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An annotated checklist of the lady beetles (Coleoptera: Coccinellidae) of Iowa, U.S.A.

Louis S. Hesler
USDA Agricultural Research Service
North Central Agricultural Research Laboratory
2923 Medary Avenue
Brookings, SD 57006-9401, USA

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Louis S. Hesler
USDA Agricultural Research Service
North Central Agricultural Research Laboratory
2923 Medary Avenue
Brookings, SD 57006-9401, USA
E-mail: louis.hesler@ars.usda.gov

Abstract. An annotated list is presented for 81 species of lady beetles (Coccinellidae: Coleoptera) that occur in the state of Iowa, U.S.A., based on literature searches and a review of over 3500 specimens in institutional and private collections. The list includes new state records for *Scymnus tenebrosus* Mulsant, *Diomus debilis* (LeConte), *Hyperaspis lateralis* Mulsant, *Hyperaspis deludens* Gordon, *Epilachna borealis* (F.), and *Subcoccinella vigintiquatuorpunctata* (L.), as well as county records for the non-native species, *Harmonia axyridis* (Pallas). Collection records are discussed for *Nephaspis oculatus* (Blatchley), *Hyperaspidius militaris* (LeConte), *Coccinella californica* Mannerheim, and *S. vigintiquatuorpunctata*, which have Iowa records that are disjunct from their larger geographic distributions in North America. I also discuss collection records and the need for additional collecting of coccinellids in Iowa, especially *Adalia bipunctata* (Schneider), *Coccinella transversoguttata richardsoni* Brown, and *Coccinella novemnotata* Herbst, which were once common and widespread but have declined drastically over much of North America, including Iowa.

Introduction

The Coccinellidae (Coleoptera), commonly known as lady beetles, consist of nearly 6000 species spanning about 360 genera that occur worldwide (Vandenberg 2002). About 90 percent of the species are arthropod predators, the remainder being phytophagous or mycetophagous (Iperti 1999; Vandenberg 2002). Many of the predatory lady beetles are important natural enemies of insect pests, and they are linked to biological control more than any other taxon of predators (Obrycki and Kring 1998).

At least 60 genera and 481 species of Coccinellidae are known from America north of Mexico (Gordon 1985; Vandenberg 2002). Inventories of the coccinellid fauna have been conducted for several regions or states in North America, including much of the Great Plains (Stehr 1930; Wingo 1952; Wise et al. 2001; Fauske et al. 2003; Hesler and Kieckhefer 2008b). However, a recent and specific list of the coccinellids of Iowa has not been published. Putnam (1876) published a list of 11 coccinellid species found in the vicinity of Davenport, Iowa, and Wickham (1911) published an inventory of 38 species of Iowa Coccinellidae. Wingo (1952) provided a list of Coccinellidae found in the upper basin of the Mississippi River, including Iowa. However, since the publication of these lists, the systematics and nomenclature of the Coccinellidae have been revised (Gordon 1976, 1985). Moreover, additional species of coccinellids have recently become established in North America (Gordon and Vandenberg 1991), and some have expanded their geographic distributions to include Iowa (Gordon 1985; Obrycki et al. 1987; Krafsur et al. 1997). The periodic review of insect collections may produce important information on species distribution (McCorquodale and Bondrup Nielsen 2004; Hesler and Kieckhefer 2008b). Thus, an updated review of collections containing coccinellids is needed to reflect the dynamics of this group in Iowa, and the objective of this paper is to provide an updated inventory of the Coccinellidae of Iowa.

Materials and Methods

A list of the Coccinellidae of Iowa was generated by reviewing the relevant literature and by examining holdings of several collections. The primary literature reviewed for distributional and systematics information for Iowa Coccinellidae included papers by Wingo (1952) and Gordon (1976, 1985). Specimens in the following institutional collections were examined: Severin-McDaniel Insect Research Collection, South Dakota State University, Brookings, South Dakota (SDSU); Iowa State University Insect Collection, Ames, Iowa (ISUI); the Iowa Insect Survey Collection at Iowa Wesleyan College, Mt. Pleasant, Iowa (IISC); USDA-ARS North Central Agricultural Research Laboratory, Brookings, South Dakota (NCARL);

and Luther College, Decorah, Iowa (LCIC). Personal collections of Iowa coccinellids held by Doug A. Veal (DAVC), Robert W. Kieckhefer (RWKC), and Paul K. Lago (PKLC) were also examined. In addition, records of *Hyperaspidius militaris* (LeConte) were confirmed by personnel at the Museum of Comparative Zoology, Cambridge, Massachusetts. Over 3500 coccinellid specimens were reviewed. The distributions of individual species are generally reported by county based on collection data associated with specimens and records presented by Wingo (1952) and Gordon (1976, 1985). Where appropriate, the list denotes broader (e.g., statewide) distributions for species with numerous and widespread county records. New state records are reported with specific locality information, and new county records are noted for *Harmonia axyridis* (Pallas) because of its recency in the state (Krafsur et al. 1997). Collection records for *Coccinella transversoguttata richardsoni* Brown, *C. novemnotata* Herbst, and *Adalia bipunctata* (L.) were examined to determine the dates of the most recent collection records for these declining species (Obrycki et al. 2000, Harmon et al. 2007).

Results

Annotated checklist. The annotated checklist of 81 species of Coccinellidae distributed in Iowa is presented below. Species are listed in the phyletic sequence of Gordon (1985) for genus and species and of Vandenberg (2002) for higher classification, and the list incorporates the most recent systematic and nomenclatural updates. Distribution information is presented by county based on collection records and cited literature. County records found in Wingo (1952) and Gordon (1976, 1985) are listed. Institutions housing specimens or literature citing records follow county names. The counties of Iowa are shown in Map 1. See the maps provided by Gordon (1976, 1985) for species distributions in the U.S. and Canada.

The Coccinellidae of Iowa, U.S.A.

Subfamily Sticholotidinae Weise

Tribe Microweisini Leng

***Microweisea misella* (LeConte).** Boone, Henry, Story (ISUI, IISC). Statewide (Gordon 1985: 40).

Tribe Serangiini Pope

***Delphastus pusillus* (LeConte).** Boone (ISUI). Distributed over the southern three-quarters of Iowa. (Gordon 1985: 62).

Subfamily Scymninae Mulsant

Tribe Stethorini Dobzhansky

***Stethorus punctum punctum* (LeConte).** Boone, Henry, Story, Woodbury (ISUI, IISC). Statewide (Gordon 1985: 95).

Tribe Scymnini Mulsant

***Nephaspis oculatus* (Blatchley).** Boone (ISUI) (Wingo 1952: 44, as *Nephaspis amnicola* Wingo; Gordon 1985: 102).

***Didion punctatum* (Melsheimer).** Story, Tama. (ISUI) (Wingo 1952: 27, as *Scymnus punctatus*). Statewide (Gordon 1985: 110).

***Didion nanum* (LeConte).** Central Iowa (Wingo 1952: 28, as *Scymnus nanus*; Gordon 1985: 111). No specimens examined.

***Scymnus* (*Scymnus*) *americanus* Mulsant.** Boone, Fayette, Hamilton, Story (ISUI). (Wingo 1952: 29; Gordon 1976: 35).

Map 1. The counties of Iowa, U.S.A.

***Scymnus* (*Pullus*) *kansanus* Casey.** Henry and Louisa (IISC), Lee and Warren (Wingo 1952: 29).

***Scymnus* (*Pullus*) *cervicalis* Mulsant.** Scott (Gordon 1976: 95). No specimens examined.

***Scymnus* (*Pullus*) *rubricaudus* Casey.** Fremont, Story (DAVC, ISUI). Also Appanoose, Boone, Van Buren, and Woodbury (Wingo 1952: 32-33). Gordon (1976: 98) projected the distribution of *S. rubricaudus* into southeastern Iowa.

***Scymnus* (*Pullus*) *fraternus* LeConte.** Bremer, Clayton, Dickinson, Monona, Muscatine and Tama (IISC). Also Woodbury (Wingo 1952: 31), Allamakee and Johnson (Gordon 1976: 110).

***Scymnus* (*Pullus*) *loewii* Mulsant.** Fremont (DAVC). Also Page County ("Shenandoah"; Wingo 1952: 30, as *Scymnus* (*Pullus*) *cinctus* Leconte).

***Scymnus* (*Pullus*) *tenebrosus* Mulsant. New state record.** Ames, Story County, 17 August 1926 (ISUI). Wingo (1952: 40) did not list *S. tenebrosus* from Iowa, although he had made a species determination in 1950 of the specimen listed here.

***Scymnus* (*Pullus*) *iowensis* Casey.** Boone, Linn, Page, Story (DAVC, ISUI). Also Black Hawk, Cass, Jefferson, and Wapello counties (Wingo 1952: 41), and Buchanan, Henry, Johnson and Plymouth counties (Gordon 1976: 156).

***Scymnus* (*Pullus*) *consobrinus* LeConte.** Clayton, Woodbury (Wingo 1952: 42; Gordon 1976: 190). No specimens examined.

***Scymnus* (*Pullus*) *compar* Casey.** Allamakee, Dickinson (Gordon 1976: 206). No specimens examined.

***Scymnus* (*Pullus*) *uncus* Wingo.** Monona (holotype male; Wingo 1952: 38). No specimens examined.

***Scymnus* (*Pullus*) *puncticollis* LeConte.** Appanoose, Bremer, Emmett, Hancock, Henry, Iowa, Polk and Story (ISUI, IISC) (Wingo 1952: 37).

***Scymnus* (*Pullus*) *caudalis* LeConte.** Henry, Scott, Woodbury (Gordon 1976: 256). No specimens examined.

***Scymnus* (*Pullus*) *creperus* Mulsant**. Lee, Page (ISUI). Gordon (1976: 260) stated lectotypes (not holotype and allotype; Wingo 1952:36, as *Scymnus* (*Pullus*) *hortensis* new species) were from Page County.

***Scymnus* (*Pullus*) *brullei* Mulsant.** Boone, Clayton, Delaware, Fremont, Guthrie, Henry, Jackson, Jefferson, Keokuk, Lee, Linn, Story, Van Buren, Washington (ISUI, IISC) (Wingo 1952: 33). Statewide (Gordon 1976: 270).

***Nephus* (*Scymnobius*) *flavifrons* (Melsheimer).** Boone, Henry, Story (ISUI, IISC). Also Johnson County (Gordon 1976: 292). Wingo (1952: 43) also listed this species (as *Scymnus* (*Nephus*) *flavifrons* Melsh.) from Iowa.

***Nephus* (*Scymnobius*) *intrusus* (Horn).** Wingo (1952: 43) noted this species as occurring in Iowa but presented no records. Distribution of *N. intrusus* in Iowa is plausible, as it has been found throughout the eastern U.S. (Gordon 1985: 310).

Tribe Diomini Gordon

***Diomus amabilis* (LeConte).** Dickinson (Wingo 1952: 43, as *Scymnus* (*Diomus*) *amabilis*). No specimens examined.

***Diomus myrmidon* (Mulsant).** Henry (IISC; Wingo 1952: 43, as *Scymnus quadritaeniatus*; Gordon 1976: 331).

***Diomus debilis* (LeConte). New state record.** Nevada, Story County, 15 November 18_3 (?) (ISUI). The printing on the specimen label is faint, and the exact decade of collection cannot be determined.

Tribe Hyperaspidini Mulsant

***Hyperaspidius transfugatus* Casey.** Dickinson (Wingo 1952: 26). No specimens examined.

***Hyperaspidius militaris* (LeConte).** Dickinson (MCZ) (Wingo 1952: 27).

***Hyperaspidius wolcotti* (Nunemacher).** Linn (DAVC). Also Emmett County (Gordon 1985: 385).

***Hyperaspidius vittigerus* (LeConte).** Dickinson, Story (ISUI) (Wingo 1952: 26).

***Hyperaspis proba* (Say).** Dickinson, Story, Van Buren, Warren (ISUI, IISC) (Wingo 1952: 25). Statewide (Gordon 1985: 414).

***Hyperaspis rivularis* Dobzhansky**. Story, Van Buren (ISUI) (Wingo 1952: 26).

***Hyperaspis binotata* (Say).** Boone, Cedar, Dickinson, Linn, Muscatine, Page, Story, Tama, Washington (ISUI). Statewide (Gordon 1985: 423).

***Hyperaspis signata signata* (Olivier).** The only specimen examined bore the label "Iowa, September" (IISC) (Wingo 1952: 25, as *Hyperaspis signata* (Olivier)). Gordon (1985: 429) projected the distribution of *H. signata signata* into southeastern Iowa.

***Hyperaspis lugubris* (Randall).** Davis, Story (ISUI). Also Johnson and Madison (Gordon 1985: 446). Wingo (1952: 25) listed this species from Iowa.

***Hyperaspis lateralis* Mulsant. New state record.** Ledges State Park, Boone County, 29 September 1969, Stephen L. Schutte (ISUI).

***Hyperaspis deludens* Gordon. New state record.** Marion, Indian Creek, Linn County, 28 June1980, Doug A. Veal, 1 female (DAVC).

***Hyperaspis pratensis* LeConte**. Story (ISUI) (Wingo 1952: 25).

***Hyperaspis inflexa* Casey.** Warren (IISC) (Wingo 1952: 26, as *Hyperaspis fimbriolata* Melsheimer).

***Hyperaspis troglodytes* Mulsant.** Henry, Madison, Story, Woodbury (ISUI, IISC) (Wingo 1952: 26, as *Hyperaspis disconotata troglodytes* Mulsant; Gordon 1985: 534).

***Hyperaspis undulata* (Say).** Black Hawk, Boone, Fremont, Guthrie, Hamilton, Hancock, Howard, Humboldt, Kossuth, Linn, Muscatine, Page, Polk, Sioux, Story, Van Buren, Webster,

Winnebago, Woodbury (ISUI, IISC, LCIC, SDSU). Essentially statewide (Wingo 1952: 26; Gordon 1985: 536).

***Hyperaspis brunnescens* Dobzhansky.** Clarke (Gordon 1985: 544). No specimens examined.

***Hyperaspis quadrivittata* LeConte.** Iowa (IISC) (Wingo 1952: 26).

Tribe Brachiacanthini Mulsant

***Brachiacantha dentipes* (F.)**. Story (ISUI). Gordon (1985: 564) projected the distribution of *B. dentipes* into extreme southern Iowa.

***Brachiacantha rotunda* Gordon**. Buchanan, Johnson (Gordon 1985: 575). No specimens examined.

***Brachiacantha felina* (F.).** Boone, Polk, Story (ISUI) (Wingo 1952: 27, as *Brachyacantha bolli* Crotch). Gordon (1985: 577) showed a virtual statewide distribution for this species.

***Brachiacantha decempustulata* (Melsheimer).** Boone (ISUI) (Wingo 1952: 27, as *Brachyacantha felina* (Fab.)).

***Brachiacantha ursina* (F.).** Boone, Davis, Decatur, Dickinson, Guthrie, Hamilton, Johnson, Kossuth, Lyon, Mahaska, Pocahontas, Story, Webster, Winneshiek, Woodbury (DAVC, ISUI). Distributed throughout Iowa except for extreme southwest corner (Gordon 1985: 580).

***Brachiacantha quadripunctata quadripunctata* (Melsheimer).** Linn, Story, Webster (DAVC, ISUI). Gordon (1985: 591) projected a distribution of *B. quadripunctata quadripunctata* into roughly the southern half of Iowa.

***Brachiacantha indubitalis* Crotch**. No specimens examined. Distributed over roughly eastern two-thirds of state (Gordon 1985: 596).

Subfamily Chilocorinae Mulsant

Tribe Chilocorini Mulsant

***Axion tripustulatum* (DeGeer).** Listed by Wingo (1952: 47), with no specific records. Virtually statewide (Gordon 1985: 615). No specimens examined.

***Chilocorus stigma* Say.** Boone, Davis, Fremont, Lee, Linn, Monona, Page, Story, Winnebago, Winneshiek (DAVC, ISUI, IISC, LCIC). Statewide (Wingo 1952: 47, as *Chilocorus bivulnerus* Mulsant; Gordon 1985: 651).

Subfamily Coccidulinae Mulsant

Tribe Coccidulini Mulsant

***Coccidula lepida* LeConte.** Hancock, Iowa, Story, Winnebago (ISUI). Statewide (Wingo 1952: 45; Gordon 1985: 656).

Subfamily Coccinellinae Latreille

Tribe Coccinellini Latreille

***Anisosticta bitriangularis* Say.** Story, Winnebago (ISUI). Statewide (Wingo 1952: 45; Gordon 1985: 683).

***Macronaemia episcopalis* (Kirby).** Winnebago (ISUI) (Wingo 1952: 45). Gordon (1985: 687) showed a distribution for this species that included most of Iowa.

***Coleomegilla maculata lengi* Timberlake.** Numerous specimens from throughout Iowa (DAVC, ISUI, IISC, LCIC, PKLC, RWKC, SDSU). Statewide (Wingo 1952: 45; Gordon 1985: 698).

***Hippodamia tredecimpunctata tibialis* (Say).** Numerous specimens from throughout Iowa (DAVC, ISUI, IISC, LCIC, PKLC, RWKC, SDSU). Statewide (Wingo 1952: 45; Gordon 1985: 709).

***Hippodamia parenthesis* (Say).** Numerous specimens from throughout Iowa (DAVC, ISUI, IISC, LCIC, RWKC, SDSU). Statewide (Gordon 1985: 715).

***Hippodamia glacialis glacialis* (F.).** Appanoose, Des Moines, Dickinson, Emmet, Guthrie, Henry, Iowa, Kossuth, Monroe, Muscatine, Page, Pottawattamie, Story, Van Buren, Wapello (ISUI, IISC). Statewide (Wingo 1952: 45; Gordon 1985: 731).

***Hippodamia quindecimmaculata* Mulsant.** Linn, Pottawattamie, Van Buren (Wingo 1952: 45, as *Hippodamia quindecim-maculata* Mulsant; Gordon 1985: 737).

***Hippodamia convergens* Guerin-Meneville.** Numerous specimens from throughout Iowa (DAVC, ISUI, IISC, LCIC, RWKC, SDSU). Statewide (Wingo 1952: 45; Gordon 1985: 741).

***Anatis labiculata* (Say).** Benton, Boone, Clayton, Clinton, Davis, Dickinson, Dubuque, Fayette, Hamilton, Jasper, Linn, Monona, Page, Polk, Scott, Webster, Woodbury (DAVC, ISUI). Statewide (Wingo 1952: 46, as *Anatis quindecimpunctata* (Olivier); Gordon 1985: 754).

***Anatis mali* (Say).** Linn, Story (DAVC, ISUI). Statewide (Gordon 1985: 762).

***Myzia pullata* (Say).** Story (ISUI). Statewide (Wingo 1952: 47, as *Neomysia horni*; Gordon 1985: 767).

***Calvia quatuordecimguttata* (L.).** Statewide (Gordon 1985: 775). No specimens examined.

***Adalia bipunctata* (L.).** Numerous specimens from throughout Iowa (DAVC, ISUI, IISC, LCIC, RWKC, SDSU). Statewide (Wingo 1952: 46, as both *A. bipunctata* and *Adalia frigida* (Schn.); Gordon 1985: 780). All but two specimens examined were collected before 1978: 1) Winneshiek County, Decorah, September 1982 (LCIC); 2) Linn County, Cedar Rapids, 15 May 1982, Doug A. Veal (DAVC). *Adalia bipunctata* has declined greatly in abundance over the last 25 years (Harmon et al. 2007).

***Coccinella trifasciata perplexa* Mulsant.** Statewide (Gordon 1985: 787). No specimens examined.

***Coccinella transversoguttata richardsoni* Brown.** Boone, Hamilton, Iowa, Linn, Osceola, Page, Story, Tama (DAVC, ISU, IISC). Statewide (Gordon 1985: 790). All specimens examined except one were collected before 1980: Geode State Park, Henry County, 17 July 2003, Doug A. Veal (DAVC). *Coccinella transversoguttata richardsoni* has declined greatly in abundance over the last 25 years (Wheeler and Hoebeke 1995), and this is the only recently documented record from Iowa (Hesler and Petersen 2008).

***Coccinella californica* Mannerheim.** Henry, Story (ISUI, IISC) (Wingo 1952: 46, Gordon 1985: 793).

***Coccinella septempunctata* L.** Black Hawk, Hardin, Linn, Muscatine, Pottawattamie, Winneshiek (DAVC, ISUI, LCIC, PKLC). This species was first reported from Iowa in 1985 (Obrycki et al. 1987; Shaefer et al. 1987), and apparently occurs statewide.

***Coccinella novemnotata* Herbst.** Numerous specimens from throughout Iowa (ISUI, IISC). Statewide (Wingo 1952: 46, Gordon 1985: 798).

***Coccinella monticola* Mulsant.** Western half of Iowa (Gordon 1985: 811). No specimens

***Cycloneda munda* (Say).** Numerous specimens from throughout Iowa (DAVC, ISUI, IISC, LCIC, SDSU). Statewide (Gordon 1985: 823).

***Olla v-nigrum* (Mulsant).** Fremont, Page, Story (ISUI, IISC). Statewide (Wingo 1952: 46, as *Olla abdominalis* (Say) and *Olla abdominalis plagiata* Casey; Gordon 1985: 826).

***Harmonia axyridis* (Pallas). New county records.** Clayton County, Bixby State Preserve, 25 May through 8 June 2007, Malaise trap, Jessica Davis (ISUII). Linn County, Cedar Rapids, 29 September 1997, Doug A. Veal (DAVCC). Mahaska County, Cedar Bluffs State Preserve, 10 through 24 June 2007, Malaise trap, Jessica Davis (ISUII). Winneshiek County, Chattahoochie Park, Norski Runs, 18 September 1997, Ranasinghe Sanjaya (LCIC). This species was first reported from Iowa in 1994 (Story County, Krafsur et al. 1997), but we did not find specimens for this record. *Harmonia axyridis* now occurs statewide (Koch et al. 2006).

***Neoharmonia venusta venusta* (Melsheimer).** Boone, Davis, Des Moines, Henry, Jefferson, Linn, Page, Story (DAVC, ISUI, IISC). Southern half of Iowa (Gordon 1985: 837).

***Mulsantina picta* (Randall).** Story (ISUI). Statewide (Gordon 1985: 844).

Tribe Halyziini Mulsant

***Psyllobora vigintimaculata* (Say).** Numerous specimens from throughout Iowa (DAVC, ISUI, IISC, LCIC). Statewide (Gordon 1985: 855).

Subfamily Epilachninae Ganglbauer

Tribe Epilachnini Costa

***Epilachna varivestis* Mulsant.** Davis, Van Buren, Story, Lee, Jackson, Jasper, Scott (ISUI) (Gordon 1985: 866).

***Epilachna borealis* (F.). New state record.** Fremont County, Waubonsie State Annex, 12 September 2005, Doug Veal (DAVC).

***Subcoccinella vigintiquatuorpunctata* (L.). New state record.** Dickinson County, Iowa Lakeside Laboratory, Sec. 23, T99N, R73W, 7 July 1973, W. Bryan Stoltzfus (ISUI).

Discussion

Faunal distributions are dynamic, and faunal lists may increase from additional collecting, curation of previously collected material, and geographic range expansion of species (Brodman et al. 2002; Fauske et al. 2003; McCorquodale and Bondrup-Nielsen 2004). In the present study, the curation and review of collected material documented six new state records of coccinellids in Iowa for *Scymnus tenebrosus*, *Diomus debilis*, *Hyperaspis deludens*, *H. lateralis*, *Epilachna borealis* and *Subcoccinella vigintiquatuorpunctata*, compared with previous distributions reported in Wingo (1952) and Gordon (1976; 1985).

Scymnus tenebrosus, *Diomus debilis*, *Hyperaspis deludens*, and *H. lateralis* are all members of the subfamily Scymninae (Gordon 1985). *Scymnus tenebrosus* has been recorded from several neighboring states to the north, east and south of Iowa (Gordon 1976), so its record from Iowa was not surprising. *Diomus debilis* is widespread in North America (Gordon 1976), with records from neighboring states of Wisconsin and South Dakota (Gordon 1985; Hesler and Kieckhefer 2008b). However, the Iowa records for *S. tenebrosus* and *D. debilis* are over 80- and 100-years old, respectively, with no additional specimens found in the collections examined. Wise et al. (2001) discovered new Manitoba records for *Stethorus punctum punctum* and *Scymnus tenebrosus* from 1918 and 1913, respectively, and Gordon (1976) stated that little information is available on the biology of *Diomus*. Collectively, these results and those of the present study serve to 1) support the claim that curation and periodic review of insect collections may produce important information on coccinellid species distribution (McCorquodale and Bondrup-Nielsen 2004; Hesler and Kieckhefer 2008b), and 2) also suggest that additional fieldwork is needed to improve our understanding of the habitat use and distribution of *S. tenebrosus* and *D. debilis* in Iowa.

Hyperaspis deludens is an uncommon species, with previous records limited to Illinois and Ohio (Gordon 1985), whereas *H. lateralis* has been recorded from western North America and states bordering the Gulf of Mexico (Gordon 1985), North Dakota (Fauske et al. 2003), and South Dakota (Hesler and Kieckhefer 2008b). The bionomics of many species of *Hyperaspis* are almost completely unknown (Majka and Robinson 2009). This is true for *H. deludens* and *H. lateralis*, and additional fieldwork is needed to determine their distribution and bionomics in Iowa.

Epilachna borealis and *Subcoccinella vigintiquatuorpunctata* are both plant-feeding coccinellids in the tribe Epilachnini (Gordon 1985). *Epilachna borealis* is distributed throughout the southeastern U.S., and had previously been recorded from northeast Kansas (Gordon 1985), about 100 miles from the collection site in southwest Iowa. The record of *E. borealis* in Iowa denotes a geographic range extension northward. The reason for its extension into Iowa is unknown, but this may have resulted from a general

expansion of a viable population, or perhaps been due to global warming effects that have extended or shifted insect species distributions poleward (Bale et al. 2002).

The occurrence of *Subcoccinella vigintiquatuorpunctata* in Iowa was represented by a single specimen, and this is apparently a disjunct record that is much farther west than one would anticipate based on this species' distribution records (Gordon 1985), which show it occurring in Ohio and eastward in North America. Three other species occurring in Iowa were also disjunct from their larger geographic distributions in North America: *Nephaspis oculatus*, *Hyperaspidius militaris* and *Coccinella californica* (Gordon 1985). Reasons for the disjunct distributions of these species and *S. vigintiquatuorpunctata* are not known, but Wingo (1952) and Gordon (1985) suggested that *C. californica* was carried into Iowa through commerce. The records encountered for each of the four species are limited and relatively old: *N. oculatus*, 1949; *H. militaris*, 1939; *C. californica*, 1948; and *S. vigintiquatuorpunctata*, 1973. It is not known if their populations are extant in Iowa, and additional sampling in areas having historical records of these species is needed to address this.

In addition, at least three species (*Adalia bipunctata, Coccinella transversoguttata richardsoni*, and *C. novemnotata*) that were once common and widespread have declined drastically over much of North America, including Iowa (Harmon et al. 2007; Hesler and Pedersen 2008). However, we found a single 2003 record of *C. transversoguttata richardsoni* among the specimens examined, and this is perhaps the only recent record of this species from Iowa. We did not find records of *A. bipunctata* and *C. novemnotata* after 1982 and 1972, respectively, and it is not known if there are extant populations in Iowa. Additional sampling for *A. bipunctata, C. transversoguttata richardsoni* and *C. novemnotata* is needed to assess their status (Ellis et al. 1999; Hesler and Petersen 2008).

The list of Iowa coccinellids was generated by reviewing pertinent literature on coccinellids and by examining specimens in institutional and private collections. The vast majority of specimens examined were in institutional collections, but two state records (*H. deludens* and *E. borealis*) were derived from specimens in a private collection. Most of the specimens examined in the institutional collections for the current paper had collection dates earlier than 1980, and this was also largely true of specimens examined recently in developing a list of the Coccinellidae of South Dakota and in tracking records of declining, but previously common coccinellids (Hesler and Kieckhefer 2008a,b). In contrast, many of the coccinellid specimens in the personal collections had been collected within the last 15 years. Moreover, the only known recent record of *C. transversoguttata richardsoni*, a previously common species, came from one of the personal collections. The 2003 specimen of *C. transversoguttata richardsoni* suggests that this species may still be present, though rare, in eastern Iowa, and reinforces an earlier point regarding the value in periodically reviewing collection holdings (McCorquodale and Bondrup-Nielsen 2004; Gabel et al. 2007). The results highlight the value of personal collections in generating species lists and in documenting records of rare species (Losey et al. 2007; Dobbs and Henry 2008). However, the results also point out the paucity of recently collected specimens and the need to incorporate new specimens to enhance the value of institutional collections as a biological science resource that may be used to support the conservation of lady beetles (McCorquodale and Bondrup-Nielsen 2004; Gabel et al. 2007).

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