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Rare and remarkable moths in the Famenne-Calestienne area: a survey (2000–2022)

Chris Steeman

Abstract. From 2000 to the end of 2022, intensive inventories were made by the author in the Famenne-Calestienne to map the moth population. The surveyed area runs from Givet eastwards to Aywaille, near Liège. Own observations (privately, with friends or as an active member of the Leafminers Working Group) are supplemented with observations from third parties. More than 380 rare and remarkable species are highlighted and their status is briefly discussed.

Samenvatting. De auteur verrichtte tussen 2000 en einde 2022 intensief inventarisaties in de Famenne-Calestienne om het nachtvlinderbestand in kaart te brengen. Het onderzochte gebied loopt van Givet oostwaarts naar Aywaille nabij Luik. Eigen waarnemingen (privé, met vrienden of als actief lid van de Werkgroep Bladmineerders) worden aangevuld met waarnemingen van derden. Meer dan 380 zeldzame en opmerkelijke soorten worden uitgelicht en hun status wordt kort besproken.

Résumé. Durant de 2000 à fin 2022, des inventaires intensifs ont été réalisés par l'auteur en Famenne-Calestienne pour cartographier les populations de papillons nocturnes. La zone étudiée s'étend de Givet vers l'est jusqu'à Aywaille près de Liège. Ses propres observations (en privé, avec des amis ou en tant que membre actif du groupe de travail des mineurs de feuilles) sont complétées par des observations de tiers. Plus de 380 espèces rares et remarquables sont mises en évidence et leur statut est brièvement discuté.

Key words: Rare species — Faunistics — Lepidoptera — Moths — Famenne — Calestienne — Belgium.

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Introduction

The Fagne-Famenne (Fig. 1) is a long and narrow depression, with an altitude that varies between 150 and 250 m and an average width of about 20 km. It narrows in a northeasterly direction and is divided into two areas: the Fagne to the west of the river Meuse at Givet and the Famenne to the east. It is located between the Condroz and the Ardennes massif and is bordered to the south by a characteristic subregion called the Calestienne (Fig. 1). This narrow limestone zone is a limestone plateau about 130 km long and 2 to 4 km wide with an altitude varying

between 250 and 300 m and is dotted with elongated hills called “tiennes”. It runs from the French border west of Chimay (HA) to Louveigné (LG) near Remouchamps (LG) in the east. Han-sur-Lesse (NA) is one of the more well-known villages of the Calestienne. Three river basins cross the area: that of the Lesse, the Lhomme and the Ourthe.

The Famenne unites the communes of Beauraing (NA), Houyet (NA), Wellin (LX), Rochefort (NA), Nassogne (LX), Marche-en-Famenne (LX), Hotton (LX), Somme-Leuze (NA), Erezée (LX), Durbuy (LX), Ferrières (LG), Hamoir (LG), Aywaille (LG), Sprimont (LG) and extends over 3 provinces, Namur, Liège and Luxembourg.

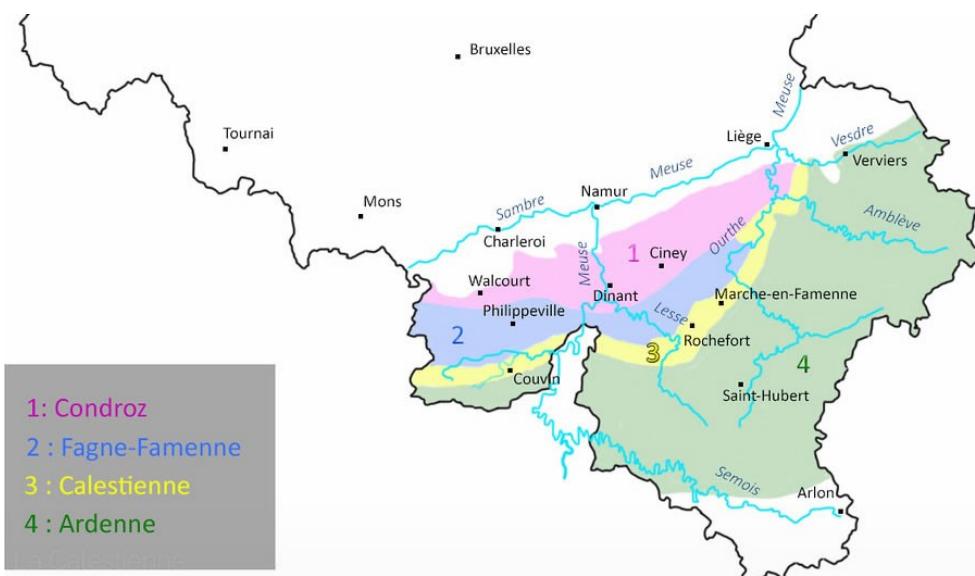


Fig. 1. Map with the geographic regions in southern Belgium with Fagne-Famenne (blue coloured) and Calestienne (yellow coloured).

Methods and equipment

In this paper, the abbreviations of the Catalogue of the Lepidoptera of Belgium (De Prins 2016; De Prins & Steeman 2003–2023) are used for the Belgian provinces. AN: Antwerp, LI: Limburg, HA: Hainaut, NA: Namen, LG: Liège, LX: Luxembourg. The list has been drawn up systematically and per family according to the Catalogue of the Lepidoptera of Belgium (De Prins & Steeman 2003–2023). The study was conducted from January 2000 to December 2022 and treats the rare and specific species of Famenne-Calestienne (the area between Givet and Aywaille). Many of these observations were made by the author himself but were also supplemented by third parties to obtain a complete overview, if possible. Searching for moths was done in many ways: looking for leaf mines, tubes, cases and caterpillars, visiting hibernation sites, day excursions, searching with a torch at night, with a butterfly net, with the use of pheromones and sugar bait but also moth traps with UV light (125W) and actinic tubes (15W blue 350nm and synergetic green 540nm) were used systematically. Usually three, but sometimes up to six or ten traps were used. The traps were set up in the evening and checked at dawn in the early morning. All specimens were counted and the majority of moths were photographed and released after observation. Some difficult species were collected for determination through genital analysis and/or DNA barcoding by Damien Gailly at the Conservation Genetics Laboratory (GeCoLab) at the University of Liège under the direction of Johan Michaux. Authorisations for the inventories were granted by the Département de la Nature et des Forêts (DNF).

Species account

Micropterigidae

Micropterix schaefferi Heath, 1975: 1 specimen on 20.v.2010 at Aywaille (LG), leg. R. Stas (De Prins & Steeman 2011). Another specimen on 21.v.2020 at the quarry de Chambralles near Aywaille (LG), leg. E. Steckx.

Nepticulidae

Ectoedemia agrimoniae (Frey, 1858) – Agrimony Pigmy: sparse sightings of leafmines.

Ectoedemia arcuatella (Herrich-Schäffer, 1855) – Strawberry Pigmy : leafmine observations at the Briqueterie de Rome near Durbuy (LX) (Wullaert 2015).

Stigmella aeneofasciella (Herrich-Schäffer, 1855) – Brassy Pigmy (Fig. 2): the place to find leaf mines in the area is at the Briqueterie de Rome near Durbuy (LX) where a healthy population occurs.

Stigmella atricapitella (Haworth, 1828) – Black-headed Pigmy: leafmines are difficult to distinguish. Through the study of the genitalia, we know this species is distributed throughout the area in low numbers.



Fig. 2. *Stigmella aeneofasciella*, 29.x.2016, Durbuy, NA. © Chris Steeman.

Stigmella mespilicola (Frey, 1856) – Wild-service Pigmy: 1 leafmine on 20.viii.2016 at Tienne de Boton at Belvaux (NA). This was **the first observation for Belgium** (Wullaert 2017). This species is only found in NA where the foodplant *Sorbus torminalis* (L.) Crantz (Rosaceae) (Wild Service-tree) is well represented. In Belgium mainly in the Calestienne area.

Stigmella ruficapitella (Haworth, 1828) – Red-headed Pigmy: leafmines are difficult to distinguish. Through the study of the genitalia, we know this species is distributed throughout the area in low numbers.

Stigmella samiatella (Zeller, 1839) – Chestnut Pigmy: 2♂ on 28.vii.2020 at Ri d'Howisse near Wavreille (NA). 1♂ on 17.viii.2020 at Comogne near Focant (NA). 1♂ on 09.viii.2021 at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. Leafminers working group, gen. det. S. Wullaert. **New species for the province of NA.**

Trifurcula beirnei Puplesis, 1984 – Greenweed Pigmy: one genitalized ♂ on 17.vii.2022 at Mont des Pins near Bomal (LX), leg. Leafminers working group, gen. det. S. Wullaert. Only the fourth observation for Belgium.

Trifurcula eureka (Tutt, 1899) – Field Lotus Pigmy: 15 leafmines on *Lotus corniculatus* (Leguminosae) (Common Bird's-foot-trefoil) on 28.ix.2013 at the Briqueterie de Rome near Durbuy (LX). **This species has never been observed in Belgium before** (Wullaert 2015).

Zimmermannia atrifrontella (Stainton, 1851) – Oak-bark Pigmy: 1♀ on 15.ix.2020 at Ri d'Howisse near Wavreille (NA). 1♀ on 19.ix.2020 at Grignaux et Hérimont at Han-sur-Lesse (NA).

Zimmermannia liebwerdella (Zimmermann, 1940): so far, the only observation in LX: 1 mine on beech bark (Fagaceae) (*Fagus sylvatica* L.) on 24.x.2020 at Resteigne (LX). **New species for the province of LX.**

Zimmermannia longicaudella Klimesch, 1953: only 2 observations between 2000 and 2022 in Belgium: 2♂ on 09.viii.2021 at Gros Tienne near Lavaux-Ste.-Anne (NA) and 4♂ on 23.vii.2022 at bois des Petites Tailles near Revogne (NA), both leg. Leafminers working group, gen. det. S. Wullaert & C. Steeman.

Adelidae

Nemophora minimella (Denis & Schiffermüller, 1775) – Small Long-horn: 11 specimens on 07.viii.2017 at Gros Tienne near Lavaux-Ste.-Anne (NA). Each time 1 specimen on 14.viii.2017 and on 28.vii.2018 at the same place, leg. R. Meeuwis & R. Nossent.

Nemophora ochsenheimerella (Hübner, 1813) – Ochsenheimer's Long-horn: 1 specimen on 24.v.2015 at Noiseux (NA), leg. J. Verstraeten. 1 specimen on 26.v.2022 at Grand Quarti near Finnevaux (NA).

Nematopogon schwarziellus (Zeller, 1839) – Sandy Long-horn: rediscovered again through examination of the genitalia in 2021 after a long period with no observations. 1♂ & 1♀ on 23.v.2021 and 1♂ & 2♀ on 16.v.2022 at Grand Quarti near Finnevaux (NA), both leg. Leafminers working group, gen. det. S. Wullaert.

Prodoxidae

Lampronia flavimitrella (Hubner, 1817) – Bramble Bright: 2 specimens at bois du Roi near Beauraing (NA), leg. D. Testaert (De Prins, Steeman & Sierens 2017).

Lampronia luzella (Hübner, 1817) – Wood Bright: only one observation of this very rare species. 1 specimen on 06.vi.2016 at Turmont at Han-sur-Lesse (NA), leg. P. Lighezzolo (Steeman & Sierens 2018). **New species for the province of NA.**

Meessiidae

Agnathosia mendicella (Denis & Schiffermüller, 1775): 1♂ to pheromone of *Synanthedon conopiformis* (Esper, 1782) (Dale's Oak Clearwing) on 28.vi.2022 at Grand Quarti near Finnevaux (NA). There are very few records of this species in Belgium.

Karsholtia marianii (Rebel, 1936): 2 specimens on 05.vi.2022 at the quarry de la Falize at Aywaille (LG), leg. T. Muus.

Stenoptinea cyaneimarmorella (Millière, 1854) – Barred Brown Clothes Moth: 1 specimen on 02.vii.2004 at Gros Tienne near Lavaux-Ste.-Anne (NA) (De Prins 2005). **This observation was only the second for Belgium and new for the province of NA.** Only 1 other observation in the area is known of this very rare species: 1♂ to pheromone on 11.vi.2022 at Les Pairées Ouest near Resteigne (LX), leg. Leafminers working group.

Tenaga rhenania (G. Petersen, 1962): 7 specimens on 22.vi.2020 at the quarry de la Falize at Aywaille (LG). This was the first observation for Belgium (Wullaert 2023). Another imago on 20.vii.2022 at the same place, leg. D. Gailly & R. Thunus.

Psychidae

Eumasia parietariella (Heydenreich, 1851): each time 1 case with larva found on 17.iii, 05.iv. and on 13.iv.2013 at the quarry de la Falize and the adjacent quarry du

Goiveux at Aywaille (LG). This species **has never been observed in Belgium before** (Darcis *et al.* 2014). Hitherto known only from those two quarries.

Psyche crassiorella Bruand, 1851 – Scarce Grass Bagworm: one of the few places and the hotspot for this species can be found at the quarry de la Falize at Aywaille (LG).

Tineidae

Triaxomasia caprimulgella (Stainton, 1851) – Small Timber Clothes Moth: 1♂ on 26.vi.2019 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group, gen. det. S. Wullaert. **New species for the province of LG.** Only known from a few specimens in Belgium.

Montescardia tessulatellus (Lienig & Zeller, 1846): 1 specimen on 13.vi.2015 at Les Spinets at On (LX), leg. D. Sloommaekers *et al.* Each time 1 specimen on 23.v., and on 11.vi.2021, both at Grand Quarti near Finnevaux (NA). **New species for the provinces of LX and NA.**

Roeslerstammiidae

Roeslerstammia erxlebella (Fabricius, 1787) – Copper Ermel: 1 specimen on 05.viii.2017 at the quarry de Bièrnauchamps at Wavreille (NA).

Bucculatricidae

Bucculatrix ainliella Murtfeldt, 1905 – Oak Skeletonizer: a North-American invasive species. 1♂ on 10.viii.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group, gen. det. S. Wullaert.

Bucculatrix cristatella (Zeller, 1839) – Crested Bentwing: 2 specimens on 15.ix.2019 and 2 specimens on 10.ix.2020, both at Mont des Pins near Bomal (LX), leg. D. Gailly *et al.* 1♂ on 22.v.2020 at Grand Quarti near Finnevaux (NA). **It was at least 40 years ago that this species was last observed in NA.**

Gracillariidae

Phyllonorycter cavella (Zeller, 1846) – Gold Birch Midget: 1 specimen on 11.vii.2016 at Grande Tinaimont near Han-sur-Lesse (NA), leg. J. Dewolf *et al.* **New species for the province of NA** (De Prins *et al.* 2017).

Phyllonorycter cerasinella (Reutti, 1852): 1♂ on 02.vi.2018, 03.v.2019, 17.v.2019 and 08.vi.2019 at Les Pairées Ouest near Resteigne (LX), leg. Leafminers working group, gen. det. S. Wullaert & R. Recour. **New species for the province of LX.** A very rare and local species in Belgium with few observations.

Phyllonorycter dubitella (Herrich-Schäffer, 1855) – Southern Midget: 1♀ on 24.v.2021 at Grand Quarti near Finnevaux (NA), leg. Leafminers working group, gen. det. S. Wullaert. Although the foodplant *Salix caprea* L. (Salicaceae) (Goat Willow) is very numerous in Belgium, it is a species that is rarely seen.

Phyllonorycter hostis Triberti, 2007 – Red Apple Midget: 1♂ on 09.v.2020 at Grand Quarti near Finnevaux (NA). **This was the first observation for Belgium** (Steeman 2021a). 7♂ on 18.iv.2022, leg. C. Steeman *et al.*, gen. det. A. Beidts and 1♂ on 16.v.2022, both at Grand Quarti near Finnevaux (NA), leg. Leafminers working group, gen. det. S. Wullaert. The species is currently only known in Belgium from four localities in the Calestienne.

Yponomeutidae

Pseudoswammerdamia combinella (Hübner, 1786) – Copper-tipped Ermine (Fig. 3): although a rare species, most sightings for Belgium occur in the Famenne-Calestienne region.



Fig. 3. *Pseudoswammerdamia combinella*, 06.iv.2017, Finnevaux, NA. © Chris Steeman.

Zelleria hepariella Stainton, 1849 – Brown Ash Ermine: present in very small numbers in the western part of the Famenne-Calestienne.

Ypsolophidae

Ypsolopa horridella (Treitschke, 1835) – Dark Smudge: rare yet widely distributed across the area in small numbers.

Ypsolopa lucella (Fabricius, 1775) – Plain Smudge: 1 specimen on 23.vii.2004 at the quarry du Fond des Vaux at Wellin (LX) (De Prins 2005). **New species for the province of LX.** Further observations: 1 specimen on 13.vii.2014 at Les Spinets at On (LX), leg. J. Jansen *et al.* 1 specimen on 25.vi.2022 at Comogne near Focant (NA). 1 specimen on 16.vii.2022 at Mont des Pins near Bomal (LX), leg. Leafminers working group. 1 specimen on 26.vii.2022 at On (LX), leg. E. Van de Schoot.

Ypsolopa mucronella (Scopoli, 1763) – Spindle Smudge: 1 specimen on 09.iv.2004 at Bois d'Oro at Wellin (LX) (De Prins 2005). **This is only the second known observation for Belgium and new for the province of LX.** About a week later, the third observation happened on 17.iv.2004 at Gros Tienne near Lavaux-Ste.-Anne (NA) (De Prins 2005) and was **the first for the province of NA.** From then on seen irregularly, mostly as singles. Still a very rare species.

Ypsolopa vittella (Linnaeus, 1758) – Elm Smudge: 1 specimen on 02.viii.2018 at Mont des Pins near Bomal (LX), leg. D. & P. Gailly.

Glyphipterigidae

Orthotelia sparganella (Thunberg, 1788) – Reed Fanner: 2 larvae on 01.v.2017 at Han-sur-Lesse (NA), leg. R. Meert. 1 specimen on 06.vii.2017 at Comogne near Focant (NA). A very rare species in southern Belgium.

Digitalvalva pulicariae (Klimesch, 1956) – Fleabane Fanner (Fig. 4): 1 specimen on 24.iv.2017 at Han-sur-Lesse (NA). **The species was only seen before 1980 in this province.**



Fig. 4. *Digitalvalva pulicariae*, 24.iv.2017, Han-sur-Lesse, NA. © Chris Steeman.

Argyresthiidae

Argyresthia abdominalis Zeller, 1839 – Downland Argent: where *Juniperus* (Cupressaceae) (*Juniperus*) grows, the species is present, sometimes even in good numbers.

Argyresthia ivella (Haworth, 1828) – Gold-four Argent: 10 specimens on 22.vii.2015 at Turmont at Han-sur-Lesse (NA), leg. W. Mertens *et al.* 1 specimen on 22.viii.2015 at Maupas near Belvaux (NA), leg. W. Mertens *et al.* 6 specimens on 13.viii.2022 at Ri d'Howisse near Wavreille (NA). A very rare species that only occurs in the provinces of NA and LX.



Fig. 5. *Argyresthia arceuthina*, 05.v.2017, Belvaux, NA. © Chris Steeman.

Argyresthia dilectella Zeller, 1847 – Juniper Argent: 1♀ on 05.viii.2017 at Tienne des Vignes near Resteigne (LX), leg. Leafminers working group, gen. det. S. Wullaert. Also, a species that is bound to *Juniperus* with few observations in Belgium.

Argyresthia praecocella Zeller, 1839 – Ochreous Argent: 1♀ on 03.v.2019, 1♀ and 1 specimen on 17.v.2019, 1♂ on 27.v.2022, all at Les Pairées Ouest near Resteigne (LX), leg. Leafminers working group, gen. det. S. Wullaert, A. Beidts & C. Steeman. A *Juniperus* specialist that is very rarely seen.

Autostichidae

Oegoconia quadripuncta (Haworth, 1828) – Four-spotted Obscure: 1♂ on 25.vi.2018 at Petite Tinaimont near Han-sur-Lesse (NA).

Oecophoridae

Aploa palpellus (Haworth, 1828) – Scarce Brown Streak: 2 specimens on 05.viii.2017 at the quarry de Bièrnauchamps at Wavreille (NA). **New species for the province of NA.** 2 specimens on 23.vii.2018 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA), leg. Leafminers working group. 1 specimen on 25.vii.2018 at Ri d'Howisse near Wavreille (NA). 1 specimen on 05.viii.2019 at the quarry du Batis d'Haurt near Bure (LX). A very rare and local species.

Pleurota aristella (Linnaeus, 1767): a very rare and local species in very small numbers throughout the area.

Depressariidae

Agonopterix atomella (Denis & Schiffermüller, 1775) – Greenweed Flat-body: 1♂ on 09.v.2021 at Mont des Pins near Bomal (LX), leg. Leafminers working group, gen. det. S. Wullaert. Only a few specimens are known in Belgium.

Agonopterix kaekeritziana (Linnaeus, 1757) – Straw Flat-body (Fig. 6): 1♂ on 08.viii.2017 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour, E. Thoen & C. Steeman, gen. det. C. Steeman. It was since 1858 that this species was reported from Belgium. A strongly declining species of which hitherto only 2 observations are known after 1980.



Fig. 6. *Agonopterix kaekeritziana*, 08.viii.2017, Marche-en-Famenne, LX. © Chris Steeman.

Agonopterix nanatella (Stainton, 1849) – Carline Flat-body: 1 specimen on 21.viii.2003 at the quarry de la Falize at Aywaille (LG), leg. R. Spronck (De Prins 2005). **New species for the province of LG.** This remains a hot spot for this species.

Agonopterix yeatiana (Fabricius, 1781) – Coastal Flat-body: 1 specimen on 02.iv.2005 at Gros Tienne near Lavaux-Ste.-Anne (NA) (De Prins 2006). **New species for the province of NA.** 1 specimen on 08.v.2016 at the Briqueterie de Rome near Durbuy (LX).

Depressaria pulcherrimella Stainton, 1849 – Pignut Flat-body: 1♂ on 21.viii.2018 at Les Pairées Ouest near Resteigne (LX). **New species for the province of LX.** 1 specimen on 15.ix.2019 at Mont des Pins near Bomal (LX), leg. D. Gailly *et al.*

Depressaria ultimella Stainton, 1849 – Fen Flat-body: currently only known from 2 locations in Belgium. The species does not fly far from the foodplant and does not come to light, which is also the reason why few sightings are known. There is a healthy population nearby Gros Tienne near Lavaux-Ste.-Anne (NA), discovered in 2019, leg. R. Meert. **A new species for the province of NA.**

Semioscopus oculella (Thunberg, 1794) (Fig. 7): 1 specimen on 29.iii.2006 at Gros Tienne near Lavaux-Ste.-Anne (NA). **New species for the province of NA.** 1 specimen on 29.iii.2017, 2 specimens on 26.iii.2018, 3 specimens on 03.iv.2018 and another specimen on 27.ii.2022, all at Grand Quarti near Finnevaux (NA). An early spring species that can fly from the end of February, is probably the reason why there are so few observations of this very rare species.



Fig. 7. *Semioscopus oculella*, 26.iii.2018, Finnevaux, NA. © Chris Steeman.

Anchinia cristalis (Scopoli, 1763): *Daphne mezereum* L. (Thymelaeaceae) (Mezereon) is a fairly common plant in the limestone region and this species is therefore well represented where this plant grows. Usually found as a mine or as a caterpillar, adults are not commonly seen as they are moderately attracted to light.

Lypusidae

Agnoea flavifrontella (Denis & Schiffermüller, 1775) – Yellow-headed Tubic: 1♂ on 31.v.2020 at Grand Quarti near Finnevaux (NA).

Agnoea latipennella (Jäckh, 1959): 1♂ on 28.v.2022 at Grignaux et Hérumont at Han-sur-Lesse (NA), leg. Leafminers working group, gen. det. S. Wullaert.

Gelechiidae

Anacamptis obscurella (Denis & Schiffermüller, 1775): in small numbers throughout the area.

Aproaerema ochrofasciella (Toll, 1936): 5 mines on 23.vi.2017 at Gros Tienne near Lavaux-Ste.-Anne (NA). 2 mines on 28.vi.2020 at Les Pairées Ouest near Resteigne (LX), leg. Leafminers working group.

Aproaerema patruella (Mann, 1857): 1♂ on 16.ix.2018 at Grand Quarti near Finnevaux (NA). **This was the first observation for Belgium** (Wullaert 2019).

Aproaerema vinella Banks, 1898: in small numbers throughout the area.

Mesophleps silacella (Hübner, 1796) – Straw Crest: irregularly found on Maupas near Belvaux (NA).

Nothris lemniscellus (Zeller, 1839): in small numbers on limestone rocks in the Calestienne. Leafmines are more commonly observed than adults.

Acompsia schmidtellus (Heyden, 1848) – Marjoram Crest: singles scattered over the area.

Aristotelia brizella (Treitschke, 1833) – Thrift Neb: for the present an unusual sighting of 2 specimens on 24.v.2021 at Grand Quarti near Finnevaux (NA), leg. Leafminers working group, gen. det. C. Steeman. **New species for the province of NA.** The foodplant *Armeria maritima* (Mill.) Willd. (Plumbaginaceae) (Thrift) is not present in the reserve, it probably grows as an ornamental plant in gardens in the nearby villages.

Metzneria aestivella (Zeller, 1839) – Carline Neb: a healthy population occurs in the quarry du Goiveux and the adjacent quarry de la Falize at Aywaille (LG).

Monochroa lutulentella (Zeller, 1839) – Black Neb: singles scattered over the area.

Oxypteryx immaculatella (Douglas, 1850) – Twilight Neb: 3 specimens on 25.vi.2018 at Petite Tinaimont near Han-sur-Lesse (NA). **New species for the province of NA.** 1♂ on 31.v.2020 and 1 specimen on 26.v.2022, both at Grand Quarti near Finnevaux (NA).

Athrips rancidella (Herrich-Schäffer, 1854) – Cotoneaster Webworm: a healthy population in the western part of the Famenne-Calestienne.

Chionodes distinctella (Zeller, 1839) – Eastern Groundling: 1♂ on 25.vi.2018 at Petite Tinaimont near Han-sur-Lesse (NA).

Chionodes fumatella (Douglas, 1850) – Downland Groundling: 1♀ on 24.vii.2016 at Ri d'Howisse near Wavreille (NA), leg. Leafminers working group, gen. det. S. Wullaert. **New species for the province of NA and second observation for Belgium.**

Mirificarma lentiginosella (Zeller, 1839) – Greenweed Groundling: 1♂ on 21.viii.2018 at Les Pairées Ouest near Resteigne (LX). 1♂ on 16.ix.2018 at Grand Quarti near Finnevaux (NA), leg. Leafminers working group, gen. det. S. Wullaert.

Caryocolum fraternella (Douglas, 1851) – Mouse-ear Groundling: 2♂ on 24.vii.2016 at Ri d'Howisse near Wavreille (NA), leg. Leafminers working group, gen. det. S. Wullaert. **New species for the province of NA.** 1♂ on 05.viii.2019 at the same place. 2♂ on 02.viii.2019 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour *et al.*

Caryocolum kroesmanniella (Herrich-Schäffer, 1854) – Scarce Groundling: 1♂ on 31.vii.2018 at Grignaux et Hérumont at Han-sur-Lesse (NA). 1 specimen on 02.viii.2018 at Mont des Pins near Bomal (LX), leg. D. Gailly. 1 larva between *Stellaria holostea* L. (Caryophyllaceae) (Greater Stitchwort) reared on 27.iv.2019 at Jemelle (NA).

Caryocolum tricolorella (Haworth, 1812) – Three-colour Groundling: 1♂ on 08.viii.2017 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour, E. Thoen & C. Steeman, gen. det. C. Steeman.

Caryocolum vicinella (Douglas, 1851) – Coast Groundling: 2♂ on 23.vii.2018 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA), leg. Leafminers working group, gen. det. S. Wullaert.

Scrobipalpa obsoletella (Fischer von Röslerstamm, 1841) – Summer Groundling: 1♂ on 08.v.2016 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group, gen. det. S. Wullaert. **New species for the province of LX.**

Carpatolechia decorella (Haworth, 1812) – Winter Oak Groundling (Fig. 8): one of the few overwintering Gelechiidae in the adult stage. 1 specimen on 23.vi.2017 at Parc animalier du Domaine des Grottes at Han-sur-Lesse. This species had not been reported from Belgium since 1858. **New species for the province of NA.** 1 specimen on 21.ii.2018, leg. M. Valdueza and 1♂ on 21.ix.2020, both at Petite-Tinaimont near Han-sur-Lesse. 1♀ on 19.ix.2020 and 1 specimen on 27.ix.2021 at Grignaux et Hérumont at Han-sur-Lesse. 1♂ on 04.xii.2020 at Belvaux. All these observations were made in the immediate vicinity of the caves near Han-sur-Lesse (NA).



Fig. 8. *Carpatolechia decorella*, 27.ix.2021, Han-sur-Lesse, NA. © Chris Steeman.

Carpotolechia fugacella (Zeller, 1839): 1 specimen on 22.vi.2020 at the quarry de la Falize at Aywaille (LG) and another specimen on 06.vi.2022 at Gros Tienne near Lavaux-Ste.-Anne (NA), both leg. Leafminers working group.

Teleiopsis rosabella (Fologne, 1862): a healthy population occurs at Jemelle (NA).

Elachistiidae

Elachista adscitella Stainton, 1851 – Oblique-barred Dwarf: 2♀ on 10.ix.2016 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. W. Mertens *et al.*, gen. det. S. Wullaert. 1♂ on 05.viii.2017 at the quarry de Bièrnauchamps at Wavreille (NA). 1♂ on 12.vi.2022 at Les Pairées Ouest near Resteigne (LX), leg. Leafminers working group, gen. det. S. Wullaert.

Elachista albifrontella (Hübner, 1817) – White-headed Dwarf: 1♂ on 21.v.2020 at Ri d'Howisse near Wavreille (NA). 4♂ on 23.v.2020 at Basse Wimbe near Lessive (NA). 3♂ on 12.vi.2022 at Les Parées Ouest near Resteigne (LX), leg. Leafminers working group, gen. det. S. Wullaert.

Elachista bedellella (Sircom, 1848) – Grey Dwarf: 1♂ on 03.v.2019 at Turmont at Han-sur-Lesse (NA).

Elachista biatomella (Stainton, 1848) – Two-dotted Dwarf: 1♂ on 29.vi.2020 at Gros Tienne near Lavaux-Ste.-Anne (NA), Leafminers working group, gen. det. S. Wullaert.

Elachista bisulcella (Duponchel, 1843) – Yellow-tipped Dwarf: 1♂ on 23.vii.2018 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA), leg. Leafminers working group, gen. det. S. Wullaert. **New species for the province of NA.** 2♂ on 20.vii.2022 at Comogne near Focant (NA). 1 ex. on 08.viii.2022 at Grand Quarti near Finnevaux. (NA).

Elachista chryso-desmella Zeller, 1850: scattered throughout the area in small numbers.

Elachista cinereopunctella (Haworth, 1828) – Grey-spotted Dwarf: scattered throughout the area in small numbers.

Elachista differens Parenti, 1978: 2♂ on 24.vi.2018 at Petite Tinaumont near Han-sur-Lesse (NA). **This species has never been observed in Belgium before** (Steehan 2019a). 1♀ on 21.vi.2020 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group, gen. det. S. Wullaert. 1♂ on 06.vi.2022 at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. Leafminers working group, gen. det. S. Wullaert.

Elachista freyerella (Hübner, 1825) – Broken-barred Dwarf: 1♂ on 02.ix.2018 at Grignaux et Hérimont at Han-sur-Lesse (NA).

Elachista gangabella Zeller, 1850 – Yellow-barred Dwarf: scattered throughout the area in small numbers.

Elachista gleichenella (Fabricius, 1781) – Twin-barred Dwarf: 1♂ on 12.vi.2022 at Les Pairées Ouest near

Resteigne (LX), leg. Leafminers working group, gen. det. C. Steeman. **New species for the province of LX.**

Elachista humilis Zeller, 1850 – Obscure Dwarf: 1♂ on 13.v.2019 at Grand Quarti near Finnevaux (NA). **New species for the province of NA.**

Elachista lastrella Chrétien, 1896: small numbers late April-May in the Calestienne around Han-sur-Lesse (NA).

Elachista metella Kaila, 2002: this species was described new to science in 2002 and belongs to the *Elachista cingillella* (Herrich-Schäffer, 1855) complex. After investigation by Kaila & Junnilainen 2002, this complex consists of 6 valid species. All references to *Elachista cingillella* from southern Europe and Belgium in fact concern *Elachista metella*. Recorded from the province of NA as *Elachista cingillella* based on three male specimens which were caught at Belvaux on 26.v.1980, leg. & gen. det. G. & W. De Prins. During 2019 one ♂ was collected on 17.v. at Les Pairées Ouest near Resteigne (LX). **The occurrence of this species is thus reported here for the first time for Belgium.** Later observations in the area: 2♂ on 10.viii.2020 at Ave-et-Auffe (NA), 1♂ on 05.vi.2021 at the quarry de la Falize at Aywaille (LG), both leg. Leafminers working group, gen. det. S. Wullaert. 1♂ on 12.vi.2022 at Les Pairées Ouest near Resteigne (LX). Hitherto a very rare species in very small numbers.

Elachista pullicomella Zeller, 1839: scattered throughout the area in small numbers.

Elachista subnigrella Douglas, 1853 – Dark Dwarf: 1♂ on 08.v.2018 and another ♂ on 17.v.2019, both at Les Pairées Ouest near Resteigne (LX). **New species for the province of LX.**

Elachista unifasciella (Haworth, 1828) – Narrow-barred Dwarf: 1♂ on 08.vi.2019 and 1♂ on 12.vi.2022, both at Les Pairées Ouest near Resteigne (LX), leg. Leafminers working group, gen. det. S. Wullaert.

Elachista utonella Frey, 1856 – Bog Dwarf: 1♂ on 06.vii.2019 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour *et al.*

Perittia obscurepunctella (Stainton, 1848) – Honeysuckle Dwarf: some leafmines found throughout the area.

Stephensia brunnichella (Linnaeus, 1767) – Basil Dwarf: 1♀ on 08.v.2018 at Tienne du Grand Sart at Wiesme (NA). Since 1862 this species had not been reported from Belgium. From the search for leafmines we now know that there is a healthy population throughout the area.

Chrysoclista linneella (Clerck, 1759) – Lime Cosmet: a species that is very rare everywhere in Belgium, only a few caterpillars have been found near Les Pairées Ouest near Resteigne (LX).

Spuleria flavicaput (Haworth, 1828) – Yellow-headed Cosmet: 1 specimen on 16.v.2015 at the Briqueterie de Rome near Durbuy (LX) (Wullaert 2021a). **New species for the province of LX.** 1 specimen on 21.v.2016 at Les Pairées Est near Resteigne (LX), leg. P. Lighezzolo.

Coleophoridae

Coleophora adjunctella Herrich-Schäffer, 1861 – Southern Case-bearer: 1 case on 03.v.2014 at Gros Tienne near Lavaux-Ste.-Anne (NA). **This was the first observation for Belgium** (Van Steenwinkel & Wullaert 2016). Nowadays well represented throughout the area.

Coleophora conspicuella Zeller, 1849 – Knapweed Case-bearer (Fig. 9): very small populations present at the Briqueterie de Rome near Durbuy (LX) and at the military camp at Marche-en-Famenne (LX).



Fig. 9. *Coleophora conspicuella*, 15.v.2018, Durbuy, LX. © Chris Steeman.

Coleophora conyzae Zeller, 1868 – Spikenard Case-bearer: 1 case on 06.vi.2015 at the quarry de la Falize at Aywaille (LX), leg. Leafminers working group.

Coleophora coracipennella (Hübner, 1796) – Blackthorn Case-bearer: 1♂ on 22.vii.2019 at Comogne near Focant (NA).

Coleophora galbulipennella Zeller, 1838 – Kent Case-bearer: 1 specimen on 07.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group (Wullaert 2015). The species was only known before 1980 in our country.

Coleophora gallipennella (Hübner, 1796): **first found new for the province of NA** on 12.ix.2010, a few bags on *Astragalus glycyphyllos* L. (Papilionoideae) (Wild Liquorice) at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. Leafminers working group (De Prins & Steeman 2011). Nowadays, present in very small numbers, usually found as a case.

Coleophora ochrea (Haworth, 1828) – Large Buff Case-bearer: well represented in dry limestone areas, only found where the foodplant *Helianthemum nummularium* Mill. (Cistaceae) (Common Rock-rose) grows.

Coleophora orbitella Zeller, 1849 – Pale Birch Case-bearer: 1♂ on 22.v.2020 at Grand Quarti near Finnevaux (NA).

Coleophora paripennella Zeller, 1839 – Dark Thistle Case-bearer: very small numbers throughout the area.

Coleophora prunifoliae Doets, 1944 – New Sloe Case-bearer: very small numbers throughout the area.

Coleophora ramosella Zeller, 1849 – Daisy Case-bearer: 5♂ on 02.vii.2016 at Maupas near Belvaux (NA). **This species has never been observed in Belgium before** (Wullaert 2017). Nowadays quite frequently in the vicinity of Han-sur-Lesse (NA) where *Galatella linosyris subsp. linosyris* (Asteraceae) (Goldilocks Aster) grows on limestone cliffs.

Coleophora saxicolella (Duponchel, 1843) – Orache Case-bearer: although the foodplants *Atriplex* sp. and *Chenopodium* sp. (Amaranthaceae) (Saltbush & Goosefoot) are common in the region and also in Belgium, the species is infrequently found.

Coleophora sylvaticella (Wood, 1892) – Hereford Case-bearer: 1♂ on 20.v.2019 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group, gen. det. S. Wullaert. 1♀ on 26.v.2022 at Grand Quarti near Finnevaux (NA).

Coleophora therinella (Tengström, 1848) – Blackbindweed Case-bearer: 1♂ on 24.vii.2016 at Ri d'Howisse near Wavreille (NA) (Wullaert 2017). **New species for the province of NA.**

Coleophora trigeminella Fuchs, 1881 – Scarce Thorn Case-bearer: 1 case found on 08.vi.2019 at Les Pairées Ouest near Resteigne (LX), leg. Leafminers working group. Only a handful of sightings in Belgium.

Coleophora trochilella (Duponchel, 1843) – Verge Case-bearer: 1 specimen on 03.v.2014 at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. Leafminers working group. 6 cases on 16.v.2015 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group (De Prins, Steeman & Sierens 2016). **New species for the province of LX.**

Coleophora versurella Zeller, 1849 – Pale Orache Case-bearer: only one observation: 1♀ on 22.vii.2020 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group, gen. det. S. Wullaert.

Coleophora vestianella (Linnaeus, 1758) – Easter Case-bearer: an extremely rare species, very few observations in Belgium. 1♀ on 23.ix.2018 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. Leafminers working group, gen. det. S. Wullaert. **New species for the province of NA.**

Coleophora virgaurea Stainton, 1857 – Golden-rod Case-bearer (Fig. 10): quite frequently in the vicinity of Han-sur-Lesse (NA) where *Solidago virgaurea* L. (Asteraceae) (Goldenrod) grows, but cases are hard to find on the foodplant.

Coleophora wockeella Heinemann, 1854 – Betony Case-bearer: 3♂ on 25.vi.2018 at Petite Tinaimont near Han-sur-Lesse (NA). **This was the first observation for Belgium** (Steeman 2019a). Cases are found every year at this place. Hitherto known from two locations in Belgium.



Fig. 10. *Coleophora virgaurea*, 17.xi.2018, Han-sur-Lesse, NA. © Chris Steeman.

Coleophora zelleriella Heinemann, 1854 - : also a very rare species with few observations in Belgium. 1♂ on 06.vii.2019 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour *et al.*

Momphidae

Mompha conturbatella (Hübner, 1819) – Large Dark Mompha: only one sighting: 1 specimen on 08.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group.

Scythrididae

Scythris dissimilella (Herrich-Schäffer, 1855): small scattered populations.

Scythris laminella (Denis & Schiffermüller, 1775): present in very small numbers.

Scythris picaepennis (Haworth, 1828) – White-dusted Owlet: 1♂ on 18.vi.2018 and 2♀ on 22.v.2020, both at Gros Tienne near Lavaux-St.-Anne (NA).

Scythris subcinctella (Bruand, 1851) – Copper Owlet: 1♂ on 25.v.2017 at Maupas near Belvaux (NA). **This species has never been observed in Belgium before** (Steeman & Sierens 2018). Nowadays the species has small and healthy populations around the Han-sur-Lesse (NA) area.

Alucitidae

Alucita desmodactyla Zeller, 1847 : 1♂ on 16.vii.2022 at Mont des Pins near Bomal (LX). **This was the first observation for Belgium** (Wullaert 2023).

Pterophoridae

Calyciphora albodactylus (Fabricius, 1794): a healthy population at the quarry de la Falize and the quarry du Goiveux at Aywaille (LG).

Capperia fusca (Hofmann O., 1898): small numbers throughout the area.

Marasmarcha lunaedactyla (Haworth, 1811) – Crescent Plume: small numbers throughout the area. A healthy population at Les Spinets at On (LX).

Merrifieldia leucodactyla (Denis & Schiffermüller, 1775) – Thyme Plume: 1 specimen on 25.vi.2016 at Gros Tienne near Lavaux-St.-Anne (NA), leg. W. Mertens *et al.*

Oxyptilus chrysodactyla (Denis & Schiffermüller, 1775): small numbers throughout the area.

Oxyptilus parvidactyla (Haworth, 1811) – Small Plume: singles at the quarry de la Falize at Aywaille (LG) and at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA).

Platyptilia nemoralis Zeller, 1841: only two sites: 1 specimen on 13.viii.2007 at the military camp at Marche-en-Famenne (LX). 1 specimen on 08.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group.

Stenoptilia stigmatodactylus (Zeller, 1852): 2 specimens on 13.viii.2007 at the military camp at Marche-en-Famenne (LX).

Epermeniidae

Phaulernis dentella (Zeller, 1839) – Scale-tooth Lancewing (Fig. 11): only 1 sighting of this ubiquitously very rare species: 1 specimen on 21.v.2020 at Ri d'Howisse near Wavreille (NA).



Fig. 11. *Phaulernis dentella*, 21.v.2020, Wavreille, NA. © Chris Steeman.

Choreutidae

Choreutis pariana (Clerck, 1759) – Apple Leaf Skeletoniser: 1 larva on 20.viii.2012 at Gros Tienne near Lavaux-St.-Anne (NA), leg. C. Snyers. 5 larvae on 30.viii.2014 at Rochefort (NA), leg. D. Sloommaekers *et al.* 2 specimens on 07.viii.2017 at the military camp at Marche-en-Famenne (LX).

Prochoreutis myllerana (Fabricius, 1794) – Small Metal-mark: 1♀ on 16.ix.2018 at Gros Tienne near Lavaux-St.-Anne (NA), leg. Leafminers working group.

Tortricidae

Olindia schumacherana (Fabricius, 1787) – White-barred Tortrix: 3 specimens on 06.vi.2015 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group. 6 specimens on 08.vi.2014 at the Briqueterie de Rome near Durby (LX), leg. Leafminers working group. 1 specimen on 25.vi.2016 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA), leg. W. Mertens *et al.* 2 specimens on 02.vi.2018 at Ave-et-Auffe (NA).

Periclepsis cinctana (Denis & Schiffermüller, 1775) – Dover Twist (Fig. 12): a species that is well represented in the limestone region. A nice population around Maupas near Belvaux (NA) with a maximum of 30 specimens on 25.v.2017.



Fig. 12. *Periclepsis cinctana*, 25.v.2017, Lavaux-Ste.-Anne, NA. © Chris Steeman.

Aphelia viburnana (Denis & Schiffermüller, 1775) – Bilberry Tortrix: 2♂ on 07.vi.2014 at the Briqueterie de Rome near Durby (LX), leg. Leafminers working group, gen. det. S. Wullaert. 2 specimens on 16.vi.2020 at Grand Quarti near Finnevaux (NA).

Choristoneura diversana (Hübner, 1817) – Forest Tortrix (Fig. 13): 3 specimens on 18.vi.2018 at Grand Quarti near Finnevaux (NA). A very rare species, not often recorded.



Fig. 13. *Choristoneura diversana*, 18.vi.2018, Finnevaux, NA. © Chris Steeman.

Clepsis senecionana (Hübner, 1819) – Obscure Tortrix: a small population is present at the Briqueterie de Rome near Durby (LX).

Dichelia histrionana (Frölich, 1828) – Spruce Tortrix: very sparsely represented in the area.

Ptycholomoides aeriferana (Herrich-Schäffer, 1851) – Yellow Larch Tortrix: only one sighting of a specimen on 11.vii.2016 at Grand Tinaimont near Han-sur-Lesse (NA).

Cnephasia cupressivorana (Staudinger, 1871): 2♂ on 13.v.2019 at Grand Quarti near Finnevaux (NA). **This species has never been observed in Belgium before** (Steeman 2021b). Nowadays there is a nice population of this early spring *Cnephasia* in this nature reserve. First observations outside this area: 1♂ on 02.v.2022 at Comogne near Focant (NA). These 2 areas are the only places in Belgium where this species occurs.

Cnephasia genitalana Pierce & Metcalfe, 1922 – Dover Shade: scattered in small numbers throughout the area.

Cnephasia longana (Haworth, 1811) – Long-winged Shade: only 1 sighting of a ♀ on 04.vii.2018 at Comogne near Focant (NA).

Cnephasia pasiuana (Hübner, 1799) – Meadow Shade: scattered in small numbers throughout the area.

Eana incanana (Stephens, 1852) – Bluebell Shade: due to its similarity to *Cnephasia* species, the species can be determined by checking the genitalia. Only one sighting: 1♂ on 26.v.2022 at Grand Quarti near Finnevaux (NA).

Eana argentana (Clerck, 1759) – Silver Shade: 3 specimens on 30.vi.2018 at Mont des Pins near Bomal (LX), leg. D. Gailly & P. Vanmeerbeek.

Exapate congelatella (Clerck, 1759) – Autumnal Shade: a nice healthy population at Ri d'Howisse near Wavreille (NA). Outside this area, there are only 2 sites in Belgium where this species occurs: at Teuven (LI) and in Vallée de la Sûre near Géronne (LX). Due to the late flight time it is possible that this species is overlooked.

Acleris permutana (Duponchel, 1836) – Buff Button: 1 specimen on 11.vii.2015 at Tienne d'Aise near Ave-et-Auffe (NA), leg. R. Nossent *et al.* A species in Belgium only known from a few specimens.



Fig. 14. *Acleris roscidana*, 17.v.2022, Focant, NA. © Chris Steeman.

Acleris roscidana (Hübner, 1799) (Fig. 14): 1♀ on 06.viii.2018 at Comogne near Focant (NA). **This was the first observation for Belgium** (Steeman 2019b). Another

♀ on 17.v.2022 at the same place. As far as known, the only place in Belgium to observe this species.

Acleris rufana (Denis & Schiffermüller, 1775) – Sweetgale Button: 1 specimen on 16.xi.2016 at Gros Tienne near Lavaux-Ste.-Anne (NA). **New species for the province of NA.** 1♀ on 13.iv.2022 at Ri d’Howisse near Wavreille (NA). The species is very rare in the Famenne-Calestienne area, but it is more common in damp and peaty areas further south in the country.

Acleris shepherdana (Stephens, 1852) – Meadow-sweet Button: 1 specimen on 16.viii.2016 at Gros Tienne near Lavaux-Ste.-Anne (NA). Two specimens on 28.vii.2020 at Ri d’Howisse near Wavreille (NA) and another specimen on 20.vii.2022 at Comogne near Focant (NA). This species is very rare in the Famenne-Calestienne area and it is confined to wetland habitats.

Aethes bilbaensis (Rössler, 1877) – Samphire Conch: a recent species new to Belgium in 2016 in LI (Steeman & Sierens 2018; Wullaert 2018). The next Belgium observation was 1♂ in Les Hectais et Fosse Eghin near Belvaux (NA) on 18.vii.2017. Another ♂ on 06.vii.2019 at the military camp at Marche-en-Famenne (LX) and 1♂ and 1♀ on 02.viii.2019 at the same location. 1♂ on 03.ix.2022 at Comogne near Focant (NA).

Aethes hartmanniana (Clerck, 1759) – Scabious Conch: a rare species that only occurs in NA and LX, it prefers *Knautia* sp. (Caprifoliaceae) (*Scabiosa* sp.) and *Scabiosa* sp. (Caprifoliaceae) (*Pincushius* sp.) that grows on drier soils. Irregularly distributed throughout the area in small numbers. A maximum of up to 10 specimens on 25.v.2016 at bois de Grandhan near Durbuy (LX), leg. L. Decrick *et al.*

Aethes margaritana (Haworth, 1811) – Silver Coast Conch: the only place in the area where the species occurs is at the military camp at Marche-en-Famenne (LX), where there is a good population.

Aethes piercei Obratzsov, 1952 – Devil’s-bit Conch: only occurring in NA and LX, it prefers wetter soils where the foodplant *Succisa pratensis* Moench (Caprifoliaceae) (Devil’s-bit Scabious) grows. A healthy population at Grand Quarti near Finnevaux (NA), outside this nature reserve only sightings of singles.

Commophila aeneana (Hübner, 1800) – Orange Conch: very sparingly distributed throughout the area with a small population at Ave-et-Auffe (NA).

Diceratura ostrinana (Guenée, 1845): after 2004 only observed in the Namur Famenne -Calestienne area with several good populations at Gros Tienne near Lavaux-Ste.-Anne (NA) and Comogne near Focant (NA).

Falseuncaria ruficiliana (Haworth, 1811) – Red-fringed Conch: a very rare species in NA and only known from 2 places in Belgium. Since 2020 seen every year in very small numbers at Grand Quarti near Finnevaux (NA).



Fig. 15. *Falseuncaria ruficiliana*, 08.viii.2022, Finnevaux, NA. © Chris Steeman.

Phalonidia gilvicomana (Zeller, 1847) – Wall-lettuce Conch: 1 specimen on 22.vii.2015 at Turmont at Han-sur-Lesse (NA), leg. W. Mertens *et al.* 1 specimen on 02.viii.2018 at Mont des Pins near Bomal (LX), leg. D. & P. Gailly. New species for the province of LX.

Phtheochroa sodaliana (Haworth, 1811) – Buckthorn Conch: a very rare species that occurs only at LG and LX and only known from a handful of observations. 1 specimen on 08.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group.

Apotomis lineana (Denis & Schiffermüller, 1775) – Willow Marble: 1 specimen on 11.vii.2015 at Tienne d’Aise near Ave-et-Auffe (NA), leg. R. Nossent *et al.*

Celypha rurestrana (Duponchel, 1843) – Hawkweed Marble: each time 1 specimen on 06.vi.2004 and 04.vi.2005, both at Gros Tienne near Lavaux-Ste.-Anne (NA). New species for the province of NA. 2♂ on 06.vi.2015 and 1♂ on 19.ix.2019, both at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group.

Phiaris umbrosana (Freyer, 1842): only a handful of sightings of this very rare species are known in NA and LX. 1 specimen on 16.v and 17.v.2017, both at Grand Quarti near Finnevaux (NA). 1 specimen on 26.v.2017 at Les Hectais et Fosse Eghin near Belvaux (NA) and also on the same day 2 specimens at Tienne d’Aise near Ave-et-Auffe (NA).

Pseudosciaphila branderiana (Linnaeus, 1758) – Great Marble: very few sightings of this very rare species in Belgium. 2 specimens on 05.vi.2017 and 1 specimen on 16.vi.2020, both at Grand Quarti near Finnevaux (NA).

Endothenia lapideana (Herrich-Schäffer, 1851) (Fig 15): 5 larvae on 21.iii.2018 at Tienne des Vignes near Resteigne (LX). **This was the first observation for Belgium** (Meert 2018). Nowadays this species is found to be particularly numerous where the foodplant *Digitalis lutea* (Plantaginaceae) (Straw Foxglove) grows in the Famenne-Calestienne area. It is found more as a larva than as an adult, because the latter does not come to light. Hitherto, the species can only be found in the wider area of Han-sur-Lesse (Famenne-Calestienne) and in the Viroinval in the wider area around Nismes (Fagne).



Fig. 16. *Endothenia lapideana*, 06.vi.2018, Ave-et-Auffe, NA. © Chris Steeman.

Bactra robustana (Christoph, 1872) – Saltern Marble: 1♂ on 24.v.2022 at bois des Petites Tailles near Revogne (NA). **New species for the province of NA.**

Ancylis tineana (Hübner, 1799) – Rannoch Roller: 1 specimen on 24.iv.2022 at Comogne near Focant (NA). A very rare species in NA.

Ancylis unguicella (Linnaeus, 1758) – Broken-barred Roller: another very rare *Ancylis* species in NA. 1 specimen on 24.vii.2016 at Ri d’Howisse near Wavreille (NA), leg. Leafminers working group. **New species for the province of NA.**

Eucosmomorpha albersana (Hübner, 1813) – Honeysuckle Bell (Fig. 16): very irregular sightings throughout the area.



Fig. 17. *Eucosmomorpha albersana*, 03.vi.2006, Belvaux, NA. © Chris Steeman.

Crociosema plebejana Zeller, 1847 – Southern Bell: only 1 sighting of this rare migrant: 1 specimen on 08.xi.2015 at Ave-et-Auffe (NA), leg. W. Mertens *et al.*

Epiblema scutulana (Denis & Schiffermüller, 1775) – Knapweed Bell: 1 specimen on 21.v.2016 at Basse Wimbe near Lessive (NA), leg. D. Sloomackers *et al.* 1♀ on 21.v.2018 at Maupas near Belvaux (NA).

Epinotia cruciana (Linnaeus, 1761) – Willow Tortrix: only one observation: 1 specimen on 19.vii.2015 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group.

Epinotia maculana (Fabricius, 1775) – Dark Aspen Bell: 1 specimen on 16.ix.2018 at Grand Quarti near Finnevaux (NA), leg. Leafminers working group.

Eriopsela quadrana (Hübner, 1813) – Four-spot Bell: 1 specimen on 07.v.2016 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. **After 110 years this species has been rediscovered** (Wullaert 2017).

Eucosma aspidiscana (Hübner, 1817) – Golden-rod Bell: stronghold of this species in NA, a good population occurs at Gros Tienne near Lavaux-Ste.-Anne (NA). Has been observed less and less in recent years.

Gypsonoma oppressana (Treitschke, 1835) – Poplar Shoot: 1 specimen on 19.vii.2015 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. **A new species for the province of LX.** 1 specimen on 18.vii.2017 at Les Hectais et Fosse Eghin near Belvaux (NA). 1 specimen on 02.viii.2018 at Mont des Pins near Bomal (LX), leg. D. Gailly.

Zeiraphera ratzeburgiana (Saxesen, 1840) – Spruce-bud Moth: 1♀ on 08.viii.2020 at Ri d’Howisse near Wavreille (NA). **New species for the province of NA.** A very rare species in southern Belgium.

Cydia conicolana (Heylaerts, 1874) – Pine-cone Piercer: 2 specimens on 26.v.2017 at Les Hectais et Fosse Eghin near Belvaux (NA).

Cydia coniferana (Saxesen, 1840) – Pine-bark Piercer: 1♂ on 10.viii.2020 at Le Roptai at Ave-et-Auffe (NA), leg. Leafminers working group.

Cydia illutana (Herrich-Schäffer, 1851) – Larch Piercer: 1 specimen on 07.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. 2 specimens on 26.v.2022 and 1♂ and 1♀ on 27.v.2022, both at Grand Quarti near Finnevaux (NA).

Cydia indivisa (Daniletsky, 1963) – Spruce-bark Piercer: 1♂ on 09.v.2020 at Grand Quarti near Finnevaux (NA).

Cydia inquinatana (Hübner, 1800) – Scarce Maple Piercer: 1 specimen on 13.vi.2015 at Les Spinets at On (LX), leg. R. Nossent *et al.* **New species for the province of LX.**

Cydia interscindana (Möschler, 1866) – Juniper Piercer: in the vicinity of Han-sur-Lesse (NA), represented in small numbers where the foodplant *Juniperus communis* L. grows.

Cydia servillana (Duponchel, 1836) – Sallow-shoot Piercer: 1 exuvia on *Salix caprea* (Salicaceae) (Goat Willow) on 23.v.2019 at Bure (LX), leg. R. Meert. 1 specimen on 23.v.2021 at Grand Quarti near Finnevaux (NA), leg. Leafminers working group.

Dichrorampha plumbagana (Tretschke, 1830) – Silver-lined Drill: 1 specimen on 03.v.2014 at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. Leafminers working group. **New species for the province of NA.**

Dichrorampha plumbana (Scopoli, 1763) – Lead-coloured Drill: scattered irregularly in very small numbers throughout the area.

Dichrorampha sedatana Busck, 1906 – Dingy Drill: scattered irregularly in very small numbers throughout the area.

Grapholita gemmiferana Tretschke, 1835 – Isle of Wight Piercer: 4 specimens on 24.v.2019 at Beauraing (NA), leg. J. Soors.

Grapholita pallifrontana Lienig & Zeller, 1846 – Liquorice Piercer: scattered irregularly in very small numbers throughout the area.

Pammene gallicana (Guenée, 1845) – Purple-shaded Piercer: 1 ex on 21.vi.2003 at the quarry de la Falize at Aywaille (LG), leg. R. Spronck (De Prins 2005). **New species for the province of LG.** 1 specimen on 16.vii.2017 at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. W. Mertens.

Pammene gallicolana (Lienig & Zeller, 1846): 1♂ on 30.vi.2006 at Maupas near Belvaux (NA). 1 specimen on 13.vi.2015 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. R. Nossent *et al.*

Pammene juniperana (Millière, 1858): in the vicinity of Han-sur-Lesse (NA), represented in very small numbers where the foodplant *Juniperus communis* grows.

Pammene rhediella (Clerck, 1759) – Fruitlet-mining Tortrix: everywhere in Belgium a very rare species, sparsely represented throughout the area.

Pammene spiniana (Duponchel, 1843) – Triangle-marked Piercer: 1♀ on 29.viii.2020 at the Briqueterie de Rome near Durbuy (LX), leg. R. Recour & R. Vernieuwe.

Pammene splendidulana (Guenée, 1845) – Drab Oak Piercer (Fig. 17): scattered irregularly in very small numbers throughout the area.



Fig. 18. *Pammene splendidulana*, 18.iv.2022, Finnevaux, NA. © Chris Steeman.

Pammene suspectana (Lienig & Zeller, 1846) – Ash-bark Piercer: 1♂ on 24.v.2021 at Grand Quarti near Finnevaux (NA), leg. Leafminers working group. **This is only the second observation for Belgium. New species for the province of NA.**

Pammene trauniana (Denis & Schiffermüller, 1775) – Maple Piercer: 1 specimen on 10.v.2003 at Gros Tienne near Lavaux-Ste.-Anne (NA). 1 specimen on 27.vi.2015 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. D. Sloommaekers.

Sesiidae

Eusphecia melanocephala (Dalman, 1816) – Aspen Clearwing (Fig. 19): this species is reasonably represented where *Populus tremula* L. (Salicaceae) (European aspen) occurs in the area.



Fig. 19. *Eusphecia melanocephala*, 21.vi.2019, Finnevaux, NA. © Chris Steeman.

Synanthedon scoliaeformis (Denis & Schiffermüller, 1775) – Welsh Clearwing: *Betula* sp. (Betulaceae) (Birch sp.) is not very common in the Famenne region, so the species is sparsely represented.

Synanthedon conopiformis (Esper, 1872) – Dale's Oak Clearwing (Fig. 20): just outside the Calestienne near Liège at Chaudfontaine (LG) there is a large healthy population, outside this area the sightings are very scarce. 5♂ to pheromones on 29.vi.2020 at Grand Quarti near Finnevaux (NA), this was also **the first record for this province.**



Fig. 20. *Synanthedon conopiformis*, 29.vi.2020, Finnevaux, NA. © Chris Steeman.

Synanthedon spuleri (Fuchs, 1908): 1 exuvia on 23.vi.2017 and 3 larvae on 30.vii.2017, both at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA), both leg. R. Meert. 2♂ to pheromone 02.vi.2018 at Les Pairées Ouest near Resteigne (LX), leg. Leafminers working group.

Synanthedon loranthei (Králíček, 1966) – Mistletoe Clearwing: although well represented in the south of our country in the Gaume (LX), this species has recently been discovered in the Famenne region of Namur. 2 exuviae on *Viscum album* (Santalaceae) (Mistletoe) on 23.vi.2022 at Comogne near Focant (NA), leg. R. Meert.

Limacodidae

Heterogena asella (Denis & Schiffermüller, 1775) – Triangle: fairly rare in the Famenne-Calestienne region with sparse observations.

Zygaenidae

Adscita geryon (Hübner, 1813) – Cistus Forester: 1♂ on 03.vii.2018 at Les Pairées Ouest near Resteigne (LX). 2 specimens on 23.v.2019 at Houyet (NA), leg. M. Paquay.

Zygaena lonicerae (Scheven, 1777) – Narrow-bordered Five-spot Burnet: 1 specimen on 09.vii.2006 en 1♀ on 03.vii.2018, both at Gros Tienne near Lavaux-Ste.-Anne (NA).

Zygaena transalpina (Esper, 1783) – Southern Six Spot Burnet: a fairly regular appearance as singles or in very small numbers. A nice population around Belvaux (NA) with a maximum of 25 specimens ever counted.

Pyralidae

Ancylosis cinnamomella (Duponchel, 1836) (Fig. 21): a very regular appearance in small numbers in the limestone region.



Fig. 21. *Ancylosis cinnamomella*, 25.iv.2017, Han-sur-Lesse, NA. © Chris Steeman.

Apomyelois bistriatella (Hulst, 1887) – Heath Knot-horn: quite rare in small numbers scattered throughout the area.

Delplanqueia dilutella (Denis & Schiffermüller, 1775) – Powdered Knot-horn: present in very small numbers around Han-sur-Lesse (NA).

Delplanqueia inscriptella (Duponchel, 1837) – Brown Powdered Knot-horn: 1 specimen on 25.vi.2016 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA). **This was the first observation for Belgium** (Slootmaekers *et al.* 2018). A very rare species that is present in small numbers around Han-sur-Lesse (NA).

Ephestia elutella (Hübner, 1796) – Cacao Moth: 1♂ on 25.vi.2016 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA), leg. D. Slootmaekers *et al.*

Ephestia welseriella (Zeller, 1848): 1 specimen on 27.vi.2015 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA). **This species has never been observed in Belgium before** (Slootmaekers *et al.* 2018). A species that is present where the foodplant *Allium* sp. (Alliaceae) (Onion sp.) grows on the calcareous rocks.

Pempelia compositella (Treitschke, 1835): a species that only occurs in NA, with good populations around Han-sur-Lesse (NA) on calcareous rocks.

Pempelia palumbella (Denis & Schiffermüller, 1775) – Heather Knot-horn: very few sightings throughout the area.

Phycitodes binaevella (Hübner, 1813) – Ermine Knot-horn: 1♂ on 19.ix.2021 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group, gen. det. S. Wullaert.

Phycitodes inquinatella (Ragonot, 1887): very few sightings throughout the area.

Selagia argyrella (Denis & Schiffermüller, 1775) – Silvery Knot-horn: 1 specimen on 22.viii.2015 at Ave-et-Auffe (NA), leg. R. Nossent *et al.*

Uncinus obductella (Zeller, 1839) – Kent Knot-horn: well distributed throughout the area.

Vitula biviella (Zeller, 1848) – Pine-blossom Knot-horn: 2 specimens on 13.ix.2020 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group.

Zophoda grossulariella (Hübner, 1809) – Gooseberry Knot-horn: 1 specimen on 11.vii.2016 at Grande Tinaimont near Han-sur-Lesse (NA), leg. W. De Rouck. 1 specimen on 11.v.2021 at Comogne near Focant (NA).

Crambidae

Anania funebris (Ström, 1768) – White-spotted Sable Moth: 1 specimen on 02.vi.2007 at Gros Tienne near Lavaux-Ste.-Anne (NA).

Anania fuscalis (Denis & Schiffermüller, 1775) – Cinerous Pearl: 1 specimen on 23.vii.2005 at Han-sur-Lesse (NA), leg. L. Janssen. 3 specimens on 22.vii.2015 at Turmont at Han-sur-Lesse (NA), leg. W. Mertens *et al.* 2 specimens on 23.vii.2019 at Grignaux et Hérumont at Han-sur-Lesse (NA).

Loxostege sticticalis (Linnaeus, 1761) – Diamond-spot Pearl: an irregular migrant which can establish small populations locally and temporarily. A few observations: 1 specimen on 18.vii.2003 at Gros Tienne near Lavaux-Ste.-Anne (NA). 1 specimen on 19.vii.2015 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. 1 specimen on 19.ix.2015 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. R. Nossent *et al.*

Paratalanta hyalinalis (Hübner, 1796) – Translucent Pearl: well distributed throughout the area.

Psammotis pulveralis (Hübner, 1796) – Scarce Marsh Pearl: 1 specimen on 06.vii.2019 at the military camp at Marche-en-Famenne (LX), leg. R. Nossent *et al.*

Pyrausta obfuscata (Scopoli, 1763): 1 larva on *Inula conyzae* (Asteroideae) (Ploughman's-spikenard) on 30.viii.2014 at Les Spinets at On (LX), leg. D. Sloommaekers *et al.*

Diasemia reticularis (Linnaeus, 1761) – Lettered China-mark: 1 specimen on 25.v.2017 at the quarry de Bièrnauchamps at Wavreille (NA).

Hellula undalis (Fabricius, 1781) – Old World Webworm: 1♀ on 24.x.2022 at Bois des Petites Tailles near Revogne (NA). **This observation was the second for our country** (Steeman 2023).

Scoparia conicella (La Harpe, 1863): 1♂ on 07.vi.2015 at the quarry du Goiveux at Aywaille (LG), leg. Leafminers working group. 1♀ on 18.vi.2018 at Grand Quarti near Finnevaux (NA). 2♀ on 25.vi.2018 at Petite Tinaimont near Han-sur-Lesse (NA).

Scoparia subfusca Haworth, 1811 – Large Grey: 4 specimens on 23.vii.2004 and 1 specimen on 28.v.2005, both at the quarry du Fond des Vaux at Wellin (LX) (De Prins, 2005). **New species for the province of LX.** 1♀ on 12.vi.2021 at Grand Quarti near Finnevaux (NA). 1 specimen on 18.vii.2022 at Ri d'Howisse near Wavreille (NA). 1 specimen on 23.vii.2022 at Bois des Petites Tailles near Revogne (NA), leg. Leafminers working group.

Catoptria mytilella (Hübner, 1805) (Fig. 22): well represented throughout the Calestienne.



Fig. 22. *Catoptria mytilella*, 12.vi.2017, Han-sur-Lesse, NA. © Chris Steeman.

Pediasia contaminella (Hübner, 1796) – Waste Grass-veneer: 1 specimen on 19.vii.2015 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group.

Platytes alpinella (Hübner, 1813): only a few sightings around Han-sur-Lesse (NA).

Lasiocampidae

Eriogaster catax (Linnaeus, 1758) – Eastern Eggar (Fig. 23): 1♂ on 09.x.2004 and 1♂ on 30.ix.2005, both at Gros Tienne near Lavaux-Ste.-Anne (NA). These are the only known observations of adult specimens after 2000 in Belgium. Adults are almost never seen as they rarely come to light. Not every year, but frequently 1 or more nests with larvae are found in the large vicinity of Lavaux-Ste.-Anne (NA). A highly threatened species.



Fig. 23. *Eriogaster catax*, 09.x.2004, Lavaux-Ste.-Anne, NA. © Chris Steeman.

Eriogaster lanestris (Linnaeus, 1758) – Small Eggar: adult specimens are rarely seen because they are rarely attracted to light. 1♂ on 08.iv.2019 at Grand Quarti near Finnevaux (NA). 1♀ laying eggs on *Prunus spinosa* L. (Rosaceae) (Blackthorn) on 16.iii.2020 at Minaure near Resteigne (LX). Every year a small number of nests with larvae are found scattered over the area.

Phyllodesma ilicifolia (Linnaeus, 1758) – Small lappet: the Belgian stronghold of this species lies in the Antwerp Campine and the Hautes Fagnes (LG). Observations elsewhere are extremely rare. 1 specimen on 05.v.2017 at Les Hectais et Fosse Eghin near Belvaux (NA).

Phyllodesma tremulifolia (Hübner, 1810) – Aspen Lappet: 1 specimen on 29.iv.2005 at Gros Tienne near Lavaux-Ste.-Anne (NA) (De Prins 2006). **New species for the province of NA.** From then onwards scattered throughout the area in small numbers.

Odonestis pruni (Linnaeus, 1758) – Plum Lappet: fairly scattered throughout the area in small numbers.

Endromidae

Endromis versicolora (Linnaeus, 1758) – Kentish Glory: fairly scattered throughout the area in very small numbers.

Sphingidae

Acherontia atropos (Linnaeus, 1758) – Death's Head Hawkmoth: only 1 observation of a dead specimen on 10.x.2019 at Rochefort (NA), leg. M. Paquay.

Hyles gallii (Rottemburg, 1775) – Bedstraw Hawkmoth (Fig. 24): a very rare species throughout the area with only one observation: 1 specimen on 28.viii.2017 at Basse Wimbe near Lessive (NA).



Fig. 24. *Hyles gallii*, 28.viii.2017, Lessive, NA. © Chris Steeman.

Proserpinus proserpina (Pallas, 1772) – Willowherb Hawkmoth: a handful of observations throughout the area.

Geometridae

Boudinotiana notha (Hübner, 1803) – Light Orange Underwing: scattered throughout the area in small numbers.

Alsophila aceraria (Denis & Schiffermüller, 1775) (Fig. 25): the Belgian stronghold of this species lies in NA, mainly around Han-sur-Lesse where it is well represented in small numbers. A maximum of 42♂ was recorded on 25.xii.2022 at Gros Tienne near Lavaux-Ste.-Anne (NA). Presumably overlooked in many places due to the late flight time of this late autumn species.



Fig. 25. *Alsophila aceraria*, 08.xii.2019, Lavaux-Ste.-Anne, NA. © Chris Steeman.

Chiasma aestimaria (Hübner, 1809) – Tamarisk Peacock (Fig. 26): 1 specimen on 23.vi.2017 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA). **The first observation for Belgium** (Steeman & Sierens 2018).



Fig. 26. *Chiasma aestimaria*, 23.vi.2017, Han-sur-Lesse, NA. © Chris Steeman.

Agriopsis bajaria (Denis & Schiffermüller, 1775): the Belgian stronghold of this species lies in NA, mainly around Han-sur-Lesse where it is well represented, mostly in small numbers. A maximum of 87♂ was recorded on 08.xi.2020 at Gros Tienne near Lavaux-Ste.-Anne. Presumably sometimes overlooked at places due to the late flight time of this autumn species.

Paradarisa consonaria (Hübner, 1799) – Square Spot: scattered throughout the Calestienne in small numbers.

Peribatodes ilicaria (Geyer, 1833) – Lydd Beauty: sighted irregularly, mostly as singles, in the great perimeter around Han-sur-Lesse (NA).

Theria primaria (Haworth, 1809) – Early Moth: a species that occurs in small to good numbers throughout the area. In the region between Han-sur-Lesse and Resteigne, the highest numbers in Belgium are recorded. A maximum number of 271♂ on 05.i.2019 and 231♂ on 09.i.2020, both at Minaure near Resteigne (LX). Because of the flight time around the end of the year and in wintertime, the species is very likely to be overlooked in many places.



Fig. 27. *Theria rupicaprararia*, 04.iii.2017, Lavaux-Ste.-Anne, NA. © Chris Steeman.

Theria rupicaprararia (Denis & Schiffermüller, 1775) (Fig. 27): the stronghold of the species lies in the perimeter around Han-sur-Lesse (NA). Usually in small numbers, up to a few dozen specimens are seen every year. A few maxima: 83♂ and 2♀ on 04.iii.2017 around Gros Tienne near Lavaux-Ste.-Anne (NA) and 164♂ and 15♀ on 05.iii.2018 at Tienne d’Aise near Ave-et-Auffe (NA).

Gerinia honoraria (Denis & Schiffermüller, 1775): a very rare and local species which nowadays only still has populations around Han-sur-Lesse (NA). Occasionally caught as 1 or 2 specimens at light around late May or beginning of June. 1 exception: 7 specimens on 28.v.2022 at Grignaux et Hérimont at Han-sur-Lesse (NA), leg. Leafminers working group.

Charissa obscurata (Denis & Schiffermüller, 1775) – Annulet: reasonably present in the Liège quarries, around Han-sur-Lesse (NA) very rare and mostly singles.

Charissa pullata (Denis & Schiffermüller, 1775) – Limestone Annulet: present in small numbers around the calcareous rocks in the Calestienne area.

Gnophos furvata (Denis & Schiffermüller, 1775): present in small numbers around the calcareous rocks in the Calestienne area. Slightly more frequent around Han-sur-Lesse (NA).

Aspitates gilvaria (Denis & Schiffermüller, 1775) – Straw Belle: present in small numbers around the calcareous rocks in the Calestienne area. This species is much more common in the Fagne near Nismes (NA).

Idaea deversaria (Herrich-Schäffer, 1847) – Ashen Wave: present in very small numbers, usually around calcareous rocks.

Idaea dilutaria (Hübner, 1799) – Silky Wave (Fig. 28): present in good numbers throughout the area, especially around calcareous rocks or in quarries where the foodplant (*Helianthemum nummularium*) is present.



Fig. 28. *Idaea dilutaria*, 22.vi.2020, Aywaille, LG. © Chris Steeman.

Idaea ochrata (Scopoli, 1763) – Bright Wave: a very rare species in the area, only seen occasionally at Gros Tienne near Lavaux-Ste.-Anne (NA).

Idaea trigeminata (Haworth, 1809) – Treble Brown Spot: 1 vagrant specimen on 18.vii.2003 at Gros Tienne near Lavaux-Ste.-Anne (NA).

Scopula immorata (Linnaeus, 1758) – Lewes Wave: present in small numbers throughout the area.

Scopula tessellaria (Boisduval, 1840) – Dusky-brown Wave: only one record: 1 specimen on 14.vi.2019 at the Briqueterie de Rome near Durbuy (LX), leg. J. Claessens.

Scopula umbelaria (Hübner, 1813): 2 larvae on 16.ix.2007 at Han-sur-Lesse (NA), leg. J. Y. Baugnée. Nowadays very probably an extinct species in the Famenne. There is still a very small population in the Fagne nearby Matagne-la-Grande (NA). This is the only known population at this time.

Rhodostrophia vibicaria (Clerck, 1759): present in small numbers in and around calcareous grasslands and rocks and quarries throughout the area, but more frequent in the Liège part of the Calestienne. Here sometimes good numbers, e.g. 51 specimens at the quarry de la Falize at Aywaille on 30.v.2020, leg. Leafminers working group.

Cyclophora annularia (Fabricius, 1775) – Mocha: the stronghold of this species lies in the Famenne-Calestienne area and in the Gaume (LX) area. Has been observed in small to moderate numbers with the exception of 164 specimens on 23.vii.2022 at Bois des Petites Tailles near Revogne (NA), leg. Leafminers working group.

Cyclophora porata (Linnaeus, 1767) – False Mocha: very sparsely represented around Han-sur-Lesse (NA).

Cyclophora pupillaria (Hübner, 1799) – Blair’s Mocha: 1 specimen of this rare migrant on 30.x.2022 at Comogne near Focant (NA).

Cyclophora ruficiliaria (Herrich-Schäffer, 1855) – Jersey Mocha: present in small numbers throughout the area.

Catarhoe rubidata (Denis & Schiffermüller, 1775) – Ruddy Carpet (Fig. 29): present in small numbers throughout the area.



Fig. 29. *Catarhoe rubidata*, 03.viii.2017, Lavaux-Ste.-Anne, NA. © Chris Steeman.

Epirrhoe galiata (Denis & Schiffermüller, 1775) – Galium Carpet: present in good numbers around calcareous rocks and quarries.

Orthonama vittata (Borkhausen, 1794) – Oblique Carpet: 1 specimen on 25.viii.2016 at Ave-et-Auffe (NA).

leg. P. Ligezzolo. 3 specimens on 25.vii.2018 at Ri d'Howisse near Wavreille (NA). Much more common in bogland in Flanders.

Xanthorhoe biriviata (Borkhausen, 1794) – Balsam Carpet: only seen a few times at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. Still a rare species in the southern part of Belgium.

Xanthorhoe quadrifasiata (Clerck, 1759) – Large Twin-Spot Carpet: well represented in small numbers throughout the area.

Euphyia biangulata (Haworth, 1809) – Cloaked Carpet: sparingly represented mainly in the western half of the Famenne-Calestienne.

Euphyia unangulata (Haworth, 1809) – Sharp-angled Carpet: sparingly represented throughout the area.

Anticlea derivata (Denis & Schiffermüller, 1775) – Streamer: present in small to moderate numbers throughout the area.

Larentia clavaria (Haworth, 1809) – Mallow: 1 specimen on 24.ix.2006 at Maupas near Belvaux (NA). 1 specimen on 15.ix and 19.ix.2020, both at Ri d'Howisse near Wavreille (NA). Better represented in the Ardennes.

Spargania luctuata (Denis & Schiffermüller, 1775) – White-banded Carpet: 2 specimens on 08.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. Better represented in the Ardennes.

Hydriomena impluviata (Denis & Schiffermüller, 1775) – May Highflyer: very sparsely represented throughout the area.

Chloroclysta miata (Linnaeus, 1758) – Autumn Green Carpet: 1 specimen on 23.ix.2006 at Surhaut near Wavreille (NA). 1♀ on 02.v.2019 at Gros Tienne near Lavaux-Ste.-Anne (NA). 1 specimen on 26.ix.2022 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group. Better represented in the Ardennes.

Coenotephria salicata (Denis & Schiffermüller, 1775) – Striped Twin-spot Carpet: unique to the region in Belgium. Present in fairly good numbers in limestone quarries throughout the area. Larger numbers in the Liège Calestienne: 40 specimens on 13.ix.2020 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group.

Colostygia multistrigaria (Haworth, 1809) – Mottled Grey: only a few observations on calcareous grasslands: 1 specimen on 27.iii.2016 at Tienne d'Aise near Ave-et-Auffe (NA), leg. W. Mertens *et al.* 1 specimen on 06.iv.2019 at Mont des Pins near Bomal (LX), leg. D. Gailly & N. Terorde. 1 specimen on 28.ii.2021 at Tienne d'Aise near Ave-et-Auffe (NA).

Colostygia olivata (Denis & Schiffermüller, 1775) – Beech-green Carpet (Fig. 30): 1 specimen on 10.viii.2002 and another specimen on 08.viii.2003, both at the quarry de la Falize at Aywaille (LG), leg. R. Spronck (De Prins 2006). **New species for the province of LG.** 1 specimen on 23.vii.2004 at Bois d'Oro at Wellin (LX). 1 specimen on 11.vii.2016 at Grande Tinaimont near Han-sur-Lesse (NA),

leg. W. Mertens *et al.* 1 specimen on 05.viii.2017 at the quarry de Bièrnauchamps at Wavreille (NA). 1 specimen on 06.viii.2017 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA).



Fig. 30. *Colostygia olivata*, 05.viii.2017, Wavreille, NA. © Chris Steeman.

Dystroma citrata (Linnaeus, 1761) – Common Marbled Carpet: present in very small numbers. Much more represented in the Ardennes.

Ecliptopera capitata (Herrich-Schäffer, 1839) – Yellow-headed Phoenix: 2 specimens on 25.vi.2016 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA), leg. W. Mertens *et al.* Better represented in the Ardennes.

Electrophaes corylata (Thunberg, 1792) – Broken-barred Carpet: present in very small numbers mainly in the wide area of Han-sur-Lesse (NA).

Eulithis prunata (Linnaeus, 1758) – Phoenix: usually observed as singles throughout the area, although still rare.

Lampropteryx otregiata (Metcalf, 1917) – Devon Carpet: 1 specimen on 16.v.2015 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. **This was the first observation for Belgium** (Wullaert 2015). 1♀ on 07.viii.2016 at Basse Wimbe near Lessive (NA), leg. Leafminers working group. Another specimen on 14.viii.2021 at the same place.

Lampropteryx suffumata (Denis & Schiffermüller, 1775) – Water Carpet (Fig. 31): quite frequent in low numbers.



Fig. 31. *Lampropteryx suffumata*, 10.iv.2016, Belvaux, NA. © Chris Steeman.

Thera juniperata (Linnaeus, 1758) – Juniper Carpet: although there are reasonable numbers of *Juniperus*, the species is still very rare in this region: 1 specimen on 14.x.2018 at Les Pairées Ouest near Resteigne (LX).

Asthena anseraria (Herrich-Schäffer, 1855): 1 specimen on 27.vi.2015 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. D. Sloommaekers *et al.*

Pareulype berberata (Denis & Schiffermüller, 1775) – Barberry Carpet: 1 specimen on 30.vi.2015 at Les Spinets at On (LX), leg. D. Sloommaekers *et al.* A very rare species in the Famenne-Calestienne.

Triphosia dubitata (Linnaeus, 1758) – Tissue (Fig. 32): due to the presence of the many caves in the Calestienne, the species can be found hibernating in large numbers. 82 specimens on 05.ii.2017 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA). Each time 166 specimens on 03.ii.2019 and on 09.ii.2020, both at Domaine des Grottes at Han-sur-Lesse (NA). This species is not often seen on the wing, as it is very poorly attracted to light.



Fig. 32. *Triphosia dubitata*, 05.ii.2017, Han-sur-Lesse, NA. © Chris Steeman.

Horisme radicularia (de La Harpe, 1855) – Cryptic Fern: the presence of this species was first proven by a specimen trapped on 07.v.2016 at Han-sur-Lesse (NA), leg. & gen. det. D. De Groote and determined via genitalia. Due to the similarity with *H. tersata* (Denis & Schiffermüller, 1775) – Fern, older specimens were examined again and it turned out that *H. radicularia* was already present from 2004 onwards: 1 specimen on 20.viii.2004 at Gros Tienne near Lavaux-Ste.-Anne (NA). **This was the first observation for Belgium** (Steeman 2017). Nowadays present in small numbers throughout the area.

Odezia atrata (Linnaeus, 1758) – Chimney Sweeper: present in very small numbers throughout the area. Much more represented in the Ardennes.

Nothocasis sertata (Hübner, 1817) (Fig. 33): 1 specimen on 19.ix.2015 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. D. Sloommaekers *et al.* 1 specimen on 17.ix.2018 and on 19.ix.2020 at Grignaux et Hérumont at Han-sur-Lesse (NA). 1 specimen on 21.ix.2020 at Petite Tinaimont near Han-



Fig. 33. *Nothocasis sertata*, 21.ix.2020, Han-sur-Lesse, NA. © Chris Steeman.

sur-Lesse (NA). The Belgian stronghold of this species is the Gaume (LX) region.

Eupithecia actaeata Walderdorff, 1869: 1♂ on 05.viii.2019 at the quarry du Batis d'Haurt near Bure (LX). The species was newly discovered to Belgium in 1980 (De Prins 1983) and since then very few observations are known.

Eupithecia egenaria Herrich-Schäffer, 1848 – Fletcher's Pug: 1 specimen on 24.v.2017 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA). **New species for the province of NA.** One week later, on 31.v.2017, 8 specimens were trapped at the same place. Another specimen on 12.vi.2017 at Grignaux et Hérumont at Han-sur-Lesse (NA).

Eupithecia expallidata Doubleday, 1956 – Bleached Pug: 1 specimen on 13.viii.2022 at Ri d'Howisse near Wavreille (NA). Much more represented in the Ardennes.

Eupithecia irriguata (Hübner, 1813) – Marbled Pug (Fig. 34): 2 specimens on 24.iv.2020 at Villers-sur-Lesse (NA), leg. J. B. Schuermans. 1 specimen on 02.v.2022 at Comogne near Focant (NA). The species lives in the treetops of old oak trees on limestone soil and is therefore very rarely encountered at light.



Fig. 34. *Eupithecia irriguata*, 02.v.2022, Focant, NA. © Chris Steeman.

Eupithecia lariciata (Freyer, 1841) – Larch Pug: 1 specimen on 08.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group.

Eupithecia plumbeolata (Haworth, 1809) – Lead-coloured Pug: 1 specimen on 11.vii.2015 at Petite Tinaumont near Han-sur-Lesse (NA), leg. W. Mertens *et al.* 2 specimens on 12.vi.2017 at Grignaux et Hérimont at Han-sur-Lesse (NA). 1 specimen on 23.vi.2017 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA).

Eupithecia pusillata (Denis & Schiffermüller, 1775) – Juniper Pug: present in small numbers at Les Pairées Ouest, and Tienne de Vignes near Resteigne (LX), where a lot of *Juniperus* grows.

Eupithecia selinata Herrich-Schäffer, 1861: present in small numbers throughout the area.

Eupithecia semigraphata Bruand, 1850: 1 specimen on 01.vii.2006 at Ave-et-Auffe (NA). 1 specimen on 25.vi.2016 and 24.vi.2017, both at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA). 1♂ on 16.vi.2016, 1 specimen on 18.viii.2018 and 9 specimens at 20.vii.2022, all at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group.

Eupithecia venosata (Fabricius, 1787) – Netted Pug (Fig. 35): 1 specimen on 24.vi.2005 at Ri d’Howisse near Wavreille (NA). 1 specimen on 13.vi.2015 at Les Spinets at On (LX), leg. D. Sloommaekers *et al.* 1 specimen on 20.v.2019 and 1 specimen on 22.vi.2020, both at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group.



Fig. 35. *Eupithecia venosata*, 24.vi.2005, Wavreille, NA. © Chris Steeman.

Notodontidae

Drymonia dodonaea (Denis & Schiffermüller, 1775) – Marbled Brown: only one observation: 1 specimen on 03.vi.2018 at Tienne des Vignes near Belvaux (LX), leg. Leafminers working group. Much better represented in the Ardennes and the Gaume (LX).

Drymonia velitaris (Hufnagel, 1766): 3 specimens on 24.vi.2005 at Ri d’Howisse near Wavreille (NA). 1 specimen on 13.v.2015 at Thier de la Haie near Han-sur-Lesse (NA), leg. R. Nossent *et al.* All other Belgian observations in the 21st century are from the Campine region (AN, LI).

Leucodonta bicoloria (Denis & Schiffermüller, 1775) – White Prominent: only one observation: 1 specimen on 16.v.2022 at Grand Quarti near Finnevaux (NA), leg.

Leafminers working group. Much more common in the Ardennes.

Odontotia carmelita (Esper 1799) – Scarce Prominent: 1 specimen on 27.iv.2013 at the Briqueterie de Rome near Durbuy (LX), leg. W. Mertens. 1 specimen on 06.v.2013 at Ave-et-Auffe (NA), leg. Y. van den Heuvel. 1 specimen on 07.v.2017 at Ri d’Howisse near Wavreille (NA), leg. Leafminers working group.

Ptilophora plumigera (Denis & Schiffermüller, 1775) – Plumed Prominent (Fig. 36): a species that is well represented and mainly occurs in the large area around Han-sur-Lesse (NA). Usually, a few dozen are observed, larger numbers are exceptions: 74 specimens on 08.xi.2020 and a whopping number of 347 specimens on 14.xi.2021, both at Gros Tienne near Lavaux-Ste.-Anne (NA).



Fig. 36. *Ptilophora plumigera*, 06.xi.2018, Lavaux-Ste.-Anne, NA. © Chris Steeman.

Erebidae

Leucoma salicis (Linnaeus, 1758) – White Satin Moth: 1 specimen on 06.vii.2019 and 1 specimen on 19.vi.2021, both at the military camp at Marche-en-Famenne (LX).

Gynaephora fascalina (Linnaeus, 1758) – Dark Tussock: 1 specimen on 11.vii.2015 at Tienne d’Aise near Ave-et-Auffe (NA), leg. R. Nossent *et al.*

Orgyia recens (Hübner, 1819) Scarce Vapourer: an extremely rare and declining species. Only known from a single caterpillar on 19.v.2018 at Behotte near Eprave (NA), leg. S. Bonmarchand.

Arctia villica (Linnaeus, 1758) – Cream-spot Tiger: fairly widespread in small numbers throughout the area, somewhat larger numbers in the Liège Calestienne area with a maximum of 55 specimens on 06.vi.2021 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group.

Diacrisia purpurata (Linnaeus, 1758) – Purple Tiger (Fig. 37): 1 specimen on 02.vi.2007 at Gros Tienne near Lavaux-Ste.-Anne (NA). The Belgian stronghold of the species is the Gaume (LX).



Fig. 37. *Diacrisia purpurata*, 02.vi.2007, Lavaux-Ste.-Anne, NA. © Chris Steeman.

Callimorpha dominula (Linnaeus, 1758) – Scarlet Tiger: sparsely represented throughout the area. Much more common in the Ardennes.

Utetheisa pulchella (Linnaeus, 1758) – Common Speckled: 1 specimen of this very rare migrant on 28.x.2022 at Baronville near Beauraing (NA), leg. D. Sevrin. Another specimen on 29.x.2022 at Wanlin (NA).

Lithosia quadra (Linnaeus, 1758) – Four-spotted Footman: compared to the past, this rare species is seen more and more in the last 15 years. Nowadays occurring in small numbers throughout the area.

Nudaria mundana (Linnaeus, 1761) – Muslin Footman: mostly seen as singles throughout the area. Observations of pre-adult stage specimens such as pupae and caterpillars can be found under rocks or near rocks: 15 larvae on 27.ii.2016 at Ave-et-Auffe (NA), leg. P. Lighezzolo. 60 pupae at a cave entrance on 30.xii.2022 at Revogne (NA).

Paidia rica (Freyer, 1858) – Glaucous Muslin (Fig. 38): 1 specimen on 30.vii.2016 at Les Spinets at On (LX), leg. W. Mertens *et al.* 1 specimen on 16.vii.2017 at Grand Quarti near Finnevaux (NA). 1 specimen on 18.vii.2017 at Les Hectais et Fosse Eghin near Belvaux (NA).



Fig. 38. *Paidia rica*, 16.vii.2017, Finnevaux, NA. © Chris Steeman.

Pelosia muscerda (Hufnagel, 1766) – Dotted Footman: a very rare species with only a few observations throughout the area.

Setina irrorella (Linnaeus, 1758) – Dew Moth: observed around Han-sur-Lesse (NA) in small numbers up to a few dozens. A maximum of 106 specimens on 23.vi.2017 at Parc animalier du Domaine des Grottes.

Dysauxes ancilla (Linnaeus, 1767) – The Handmaid: usually seen as singles around Han-sur-Lesse (NA), somewhat more common in the Liège Calestienne area.

Lygephila pastinum (Treitschke, 1826) – Blackneck: present in very small numbers.

Schrankia coastaestrigalis (Stephens, 1834) – Pinion-streaked Snout: observed occasionally, usually as singles.

Colobochyla salicalis (Denis & Schiffermüller, 1775) – Lesser Belle: 1 specimen on 08.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. 1 specimen on 05.viii.2017 at the quarry de Bièrnauchamps at Wavreille (NA).

Eublemma purpurina (Denis & Schiffermüller, 1775) – Beautiful Marbled: sparse observations of specimens, with the exception of 21 specimens on 22.vii.2022 at the quarry de la Falize at Aywaille (LG), leg. D. Gailly & R. Thunus.

Phytometra viridaria (Clerck, 1759) – Small Purple-barred: present in very small numbers.

Catephia alchymista (Denis & Schiffermüller, 1775) – Alchemist: somewhat more common in the western part of the Famenne-Calestienne. Is usually observed in singles or in smaller numbers.

Minucia lunaris (Denis & Schiffermüller, 1775) – Lunar Double-stripe (Fig. 39): a species that has been observed a little more in recent years. 1 specimen on 22.v.2020 at Grand Quarti near Finnevaux (NA). 1 specimen on 10.vi.2020 at the quarry du Batis d'Haurt near Bure (LX), leg. J. S. Rousseau-Piot. 1 specimen on 27.v.2022 at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. B. De Ketelaere. 1 specimen on 28.v.2022 at Grignaux et Hérimont at Han-sur-Lesse (NA), leg. Leafminers working group. 1 specimen on 06.vi.2022 at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. Leafminers working group.



Fig. 39. *Minucia lunaris*, 22.v.2020, Finnevaux, NA. © Chris Steeman.

Noctuidae

Abrostola asclepiadis (Denis & Schiffermüller, 1775) (Fig. 40): represented in small numbers where the foodplant, *Vincetoxicum hirundinaria* (Apocynaceae) (Common Vincetoxicum), grows on calcareous rocks.



Fig. 40. *Abrostola asclepiadis*, 17.iv.2017, Belvaux, NA. © Chris Steeman.

Acontia lucida (Hufnagel, 1766) – Pale Shoulder: 1 specimen on 13.viii.2020 at Aye (LX), leg. W. De Smet & M. Baete.

Acontia trabealis (Scopoli, 1763) – Spotted Sulphur: 1 specimen on 13.viii.2020 at Aye (LX), leg. W. De Smet & M. Baete. 1 specimen on 20.vii.2022 at the quarry de la Falize at Aywaille (LG), leg. D. Gailly & R. Thunus.

Aedia funesta (Esper, 1786) – The Druid: 1 vagrant specimen on 26.vi.2019 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group. This is the second observation for Belgium.

Acronicta cuspis (Hübner, 1813) – Large Dagger: 1 specimen on 20.v.2004 at Gros Tienne near Lavaux-Ste.-Anne (NA). 1 specimen on 28.v.2005 at the quarry du Fond des Vaux near Wellin (LX). 1 specimen on 29.vii.2006 and 1 specimen on 04.viii.2006, both at Gros Tienne near Lavaux-Ste.-Anne (NA).

Tyta luctuosa (Denis & Schiffermüller, 1775) – Four-spotted: 1 specimen on 02.viii.2019 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour *et al.*



Fig. 41. *Cucullia chamomillae*, 01.vi.2018, Ave-et-Auffe, NA. © Chris Steeman.

Cucullia chamomillae (Denis & Schiffermüller, 1775) – Chamomile Shark (Fig. 41): a species that is found more as a caterpillar than as an adult specimen. 4 larvae on 01.vi.2018 at Ave-et-Auffe (NA).

Cucullia lucifuga (Denis & Schiffermüller, 1775): 1 specimen on 09.vi.2019 at Tienne des Vignes near Resteigne (LX), leg. Leafminers working group. **New species for the province of LX.** Only a few historical Belgian records, all from the Han-sur-Lesse area (NA).

Amphipyra perflua (Fabricius, 1787) – Larger Pale-tipped Moth: 1 specimen on 27.vii.2001 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. P. Lighizzolo. 7 specimens on 21.vii.2015 at Turmont at Han-sur-Lesse (NA), leg. J. Jansen *et al.* 7 specimens on 24.vii.2016 at Ri d'Howisse near Wavreille (NA), leg. Leafminers working group. 3 specimens on 16.vii.2017 at Grand Quarti near Finnevaux (NA), leg. Leafminers working group. 1 specimen on 17.vii.2017 and 4 specimens on 18.vii.2017, both at Les Hectais et Fosse Eghin near Belvaux (NA). 1 specimen on 21.vii.2018 and 2 specimens on 27.vii.2020, both at Ri d'Howisse near Wavreille (NA).

Brachionycha nubeculosa (Esper, 1785) – Rannoch Sprawler (Fig. 42): 1 specimen on 29.iii.2017, 1 specimen on 03.iv.2018 and 1 specimen on 10.iv.2023 all at Grand Quarti near Finnevaux (NA). 1 specimen on 20.iii.2022 at Gros Tienne near Lavaux-Ste.-Anne (NA). 1 specimen on 28.iii.2022 and 1 specimen on 13.iv.2022, both at Ri d'Howisse near Wavreille (NA). More common in the Fagne area.



Fig. 42. *Brachionycha nubeculosa*, 29.iii.2017, Finnevaux, NA. © Chris Steeman.

Heliothis peltigera (Denis & Schiffermüller, 1775) – Bordered Straw: a rare migrant: 1 specimen on 13.vi.2015 at Thier de la Haie near Han-sur-Lesse (NA), leg. R. Nossent *et al.* 1 specimen on 08.viii.2015 at Tienne des Vignes near Resteigne (LX), leg. V. Goethals.

Heliothis viriplaca (Hufnagel, 1766) – Marbled Clover: 1 specimen on 16.viii.2019 and 1 specimen on 02.vii.2022, both at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. F. Clarinval & F. Vanhove. 1 specimen on 31.vii.2020 near the quarry Fond des Vaux near Wellin (LX), leg. T. Vandaudenard & A. Pouillon. 1 specimen on 12.viii.2021 at the quarry de la Lesse at Resteigne (LX).

Spodoptera exigua (Hübner, 1808) – Small Mottled Willow: a rare migrant: 12 specimens on 19.vii.2015 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. 1 specimen on 22.vii.2015 at Turmont at Han-sur-Lesse (NA), leg. W. Mertens *et al.* 1 specimen on 12.ix.2015 at Les Pairées Ouest near Resteigne (LX), leg. R. Nossent *et al.* 1 specimen on 13.viii.2022 at Ri d’Howisse near Wavreille (NA). 1 specimen on 01.x.2023 at Gros Tienne near Lavaux-Ste.-Anne (NA).

Caradrina gilva (Donzel, 1837) (Fig. 42): 1 specimen on 26.vi.2019 and 1 specimen on 30.v.2020, both at the quarry de la Falize at Aywaille (LG), leg. D. Gailly *et al.*

Caradrina flavirena (Guenée, 1852) – Lorimer’s Rustic: 1♀ on 13.ix.2020 at the quarry de la Falize at Aywaille (LG). As far as known, the only sighting in Belgium (Wullaert 2021b).

Hoplodrina respersa (Denis & Schiffermüller, 1775) – Sprinkled Rustic: well represented and usually observed around calcareous rocks, but sometimes seen outside this habitat. It has been expanding northwards in the last decade.

Hoplodrina superstes (Ochsenheimer, 1816) – Powdered Rustic: present in small numbers and more bound to calcareous rocks than the previous species.

Chloantha hyperici (Denis & Schiffermüller, 1775) – Pale-shouldered Cloud: exclusively observed in the Liège Calestienne area. 1 specimen on 26.vi.2019, 1 specimen on 30.v.2020, 2 specimens on 22.vi.2020, 3 specimens on 11.viii.2020, 2 specimens on 15.viii.2020 and 7 specimens on 06.vi.2021, all at the quarry de la Falize at Aywaille (LG), leg. D. Gailly & Leafminers working group.

Apamea lateritia (Hufnagel, 1766) – Scarce Brindle: sparse sightings of mostly singles throughout the area. Much better represented in the Ardennes.

Helotropha leucostigma (Hübner, 1808) – The Crescent: 1 specimen on 02.viii.2019 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour *et al.* Locally common in Flanders.

Litoligia literosa (Haworth, 1809) – Rosy Minor: 1 specimen on 06.vii.2019 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour *et al.*

Photodes fluxa (Hübner, 1809) – Mere Wainscot: 8 specimens on 16.vii.2017 and 2 specimens on 19.vii.2022, both at Grand Quarti near Finnevaux (NA).

Photodes minima (Haworth, 1809) – Small Dotted Buff: 1 specimen on 30.vii.2016 at Les Spinets at On (LX), leg. W. Mertens *et al.* 1 specimen on 16.vii.2017 at Grand Quarti near Finnevaux (NA), leg. Leafminers working group. Another specimen at the same spot on 18.vi.2018. 4 specimens on 06.vii.2019 at the military camp at Marche-en-Famenne (LX), leg. D. Dufour *et al.*

Episema glaucina (Esper, 1789) (Fig. 43): a very rare xerotherm species, only found in NA. The species is very variable in its colouration and forewing pattern, well-marked and patternless, including dark (brown) and pale (white) forms. There are about 6 small populations in the



Fig. 43. *Episema glaucina*, 24.ix.2018, Belvaux, NA. © Chris Steeman.

immediate vicinity of Han-sur-Lesse. A maximum number of 17 specimens (12 white form, 5 brown form) were trapped on 03.x.2018 at Maupas near Belvaux.

Aporophyla lueneburgensis (Freyer, 1848) – Northern Deep-brown Dart: until recently it was generally accepted that *Aporophyla lutulenta* ([Denis & Schiffermüller, 1775) – Deep-brown Dart occurred in southern Belgium. However, according to a recent study by Nowacki *et al.* (2023), we now know that *A. lutulenta* has a more eastern distribution in Europe and does not occur in Belgium where it is replaced by *A. lueneburgensis*. The species is well represented in the western part of the Famenne-Calestienne area.

Dicycla oo (Linnaeus, 1758) – Heart Moth: well represented, most observations in the Namur Famenne-Calestienne.

Dryobotodes eremita (Fabricius, 1775) – Brindled Green: although the foodplant *Quercus* sp. (Fagaceae) (Oak sp.) is abundant everywhere, this still remains a species mainly from the Campine area (AN, LI) and it is extremely rare in the Famenne-Calestienne. 1 specimen on 26.ix.2015 at Gros Tienne near Lavaux-Ste.-Anne (NA), leg. R. Nossent *et al.* 1 specimen on 26.ix.2022 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group.

Mniotype adusta (Esper, 1790) – Dark Brocade: 1 specimen on 13.vi.2016 at Thier de la Haye near Han-sur-Lesse (NA), leg. R. Nossent *et al.* 1 specimen on 31.v.2017 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA).



Fig. 44. *Mniotype satura*, 28.viii.2017, Ave-et-Auffe, NA. © Chris Steeman.

Mniotype satura (Denis & Schiffermüller, 1775) – Beautiful Arches (Fig. 44): scattered in small numbers.

Polymixis flavicincta (Denis & Schiffermüller, 1775) – Large Ranunculus: scattered in small numbers throughout the area.

Egira conspicularis (Linnaeus, 1758) – Silver Cloud: well represented, sometimes up to a few dozen in the larger surroundings of Han-sur-Lesse (NA) and Beauraing (NA).

Tholera cespitis (Denis & Schiffermüller, 1775) – Hedge Rustic: 1 specimen on 15.viii.2021 at Grand Quart near Finnevaux (NA).

Ceramica pisi (Linnaeus, 1758) – Broom Moth: 1 specimen on 27.vi.2015 at Belvédère, Rocher Serin et Fond St.-Martin at Han-sur-Lesse (NA), leg. D. Sootmaekers *et al.* 1 specimen on 06.vii.2017 at Comogne near Focant (NA). 1 specimen on 03.vi.2018 at Tienne des Vignes near Resteigne (LX), leg. Leafminers working group. 1 specimen on 22.vi.2020 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group. More common in the Ardennes.

Hadena compta (Denis & Schiffermüller, 1775) – Varied Coronet: 1 specimen on 27.v.2022 at Mont des Pins near Bomal (LX), leg. J. Werts.

Hecatera bicolorata (Hufnagel, 1766) – Broad-barred White: occurring in very small numbers.

Lacanobia contigua (Denis & Schiffermüller, 1775) – Beautiful Brocade: 1 specimen on 08.vi.2014 at the Briqueterie de Rome near Durbuy (LX), leg. Leafminers working group. 7 specimens on 03.vi.2018 at Tienne des Vignes near Resteigne (LX), leg. Leafminers working group.

Lacanobia suasa (Denis & Schiffermüller, 1775) – Dog's Tooth: occasional sightings throughout the area.

Lacanobia aliena (Hübner, 1809) (Fig. 45): an extremely rare species only occurring in NA. 1 specimen on 24.vi.2006 at Maupas near Belvaux. 1 specimen on 25.vi.2016 at Parc animalier du Domaine des Grottes at Han-sur-Lesse, leg. W. Mertens *et al.* 1 specimen on 02.vii.2016 at Maupas near Belvaux, leg. R. Nossent & W. De Rouck. 1 specimen on 11.vii.2016 at Grande Tinaimont near Han-sur-Lesse, leg. W. Mertens *et al.*



Fig. 45. *Lacanobia aliena*, 24.vi.2006, Belvaux, NA. © Chris Steeman.

Lacanobia splendens (Hübner, 1808) – Splendid Brocade: 1 specimen on 12.vii.2014 at Ri d'Howisse near Wavreille (NA), leg. D. Sootmaekers *et al.* 1 specimen on 20.vii.2022 at Comogne near Focant (NA).

Pachetra sagittigera (Hufnagel, 1766) – Feathered Ear: only two observations: 1 specimen on 20.v.2004 at Gros Tienne near Lavaux-Ste.-Anne (NA). 1 specimen on 22.vi.2013 at Tienne de Boton at Belvaux (NA), leg. T. Merckx.

Polia bombycina (Hufnagel, 1766) – Pale Shining Brown: occasional sightings throughout the area.

Polia hepatica (Clerck, 1759) – Sivery Arches: 1 specimen on 24.vii.2016 at Ri d'Howisse near Wavreille (NA), leg. Leafminers working group.

Leucania obsoleta (Hübner, 1803) – Obscure Wainscot: occasional sightings throughout the area.

Mythimna pudorina (Denis & Schiffermüller, 1775) – Striped Wainscot: occasional sightings around Han-sur-Lesse (NA).

Mythimna sicula (Treitschke, 1835): a species with a preference to limestone habitats. Scattered in small numbers throughout the area.

Chersotis multangula (Hübner, 1803) (Fig. 46): quite regularly in small numbers around Han-sur-Lesse (NA) and also in LG at the quarry de la Falize, with a maximum of 51 specimens on 22.vi.2020, leg. Leafminers working group.



Fig. 46. *Chersotis multangula*, 01.vi.2017, Han-sur-Lesse, NA. © Chris Steeman.

Naenia typica (Linnaeus, 1758) – Gothic: 1 specimen on 07.vii.2006 at Maupas near Belvaux (NA). 1 specimen on 25.vi.2016 at Parc animalier du Domaine des Grottes at Han-sur-Lesse (NA), leg. D. Sootmaekers *et al.* 1 specimen on 29.vii.2016 at Les Spinets at On (LX), leg. E. Thoen *et al.* 1 specimen on 30.vi.2019 at Mont des Pins near Bomal (LX), leg. D. Gailly *et al.*

Rhyacia simulans (Hufnagel, 1766) – Dotted Rustic: only one sighting: 1 specimen on 05.ix.2003 at Gros Tienne near Lavaux-Ste.-Anne (NA).

Xestia agathina (Duponchel, 1827) – Heath Rustic: 1 specimen on 10.ix.2020 at Mont des Pins near Bomal (LX), leg. D. Gailly & N. Terorde. 1 specimen on 13.ix.2020 at the quarry de la Falize at Aywaille (LG), leg. Leafminers working group.



Fig. 47. *Xestia stigmatica*, 06.viii.2018, Focant, NA. © Chris Steeman.

Xestia stigmatica (Hübner, 1813) – Square-spotted Clay (Fig. 47): present in small numbers in the western part of the Famenne-Calestienne area.

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Uitsluitstrategieën bij wespvlinders (Lepidoptera: Sesiidae)

Rudi Goossens

Samenvatting. Rupsen en poppen van endofytische insecten, waaronder wespvlinders, leven vrij goed verborgen. Het moeilijke aan een dergelijke levenswijze is dat het imago zich een weg naar de buitenwereld moet kunnen banen zonder hierbij te erg in het oog te springen van natuurlijke vijanden. Hiervoor hebben soorten verschillende strategieën ontwikkeld. In dit artikel worden hiervan een aantal voorbeelden beschreven.

Abstract. Caterpillars and pupae of endophytic insects, including clearwings, are quite well hidden from possible natural enemies. The disadvantage of such a way of life is that the imago must be able to make its way to the outside world without being too conspicuous to natural enemies. Species have developed different strategies for this. This article describes several examples.

Résumé. Les chenilles et les chrysalides d'insectes endophytes, y compris les Sesiidae, sont assez bien cachées des ennemis naturels éventuels. L'inconvénient d'un tel mode de vie est que l'adulte doit pouvoir se frayer un chemin vers le monde extérieur sans être trop visible pour les ennemis naturels. Des espèces ont développé différentes stratégies pour cela. Cet article relate plusieurs exemples.

Key words: Sesiidae — Uitsluitopening — Endofytische soorten — Rups — Pop — Parasieten.

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Inleiding

Dieren kunnen ten prooi vallen aan vijanden zoals predatoren of parasieten. Om dat te vermijden zijn verschillende strategieën ontwikkeld.

Dat dit ontsnappen aan de vijand maar gedeeltelijk lukt en er toch nog slachtoffers vallen, is de prijs die elk organisme betaalt voor het in stand houden van het ecologisch evenwicht.

Bij holometabole insecten zoals vlinders, zijn het ei, de rups en de pop weinig tot niet mobiel en dus een makkelijke prooi. Het vergde dus wel wat inventiviteit van deze dieren, waaronder wespvlinders, om deze stadia zo goed mogelijk te beschermen.

Ontsnapping van de rups of pop aan predatoren

Rupsen kunnen verpoppen in de grond, zoals bv. pijlstaartvlinders (Sphingidae) of een stevige, beschermende cocon maken zoals de hermelijnvlinders doen. Poppen van dagvlinders die zichtbaar aan planten opgehangen zijn, kunnen gecamoufleerd zijn of zodanig los hangen dat parasitaire wespen geen houvast vinden om hun legboor erin te steken (Zimmer 2000).

Rupsen en poppen van vlinders die in planten leven (endofytisch ontwikkelende vlinders), zoals wespvlinders, hebben door hun levenswijze in principe het grote voordeel dat ze moeilijker door predatoren of parasieten gevonden worden.

Het uitsluipen bij endofytische soorten

Het probleem bij zich endofytisch ontwikkelende soorten is echter wel dat het imago bij het uitsluipen uit de plant moet kunnen ontsnappen. Hiervoor hebben de dieren een aantal aanpassingen verworven. En omdat een ontsnappingsroute ook wel eens een toegangsroute kan zijn voor predatoren, hebben onder meer de Sesiidae een

gamma aan strategieën ontwikkeld om een zo onopvallend mogelijke uitweg uit de plant te creëren. Niettemin slagen sluipwespen, parasitaire vliegen of andere natuurlijke vijanden er soms alsnog in de rups of pop te vinden.

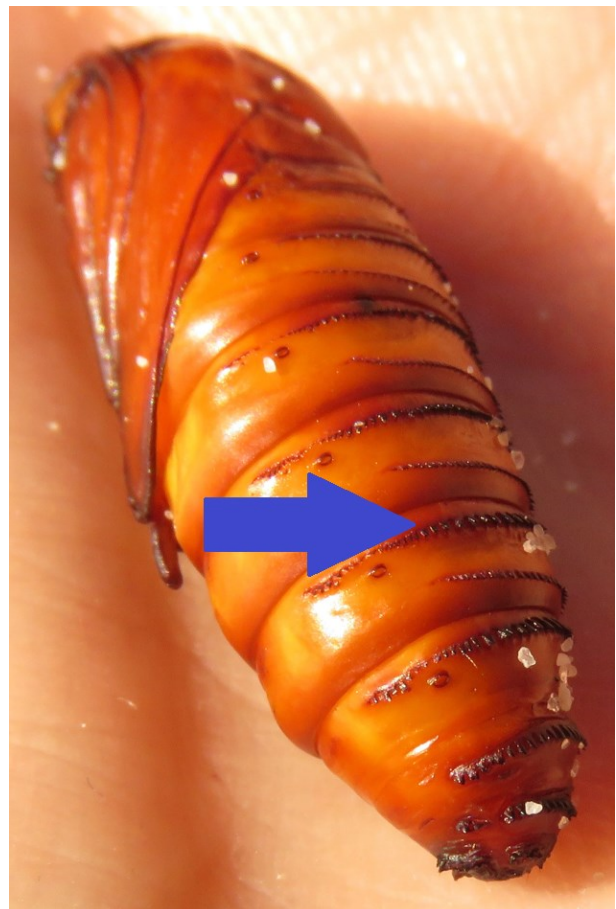


Fig. 1. Pop van *Sesia apiformis* (hoornaarvlinder), met kransen van tandjes, een kenmerk dat voorkomt bij vele endofytische soorten, Baasrode (OV), 9.vii.2019. © Rudi Goossens.

Fig. 1. Pupa of *Sesia apiformis* (hornet moth), with whorls of teeth, a feature found in many endophytic species, Baasrode (OV), 9.vii.2019. © Rudi Goossens.

Aanpassingen van de pop

Vooreerst hebben de poppen van vele endofytische soorten zoals Sesiidae aan de segmenten kransen van tandjes die helpen bij het zich uit een gang murwen (Fig. 1). Daarenboven heeft de pop van vele soorten vooraan een puntvormig uiteinde wat het doorprikken van plantenweefsel makkelijker maakt (Fig. 2), een beetje te vergelijken met de eitand bij vogels.



Fig. 2. Pop van *Ch. nigrifrons* (hertshooiwespvliinder) met puntig uitsteeksel aan de kop, Habay (LX), 26.v.2020. © Rudi Goossens.

Fig. 2. Pupa of *Ch. nigrifrons* with pointed protrusion at the head, Habay (LX), 26.v.2020. © Rudi Goossens.

Het uitsluipen bij de boom- en struikbewonende soorten

De inheemse soorten van het genus *Sesia*, de hoornaarvlinder, *Sesia apiformis* (Clerck, 1759) en de gekraagde wespvlinder, *Sesia bembeciformis* (Hübner, 1806), leven in de wortels en het onderste deel van de

stam van bomen. De hoornaarvlinder tref je vooral aan in populieren (*Populus* spp.), de gekraagde wespvlinder voornamelijk in breedbladige wilgensoorten (*Salix* spp.) (Laštůvka Z. & Laštůvka A. 2001). De rupsen van de gekraagde wespvlinder leven, zoals alle wespvlinders, van de sapstroom van de plant. Wanneer de rups volgroeid is, maakt ze een gang naar de buitenwereld, meestal heel laag bij de grond. Ze knaagt tot er nog een dun laagje schors overblijft, dat in de loop van de winter meestal afvalt. Dit gebeurt wellicht door de schommelingen in de temperatuur en de vochtigheid, waardoor het dunne luikje opkrult en langzaam afscheurt (Fig. 3). De rups maakt na haar werk aan de ontsnappingsroute een cocon, meestal enkele centimeters, in zeer natte omgeving soms beduidend hoger, boven de uitsluitopening en verpopt. De opening wordt wel door spechten herkend en erboven vindt men dan ook vaak een 'spechtengat' (Fig. 4) langs waar de vogel de rups of pop buitmaakte.

De hoornaarvlinder maakt een cocon die steviger is dan die van de gekraagde wespvlinder en heeft een gang die onder de uitsluitopening zit en wel met het kopeinde stevig geplakt tegen de uitsluitplaats. Hier verschijnt echter meestal pas een gat wanneer de pop door de schors prikt (Fig. 5). Het laagje schors waarlangs het dier ontsnapt, is bij deze soort dus steviger. Gedurende 11 jaren van waarnemingen van uitsluitopeningen van *S. apiformis*, trof de auteur geen enkel spechtengat aan, hetgeen misschien niet te verwonderen is vermits de pop zich niet verradt met een opening. De vraag waarom de hoornaarvlinder een cocon maakt onder het uitsluitgat en de gekraagde wespvlinder erboven, valt moeilijk te beantwoorden. Als voorbereiding op een excursie hakte de auteur de schors voor de cocon van een hoornaarvlinder weg zodat de cocon zichtbaar werd.

Dit werd het dier fataal want enkele dagen later bleek de rups eruit geroofd. De gekraagde wespvlinder kan zich beter veroorloven dat zijn uitsluitopening zichtbaar is omdat de cocon er een eindje onzichtbaar boven zit. Maar dat is dan natuurlijk weer zonder de spechten gerekend. De rups van de zwartkophoornaarvlinder, *Eusphacia melanocephala* (Dalman, 1816) leeft in het callusweefsel aan de basis van dode takken van trilpopulier (*Populus tremula* L., 1753).



Fig. 3. Opkrullend luikje van *Sesia bembeciformis* (gekraagde wespvlinder), Baasrode (OV), 04.iii.2021 en 03.iv.2021. © Rudi Goossens.

Fig. 3. Curved hatch of *Sesia bembeciformis* (Lunar Hornet Moth), Baasrode (OV), 04.iii.2021 and 03.iv.2021. © Rudi Goossens.



Fig. 4. Uitsluitopening van *Sesia bembeciformis* (gekraagde wespvlinder) (onderaan) met erboven een spechtengat, Baasrode (OV), 3.ii.2023.

Fig. 4. Exit hole of *Sesia bembeciformis* (Lunar Hornet Moth) (at the bottom) with a woodpecker hole above, Baasrode (OV), 3.ii.2023.

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Fig. 5. Oude uitsluitgaten en een oude cocon in een opengemaakte gang van *Sesia apiformis* (hoornaarvlinder), Baasrode (OV), 25.ii.2019.

Fig. 5. Old emergence holes and an old cocoon in an opened corridor of *Sesia apiformis*, Baasrode (OV), 25.ii.2019.

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Fig. 6. Gedeeltelijk open luikje van *Eusphacia melanocephala* (zwartkophoornaarvlinder), Nismes (NA), 25.vi.2015.

Fig. 6. Partly opened hatch of *Eusphacia melanocephala* (Aspen clearwing), Nismes (NA), 25.vi.2015.

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De rups maakt voor het uitsluipen een gang naar buiten in de tak waar ze een luikje open laat dat soms nog gedeeltelijk of helemaal vastzit en dus nog geen zichtbare opening laat (Fig. 6). De geelbuikwespvlinder, *Synanthedon flaviventris* (Staudinger, 1883) is een van de soorten die in takken leeft (in dit geval van sommige wilgensoorten) en daar een gal veroorzaakt. De rups knaagt een luikje in de schors dat ze tijdens het knagen rondom weer vast spint (Fig. 7).

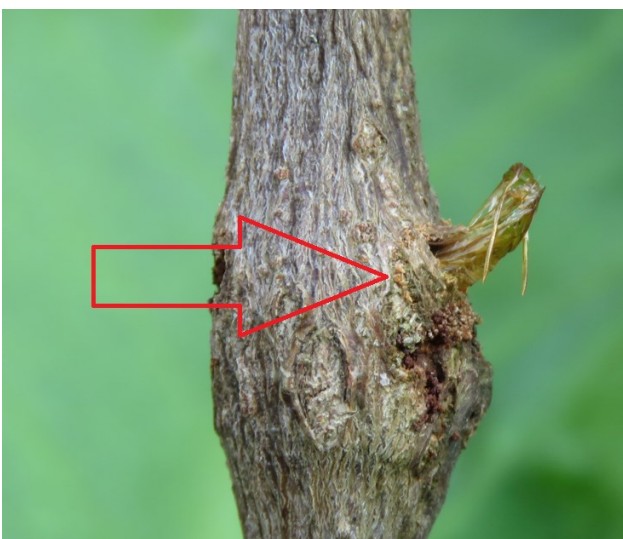


Fig. 7. Exuvia van *Synanthedon flaviventris* (geelbuikwespvlinder) met vastgesponnen luikje in de tak (zie pijl) langs waar de pop zich naar buiten wringt, Vielsalm (LX), 10.vii.2021. © Rudi Goossens.

Fig. 7. Exuvia of *Synanthedon flaviventris* (Sallow Clearwing) with spun hatch in the branch (see arrow) through which the pupa squeezes out, Vielsalm (LX), 10.vii.2021. © Rudi Goossens.



Fig. 8. Uitsluitgang van *Synanthedon andrenaeformis* (sneeuwbalwespvlinder), Epannes (FR), 11.iv.2023. © Rudi Goossens.

Fig. 8. Emergence corridor of *Synanthedon andrenaeformis* (Orange-tailed Clearwing), Epannes (FR), 11.iv.2023. © Rudi Goossens.



Fig. 9. Dekselletje op het uitsluitgat van *Synanthedon andrenaeformis* (sneeuwbalwespvlinder), Epannes (FR), 11.iv.2023.

Fig. 9. Hatch on the exiting hole of *Synanthedon andrenaeformis* (Orange-tailed Clearwing), Epannes (FR), 11.iv.2023.

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Fig. 10. Elzenstammetje met duidelijke vlek die verraadt langs waar het imago van *Synanthedon spheciformis* (elzenwespvlinder) zich naar buiten zal wringen, Aalst (OV), 11.iv.2018.

Fig. 10. Stem of alder with clear spot that betrays the point where the imago of *Synanthedon spheciformis* (White-barred Clearwing) will exit, Aalst (OV), 11.iv.2018.

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De rupsen van de sneeuwbalwespvlinder *Synanthedon andrenaeformis* (Laspeyres, 1801) leven in wollige sneeuwbal (*Viburnum lantana* L. 1753). Ze maken een uitsluitgang (Fig. 8) en spinnen een dekseltje van het stukje schors boven hun uitsluitgat (Fig. 9). Sommige exemplaren sluiten de opening af met een prop van knaagsel (frass), nadat het dekseltje verloren is gegaan. De rupsen van de elzenwespvlinder, *Synanthedon*

spheciformis (Denis & Schiffermüller, 1775) leven in de stammetjes en wortels van heel jonge en in regelmatig gesnoeide tronken van els (*Alnus* sp.) en berk (*Betula* sp.). Ze laten voor hun ontsnappingsroute een heel dun laagje van de schors over, dat makkelijk door de pop doorboord wordt. Omdat de schors op die plaats zo dun is, verdroogt en verkleurt ze en wordt ze op die manier zichtbaar (Fig. 10).



Fig. 11. Tubusje met uitgeslopen exuvia en imago van *Pyropteron affinis* (zonneroosjeswespvlinder), Han-sur-Lesse, (NA) 24.v.2018.

Fig. 11. Tube with empty exuvia and imago of *Pyropteron affinis*, Han-sur-Lesse (NA), 24.v.2018.

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Fig. 12. Gedeeltelijk afgeknaagde en afgebroken stengel van *Hypericum perforatum* L., 1753 door *Chamaesphecia nigrifrons* (hersthooiwesvlinder) waarbij al een deel van de opening door frass en spinsel is dichtgemaakt, Latour (LX), 4.ix.2017. © Rudi Goossens.

Fig. 12. Partially gnawed and broken stem of *Hypericum perforatum* L., 1753 by *Chamaesphecia nigrifrons*, part of the opening has already been closed by frass and spun silk, Latour (LX), 4.ix.2017. © Rudi Goossens.

Het uitsluipen bij soorten in wortels van kruiden

Vele wespvlindersoorten die in wortels van kruidachtige planten leven, maken voor het verpoppen een tubus van aan elkaar gesponnen knaagsel naar het oppervlak. In de tubus verpoppen ze en langs de top ervan sluipen ze uit.

De zuiderse soort *Chamaesphecia masariformis* (Ochsenheimer, 1808), die terecht 'toortswespvlinder' zou mogen worden genoemd, maakt een dergelijke tubus vanuit de wortel van toortsoorten zoals de koningskaars (*Verbascum thapsus* L.). Deze strategie treffen we ook aan bij *Synanthedon stomoxiformis* (Hübner, 1790, die in de wortels van vuilboom (*Frangula alnus* Mill.), wegedoorn (*Rhamnus cathartica* L.) en meelbes (*Sorbus aria* Crantz) leeft en om aan de oppervlakte te geraken soms tubussen van tientallen centimeters lang spint (pers. comm. Theo Garrevoet).

Ook de rupsen van de zonneroosjeswespvlinder, *Pyropteron affinis* (Staudinger, 1856) (Fig. 11) en de klaverwespvlinder, *Bembecia ichneumoniformis* (Denis & Schiffermüller, 1775) maken een tubusje, respectievelijk op zonneroosje (*Helianthemum*) en klaversoorten.

De hertshooiwesvlinder *Chamaesphecia nigrifrons* (Le Cerf, 1911) heeft een bijzondere ontsnappingsstrategie die je ook bij enkele soorten bladrollers (Tortri-



Fig. 13. Door de rups van *Synanthedon spuleri* (Spulers wespvlinder) geknaagde opening in plakband, Vaals (NL), 8.ii.2019.

Fig. 13. Opening in tape gnawed by the caterpillar of *Synanthedon spuleri*, Vaals (NL), 8.ii.2019.

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cidae) aantreft. De rups verpopt in de stengel van hertshooisoorten (*Hypericum* spp.) en bereidt haar uitsluiting voor door in de late zomer de stengel van binnenuit rondom af te knagen tot er een buitenste laagje overblijft dat zo dun is dat de stengel bij wat wind of een beetje aanraking afbreekt. De opening die hierbij ontstaat, is wel op voorhand door de rups met knaagsel dicht gesponnen waardoor predatoren moeilijk toegang hebben. Toevallig brak de auteur eens een stengel af die al grotendeels maar niet volledig door de rups was afgeknaagd. De rups begon onmiddellijk de ontstane opening met knaagsel en spinsel dicht te maken (Fig. 12).

Onnatuurlijke hindernissen

Ook bij onnatuurlijke hindernissen weten wespvlinderrupsen zich vaak een uitweg te banen. Hieronder enkele opmerkelijke ervaringen. De rups van Spulers wespvlinder, *Synanthedon spuleri* (Fuchs, 1908) leeft in verschillende boomsoorten maar ook heel vaak in takgezwellen veroorzaakt door een schimmel in jeneverbessorten (*Juniperus* sp.). Toen de auteur rupsen hierin probeerde uit te kweken, knaagde een ervan stukjes uit de plakband waarmee de auteur het gezwel had omwikkeld (Fig. 13).



Fig. 14. Uitgeslopen imago van *Paranthrene tabaniformis* (populierenwespvlinder) doorheen een gaatje in de tape, Waasmunster (OV), 8.vii.2019. © Rudi Goossens.

Fig.14. Imago of *Paranthrene tabaniformis* (Dusky Clearwing) emerging through a hole in the tape, Waasmunster (OV), 8.vii.2019. © Rudi Goossens.



Fig. 15. Exuvia van *Chamaespechia empiformis* (schijnwolfofsmelkwespvlinder) in een voeg tussen bakstenen, Baasrode (OV), 7.vi.2020. © Rudi Goossens.

Fig. 15. Exuvia of *Chamaespechia empiformis* in mortar between bricks, Baasrode (OV), 7.vi.2020. © Rudi Goossens.



Fig. 16. Tubus met exuvia en imago van *Chamaesphecia masariformis* met ingesponnen papier van een broodzak, Kineta (Griekenland), 21.v.2019. © Rudi Goossens.

Fig. 16. Tubus with exuvia and imago of *Chamaesphecia masariformis* with spun paper of a bread bag, Kineta (Griekenland), 21.v.2019. © Rudi Goossens.

Ook bij de populierenwespvlinder, *Paranthrene tabaniformis* (Rottemburg, 1775) stelde de auteur dit vast. Deze soort maakte in dit geval een perfect ronde opening in de tape (Fig. 14). Een rups van de schijn-wolfsmelkwespvlinder, *Chamaesphecia empiformis* (Esper, 1783), ontsnapte uit een van de vlinderkooien van de auteur en vond blijkbaar geen natuurlijke schuilplaats

meer. Een tijd later vond de auteur het exuvia dat uitstak uit een gaatje in de voegmortel tussen de stenen van zijn garage (Fig. 15). Toen de auteur tijdens een reis in Griekenland een afgeknipte wortel van een koningskaars, met een rups van *Ch. masariformis* erin, in een broodzak mee naar zijn verblijf nam, bleek na een nacht de rups een tubus te hebben gesponnen vanuit de houtige wortel door de broodzak heen waarbij het witte papier van de broodzak duidelijk mee als materiaal was gebruikt (Fig. 16).

Een laatste anekdote die de ontsnappingskills van Sesiidae nogmaals in de verf zet, deed zich voor in de Duitse deelstaat Rheinland-Pfaltz. Bij het opkweken van rupsen van de zuringwespvlinder *Pyropteron chrysidiformis* (Esper, 1782) bleken verschillende exemplaren gaten doorheen het plastic van een bloempot te hebben gebeten om langs daar als imago te verschijnen (pers. comm. Theo Garrevoet).

Epiloog

Dit artikel heeft niet als bedoeling volledig te zijn en alle mogelijke strategieën van wespvlinderrupsen om een zo onopvallend mogelijke uitweg naar de buitenwereld te creëren onder de loep te nemen. Evenmin wil het pretenderen een antwoord te geven op alle waaromvragen die de lezer hier kan stellen. Het wil wel uitnodigen om verder te denken en/of verder onderzoek te doen naar de redenen achter het gedrag en de bouwsels van in dit geval de wespvlinders, een familie die om meerdere redenen mijn niet aflatende belangstelling heeft gewekt.

Dankwoord

De auteur wil graag Ruben Meert en Theo Garrevoet bedanken voor hun tips en voor het nalezen van het artikel.

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Celypha woodiana (Lepidoptera: Tortricidae), de facto een nieuwe soort voor België

Theo Garrevoet

Samenvatting. In maart 2019 werd in het zuiden van de provincie Luxembourg een aantal gezwellen, veroorzaakt door maretak (*Viscum album* L.), ingezameld om een eventuele aanwezigheid van *Synanthedon loranthi* (Králíček, 1966) aan te tonen. Zowel gezwellen op appel (*Malus domestica* (Suckow) Borkh.) als op eenstijlige meidoorn (*Crataegus monogyna* Jacq.) werden meegenomen. Als nevenvondst werd ook een rupsje van *Celypha woodiana* (Barrett, 1882) (Tortricidae) aangetroffen. Deze soort werd al vele decennia niet meer waargenomen in België en de correctheid van de enige eerdere vondst is twijfelachtig. Het betreffende exemplaar is bovendien niet meer te traceren en daardoor is het gekweekte vlindertje uit de provincie Luxembourg de eerste verifieerbare waarneming uit België. De levenswijze van de soort wordt hier besproken alsook de momenteel gekende verspreiding in Europa. Ook een andere Tortricidae, *Archips podana* (Scopoli, 1763), werd op maretak gevonden; deze wordt ook besproken evenals een schildwesp die de rups parasiteert.

Abstract. In March 2019, several swellings caused by mistletoe (*Viscum album* L.) were collected in the south of the Province of Luxembourg to demonstrate a possible presence of *Synanthedon loranthi* (Králíček, 1966). Some galls were collected both on apple (*Malus domestica* (Suckow) Borkh.) and hawthorn (*Crataegus monogyna* Jacq.). As a coincidental find, a caterpillar of *Celypha woodiana* (Barrett, 1882) (Tortricidae) was also found. This species has not been observed in Belgium for many decades and the correct identification of the only previous find is doubtful. Moreover, the specimen in question can no longer be traced, making the bred moth from the Luxembourg province the first verifiable observation from Belgium. The biology of the species is discussed here as well as its currently known distribution in Europe. Another Tortricidae, *Archips podana* (Scopoli, 1763), was also found on mistletoe; this species is also discussed as well as a parasitic wasp that parasitises the caterpillar.

Résumé. En mars 2019, un certain nombre de galles causées par le gui (*Viscum album* L.) ont été recueillies dans le sud de la province de Luxembourg pour démontrer la présence possible de *Synanthedon loranthi* (Králíček, 1966). Des galles ont également été collectées sur des pommiers (*Malus domestica* (Suckow) Borkh.) et des aubépines (*Crataegus monogyna* Jacq.). Par coïncidence, une chenille de *Celypha woodiana* (Barrett, 1882) a également été trouvée. Cette espèce n'a pas été observée en Belgique depuis de nombreuses décennies et l'identification correcte de la seule découverte précédente est discutable. De plus, le spécimen en question ne peut plus être retrouvé et donc, le papillon élevé de la province de Luxembourg est la première observation vérifiable de Belgique. Le mode de vie de l'espèce est abordé ici ainsi que la répartition actuellement connue en Europe. Un autre Tortricidae, *Archips podana* (Scopoli, 1763), a également été trouvé sur le gui ; ceci est aussi mentionné ainsi qu'une guêpe parasite qui parasite la chenille.

Key words: Lepidoptera — First record — Tortricidae — Faunistics — La Gaume — *Celypha woodiana* — *Archips podana*.

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Inleiding

In maart 2019 werd, bij de zoektocht naar *Synanthedon loranthi* (Králíček, 1966) (maretakwespvlinder) (Garrevoet 2020), als nevenvondst op maretak (*Viscum album* L.) ook het typische rupsje van *Celypha woodiana* (Barrett, 1882) (maretakbladroller) aangetroffen. In 2022 werd deze vondst bevestigd met meerdere bijkomende waarnemingen: twee rupsen op 11.iv.2022 te Lamorteau (LX) (die jammer genoeg stierven) en een pop op 22.v.2022 te Torgny (LX). In dezelfde streek werden nog eens drie rupsen gevonden op 28.iv.2022 (pers. comm. Ruben Meert).

Geschiedenis

De soort werd ontdekt door John H. Wood in 1878 in Herefordshire (UK) maar door Barrett C. G. beschreven in 1882 als *Brachytaenia woodiana*. Het was opnieuw J. H. Wood die in 1892 (10 jaar later!) de levenswijze en waardplant achterhaalde (Wood 1892).

In België werd deze soort voor het eerst gemeld uit Oost-Vlaanderen in de omstreken van Gent (Van Daele & Pelereyts 1966). Een enkel exemplaar zou in 1964

verzameld zijn met een kwikdamplamp. Dit specimen is echter niet te traceren: de museumcollecties van de Rijksuniversiteit Gent zijn al jaren ontoegankelijk wegens een grondige herwerking, maar de collectiebeheerder meldt dat hij de namen van de auteurs van betreffend artikel niet is tegengekomen in de collecties.

Een controle of de exemplaren eventueel gedeponereerd werden in het KBIN gaf ook een negatief resultaat. Bovendien, vermits *Viscum album* L. niet of nauwelijks voorkomt in de omgeving van Gent, lijkt het zeer waarschijnlijk dat de waarneming van deze Tortricidae berust op een misidentificatie. Een verwarring met *Apotomis lineana* (Denis & Schiffermüller, 1775) of met een licht getekend exemplaar van *Apotomis betuletana* (Haworth, 1811) is niet uit te sluiten. Het is overigens deze laatstgenoemde soort die gesuggereerd wordt – bij gebrek aan gevalideerde foto's van *C. woodiana* – door ObsIdentify, de op AI gebaseerde fotoherkenningsapp van Stichting Observation International. Daardoor zijn de huidige gekweekte exemplaren de eerste verifieerbare meldingen van deze soort in België. Vooralsnog beperken de Belgische waarnemingen zich tot het uiterste zuiden van het land (La Gaume).

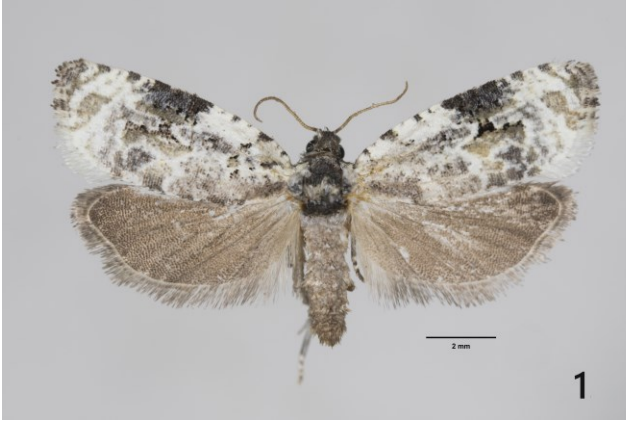


Fig. 1. *Celypha woodiana*, ex larva 30.iii.2019, Chenois (LX), imago op 05.v.2019. © Theo Garrevoet.

Fig. 1. *Celypha woodiana*, ex larva 30.iii.2019, Chenois (LX), imago on 05.v.2019. © Theo Garrevoet.

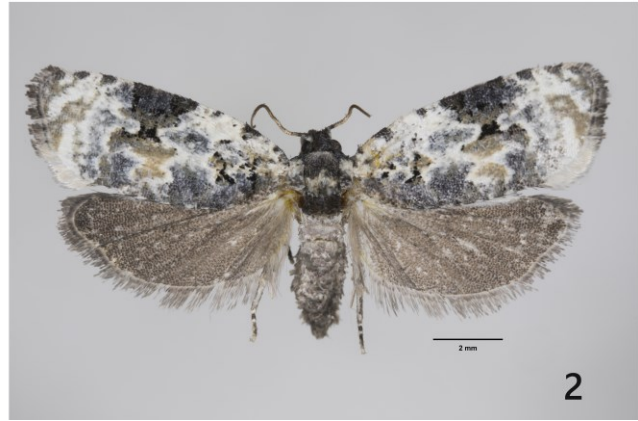


Fig. 2. *Celypha woodiana*, ex pupa 22.v.2022, Torgny (LX), imago op 09.vi.2022. © Theo Garrevoet.

Fig. 2. *Celypha woodiana*, ex pupa 22.v.2022, Torgny (LX), imago on 09.vi.2022. © Theo Garrevoet.

Verspreiding

Celypha woodiana werd beschreven op basis van in Zuid-Engeland ontdekte exemplaren en is momenteel bekend van het Verenigd Koninkrijk (uitgezonderd Noord-Ierland), Spanje, Frankrijk (behalve Corsica), G. H. Luxemburg, Italië (enkel vasteland), Zwitserland, Oostenrijk, Liechtenstein, Duitsland, Denemarken, Griekenland, Roemenië, Hongarije, Slowakije, Tsjechië, Polen, Litouwen en Ukraine tot in het Europese deel van Turkije (Lepiforum 2022). De soort komt dus in een uitgestrekt gebied voor maar vertoont een zeer disjunct verspreidingspatroon vermits deze bladroller monofaag leeft op *Viscum album* (Santalaceae) (Maretak), een halfparasiet die lang niet overal voorkomt. De Nederlandse naam – Maretakbladroller – is hier ook van afgeleid.

Morfologie

Het imago van *C. woodiana* heeft een spanwijdte van 16–18 mm. De voorvleugels zijn krijt wit met talrijke kleine, niet scherp afgelijnde, blauwgrijze wolkjes en een paar okergele vlekken. Aan de voorrand van de voor-



Fig. 3. *Celypha woodiana*, ex larva 30.iii.2019, Chenois (LX), imago op 05.v.2019. © Theo Garrevoet.

Fig. 3. *Celypha woodiana*, ex larva 30.iii.2019, Chenois (LX), imago on 05.v.2019. © Theo Garrevoet.

vleugel bevindt zich in het midden een opvallende driehoekige donkergrijze vlek. De voorvleugel heeft hierdoor een gemarmerd uitzicht dat ook wel aan uitwerpselen van een vogel doet denken. De grootte en helderheid van de vlekken is vrij variabel (Figs 1, 2). De franjes van de voorvleugels zijn grijs maar wit aan de tornus. De achtervleugels zijn, net als de franjes, grijsbruin. De kop is zwart en de antennen lichtbruin. De thorax is zwart behalve het middelste segment (mesothorax) dat opvallend lichter getint is. Op de thorax staat een opvallende borstel van opgerichte schubben. (Fig. 3).

De zeer herkenbare, karakteristiek donkergroen gekleurde rups heeft een glanzend zwarte kop en prothoracale plaat. De kleine pinacula op het abdomen zijn zwartgroen. De anale plaat is zwart of groenbruin gevlekt met zwart. De borstpoten zijn donkergrijs of zwart (Fig. 4). De pop is roodbruin met wat groene tinten. (Fig. 5).

Biologie

Celypha woodiana heeft één generatie per jaar en vliegt van eind juni of begin juli tot in augustus. De eitjes worden afgezet op maretak en de pas uitgekomen rupsjes maken een smal, onopvallend, onderzijdig gangetje in een blad van deze plant en overwinteren dan hierin (Bladmineerders.nl 2022). Vroeg in het volgende voorjaar wordt het rupsje terug actief en breidt de mijn verder uit tot in mei het beeld van het steeds verder uitgeholde blad resulteert in een opvallende blaasmijn (Figs 6, 7). Deze is grotendeels doorzichtig omdat de meeste frass door de rups verwijderd wordt.

In juni verlaat de rups de mijn en verpopt meestal onder schors of in een spleet in de schors van de gastheer van de maretak (pers. obs.) (Fig. 8). De cocon wordt, alleszins onder kweekomstandigheden, ook tussen twee samengesponnen bladeren van de voedselplant geconstrueerd. Of dit ook in de vrije natuur voorkomt is nog nader te onderzoeken. Het gemineerde blad valt doorgaans af en daardoor wordt het vanaf dan een stuk moeilijker om de aanwezigheid van de soort na te gaan.



Fig. 4. *Celypha woodiana*, rups tussen twee blaadjes van *Viscum album*, 30.iii.2019, Chenois (LX). © Theo Garrevoet.

Fig. 4. *Celypha woodiana*, caterpillar between two leaves of *Viscum album*, 30.iii.2019, Chenois (LX). © Theo Garrevoet.



Fig. 5. *Celypha woodiana*, exuvia dat uit een losjes gesponnen cocon steekt, 30.iii.2019, Chenois (LX). © Theo Garrevoet.

Fig. 5. *Celypha woodiana*, exuvia protruding from a loosely spun cocoon, 30.iii.2019, Chenois (LX). © Theo Garrevoet.



Fig. 6. *Celypha woodiana*, minerende rups in een blad van *Viscum album*, 28.iv.2022, Torgny (LX). © Ruben Meert.

Fig. 6. *Celypha woodiana*, caterpillar mining inside a *Viscum album* leaf, 28.iv.2022, Torgny (LX). © Ruben Meert.



Fig. 7. *Celypha woodiana*, verlaten mijn in een blad van *Viscum album*, onderzijde, 30.iii.2019, Chenois (LX). © Theo Garrevoet.

Fig. 7. *Celypha woodiana*, abandoned mine in a *Viscum album* leaf, underside, 30.iii.2019, Chenois (LX). © Theo Garrevoet.



Fig. 8. *Celypha woodiana*, exuvia in een spleet achter een stuk schors (zie pijltje), ex pupa 22.v.2022, Torgny (LX), imago op 09.vi.2022. © Theo Garrevoet.

Fig. 8. *Celypha woodiana*, exuvia in a crevice behind a piece of bark (see arrow), ex pupa 22.v.2022, Torgny (LX), imago on 09.vi.2022. © Theo Garrevoet.



Fig. 9. *Archips podana*, een zich voedende rups tussen samengesponnen bladeren van *Viscum album*, 10.v.2022, Torgny (LX). © Theo Garrevoet.

Fig. 9. *Archips podana*, a feeding caterpillar among spun leaves of *Viscum album*, 10.v.2022, Torgny (LX). © Theo Garrevoet.

Het imago is actief vanaf de schemering en wordt aangetrokken door licht. De typische habitat zijn boomgaarden, houtwallen en akkerranden waar maretak voorkomt. De gastheer voor de maretak lijkt geen kritische factor te zijn, maar de meeste waarnemingen gebeuren blijkbaar op appel (*Malus* sp.) en meidoorn

(*Crataegus* sp.) (Lepiforum.org 2022). Maar ook op populier (*Populus* sp.) en den (*Pinus* sp.) zijn al mijnen gevonden (Ruben Meert, pers. comm.)

Er is ook een andere soort die op maretak werd waargenomen en die als rups, op het eerste gezicht, goed lijkt op *C. woodiana*. In de lente van 2022 werden, in



Fig. 10. *Archips podana*, pop in een spinsel tussen samengesponnen bladeren van *Viscum album*, 10.v.2022, Torgny (LX). © Theo Garrevoet.
 Fig. 10. *Archips podana*, pupa in a loose web between spun leaves of *Viscum album*, 10.v.2022, Torgny (LX). © Theo Garrevoet.



Fig. 11. *Archips podana*, een imago ♀, ex larva 10.v.2022, Torgny (LX), imago op 01.vi.2022. © Theo Garrevoet.
 Fig. 11. *Archips podana*, an adult ♀, ex larva 10.v.2022, Torgny (LX), imago emerged on 01.vi.2022. © Theo Garrevoet.



Fig. 12. *Archips podana* ♀, geprepareerd imago, ex larva 10.v.2022, Torgny (LX), imago op 01.vi.2022. © Theo Garrevoet.
 Fig. 12. *Archips podana* ♀, set imago, ex larva 10.v.2022, Torgny (LX), imago op 01.vi.2022. © Theo Garrevoet.



Fig. 13. *Macrocentrus linearis*, schildwesplarven die de rups van hun gastheer *A. podana* verlaten, 10.v.2022, Torgny (LX), larven op 22.v.2022. © Theo Garrevoet.
 Fig. 13. *Macrocentrus linearis*, parasitic wasp larvae leaving the caterpillar of their host *A. podana*, 10.v.2022, Torgny (LX), larvae on 22.v.2022. © Theo Garrevoet.



Fig. 14. *Macrocentrus linearis*, verpopte schildwesplarven in hun coconnetjes. De lege rupsenhuid is nog zichtbaar op de foto, 10.v.2022, Torgny (LX), poppen op 25.v.2022. © Theo Garrevoet.
 Fig. 14. *Macrocentrus linearis*, pupated braconid wasp larvae in their cocoons. The empty caterpillar skin is still visible in the picture, 10.v.2022, Torgny (LX), pupae on 25.v.2022. © Theo Garrevoet.



Fig. 15. *Macrocentrus linearis*, imago, ex larva 10.v.2022, Torgny (LX), imago op 09.vi.2022. © Theo Garrevoet.
 Fig. 15. *Macrocentrus linearis*, imago, ex larva 10.v.2022, Torgny (LX), imago on 09.vi.2022. © Theo Garrevoet.

dezelfde biotopen als deze van *C. woodiana*, enkele rupsjes gevonden die zich tussen samengesponnen blaadjes van maretak voedden met deze plant. Bij het uitkweken van deze soort bleek het te gaan om *Archips*

podana (Scopoli, 1763), ook behorend tot de Tortricidae. Dit is een algemene soort in België en is zeer polyfaag.

De rupsen van deze soort vertonen vaak een iets vagere tint groen dan die van *C. woodiana*. De kleur van de kop en thoracale plaat zijn hier zwart of donkerbruin

maar de anale plaat daarentegen is niet donkergekleurd. De pinacula zijn wit-groen (Fig. 9). Ook de pop lijkt op deze van *C. woodiana* en zit in een los wit spinsel tussen de samengesponnen bladeren van de waardplant (Fig. 10).

Van de drie ingezamelde rupsen kon er slechts één uitgekweekt worden (Figs 11, 12) omdat beide andere geparasiteerd waren door de schildwesp *Macrocentrus linearis* (Nees, 1811) (Braconidae). Kort voor de verpopping kwam een groot aantal larven van dit wespje uit het lijf van de beide rupsen gekropen en deze verpopten na een drietal dagen (Fig. 13, 14).

De adulte schildwespen (Fig. 15) ontloopten vanaf 09.vi.2022.

Conclusies

Celypha woodiana is de facto een nieuwe soort voor de vlinderfauna van België. De eerste en tot nu enige melding dateert uit de zestiger jaren van vorige eeuw en het betreffende exemplaar is niet te traceren en berust wellicht op een foutieve determinatie. Alle recente waarnemingen die in deze publicatie vermeld worden, situeren zich in 'La Gaume', een landstreek in het uiterste zuiden van België. Of deze soort hier al langere tijd

voorkomt of, zoals bij een heel aantal andere soorten, zijn areaal naar het noorden heeft uitgebreid door het warmer wordende klimaat, blijft een vraagteken.

Het eerst waargenomen exemplaar van *C. woodiana* zal gedeponereerd worden in de collecties van het RBINS.

De rups van de polyfage soort *Archips podana* lijkt op die van *C. woodiana* en komt ook voor op maretak. Deze wordt soms geparasiteerd door een kleine schildwesp.

Dankwoord

De auteur dankt Ruben Meert voor het nalezen van een eerdere versie van dit artikel, de melding van zijn eigen waarnemingen van *C. woodiana* in 2022 en het ter beschikking stellen van een foto van een minerende rups. Ook André Verboven bezorgde verscheidene nuttige opmerkingen.

Dominick Verschelde (Zoology Collections Manager, UGent) wordt bedankt voor de informatie over de Gentse universiteits-collecties.

Zowel Fons Verheyde als Mark Shaw maar vooral ook Augustijn De Ketelaere worden bedankt voor de determinatie van de parasitaire schildwesp.

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Entomology: a multitude of cross-disciplinary opportunities

Radoslav Valkov

Abstract. A noteworthy feature of entomology is the opportunity for it to be practically integrated into our lives. It stretches out over a wide spectrum of useful applications across many scientific fields. Several challenges to fully understanding the complexity of entomology are presented, such as considering its vast research paradigm and raising awareness as to the importance of insects on a global scale. The current study offers an interdisciplinary outlook on insects regarding their potential role in human surgical interventions. This is achieved through the description of anatomical features and their biomechanical manifestations, observed in rare neuropteran and dipteran insect species from the European fauna, documented by the author. Empirically justified parallels between insect anatomy and advancement in surgery are exemplified through analysis of evident mechanical properties of legs in *Mantispa aphavexelte* (U. Aspöck & H. Aspöck, 1994) and *Rainieria calceata* (Fallén, 1820). In addition, suggestions on implementing specific examples of insect biomechanical design in robot-assisted surgery setups are made.

Samenvatting. Een opmerkelijk kenmerk van entomologie is de mogelijkheid om het praktisch te integreren in ons leven. Het strekt zich uit over een breed spectrum van nuttige toepassingen in vele wetenschappelijke gebieden. Er zijn verschillende uitdagingen om de complexiteit van entomologie volledig te begrijpen, zoals het in ogenschouw nemen van het enorme onderzoeksparadigma en de bewustwording van het belang van insecten op wereldschaal. De huidige studie biedt een interdisciplinaire kijk op insecten met betrekking tot hun mogelijke rol in chirurgische ingrepen bij mensen. Dit wordt bereikt door de beschrijving van anatomische kenmerken en hun biomechanische manifestaties, waargenomen bij zeldzame Neuroptera en Diptera insectensoorten uit de Europese fauna, gedocumenteerd door de auteur. Empirisch onderbouwde parallellen tussen insectenanatomie en vooruitgang in de chirurgie worden geïllustreerd door analyse van duidelijke mechanische eigenschappen van poten bij *Mantispa aphavexelte* (U. Aspöck & H. Aspöck, 1994) en *Rainieria calceata* (Fallén, 1820). Daarnaast worden suggesties gedaan voor het implementeren van specifieke voorbeelden van biomechanisch ontwerp van insecten in robot-geassisteerde chirurgieopstellingen.

Résumé. L'une des caractéristiques remarquables de l'entomologie est la possibilité de l'intégrer concrètement dans notre vie. Elle s'étend à un large spectre d'applications utiles dans de nombreux domaines scientifiques. Plusieurs défis sont à relever pour comprendre pleinement la complexité de l'entomologie, comme la prise en compte de son vaste paradigme de recherche et la sensibilisation à l'importance des insectes à l'échelle mondiale. L'étude présentée ici offre une perspective interdisciplinaire sur les insectes en ce qui concerne leur rôle potentiel dans les interventions chirurgicales humaines. Pour ce faire, elle décrit les caractéristiques anatomiques et leurs manifestations biomécaniques, observées chez de rares espèces d'insectes neuroptères et diptères de la faune européenne, documentées par l'auteur. Des parallèles empiriquement justifiés entre l'anatomie des insectes et les progrès de la chirurgie sont illustrés par l'analyse des propriétés mécaniques évidentes des pattes chez *Mantispa aphavexelte* (U. Aspöck & H. Aspöck, 1994) et *Rainieria calceata* (Fallén, 1820). En outre, sont formulées ici des suggestions sur la mise en œuvre d'exemples spécifiques de conception biomécanique d'insectes dans des installations de chirurgie assistée par robot.

Key words: Neuroptera — Robot-assisted surgery — Insect functional morphology — Interdisciplinary relationships — Biomechanics — *Mantispa* — *Rainieria*.

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A brief note on observation seen as a major methodological advantage

Observation is essential, even for the most demanding scientific task. It has two aspects that qualitatively affect the inferences from a given study, namely *depth* and *appropriacy* of the initial observation. *Interpretative ingenuity* and aptly defined *span of sought research complexity* underpin advancement. Reliance on verified circumstances and smart extraction of data from a specified observation naturally predispose to reaching the desired scientific goal. The resourceful perspective to adopt an imitative approach to technological progress through “copying” designs seen in nature has been already acknowledged – such an approach fosters sensibility to make rational and innovative suggestions. This is why the current paper leans towards a forward-looking viewpoint to discern practicably relevant cross-disciplinary links between entomology and other fields of science and technology, with an emphasis on medical

science. The article highlights the importance of a key aspect that entomological literature omits, namely the scalability of knowledge. Therefore, it is appropriate to perceive insects as accessible sources of valuable knowledge. Here a compact piece of observational data on two insect species draws attention to heterogeneous scientific domains and puts forward an idea that originally stems from entomology.

Introduction to robot-assisted surgery

Minimally invasive surgery (MIS) is a good alternative to traditional surgery if known methods are not deemed sufficiently applicable for a given human surgical intervention. The evolution of MIS leads to increased demand for automation through the use of robot-assisted surgery (RAS). Reported data on the advantages of its use are promising (Secoli *et al.* 2022). Analysis of patient data collected for patients between January 2010 – December 2017 who had undergone pulmonary resection via

robotised equipment at the University Hospital of Pisa, Italy, suggests a high success rate of this surgical method for patients with non-small cell lung cancer (NSCLC) (Zirafa *et al.* 2021). The approach is also used in rectal surgery (Becker *et al.* 2016). Complete RAS setups on the market that are available in serial production are being used for various surgical interventions, such as laparoscopic MIS, including robot-assisted radical prostatectomy (RARP) (Huynh & Ahlering 2018). Intriguing that RAS is also used in neurosurgery (Secoli *et al.* 2022). Not only does this method ensure a shorter hospital stay, but also allows quicker and more efficient post-operative recovery (Huynh & Ahlering 2018). Awareness on the efficacy of RAS in minimally invasive surgery depends on the continuous collection and stringent administration of patient data concerning their scientific use (Becker *et al.* 2016). The development of this technology is also determined by the necessary upgrades to achieve better tool precision through miniaturisation and more intuitive control for the operator. Additionally, reducing production and maintenance costs is dependent upon the presence of a competitive market and the requirement for frequent patent updates of such equipment (Longmore *et al.* 2020).

Insect anatomy in surgery – overview of current advancement and the challenges

Designing and using insect cyborgs is a recent avenue of technological improvement and undoubtedly a source of intense discussions and ethical concerns over the balance between practicability and strict management of such engineering. Its application induces fears over lawful use and regulatory mechanisms to limit potential issues (Siljak *et al.* 2022). Introducing innovation through insect anatomy is rapidly evolving thanks to the widespread use of materials with specific electrostatic and suitable elastic properties, resulting in synthetic assembly of insect biomechanics (Wang *et al.* 2021). Insects can be safely regarded as reliable anatomical models to be utilised by robotics through the simulation of studied anatomical structures (Quinn & Ritzmann 2018). Therefore, it is reasonable to extend research on insect anatomy beyond their general anatomical attributes. The concept of incorporating insect anatomy in human surgical tools can potentially refer to designing specific instrumental attachments for precision surgical manipulation of tissue, based on anatomical configurations seen in insects. The growing expansion of minimally invasive surgery is inextricably related to its execution by RAS setups. This poses a challenge to achieving speedy improvement of the essential mechanical parts, very often strictly characteristic to a given RAS system, the *manipulation effectors*. Therefore, anatomical microstructures in insects with markedly flexible mechanical articulation deserve special scientific attention and can be seen as “natural” manipulation effectors.

Methods

Two insect species, *Mantispa aphavexelte* (U. Aspöck & H. Aspöck, 1994) and *Rainieria calceata* (Fallén, 1820), were subjected to visual examination *in situ* to identify distinct anatomical characters that could be considered of potential use in the context of medical applications. Observation is further backed with literary evidence that links up insect anatomical complexity with other sciences. Interpretation of the observed structures and their mechanical articulation is based on photographic evidence and notes on ethology at the time the insects were being observed (a retrospective approach to the analysis of the documentary material is applied). Documenting within the natural habitat (43°28'N, 23°56'E, Byala Slatina, Bulgaria) allowed careful inspection of how insects use the identified complex leg anatomy, with minimum disturbance i.e., the exhibited biomechanical capabilities of the two species are reported, as seen. Nikon D70s digital camera, Kenko macro extension tubes, Nikon AF Nikkor 28-80mm f/3.3~5.6 G lens and wirelessly controlled remote camera flash Nikon SB-R200 were used for taking the photographs. *Mantispa aphavexelte* was attracted to a 125W MV moth trap and *Rainieria calceata* was documented grooming on the tree bark of *Salix fragilis* from a specific survey taking place in 2021 for the above-mentioned locality, during the day (Valkov 2021, -unpublished data). Discerning *Mantispa aphavexelte* from *Mantispa styriaca* is based on Snyman *et al.* (2018).

Results



Fig. 1. *Mantispa aphavexelte*, 18.viii.2022, 23:17:55; 43°28'N, 23°56'E, Byala Slatina, Bulgaria, 125W MV moth trap. © Radoslav Valkov.

The individual is photographed next to the light source, feeding on the Diamond-back moth *Plutella xylostella* (Linnaeus, 1758) (Fig. 1).

Lateral view of key external biomechanical elements of forelegs (Fig. 2): the coxo-trochanteral joint (a) allows different angles of rotation (b), ensuring high degree of flexibility between the femur (c) and the forecoxal sulcus (d) to aid handling of prey. A brighter diagonal line on the coxa is observed (d). The notably bright forecoxal sulcus depicts a fracture of unknown origin (Fig. 2d), which does not impair the biomechanical properties of the foreleg (evidence on the notable strength of the chitinous cuticle

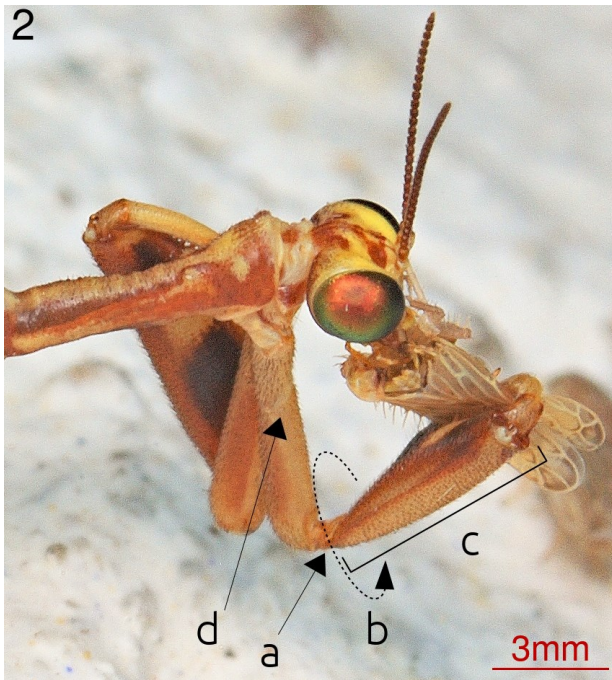


Fig. 2. *Mantispa aphavexelte*, 18.viii.2022, 23:15:16; 43°28'N, 23°56'E, Byala Slatina, Bulgaria, 125W MV moth trap. © Radoslav Valkov.

for *Mantispa aphavexelte*). The robust exoskeleton protects the muscles, which continue to function as required, even in the presence of physical harm to the leg. The observed joint rotation allows precise control over positioning food near the feeding apparatus. The ability for independent control of the forelegs during the feeding process is an important element of this potentially useful biomechanical design for surgical purposes. The insect accurately commands the rotation of the foreleg to move an object with physical dimensions within the millimetre range – a convincing analogy with a robotised microconstruction of an effector, expected to perform fine movements (Fig. 3). This observation is in line with a necessary prerequisite for improving and designing new RAS systems – miniaturisation of the manipulation effectors.

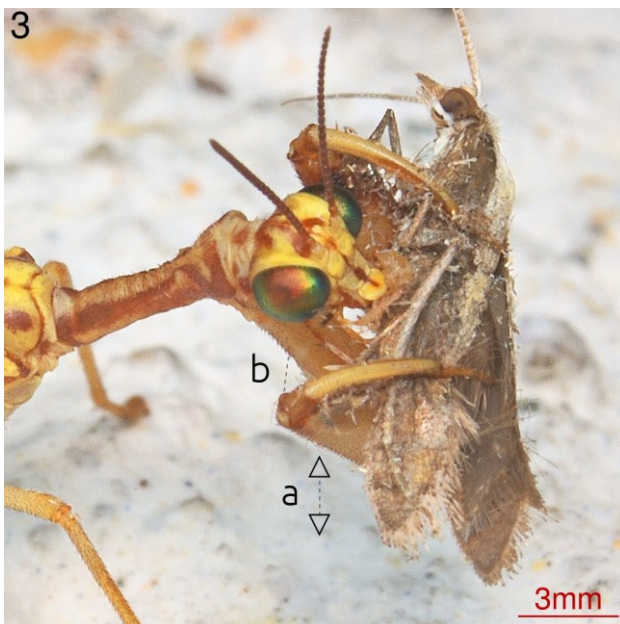


Fig. 3. *Mantispa aphavexelte*, 18.viii.2022, 23:17:55; 43°28'N, 23°56'E, Byala Slatina, Bulgaria, 125W MV moth trap. © Radoslav Valkov.

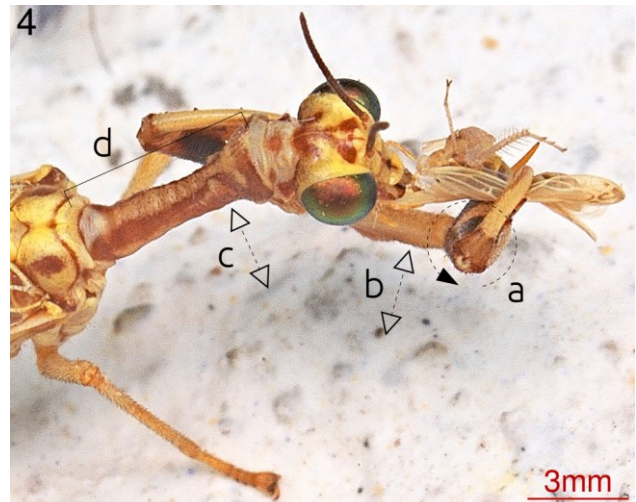


Fig. 4. *Mantispa aphavexelte*, 18.viii.2022, 23:15:52; 43°28'N, 23°56'E, Byala Slatina, Bulgaria, 125W MV moth trap. © Radoslav Valkov.

Distance between forelegs and contact surface (Fig. 4) (a) during active handling of load, increasing the angle between the coxa and the femur when feeding – an extra detail on the flexibility of the coxo-trochanteral joint. Dorsal view of key external biomechanical elements: the coxo-trochanteral joint and its rotation (a) ensure precise handling of prey; distance between the coxa and the contact surface (b); distance between the prothorax from the contact surface (c). The elongated prothorax (d) is an important support of the whole biomechanical construction of the forelegs, aided by the walking legs. This sclerotised structure is probably elongated to keep captured prey away from the body and the abdomen.

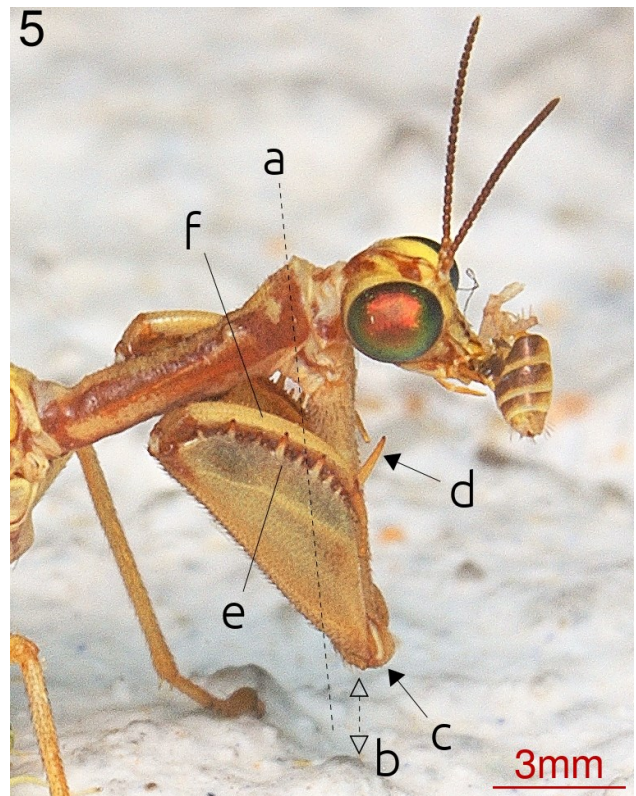


Fig. 5. *Mantispa aphavexelte*, 18.viii.2022, 23:17:12; 43°28'N, 23°56'E, Byala Slatina, Bulgaria, 125W MV moth trap. © Radoslav Valkov.

The dashed line (Fig. 5) (a) that is parallel to the coxa illustrates the position of the coxae; visible distance

between the foreleg and contact surface (b); the coxotrochanteral joint (c) allows the femur to rotate backwards. Subbasal spine (d) is an additional blocking mechanism to complement the firm grip of prey pressed against the anteroventral spines (e) by the tibia (f).



Fig. 6. *Rainieria calceata*, 23.vi.2021, 11:57:17; 43°28'N, 23°56'E, Byala Slatina, Bulgaria. © Radoslav Valkov.

Note the finely regulated body posture (Fig. 6) even when the pair of legs are used for grooming. Such degree of mechanical flexibility is not present in many dipteran species.

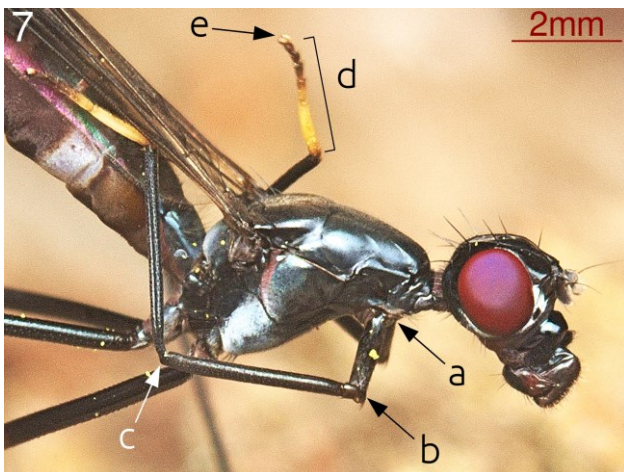


Fig. 7. *Rainieria calceata*, 23.vi.2021, 11:57:17; 43°28'N, 23°56'E, Byala Slatina, Bulgaria. © Radoslav Valkov.

Flexibility of foreleg joints (Fig. 7) (a, b, c); leg segment, which colouration is useful for identification purposes in the field (d) ends with a terminal structure – pretarsus (e).

Discussion

The requirement to miniaturise manipulation effectors, the essential hardware components in any given RAS system, is of the utmost importance because they carry out the actual surgical process and qualitatively determine the outcome of a surgical treatment.

Furthermore, added multifunctionality of the effectors would allow wider spectrum of surgical capabilities. That would be possible through adapting known evolutionarily distinct mechanical properties, designed by nature, to robotics. In order to feasibly implement this complex process into surgery, availability of initial entomological data input is vital. Some layers of entomological knowledge are not instantly usable in a cross-disciplinary setting if the researched insects have not been subjected to consistent studies over time. Thus, acquiring specific anatomical detail requires species-specific concretisation. Such streamlined approach is very often absent, even within the scope of the primary source of information (entomology). Up-to-date prototyping is impossible without thoroughly assessed entomological data that is checked against criteria for adequate relatedness to a usable surgical design. Another additional potential risk to the above-mentioned circumstances is what could be defined as “unilaterality in research” i.e., presenting knowledge without explicit strategy as to how it could be qualitatively refined over time through ingenious interdisciplinary links to achieve a well-adapted practical application. Overcoming scientific challenges implies an abstract view on a given topic. The impressive biomechanics of insects could be incorporated into substantially important innovations, requiring scientific mutuality between functionally linked disciplines.

A useful surgical breakthrough, for example, inspired by an insect, is the work of Sakes *et al.* (2020) where an alternative to the known method of aspiration-based tissue transport in minimally invasive surgery is suggested. A specific anatomical feature of a wasp from the Ichneumonidae family is used as a model, more precisely the ovipositor of females. Its working principle and internal anatomy had given the authors the idea to carry out an experiment, justified by a known problem with the insufficient pressure differential in long and narrow tubes, used in aspiration-based tissue transport. The need for deep penetration into the human body requires long distances from the aspiration device to the target area of operation, causing pressure loss and consequently, unsuccessful tissue extraction. Another significant problem is the damage of healthy tissue during the process, despite the aim being exactly the opposite – speedy extraction with minimum damage. This is how Sakes *et al.* (2020) present a medically justified application of an anatomical feature, known in Ichneumonidae.

Mantispa aphavexelte belongs to the family Mantispidae (mantisflies, Order Neuroptera). Despite resembling a true mantis, the superficial similarity is due to the anatomy of the raptorial forelegs (adult Mantispidae are small, with wingspan of 15–20 mm). *Mantispa aphavexelte* is an active predator and feeds on other small insects. Being attracted by UV light at night, in such active state, it inevitably interacts with other insects, performs ambush strategy, and catches prey. This circumstance permitted documenting its feeding habits. Acquisition of food is accomplished through instant attack with the raptorial legs. Such evidently agile response of the whole biomechanical foreleg apparatus used for

capturing prey implies a high level of precision during the predatory strike.

Büsse, Bäumlér & Gorb discuss the internal muscular structure of an insect from the Mantispidae family – *Mantispa styriaca* (Büsse *et al.* 2021). The authors address such a finely synchronised system of articulating elements in light of an evolutionary sophisticated system to obtain food. For instance, the proposed presence of a “catapult” mechanism when the tibia is closed against the anteroventral spines on the femur when prey is attacked, suggests the legs are seen as advanced adaptations that ensure better survivorship of the insect. The authors visualise microstructures and detect differences in the material properties of articulating internal muscular elements using scan electron microscopy (SEM), micro computed tomography (μ CT) and confocal laser scanning microscopy (CLSM). This comprehensive analysis on the functional morphology of *Mantispa styriaca* from 2021 generates a well-deserved fascination regarding the biomechanical evolution of *Mantispa styriaca* and Mantispidae in general. The authors highlight that even mantises (Mantodea) have not undergone thorough biomechanical analyses of the forelegs (Niederegger & Gorb 2003). Snyman & Binoy (2022) describe an unexpected instance of a dietary shift in Mantispinae, due to the well-documented presence of Mantispinae eggs near a hymenopteran nest. This finding suggests that mantisflies are evolutionary significant insects that very much deserve attention i.e., not to be overshadowed by a prevailing interest in other preferred areas of entomological research.

Studies within the scope of robotics appropriate “copying” insect muscular design due to differences in muscle arrangement between insects and vertebral organisms, unsurprisingly, in favour of insects when it comes to artificial replication of their biomechanics (Wang *et al.* 2021). All the observed mechanical activities performed by *Mantispa aphavexelte* have been photographed while the insect was positioned on a wall near the light trap. The photographic material suggests that the walking-type legs support the necessary grip to resist the weight load caused by the overall body mass of the insect, minimizing the risk of falling. The firm grip between the wall surface and the microanatomical leg structures is mediated by microscopic adhesive plates, pulvilli, present in all insect taxa (Niederegger & Gorb 2003). The mechanism of stable adherence of the legs to various surfaces, including smooth ones, ensures secure locomotion without sliding and falling (Niederegger & Gorb 2003). Attachment is accomplished through the mechanical intricacy of the pulvillus that secretes specific “adhesive”; Fowler *et al.* (2021a) researched its composition in the Seven-spotted ladybird (*Coccinella septempunctata*). Both the complex attachment mechanisms and production of the “glue” that mediates the process, are presented through an innovative combination of tensiometric and spectroscopic methods in 2021 (Fowler *et al.* 2021b). This research cannot provide an exact answer as to whether these secretions are species-optimised and what the differences are, especially in rarely seen species of insects, like *Mantispa*

aphavexelte. However, the evident stability of *Mantispa aphavexelte* on the wall surface raises questions over the strength of this “adhesive” and its specific properties. The aforementioned research on ladybirds from 2021 (Fowler *et al.* 2021b) validates the necessity of further studies of these complex structures. A potentially useful relationship with surgery is determined by the need for synthesising more advanced biomimetic adhesives, which offer surgically optimised properties i.e., safe biodegradation, reliable tissue adhesion and compatibility (no indication of tissue rejection or antagonistic physiological effects) (Mazur *et al.* 2022).

Order Diptera (True flies) includes one of the most spectacular native species for Europe from the family Micropezidae - *Rainieria calceata*. This is a rare local species for Europe, as well as for Bulgaria, with poorly studied mechanisms of dispersal and population dynamics (Valkov 2021). A small population has been documented, studied, and counted in Bulgaria in 2021 (Valkov 2021, unpublished data). The fly is strictly associated with undisturbed woody habitats where conditions for natural wood decay of old trees are present. Larvae utilise it as food; research on the presence of the fly is of particular interest due to the fact the insect is a bioindicator – both for the diversity of European fauna and for being strategically important in classifying a given habitat as ecologically valuable (Valkov 2021).

Beyond its ecological significance, not only does this understudied insect of the Bulgarian fauna exhibit remarkable mechanical flexibility but it also highlights the previous topic about adherence to smooth surfaces. Specimens from the observed population were kept and observed under controlled conditions and then released back into nature in 2021 (Valkov 2021, unpublished data). Their ability to freely walk on glass is hardly surprising, as many insects do so with ease (Walker 1993). The unusual articulation of leg joints (see Figs 6, 7) nevertheless raises further questions on the highly efficient use of the contact “adhesive”. Regarding *Rainieria calceata*, visualisation of the pulvillus has not been addressed yet in scientific literature. Furthermore, the attachment mechanism of the pulvillus to a given substrate is actually a process that occurs at the nanoscale. Nanotechnology is the future of minimally invasive surgery, especially when precision is required. Studying the specificity of secreted adhesive agents by insects is yet to gain more traction. Apparently, this is a complex mechanism of attachment, based on nanotechnologies that are already available in nature. Better understanding of their function and use would allow improvement within many practically significant fields, such as molecular biology, electronics, the environment, and surgical treatment e.g., in orthopaedic surgery (for implants, correcting osteochondral defects and drug delivery in the treatment of bone cancers) (Mariappan 2019).

Conclusion

As evident from the supplied documentary material and literature, this observation correlates entomology with medical sciences. Such an idea to rationalise

entomological data on external morphology for medical use has not been suggested in scientific literature to date. Current research on the morphological structures in insects and their mechanical articulation defines an intelligible method of transferring empirically authenticated evidence for biomechanical properties from entomological science to the world of modern medical RAS systems. The observed rarely encountered species of insects, *Mantispa aphavexelte* and *Rainieria calceata*, have never been considered by entomologists in terms of the practical usefulness of their leg functional morphology. The first step required to bring into action the proposed concept is to further focus on targeted exploration of mechanical micro and ultrastructures in *Mantispa aphavexelte* and *Rainieria calceata* through SEM, μ CT, CLSM and other advanced methods of visualisation. Through further data collection of this kind, the above-discussed suggestions can result in actual technological development.

Order Neuroptera are of particular evolutionary interest. Snyman *et al.* (2020) remind us that Mantispidae are generally poorly researched. This further substantiates the need to subject the genus *Mantispa* to additional studies, both at an evolutionary and morphological level. In addition, their noteworthy anatomical properties are not restricted to a particular anatomical character, as seen in *Mantispa aphavexelte*. For example, the conspicuously convex shape of the pulvillus (Figs 4, 5), observed in the walking legs, as well as the presence of bifurcate claws (similar to those seen in order Coleoptera), require thorough inspection and visualisation of the respective ultrastructures. Also, studying the biomechanical function of the secreted

“adhesive” and its properties for *Mantispa aphavexelte* and *Rainieria calceata* requires handling prepared specimens, as well as *in vivo* experiments.

This is where ecology, taxonomy and human medicine intersect. The pace at which such conceptual and seemingly imperceptible relationships are detected is slow. Furthermore, initiating surveys to verify the probable applicability of similar observations requires consistent dedication to studies that explore poorly researched taxa, as well as a timely response when it comes to inspecting and visualising micro and ultrastructures. Such an approach to the topic necessitates the consistent availability of technical resources to aid visual inspections. In reference to the number of ongoing studies, there is an appreciable need to put forward unconventional ideas. The limited amount of literature outlining the evolutionary sophistication of functional insect anatomy nonetheless prompts the need for further studies. Seeking odd anatomical features in rare insects of evolutionary interest is a feasible strategy to create usable cross-disciplinary links that emphasise the global role of entomology and its multifaceted significance.

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Note. The second record of the rare species *Turanana durranii* (Lepidoptera: Lycaenidae) from Afghanistan

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Abstract. *Turanana durranii* Coutsis & Tshikolovets, 2016 (Lepidoptera: Lycaenidae) was described from a single holotype male collected by I. Pljushtch in Afghanistan. The second discovered specimen is identical to the holotype, which supports the conclusion that this species occurs in the Band-e Amir National Park, Bamyan Province, Afghanistan.

Samenvatting. *Turanana durranii* Coutsis & Tshikolovets, 2016 (Lepidoptera: Lycaenidae) is beschreven van een enkel holotype mannetje, verzameld door I. Pljushtch in Afghanistan. Het tweede ontdekte exemplaar is identiek aan het holotype, wat de conclusie ondersteunt dat deze soort voorkomt in het Band-e Amir National Park, provincie Bamyan, Afghanistan.

Résumé. *Turanana durranii* Coutsis & Tshikolovets, 2016 (Lepidoptera : Lycaenidae) a été décrit à partir d'un seul mâle holotype collecté par I. Pljushtch en Afghanistan. Le deuxième spécimen découvert est identique à l'holotype, ce qui confirme la présence de cette espèce dans le parc national de Band-e Amir, province de Bamyan, Afghanistan.

Key words: Lycaenidae — Second record — *Turanana durranii* — Afghanistan.

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Turanana durranii Coutsis & Tshikolovets, 2016 (Lepidoptera: Lycaenidae) was described from a single holotype male collected by I. Pljushtch in Afghanistan, Band-e Amir, 3000 m, 4.vii.2009. I received additional material from Afghanistan in 2023 collected by Y. Skrylnik, another participant of the Ukrainian expeditions to Afghanistan in 2007–2016. Among several species of Lycaenidae was a male *Turanana durranii* collected in Bamyan Province, 4 km southern of Jarukashan, Band-e Amir National Park, 3300 m, 29.vi.2016. The species

independence of *Turanana durranii* was justified by unique features in the structure of the genitalia and wing pattern (see Coutsis & Tshikolovets 2016: 76–77). The second available specimen is identical to the holotype, as shown in the photograph below, which supports the conclusion that this species actually exists with a range in Band-e Amir in Bamyan Province. The only obvious difference is more pronounced black spots in the postdiscal area of the underside of the wings, which are partially visible on the upper side of the wings.

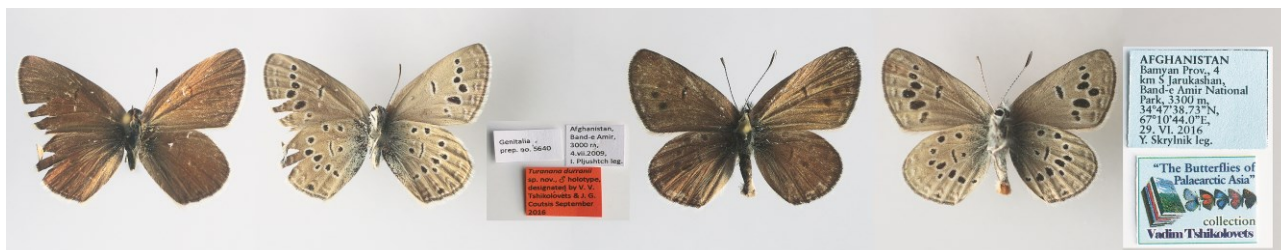


Fig. 1. *Turanana durranii* Coutsis & Tshikolovets, 2016: Holotype ♂ (left); second known specimen ♂ (right). © Vadim Tshikolovets.

Reference

Coutsis J. G. & Tshikolovets V. V. 2016. A new species of brown *Turanana* from Afghanistan (Lepidoptera: Lycaenidae, Polyommataini, Glaucopsychiti). — *Phegea* 44(3): 76–79, figs 1–14. http://www.phegea.org/Phegea/2016/Phegea44-3_76-79.pdf

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