

First Record of the Bee *Melitta americana* (Smith) (Hymenoptera: Melittidae) for Quebec and Canada

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The first record of the bee *Melitta americana* (Smith) (Hymenoptera: Melittidae) for the province of Quebec and for Canada is reported. Female bees were found foraging on pollen and nectar on flowers of the Large Cranberry, *Vaccinium macrocarpon* Aiton (Ericaceae), in a cultivated Large Cranberry field in the Centre-du-Québec region.

Première mention de l'abeille *Melitta americana* (Smith) (Hyménoptères : Méliittides) pour la province du Québec et pour le Canada. Les abeilles femelles ont été observées en train de butiner du pollen et du nectar sur les fleurs de canneberges à gros fruits, *Vaccinium macrocarpon* Aiton (Éricacées), dans une culture commerciale de canneberges dans la région du Centre-du-Québec.

Key Words: oligolectic bee, *Vaccinium macrocarpon*, Large Cranberry, cranberry bog, native pollinator, nesting site, pollen analysis, range extension, Quebec, Canada.

Mots-clés : abeille oligolecte, *Vaccinium macrocarpon*, canneberge à gros fruits, cannebergière, pollinisateur indigène, site de nidification, analyse pollinique, extension d'aire, Québec, Canada.

Cranberries are an important commercial crop in the United States and Canada, particularly in Quebec. Production in Quebec has increased rapidly in recent years, from three producers in 1992 with a total of 127 ha (318 acres) to 80 producers in 2012 with a total of 2861 ha in production (7071 acres) (Association des producteurs de canneberges du Québec 2012*). Quebec, the third largest cranberry producing region in the world (Jean-Pierre Deland, Club environnemental et technique Atocas Québec (CETAQ), personal communication), produced 84 million kg (186 million pounds) by volume of harvested cranberries in 2012 (Association des producteurs de canneberges du Québec 2012*), valued at \$70 million. In 2011, 7754 Honey Bee (*Apis mellifera* L.) colonies were rented for the pollination of cranberries, for a total value of \$786,200 (Institut de la statistique du Québec 2012*). Understanding the diversity of native bees associated with large commercial cranberry operations in Quebec could have a significant economic impact on cranberry production.

Study Area and Methods

Bee biodiversity inventories were conducted in 12 commercial Large Cranberry (*Vaccinium macrocarpon*) (Ericaceae) fields in southern Quebec from 2005 to 2012. Two of the fields are on peat deposits and ten are on acidic sand. During the inventories, a particular emphasis was placed on the discovery of *Megachile addenda* Cresson (Megachilidae), a common species in commercial Large Cranberry crops in Massachusetts (Cane et al. 1996). The first survey of flower-visiting bees took place in the Outaouais region (western Quebec) from 25 to 29 June 2005, followed by Lanaudière region (on the north shore of the St. Lawrence River) in July 2006, and by the Centre-du-Québec region (on

the south shore of the St. Lawrence River midway between Montreal and Quebec City) from 11 to 15 July 2005, from 8 June to 20 July 2006, and in July 2009 and 2012. Other bee collecting took place, before, during, and after the flowering period of *V. macrocarpon*, on different species of plants in bloom around these sites. In the Centre-du-Québec, the Large Cranberries flowered in late June and early July. The flowering period lasted from three to four weeks, depending on the weather.

Many species of wild bees visited the Large Cranberries surveyed, mostly represented by bumble bees, *Bombus* spp. (Apidae), and *Megachile* spp. (Megachilidae, leaf-cutting bees), but few occurred in large numbers. In one of the peat bog farms (the Daveluyville site), the most frequent pollinator was the introduced Honey Bee, followed by the native solitary bee *Melitta americana* (Smith) (Payette 2013*).

In southeastern Massachusetts, MacKenzie and Averill (1995) have identified bumble bees and Cane et al. (1996) *Megachile addenda* as common pollinators of the Large Cranberry in this region. It is not a common species in Canada or in Quebec (Payette, *in press*), and I did not find *Megachile addenda* on Large Cranberry flowers or in the vicinity of the crops surveyed. On the Large Cranberry crops in Ontario, Kevan et al. (1983) did not find this species of Megachilidae.

After the first specimens of *Melitta americana* were found in Quebec, I consulted the following collections to verify whether a species of that genus had previously been found in Quebec or in other Canadian provinces (acronyms follow the Biodiversity Collections Index 2013*): author's collection, Montreal, Quebec; Marc Payette collection, Venise-en-Québec, Quebec; Canadian National Collection of Insects and Arachnids, and Nematodes, Agriculture and Agri-Food Canada,

Ottawa, Ontario (CNC); Insectarium de Montréal collection, Montreal, Quebec (IMQC); University of Kansas Natural History Museum, Division of Entomology, Snow Collections, Lawrence, Kansas (SEMC); Lyman Entomological Museum collection, McGill University, Macdonald Campus, Sainte-Anne-de-Bellevue, Quebec (LEMQ); Packer's Apoidea Collection, Department of Biology, York University, Toronto, Ontario (PCYU); Collection entomologique Ouellet-Robert, département de sciences biologiques de l'Université de Montréal, Montreal, Quebec (QMOR); and the University of Guelph Insect collection, School of Environmental Sciences, University of Guelph, Guelph, Ontario (DEBU).

No previous records were found.

Taxonomy

New phylogenetic hypotheses suggest that one of the smallest families, the Melittidae, could be the basal group of the bee clade (Danforth et al. 2006). Within this family, ground nesting bees of the genus *Macropis* and *Melitta* are Holarctic and are found in the eastern and central United States and southern Canada. *Macropis* bees are apparently all oligolectic (specialists), and the females collect pollen and floral oil on their host-plant, *Lysimachia* (Primulaceae) (Michez et al. 2008).

The bees of the genus *Melitta* Kirby, 1802 resemble species of *Andrena* (Andrenidae) in general aspects of body morphology. The facial foveae are absent, and they have one subantennal suture below each antenna. The labrum has a lateral apical lobe, a character not found in other bees. The genus is Holarctic and African in distribution (Michener 2007; Michez and Eardley 2007). Nesting behaviour of *Melitta* has been described by Türgari (1968), the biology by Celary (2006), the ecology by Michez and Eardley (2007), and the pollination ecology by Cane et al. (1985). *Melitta* appear to be oligolectic on different plant families (Michez et al. 2008).

In eastern North America, *Melitta* species appear to be restricted to a few species of Ericaceae (Snelling and Stage 1995; Michener 2007; Michez et al. 2008). Four described species in the genus are found in North America: one in Mexico and the western United States, and three in the eastern United States. *M. eickworti* is known from northern New York, whereas *M. americana* is generally found farther south (Massachusetts to Florida) (Bartholomew 2004).

Specimens were identified as *Melitta americana* (Smith) using the keys of Mitchell (1960) and Snelling and Stage (1995). Subsequently (in 2007 and 2009), voucher material was sent to Charles D. Michener (University of Kansas, Lawrence, Kansas) for verification and identification, and to Cory Sheffield (Royal Saskatchewan Museum, Regina, Saskatchewan) and Laurence Packer (York University, Toronto, Ontario). The latter authors will use the material collected in the pres-

ent study in an ongoing study to obtain DNA barcodes for all bees in Canada and for a generic key to bees in Canada. DNA barcode sequences will be available on the Barcodes of Life Data system.

For identification, users of the key in the Bee Genera of Eastern Canada (Packer et al. 2007) should insert the following couplet into couplet 19:

- Apex of marginal cell on costal margin of forewing or pointed and approximately one vein-width from costal margin
..... *Melitta americana* (Smith)
- Apex of marginal cell curved away from costal margin of forewing
..... [resume with couplet 19]

Results

Bees of the genus *Melitta* were found and observed at only one site in Daveluyville (46°14'55"N, 72°08'29"W), Quebec. The site is a small farm established in 1997 on peatlands extending to 16 beds of 1 ha each separated by dykes. This farm has a diverse set of natural habitats, with deciduous and coniferous forests adjacent to the Large Cranberry fields, which are located in an open area of sphagnum bogs and fens. The *Vaccinium* species surrounding the cultivated crops are Early Lowbush Blueberry (*V. angustifolium* Aiton), Highbush Blueberry (*V. corymbosum* L.), Velvet-leaved Blueberry (*V. myrtilloides* Michaux), and Small Cranberry (*V. oxycoccos* L.).

Specimens were found on 15 July 2005, 12 July 2006, 10 July 2009, and 6 July 2012; they were foraging exclusively on the flowers of the cultivated Large Cranberry. I collected more specimens from a nesting site I discovered in the dyke, between the edge of the crop and the bog, on 6 July 2012 at the same place. Following the discovery of the nesting site, a pollen analysis of *M. americana* provisioning masses from a total of three cells from three different nests was made. The results of this analysis confirmed that 100% of the pollen came from *V. macrocarpon*. At this site, *M. americana* uses a single floral host, *V. macrocarpon*, and it seems to be an oligolectic species for its pollen and nectar needs.

The presence of specimens at the collecting site during the summers of 2005, 2006, 2009, and 2012 and at the nesting site in 2012 indicates that the population is likely well established and the cultivated Large Cranberry field is a suitable habitat for the species. My observations so far support the information about the oligolectes of *M. americana* on various *Vaccinium* spp. (Ericaceae) in Snelling and Stage (1995) and Michez and Eardley (2007).

Specimens examined

Voucher specimens (34 males and 53 females) collected by net sweeping by A. Payette, Daveluyville, Quebec, 46°14'55"N, 72°08'29"W, and deposited in the following collections: collected on *V. macrocarpon* flowers: 1 female on 15 July 2005, 1 male and 2 fe-

males on 12 July 2006, 11 males and 7 females on 10 July 2009, 8 males and 25 females on 6 July 2012, 7 males and 3 females near the entrance of nesting site on 6 July 2012 (author's collection); 1 male and 2 females on 10 July 2009 (CMPA); 1 male and 2 females on 10 July 2009 (CNC); 1 male and 2 females on 10 July 2009 (IMCQ); 1 male and 3 females on 10 July 2009 (SEMC); 1 male and 2 females on 10 July 2009 (LEMQ); 1 male and 2 females on 10 July 2009 (PCYU); and 1 male and 2 females on 10 July 2009 (QMOR).

As no additional specimens were found in the collections cited above from Quebec or elsewhere in Canada, the specimens recorded here constitute a new record for Quebec and for Canada.

The collection in Daveluyville, Quebec, is the northernmost for the genus *Melitta* in North America (46°N) and it represents a range extension of about 550 km from Massachusetts.

Discussion

Cranberries need bees for pollination (McGregor 1976). *M. americana* is a specialized pollinator species and I observed that it is adapted to Quebec's climatic conditions. The population discovered in Daveluyville, aside from its conservation interest, should be studied more intensively to develop adapted management practices that would encourage the expansion and use of *M. americana* as a potential pollinator of Large Cranberry crops or could also be interesting for other *Vaccinium* spp. for Quebec producers.

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