

## **The Status of *Coccinella undecimpunctata* (L.) (Coleoptera: Coccinellidae) in North America: An Updated Distribution from Citizen Science Data**

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SCIENTIFIC NOTE

THE STATUS OF *COCCINELLA UNDECIMPUNCTATA* (L.) (COLEOPTERA:  
COCCINELLIDAE) IN NORTH AMERICA: AN UPDATED  
DISTRIBUTION FROM CITIZEN SCIENCE DATA

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*Coccinella undecimpunctata* L. is an Old World aphid predator that is native to central Asia, North Africa, Iceland, and much of Europe. The species was introduced accidentally (Gordon 1985) and first reported in North America by Schaeffer (1912) based on two specimens from near Boston, Massachusetts. Since then, the species was found again in Massachusetts (Dobzhansky 1931), Vermont (Parker *et al.* 1976), Maine and New Jersey (Belicek 1976), and Ohio (Dailey *et al.* 1978) in the eastern USA and in Canada in New Brunswick, Prince Edward Island, and Quebec (Brown 1940), Nova Scotia and Newfoundland (Chapin 1956), and Ontario (Brown 1962). By the 1960s, *C. undecimpunctata* had also been found in the Pacific Northwest, near Seattle, Washington (Russell 1968), Vancouver, British Columbia (Belicek 1976) and Corvallis, Oregon (Wheeler and Hoebeke 1981). Wheeler and Hoebeke (1981) also added Connecticut, New York, Pennsylvania, and Rhode Island to update the distribution of *C. undecimpunctata* and noted the importance of this predator's role in pest suppression. On Long Island, *C. undecimpunctata* had been found to represent 55% of all coccinellids found on potatoes (Day 1965).

It has been proposed that *C. undecimpunctata* successfully extended its range with the help of the St. Lawrence Seaway as well as the railroad (Laroche 1979; Watson 1979; Wheeler and Hoebeke 1981). But following a period of increase in the mid-20th century, the species appears to have declined to the point of extirpation from much of its former North American range. Wheeler and Hoebeke (2008) posed the question of whether or not *C. undecimpunctata* was still present in North America. Those authors reported that no additional USA states or Canadian provinces had been added to the distribution of *C. undecimpunctata* since the 1980s and documented the lack of recent records of *C. undecimpunctata* in Ontario, Québec, the Atlantic Provinces of Canada, New England, the mid-

Atlantic states of Pennsylvania, Delaware, Maryland, and Virginia, and New York State. They suggested that *C. undecimpunctata* may persist in low numbers in some parts of the Northwest and Northeast of the USA, and in southwestern British Columbia and the eastern Maritime Provinces of Canada; they invited anyone who encountered this species to document the finding.

Here we confirm the presence of *C. undecimpunctata* in the Pacific Northwest and lend further evidence to its possible extirpation elsewhere in North America. Two *C. undecimpunctata* were located through postings to BugGuide.net – a continuing online collection of insect photographs curated by a community of naturalists. Twelve more *C. undecimpunctata* were located through submissions to the Lost Ladybug Project ([www.lostladybug.org](http://www.lostladybug.org)) – a continent-wide coccinellid survey funded by the National Science Foundation since 2008. The Lost Ladybug Project is a web-based, citizen science program in which participants provide a digital photograph of the insect, contact information, location details, and habitat information via an online form. All specimens are photo-vouchered and identifications are made by researchers at Cornell University. During the five years between 2008 and 2012, the Lost Ladybug Project has received and identified over 20,000 photographic specimens. This relatively inexpensive method of data collection has permitted an abundance of data to be collected over a broad geographic range.

Much as predicted by Wheeler and Hoebeke (2008), all 14 recently located *C. undecimpunctata* were found in the Pacific Northwest: Coquitlam, British Columbia; Puyallup and Bothell, Washington; Salem and Scio, Oregon. The Lost Ladybug Project has not received any reports from two eastern locations suggested by Wheeler and Hoebeke (2008) where *C. undecimpunctata* may persist: Sable Island and Brier Island, both in the Maritime Provinces of Canada.

**Table 1.** Published surveys of North American Coccinellidae not included in Wheeler and Hoebeke (2008). \* indicates that these data refer to larvae. Hesler and Kieckhefer (2008) state that exotic species were more abundant than natives but do not give precise numbers. @ indicates that in Carroll *et al.* (2007) bar graphs show a significant majority of *Hippodamia convergens* (native) but no precise numbers are given. ~ indicates that raw numbers were not published but numbers have been compiled from published means. (+) indicates states in which *Coccinella undecimpunctata* had previously been found. (-) indicates locations with neither previous nor new records for *C. undecimpunctata*.

Habitat	Location	Total <i>N</i>	Coccinellidae		Study time frame	Reference
			Native (%)	Introduced (%)		
corn, potato, winter squash	Pennsylvania (+)	3,951	1,103 (28)	2,848 (72)	2001	Hoheisel and Fleischer 2007
Agricultural and non-agricultural	Maine (+)	6,390	~ 2,109 (33)	~ 4,281 (67)	2004, 2005	Finlayson <i>et al.</i> 2008
Cotton	Texas (-)	471	464 (98.5)	7 (1.5)	1998-2000	Parajulee and Slosser 2003
Wheat and alfalfa		103	90	13	2002-2003	
Alfalfa, maize, soybean		188	101	87	2002-2003	
Alfalfa, maize, soybean		204	* <50%	* >50%	2002-2003	Hesler and Kieckhefer 2008
Field crop and arboreal	South Dakota (-)	1,954	1,791	163	2002-2003	
Woods and maize		239	232	7	2001, 2003	
Maize, woods, relict prairie		36	30	6	2003	
Cotton, alfalfa, weeds	Texas High Plains (-)	27,058 adults, 3,936 larvae	@	@	2004, 2005	Carroll <i>et al.</i> 2007
<i>Bt</i> Corn	Kentucky (-)	105	73%	27%	2004	Harwood <i>et al.</i> 2005
Meadow	Michigan (-)	562	30 (5.4)	532 (94.6)	2005	Costamagna <i>et al.</i> 2008
Winter wheat, alfalfa, cotton, sorghum	Oklahoma (-)	12,250	11,648 (95)	602 (5)	2003-2006	Phoofolo <i>et al.</i> 2010
Soybean	Iowa (-)	1,739	1,455 (84)	284 (16)	2004-2005	Schmidt <i>et al.</i> 2008
Cotton	Georgia (-)	29,785	12,030 (40.4)	17,755 (59.6)	2006-2007	Tillmann and Cottrell 2012
Agricultural	Michigan (-)	361	~ 249 (69)	~ 112 (31)	2008	Gardiner <i>et al.</i> 2010

The Lost Ladybug Project sponsored “blitzes” and unpublished data from JEL from 2006 ( $n = 1,027$ ) and 2007 ( $n = 851$ ) in the area of Ithaca, New York, where *C. undecimpunctata* had been reported during 1969–1980 (Wheeler and Hoebeke 1981), turned up no *C. undecimpunctata*. Two published coccinellid surveys, Hoheisel and Fleischer (2007) in Pennsylvania and Finlayson *et al.* (2008) in Maine, from areas within the former range of *C. undecimpunctata* and nine other recent surveys from across the USA (Table 1) all turned up no *C. undecimpunctata*.

Our data suggest that *C. undecimpunctata* currently persists at low densities in locations of the Pacific Northwest of North America. This species constitutes only 0.06% of the more than 22,000 Coccinellidae recorded by the Lost Ladybug Project to date, and the two individuals recorded on BugGuide.net are among approximately 4,000 Coccinellidae in that online collection. Given that nine of the 14 *C. undecimpunctata* in the Lost Ladybug Project database were found on two organic farms in Scio, Oregon, the species may also be “locally abundant” where it persists. However, the nine *C. undecimpunctata* found in Scio comprise only 2.6% of the 352 Coccinellidae submitted to the Lost Ladybug Project from that location.

Citizen science is proving to be an inexpensive and effective way to locate small and/or declining populations like these. Originally conceived to detect rare extant populations of three once common North American native species, data from citizen science has uncovered *Coccinella novemnotata* Herbst in 21 counties in 14 states/provinces; *Coccinella transversoguttata* Faldermann in 44 counties in 14 states/provinces, and *Adalia bipunctata* (L.) in 83 counties in 21 states/provinces of the USA and Canada. Many of these locations were not predicted or easily accessible to professional entomologists.

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