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First Records of *Stelis permaculata* Cockerell (Hymenoptera: Megachilidae) in Minnesota, United States of America and Manitoba, Canada

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Cover Page Footnote

Acknowledgements We would like to thank the two anonymous reviewers for their helpful suggestions and comments. Many thanks to the Minnesota Bee Atlas volunteer Zeb Lamp for hosting and diligently observing blocks 492 and 537. Terry Griswold (USDA-ARS) verified determinations of Manitoba *Stelis*. The Minnesota Bee Atlas principal investigator was Dr. Rob Blair. Funding for the Minnesota Bee Atlas project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR) (Legal Citation M.L. 2015, Chp. 76, Sec. 2, Subd. 03g).

**First Records of *Stelis permaculata* Cockerell
(Hymenoptera: Megachilidae) in
Minnesota, United States of America and Manitoba, Canada**

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Abstract

New records are reported for the cleptoparasitic bee *Stelis permaculata* Cockerell (Hymenoptera: Megachilidae) from Minnesota, United States of America and Manitoba, Canada. Minnesota records come from trap-nests, which also collected the host, *Heriades carinata* Cresson.

Keywords: *Stelis*, *Heriades*, Megachilidae, cavity-nesting, trap nest

Stelis permaculata Cockerell is a cleptoparasitic bee (Hymenoptera: Megachilidae: Anthidiini) that attacks nests of *Heriades carinata* Cresson, a tunnel-nesting resin bee (Megachilidae: Osmiini) (Hicks 1927, Matthews 1965). In eastern North America, both sexes are distinctive for the combination of black mesoscutum with pale maculations on the head (Mitchell 1962, Andrus and Droege 2020). *Stelis permaculata* has been recorded east of the Mississippi River and as far west as the Rocky Mountains and south to Austin, Texas (Brues 1903, Hurd 1979, Wolf and Ascher 2009, Reese et al. 2018, Delphia et al. 2019, GBIF 2021).

Manitoba records come from the J.B. Wallis / R.E. Roughley Museum of Entomology, University of Manitoba, Winnipeg, Canada. Minnesota records originate from trap-nesting surveys by the Minnesota Bee Atlas and specimens are deposited at the University of Minnesota Insect Collection, Saint Paul, Minnesota, United States of America. In 2018, two solid wood nest traps (design and methods in Satyshur et al. 2020) were placed successively in the same location in Felton Prairie Scientific and Natural Area (47.1014°N, -96.4097°W) in Clay County, Minnesota. Traps were hung 1.2 m high, with nest entrances facing southeast, on a small ash tree in an area described by the volunteer as wet prairie with shrubs. Field observations by the volunteer helped define the nest building timeline. Activity in a nesting tunnel in the first trap was noted on 5 July 2018, and nest cells would have been constructed by the time that trap was removed on 14 July 2018. The second trap was immediately hung to replace the first.

Nests in two tunnels in the second trap were therefore completed between 14 July 2018 and observations of final outer nest plugs on 29 July 2018 and 14 Aug 2018. At the end of the growing season, both traps were placed in cold storage (5 °C) for overwintering. Bees were reared to emergence in a growth chamber (25 °C–29 °C) the following spring. Specimens were identified using the Discover Life key (Andrus and Droege 2020) and Bees of the Eastern United States (Mitchell 1962).

Stelis permaculata emerged from three 3.18 mm diameter nesting tunnels from the two traps. One *H. carinata* emerged from one of the same nesting tunnels. No host bees emerged from the other two nesting tunnels. However, *H. carinata* emerged in nearby nesting tunnels in both traps, and *Heriades variolosa* (Cresson) also emerged from one trap. *Heriades variolosa* has similar nesting biology to *H. carinata* which may make it a potential host for *S. permaculata*. Photos of a female *S. permaculata* are shown in Figure 1 and others can be found on the Minnesota Bee Atlas project page under “Species Guide” (University of Minnesota Extension 2020).

Stelis permaculata

Stelis lateralis var. *permaculata* Cockerell, 1898. Entomologist 31: 167. ♂.

Stelidium trypetinum Robertson, 1902. Can. Entomol. 34: 323. ♀.

Stelis (Stelidium) ontariana Sladen, 1916. Can. Entomol. 48: 312. ♀, ♂.

Records. USA: MINNESOTA: Clay
• Felton Prairie Scientific and Natural



Figure 1: Photographs of female *S. permaculata* A) face view, B) side view. Courtesy of Thea Evans.

Area, 47.1014, -96.4097, 2019-04-20, leg. C. Satyshur & T. Evans (2 ♀); 2019-05-04, leg. C. Satyshur & T. Evans (1 ♀), **CANADA: MANITOBA: Glenboro-South Cypress** • Canadian Forces Base Shilo, 49.8363, -99.5841, 2011-08-18, leg. K. Wareham & S. Patterson (1 ♀) • **Reynolds** • Sandilands, 49.647, -96.26, 2017-07-30, leg. J. Gibbs & G.Y. Nozoe (1 ♂) • **Whitemouth** • Seven Sisters, 50.12, -96.04, 1983-07-14, leg. T.D. Galloway (1 ♀).

These records help fill distribution gaps between central Wisconsin and north-western North Dakota and between Saskatchewan and southern Ontario (Hicks 1927, Wolf and Ascher 2009, Sheffield et al. 2014, GBIF 2021). The Minnesota record supports the host bee species as *H. carinata*.

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