

Twenty species of Agromyzidae (Diptera) from Hedmark and Finnmark not previously recorded from Norway

KAJ WINQVIST, MILOŠ ČERNÝ & TROND ANDERSEN

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Altogether 20 species of Agromyzidae (Diptera), *Agromyza conjuncta* Spencer, 1966, *Agromyza polygoni* Hering, 1941, *Cerodontha (Dizygomyza) chaixiana* (Hering, 1956), *Cerodontha (Dizygomyza) lindrothi* Griffiths, 1964, *Cerodontha (Dizygomyza) spinata* (Groschke, 1954), *Cerodontha (Icteromyza) churchillensis* Spencer, 1969, *Cerodontha (Icteromyza) lineella* (Zetterstedt, 1840), *Cerodontha (Poemyza) estlandica* Zlobin, 1993, *Cerodontha (Poemyza) imbuta* (Meigen, 1838), *Chromatomyia arctagrostidis* Griffiths, 1980, *Chromatomyia cinnae* Griffiths, 1980, *Chromatomyia cygnicollina* Griffiths, 1980, *Chromatomyia furcata* Griffiths, 1980, *Chromatomyia spenceriana* Griffiths, 1980, *Chromatomyia styriaca* Griffiths, 1980, *Galiomyza galiivora* (Spencer, 1969), *Liriomyza europaea* Zlobin, 2003, *Phytobia cambii* (Hendel, 1931), *Phytoliriomyza mikii* (Strobl, 1898) and *Phytomyza enigmoides* Hering, 1937, are recorded for the first time in Norway. The species have been collected in eastern Troms and Finnmark Province in 2010 and in eastern part of Innlandet Province in 2016–17 during projects funded through the Norwegian Taxonomy Initiative. After these 20 new additions 278 Agromyzidae species are now known from Norway.

Key words: Diptera, Agromyzidae, *Agromyza*, *Cerodontha*, *Chromatomyia*, *Galiomyza*, *Liriomyza*, *Phytobia*, *Phytoliriomyza*, *Phytomyza*, new records, Hedmark, Finnmark, Norway.

Kaj Winqvist, Kastuntie 45 D 36, FI-20300 Turku, Finland. E-mail: zeitkajw@gmail.com

Miloš Černý, CZ-763 63 Halenkovice 1, Czech Republic. E-mail: cerny.milos@centrum.cz

Trond Andersen, Department of Natural History, University Museum of Bergen, University of Bergen, P.O. Box 7800, NO-5020 Bergen, Norway. E-mail: trond.andersen@uib.no

Introduction

The Agromyzidae is a Diptera family commonly referred to as the leaf-miner flies, due to the feeding habits of their larvae, most of which are leaf miners on various plants. These are small, sometimes minute, flies, usually between 0.9 and 6.0 mm in length. The thorax and abdomen are often light grey, rarely dark, but may be yellow, green or variably coppery or metallic. The family is distributed worldwide and is the most species-

rich family of Acalyprate Diptera, with more than 3,000 described species. Currently about 950 species are known from Europe. However, new Agromyzidae species are still regularly discovered and described, so that figure is far from final.

In Fennoscandia there has been a steady progress in the study of the family. Zlobin (2005) provided a checklist for Sweden comprising 321 species. Kahanpää (2014) recorded 280 Agromyzidae species in his updated Finnish list; later about 30 additional species have been added.

Norway has traditionally lacked a bit behind in comparison, but the comprehensive contributions by Andersen (2016, 2018) have greatly improved the knowledge of the Norwegian Agromyzidae fauna and brought the number of species more in level with our neighbouring Nordic countries. Prior to this publication a total of 258 species were known from Norway (A. Andersen, pers. comm.). During projects funded through the Norwegian Taxonomy Initiative in eastern Troms and Finnmark Province and in eastern part of Innlandet Province various Diptera groups were targeted. During the project "Insects inhabiting freshwater and humid habitats in Finnmark, northern Norway" (2010–2014) insects were collected in more than 100 localities from Alta in the west to Sør-Varanger in the east (see Artsdatabanken 2010, 2013, Ekrem *et al.* 2012). During the project "Insects on rich fens in Hedmark, eastern Norway" (2016–2017) insects were collected in nearly 100 localities, mainly in the northern part of the province (see Artsdatabanken 2016, Jonassen & Andersen 2020).

Traditionally the identification of North European Agromyzidae has relied on Spencer (1976), but in the recent years the new Hungarian monographs by Papp & Černý (2015, 2016, 2017, 2020) have considerably improved the European literature of this family. Since the identification of Agromyzidae is mainly based on the male genitalia, the detailed and well-illustrated genital descriptions in these publications have helped to solve many difficult cases. Also, the older standard revision by Griffiths (1980) on the mainly northern genus *Chromatomyia* is highly relevant, since the number of specimens belonging to that genus was surprisingly large in both the Hedmark and Finnmark materials.

Material and methods

During the projects adult Diptera were collected using different methods like Malaise traps, light traps, sweep-nets, window traps, and yellow pan traps. All material was preserved in 75–80% ethanol, brought to the Department of Natural History, University of Bergen, and sorted to

family level. The material of the various families was then sent to experts for identification.

All species of Agromyzidae have been identified by the senior author except for *Cerodontha (Dizygomyza) chaixiana* (Hering, 1956), *Cerodontha (Dizygomyza) lindrothi* Griffiths, 1964, and *Phytomyza enigmoides* Hering, 1937, which have been identified by the second author.

The former counties Oppland and Hedmark were merged into Innlandet county and the former counties Troms and Finnmark were merged into Troms and Finnmark county on 1 January 2020. The field work was performed in the former counties Hedmark and Finnmark, and we have used the biogeographical regions southern Hedmark (HES) and northern Hedmark (HEN) and northern Finnmark (FN) and inner Finnmark (FI) following the "Strand-system" as revised by Økland (1981).

The material is stored in the Entomological collection, Department of Natural History, University Museum of Bergen.

The species

Agromyza conjuncta Spencer, 1966

Material. Hedmark (HEN): Stor-Elvdal, Ottestad, 61.297111°N 11.277147°E, 239 m a.s.l., 21 June–20 July 2017, 3♂♂, light trap, leg. T. Andersen & L. Hagenlund.

Remarks. A Graminae-feeding species resembling some other recently differentiated European species. The species is similar to *A. nigrella* (Rondani, 1875), which has been known from the Nordic countries for quite long. Papp & Černý (2016) illustrate the differences from *A. nigrella* in the shape of the distiphallus and ejaculatory apodeme. Closest to Norway the species has so far been recorded from England, but the distribution of the different species in this group has not yet been well outlined in Europe. The males from Hedmark were taken in a light trap situated close to a ravine with broad leaved trees, herbs, sedges and grasses.

***Agromyza polygoni* Hering, 1941**

Material. Hedmark (HEN): Stor-Elvdal, Søstu Messelt, 61.455820°N 11.033918°E, 260 m a.s.l., 29 July 2016, 3♂♂, sweep net, leg. T. Andersen & L. Hagenlund.

Remarks. According to Papp & Černý (2016) previously only known from the Czech Republic, Slovakia, Germany, Poland, Lithuania, France and Switzerland. The record from Hedmark thus represents the first record from Scandinavia. It lives on common bistort (*Polygonum bistorta*) (Papp & Černý 2016). The males from Hedmark were netted close to a spring, in an area with spruce (*Picea*) forest and moss and herb vegetation.

***Cerodontha (Dizygomyza) chaixiana* (Hering, 1956)**

Material. Finnmark (FN): Porsanger: Baukop, 70.20469°N 24.90605°E, 26 m a.s.l., 26 July–25 August 2010, 1♂, Malaise-trap no. 6, leg. Finnmarksprosjektet.

Remarks. According to Papp & Černý (2016) previously only known from the Czech Republic, Germany, Poland and Hungary. The record from Finnmark thus expands its known range considerably northwards. It lives on broad-leaved meadow-grass (*Poa chaixii*) and probably other *Poa* species (Papp & Černý 2016). The specimen from Finnmark was taken in a Malaise trap situated close to a small stream surrounded by birch (*Betula*) forest and grassland.

***Cerodontha (Dizygomyza) lindrothi* Griffiths, 1964**

Material. Hedmark (HES): Ringsaker, Prest-tjernet, 61.203850°N 10.746840°E, 885 m a.s.l., 20 July 2017, 1♂, sweep net, leg. T. Andersen & L. Hagenlund; Hedmark (HEN): Engerdal, Tjernli, 61.875504°N 12.146184°E, 666 m a.s.l., 25 July 2016, 1♂, sweep net, leg. T. Andersen & L. Hagenlund.

Remarks. The species was described and is hitherto known only from Greenland and Iceland. This is the first record from continental Europe. Biology and larva are unknown, but capitate sedge (*Carex capitata*), black sedge (*C. nigra*), russet sedge (*C. saxatilis*) or baltic rush (*Juncus balticus*) are possible host plants (Griffiths 1964). The two

males from Hedmarks were both collected with sweep nets on two different fens, of which the fen at Tjernli is classified as extremely rich.

***Cerodontha (Dizygomyza) spinata* (Groschke, 1954)**

Material. Hedmark (HEN): Engerdal, Småsjøelva, 62.047016°N 12.072970°E, 734m a.s.l., 16–17 August 2016, 1♂, sweep net, leg. T. Andersen.

Remarks. The species is known from several Central European countries, including Germany and Poland, and from the British Isles (Papp & Černý 2016), and it has also been recorded from North Korea (Černý 2007). The larval host plants are wood sedge (*Carex sylvatica*) and wimper sedge (*C. pilosa*). The specimen from Hedmark was netted on a rich fen with *Sphagnum* and *Carex* vegetation.

***Cerodontha (Icteromyza) churchillensis* Spencer, 1969**

Material. Hedmark (HES): Elverum, Halåa, 61.039260°N 12.093200°E, 500m a.s.l., 22 July 2017, 3♂♂, sweep net, leg. T. Andersen & L. Hagenlund.

Remarks. A well-characterized, but rare Holarctic species, which has previously been recorded from Finland, Sweden and Estonia. Biology and larva are unknown (Papp & Černý 2016). The specimens from Hedmark were netted along the bank of a small lake grown with herbs, sedges and grasses.

***Cerodontha (Icteromyza) lineella* (Zetterstedt, 1840)**

Material. Hedmark (HEN): Stor-Elvdal, Rasta, 61.399254°N 11.144010°E, 254m a.s.l., 29–31 July 2016, 1♂, light trap, leg. T. Andersen & L. Hagenlund; Stor-Elvdal, Ottestad, 61.297111°N 11.277147°E, 239m a.s.l., 21 June–20 July 2017, 1♂, light trap, leg. T. Andersen & L. Hagenlund.

Remarks. In all essential aspects like the previous species, but more common and known from a wider area in Europe. Biology and larva are unknown, though probably a stem miner in Monocotylodoneae (Papp & Černý 2016). The specimens from Hedmark were taken in light

traps; at Rasta the trap was situated close to the River Glomma in an area with a dense vegetation of grasses and herbs; the locality at Ottestad is the same as for *A. conjuncta*.

***Cerodontha (Poemyza) estlandica* Zlobin, 1993**

Material. Hedmark (HEN): Stor-Elvdal, Ottestad, 61.297111°N 11.277147°E, 239m a.s.l., 21 June–20 July 2017, 1♂, light trap, leg. T. Andersen & L. Hagenlund.

Remarks. Rather recently described from Estonia and subsequently recorded from the Czech Republic, Hungary, Latvia and Lithuania. The record from Hedmark thus extends its known range considerably northwards. Biology and larva are unknown (Papp & Černý 2016). The male from Hedmark was taken in the same light trap as *A. conjuncta*.

***Cerodontha (Poemyza) imbuta* (Meigen, 1838)**

= *deschampsiae* (Spencer, 1957)

Material. Hedmark (HEN): Stor-Elvdal, Ottestad, 61.297111°N 11.277147°E, 239m a.s.l., 21 June–20 July 2017, 1♂, light trap, leg. T. Andersen & L. Hagenlund; Rendalen, Sekserbua NE, 61.556056°N 11.168556°E, 520m a.s.l., 23 June–11 July 2016, 1♂, Malaise trap, leg. T. Andersen & L. Hagenlund.

Remarks. A widespread species in Europe, which has also been recorded from Turkey (Spencer 1976, Papp & Černý 2016). Belongs to the same group as the distinctly more common *C. (P.) atra* (Meigen, 1830), but is easily recognized by its longer distiphallus in the aedeagus. The male from Ottestad was taken in the same light trap as *A. conjuncta*; the male from Rendalen was taken in a Malaise trap situated on a small intermediate to rich fen with firm substrate grown with shrubs, herbs, sedges and grasses.

***Chromatomyia arctagrostidis* Griffiths, 1980**

Material. Finnmark (FV): Alta: Gargia fjellstue 69.80525°N 23.48937°E, 120m a.s.l., 7–24 August 2010, 1♂, Malaise trap no. 1, leg. Finnmarksprosjektet; (FN): Porsanger: Baukop, 70.20469°N 24.90605°E, 26m a.s.l., 26 July–25 August 2010, 1♂, Malaise-trap no. 6, leg. Finnmarksprosjektet.

Remarks. A Nearctic species previously only known from Canada, and thus a new species for Europe. The species is similar to *Ch. isicae* (Hering, 1962); the main difference is in the thickness of the supporting sclerites of the dorsal lobe of aedeagus (Griffiths 1980). According to Griffiths (1980) the host plant is Russian grass (*Arctragrostis latifolia*), a circumpolar species characteristic of wet places on permafrost. Both specimens from Finnmark was taken in Malaise traps; at Gargia the trap was situated close to a fast-flowing stream in an area with mixed forest; the specimen from Porsanger was taken in the same trap as *C. (D.) chaixiana*.

***Chromatomyia cinnae* Griffiths, 1980**

Material. Hedmark (HEN): Engerdal, Åsen, 61.885861°N 11.782833°E, 700m a.s.l., 11–21 July 2016, 1♂, Malaise trap, leg. T. Andersen & L. Hagenlund.

Remarks. A Nearctic species previously only known from Canada, and thus a new species for Europe. In this species the supporting sclerites of the dorsal lobe of aedeagus are characteristically expanded dorsally (Griffiths 1980). Larvae are leaf-miners on woodreeds (*Cinna* spp.). The male from Hedmark was taken in a Malaise trap on a small, fragmented rich fen with low, open mixed forest and herbs, sedges and grasses.

***Chromatomyia cygnicollina* Griffiths, 1980**

Material. Hedmark (HEN): Engerdal, Åsen, 61.885861°N 11.782833°E, 700m a.s.l., 11–21 July 2016, 2♂♂, Malaise trap, leg. T. Andersen & L. Hagenlund; Finnmark (FI): Kautokeino: Lahpoluoppal, 69.20992°N 23.757661°E, 320m a.s.l., 9–24 July 2010, 1♂, Malaise-trap no. 3, leg. Finnmarksprosjektet.

Remarks. A Nearctic species previously only known from Canada, and thus a new species for Europe. It groups with *Ch. spenceriana* Griffiths, 1980 and *Ch. beigeriae* Griffiths, 1980 in its aedeagal structures. However, the clear yellow frons is given as the main distinguishing character for this species (Griffiths 1980). The larva is a leaf-miner in rushes (*Luzula* spp.). The males from Hedmark were taken in the same Malaise trap as *Ch. cinnae*. The male from Finnmark was taken

in a Malaise trap situated on the bank of a river dominated by reeds, sedges and willow (*Salix*).

***Chromatomyia furcata* Griffiths, 1980**

Material. Hedmark (HEN): Engerdal, Åsen, 61.885861°N 11.782833°E, 700m a.s.l., 23 June–11 July 2016, 2♂♂, Malaise trap, leg. T. Andersen & L. Hagenlund.

Remarks. The species is hitherto only recorded with certainty from Kamchatka in the East Palaearctic. However, Griffiths (1980) notes that similar specimens are known also from northern Finland and Sweden. The partially fused supporting sclerites of the dorsal lobe of aedeagus is diagnostic for this species. Host plant and early stages are unknown (Griffiths 1980). The males from Hedmark was taken in the same Malaise trap as *Ch. cinnae*.

***Chromatomyia spenceriana* Griffiths, 1980**

Material. Hedmark (HEN): Engerdal, Åsen, 61.885861°N 11.782833°E, 700m a.s.l., 23 June–11 July 2016, 2♂♂, Malaise trap, leg. T. Andersen & L. Hagenlund.

Remarks. Griffiths (1980) described this species based on a single type specimen collected by K.A. Spencer in Abisko, northern Sweden in 1972. Subsequently the species has been recorded from the Czech Republic and Switzerland (Papp & Černý 2020). Parts of genitalia were lost in the type specimen, which makes the description somewhat lacking. The species is similar to *C. cygnicollina*, but the two species can be separated as *Ch. spenceriana* has a darker frons. The males from Hedmark were taken in the same Malaise trap as *Ch. cinnae*.

***Chromatomyia styriaca* Griffiths, 1980**

Material. Hedmark (HEN): Åmot, Kildesaga, 61.178778°N 11.402167°E, 290m a.s.l., 26 May–9 June 2016, 1♂; 9–23 June 2016, 1♂; 21 July–4 August 2016, 1♂, Malaise trap, leg. T. Andersen & L. Hagenlund.

Remarks. The species has previously been recorded from several countries in Central Europe and it is also recorded from Finland and Sweden (Papp & Černý 2020). The weakly developed supporting sclerites of the dorsal lobe are

diagnostic. Host and early stages are unknown. The males from Hedmark were taken in a Malaise trap on a small rich fen with a high number of herb species, surrounded by spruce forest.

***Galiomyza galiivora* (Spencer, 1969)**

Material. Hedmark (HEN): Stor-Elvdal, Ottestad, 61.297111°N 11.277147°E, 239m a.s.l., 21 June–20 July 2017, 1♂, light trap, leg. T. Andersen & L. Hagenlund.

Remarks. A rarely encountered species. The record from Hedmark is the first from Scandinavia; the previous northernmost records are from Germany, Poland and Lithuania (Papp & Černý 2017). The combination of yellow third antennal segment and an apically round aedeagus are diagnostic. Like its name suggests, the species feeds on bedstraw (*Galium* spp.) (Papp & Černý 2017). The male from Ottestad was taken in the same light trap as *A. conjuncta*.

***Liriomyza europaea* Zlobin, 2003**

Material. Hedmark (HEN): Åmot, Kildesaga, 61.178778°N 11.402167°E, 290m a.s.l., 9 June–21 July 2016, 1♂, Malaise trap, leg. T. Andersen & L. Hagenlund; Rendalen, Sekserbua NØ, 61.556056°N 11.168556°E, 520m a.s.l., 11–21 July 2016, 2♂♂, Malaise trap, leg. T. Andersen & L. Hagenlund; Tynset, Brydalskjølen, 62.255444°N 10.907250°E, 780m a.s.l., 21 July–4 August 2016, 1♂, Malaise trap, leg. T. Andersen & L. Hagenlund.

Remarks. Zlobin (2003) described the species in his revision of the *L. flaveola*-group from Russia, England and Spain. It has later been recorded from the Czech Republic and Sweden (Papp & Černý 2017), and recently also from the Netherlands (Tschirnhaus & Wielink 2020). The larva most probably feeds on Poaceae (Papp & Černý 2017). The males from Hedmark were taken in Malaise traps on three different rich fens.

***Phytobia cambii* (Hendel, 1931)**

Material. Hedmark (HEN): Stor-Elvdal, Nabbtjern, 61.378417°N 11.191750°E, 251m a.s.l., 9–23 July 2016, 3♂♂, Malaise trap, leg. T. Andersen & L. Hagenlund; Stor-Elvdal: Evenstad, Høgskolen i Innlandet, 61.4244977°N

11.077615°E, 251 m a.s.l., 3–10 June 2016, 1♂, sweep net, leg. M. Hagenlund.

Remarks. The species has previously been recorded from all countries in Central and Northern Europe except for Norway. It is easy to identify due to its characteristic hypopygium and large size. The larva feeds on various poplar (*Populus*) and willow (*Salix*) species (Papp & Černý 2016). The specimens from Nabbtjern were taken in a Malaise trap situated on a medium-large rich fen surrounded by spruce forest and grown with willow shrubs, herbs, sedges and grasses; the specimen from Evenstad was netted close to the River Glomma in an area with broad-leaved trees, sedges and grasses.

Phytoliriomyza mikii (Strobl, 1898)

Material. Hedmark (HEN): Engerdal, Åsen, 61.885861°N 11.782833°E, 700m a.s.l., 23 June–11 July 2016, 2♂♂, Malaise trap, leg. T. Andersen & L. Hagenlund.

Remarks. According to Spencer (1976) the species has a typical boreo-alpine distribution. However, it has also been recorded from Denmark, Lithuania and Poland, and recently from the Azores (Papp & Černý 2017, Černý et al. 2018). Host plant and early stages are unknown. The males from Hedmark were taken in the same Malaise trap as *Ch. cinnae*.

Phytomyza enigmoides Hering, 1937

Material. Hedmark (HEN): Åmot, Kildesaga, 61.178778°N 11.402167°E, 290m a.s.l., 23 June–11 July 2016, 1♂, Malaise trap, leg. T. Andersen & L. Hagenlund.

Remarks. A rather rare European species, in northern Europe hitherto recorded from Finland and Sweden (Papp & Černý 2020). According to Pakalniškis (1998) the puparium closely resembles *P. evanescens* Hendel, 1920. The larva feeds on Kashubian buttercup (*Ranunculus cassubicus*). The male from Hedmark was taken in the same Malaise trap as *Ch. styriaca*.

Discussion

The project in Finnmark targeted insects living

in fresh water and in humid places along rivers and streams. In the light of the Finnmark material there may be further *Chromatomyia* species present in the very north of Norway. The species of this genus can be extremely difficult to identify and the morphological differences between the species used by Griffiths (1980) in his Palaearctic and Holarctic keys are often very slight. Thus, barcoding would be favourable in delimiting several *Chromatomyia* species, like in the case of the difficult species-pair *Ch. cygnicollina* and *Ch. spenceriana*.

The project in Hedmark targeted the insect fauna on rich fens. Twelve of the species were collected on rich fens, of which eight were exclusively collected in this habitat. Of these, *L. europaea* was collected on three different rich fens, but not in any other habitat. The species-rich genus *Cerodontha* is known to favour boggy places, but the large diversity of *Chromatomyia* species in Hedmark, particularly on the rich fen at Åsen in Engerdal was a real surprise. Nothing equivalent has so far been observed at least in Finnish boreal mires.

As mentioned in the remarks on the different species, several species were also taken in other types of habitats. In the light trap at Ottestad no less than five of the species were collected. This trap was situated close to a ravine with broad leaved trees, and a variety of herbs, sedges and grasses. The distance to the River Glomma is just a few hundred meters and the area is dominated by farmland and pine (*Pinus*) forest.

The two projects gave a substantial addition to the list of Norwegian Agromyzidae, now comprising 278 species. However, as more than 300 species are listed for both Sweden and Finland there should still be more species to encounter in Norway, particularly in the more remote and northern parts of the country.

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