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Cover Page Footnote

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Novel Prey Record for *Scymnus caudalis* LeConte and First Records of Four Other Species of Coccinellidae (Coleoptera) in Wisconsin, U. S. A

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Abstract

New prey and distribution records are presented for five species of lady beetles (Coleoptera: Coccinellidae). *Scymnus (Pullus) caudalis* LeConte is recorded for the first time preying on *Aphis asclepiadis* Fitch (Hemiptera: Aphididae). Four other lady beetle species are newly recorded in the state of Wisconsin, U.S.A: *Diomus amabilis* (LeConte), *Diomus terminatus* (Say), *Scymnus (Pullus) uncus* Wingo, and *Hyperaspidius wolcotti* (Nunenmacher). The new state records represent minor to moderate extensions of previously known geographic distributions for these species. In addition, the records emphasize the importance of processing uncurated entomological specimens to provide information about the prey of particular species and to enhance knowledge about a region's biodiversity. Furthermore, some specimens with the new state records were obtained as trap bycatch and thereby demonstrate the importance of processing nontarget species to increase knowledge of regional biodiversity.

Keywords: *Diomus*, *Hyperaspidius wolcotti*, *Scymnus*

Frequent collecting and the subsequent processing of entomological specimens is necessary to maintain current faunal lists for various taxa, to accurately estimate regional biodiversity, and to understand interactions among species (Brodman et al. 2002, McCorquodale and Bondrup-Nielsen 2004, Marché 2017). Faunal lists for an area change due to geographic range expansion of native and introduced species and the discovery of new species within an area (Brodman et al. 2002, Fauske et al. 2003, McCorquodale and Bondrup-Nielsen 2004, Diepenbrock et al. 2016). Sometimes, specimen data may be used to establish new host plant or prey associations when that information is included as part of the collection label or otherwise documented (Wheeler 2003, Hesler and Kieckhefer 2008a).

Gordon (1985) provided a comprehensive overview of the lady beetle (Coleoptera: Coccinellidae) fauna of North America north of Mexico. Several additional species have been discovered for this region (e.g., Gordon and Vandenberg 1991, Gordon 1993, Pollock and Michels 2003), and Hesler and Kieckhefer (2008b) suggested that continued

examination of undetermined material in beetle collections may yield further species records of coccinellids. In this paper, we present a prey record for one lady beetle and new state records for four other species of lady beetles in Wisconsin, U.S.A.

Material Examined

Uncurated specimens from the Wisconsin Insect Research Collection (WIRC), University of Wisconsin, Madison, WI, were examined and species determined using keys in Gordon (1976) and Gordon (1985). A revised classification of the Coccinellidae (Seago et al. 2011) was used for nomenclatural purposes. Pinned specimens of beetles that represent the primary state records in this paper were deposited as voucher specimens in the WIRC.

Results

New prey record. *Scymnus (Pullus) caudalis* LeConte is newly recorded preying on *Aphis asclepiadis* Fitch (Hemiptera: Aphididae) from two locations in Wisconsin. The lady beetles were found as larvae among the aphids on *Asclepias syriaca* L. (common milkweed), collected with the aphids, and reared indoors to adults. The first record comprises

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7 *S. caudalis* from Muscoda RR Prairie (T8N R1W Section 10), Grant County, on 17 June 1999; and the second record consists of 10 *S. caudalis* from Kessler RR Prairie (T2N R11E Sections 13 and 24), Rock County, on 18 June 1999.

New geographic distribution records. Four lady beetle species were recorded for the first time from Wisconsin, as follows.

***Diomus amabilis* (LeConte, 1852)**
(Coccinellinae: Diomini)

WISCONSIN: Dane Co., Lake Waubesa, 14-IX-1985, P. Dolan, 2 males, 6 females. Dane Co., Lake Waubesa, 14-IX-1985, P. Dolan, 2 females. Door County, degraded alvar, T28N/R25E/SC27NE, 10-VI-1999, K Kirk ED Maurer, 1 female. **New state records.** The Wisconsin records establish an intermediate geographic distribution of *D. amabilis* between its known distribution in the central U.S.A. from Louisiana northward to Minnesota and that along the northern Atlantic coast (Gordon 1976).

***Diomus terminatus* (Say, 1835)**
(Coccinellinae: Diomini)

WISCONSIN: Dane County, Prairie du Sac, 27-IX-1983, N. Randin, 1 female. Dane Co., Lake Waubesa, 14-IX-1985 coll. P. Dolan, 1 male. Dane Co., Madison, U.W. Arboretum, 18-IX-1985, P. Dolan, 1 male. Sauk County, Leopold Reserve, 23-VIII -7-IX-1988, Malaise trap, 1 male. Dane County, Madison, U.W. Campus Muir Woods, 30-IX-1991, Peter R. Edelman, 1 female. La Crosse County, La Crosse R. Tr. Pr., 24-VIII-1995, 1 male. Monroe County, Ft. McCoy 1.5 mi. E, 17 to 22-VII-1997, Judith A. Maxwell, 1 female. Green County, T3N R8E, section 10, roadside of Hwy EE, 27-VIII -1999, on leaf of *A. syriaca* among aphids, *Aphis nerii* Boyer de Fonscolombe (Hemiptera: Aphididae) and reared from a pupa; Andrew H. Williams, 1 female. Dane County, Madison, 1-IX-1999, A. Mengistu, 1 male. Columbia Co., T19N, R10E, S33, 7-IX-1999, A. Mengistu, 1 male. **New state records.** These records extend the known geographic distribution of *D. terminatus* a few hundred miles north of its previously known most proximate range in northern Illinois (Gordon 1976).

***Scymnus (Pullus) uncus* Wingo, 1952**
(Coccinellinae: Coccidulini)

WISCONSIN: Grant County, T6N R6W, S17, 29-V-3-VI-1975, Gypsy Moth M.T., 2 males; Grant County, T6N, R6W, S17, 7-14-VI-1976, Gypsy Moth M.T., 1 male; Grant County, T6N R6W, S17, 28-V-7-

VI-1976, Gypsy Moth M.T., 1 male; Grant County, T6N, R6W, S17, 7-14-VI-1976, Gypsy Moth M.T., 1 female; Jackson County, T21N, R4W, S33, 3-7-VI-1976, Gypsy Moth M.T., 1 female; Grant County, T6N, R6W, S17, 8-15-VII-1975, Gypsy Moth M.T., 1 female; Grant County, T6N, R6W, S17, 29-V-3-VI-1975, Gypsy Moth M.T., 1 female; Wood County, Babcock, 20 May 1989, J. E. Fetter, 1 female; Iowa County, T6N R5W, S1, 1-7-VI-1976, Gypsy Moth M.T., 1 female. **New state records.** Gordon (1976) describes *S. uncus* as widely distributed, but rarely collected. However, in an annotated list of coccinellids from states in the upper Mississippi River basin, including Wisconsin, Wingo (1952) noted *S. uncus* only from Iowa. The records herein establish Wisconsin as an additional state within the geographic distribution of *S. uncus* in the upper Mississippi River basin.

Hyperaspidius wolcottii
(Nunenmacher, 1911)
(Coccinellinae: Hyperaspini)

WISCONSIN: Shawano Co., Navarino Wildlife Area, 44° 39' 11' N, 88° 34' 49' W; 6-18-VI-2002, Jeffrey P. Gruber, 1 male. **New state record.** This specimen extends the known geographic distribution of *H. wolcottii* northward from previous records in northwest Indiana and northern Iowa (Gordon 1985).

Discussion

Members of the genus *Scymnus* prey on various Hemiptera, including aphids, Adelgidae, and Pseudococcidae (Gordon 1976, Lyon and Montgomery 1995). However, the prey of many species in this genus is unknown, and we did not find published prey records for *S. caudalis*. Thus, its predation on *A. asclepiadis* is apparently novel information. *Aphis asclepiadis* was considered a specialist on *Asclepias* (milkweed plants), but recent analysis determined it to be a senior synonym for the polyphagous aphid previously known as *Aphis carduella* Walsh (Lagos-Kutz et al. 2016). Future surveys are needed to determine whether *S. caudalis* preys on *A. asclepiadis* on other host plants. Moreover, additional surveys are needed to determine prey for several other *Scymnus* species.

New state records of the other four coccinellid species presented here are minor to moderate extensions of their previously known geographic distributions, and increase knowledge of Wisconsin's insect biodiversity. The records demonstrate the importance of continual processing of uncurated entomological material (Fauske et al. 2003, Hesler and Kieckhefer 2008b).

The specimens were collected by various methods, but some of *Scymnus uncus* were obtained from gypsy moth (*Lymantria dispar* [L.], Lepidoptera: Erebididae) trapping, and thus they provide another example of the value in processing bycatch to increase knowledge of species inventories and to accurately depict broad-scale distribution ranges (Buchholz et al. 2011, Kelly et al. 2013, Spears and Ramirez 2015).

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