)-butyl 2-dodecenoate) produced in the Crimean Federal University (EFETOV *et al*., 2014b) was applied onto rubber caps which were attached to hard paper and placed inside the traps. Delta traps of transparent PVC foil and sticky layers were used. Two traps were set in each of the vineyard with a distance of 10-20 m.

Only abandoned vineyards were selected at the following localities: Ohrid town, Trebenishta village, 41º12’44” N, 20º45’33” E, 715 m (Fig. 1).

The area is characterized by vineyards of various management, other agricultural fields, and abandoned fields. It is 5 km in the North from Ohrid Lake.

Ohrid Lake, between Ljubanishta village and Sveti Naum, 40º54'49" N, 20º45'21" E, 710 m (Fig. 2).

The area of ca. 300 ha surrounded by Ohrid Lake and Mt. Galichica foothill consists of one small village, scattered vineyards of various management, other agricultural fields, and many meadows.

Demir Kapija, Chiflik village E, Gorna Ergela, 41º23'18" N, 22º12'44" E, 168 m (Fig. 3).

Demir Kapija is situated in a well-known viticulture area of Tikvesh. It was difficult to find abandoned vineyard of size of at least 2 ha around Demir Kapija. Selected vineyard is almost 7 ha. The majority of the agricultural fields in the valley were moderately to well-managed vineyards with usage of pesticides. Valley is surrounded by hills covered mostly with pseudomaquis.

Dojran Lake, Nov Dojran 6 km NW, Atica, 41º14'38" N, 22º38'07" E, 178 m (Fig. 4).

Abandoned vineyard of 50 ha. Vines are growing upon horizontal network trellis. There are several vineyards of similar size and with various management as well as abandoned vineyards and vineyards of smaller sizes.

Results

Theresimima ampellophaga males were observed in traps at all four investigated sites: Trebenishta and between Ljubanishta village and Sveti Naum in 2016, in Demir Kapija in 2017 and near Nov Dojran in 2018. In the area of Ohrid Lake traps were checked once or twice just to record the presence of *Th. ampellophaga*. In Trebenishta traps were set on 9 June and removed on 8 August and checked only once on 9 July. Two and three moths were caught in both periods, respectively. On 9 July one specimen was found alive in the trap. In the vineyard between Ljubanishta village and Sveti Naum traps were set on 5 June and checked on 4 July when they were removed. Three moths were caught in the traps. In Demir Kapija traps were set in the field from 6 May to 25 August, and lures were replaced on 9 July. Altogether 45 moths were recorded in traps from 20 May until 9 July (Fig. 5). Near Nov Dojran traps were placed on 2 June and checked on 11 June, 8 July, 5 August and removed on 25 September. Only one male was found in a trap on 11 June.

Discussion

In North Macedonia sex attractants were used for the detection of this species for the first time. The last time *Th. ampellophaga* was recorded in North Macedonia about 80 years ago by THURNER (1938-1941). We confirmed the occurrence of this species in the area of Ohrid Lake – Mt. Galichica and reported it from two new localities (Fig. 6). Demir Kapija is a new locality in central part of North Macedonia ca. 27 km from Drenovo, the next nearest locality of *Th. ampellophaga*. Dojran Lake represents the first locality of *Th. ampellophaga* in south-eastern North Macedonia.

Theresimima ampellophaga was very rarely found at altitudes above 700 m. DRENOWSKY (1930) placed this species in a group of species that appear up to 1000 m. As Ohrid Lake surface is at 700 m this span appears to be 700-1000 m. We recorded exact altitudes in this area (710 and 715) which represent the highest altitudes on the Balkan Peninsula where *Th. ampellophaga* occurs. Besides localities at Ohrid Lake, the only locality where *Th. ampellophaga* occurs around 700 m on the Balkan Peninsula is Dragoman town area in Bulgaria at 700 m and 250 km inland (FREINA & WITT, 2001). It occurs at higher altitudes in France (DROUET & LAMBERT, 2010; RYMARCZYK & DROUET, 2006), Italy (BERTACCINI & FIUMI, 1999) and Turkey (CAN *et al*., 2010), but most of these localities are close to the sea. In Kahramanmaraş province in Turkey *Th. ampellophaga* was found at several localities at 784-916 m and ca. 100-130 km inland (CAN *et al.*, 2010; Can, personal communication). However, these localities are on smaller latitude and situated in a Amuq - Islahiye - Maraş depression which is opened to the sea. Another exceptional locality is Pond in Italian Alps (BERTACCINI & FIUMI, 1999) where *Th. ampellophaga* could have penetrated through Aosta river

valley. Pond is situated at 900 m and it is ca. 180 km inland. The distance of 105-110 km from the sea over the mountains, not connected to any valley opened to the sea, makes Ohrid area quite unique among the other *Th. ampellophaga* localities. The presence of *Th. ampellophaga* so high and so inland is driven by the limestone bedrock, western exposition and the vicinity of the big water body Ohrid Lake which mitigates the local climate.

In the area Ohrid-Galichica assumable flight period was in July, thought it is possible that specimens could have been caught in June as well, however one of the two specimens in traps was alive on 9 July in Trebenishta. Moreover, flight period could extend to August since our observation period was from 10 July to 8 August in Trebenishta. THURNER (1938-1941) found this species in Ohrid in June. In Demir Kapija flight period began between 20 May and 10 June and lasted until the period 3 July - 9 July. During the period of 10-17 June, no moths were caught in traps which can be explained by the very bad weather that time. ALBERTI (1922) reported *Th. ampellophaga* from the beginning of May in Drenovo. Although we do not have weekly data, we can conclude that flight period of *Th. ampellophaga* in the area Ohrid-Galichica started approximately one month later than in Demir Kapija probably because of the difference in elevation which is ca. 550 m higher. Only one male in Dojran Lake area was certainly not expected considering wide area of vineyards especially those abandoned, good connectivity between vineyards, vicinity of other vineyard areas such as Valandovo and Bogdanci and suitable climate.

Theresimima ampellophaga does not represent a threat for vineyards in North Macedonia. However, abandoned vineyards in vicinity of managed ones can constitute potential reservoirs of various diseases and pests. On the other side, they may provide a refuge for wildlife in highly intensified agricultural areas. Eventually, succession will take place and they will change toward primary potential vegetation.

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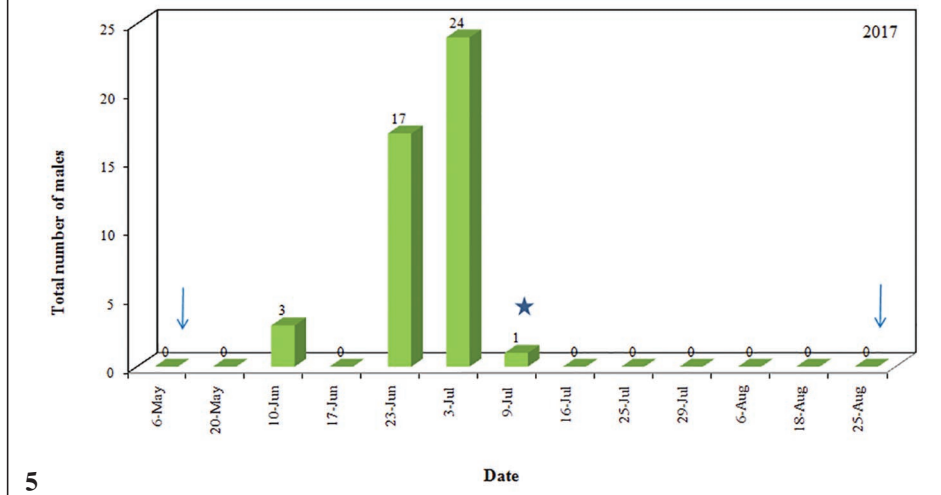
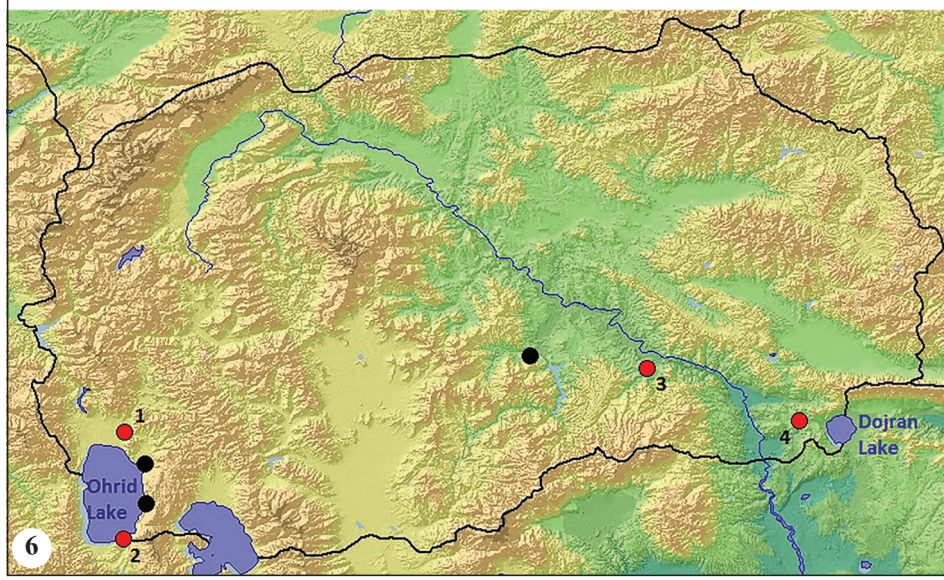
Figures 1-2.– Studied localities: 1. Ohrid town, Trebenishta village, 09-VI-2016; **2.** Ohrid Lake, between Ljubanishta village and Sveti Naum, 05-VI-2016. (Photos: A. Nahirnić).

Figures 3-4.– Studied localities: 3. Demir Kapija, Chiflik village E, Gorna Ergela, 18-VIII-2017; **4.** Dojran Lake, Nov Dojran 6 km NW, Atica, 08-VII-2018. (Photos: A. Nahirnić).





Figures 5-6.– 5. Seasonal flight of *Th. ampellophaga* males at Chiflik village (Demir Kapija) in 2017 recorded from two replicates of traps baited with synthetic sex attractant EFETOV-2 (racemic mixture of (2*R*)-butyl 2-dodecenoate and (2*S*)-butyl 2-dodecenoate). The arrows indicate the monitoring period while asterisk indicates date when lures were renewed. **6.** Localities of *Theresimima ampellophaga* in North Macedonia. Black dots - published records, red dots - new records. 1 - Trebenishta, 2 - between Ljubanishta and Sveti Naum, 3 - Demir Kapija, 4 - Nov Dojran.

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Descriptions of five new species of the family Lecithoceridae from Thailand (Lepidoptera: Gelechioidea)

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Abstract

Five new species of the family Lecithoceridae are described from Thailand: two new species of Torodorinae (*Lepidozonates verberis* Park, sp. n. and *Torodora hispiduana* Park, sp. n.) and three new species of Lecithocerinae (*Lecithocera indanonensis* Park, sp. n., *Lecithocera petalialis* Park, sp. n., and *Opacoptera kerastiodes* Park, sp. n.). In addition, *Eccedoxa lysimopa* (Meyrick, 1933) is reported for the first time from Thailand.
KEY WORDS: Lepidoptera, Gelechioidea, Lecithoceridae, taxonomy, new species, Thailand.

Descripción de cinco nuevas especies adicionales de la familia Lecithoceridae de Tailandia (Lepidoptera: Gelechioidea)

Resumen

Se describen de Tailandia cinco nuevas especies de la familia Lecithoceridae, incluyendo dos nuevas especies de Torodorinae (*Lepidozonates verberis* Park, sp. n. y *Torodora hispiduana* Park, sp. n.) y tres nuevas especies de Lecithocerinae (*Lecithocera indanonensis* Park, sp. n., *Lecithocera petalialis* Park, sp. n. y *Opacoptera kerastiodes* Park, sp. n.). Adicionalmente, se registra por primera vez para Tailandia a *Eccedoxa lysimopa* (Meyrick, 1933).
PALABRAS CLAVE: Lepidoptera, Gelechioidea, Lecithoceridae, taxonomía, nuevas especies, Tailandia.

Introduction

The family Lecithoceridae in Thailand has not been well explored, but it is assumed that the fauna is one of the richest areas in the world. Since PARK (2002) reviewed the genus *Torodora* Meyrick, 1894 of Thailand describing 15 new species, more than 30 species belonging to various genera of the family have been reported, including the review of the genus *Thubana* Walker, 1894 with descriptions of 12 new species (PARK, 2003) and descriptions of two new species of the genus *Lepidozonates* Park, 2013 (PARK *et al*., 2013).

Material and methods

This study is based on the loan material which was collected by Ole Karsholt and his colleagues in 1981 and 1984 in Thailand and preserved in the Zoological Museum, University of Copenhagen, Copenhagen (ZMUC), Denmark. For the new species and the newly reported species from Thailand, images of moths and their genitalia were photographed by the camera, Leica S8APO, with an extension of Leica 10450327 1.0 x mounted by the scientific CMOS (model: Dhyana 400DC). Preparation of the genitalia and the wing slide follows ROBINSON (1976). Wingspan of the species was measured from

the apex of the left wing to the apex of the right wing, and the color standard of adults follows KORNERUP & WANSCHER (1978). All type specimens will be deposited in ZMUC.

Taxonomic accounts

TORODORINAE

***Lepidozonates verberis* Park, sp. n.** (Figs. 1A-G)
http://zoobank.org/act:D72EEC14-4C07-43D7-9335-B63C08C023E8

Type. Holotype: ♂, THAILAND, Chiang Mai, Doi Inthanon Nat. Park, main road, 1900 m, 7-X-1981, Zool. Mus., Copenhagen, gen. slide no. CIS-5859, in ZMUC. Paratypes: 1 ♂, same data as the holotype, gen. slide no. CIS-8114; 1 ♀, same locality and date, gen. slide no. CIS-4802, wing slide no. CIS-5860.

Diagnosis: The new species is superficially very similar to *L. tenebrosellus* Park, 2013 which was described from Thailand and Cambodia (paratype), but it can be distinguished by the male genitalia with cucullus roundly expanded in lower corner and the aedeagus with long, arched cornutus, longer than aedeagus.

Description: Wingspan 18.0-19.0 mm. Head: Dark brown on dorsal surface, orange-white erect scales laterally; frons grayish. Antenna with rather short basal segment, orange white on dorsal and ventral surface; dark brown anteriorly and posteriorly; flagellum orange white throughout, without distinct annulations. Second segment of labial palpus (Fig. 1B) normally thickened; orange white on outer surface; 3rd segment slender as long as 2nd segment, dark brown ventrally. Thorax: Tegula and thorax dark brown. Forewing elongated; ground color uniformly yellowish dark brown, speckled with fuscous scales; discal stigmata invisible; small orange-white costal patch beyond 3/4 of costa; apex obtuse; termen slightly oblique; fringe dark brown, with narrow, orange-white basal line. Hind wing broader than forewing, with a bundle of long hair-like scales at base, grayish white; apex produced; termen sinuate; fringe concolorous, with narrow, yellowish-white basal line; venation with M_2 absent. Abdomen (Fig. 1F): Abdomen with dense spinose zones on dorsal surface; sternite VIII with shortly produced median lobe.

Male genitalia (Figs. 1C-E): Uncus slender, heavily sclerotized, as long as basal plate of gnathos. Gnathos short. Valva expanded anteriorly at base; costa deeply concave before middle; cucullus broadened, roundly expanded around lower corner; densely setose on surface. Juxta helmet-shaped, with round caudal margin and narrow median ridge; latero-caudal lobes absent. Aedeagus slender, curved, tapering toward apex, slightly longer than valva; cornutus single whip-shaped, longer than aedeagus.

Female genitalia (Fig. 1G): Apophyses anteriores longer than half of apophyses posteriores. Abdominal sternite VIII deeply emarginate at middle; signum broadened, about three times wider than length, emarginate on posterior margin medially, with dense strong conic spines.

Distribution: Thailand.

Etymology: The specific name is derived from the Latin, *verber* (= whip), referring to the whip-like cornutus in the male genitalia.

Remarks: The genus *Lepidozonates* Park, 2013 is an Oriental genus, with four known species from Thailand and China including Taiwan. The genus is characterized by having specialized plumose coremata scales along the pleural membrane of the abdominal segments (usually segments IV-VI) in the male. The forewing venation is similar to that of *Torodora* Meyrick, 1894 but the hind wing has M_2 absent.

***Torodora hispiduana* Park, sp. n.** (Figs. 2A-G)
http://zoobank.org/276E57B7-47C9-4FD1-A76C-CD816A35C245

Type. Holotype: ♂, THAILAND, Loei Prov., Phu Luang Wildlife Sanctuary, 700-900 m, 8-14-X-1984, Zool. Mus., Copenhagen, gen. slide no. CIS-8119, wing slide no. CIS-8118, in ZMUC.

Diagnosis: The new species is characterized by the labial palpus with a bristly haired 2nd segment dorsally and the unique forewing venation (Fig. 2C), the forewing with a whitish scale-tuft near middle of cell. The male genitalia are very similar to those of *Torodora flavescens* Gozmány, 1978 but the uncus is elongated with rounded apex and the cucullus is nearly quadrate, truncate on apical margin, whereas in the latter the uncus is broadened apically, concave on caudal margin and the cucullus has rounded outer margin.

Description: Wingspan 12.0 mm. Head: yellowish white dorsally, with erect scales of same color laterally above compound eyes. Antenna longer than forewing, with basal segment elongate, yellowish white, as long as diameter of compound eye; flagellum yellowish white in basal 3/4, without annulations, brownish gray in apical 1/4. Second segment of labial palpus (Fig. 2B) thickened, yellowish brown on outer surface, with hair-like bristly scales above; 3rd segment slender, shorter than 2nd, yellowish white on outer surface. Thorax: Thorax and tegula yellowish white. Hind tibia yellowish white in basal 2/5, yellowish brown beyond on outer surface, with some pale-orange scales on ventral surface apically. Forewing elongate; covered with yellowish brown scales, with short scale-tuft at middle of cell (Fig. 2D, arrow); apex slightly produced; termen concave beyond apex; sinuate; fringe concolorous with ground color, with narrow yellowish-white basal line; venation (Fig. 2C) with R_1 arising from before middle of cell; R_2, R_3, R_4, and R_5 on a common stalk: R_2 stalked with R_{3+4} for basal 1/3; R_3 stalked with R_{4+5} for about basal 3/5; R_4 and R_5 stalked for about basal 4/5; R_5 to termen; M_1 nearly approximate to R_{2+3} at base; M_2 and M_3 short-stalked; CuA_1 and CuA_2 coincident, arising from beyond cell; cell short, closed. Hindwing pale brownish gray, apex produced; venation with M_2 present; M_3 and CuA_1 short-stalked for basal 1/4. Abdomen: Abdomen (Fig. 2G) with broad spinose zones; sternite VIII with triangular protrusion latero-caudally.

Male genitalia (Figs. 2E, F): Uncus elongated, slightly broadened distally, rounded apically. Gnathos strongly bent from 3/5 downward. Tegumen deeply concave on anterior margin. Valva with broad basal part in 1/3 length; costa deeply concave medially; cucullus quadrate with truncate apical margin, dense setose; sacculus broad, terminated before emargination on ventral margin medially. Vinculum narrowly banded. Juxta broad with short, triangular latero-caudal lobes and small median lobe. Aedeagus stout, shorter than valva; dorsal margin nearly straight; ventral margin strongly bent at 1/3; cornuti consisting of a narrow, short bar distally, as long as 1/5 of aedeagus, and a sclerotized plate about 1/3 length of aedeagus basally.

Distribution: Thailand.

Etymology: The specific name is derived from the Latin, *hispidus* (= hairy, bristly), referring to the 2nd segment of labial palpus.

Remarks: The genus *Torodora* Meyrick, 1894 is one of the most diverse genera in the family Lecithoceridae, with about 200 species. The new species has a unique forewing venation with R_2, R_3, R_4 and R_5 on a common stalk, M_2 and M_3 shortly stalked, CuA_2 absent (Fig. 2C) and the labial palpus has rough scales dorsally. Due to these superficial characters, it can be considered to be a new generic assignment as a related genus to *Torodora*, but the male genitalia of this new species are well accordant with those of the genus. Therefore, this species is tentatively placed in *Torodora* here in this paper, until additional species are found, or fresh material is obtained for analysis of the DNA sequence.

Eccedoxa lysimopa (Meyrick, 1933) (Figs. 3A-F)

Cophomantis lysimopa Meyrick, 1933. *Exot. Microl*., **5**: 357. TL: Bombay, India

Eccedoxa lysimopa; Gozmány, 1973. *Ergebn. ForschungUnternehmens Nepal Himalaya,* **4**(3): 441; 1978. *Microl. Palaearctica*, **5**: 247

Diagnosis: This species is characterized by the antenna shorter than the forewing, the forewing without any distinct markings and somewhat rounded apex; venation with R_5 absent; M_1 remote from and M_{2+3} at base; M_2 entirely merged to M_3; CuA_1 and CuA_2 shortly stalked. The hind wing has M_2

absent. The male genitalia can be distinguished by having a long gnathos; valva elongated, rounded apically; and juxta with triangularly produced latero-caudally. Abdomen (Fig. 3F) with broad spinose zones. Wingspan 16.5 mm.

Male genitalia (Figs. 3C-E): Uncus elongated. Gnathos long, bent pre-apically. Valva broad at base, slightly narrowed to 3/4, dilated distally with rounded apex; juxta cup-shaped, concave on the caudal margin, triangularly produced latero-caudally. Aedeagus stout as long as valva, dorsal surface produced apically; cornuti consisting of two half-moon-shaped plates and a bundle of spines.

Female unknown.

Material examined: 1 ♂, Thailand, Chiang Mai, Doi Indanon Nat. Park, main road, 1,900 m, 7-X-1981, Zool. Museum Copenhagen leg., gen. slide no. CIS-8115.

Distribution: India, Nepal, Thailand (new record).

Remarks: The genus *Eccedoxa* Gozmány, 1973 is one of the less diverse genera, comprising six known species which are mostly distributed in India, Sri Lanka and China (one species is known from Australia). The genus is defined by the forewing venation with M_2 entirely merged to M_3, CuA_1 and CuA_2 stalked and the hind wing with M_2 absent. The holotype is deposited in the Natural History Museum, London, UK.

LECITHOCERINAE

Lecithocera indanonensis **Park, sp. n.** (Figs. 4A-D)

http://zoobank.org:act:E8FCBFBA-5ADB-4844-AB13-D8976D6FAESF

Type. Holotype: ♂, Thailand, Chiang Mai, Doi Indanon Nat. Park, 2200-2500 m, 22-23-X-1984, Karsholt, Lomholdt & Nielsen, leg., Zool. Mus., Copenhagen, gen. slide no. CIS-8120, in ZMUC.

Diagnosis: The male genitalia of the new species are similar to those of *L. raphidica* Gozmány, 1978 with conic spines along the ventral margin of the cucullus and with strong median process of the juxta, but can be distinguished by the tegumen deeply emarginated on anterior margin, the juxta with a heavily sclerotized, long, strong caudal process medially, and the aedeagus stouter, with variously shaped cornuti.

Description: Wingspan 18.0 mm. Head: Yellowish brown dorsally. Antenna as long as forewing, basal segment elongated, slightly dilated distally, creamy white on dorsal surface, brownish anteriorly and posteriorly, flagellum creamy white, without annulations. Labial palpus (Fig. 4B) thickened, pale yellowish brown on outer surface, 3rd segment as long as 2nd segment, creamy white dorsally, dark brown ventrally. Thorax: Tegula and thorax yellowish brown. Forewing elongated, slightly dilated distally; ground color pale yellowish-brown; discal spot at middle smaller than spot at end of cell apex obtuse; termen oblique; fringe concolorous with ground color, with yellowish-white basal line; venation with R_3 stalked with R_{4+5} for basal 1/3; R_4 and R_5 stalked for basal 2/3; R_5 to termen; M_1 remote from R_{3+4} at base; M_2 and M_3 nearly parallel; M_3 free, CuA_1 and CuA_2 short-stalked. Hind wing pale grayish, with a bundle of long hair-pencils at base; venation with M_2 present, close to M_3 at base; M_3 and CuA_1 stalked for basal 1/3. Abdomen: Spinose zones absent.

Male genitalia (Figs. 4C, D): Gnathos relatively short, gently bent beyond middle. Tegumen deeply and narrowly emarginated on anterior margin. Valva broad in basal 1/3 with large semi-ovate concavity ventrally; cucullus with conic spines along the ventral margin; the juxta having a large, heavily sclerotized median process. Aedeagus longer than valva.

Distribution: Thailand (Chiang Mai).

Etymology: The specific name is derived from the type locality, Doi Indanon.

Remarks: Although the male genitalia resemble *Homaloxestis* Meyrick, 1910 by having short, conic spines along the ventral margin of the cucullus and by the juxta with a strong median process, which are main diagnostic characteristics of the genus, the presence of the discal stigmata and the

veins CuA_1 and CuA_2 stalked on the forewing make this new species clear to place in the genus *Lecithocera* Herrich-Schäffer, 1853.

***Lecithocera petalialis* Park, sp. n.** (Figs. 4E, F)
http://zoobank.org/F19-4A77-B300-98894AEFD301

Type. Holotype: ♀, THAILAND, Chiang Mai, Doi Indanon Nat. Park, 1,200-1,300 m, 21-24-X-1984, Karsholt, Lomholdt & Nielsen, leg., Zool. Mus., Copenhagen, gen. slide no. CIS-8121, in ZMUC.

Diagnosis: The new species is superficially similar to *L. pelomorpha* Meyrick, 1931. The female genitalia can be distinguished from any known species of the genus by having a long, heavily sclerotized, specifically formed plate in the ductus bursae.

Description: Wingspan, 17.0 mm. Head: Light yellow dorsally. Antenna broken distally; basal segment elongated, dilated distally, light yellow dorsally, brownish ventrally; flagellum light yellow to light orange, without annulations. Second segment of labial palpus thickened, sickle-shaped, light yellow to orange on outer surface, paler on inner surface; 3rd segment slender, pale yellowish brown, as long as 2nd segment. Thorax: Tegula and thorax light yellow dorsally. Hind tibia with light yellow rough scales dorsally. Forewing ground color light yellow to orange, rarely scattered with brownish scales; discal spot at middle small, dark brown and spot at end of cell suffused below; costa straight medially, oblique beyond termination of R_3; apex obtuse; termen slightly sinuate; fringe shiny, pale yellow; venation with R_1 arising from before middle of cell; distance between origin of R_1 and R_2 about 1.5x than that of R_2 and R_3; R_3 and R_4 stalked for basal 1/4; R_4 and R_5 stalked for basal 2/3; M_1 nearly parallel to M_2; CuA_1 and CuA_2 short-stalked. Hind wing pale grayish white, with a bundle of long hair-pencils at base; venation with M_3 and CuA_1 short-stalked. Abdomen: Spinose zones absent.

Female genitalia (Fig. 4F): Abdominal segment VIII weakly sclerotized. Apophyses anteriores slightly longer than 1/2 length of apophyses posteriores. Subgenital plate trapezoidal, weakly sclerotized. Colliculum well-developed. Ductus burase longer than corpus bursae with two long, heavily sclerotized plates in distal 3/5. Corpus bursae ovate; signum ameba-like, transversally elongated, bearing dense conic spines.

Male unknown.

Distribution: Thailand.

Etymology: The specific name is derived from the Latin, *petalum* (= metal plate), referring to the sclerotized plate in ductus bursae of the female genitalia.

***Opacoptera kerastiodes* Park, sp. n.** (Figs. 5A-F)
http://zoobank.org/6519C029-B37D-411F-9D54-9B9574F25608

Type: Holotype: ♂, THAILAND, Chiang Mai, Doi Chiang Dao, 1,130 m, 18-X-1984, Karsholt, Lomholdt & Nielsen, leg., Zool. Mus., Copenhagen, gen. slide no. CIS-8116, in ZMUC.

Diagnosis: This new species is superficially similar to *Opacoptera ecblasta* Wu, 1996 described from China (Sichuan), but it is smaller (13.0 mm in *O. ecblasta*). The male genitalia are also similar, but can be distinguished by the following: sacculus with a spine-like apical process (a digitate process in *O. ecblasta*); latero-caudal process of the juxta more or less horn-shaped, longer than juxta, sharply pointed apically, directed dorsad, without median spine (in *O. ecblasta* shorter with median spine); cornuti of the aedeagus more than 10 with similar length of strong spines (in *O. ecblasta,* differently sized spines).

Description: Wingspan 11.0 mm. Head: Shiny, yellowish brown dorsally. Antenna slightly longer than forewing; basal segment elongated broadened distally, orange white; flagellum orange white in basal 3/5, then shiny yellowish white beyond, without annulations. Second segment of labial palpus (Fig. 5B) thickened, slightly arched, orange white on dorsal surface; 3rd segment slender, as

long as 2nd segment, dark brown ventrally. Thorax: Thorax and tegula yellowish brown. Hind tibia with yellowish-white rough scales dorsally in basal 2/3, orange-gray scales in distal 1/3. Forewing yellowish brown, scattered with dark-brown scales evenly; costa nearly straight; apex obtuse; termen oblique; fringe concolorous with ground color; venation (Fig. 5C) with R_3 free; R_3 and R_4 stalked beyond middle; R_5 to termen; M_1 remote from R_{4+5}; M_2 nearly parallel to M_1; M_3 closer to M_2 than CuA_{1+2} at base; CuA_1 and CuA_2 very short-stalked (CuA_1 and CuA_2 free in the type species); CuA_2 strongly bent basally. Hind wing gray; apex acute; venation with Rs and M_1 long-stalked, M_2 present; M_3 and CuA_1 coincident; CuP presented in distal 1/4. Abdomen (Fig. 5F): rare spines on spinose zones.

Male genitalia (Figs. 5D, E): Uncus short, triangular. Gnathos with rather short, median process. Tegumen with long, bar-shaped basal processes, directed inwardly. Valva with nearly straight costal band; basal part broad basally, triangular; cucullus more or less clavate with round apex, directed inwardly; saculus broadly elongated, exceeding to lower corner of cucullus, with apical spine. Juxta shield-shaped, medially produced on anterior margin; latero-caudal processes long, horn-shaped, sharply pointed apically. Vinculum banded with round apex. Aedeagus very stout, as long as valva; cornuti consisting of more than 10 strong spines of similar length.

Female unknown.

Distribution: Thailand (Chiang Mai).

Remarks: The genus *Opacoptera* Gozmány, 1978 is restricted to China, with two known species: *O. callirrhabda* (Meyrick, 1936) and *O. ecblasta* Wu, 1996 so far. The genus is defined by the forewing venation with all veins free except R_4 and R_5 stalked, (the new species with CuA_1 and CuA_2 short-stalked: considered to be an infraspecific variation); the male genitalia with usually narrowly elongated valva, rounded in apical part.

Etymology: The specific name is derived from the Greek, - *κεράς* (= horn), referring to the horn-like processes of the juxta in the male genitalia.

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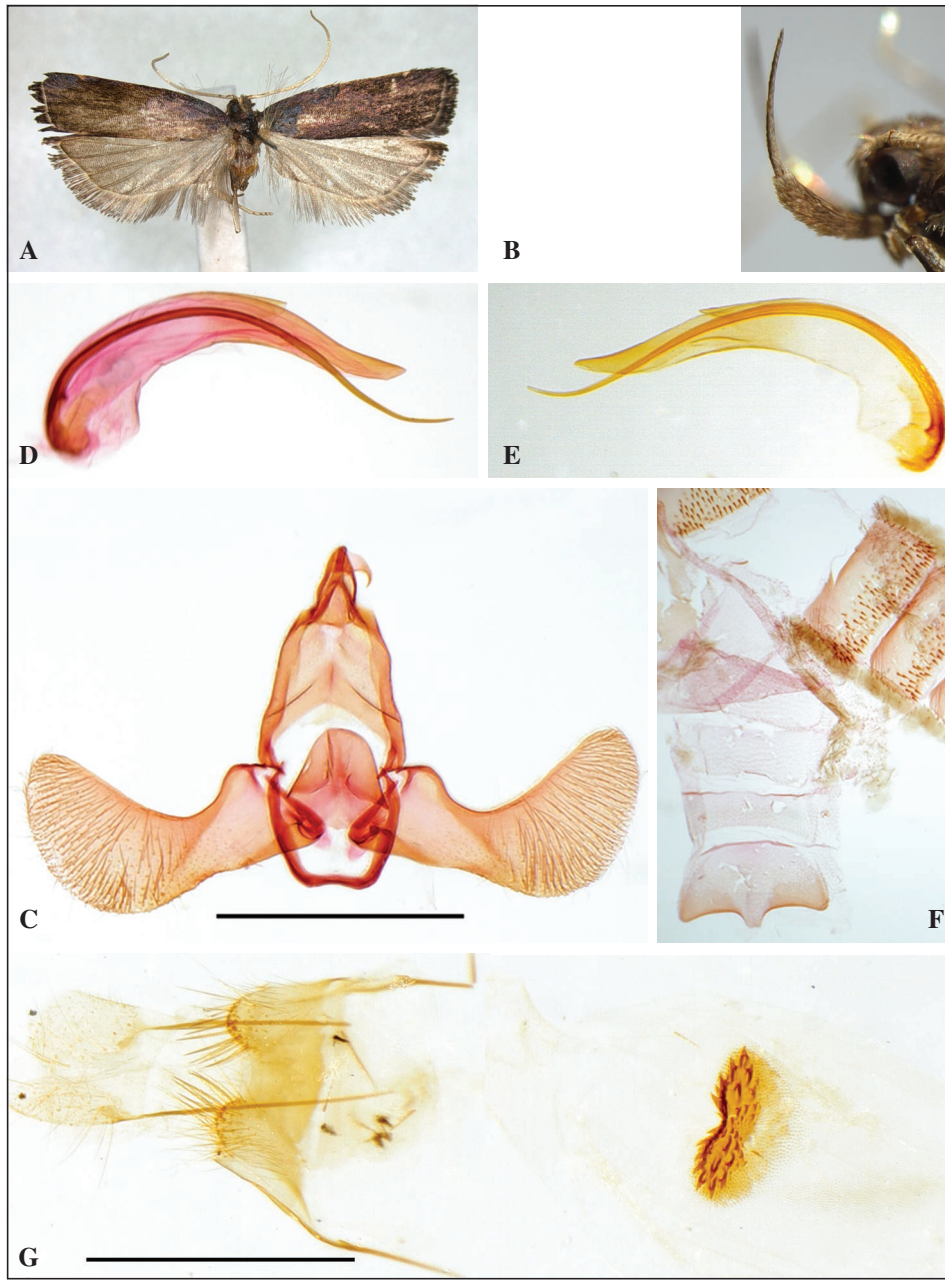

Figure 1.– *Lepidozonates verberis* Park, sp. n.: **A.** holotype; **B.** ditto, labial palpus; **C.** male genitalia, holotype, gen. slide no. CIS-5859; **D.** ditto, aedeagus; **E.** aedeagus of a paratype; **F.** abdomen; **G.** female genitalia, gen. slide no. CIS-4802. Scale bar for the genitalia and aedeagus: 1 mm.

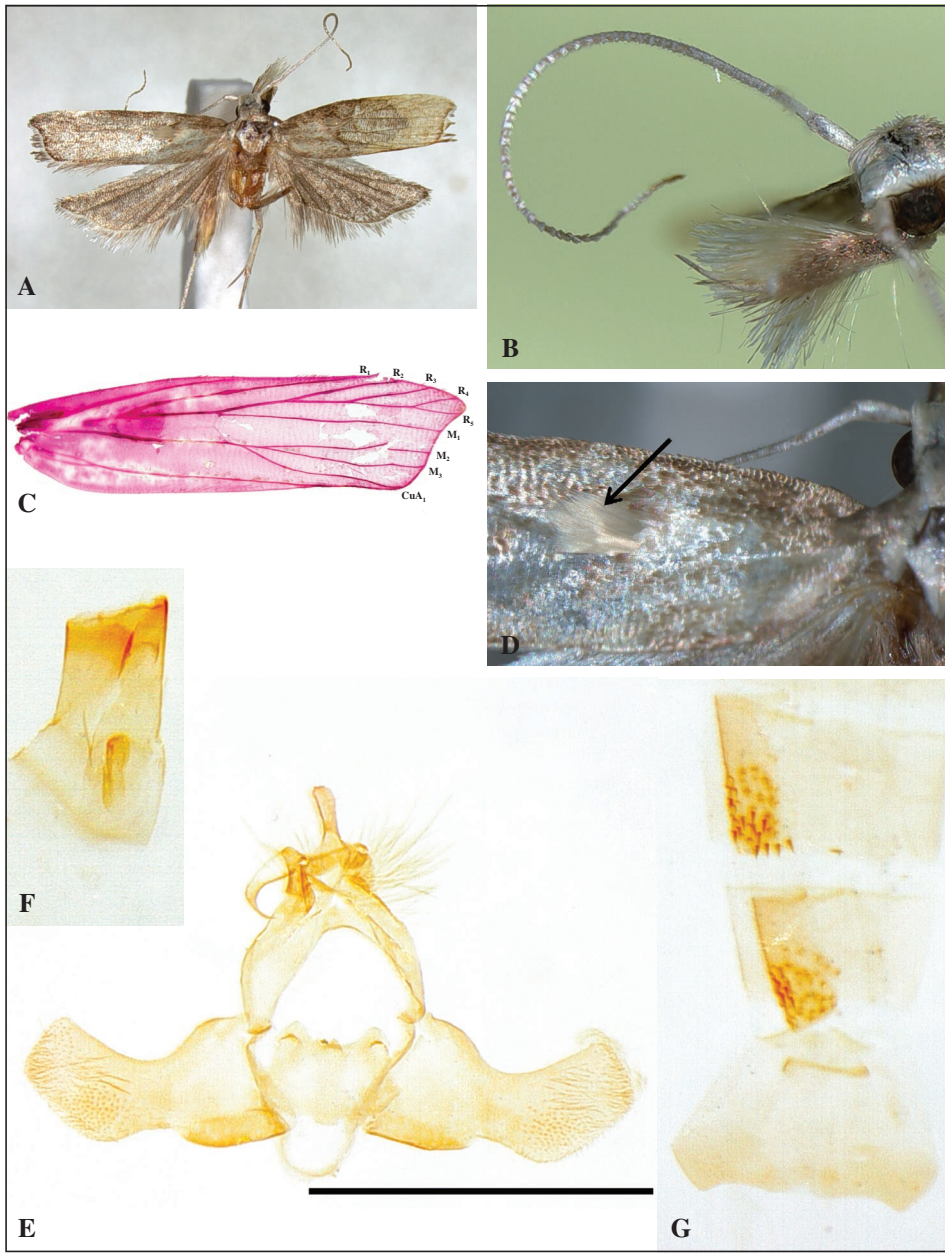

Figure 2.– *Torodora hispiduana* Park, sp. n.: **A.** holotype; **B.** ditto, antenna and labial palpus; **C.** venation of the forewing, wing slide no. CIS-8118; **D.** left forewing with scale tuft; **E.** male genitalia, holotype, gen. slide no. CIS-8119; **F.** ditto, aedeagus; **G.** abdominal segments VI-VIII with spinous zones. Scale bar for the genitalia and aedeagus: 1 mm.

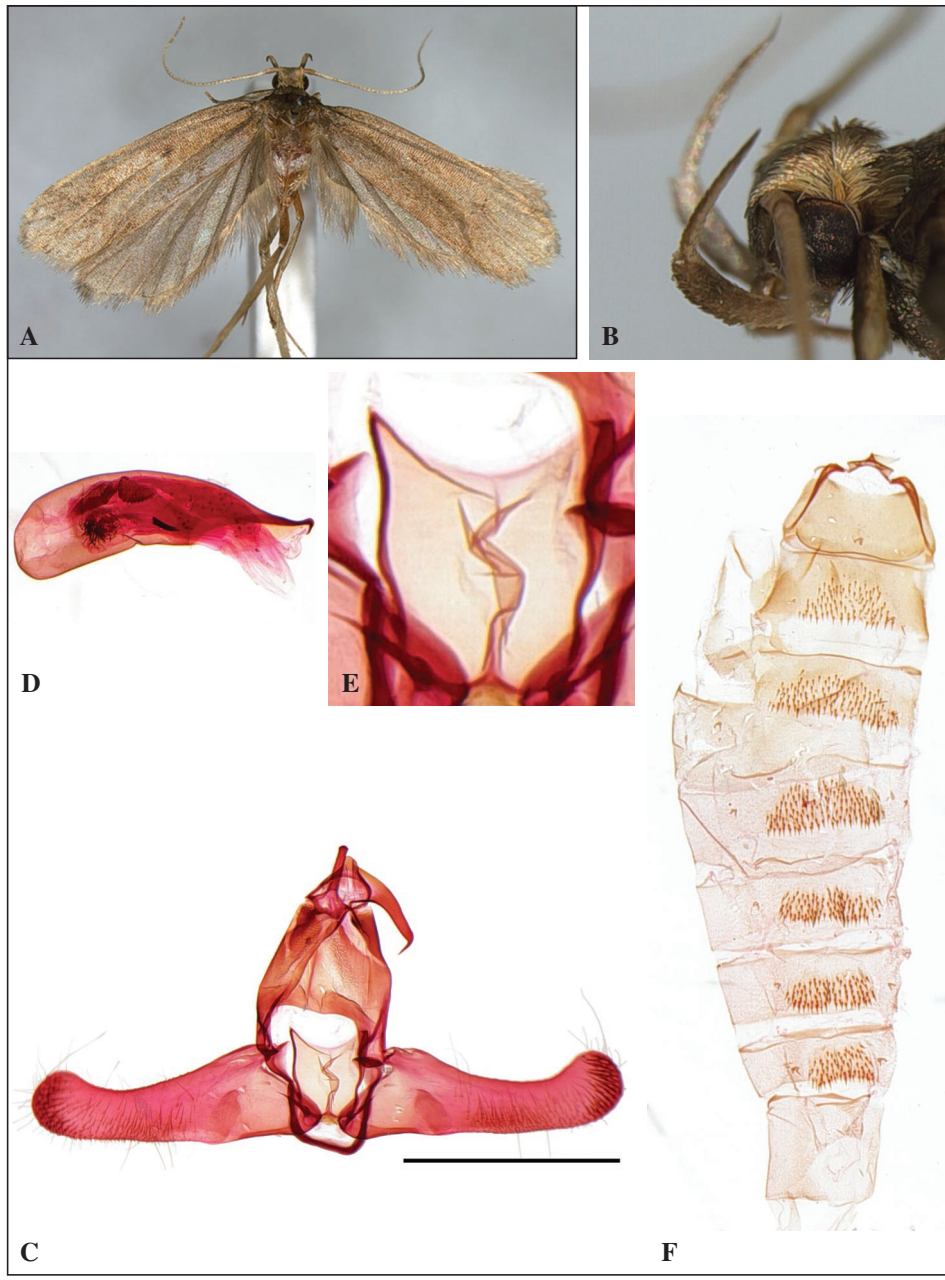

Figure 3.– *Eccedoxa lysimopa* (Meyrick, 1933): **A.** adult; **B.** ditto, head with labial palpus; **C.** male genitalia, gen. slide no. CIS-8115; **D.** ditto, aedeagus; **E.** close-up juxta; **F.** abdomen. Scale bar for the genitalia and aedeagus: 1 mm.

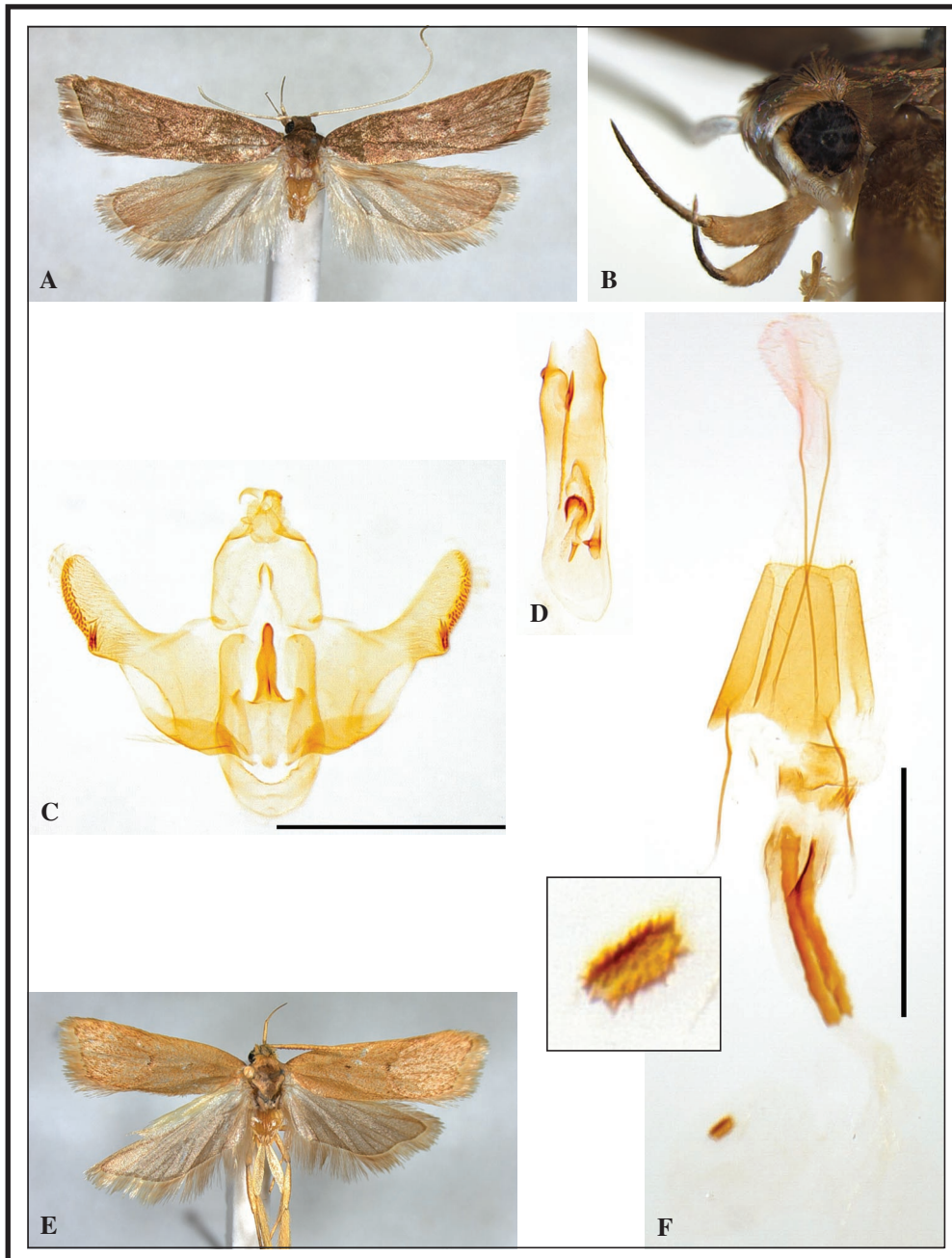

Figure 4.– *Lecithocera indanonensis* Park, sp. n. **(A-D)**: **A.** holotype; **B.** ditto, head & labial palpus; **C.** male genitalia, holotype, gen. slide no. CIS-49; **D.** ditto, aedeagus. *Lecithocera petalialis* Park, sp. n. **(E, F)**: **E.** holotype; **F.** female genitalia, gen. slide no. CIS-8121. Scale bar for the genitalia and aedeagus: 1 mm.

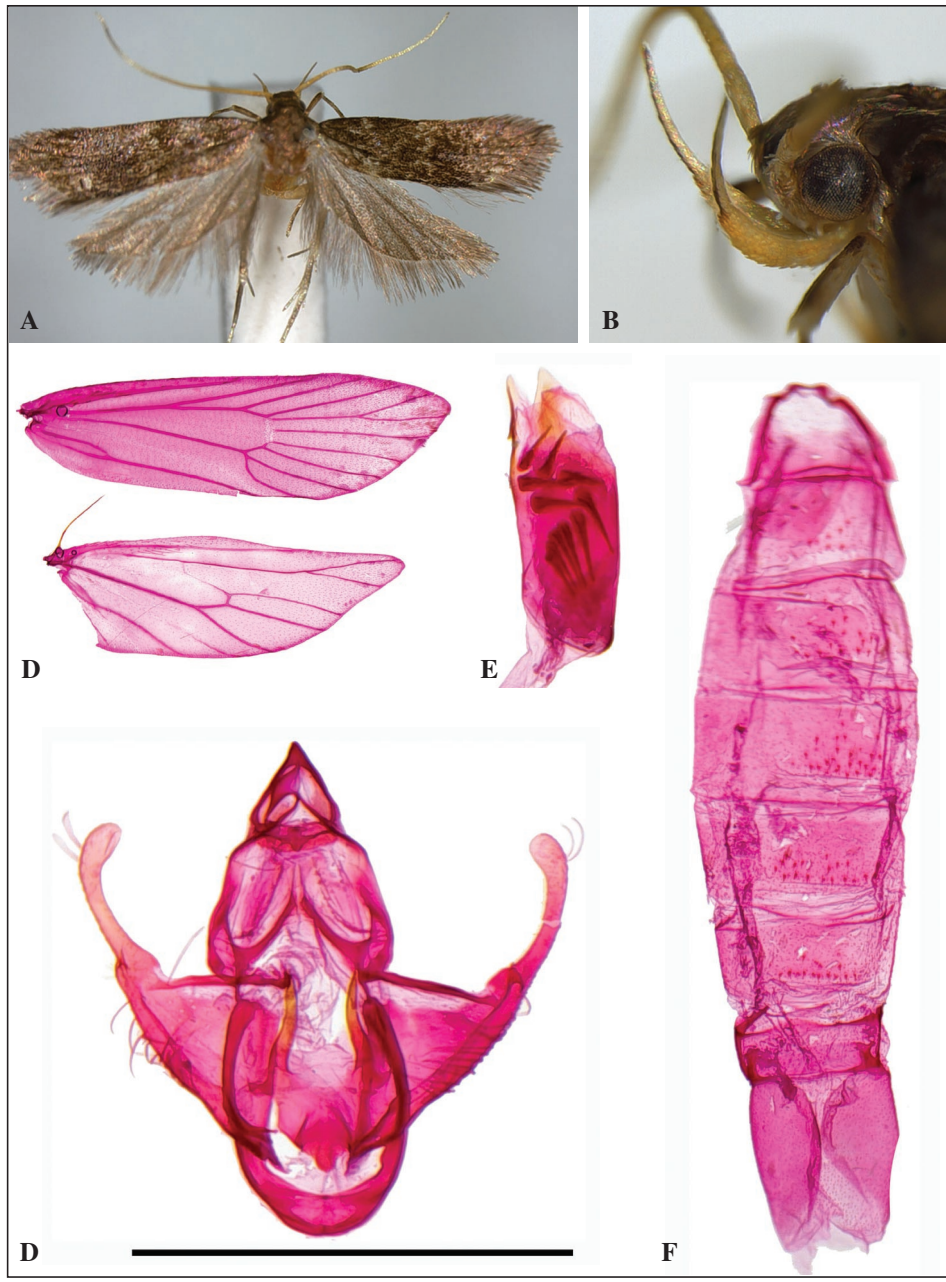

Figure 5.– *Opacoptera kerastiodes* Park, sp. n.: **A.** holotype; **B.** ditto, head and labial palpus; **C.** venation. **D.** male genitalia, holotype, gen. slide no. CIS-8116; **E.** ditto, aedeagus; **F.** abdomen. Scale bar for the genitalia and aedeagus: 1 mm.

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Results of the use of synthetic sex attractant lures for Zygaenidae in south-eastern France (Lepidoptera: Zygaenidae)

E. Drouet, T. B. Toshova & K. A. Efetov

Abstract

The sex attractant 2-butyl 2-dodecenoate (EFETOV-2), (2*R*)-butyl (7Z)-dodecenoate (R12) (a component of *Illiberis rotundata* sex pheromone) and a mixture with its opposite enantiomer (2*S*)-butyl (7Z)-dodecenoate (R12+S12, 1:1), were tested over a period of two years for studying Zygaenidae fauna in south-eastern France. As a result, eight Zygaenidae species were attracted in the vicinity of the lures, one of them in quantities never previously recorded by other methods in France.
KEY WORDS: Lepidoptera, Zygaenidae, sex attractants, *Rhagades pruni*, 2-butyl 2-dodecenoate, (2*R*)-butyl (7Z)-dodecenoate, (2*S*)-butyl (7Z)-dodecenoate, France.

Résultats de l'usage d'attractants sexuels pour l'étude des Zygaenidae, dans le sud-est de la France (Lepidoptera: Zygaenidae)

Résumé

L'attractant sexuel 2-butyl 2-dodecenoate (EFETOV-2), (2*R*)-butyl (7Z)-dodecenoate (R12) (un composé des phéromones sexuelles de *Illiberis rotundata*) et un mélange avec son énantiomère opposé (2*S*)-butyl (7Z)-dodecenoate (R12+S12, 1:1), ont été testés durant deux années pour étudier la faune des Zygaenidae du sud-est de la France. Ces appâts ont attirés 8 espèces de Zygaenidae et pour l'une d'entre elle, dans des quantités jamais observées avec d'autres méthodes en France.
MOTS CLES: Lepidoptera, Zygaenidae, attractants sexuels, *Rhagades pruni*, 2-butyl 2-dodecenoate, (2*R*)-butyl (7Z)-dodecenoate, (2*S*)-butyl (7Z)-dodecenoate, France.

Resultados del uso de los señuelos del atrayente sexual para Zygaenidae en el sudeste de Francia (Lepidoptera: Zygaenidae)

Resumen

El atrayente sexual 2-butil 2-dodecanoato (EFETOV-2), (2*R*)-butil (7Z)-dodecanoato (R12) (un componente de la feromona sexual de *Illiberis rotundata*), y una mezcla con su enantiómero opuesto (2*S*)-butil (7Z)-dodecanoato (R12+S12, 1:1), fueron testados por un período de dos años para estudiar la fauna de Zygaenidae del sudeste de Francia. Como el resultado ocho especies de Zygaenidae fueron atraídas en las proximidades de los señuelos, una de ellas en cantidades antes nunca registradas, por otros métodos en Francia.
PALABRAS CLAVE: Lepidoptera, Zygaenidae, atrayente sexual, *Rhagades pruni*, 2-butil 2-dodecanoate, (2*R*)-butil (7Z)-dodecanoate, (2*S*)-butil (7Z)-dodecanoate, Francia.

Introduction

Over last two decades, new sex pheromones and sex attractants of the Zygaenidae were discovered (SUBCHEV *et al*., 1998, 2009; EFETOV *et al*., 2014c; EFETOV & KUCHERENKO, 2020; SUBCHEV, 2014). Their application allowed to obtain new knowledge on the distribution, ecology and phenology of many species of this family in different countries (SUBCHEV *et al*., 2004, 2006, 2008a, 2008b, 2010, 2012, 2013, 2016; CAN *et al.* 2010, 2019; EFETOV *et al*., 2010, 2011, 2012, 2014b, 2015, 2016, 2018, 2019; NAHIRNIĆ *et al*., 2015; RAZOV *et al*., 2017, CAN CENGIZ *et al*., 2018; TOSHOVA *et al*., 2017; VRENOZI *et al*., 2019, 2020).

According to the contemporary systematics the family Zygaenidae is represented by five subfamilies (EFETOV, 1999; EFETOV & TARMANN, 2013, 2014a, 2017; EFETOV *et al*., 2014a), three of which are present in France: Chalcosiinae, Procridinae and Zygaeninae, the last subfamily being most numerous (RYMARCZYCK, 2007; DROUET & LAMBERT, 2010; EFETOV & TARMANN, 2014b; DROUET, 2016). Several species of French foresters (Procridinae) are not observed attracted to flowers, or rarely have been seen sitting on them, during the day. Locating adults, therefore, is very difficult so that their regional distribution and local abundance are poorly known. Such species often do not appear during surveys conducted to evaluate conservation measures in protected territories. This situation applies also to some species of burnet moths (Zygaeninae), which are not on the wing during the hottest part of the day, or which are difficult to be detected with low indigenous populations.

Consequently, a combination of methods is necessary to obtain a clearer picture of the species spectrum of Zygaenidae in certain region and relative abundance of the target species. Most common methods are searching by eye for larvae and adults on host plants, or by beating convenient bushes. Resorting to live virgin females is very efficient but not easy to carry out, since it is limited to the calling period, and by the short life of captive females. The use of synthetic sex pheromones or sex attractants gives possibilities for faunistic investigations and the results obtained could enrich our knowledge of Zygaenidae distribution. Recently, a comprehensive review of the known sex pheromones and attractants of Zygaenidae species had been published (SUBCHEV, 2014). Later synthesis, discovering of the attractive properties of 2-butyl 2-dodecenoate (EFETOV *et al*., 2014c) and intensive field testing of the enantiomer molecules and their racemic mixture in different countries resulted of increased knowledge about distribution and relative abundance of several Procridinae species in the studied regions (EFETOV *et al*., 2016, 2018, 2019, 2020).

The purpose of this study was to establish occurrence and distribution of Zygaenidae species attracted by the synthetic sex attractant and sex pheromone lures in south-eastern France.

Materials and methods

In 2017 and 2018, the first author used the sex attractant EFETOV-2 (racemic mixture of enantiomers of 2-butyl 2-dodecenoate), produced by the method described in EFETOV *et al*. (2014c). For preparing lures, rubber caps mounted on cardboard holders were impregnated with 50 µl of the racemic mixture and wrapped singly in aluminium foil pieces. During the experiments, the static method of using lures without trap was followed (EFETOV *et al*., 2011; TARMANN *et al*., 2019). The lure wrapped in a piece of aluminum foil was stored in a freezer before the use in the field. At the selected locality, the lure was exposed for 10-15 minutes. It was fixed to a stem or a branch at a maximum height of 1 meter from the ground, taking care of the wind direction when there was one. The occurrence of Zygaenidae species in the biotope were checked by visual observation before and during the trial. The Procridinae males attracted to the lure were netted and captured. The netted *Zygaena* were identified, counted, kept in a net and then released after the trial. The trials had been carried out from May to July 2017 during the afternoon, in places where target species where flying or supposed to exist. Some results obtained in 2016 with a lure containing the blend EFETOV-2, using the same protocol are added.

In 2018, (2*R*)-butyl (7*Z*) dodecenoate) (R12), the sex pheromone component of *Illiberis rotundata* Jordan (SUBCHEV *et al*., 2009) and the mixture of this compound and its opposite enantiomer, (2*S*)-butyl (7*Z*) dodecenoate) (S12), (R12 + S12; ratio 1:1) were also tested in the field. For preparing the lures, the pure compounds were dissolved in hexane and applied at a dose of 100 µg onto rubber vial caps of serum bottles mounted on cardboard holders. The lures were prepared at the Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences. The lure with R12+S12 was tested using the static method while the lure with R12 alone was tested by Delta sticky trap of transparent PVC foil.

A total of 31 trials were carried out using the static method, 20 with EFETOV-2, and 11 with R12+S12.

All trials took place in France, in the departement of Hautes-Alpes, except for those in Venterol, Curbans and Uvernet-Fours, which are located in the department of Alpes-de-Haute-Provence and that at Quet-en-Beaumont, located in the department of Isère. Details about localities and periods of observations are present in Table 1, with a map of localities on Fig. 1.

Table 1.– Trials with EFETOV-2 and R12+S12 using the static method of exposure of attractant lure in south-eastern France in 2016-2018.

Commune, locality	Altidude, m a.s.l.	Date	Time of observation		Lure	Family	Attracted species	Nb ex
			Beginning	End				
Théus, Maruvert	750	09-V-2017	15h15	15h30	EFETOV-2	Psychidae	*Ptilocephala albida*	2
Chorges, Rivay	1000	09-VI-2017	16h30	16h40	EFETOV-2		nul	0
Chorges, Rivay	1000	09-VI-2017	21h26	21h30	EFETOV-2	Zygaenidae	*Adscita statices*	2
La Cluse, Bauchière	1250	15-VI-2016	15h10	15h20	EFETOV-2	Zygaenidae	*Adscita statices*	2
Cervières, Le Laus	1800	05-VII-2017	16h40	16h55	EFETOV-2		nul	0
Venterol, Serre Barbière	750	10-VII-2017	17h40	17h50	EFETOV-2	Zygaenidae	*Zygaena transalpina*	11
Savournon, Torrent du Béal	880	13-VII-2017	18h00	18h15	EFETOV-2	Zygaenidae	*Zygaena transalpina*	10
Montmaur, Col de Gaspardon	1450	14-VII-2015	15h00	15h15	EFETOV-2	Zygaenidae	nul	0
Saint-Michel-de-Chaillol, Sellaret, ravin du Renc	1950	18-VII-2017	17h05	17h25	EFETOV-2	Zygaenidae	*Adscita statices*	3
Saint-Michel-de-Chaillol, Sellaret, ravin du Renc	1950	18-VII-2017	17h05	17h25	EFETOV-2	Zygaenidae	*Zygaena transalpina*	1
Val Buëch-Méouge, Chemin du Roc de l'Aigle	950	09-VI-2018	15h10	15h25	EFETOV-2		nul	0
Val Buëch-Méouge, Les Autarets	550	09-VI-2018	17h55	18h10	EFETOV-2	Zygaenidae	*Adscita mannii*	1
Curbans, Les Deux Riou	640	16-VI-2018	15h45	16h00	EFETOV-2	Zygaenidae	*Zygaena viciae*	1
Eourres, Col d'Araud	900	17-VI-2018	15h50	16h05	EFETOV-2	Zygaenidae	*Adscita mannii*	1
Gap, Col de Gleize	1390	19-VI-2018	14h55	15h10	EFETOV-2		nul	0
La Piarre, Le Vissac	1060	22-VI-2018	13h40	13h55	EFETOV-2		nul	0
La Piarre, Le Vissac	1060	22-VI-2018	15h40	16h05	EFETOV-2	Zygaenidae	*Adscita mannii*	1
Sigottier, La Montagne	1090	22-VI-2018	18h30	18h45	EFETOV-2		nul	0
Eourres, Col d'Araud	890	28-VI-2018	17h20	17h35	EFETOV-2	Zygaenidae	*Adscita mannii*	11
Eourres, Col d'Araud	890	28-VI-2018	17h20	17h35	EFETOV-2	Zygaenidae	*Zygaena loti*	1
Théus, Maruvert	760	29-VI-2018	16h22	16h37	EFETOV-2	Zygaenidae	*Adscita mannii*	1
Théus, Maruvert	760	29-VI-2018	16h22	16h37	EFETOV-2	Zygaenidae	*Jordanita subsolana*	1
Curbans, Les Deux Riou	670	29-VI-2018	17h25	17h40	EFETOV-2	Zygaenidae	*Adscita mannii*	10
Curbans, Les Deux Riou	670	29-VI-2018	18h25	18h40	R12+S12	Zygaenidae	*Adscita mannii*	2
La Beaume, Ruisseau de Chauranne	970	30-VI-2018	17h45	18h00	R12+S12	Zygaenidae	*Adscita mannii*	4

La Beaume, Ruisseau de Chauranne	970	30-VI-2018	17h45	18h00	R12+S12	Zygaenidae	*Zygaena transalpina*	2
Quet-en-Beaumont, Gros Bois	980	02-VII-2018	16h00	16h10	R12+S12	Zygaenidae	nul	0
Saint-Michel-en-Beaumont, Combe des Ferrands	1180	02-VII-2018	17h35	17h50	R12+S12	Zygaenidae	nul	0
Uvernet-Fours, Col d'Allos-ouest	2260	08-VII-2018	14h40	15h00	R12+S12	Zygaenidae	*Adscita geryon*	1
Venterol, Pont de l'Archidiacre	620	10-VII-2018	17h45	18h00	R12+S12	Zygaenidae	nul	0
Val Buëch-Méouge, Les Charles	800	11-VII-2018	15h20	15h35	R12+S12	Zygaenidae	*Adscita mannii*	8
Val Buëch-Méouge, Chabottes	800	11-VII-2018	16h15	16h30	R12+S12	Zygaenidae	*Adscita mannii*	4
Barcillonnette, Le Viarar	570	18-VII-2018	16h30	16h45	R12+S12	Zygaenidae	*Zygaena transalpina*	1
Chorges, Rivay	1000	30-VII-2018	17h15	17h30	R12+S12	Zygaenidae	*Adscita mannii*	2
Embrun, Mont Guillaume	2530	31-VII-2018	13h25	13h40	R12+S12	Zygaenidae	*Adscita geryon*	3

Results

Totally five species of Procridinae and three species of Zygaeninae were attracted to the lures tested during the study (Tables 1-2). They belong to the genera *Adscita* Retzius, 1783 (three species), *Jordanita* Verity, 1946 (one species), *Rhagades* Wallengren, 1863 (one species), and *Zygaena* Fabricius, 1775 (three species). EFETOV-2 lures attracted males of the following species: *Adscita statices* (Linnaeus, 1758) (three localities), *A. mannii* (Lederer, 1853) (six localities), *J. subsolana* (Staudinger, 1862) (one locality), *Zygaena transalpina* (Esper, 1780) (three localities), *Z. loti* ([Denis & Schiffermüller], 1775) (one locality), and *Z. viciae* ([Denis & Schiffermüller], 1775) (one locality) (Table 1). The lures with the mixture R12+S12 showed behavioural activity for *A. mannii* (five localities), *A. geryon* (Hübner, 1813) (two localities) and *Z. transalpina* (two localities). The most frequently observed species during the study were *A. mannii* and *Z. transalpina*.

Traps baited with R12 captured males of *Rhagades pruni* ([Denis & Schiffermüller], 1775), in two localities at the end of June - middle of July, 2018 (Table 2, Fig. 2).

Table 2.– Trials with the sex pheromone compound R12 by means of Delta sticky trap in south-eastern France in 2018 (one trap per locality).

Commune, locality	Altidude m a.s.l.	Period	Lure	Family	Attracted species	Nb ex
Val Buëch-Méouge, Chabottes	800	11-VII to 18-VII-2018	R12	Zygaenidae	*Rhagades pruni*	9
Remollon, Gouitrouse	760	29-VI to 10-VII-2018	R12	Zygaenidae	*Rhagades pruni*	9
Lardier-et-Valença, La Citadelle	585	21-VII to 02-VIII-2018	R12	Tischeriidae	*Tischeria ekebladella*	1

Eleven trials were unsuccessful and no Zygaenidae specimens were attracted. One of the observations, on 14-VII-2015, from 15:00 to 15:15, gave no result in a biotope where *A. geryon*, *J. subsolana*, *J. globulariae* (Hübner, 1793), and eight *Zygaena* species (*Zygaena carniolica* (Scopoli, 1763), *Z. hilaris* Ochsenheimer, 1808, *Z. loti, Z. filipendulae* (Linnaeus, 1758), *Z. lonicerae* (Scheven, 1777), *Z. transalpina, Z. viciae,* and *Z. romeo* Duponchel, 1835, were observed on the wing. In addition to the target species, the lure with EFETOV-2 was attractive to two males of *Ptilocephala albida* (Esper, 1786) (Psychidae) in Théus, Maruvert in May 2017 (Table 1 and Fig. 3). A single specimen of *Tischeria ekebladella* (Bjerkander, 1795) (Tischeriidae) was captured in a trap baited with R12 (Table 2).

Discussion

During the investigation period, eight Zygaenidae species were attracted out of the 34 potential species in the area (DROUET, 2016; BENCE & RICHAUD, 2020). EFETOV-2 attracted wider spectrum of species (six species) while the mixture R12+S12 attracted four species. The most frequent response to the sex attractant was by *A. mannii* - it was attracted during 11 observation periods to two types of lures - EFETOV-2 and R12+S12.

Attractiveness of a lure with EFETOV-2 to males of *A. statices* (EFETOV & GORBUNOV, 2016; CAN CENGIZ *et al*., 2018), *A. mannii* (EFETOV *et al*., 2020) and *J. subsolana* (EFETOV *et al*., 2016; CAN CENGIZ *et al*., 2018) have been published from several countries.

R. pruni was recorded by trapping method in traps baited with R12. It is an interesting result, because we do not have a clear idea about the density of *R. pruni* in the region. Earlier it was recorded in France mainly by beating blackthorn *Prunus spinosa* L. and *Crataegus* sp. in the spring, with rarely more than one caterpillar per locality (BENCE & RICHAUD, 2020). R12 or the mixture R12+S12 were attractive to *R. pruni* in Crimea and Hungary (SUBCHEV *et al*., 2010)

Z. transalpina has been the most attracted *Zygaena* species and the number of specimens is a testimony of the efficiency of the EFETOV-2 sex attractant. Some specimens were attracted also to R12+S12. Attraction of *Zygaena* species to esters of long-chain unsaturated fatty acids was observed for the first time.

Trials were carried out only during the afternoon. Nevertheless, the results show the peak of flight activity for *A. mannii* males, to be in the afternoon, between 16:00 to 18:00. This is consistent with the results of visual observations of responses of males of this species made by G. TARMANN, in Pordenone, Friuli, Italy to the sex attractant EFETOV-S-2 (EFETOV *et al*., 2020).

As far as we know, no sex attractant is known for the species *P. albida* (EL-SAYED, 2020). Although few males of this species were observed attracted to the lure baited with EFETOV-2, this is not surprising taking into account the similarity in pheromone chemistry and sex pheromone glands in the Zygaenidae subfamily Procridinae and Psychidae (see SUBCHEV *et al.*, 2000). In one of the Delta traps, although without result regarding Zygaenidae, *T. ekebladella* male was captured. The larvae of this species mine the leaves of *Quercus* sp. Since the trap was hung on a *Quercus* branch and, without a control trap, this capture could have been purely accidental. MOLNÁR *et al*. (2012) identified the sex pheromone of *T. ekebladella* females as a two-component mixture of (3*Z*,6*Z*,9*Z*)-tricosa-3,6,9-triene and (3*Z*,6*Z*,9*Z*,19*Z*)-tricosa-3,6,9,19-tetraene but only the tetraene attracted males in the field.

Our results reinforce our knowledge of the distribution of the Zygaenidae in the study area, enabling the discovery of species in places, where they were previously unknown. The methods applied in the current study are less time consuming and can be managed easily in locations of interest to assess the presence of a particular species and its abundance.

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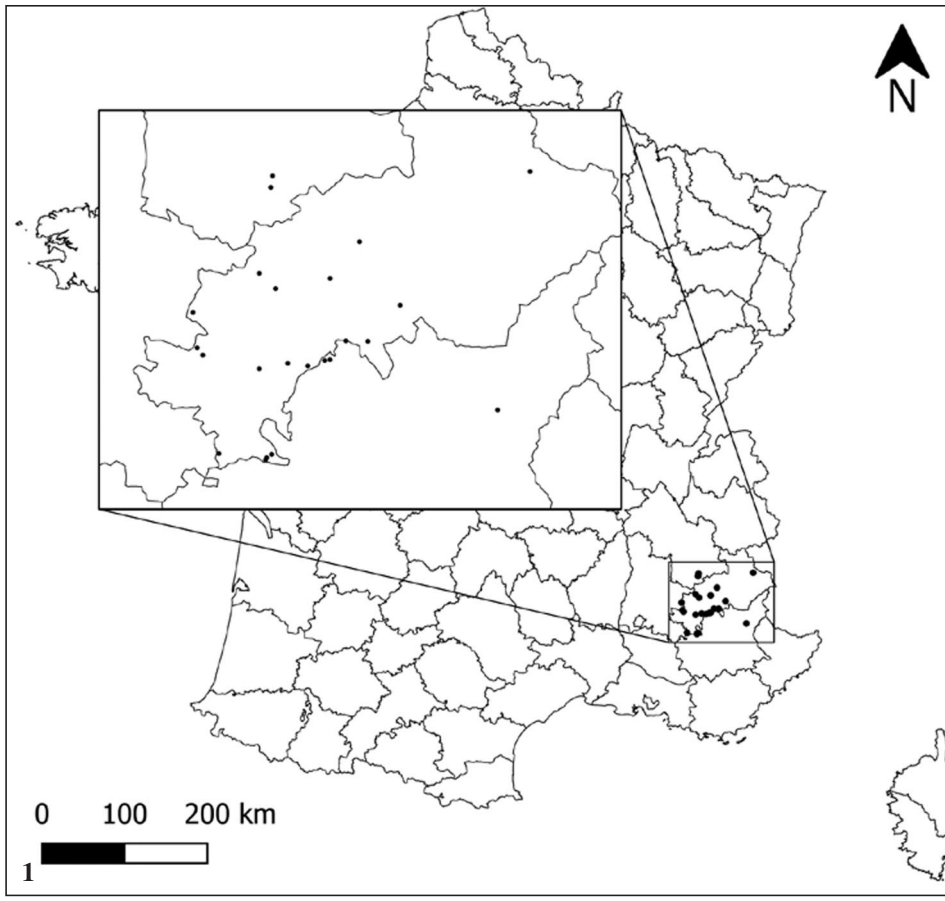

Figs 1-3.– 1. Map of France showing the area covered by the survey. One dot corresponds to a surveyed commune. **2.** Catches of *Rh. pruni* in a Delta trap baited with R12, Hautes-Alpes, Remollon, 10-VII-2018, photo E. Drouet. **3.** *P. albida*, Hautes-Alpes, Théus, Maruvert, 750 m, 09-V-2017, which was attracted to EFETOV-2 lure, photo Jean Raillot.

NOTICIAS GENERALES / *GENERAL NEWS*

REVISORES 2019-2020 / *REFEREES 2019-2020*.– Los siguientes revisores colaboraron en la evaluación de los manuscritos durante el año 2019-2020. 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 2019-2020. 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*: Mr. Leif Aarvik (Noruega / *Norway*); Prof. Dr. Vasilii V. Anikin (Rusia / *Russia*); Dr. Elias Araujo (Brasil / *Brazil*); Dr. Bengt A. Bengtsson (Suecia / *Sweden*); Dr. Stoyan Beshkov (Bulgaria / *Bulgaria*); Dr Yuriy Budashkin (Rusia / *Russia*); Dr. Jaroslaw Buszko (Polonia / *Poland*); Dr. Giorgio Baldizzone (Italia / *Italy*); Dr. Francesca Barbero (Italia / *Italy*); Dr. Salvatore Bella (Italia / *Italy*); Dr. Oleksiy Bidzilya (Rusia / *Russia*);Dr. Feza Can (Turquía / *Turkey*); Dr. Steve Collins (Reino Unido / *United Kingdom*); Dr. Selami Candan (Turquía / *Turkey*); D. Francisco Javier Conde de Saro (España / *Spain*); Dr. Willy de Prins (Bélgica / *Belgium*); Dr. Eric Drouet (Francia / *France*); Dr. Konstantini A. Efetov (Rusia / *Russia*); Dr. Mehdi Esfandiari (Irán / *Iran*); Dr. Cees Gielis (Países Bajos / *Netherlands*); Ing. Andrés Expósito Hermosa (España / *Spain*); Dra. Sonia Ferreira (Portugal / *Portugal*); Dr. Enrique García-Barros Saura (España / *Spain*); D. Javier Gastón Ortiz (España / *Spain*); D. Juan José Guerrero Fernández (México / Mexico); D. Jesús Gómez Fernández (España / *Spain*); Dr. Monsoon Jyoti Gogoi (India / *India*); Dr. Elena Guskova (Rusia / *Russia*); Dr. Péter Gyulai (Hungría / *Hungary*); Dr. Axel Hausmann (Alemania / *Germany*); Dr. Peter Huemer (Austria / *Austria*); Dr. Blanca Huertas (Reino Unido / *United Kingdom*); Dr. Marco Infusino (Italia / *Italy*); Dr. Predrag Jaksic (Serbia / *Serbia*); Dr. Lauri Kaila (Finlandia / *Finland*); Prof. Dr. Ahmet Ö. Koçak (Turquía / *Turkey*); Dr. Stanislav K. Korb ((Rusia / *Russia*); Dr. Bernard Landry (Suiza / *Switzerland*); Prof. Dr. Gerardo Lamas Muller (Perú / *Peru*); Dr. Zdeněk Laštůvka (República Checa / *Czech Republic*); Prof. Dr. Houhun Li (China / *China*); Dr. Koen V. M. Maes (Bélgica / *Belgium*); Dr Alexander Matov (Rusia / *Russia*); Dr. Scott Miller (EE.UU. / *USA*); Dr. Matthias Nuss (Alemania / *Germany*); Dr. David Plotkin (EE.UU. / *USA*); Dr. Alexander N. Poltavsky (Rusia / *Russia*); Dr. Lukas Przybylowicicz (Polonia / *Poland*); Dr. Franz Pühringer (Austria / *Austria*); Prof. Dr. Józef Razowski (Polonia / *Poland*); Dr. Julio César Rojas León (México / *Mexico*); Dr. Lászlo Ronkay (Hungría / *Hungary*); Dr. Motoki Saito (Japón / *Japan*); Dr. Martina Sasic (Hungría / *Hungary*); Dr. Gaurav Sharma (India / *India*); Dr. Klaus Sattler (Reino Unido / *United Kingdom*); Dr. Arturo Serrano (Portugal / *Portugal*); Dr. Hikmet Murat Sipahioglu (Turquía / *Turkey*); Mr. František Slamka (Eslovaquia / *Slovakia*); Dr. Alma Solís (EE.UU. / *USA*); Dr. Andrej Sviridov (Rusia / *Russia*); Mr. Jukka Tabell (Finlandia / *Finland*); Dr. Gerhard Tarmann (Austria / *Austria*); Dr. Pasquale Trematerra (Italia / *Italy*); Dr. Paolo Triberti (Italia / *Italy*); Dra. Tatiana Trisliova (Rusia / *Russia*); Dr. Petr Ustjuzhanin (Rusia / *Russia);* Dr. Héctor Vargas (Chile / *Chile*); Prof. Dr. José Luis Viejo Montesinos (España / *Spain*); Dr. Jaan Viidalepp (Estonia / *Estonia*); Dr. Antonio Vives Moreno (España / *Spain*); Dr. Anton Volynkin (Rusia / *Russia*); Dr. Rong-Jiang Wang (China / *China*); Dr. Roman V. Yakovlev (Rusia / *Russia*); Dr. José Luis Yela García (España / *Spain*); Dr. Vadim V. Zolotuhin (Rusia / *Russia*).– **DETALLES / *DETAILS*:** SHILAP; Apartado de correos, 331; E-28080 Madrid, ESPAÑA / *SPAIN* (E-mail: avives1054@outlook.es).