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Thirteen new Agromyzidae for Belgium (Diptera: Agromyzidae)

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Abstract

Several field surveys conducted during 2009-2014 with attention for leaf mines of Diptera revealed thirteen species of leaf-mining flies new to the Belgian fauna: *Agromyza archangelicae* Hering, 1937; *Agromyza flavipennis* (Hendel, 1920); *Agromyza spiraeoidarum* Hering, 1954; *Agromyza vicifoliae* Hering 1932; *Aulagromyza similis* (Brischke, 1880); *Phytomyza aconiti* Hendel, 1920; *Phytomyza brunnipes* Brischke, 1880; *Phytomyza griffitsi* Spencer, 1963; *Phytomyza hellebori* Kaltenbach, 1872; *Phytomyza petoei* Hering, 1924; *Phytomyza thysselinivora* Hering, 1924; *Phytomyza podagrariae* Hering, 1954 and *Phytomyza tussilaginis* (Hendel, 1925). Seven of these flies were reared and confirmed based on adult morphology. This fascinating group of flies has previously received only little attention, and there is a need for an updated checklist.

Keywords: new species for Belgium, leaf mining flies, *Agromyzidae*

Samenvatting

Verschillende excursies tijdens 2009-2014 met aandacht voor bladmijnen van Diptera onthulden maar liefst dertien nieuwe soorten bladminerende vliegen voor België: *Agromyza archangelicae* Hering, 1937; *Agromyza flavipennis* (Hendel, 1920); *Agromyza spiraeoidarum* Hering, 1954; *Agromyza vicifoliae* Hering, 1932; *Aulagromyza similis* (Brischke, 1880); *Phytomyza aconiti* Hendel, 1920; *Phytomyza brunnipes* Brischke, 1880; *Phytomyza griffitsi* Spencer, 1963; *Phytomyza hellebori* Kaltenbach, 1872; *Phytomyza petoei* Hering, 1924; *Phytomyza thysselinivora* Hering, 1924; *Phytomyza podagrariae* Hering, 1954 en *Phytomyza tussilaginis* (Hendel, 1925). Voor zeven van deze soorten lukte het opkweken en werd de identiteit bevestigd aan de hand van adulte kenmerken. Deze fascinerende groep kreeg voorheen slechts weinig aandacht, en er is nood aan een nieuwe checklist.

Résumé

Plusieurs prospections, menées entre 2009-2014, ciblées sur la recherche de mineuses de Diptera ont révélé treize nouvelles espèces de mineuses pour la faune belge: *Agromyza archangelicae* Hering, 1937 ; *Agromyza flavipennis* (Hendel, 1920) ; *Agromyza spiraeoidarum* Hering, 1954 ; *Agromyza vicifoliae* Hering, 1932 ; *Aulagromyza similis* (Brischke, 1880) ; *Phytomyza aconiti* Hendel, 1920 ; *Phytomyza brunnipes* Brischke, 1880 ; *Phytomyza griffitsi* Spencer, 1963 ; *Phytomyza hellebori* Kaltenbach, 1872 ; *Phytomyza petoei* Hering, 1924 ; *Phytomyza thysselinivora* Hering, 1924 ; *Phytomyza podagrariae* Hering, 1954 et *Phytomyza tussilaginis* (Hendel, 1925). Sept d'entre-elles ont été mises en élevage afin de confirmer leur identification basée sur la morphologie des adultes. Ce groupe fascinant a, jusqu'à présent, suscité peu d'intérêt or, la liste des espèces a besoin d'être mise à jour.

Introduction

Agromyzidae are commonly known as leaf-mining flies due to the larvae that create typical mines in leaves. In Belgium, Agromyzidae is a species rich family of flies but knowledge about the occurring species and their distribution is only fragmentary. Only few surveys focused on adult Agromyzidae (eg. SCHEIRS *et al.,* 1995; 1996; 1999), and fewer on the younger life stages (eg. MORTELMANS *et al.,* 2013). Extensive search efforts for leaf mining flies in Belgium took place in 2013. As a result, thirteen species new to the Belgian fauna are reported. Well-characterized mines and larva/pupae on specific host plants were identified, and for seven species, larva/pupae were reared till the adult life stage to confirm the identifications.

Results

Agromyza archangelicae Hering, 1937

MATERIAL EXAMINED. 6.VII.2013, Jansbach (prov. Liege), one larvae on *Angelica sylvestris*, reared and confirmed by adult characteristics. leg det col. J. Mortelmans (Fig. 1).

From neighbouring countries *Agromyza archangelicae* is known from Germany, France, the Netherlands and Great Britain (MARTINEZ, 2013), although confirmation of its British status is required (CHANDLER, 1998). The mines of this species are typically starting on the underside of the leave, and after mining a short corridor, the larvae will turn to the upper side of the leave where it continues its corridor. Frass is dispersed in thick, black dots along the corridor, often in strings or thick packets. Larvae will pupate outside the mine (HERING, 1957). The species is linked to *Angelica archangelica* and *Angelica sylvestris* (ROBINS, 1991; SPENCER, 1990*)*, and larvae can be seen from June to August (HERING, 1957).

Agromyza flavipennis (Hendel, 1920)

MATERIAL EXAMINED. 15.VI.2013, Etalle (prov. Luxembourg), one empty mine on *Lamium album*, leg. det. D. Dekeukeleire & J. Mortelmans; 4.V.2014, Deurne, Rivierenhof (prov. Antwerp), one larva on *Lamium album* leg. det S. Van Looveren; 14.VII.2014, Gouvy (prov. Luxembourg), empty mine on *Lamium album,* leg. det. J. Mortelmans.

Agromyza flavipennis is widespread across Europe (MARTINEZ, 2013). From neighbouring countries it is known from Germany, France, the Netherlands and Great Britain (MARTINEZ, 2013). This species is linked to *Lamium* sp. (SPENCER, 1976) although records from *Glechoma hederacea* are known (ROBBINS, 1991). Larvae create a deep, transparent blotch mine always situated next to the leaf margin. This blotch preceded by a short corridor which is overrun most of the times (ELLIS, 2014). Larvae will exit the leaf trough a slit in the lower epidermis and can be found from May to the beginning of June, in one generation (VAN FRANKENHUYZEN & FRERIKS, 1969).

Agromyza spiraeoidearum Hering, 1954

MATERIAL EXAMINED. 17.XI.2013, Destelbergen Damvallei (prov. East Flanders), empty mine on *Spiraea* sp., leg. det. J. Mortelmans (Fig. 2); 20.V.2014, Gent centrum (prov. East Flanders), empty mine on *Spiraea* sp., leg. det. W. Tamsyn, M. Boeraeve, J. Hendricx, W. Proesmans.

A very nice leaf mine on the upper surface of the leaf, starting with a short and broad corridor, but suddenly widening and forming a blotch-like corridor. Big, sharp parts of frass present in the corridor with rather big parts in the end. In fresh mines some secondary feeding lines are visible. Larvae were found from June to September (HERING, 1957) and pupate outside the mine.
The species is present throughout large parts of Europe (MARTINEZ, 2013). From neighbouring countries it is known from Germany and the Netherlands only (MARTINEZ, 2013).

Agromyza vicifoliae Hering, 1932

MATERIAL EXAMINED. 15.VI.2013, Etalle (prov. Luxemburg), four pupae on *Vicia sepium*, leg. det. J. Mortelmans & D. Dekeukeleire (Fig. 3); 30.VI.2013, Damvallei Destelbergen (prov. East Flanders), one pupa on *Vicia* sp., reared and confirmed by adult characteristics, leg. det. col. J. Mortelmans; 26.VII.2013, Gelinden (prov. Limburg), empty mine on *Vicia sepium*, leg. det. D. Dekeukeleire, M. Boeraeve & W. Tamsyn.

Larvae of *Agromyza vicifoliae* can be found on *Vicia cracca, V. hirsuta* and *V. sepium* (ELLIS, 2014). This species forms blotch mines, preceded by a corridor that strictly follows the leaf margin. The blotch is mined much deeper than the corridor (ELLIS, 2014) and both types of mine are much different in colour. The pupation takes place outside the mine. *Agromyza vicifoliae* has a wide European distribution (MARTINEZ, 2013). From neighbouring countries the species is known from the Netherlands, Germany, Great Britain and France (MARTINEZ, 2013). In the Netherlands it appears to be a rare species with no recent observations (pers. comm. W. Ellis).

Aulagromyza similis (Brischke, 1880)

MATERIAL EXAMINED. 11.XII.2013, Nismes (prov. Namur), one empty mine on *Scabiosa columbaria,* leg. det. D. Dekeukeleire, M. Boeraeve & W. Tamsyn, col. D. Dekeukeleire (Fig. 4).

Aulagromyza similis is widespread across Europe and occurs in most countries (MARTINEZ, 2013). From neighbouring countries it is known from Germany and France only (MARTINEZ, 2013). It was once reported mistakenly in Belgium in synonymy of *Phytomyza agromyzina* by DE BRUYN & VON TSCHIRNHAUS (1991).
Mines of *A. similis* are very long, situated at the upper-surface and have a whitish colour. No or very little frass is found in the mines. Larvae exit the leaf by a slit in the leaf and pupate outside of the leaf. These larvae can be found from May till August.
Known hosts of *A. similis* are *Centaurea, Knautia* sp.*, Scabiosa* sp. and *Succisa* sp. The only record in Belgium is on *Scabiosa columbaria*, but other host species are also present in Belgium and should be checked on the presence of mines. The species might be more common than currently thought.

Phytomyza aconiti Hendel, 1920

MATERIAL EXAMINED. 15.VII.2014, Ovifat, Reinhardtstein castle (prov. Liege), several empty mines on *Aconitum vulparia*, one larva on *Aconitum vulparia*, leg. det. col. J. Mortelmans.

From neighbouring countries *Phytomyza aconiti* is known from Germany, France, the Netherlands and Great Britain (MARTINEZ, 2013). It is a widespread species in Europe (MARTINEZ, 2014) and was introduced to Northern America (SPENCER, 1969). Larvae of *P. aconiti* create large blackish blotch-mines without a preceding corridor. This blotch mine is often in the tip of the leaves with an exit slit in upper epidermis through which larvae exit for pupation (PAKALNIŠKIS, 2004). Leaves can be destroyed completely by these mines (SPENCER, 1966, 1969). Due to this feature the species is thought to have some capacity as a pest species on its host plants *Aconitum* and *Delphinium* (SPENCER, 1976). From the Netherlands (VAN FRANKENHUYZEN *et al.*, 1982) and Great Britain (SPENCER, 1976) the species is reported frequently from gardens and in high numbers.

Phytomyza brunnipes Brischke, 1880

MATERIAL EXAMINED. 31.V.2014, Hasselbos, Riksingen, Tongeren (prov. Limburg), one empty mine and two leaves with populated mines on *Sanicula europaea* leg. det. col. W. Proesmans.

The species forms a long, brownish corridor mine with many bends on the upper-surface. The frass is deposited in small granules in the centre of the corridor. Leaves with mines were collected. Pupation took place outside the mine. The larva left the mine via a semi-circular slit in underside of the leaf

(ELLIS, 2014). Two larvae pupated at 1.VI.2014. Pupae are shiny black, spindle-shaped and about 1.5 mm long.
Mines are only known from *Sanicula*, and the species is the only known leaf miner on this plant. This may be because of the specific chemistry of Apiaceae, which makes these plants relatively free from insect attack. *Sanicula* is known to produce alkaloids, which makes that only highly adapted species are able to feed on this plant (BERENBAUM, 1990).
The species is present throughout large parts of Europe. In our neighbouring countries, the species has only been recorded in the Netherlands and Germany (MARTINEZ, 2013).

Phytomyza griffithsi Spencer, 1963

MATERIAL EXAMINED. 13.VIII.2013, Nietelbroeken, Diepenbeek (prov. Limburg), mines (with larvae) on several *Plantago major*, det. leg. col. D. Dekeukeleire.

Larvae of *Phytomyza griffithsi* can be found on *Plantago media* and *P. major* (ELLIS, 2014). There are typically several mines on the same leaf, and they descend in the direction of the petiole, where lobate corridors are formed that fan out to the basal part of the leaf. Larvae can be found from July to November (BUHR, 1964). The Belgian record is situated on a gravel road with a lot of stress for *Plantago* by passants, this type of habitat is also described in the Netherlands (ELLIS, 2014) and Germany (BUHR, 1964). *Phytomyza griffithsi* has a wide European distribution (MARTINEZ, 2013). From neighbouring countries the species is known from the Netherlands, Germany, Great Britain and France (MARTINEZ, 2013).

Phytomyza hellebori Kaltenbach, 1872

MATERIAL EXAMINED. 16.V.2009, Namen (prov. Namur), 10 larvae on *Helleborus foetidus*, det. leg. C. Snyers; 16.XI.2010, Steenbergse bossen, Zottegem (prov. Eastern Flanders), 4 larvae on *Helleborus viridis*, leg. det. D. Dekeukeleire; 22.VI.2011, Hasseltbos, Riksingen (prov. Limburg), several larvae on *H. viridis*, det. leg. D. Dekeukeleire; 03.VIII.2011, Hasseltbos Riksingen (prov. Limburg), empty mine *H. viridis*, det. leg. D. Dekeukeleire & W. Proesmans; 14.I.2012, Barvaux (prov. Luxemburg), 1 larvae on *H. foetidus*; det. J. Mortelmans, leg. K. Boux; 1.II.2012, Steenbergse bossen, Zottegem (prov. Eastern Flanders), several larvae on *H. viridis*, det. leg. J. Mortelmans; 27.XII.2012, Steenbergse bossen, Zottegem (prov. Eastern Flanders), larvae and pupae on *H. viridis*, reared to imago (2♂, 1♀), det. leg. col. J. Mortelmans; 29.XII.2012, Steenbergse bossen, Zottegem (prov. Eastern Flanders), larvae and pupae on *H. viridis*, det. leg. D. Volckaert; 20.IV.2013, Les Abannets, Nismes (prov. Namen), larvae on *H. foetidus*, leg. det. col. J. Mortelmans; 27.IV.2013, Mont des Pins (prov. Luxembourg), empty mine on *H. foetidus,* leg. det. C. Van Steenwinkel; 25.V.2013, Steenbergse bossen, Zottegem (prov. Eastern Flanders), larvae and pupae on *H. viridis*, det. leg. col. J. Mortelmans; 7.XII.2013, Haute Roche, Viroinval (prov. Namur), larvae and pupuae on *H. foetidus*, det. leg. J. Mortelmans & D. Dekeukeleire; 7.XII.2013, Dourbes (prov. Namur), larvae and pupuae on *H. foetidus*, det. leg. J. Mortelmans & D. Dekeukeleire; 29.XII.2013, Rochers de Fau, Yvoir (prov. Namur), larvae and pupae on *H. foetidus*, det. leg. col. J. Mortelmans; 15.III.2014, Les Abannets et le Morainy, Viroinval (prov. Namur), several empty mines on *H. foetidus,* det. leg. D. Dekeukeleire, W. Tamsyn & W. Proesmans; 11.IV.2014, Arenberg, Leuven (prov. Vlaams Brabant), several empty mines on *H. foetidus*, det. leg. D. Dekeukeleire; 11.V.2014, Les Cretias, Dinant (prov. Namur), several larvae on *H. foetidus,* det. leg. J. Hendrix, M. Boeraeve & W. Tamsyn.

Phytomyza hellebori is the only leaf miner on *Helleborus* species (ELLIS, 2014). The species seems to have a preference for *H. foetidus*, but observations are also known *from H. viridis, H. niger* (ELLIS, 2014) and on wild populations of *H. argutifolius* in Corsica (Dekeukeleire, Tamsyn & Proesmans, own observations). Its mines have frass in little strings and begin with a narrow corridor that eventually ends up into an upper-surface blotch. Pupation occurs within the mine, in a lower-surface pupal chamber; the two coloured, front spiracula penetrates the epidemis (HERING, 1957; SPENCER, 1976).
The species was first observed in 2008 in the province Namur. In subsequent years, more observations were noted, and in 2012 three larvae were reared to imagoes to confirm the identification of the mines.
In Wallonia, the species is observed on *H. foetidus*, while in Flanders, the species is found on *H. viridis*. In the botanical garden in Arenberg (Leuven), mines could only be found on *H. foetidus*, even though *H. viridis* grows just next to it. Similar observations are mentioned by LUDWIG (1907)

and ELLIS (2014). Remarkably, pupae of *P. hellebori* on *H. viridis* are very easy to rear: collected material reached adult stage in all cases. In contrast, pupae of *P. hellebori* on *H. foetidus* are very difficult to rear: we never succeeded to rear pupae till adult life stages.
P. hellebori has a wide distribution in Europe. In the Netherlands and Great Britain the species is considered a recent arrival. In these regions the species is mainly recorded on *Helleborus* species planted in gardens and parks (ELLIS, 2014; STUBBS, 2000; SMITH *et al.,* 2007). In Belgium however, almost all known records are situated in ancient forests, at sites were large populations of the host species are naturally occurring. Furthermore, despite multiple visits in 2011 and 2012, the species could not be found on *Helleborus* species planted in the botanical garden of the University of Ghent or in three private gardens in Eastern Flanders. The species could be observed in the botanical garden in Arenberg (Leuven). However, the *H. foetidus* plants here were directly transplanted from naturally occurring populations in the Ardennes. It seems thus more likely that *P. hellebori* is a native species in Belgium, and its presence has long gone unnoticed.

Phytomyza petoei Hering, 1924

MATERIAL EXAMINED. 24.VIII.2011, Industriezone Biezenhoed en Langvoort (prov. Antwerp), six empty mines on *Mentha* sp., leg. det. C. Van Steenwinkel; 10.X.2012, Bos 't Ename, Grootbos zuid (prov. East Flanders), empty mine on *Mentha* sp., leg. det. D. Dekeukeleire; 9.VII.2013, Gent centrum (prov. East Flanders), 17 larvae on *Mentha* sp., reared and confirmed by adult characteristics, det. leg. col. J. Mortelmans; 25.VIII.2013, Damvallei Destelbergen (prov. East Flanders), empty mine on *Mentha* sp., leg. J. Mortelmans; 11.IX.2013, Industriezone Biezenhoed en Langvoort (prov. Antwerp), 12 empty mines on *Mentha* sp., det. C. Van Steenwinkel;5.X.2013, Deinze (prov. East Flanders), 1 empty mine on *Mentha* sp. det. S. Vantieghem; 30.V.2014, Gent centrum (prov. East Flanders), 35 larvae on *Mentha* sp., det. leg. col. J. Mortelmans; 3.VI.2014, Gent centrum (prov. East Flanders), 40 larvae of which 15 reared on *Mentha* sp., det. leg. col. J. Mortelmans.

Phytomyza petoei is a widespread species in the Palearctic. The species is present in the Nearctic region since 2008 (BOUCHER, 2009). *Phytomyza petoei* is a pest species on cultivated mint species, and can be harmful for these cultivations (BOUCHER, 2009).
Leaf mines are recognizable by irregularly linear mines which may become a secondary blotch. The mine is an upper-surface corridor often crossing itself with frass in thread like fragments. Pupation is external, but records of pupation near the lower epidermis within the mine are known, always near the prepared exit slit (SPENCER, 1972; 1976; HERING, 1924; 1957; BOUCHER, 2009).
Larvae can be found from April till October in several generations (HERING, 1957). In temperate Europe, adults can be found from May till June and August till September (CERNY, pers. comm.).

Phytomyza thysselinivora Hering, 1924

MATERIAL EXAMINED. 27.VII.2014, De maten (prov. Limburg), 25 mines with pupa on *Peucedanum palustre*, four pupae reared and imagos confirmed, leg. det. col. J. Mortelmans.

Phytomyza thysselinivora is represented in a wide range of European countries, from neighbouring countries it is only known from the Netherlands and Germany (MARTINEZ, 2013). The species is known to mine *Peucedanum palustre* only (ELLIS, 2014) in which larvae create short corridor mines, then turning into small blotch mines. Due to the limited space within *Peucedanum* leaves, the initial corridor mine is often overrun by the blotch. The mines are never situated in the tip of the leaves, but they start in the centre of the leaf. Frass is typically in strings and well present in the mines (HERING, 1957; ELLIS, 2014). Occupied mines can be found from May to September (HERING, 1957). Larvae create an exit slit in the upper epidermis and will pupate on the upper surface of the leaf, often some distance from the exit slit. On 20 empty mines, pupae were found still attached to the leaf.

Phytomyza podagrariae Hering, 1954

MATERIAL EXAMINED. 15.XII.2012, Merendree (prov. East Flanders), eight mines with larvae on *Aegopodium podagraria*, one larva was successfully reared and imago identified as *P. podagrariae*, leg. J. Mees, det. col. J. Mortelmans; 27.XII.2012, Zottegem (prov East Flanders); fifteen mines with larvae on *Aegopodium podagraria*, eight reared as *P. podagrariae*, leg. J. Mortelmans & D. Volckaert, det. col. J. Mortelmans.

Fig 1. Leaf mine of *Agromyza archangelicae*

Fig 2. Leaf mine of *Agromyza spiraeoidarum*

Fig 3. Leaf mine of *Agromyza vicifoliae*

Fig 4. Leaf mine of *Aulagromyza similis*

Fig 5. Leaf mine of *Phytomyza aconiti*

Fig 6. Leaf mine of *Phytomyza thysselinivora,* pupae clearly visible.

Occupied mines can be found from June till December, longer than the usually described October (HERING, 1957). They are upper-surface mines widening towards the end and are usually not associated with the border of the leaves (ELLIS, 2014). Pupation occurs outside the mine. Own observations of reared material showed frass never to be in strings, whereas frass in similar species (*Phytomyza obscurella* or *Phytomyza chaerophylli*) is often, but not always, threadlike. *Phytomyza podagrariae* is represented in a wide range of European countries, from neighbouring countries it is only known from the Netherlands and Great Britain (MARTINEZ, 2013).

During this study 20 leaf mines with 37 pupae identified as *P. podagrariae* with the key from ELLIS (2007) were reared and shown to be in fact *P. obscurella* or *P. chaerophylli.* This shows that it is not possible to identify the mines. All material of potential *P. podagrariae, P. obscurella* or *P. haerophylli* has to be reared to obtain 100% certainty about the species identity.

Phytomyza tussilaginis (Hendel, 1925)

MATERIAL EXAMINED. 12.XII.2012, Maria Hendrikapark Oostende (prov. West Flanders), several larvae on *Petasites hybridus,* reared and confirmed by adult characteristics*,* det. leg. col. J. Mortelmans; 11.IX.2013, Neuville-en-Condroz (prov. Liege), empty mine on *Petasites hybridus*; leg. det. W. Proesmans; 28.X.2013, Maria Hendrikapark Oostende (prov. West Flanders), empty mine on *Petasites hybridus*; leg. det. W. Decock; 31.X.2013, Vallée de Rabais (prov. Luxembourg), empty mine on *Petasites hybridus,* leg. det. J. Mortelmans; 20.V.2014, Bourgoyen-Ossemeersen, Gent, several larvae on *Petasites hybridus*, det. leg. W. Proesmans, J. Hendrix, W. Tamsyn & M. Boeraeve.

Phytomyza tussilaginis appears to be host-specific to *Petasites* sp. and *Tussilago* sp. The green-whitish mines are striking and are easily spotted on the big leaves of the host plants. The species creates long, irregular, upper-surface mines with frass in discrete grains alternating along the sides (SPENCER, 1972).
Larvae can be seen from June-September (HERING, 1957). Larvae create an exit slit in the upper epidermis and pupate outside the mine. *Phytomyza tussilaginis* is represented in a wide range of European countries, and from neighbouring countries it was already recorded from France, Germany, the Netherlands and Great Britain (MARTINEZ, 2013).

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References

BERENBAUM M.R., 1990. - Evolution of specialization in insect-umbellifer associations. *Annual review of entomology,* 35: 319-343.

BOUCHER S., 2009. - *Phytomyza petoei* (Diptera: Agromyzidae), a leaf miner on cultivated mint, newly recorded in the Nearctic Region. *Canadian Entomologist,* 141: 126-128.

BUHR H., 1964. - Sächsische Minen. *Abhandlungen und Berichte des Naturkundemuseum Görlitz,* 39(3): 1-72.

CHANDLER P., 1998. - Checklist of insects of the British Isles: Diptera. *Handbooks for the Identification of British Insects* 12: 1-234.

DE BRUYN L. & VON TSCHIRNHAUS M., 1991. - Agromyzidae. *In*: GROOTAERT P., DE BRUYN L & DE MEYER M. (EDS.) 1991. - Catalogue of the Diptera of Belgium. *Studiedocumenten van het KBIN,* 70: 151-154.

HERING M., 1924. - Minenstudien 4. *Zeitschrift für Morphologie und Ökologie der Tiere,* 2: 217-250.

HERING M., 1957. - *Bestimmunstabellen der Blattminen von Europa: einschliesslich des Mittelmeerbeckens und der Kanarischen Inseln*. Uitgeverij Dr. W. Junk. 1185 pp.

HERING M., 1959. - Zwei Zugänge zur "Naamlijst van Nederlandsche Diptera". *Entomologische Berichten,* 19: 134.

ELLIS W., 2014. - Bladmineerders van Europa / Leafminers of Europe. www.bladmineerders.nl [5 May 2014].

LUDWIG F., 1907. - Weiteres zur Biologie von *Helleborus foetidus*. *Zeitschrift für wissenschaftliche Insektenbiologie,* 3: 45-50.

MARTINEZ M., 2013. - Fauna Europaea: Agromyzidae. *In*: Pape T. & Beuk P., 2014. Fauna Europaea: Diptera: Agromyzidae. Fauna Europaea version 2.6, http://www.faunaeur.org

MORTELMANS J., DEKEUKELEIRE D. & BAUGNÉE J.Y., 2013. - Four leaf mining flies on *Ranunculus* sp. new for Belgium (Diptera: Agromyzidae). *Bulletin S.R.B.E./K.B.V.E.,* 149: 29-33.

ROBBINS J., 1991. - *The leaf miners of Warwickshire with notes on other occurring in the Midlands*. Warwicks Museum 182 pp.

PAKALNIŠKIS S, 2004. - The Agromyzidae (Diptera) feeding particularities on some genera of Ranunculaceae. *Latvijas Entomologs,* 41: 93-99.

SCHEIRS J., DE BRUYN L. & VON TSCHIRNHAUS M., 1995. - Agromyzidae (Diptera) of the nature reserve "Hobokense Polder": faunistics and life-history aspects. *Bulletin et Annales de la Société royale belge d'Entomologie* 131: 191-205.

SCHEIRS J., DE BRUYN L. & VON TSCHIRNHAUS M., 1996. - Agromyzidae (Diptera) of the nature reserve "De Kuifeend": faunistics and life-history aspects. *Bulletin et Annales de la Société royale belge d'Entomologie,* 132: 245-249.

SCHEIRS J., DE BRUYN L. & VON TSCHIRNHAUS M., 1999. - Agromyzidae (Diptera) of the nature reserve "Étang de Virelles": faunistics and life-history aspects. *Bulletin S.R.B.E./K.B.V.E.,* 135: 152-158.

SMITH R.M., BAKER R.H., MALUMPHY C.P., HOCKLAND S. HAMMON R.P, OSTOJA-STARZEWSKI J.C., COLLINS D.W. 2007. - Recent non-native invertebrate plant pest establishments in Great Britain: origins, pathways, and trends. *Agricultural and Forest Entomology,* 9: 307-326.

SPENCER K.A, 1966. - Notes on European Agromyzidae. *Beiträge zur Entomologie,* 16: 285-309.

SPENCER K.A, 1969. - Notes on European Agromyzidae. *Beiträge zur Entomologie,* 19: 5-26.

SPENCER K.A., 1972. - Diptera, Agromyzidae. -*Handbooks for the Identification of British Insects,* 10: 1-136.

SPENCER K.A., 1976. - The Agromyzidae (Diptera) of Fennoscandia and Denmark. *Fauna entomologica scandinaviaca,* 5(1-2): 1-606.

STUBBS A., 2000. - The hellebore leaf-miner *Phytomyza hellebori* Kaltenbach (Diptera, Agromyzidae) new to Britain. *Dipterists Digest,* 7: 33-35.

VAN FRANKENHUYZEN A. & FRERIKS J.M., 1969. - De levenswijze van *Phytomyza flavipennis*, mineervlieg op dovenetel. *De levende Natuur,* 72: 160-161.