# First Manitoba records of the non-native beetles, *Cantharis rufa* (Coleoptera: Cantharidae) and *Hippodamia variegata* (Coleoptera: Coccinellidae)

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**Abstract** – Here we present the first records of occurrence for two non-native beetle species in Manitoba, Canada: the soldier beetle *Cantharis rufa* and the lady beetle *Hippodamia variegata*.

## Introduction

*Cantharis rufa* (Linnaeus) is a soldier beetle (Cantharidae) inadvertently introduced into Atlantic Canada from Europe. The first known record is from New Brunswick in 1901 (C. Majka, *personal communication*, 23 November 2015), and it was later found in Nova Scotia in 1914, insular Newfoundland in 1950, and Prince Edward Island in 1952 (C. Majka, *personal communication*, 23 November 2015). The known range of *C. rufa* in Canada includes the Maritime Provinces (excluding Labrador), Quebec, and southern Ontario (Brown 1950, Bousquet *et al*. 2013, Pelletier and Hébert 2014, C. Majka, *personal communication*, 23 November 2015). Records of occurrence from the United States include New York, Massachusetts, and the northern Appalachians (Pelletier and Hébert 2014). The habitat of this species is typically grasslands, softwood tree plantations, and young forests (Pelletier and Hébert 2014). Little appears to be known about the life history of *C. rufa*, with adults reported as short-lived beetles which feed on pollen, nectar, and aphids (Evans 2014).

The variegated lady beetle, *Hippodamia variegata* (Goeze), native to Europe, northern Asia (excluding China), and North Africa, has been successfully introduced to North America, South Africa, Australia, and Chile to control aphids on crops (Wheeler 1993, Franzmann 2002, Rebolledo *et al*. 2009). The species was first intentionally introduced to the USA from 1957–1958 (Gordon and Vandenburg 1991) but has not been released in Canada. It was first reported in Canada in the vicinity of Montreal, Quebec in 1984 (Gordon 1987). The species was detected in New Brunswick in 1987, Ontario in 1989, Prince Edward Island in 1991, insular Newfoundland in 1992, Nova Scotia in 1994, and

British Columbia in 2009 (Klimaszewski *et al*. 2015). The species became common in Ontario in the 1990s (Marshall, no year) and now occurs as far west as Manitoulin Island and Windsor (Klimaszewski *et al.* 2015). The British Columbia population likely represents a translocation of specimens from eastern North America (Klimaszewski *et al*. 2015). Although the species was widely released in the United States, *e.g*., from New Jersey to Florida, Texas to California, and Hawaii (Wheeler 1993), not all releases were successful. Wheeler (1993) recorded it surviving in eight New England states in 1992, and it had dispersed to western Wisconsin, Minnesota and South Dakota by 2009 (Williams and Young 2009, Hesler and Lundgren 2010, Heidel and Morey 2011). The dispersal of *H. variegata* may be augmented by high fecundity. In Greece, females may produce 960 eggs, with a mean generation time of 34 days (Kontodimas and Stathas 2005).

It is interesting that both *C. rufa* and *H. variegata* were found for the first time by a number of collectors in 2014 and 2015 in Winnipeg and surrounding areas. These localities had been frequently surveyed in previous years, with no sign of the beetles' presence. Surveys in a number of suitable natural habitats from Winnipeg to the United States' border by Wrigley failed to reveal their presence over the past two decades, and neither species was collected in recent crop surveys in southern Manitoba (J. Gavloski, Manitoba Agriculture and Rural Development, *personal communication*, 4 February 2016).

Here we provide the first records of occurrence for *C. rufa* and *H. variegata* in Manitoba. We will discuss the locations of specimens, potential source populations, and the future impacts of these species in the province.

## Materials and Methods

Three specimens of *C. rufa* (Fig. 1) were collected by aerial net in Winnipeg, Manitoba, by staff of the Living Prairie Museum (LPM). Two specimens were found on 9 June 2015 in a tall grass prairie remnant in Assiniboine Forest (49.856307 N, 97.249187 W), one by E. Miller on dandelion (*Taraxacum officinale* F.H. Wigg.), and one by K. Morwick and H. Webb on three-flowered avens (*Geum triflorum* Pursh). A third specimen was collected by K. Morwick and H. Webb on 30 June 2015 in the remnant tall grass prairie habitat of LPM (49.89050 N, 97.27149 W) on beautiful sunflower (*Helianthus pauciflorus* Nutt.); however, pollinia on the meso tarsi indicate it had also visited milkweed (*Asclepias* spp.). Specimens were identified using Pelletier and Hébert (2014) and were verified by photograph by Georges Pelletier in October 2015. These three specimens are deposited in the LPM entomological collection.

Wrigley (2015) reported *C. rufa* from three additional locations in Manitoba. Two specimens were captured from Birds Hill Provincial Park (50.017835 N, 96.935951 W) on 11 June 2014 from roadside willows, and one specimen from Kenaston Boulevard in Winnipeg (49.86 N, 97.22 W) was collected on the night of 5 June 2015 from the wall of a building adjacent to a water-retention pond. Furthermore, *C. rufa* and *Cantharis aneba borealis* (Fender) were abundant on several kinds of flowers in Labarrière Park, south of Winnipeg (49.74 N, 97.15 W) on 21 June 2015 (Wrigley 2015). Specimens of *C. rufa*

were collected and deposited in the Wallis/Roughley Museum of Entomology (WRME), University of Manitoba, and the Manitoba Museum.

Semmler found one specimen of *H. variegata* (Fig. 2) in tall grass prairie habitat within Little Mountain Park, Manitoba (49.957278 N, 97.247553 W) on 27 June 2014, and a second specimen at LPM on 21 September 2014. She collected three specimens from the LPM's prairie seed plots located in St. Norbert (49.746077 N, 97.145501 W), one on 9 September 2014 and two on 22 September 2014. Specimens were identified using Marshall (2007) and Kits and Quinn (2015), and are currently held in the LPM entomological collection.

Wrigley collected 20 specimens of *H. variegata* on 16 May 2015 at Birds Hill Provincial Park, Manitoba (51.40 N, 97.03 W) on a patch of balsam poplar (*Populus balsamifera* Linnaeus) in the center of an abandoned gravel pit. No other species of beetles were observed. Three additional specimens were collected on 31 June 2015 on Ducharme Road north of Highway 15, 3 km NW St. Rita (49.86 N, 96.33 W) in a shrub-meadow opening within aspen-jack pine forest (deposited in WRME). Four other species of lady beetles were common in the same vegetation: the native three-banded lady beetle (*Coccinella trifasciata* Linnaeus), the parenthesis lady beetle (*Hippodamia parenthesis* Say), the non-native Halloween lady beetle (*Harmonia axyridis* Pallas) and the seven-spotted lady beetle (*Coccinella septempunctata* Linnaeus).

Figure 1. *Cantharis rufa*. Photos by S. Semmler.


Figure 2. *Hippodamia variegata*. Photos by S. Semmler.

## Discussion

The means of arrival and abundance of *C. rufa* in Manitoba is unclear. The species is common in much of its eastern range (Pelletier and Hébert 2014, C. Majka *personal communication*, 23 November 2015). The nearest source population in Ontario reported by Pelletier and Hebert (2014) is Manitoulin Island, ~1200 km east of Winnipeg. Eight specimens in the WRME were collected on 30 June 1984 at Katharine Cove (47.44 N, 84.75 W) in Lake Superior Provincial Park, Ontario, indicating a source population ~947 km east of Winnipeg. While it is possible that *C. rufa* spread to Manitoba via North Dakota, the species is not yet known from that state based on examination of specimens at the University of Minnesota (R. Thomson, *personal communication*, 19 November 2015), University of North Dakota, Grand Forks (J. Vaughan, *personal communication*, 23 November 2015), and North Dakota State University, Fargo (G. Fauske, *personal communication*, 29 January 2016). However, both individuals from North Dakota reported that numerous *Cantharis* specimens in their collections had not been identified to species, so perhaps *C. rufa* may be represented there. Also, no records or specimens are

known farther west in the Minot, North Dakota area (G. Handley, *personal communication*, 29 January 2016). As the boreal forest is suitable habitat for *C. rufa*, and the closest known population in Canada exists in Ontario, it seems likely that *C. rufa* spread through boreal habitat from Ontario to Manitoba, either naturally or with human assistance.

The North Dakota-Minnesota population of *H. variegata* is the likely source of the Manitoba population. Heidel and Morey (2011) reported the first Minnesota records of *H. variegata* in soybean and sweet corn fields in the summer of 2009 at Evansville, St. Paul, and Rosemount. The expansion has been attributed to available prey such as the soybean aphid (*Aphis glycines* Matsumura) and the corn leaf aphid (*Rhopalosiphum maidis* Fitch) (Heidel and Morey 2011). The entomology collection of the University of Minnesota lists specimens from the state starting from 2009 (R. Thomson, *personal communication*, 5 February 2016). In North Dakota, the species was first noticed, and was already common, in 2013 in the Fargo area (G. Fauske, *personal communication* 29 January 2016). No specimens are currently known farther west in the region of Minot, North Dakota (G. Handley, *personal* comm*unication* 29 February 2016). Thus, Fargo represents the closest known population to Manitoba.

It is possible that one or both of these species represent recent range expansions through a combination of human activity and natural dispersal. Non-native beetles have been transported between provinces on seedlings, garden ornamentals, building materials, firewood, and food products (Polland and McCullough 2006, Majka and LaSage 2008, Haack *et al.* 2010, CFIA 2012). Also, Wrigley has found numerous species of cantharids and coccinellids occurring in the sedge-grass-shrub borders of roads, rail lines, and watercourses, which present suitable dispersal routes into new areas. For example, individuals could fly along the Red River riparian forest, or raft down the river from Fargo, 226 km away. Lady beetles are frequently found in large numbers along shores of rivers and lakes, and they may survive above the water surface for the several weeks it takes for driftwood or live trees to carry them to Winnipeg and Birds Hill Park. There is also evidence of range expansions linked to increased seasonal temperatures due to climate change for several species of insects in Canada (Kerr 2001, Carroll *et al.* 2003, Westwood and Blair 2010, Semmler and Westwood 2013).

In view of both species' apparent rapid expansion westward from eastern North America, we surmise that they arrived in southern Manitoba from Ontario, Minnesota and North Dakota. Manitoba's diverse natural and altered habitats provide suitable resources and the warm summer climate is conducive to establishment and persistence of populations.

It will be interesting to observe if *C. rufa* and *H. variegata* fit relatively innocuously into Manitoba's insect fauna, or become a threat to native biodiversity. Introduced lady beetle species have been found to have a negative impact on native aphidophagous insects through competition for prey (Roy *et al*. 2016). *Cantharis rufa* has yet to be designated as a pest species within Canada (CFIA 2015); however, larvae and adults are predatory so it is possible that this beetle species could affect other insects (Evans 2014, Pelletier and Hébert 2014). Further surveys in Manitoba are needed to better understand range, abundance, and interactions with native species.

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