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## Annotated Checklist of the Aradidae (Hemiptera:Heteroptera) or “Flat Bugs” of Iowa

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### Abstract

A review of the species of Aradidae or flat bugs found in Iowa is presented. New state records for *Aradus aequalis* Say, *A. crenatus* Say, *A. implanus* Parshley, and *Mezira lobata* (Say) (Hemiptera: Heteroptera) are included.

**Keywords:** Aradidae, flat bugs, new state records, Iowa

The flat bug family Aradidae (Hemiptera: Heteroptera) is represented by 127 species in America north of Mexico (Froeschner 1988; Taylor and Gill 2009; Swanson 2020a, b, 2021) with 24 of those species known from the Midwest states of Iowa, Illinois, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin (Froeschner 1988).

There are very few records of Iowa species in the published literature. Herbert Osborn (1892, 1897) published the first two articles containing a total of five species from Iowa. Edward P. Van Duzee (1917) listed only one species from Iowa which had previously been listed by Osborn (1892, 1903). Howard Madison Parshley (1921) listed three species from Iowa, one of which was new to the listing. Richard C. Froeschner (1988) listed only three species from Iowa, while apparently missing two species previously published by Osborn (1892, 1897). No new species have been recorded from Iowa since the 1988 catalog.

The intent of this study was to update the checklist of Iowa Aradidae. Based on records in the 1988 catalog of Heteroptera by Henry and Froeschner several more species and two more genera might eventually be added as new to the Iowa fauna.

### Methods

This checklist began with the species of Aradidae listed by Osborn (1892, 1897) and Froeschner (1988). Journal articles, books, and internet sources were searched for published records, specimen data, assistance with synonyms, biological information, and help with identifications; several articles were first located via Biodiversity Heritage

Library (<https://www.biodiversitylibrary.org>). Taxonomy and arrangement of subfamilies, genera, and species was adapted from the catalog of Heteroptera or “True Bugs” by Henry and Froeschner (1988, 1992). Any taxonomic changes since 1988 are incorporated into the checklist.

Specimens were collected in the field from 2012 through 2021. During daylight hours standing dead trees and logs were examined and bark was pulled back to expose specimens; bracket fungi was also searched on trees, branches, and logs. At night a light source was used to look for specimens on tree trunks and logs. Several specimens were found in panel and Malaise trap samples. One species was also first located as a photo on line at <https://www.bugguide.net/node/view/15740> (*Aradus crenatus* Say). The majority of field collected specimens were identified by the author (SWC).

Several insect collections were pursued for flat bug specimens from Iowa. The Iowa State University insect collection (ISIC), Ames, Iowa, was surveyed thanks to permission from Gregory W. Courtney. The Iowa Wesleyan University insect collection (IWUC), also known as the Iowa Insect Survey Collection (Jaques 1932, 1934), Mt. Pleasant, Iowa, was searched thanks to permission from Donald Wick, Delores P. Wilson, and Rosemary Peck. The University of Wisconsin Insect Research Collection (WIRC), Madison, Wisconsin, was also searched thanks to permission from Steven J. Krauth. Label data was obtained from each species per collection. Several flat bug specimens from the Iowa Wesleyan University insect collection (IWUC) were forwarded to Daniel R. Swanson (Depart-

ment of Entomology, University of Illinois at Champaign-Urbana, Urbana, Illinois) to verify identifications. Several *Neuroctenus* specimens were verified by Ernst Heiss (Research Entomologist, Tiroler Landesmuseum, Innsbruck, Austria).

#### Collector – Collection Codens

DAV = Doug A. Veal collector, Cedar Rapids, Iowa

DRS = Daniel R. Swanson, University of Illinois at Urbana-Champaign, Urbana, Illinois

ELF/C = Edwin L. Freese collector/ collection, Adel, Iowa

ISIC = Iowa State University Insect Collection, Ames, Iowa

IWUC = Iowa Wesleyan University Insect Collection, Mt. Pleasant, Iowa

MJH = Mary Jane Hatfield collector, Cresco, Iowa

OSUC = Ohio State University Insect Collection, Columbus, Ohio

SWC = Stephen W. Chordas III, Ohio State University, Columbus, Ohio

WIRC = Wisconsin Insect Research Collection, University of Wisconsin, Madison, Wisconsin

#### Results

A total of ten species of Aradidae or “Flat Bugs” are herein reported from Iowa in the following listing. Previously only six species had been published from Iowa (Osborn 1892, 1897, 1903; Van Duzee 1917; Parshley 1921; Froeschner 1988). The following four species are listed as new state records: *Aradus aequalis* Say, *A. crenatus*, *A. implanus* Parshley, and *Mezira lobata* (Say).

All located references are listed in the following checklist for each species which contained an Iowa record or specimen data. In a few cases the taxonomy has changed which is noted in parenthesis. Codens for collections having specimens from Iowa are given next with quantity of specimens in that collection is given in brackets.

Specimen label data are presented for new Iowa state records, oldest or earliest collected Iowa specimens located in collections, and or specimens that represent collecting in Iowa over the decades. Brackets were added by the author (ELF) to insert correct county name as needed (note: the Iowa Insect Survey Collection (IWUC) [Jaques 1932, 1934] used a unique county numbering system on many labels instead of writing out the county

names). If more than one specimen per collection date, the quantity is given in brackets.

One species, *Aradus medioximus* Parshley, has been placed on the “Excluded Species” list as this species likely does not occur in Iowa (Daniel R. Swanson, pers. comm., June 2022).

#### Aradidae or “Flat Bugs” of Iowa

**Hemiptera** Linnaeus, 1758

**Heteroptera** Latreille, 1810

Family **Aradidae** Spinola, 1837

Subfamily **Aradinae**

Amyot and Serville, 1843

**Aradus** Fabricius, 1803

#### *Aradus acutus* Say, 1832

Osborn 1892: 124 (as “*Aradus americanus* H. Schf. Common.”); IWUC [14]

Specimen label data: Mt. Pleasant, Henry Co., Iowa, 25 March 1934 [8], Dick D. Millsbaugh, determined Harry G. Barber, verified DRS 2013 (IWUC)

Notes: Matsuda 1977: 44 (AR, VA); Froeschner 1988: 33 (species known from: AK, AL, CA, CO, DC, DE, FL, GA, ID, IL, IN, KS, MB, MD, ME, MO, MS, MT, NC, NH, OH, PA, SC, TX, UT, WA); Taylor and McPherson 1989: 20 (AR)

#### *Aradus aequalis* Say, 1832

NEW STATE RECORD: White Pine Hollow State Preserve, Dubuque Co., Iowa, 14–22 May 2014, panel trap [baited Melange], DAV, determined SWC 2015 (ELFC)

Notes: Froeschner 1988: 33 (species known from: DC, IL, IN, MD, ME, NJ, NY, OH, OK, ON, PA, QC, TX, VA, VT); Scudder 2012: 58 (MI)

#### *Aradus crenatus* Say, 1832

NEW STATE RECORD: 100 Acre Wood, Winneshiek Co., Iowa, 27 June 2010, standing dead tree, night lighting headlamp, MJH [photo posted <https://bugguide.net/node/view/486040>], determined T. Loh and Vassili Belov 2011, verified DRS 2013 (ELFC); 100 Acre Wood, Winneshiek Co., Iowa, 3 September 2012, MJH [photo posted <https://bugguide.net/node/view/1188457>]; White Pine Hollow State Preserve, Dubuque Co., Iowa, 14–22 May 2014, panel trap [baited Melange], DAV, determined SWC 2015 (ELFC)

Notes: Blote 1965 (TN); Froeschner 1988: 35 (species known from: AL, CT, DC, GA, IL, IN, MD, MI, MO, NC, NY, OH, ON, PA, QC, VA); Taylor and McPherson 1989: 20 (AR); Swanson 2020b: 106 (KY)

*Aradus implanus* Parshley, 1921

**NEW STATE RECORD:** Swiss Valley Nature Center, Dubuque Co., Iowa, 24 April–3 May 2007 [2], Malaise trap, M. Wilhelm, determined SWC 2015 (ELFC)

**Notes:** Froeschner 1988: 36 (species known from: DC, IL, IN, MI, ON, PA, QC)

*Aradus lugubris* Fallen, 1807

Osborn 1892: 124 (as “*Aradus rectus* Say.”); Swanson 2020b: 106 (Iowa via Osborn, 1892)

**Specimen label data:** no specimens located in collections or collected in the field during this survey

**Notes:** Froeschner 1988: 37 (species known from: AB, AK, AZ, BC, CA, CO, DC, ID, IL, MA, MB, ME, MI, MN, MO, MT, NC, ND, NE, NF, NH, NM, NS, NT, NV, NY, ON, OR, PA, QC, RI, SK, UT, WA, WI, YK); Swanson 2020b: 106 (IA, WY)

*Aradus quadrilineatus* Say, 1825

Parshley 1921: 33 (“Iowa: Ames (H. Osborn)”); Froeschner 1988: 39 (Iowa); ISIC [3]

**Specimen label data:** Ames, Story Co., Iowa, [no date], Herbert Osborn (ISIC); Mt. Pleasant, Henry Co., Iowa, 28 March, 3 April, 1927, Kinkade (ISIC)

**Notes:** Froeschner 1988: 39 (species known from: AB, BC, CT, DC, FL, GA, IA, IL, IN, KS, LA, MA, MB, MD, ME, MI, MN, MO, NB, NC, NH, NJ, NT, NY, OH, ON, PA, QC, RI, SK, VA, WI, YK)

*Aradus robustus* Uhler, 1871

Osborn 1892: 124 (“Abundant in 1886, locally.”), 1903: 38; Van Duzee 1917: 130 (Iowa); Parshley 1921: 41 (“Iowa: Ames (H. Osborn)”); Leschen and Taylor 1987: 184 (Iowa); Froeschner 1988: 39 (Iowa); ISIC [18]; IWUC [7]; MJHC [1]

**Specimen label data:** Ames, Story Co., Iowa, [no date], Osborn (ISIC); Ames, Iowa, 23 April 1924, H. M. Harris (ISIC); Mt. Pleasant, Henry Co., Iowa, 12 April 1930, O. Smith (IWUC); Ames, Iowa, 18 June 1930, M. L. Russell (ISIC); Mt. Pleasant, Iowa, 29 March 1934, Millsbaugh, determined Barber 1935 (IWUC); County #76 [Louisa], Iowa, 25 May 1934, Cutkomp, determined HGBarber (IWUC); Ames, Iowa, 27 May 1935, G. E. Carman (ISIC); Ames, Iowa, 18 May 1948, J. Barker (ISIC); Heritage Valley, Allamakee Co., Iowa, 26 May 2020, collected while pulling garlic mustard, MJ Hatfield [photo posted <https://bugguide.net/view/1935577>, determined Vassili Belov 2021] (MJHC)

**Note:** all Iowa records have been assigned to the nominate subspecies; Leschen and Taylor 1987: 183 (AR), 184 (IA, ND); Froeschner 1988: 39 (species known from: CT, DC, DE, FL, IA, IL, IN, KS, MA, MD, ME, MI, MN, MO, MS, NC, NE, NH, NJ, NT, NY, OH, OK, ON, PA, QC, RI, TN, TX, WD); Taylor and McPherson: 19 (AR)

*Aradus similis* Say, 1832

Osborn 1892: 124 (“*Aradus similis* Say.”); Parshley 1921: 64 (“Iowa: Ames (H. Osborn)”); Froeschner 1988: 40 (Iowa); IWUC [4]; ELFC [2]

**Specimen label data:** Mt. Pleasant, Henry Co., Iowa, 14 May 1933, Edwards, determined HGBarber (IWUC); Mt. Pleasant, Iowa, 1 February 1934, Cutkomp, determined HGBarber (IWUC); Waubonsie State Park, Fremont Co., Iowa, 3 May 2014 [2], on limestone gravel path at gazebo, ELF, DAV, determined SWC 2015 (ELFC)

**Notes:** Froeschner 1988: 40 (species known from: AL, AK, CT, DC, FL, GA, IA, IL, IN, KS, MA, MD, ME, MI, MO, MS, NC, NH, NJ, NS, NY, OH, ON, PA, QC, SC, TX, VA, WI); Scudder 2012: 58 (NB)

*Subfamily Mezirinae* Oshanin, 1908*Mezira* Amyot and Serville, 1843*Mezira lobata* (Say, 1832)

**NEW STATE RECORD:** RR Adel, Dallas Co., Iowa, 12 May 2015, on dead red oak trunk [1], under red oak bark [1] [*Quercus* sp.], ELF, determined SWC 2016 (ELFC)

**Notes:** Blote 1965 (TN); Froeschner 1988: 44 (species known from: CA, DC, FL, GA, IL, IN, MD, MI, MO, NC, NY, OH, PA, TX); Taylor and McPherson 1989: 21 (AR)

*Neuroctenus* Fieber, 1960*Neuroctenus simplex* (Uhler, 1876)

Osborn 1897: 233 (“Ames. October 11, 1897. On grass far from timber.”), 1903: 41 (“...and west to Iowa...”); Swanson 2020b: 107 (Iowa via Osborn, 1898 [1897]); ISIC [21]; IWUC [26]; WIRC [2]; OSUC [2]; ELFC [53]

**Specimen label data:** Experiment Station, Ames, Story Co., Iowa, 1 October 1896, [no collector] (ISIC); Ames, Iowa, 14 July 1925, Halbert M. Harris (ISIC); Mt. Pleasant, Henry Co., Iowa, 19 February 1930, Alexander, determined DRS 2013 (IWUC); Ames, Iowa, 21 April 1930, George Thurber (ISIC); County #98 [Van Buren], Iowa, 21 April 1930, Rambo, determined DRS 2013 (IWUC); Mt. Pleasant, Iowa, 16

March 1934, Millspaugh, determined Barber 1935 (IWUC); County #87 [Jefferson], Iowa, 1 January 1935, Pierson, determined Barber 1935 (IWUC); LeMars, Plymouth Co., Iowa, 19 April 1937, apple bark, Gale Bleasdale (ISIC); Ames, Iowa, 27 April 1953, Dale M. Norris (WIRC); Cedar Rapids, Linn Co., Iowa, 11 October 1999, under "oak" bark, DAV, determined SWC 2011 (OSUC); RR Adel, Iowa, 19 [30], 30 [25] April 2018, under bark dead black oak branch [*Quercus velutina*], ELF, determined SWC 2021, verified Ernst Heiss 2021 (ELFC, OSUC); Hitchcock Nature Area, Pottawattamie Co., Iowa, 14 June 2018, under bark, ELF, determined SWC 2021 (ELFC)

**Notes:** Several specimens in university collections were originally identified as *Neuroctenus pseudonymus* Bergroth, 1898; Taylor and McPherson 1989: 22 (AR); Froeschner 1988: 46 (species known from: CT, DC, FL, GA, IL, KS, MA, MD, ME, MO, MT, NC, NJ, NY, OH, PA, SC, TX); Swanson 2020b: 107 (IA, WI)

#### Excluded species

##### *Aradus medioximus* Parshley, 1921

Matsuda 1977 (page 70) listed this species only from British Columbia, California, and Oregon, while Froeschner 1988 (page 38) also listed this species from Iowa. This Iowa record is likely an error as this species is probably only known from the Pacific Northwest (Swanson, pers. comm., June 2022)

#### Discussion

The landscape containing the habitats utilized by Aradidae in Iowa has changed considerably since Euro-American settlement with a large portion of Iowa being converted to agricultural lands (Bishop 1981, Jungst et al. 1998, Smith 1998, Mutel 2008). In recent decades thousands of acres of agricultural land formerly used as pasture and pastured woodlands were also converted to row-crops (Mutel 2008). The net effect has been a huge loss of habitat for Iowa's insects.

Another change in the opposite direction has also been slowly occurring in Iowa over the decades, with more acreage being set aside as city, county, and state parks, state forests, state preserves, and state and federal wildlife management areas (Bishop et al. 1998, Jungst et al. 1998, Smith 1998, Mutel 2008). Here the net effect is a small gain for the insects.

Anyone driving around Iowa today should then notice that a large portion of the state is currently used for agricultural purposes, especially row-crops. Much of the

woody vegetation in some areas may only be found in fence lines, along stream corridors, around farmsteads, and areas not currently farmed as being odd-shaped or inaccessible or too steep, or too wet, rocky, or sandy. Grassland vegetation, prairies, or areas not yet invaded by brush and trees may only be found in roadside ditches, pastures, and areas currently not being farmed with row-crops. Overall the remaining habitats are much reduced and in many cases degraded from pre-settlement days. When the original habitat has been so altered by human usage, some species become rare or extinct, and other species that prefer disturbances increase (Schwert 1996, Cruden and Gode 2000, Wagner 2020).

During this recent study of Iowa Aradidae four new state record species were added to the checklist. Of the ten species now known from Iowa six of those species were collected since the year 2000 including three of the previously recorded species. Two of the previously known species (*A. acutus* and *A. quadrilineatus*) are represented only in collections by specimens collected nearly a century ago. The other species (*A. lugubris*) was neither collected in the field during this study nor located in Iowa collections.

Very few specimens of Aradidae were collected in the field during this survey while numbers of specimens in collections were more numerous. One exception being *N. simplex* which was collected at one location in large numbers (55 specimens) from under bark of a large dead black oak branch that had been blown down by a storm in the author's (ELF) backyard. Easy access to the dead oak branch made collecting rather easy here once the first specimen was found. Also there are quite a few specimens of this species in Iowa collections (47 specimens). Specimens of three species were collected basically as bycatch during this study in a panel trap or Malaise trap (*A. aequalis*, *A. crenatus*, and *A. implanus*) and two species were possibly located more by chance while pulling garlic mustard (*A. robustus*) and while the author (ELF) was resting at a gazebo looking down watching insects on the path (*A. similis*). Two species were collected at night on tree trunks while searching with a light (*A. crenatus* and *M. lobata*). These findings indicate several species of flat bugs may be collected in a variety of ways and at least two species may have a preference for oak trees (*M. lobata* and *N. simplex*) (Swanson 2020a).

There are several other genera and species of Aradidae that might occur in Iowa based on published records for adjacent and nearby states (Froeschner 1988; Swanson 2020b, 2021). Information on preferred food

plants and or habitat preferences (Taylor and Gil 2009) might assist in locating these species. Further searching and collecting in Iowa along with knowledge of ranges might eventually locate some of these species.

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