

First record of adventive species *Micromus variegatus* (Fabricius) from eastern Canada (Neuroptera, Hemerobiidae)

Jan Klimaszewski¹, Laurent LeSage², Karine Savard¹

¹ Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, 1055 du P.E.P.S., P.O. Box 10380, Stn. Sainte-Foy, Québec, Québec, Canada G1V 4C7 ² Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre, Neatby Bldg. -1004, 960 Carling Ave., Ottawa, Ontario, Canada K1A 0C6

Corresponding author: Jan Klimaszewski (jan.klimaszewski@nrca-nrcan.gc.ca)

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Abstract

An adventive Palaearctic species, *Micromus variegatus* (Fabricius) (Neuroptera, Hemerobiidae), is reported as new to Québec, eastern Canada. It was recorded for the first time from North America in 1988, from Galiano Island, off the coast of southwestern British Columbia. The present records confirm the occurrence of this species in eastern Canada, which constitutes the second known introduction of *M. variegatus* into North America.

Keywords

Adventive species, Neuroptera, *Micromus*, Canada

Introduction

Klimaszewski and Kevan (1988) revised the species of *Micromus* Rambur from Canada and Alaska. Seven species were reported including the first record of *Micromus variegatus* from North America, on Galiano Island, British Columbia. The authors suspected the possible introduction of this species into Canada from Japan. *Micromus variegatus* is a Palaearctic species occurring in the British Isles and Western Europe (Killington 1936). Aspöck et al. (1980) reported it from most of Europe, Turkey (Anatolia), northern Iran and Japan. Agekyan (1973) reported it from the Black Sea littoral of

the former Soviet Union. The present new record from Québec, Canada, most likely represents the second known introduction of this species into North America.

Material and methods

In 2009, 20 yellow pan traps (Fig. 1) were placed in rows of raspberries grown in tunnels (Fig. 2) in Saint-Laurent-de-l'Île-d'Orléans, east of Quebec City, in order to study flea beetles, which could cause problems in this artificial environment. The tunnels were open ended at least occasionally to improve ventilation. Yellow pan traps are attractive to several flying insects and have been successfully used for the study of flea beetles in raspberry fields (Lévesque and Lévesque 1998) and in vineyards (LeSage et al. 2008). One of the main advantages of yellow pan trapping is to collect not only flying insects but also ground insects, both at the same time. Consequently, “collateral” benefits can be obtained by looking at “residues” that may contain interesting species and/or records in groups that were not specifically targeted. The hemerobiids reported here were obtained from residues of samples collected for a survey of flea beetles.

The specimens are deposited in the following collections:

CNC Canadian National Collection of Insects, Arachnids and Nematodes, Agriculture and Agri-Food Canada, Ottawa, Ontario, Canada



Figure 1. Yellow pan traps used for capturing specimens of *Micromus variegatus*.

LFC Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, Insectarium R. Martineau, Quebec City, Québec, Canada

IM Insectarium de Montréal, 4581 Sherbrooke est, Montréal, Québec, Canada

Material examined. CANADA, Québec, Saint-Laurent-de-l'Île-d'Orléans, 25.V.2009, *Les Fraises de l'Île d'Orléans Inc.*, sur *Rubus idaeus* Autumn Britten, Chapelle 4, Filet fauchoir, V. Fournier, M. Roy & L. LeSage (CNC, LFC, IM), 14 adult specimens.

Discussion

According to the CFIA (2009) Web site, the cultivar 'Autumn Britten' is the result of a controlled cross made in 1974 between 'EM 2806/86' and 'EM 2335/47'. The parentage includes *Rubus strigosus* Michx., *R. arcticus* L., *R. occidentalis* L., and the red raspberry varieties 'Malling Landmark', 'Malling Promise', 'Lloyd George', 'Pyne's Royal', 'Burnetholm' and 'Norfolk Giant'. 'Autumn Britten' was grown at Horticultural Research International in East Malling, United Kingdom and selected in 1976 based on its early fall fruiting, large fruit size and good fruit colour. Initial trials were conducted at the National Fruit Trials in Brogden, United Kingdom from 1977 to 1983. Material was sent to Agriculture and Agri-Food Canada's Research Station in Kentville, Nova Scotia in 1980 and the Pacific Agricul-



Figure 2. The cultivated imported variety of raspberries *Rubus idaeus* 'Autumn Britten' grown in tunnels in Québec where *M. variegatus* specimens were found.

ture Research Centre in Vancouver, British Columbia in 1983. Trials were also conducted at the Horticultural Research Institute of Ontario's Horticultural Experiment Station in Simcoe, Ontario from 1987 to 1991. Plants cultivated in tunnels on Île d'Orléans were purchased in 2006 from Strawberry Tyme Farms, Inc., Simcoe, Ontario.

A first hypothesis is that *M. variegatus* could have been introduced much earlier in the 1980s or 1990s as eggs or other life forms with the raspberry plants imported into Canada from other countries (e.g., United Kingdom or the United States). Or it could be a fairly recent introduction directly into Quebec City through the international commerce of plant material. In this case, the growth tunnels may have served as a "refugium" for this exotic insect.

With an increased volume of commercial goods, we are experiencing many new introductions of exotic insect species into Canada and throughout the world (Majka and Klimaszewski 2008). The occurrence of *M. variegatus* in Québec provides another example of this trend. The British Columbia adults were collected from June through August but no other collecting details are known. Dunn (1956) recorded this species from an alfalfa field infested with pea aphids. Agekyan (1973) found this species on bamboo infested with bamboo aphids in the Black Sea littoral. Killington (1936) reported it from the British Isles occurring on low vegetation in gardens and with at least two generations annually occurring in southern England, the first appearing in April, May and June and the second in August and September. Aspöck et al. (1980) recorded this species from gardens and parks in central Europe. The adults were re-described and illustrated, including the genital structures, by Klimaszewski and Kevan (1988) [Figs 32–35, 42 A, B], and the habitus image is shown in this publication (Fig. 3).

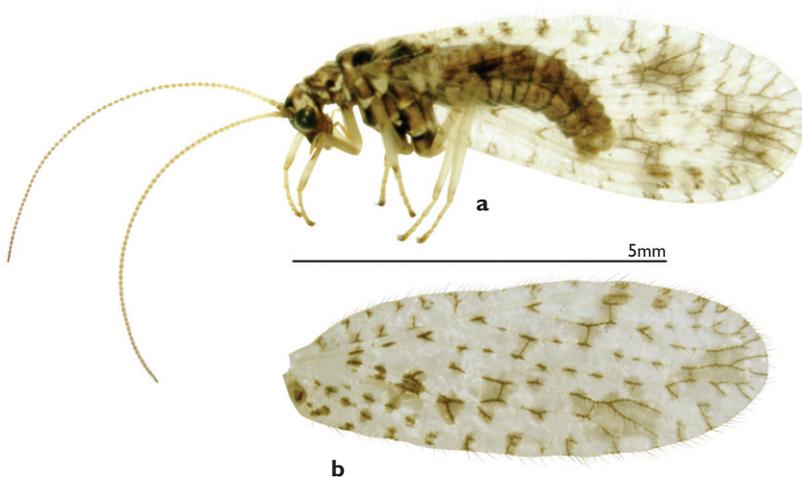


Figure 3. **a** Lateral image of *Micromus variegatus* (Fabricius), based on a specimen captured in Québec **b** Forewing of *Micromus variegatus* (Fabricius), based on a specimen captured in Québec.

The immature stages have been described by Brauer (1871), Killington (1936), Dunn (1956) and Agekyan (1973). There are three larval instars, all described in detail by Klimaszewski and Kevan (1988), and the same applies to the egg and pupa. The literature review indicates that the species mainly feeds on aphids and the larvae are extremely voracious and feed on both nymphs and adult females of aphids. Due to the known life history of *Micromus variegatus*, there are no direct economic risks posed by the introduction of this species into Canada but its presence may prove not to be beneficial to some of our native species.

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References

- Agekyan NG (1973) Setchatokrylye (Neuroptera) – Vragi bambukovykh tlei v Adzharii I ikh parazyty ([Lacewings] Neuroptera feeding of [*sic*] bamboo aphids in the Adzhar ASSR and their parasites). *Ėntomologicheskoe obozrenie* 52: 549–564.
- Aspöck H, Aspöck U, Hölzel H (1980) Nie Neuropteren Europas. Eine zusammenfassende Darstellung, der Systematik, Ökologie und Chorologie der Neuropteroidea (Megaloptera, Raphidioptera, Planipennia) Europas. Goecke & Evers, Krefeld, 1: 1–495; 2: 1–355.
- Brauer F (1871) Beiträge zur Kenntniss der Lebensweise und Verwandlung der Neuropteren (*Micromus variegatus* Fabr., *Panorpa communis* L., *Bittacus italicus* Klg., und *Bittacus hageni* Brau.). Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien 21: 107–116.
- CFIA (2009) Autumn Britten. Available at <http://www.inspection.gc.ca/english/plaveg/pbrpov/cropreport/ra/ra63e.pdf>
- Dunn JA (1956) *Micromus variegatus* Fabricius (Neuroptera) as a predator of the pea aphid. *Proceedings of the Royal Entomological Society, London (A)* 29: 76–80. 1 pl.
- Killington FJ (1936) A monograph of the British Neuroptera. Monograph of the Royal Entomological Society, London 122: XX+270 pp., 15 pls.
- Klimaszewski J, Kevan DK McE (1988) The brown lacewing flies of Canada and Alaska (Neuroptera, Hemerobiidae). Part III. The genus *Micromus* Rambur. *Giornale Italiano di Entomologia* 19: 31–76.
- LeSage L, Bouchard P, Goulet H (2008) Leaf beetle diversity and abundance in two Quebec vineyards (Coleoptera, Chrysomelidae). *Nouvelle Revue d'Entomologie* 25: 3–16.

- Lévesque C, Lévesque GY (1998) Faunal composition, wing polymorphism and seasonal abundance of some flea beetles (Coleoptera, Chrysomelidae) in Southern Quebec (Canada). *Great Lakes Entomologist* 31: 39–48.
- Majka CG, Klimaszewski J (2008) Introduced Staphylinidae (Coleoptera) in the Maritime Provinces of Canada. *The Canadian Entomologist* 140: 48–72.