

**GEOMYZA TRIPUNCTATA FALLÉN, A PALAEARCTIC OPOMYZID FLY NEW TO
NORTH AMERICA, WITH NOTES ON RANGE EXPANSIONS IN HOLARCTIC
OPOMYZIDAE (DIPTERA)**

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Abstract

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The western Palaearctic opomyzid fly *Geomyza tripunctata* Fallén is recorded from the Nearctic region for the first time, from specimens collected in Ontario, Quebec, Nova Scotia and Prince Edward Island. The species was probably introduced to eastern Canada by human activity. The date of the initial introduction is unknown, but the range expansion of *G. tripunctata* in southern Ontario is quite recent, probably since the mid 1980s, and the species appears to be expanding its range rapidly in that region. *Geomyza tripunctata* is illustrated and distinguished from the ten other known Nearctic species of *Geomyza*. Notes on range expansions in the Nearctic region are also provided for two other Holarctic species of Opomyzidae, *Opomyza germinationis* (L.) and *O. petrei* Mesnil.

Résumé

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Geomyza tripunctata Fallén, un opomyzid paléarctique a été découvert pour la première fois dans la région néarctique. Les spécimens ont été collectés en Ontario, Québec, Nouvelle Écosse, et à l'Île du Prince Édouard. Cette espèce a probablement été introduite dans l'est du Canada par l'intermédiaire des activités humaines. La date de cette introduction n'est pas connue, mais la présence de *G. tripunctata* en Ontario est récente, probablement depuis le milieu des années quatre-vingts et l'espèce semble étendre sa distribution rapidement dans cette région. Ici, *G. tripunctata* est différenciée des dix autres espèces néarctiques connues de *Geomyza*. De plus, la nouvelle répartition plus étendue dans la région néarctique de deux autres espèces holarctiques d'Opomyzidae, *Opomyza germinationis* (L.) et *O. petrei* Mesnil est donnée.

Introduction

It is clear that there are more species of Holarctic acalyprate Diptera than previously realized. Many species have been recorded as either naturally Holarctic, or introduced from the Palaearctic region (e.g., McAlpine 1965; Hoebeke and Wheeler 1994; Wheeler 1994). With more effort to document such range extensions by collecting in likely localities, the number of Holarctic species will probably continue to rise. The Opomyzidae is one family in which there are already several known Holarctic species; five of 13 species known from the Nearctic region are either

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naturally Holarctic or have been introduced to North America. *Opomyza germinationis* (L.) and *O. petrei* Mesnil were introduced to the east and west coasts of North America, respectively, and *Geomyza balachowskyi* Mesnil was introduced to both the east and west coasts (Vockeroth 1961). Vockeroth (1961) considered *Anomalochea guttipennis* (Zetterstedt) and *Geomyza apicalis* (Meigen) naturally Holarctic. We have been aware for some time of another Palaearctic species of *Geomyza* in eastern North America; the purpose of this paper is to record the presence of *Geomyza tripunctata* Fallén in the Nearctic region, and to provide notes on range expansions of *G. tripunctata* and other Holarctic Opomyzidae based on collections made since Vockeroth (1961).

Materials and Methods

The specimens on which this paper is based are housed in the following collections (acronyms used in the text are in parentheses): Canadian National Collection of Insects, Ottawa, ON (CNC); University of Guelph Insect Collection, Guelph, ON (GUE); collection of K.N. Barber, Sault Ste. Marie, ON (KNB); Lyman Entomological Museum, McGill University, Ste-Anne-de-Bellevue, QC (LEM).

Preparations of postabdomens were made by removing abdomens from specimens and clearing them for several minutes in warm 85% lactic acid. Cleared abdomens were placed in glycerin for further dissection and examination.

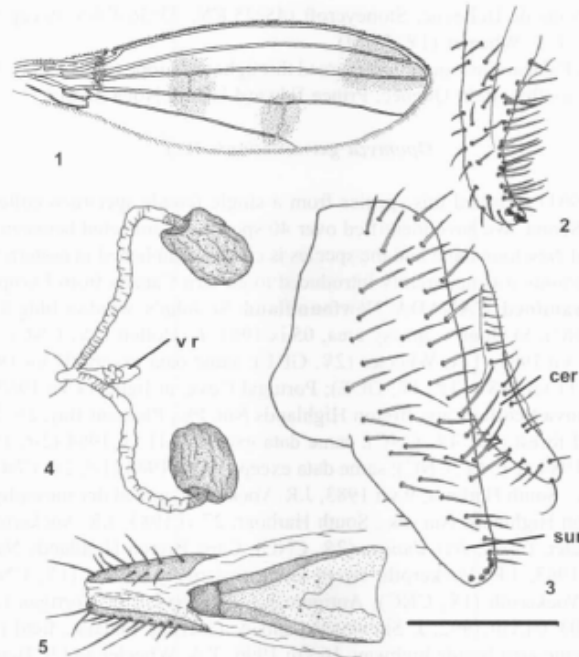
Results

Geomyza tripunctata Fallén

Diagnosis. *Geomyza tripunctata* may be distinguished from all other known *Geomyza* species in the Nearctic region by the wing pattern, with a distinct, large spot at the apex and one large spot over each of crossveins r-m and dm-cu (Fig. 1). The wing pattern permits identification of this species in the field, without the need for magnification. *Geomyza tripunctata* also has a strong anepimeral bristle (pteropleural bristle of Vockeroth, 1961), a character present only in *G. lurida* (Loew) among the other Nearctic species of the genus. *Geomyza lurida* is known only from west of the coastal mountain ranges from Alaska to California and has much smaller spots on the crossveins than does *G. tripunctata* (see fig. 4 in Vockeroth, 1961).

Mesnil (1934) and Balachowsky and Mesnil (1935) provided comprehensive descriptions and illustrations of external characters for *G. tripunctata*. Illustrations of the male and female genitalia are included here. The male genitalia are relatively uniform in *Geomyza*, with only minor differences in shape of the epandrium, surstylus and cercus among species. The surstylus of *G. tripunctata* is straight and evenly tapering, with a broadly rounded apex (Fig. 3), which is slightly curved medially, and has a single row of 4–7 short stout subapical spines on the medial surface (Figs. 2–3). The cercus is slightly curved posteriorly with scattered fine setae apically (Fig. 3). The female sternite 8, cerci, spermathecae and ventral receptacle of *G. tripunctata* are illustrated in Figs. 4–5. The female genitalia of most other Nearctic species of *Geomyza* have not been illustrated, but may provide useful taxonomic characters.

Specimens examined. CANADA: Nova Scotia: 1 km N Mabou, picnic area beside highway, 16.viii.1996, T.A. Wheeler and S. Boucher, sweeping disturbed grasses and herbage (1♂, 1♀, LEM); Ontario: Almonte, Indian River, 29.v.1992, T.A. Wheeler, swept along shore (1♀, LEM); Burlington, edge Tuck Ck, 20.vii.1997, K.N. Barber, sweeps/pooter *Bromus inermis*, 43°21.2'N, 79°46.6'W (1♂, 1♀, KNB); Fergus, Grand R., floodplain, 17.vii.1997, K.N. Barber, sweeps/pooter, *Phalaris arundinacea*, 43°41.5'N, 80°23.2'W (1♂, 1♀, KNB); same data except sweeps/pooter,



FIGURES 1–5. *Geomyza tripunctata*: 1, wing; 2, male left surstylus, posterior; 3, male epandrial complex, left lateral; 4, female spermathecae and ventral receptacle; 5, female sternite 8 and cerci, ventral. Abbreviations: cer - cercus; sur - surstylus; vr - ventral receptacle. Scale bar (Figures 2–5) = 0.2 mm.

Bromus inermis (2♂, 5♀, KNB); Fergus, on *Formica* mound, 07.iv.1996, S.A. Marshall (2♀, GUE); Ottawa, 06.vi.1987, J.R. Vockeroth (1♂, 1♀, CNC); same data except 12.v.1987 (1♀, CNC); Ottawa, 15.viii.1987, J.R. Vockeroth, swept from *Sagittaria* (1♀, CNC); Ottawa, 04.vii.1989, J.R. Vockeroth, swept over bare path in *Acer* wood (1♀, CNC); Ottawa, 18.vii.1990, J.R. Vockeroth, damp second growth *Acer-Betula* wood (1♂, CNC); same data except 23.vii.1990 (1♀, CNC); same data except 27.iv.1991 (1♀, CNC); same data except 22.vii.1991 (1♀, CNC); Ottawa, nr. Uplands Airport, 22.v.1990, J.M. Cumming (1♀, CNC); ca. 1km NW Ponsonby, 17.vii.1997, K.N. Barber, sweeps/pooter, roadside, mostly *Poa pratensis* and *Poa compressa*, 43°38.2'N, 80°22.9'W (5♂, 4♀, KNB); **Prince Edward Island**: 1km SW Suffolk, sweep grasses along roadside, 15.viii.1996, T.A. Wheeler and S. Boucher (1♂, 1♀, LEM); **Quebec**: Lachute, 08.ix.1992, J.R. Vockeroth, swept in *Acer-Tsuga* wood (1♂, CNC); Old Chelsea, 20.v.1987, J.R. Vockeroth (1♂, CNC); Luskville, Piton Rd., 19.iv.1993, J.R. Vockeroth (1♀, CNC); Lac Roddick, 12 km N Bouchette, 10.x.1999, L. Masner, pan trap on lakeshore (1♀, CNC); Ste-Anne-de-Bellevue, Morgan Arboretum, vi.1995, C. Riley, pan traps in *Typha* at pond margin (1♀, LEM); Ste-Anne-de-Bellevue, Stoneycroft (45°25.8'N, 73°56.4'W), sweep grass at south end of pond, 28.v.1998, J. Savage (1♀, LEM); same data except 02.vii.1998 (1♂, 4♀, LEM); same data except 02.vii.1998, J. Pérusse

(1♀, LEM); Ste-Anne-de-Bellevue, Stoneycroft (45°25.8'N, 73°56.4'W), sweep vegetation near pond, 02.vii.1999, T.A. Wheeler (1♀, LEM).

Distribution. Palaearctic region: widespread throughout Europe (Soós 1984). Nearctic region: southern Ontario, southwestern Quebec, Prince Edward Island, Nova Scotia.

Opomyza germinationis (L.)

Vockeroth (1961) recorded this species from a single female specimen collected in 1958 at Lockeport, Nova Scotia. We have identified over 40 specimens collected between 1983 and 1996 in Nova Scotia and Newfoundland and the species is clearly established in eastern North America. *Opomyza germinationis* was apparently introduced to eastern Canada from Europe.

Specimens examined. CANADA: Newfoundland: St. John's, window bldg 810, 06.vii.1983, L. Hollett (1♂, CNC); St. John's, grassy area, 05.ix.1983, L. Hollett (1♀, CNC); Portugal Cove, sweep pasture, 01.vii.1987, T.A. Wheeler (2♀, GUE); same data except 07.vii.1987 (1♂, GUE); same data except 11.vii.1987 (3♂, 3♀, GUE); Portugal Cove, at light, 11.vii.1987, T.A. Wheeler (1♂, 2♀, GUE); **Nova Scotia:** Cape Breton Highlands Nat. Pk., Pleasant Bay, 25–29.vi.1984, H.J. Teskey, dry mixed forest (4♂, 4♀, CNC); same data except 2–11.vii.1984 (2♂, 1♀, CNC); same data except 28.vi.1984 (1♂, 1♀, CNC); same data except 10.vii.1984 (1♂, 2♀, CNC); Cape Breton Highlands Nat. Pk., South Harbour, 9.vii.1983, J.R. Vockeroth, mixed dry mesophytic woods (1♂, CNC); Cape Breton Highlands Nat. Pk., South Harbour, 27.vi.1983, J.R. Vockeroth, marshy lake shore, brackish water, *Carex*, *Iris*, *Juncus* (2♀, CNC); Cape Breton Highlands Nat. Pk., Beulach Ban Falls, 11.vii.1983, J.R. Vockeroth, swept along fast rocky stream (1♀, CNC); Lockeport, 20.vii.1958, J.R. Vockeroth (1♀, CNC); Antigonish, 18.vi.1983, J.E. Corrigan (2♂, 2♀, GUE); Little Bras D'or, 03–04.viii.1992, J. Skevington and A. Goering, malaise, field (1♂, 1♀, GUE); 1km N Mabou, picnic area beside highway, 16.viii.1996, T.A. Wheeler and S. Boucher, sweeping disturbed grasses and herbage (2♂, 2♀, LEM).

Opomyza petrei Mesnil

Vockeroth (1961) recorded this species from several localities in southwestern British Columbia and on Vancouver Island. Like *O. germinationis*, this species is apparently introduced. *Opomyza petrei* has recently been collected in eastern Canada as well, suggesting that it, like *Geomyza balachowskyi*, has been introduced on both the east and west coasts of North America. The single specimen from Ohio, collected far inland, may be evidence of further dispersal of introduced coastal populations, especially because the locality is close to Lake Erie and heavy shipping traffic. The presence of the species in Ohio could also indicate that the species is naturally Holarctic, as suggested for *Geomyza apicalis* by Vockeroth (1961) and the chloropid fly *Conioscinella zetterstedti* Andersson by Wheeler (1994). This latter explanation would be more plausible, however, if more than a single specimen had been collected in inland localities, and if eastern Nearctic specimens had been collected before 1962.

Specimens examined. (22 specimens listed by Vockeroth (1961) omitted). **CANADA: British Columbia:** Pitt Meadow, 16.vi.1960, A.T. Wilkinson (1♂, 1♀, CNC); Royal Oak, 15.vii.1959, L.A. Kelton (1♂, 1♀, CNC); Vancouver, UBC campus, forest trail, 3–9.vii.1988, S.A. Marshall (1♀, GUE); **Nova Scotia:** Ingonish, North Bay, 7–8.vii.1984, H.J. Teskey (1♂, CNC); Cherry Hill, 20.viii.1989, along shore, S.A. Marshall (1♂, GUE); 1km N Mabou, picnic area beside highway, 16.viii.1996, T.A. Wheeler and S. Boucher, sweeping disturbed grasses and herbage (3♂, 4♀, LEM). **USA: Ohio:** Mimitla Lake, 16.viii.1962, D. Miletich (1♂, CNC); **Oregon:** Benton Co.,

Lobster Valley, 15mi SW Aalsea, 27.v.1975, J.D. Lattin (1♂, 1♀, GUE); **Washington**: Olympia, 23.vii.1960, F.C. Harmston (1♂, CNC); Quinault, 21.vii.1960, F.C. Harmston (1♀, CNC).

Discussion

Vockeroth (1961) predicted that *Geomyza tripunctata*, a common species in the western Palaearctic, would eventually be recorded in North America. It is difficult to reconstruct the history of the introduction and subsequent movements of *G. tripunctata* in eastern Canada, mainly because of collection bias. While the Diptera fauna of regions surrounding Ottawa and Guelph has been subject to regular collecting in recent decades, this is not true of Quebec and the Atlantic provinces, where interest in small acalyprate Diptera has been less pronounced. The first known Nearctic specimens of *G. tripunctata* were collected in 1987 and all specimens collected before 1992 were taken in the Ottawa region. *Geomyza tripunctata* was probably not established in the Ottawa region before the 1980s because the Diptera of that region have been well collected for many years and it is unlikely that such a conspicuous species would have been overlooked. Given the broad geographic distribution of specimens collected since 1996, *G. tripunctata* seems to be expanding its range rapidly in southern Ontario. Extensive collecting has been done by students and staff at the University of Guelph since the mid 1970s and it is unlikely that *G. tripunctata* was established in southwestern Ontario much before the first collections there in 1996. Since 1996, we have made a more concerted effort to collect this species east of Ottawa, and it has now been recorded in several localities and is clearly widespread in eastern Canada. The lack of past collecting of acalyprate Diptera in Quebec and the Atlantic provinces makes it impossible to determine whether *G. tripunctata* has been established in eastern Canada for some time or whether specimens from there represent a recent range expansion.

An unresolved question concerning the Holarctic species of Opomyzidae (and other families) is the origin of the Nearctic fauna. Despite strong circumstantial evidence for recent introduction, it is impossible to establish, based on morphological and geographic criteria, whether Nearctic populations of Holarctic species such as those discussed here are naturally Holarctic or recently introduced (and if so, on how many occasions). Analysis of population level genetic characters may provide the necessary evidence to establish the approximate time of divergence of Nearctic and Palaearctic populations of these species. Efforts should also be made to determine the actual distribution of such species in the Nearctic. While established insect collections provide crucial data on the introduction and range expansion of species, those data are often limited by a lack of collecting in appropriate regions. Continued faunal inventories are necessary to document the changing distributions of insect species.

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