



NOTE

New records of *Andrena* (Hymenoptera: Andrenidae) in New Brunswick, Canada

Don P. Ostaff, John S. Ascher, Steve Javorek, and Alex Mosseler

Andrena is an Holarctic genus, found on all continents except Australia, Antarctica, and South America, with about 500 species in North America and 650–700 species in Eurasia (LaBerge 1986). The distribution of each species is restricted by food preference, i.e., some collect pollen from one or a few plants (oligolectic), and edaphic requirements (LaBerge 1986). Many species are important native pollinators of fruit and berry crops. Studies have shown that native pollinators, such as *Andrena*, provide better quality of pollination regardless of crop, sample size, relative frequency of honey bees in pollinator assemblage, the pollinator dependence of crops, or whether the crop was herbaceous or woody, native or exotic (Garibaldi et al. 2013).

Most species of *Andrena* are vernal, i.e., active during the spring (LaBerge 1986). They typically pupate in late summer and overwinter as adults, allowing early emerging *Andrena* to begin nesting activities on the first warm days in the spring (e.g., Batra 1999). A typical nest-provisioning strategy of many solitary bees is to construct the nest, provision brood cells therein with a pollen loaf, and then add nectar to moisten the mass before depositing the egg (Thorpe 2000). By emerging early, *Andrena* can forage when tree fruits bloom, in the absence of workers of eusocial Halictinae and *Bombus*, which are numerically dominant at floral resources during the summer and autumn (Ginsberg 1983). Many *Andrena* appear before flowering of important fruit and berry crops, such as lowbush blueberry, *Vaccinium angustifolium* Aiton (Boulanger et al. 1967) and apple, *Malus* spp. (Sheffield et al. 2003) and serve as important pollinators of these crops. Large *Andrena* are efficient and locally abundant pollinators especially during periods of adverse weather when honey bee activity is reduced (e.g., Boyle-Makowski 1987, and references therein; Jacob-Remacle 1989). *Andrena* are better pollinators than honeybees because they carry more pollen per individual; are present during peak blossom; their range of activity is slightly narrower than that of the honeybees, but their numbers do not fluctuate with the changing weather conditions; and they may suffer less from competition with honey bees than do bumble bee populations (Boyle-Makowski 1987).

Twenty-four species of *Andrena* use willows (*Salix* spp.) as their principal source or at least an important component of pollen used for rearing their young (LaBerge 1986) with some, such as *Andrena salictaria* and *Andrena bisalictis*, being considered as oligoleges (i.e., specialist pollinators) on *Salix* (LaBerge 1986; Sheffield et al. 2003). In 2010, three species of *Andrena* (*bisalictis*, *rugosa*, and *salictaria*, det. by John Ascher), representing new species records for New Brunswick, were collected from a common-garden field test established in 2008 (Ostaff et al. 2015). The test was established to determine the seasonal flowering phenology of seven common native North American willow species, and the composition, phenology, and relative abundance of the most common pollinator insects visiting male and female willow flower catkins (Ostaff et al. 2015). The common garden was started with stem cuttings collected during winter from vigorous 1- and/or 2-yr-old stem sections (Densmore and Zazada 1978) from natural willow populations located in southern and eastern Ontario and adjacent areas of the Ottawa River Valley in Quebec (Mosseler et al. 2014). Insect collections were made using a heavy-duty hand-held, battery-powered vacuum/aspirator (product

Received 11 January 2015. Accepted for publication 5 April 2015. Published on the Acadian Entomological Society website at www.acadianes.ca/journal.html on 16 April 2015.

Don P. Ostaff and Alex Mosseler: Natural Resources Canada, Canadian Forest Service - Atlantic Forestry Centre, P.O. Box 4000, Fredericton, NB, Canada, E3B 5P7.

John S. Ascher: Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, Singapore 117543.

Steve Javorek: Agriculture and Agri-Food Canada, Atlantic Food Horticulture Research Centre, 32 Main Street, Kentville, NS, Canada, B4N 1J5.

Corresponding author (email dostaff65@gmail.com)

2820GA, BioQuip Products Inc., Rancho Dominguez, CA, USA; <http://www.bioquip.com/>). Specimen vouchers will be deposited with the New Brunswick Museum.

***Andrena bisalicensis* Viereck, 1908**



Andrena bisalicensis female, Don Ostaff

NEW BRUNSWICK: York County: Fredericton (45°56'4"N, 66°39'20"W), 14 April 2010, D.P. Ostaff, collected from *Salix discolor* (♂), (1♀, DPO 24344).

Andrena bisalicensis is found from North Dakota southeast to Louisiana; Ontario, southern Quebec, PEI, Nova Scotia, Maine, south to Georgia (Mitchell 1960; *Andrena* Fabricius - Discover Life 2014). Throughout its range, it has been collected from February to September from the flowers of 23 genera belonging to 12 different families, including *Salix gracilistyla* Miq., *Salix humilis* Marshall (Prairie Willow), *Salix interior* Rowlee (Sand-bar willow), and *S. nigra* Marshall (Black Willow) (Salicaceae) (Mitchell 1960; Stubbs et al. 1992; Boulanger et al. 1967; Wolf and Ascher 2009; *Andrena* Fabricius - Discover Life 2014). *Salix discolor* is a new host record for *Andrena bisalicensis*. The earliest collection period of *Andrena* in New Brunswick was 7 April 2010 (Ostaff et al. 2015).

Tuell et al. (2009) collected *Andrena bisalicensis* during the pre- and post-bloom period of highbush blueberry (*Vaccinium corymbosum* L.), with all specimens being female. Park et al. (2010) collected *bisalicensis* visiting apple blossoms.

***Andrena rugosa* Robertson, 1891**



Andrena rugosa female, Don Ostaff

NEW BRUNSWICK: York County: Fredericton (45°56'4"N, 66°39'20"W), date unknown, D.P. Ostaff, collected from *S. interior* (♂), (1♀, DPO 24584).

Andrena rugosa is found from Utah southeast to Florida and east to Maine, south to Florida; southern Ontario, Quebec, Nova Scotia, and Prince Edward Island. Throughout its range, it has been collected from April to July from the flowers of 48 genera belonging to 24 families including *Salix babylonica* L., *Salix gracilistyla*, *Salix humilis* (Salicaceae) (Mitchell 1960; Stubbs et al. 1992; Wolf and Ascher 2009; *Andrena* Fabricius - Discover Life 2014). *Salix interior* is a new host record for *Andrena rugosa*.

Mackenzie and Eickwort (1996) collected *Andrena rugosa* from a commercial highbush blueberry field. Tuell et al. (2009) collected *Andrena rugosa* during the pre-bloom and bloom period of highbush blueberry, with >90% of specimens being females. Park et al. (2010) collected *Andrena rugosa* visiting apple blossoms. Boulanger et al. (1967) found *Andrena rugosa* occurring in very low numbers on lowbush blueberry complex (*Vaccinium angustifolium* / *Vaccinium myrtilloides* Michx.). *Andrena rugosa* males were observed taking nectar from female flowers of red maple (*Acer rubrum* L. (Aceraceae)), and red maple pollen was found in the gut (Batra 1985).

***Andrena salictaria* Robertson, 1905***Andrena salictaria* female, Don Ostaff

NEW BRUNSWICK: York County: Fredericton (45°56'4"N, 66°39'20"W), 19 May 2010, D.P. Ostaff, *Salix amygdaloides* (♂), (1♀, DPO 24499); 31 May 2010, D.P. Ostaff, *S. nigra* (♂) (1♀, DPO 24586).

Andrena salictaria has been found in southern BC southeast to New Mexico east to Georgia north to Maine; Alberta, Saskatchewan, Manitoba, southern Ontario, southern Quebec, and Nova Scotia. Throughout its range, it has been collected from March to June from the flowers of 20 genera belonging to 10 families, including *Salix sericea* Marsh. (Silky Willow) (Salicaceae) (Mitchell 1960; Stubbs et al. 1992; Wolf and Ascher 2009; *Andrena* Fabricius – Discover Life 2014). *Salix amygdaloides* and *Salix nigra* are new host records for *Andrena salictaria*.

A. salictaria is considered an oligolege of *Salix*. Pearson (1933) collected *Andrena salictaria* from five species of willow growing in a variety of habitats, ranging from sand dunes to flood plains. Sheffield et al. (2003) considered several species of *Andrena* in Nova Scotia oligoleges of *Salix* (*Andrena salictaria* being one), *Vaccinium* spp., and other vernal blooming plants. Tuell et al. (2009) collected *Andrena salictaria* during the pre- and post-bloom period of highbush blueberry, with all specimens being females.

The three new species of *Andrena* bring the total number of species in New Brunswick to 39, 48 in the Maritime provinces (*Andrena* Fabricius – Discover Life 2014). These are important additions to the native bee pollinator

assemblage because of their ability to use fruit and berry crops as sources of pollen for their nutrition and nest provisioning. Maintaining or supporting diverse wild pollinator populations is particularly important to a broad range of agricultural crops for which honey bees alone are insufficient to maximize pollination and associated fruit and seed set (Garibaldi et al. 2013; Ostaff et al. 2015).

REFERENCES

- Andrena* Fabricius – Discover Life. 2014. [available online at <http://www.discoverlife.org/20/q?search=Andrena>]
- Batra, S.W.T. 1985. Red maple (*Acer rubrum* L.), an important early spring food resource for honey bees and other insects. *Journal of the Kansas Entomological Society* **58**: 169–172.
- Batra, S.W.T. 1999. Foraging ecology of bees in an old field. *Ecology* **64**: 165–175.
- Boulanger, L.W., Wood, G.W., Osgood, E.A., and Dirks, C.O. 1967. Native bees associated with the low-bush blueberry in Maine and eastern Canada. *Maine Agricultural Experiment Station Technical Bulletin* **26**.
- Boyle-Makowski, R.M.D. 1987. The importance of native pollinators in cultivated orchards: their abundance and activities in relation to weather conditions. *Proceedings of the Entomological Society of Ontario* **118**: 124–141.
- Densmore, R., and Zazada, J.C. 1978. Rooting potential of Alaskan willow cuttings. *Canadian Journal of Forest Research* **8**: 477–479.
- Garibaldi, L. A., Steffan-Dewenter, I., Winfree, R., Aizen, M. A., Bommarco, R., Cunningham, S. A., Kremen, C., Carvalheiro, L. G., Harder, L. D., Afik, O., Bartomeus, I., Benjamin, F., Boreux, V., Cariveau, D., Chacoff, N. P., Dudenhöffer, J.-H., Freitas, B. M., Ghazoul, J., Greenleaf, S., Hipólito, J., Holzschuh, A., Howlett, B., Isaacs, R., Javorek, S. K., Kennedy, C. M., Krewenka, K. M., Krishnan, S., Mandelik, Y., Mayfield, M. M., Motzke, I., Munyuli, T., Nault, B. A., Otieno, M., Petersen, J., Pisanty, G., Potts, S. G., Rader, R., Ricketts, T. H., Rundlöf, M., Seymour, C. L., Schüepp, C., Szentgyörgyi, H., Taki, H., Tschardtke, T., Vergara, C. H., Viana, B. F., Wanger, T. C., Westphal, C., Williams, N. M. and Klein, A. M. 2013. Wild pollinators enhance fruit set of crops regardless of honey bee abundance. *Science* **340**: 1608–1611.
- Ginsberg, H.S. 1983. Ecology of bees in an old field. *Ecology* **64**: 165–175.
- Jacob-Remacle, A. 1989. The foraging behavior of honeybees and wild bees in Belgian apple orchards. *Apidologie* **20**: 271–286.

- LaBerge, W.L. 1986. The zoogeography of *Andrena* Fabricius (Hymenoptera, Andrenidae) of the Western Hemisphere - The Prairie: Past, Present and Future. Proceedings of the Ninth North American Prairie Conference, July 29–August 1, 1984, Moorhead, Minnesota. pp. 110-115.
- MacKenzie, K.E., and Eickwort, G.C. 1996. Diversity and abundance of bees (Hymenoptera: Apoidea) foraging on highbush blueberry (*Vaccinium corymbosum* L.) in central New York. Journal of the Kansas Entomological Society **69**: 185–194.
- Mitchell, T.B. 1960. Bees of the Eastern United States. North Carolina Agricultural Experiment Station Technical Bulletin No. **141**.
- Mosseler, A., Major, J.E., and Labrecque, M. 2014. Growth and survival of seven native willow species on highly disturbed coal mine sites in eastern Canada. Canadian Journal of Forest Research **44**: 340–349.
- Ostaff, D.P., Mosseler, A., Johns, R.C., Javorek, S., Klymko, J., and Ascher, J.A. 2015. Willows (*Salix* spp.) as pollen and nectar sources for sustaining fruit and berry pollinating insects. Canadian Journal of Plant Science 10.4141/CJPS-2014-339. Published on the web 23 January 2015.
- Park, M.G., Orr, M.C., Danforth, B.N., and Hall, C. 2010. The role of native bees in apple pollination. New York Fruit Quarterly **18**: 21–25.
- Pearson, J.F.W. 1933. Studies on the ecological relations of bees in the Chicago region. Ecological Monographs **3**: 373–441.
- Sheffield, C.S., Kevan, P.G., and Smith, R.F. 2003. Bee species of Nova Scotia, Canada, with new records and notes on bionomics and floral relations (Hymenoptera: Apoidea). Journal of the Kansas Entomological **76**: 357–384.
- Stubbs, C.A., Jacobson, H.A., and Osgood, E.A. 1992. Alternative forage plants for native (wild) bees associated with lowbush blueberry, *Vaccinium* spp., in Maine. Maine Agricultural Experiment Station Technical Bulletin **148**. 54 pp.
- Thorp, R.W. 2000. The collection of pollen by bees. Plant Systematics and Evolution **222**: 211–223.
- Tuell, J.K., Ascher, J.S., and Isaacs, R. 2009. Wild bees (Hymenoptera: Apoidea: Anthophila) of the Michigan highbush blueberry agro-ecosystem. Annals of the Entomological Society of America **102**: 275–287.
- Wolf, A.T., and Ascher, J.S. 2009. Bees of Wisconsin (Hymenoptera: Apoidea: Anthophila). Great Lakes Entomologist **41**: 129–168.