Wisconsin Freshwater Isopod Atlas

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Summary: This report provides distribution maps for seven species of freshwater isopods (Crustacea: Isopoda: Asellidae) occurring in Wisconsin lakes and rivers, including three species previously unreported from the state. Technical literature, museum specimens, and Wisconsin DNR field staff investigations provide the basis for county records. This atlas can serve as a baseline for conservation planning purposes.

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Cover Illustrations: An aquatic isopod, from the University of Wisconsin's Wisconsin Water Resources Clip Art Collection, http://clean-water.uwex.edu/pubs/clipart/critters.pond.htm.

Introduction

About 30 species of the isopod family Asellidae occur in North American freshwater habitats where they are primarily bottom-dwelling, omnivorous scavengers. These crustaceans provide a food source for predatory fishes and water birds (Martin and Uhler 1939, Combs and Fredrickson 1996, Janssen and Luebke 2004), and some species serve as the intermediate hosts for parasites of these vertebrates (Amin 1978, McDonald 1988, Zellmer 2009). Isopods are often used to gauge water quality, particularly in streams (Hilsenhoff 1982, Watton and Hawkes 1984). In spite of this importance, relatively little has been published about this group in Wisconsin waters.

Jass and Klausmeier (1990, 1997) described the size range, habitat characteristics, distribution, and life history traits of Wisconsin asellids based on their field work in southeastern counties, specimens in the Milwaukee Public Museum (MPM) collection, and the published literature. They documented four species in 23 counties, primarily in the southern part of the state, and provided a provisional key for their identification. Since then, Wisconsin Department of Natural Resources (DNR) biologists have collected macro-invertebrates, including isopods, at numerous sites throughout the state and submitted samples to the macroinvertebrate laboratory at the University of Wisconsin-Stevens Point for identification and enumeration. Records from this work are maintained in the Wisconsin DNR's Surface Water Integrated Monitoring System (SWIMS) database[1] and are used for various water quality assessment purposes. To date, only limited efforts have used SWIMS data for species conservation planning purposes. Recently, I downloaded and analyzed the 1,968 isopod records included in SWIMS, covering the period 2005 through 2016, and updated Jass and Klausmeier's (1997) distribution maps for species found in Wisconsin[2,3]. I also identified additional literature reports and specimen records from the United States National Museum of Natural History (Smithsonian Institution, USNM) and Harvard University's Museum of Comparative Zoology (MCZ). In a few cases, I supplemented these records with unpublished data from the Wisconsin DNR's Bureau of Natural Heritage Conservation (NHC). These data expand the known distributions of several species and reveal the presence of three additional species in the state.

Species Accounts

Seven asellid species are now documented from Wisconsin. County records for each species are summarized in the accompanying maps. Shaded counties reflect SWIMS data and may represent a single collection record, records from multiple collections, or collections from multiple waterbodies within the county. Dots centered in counties depict all available literature records; squares represent additional museum specimens. Open circles denote unpublished NHC records. Literature records are from Jass and Klausmeier (1990, 1997) unless otherwise indicated. Collection information is provided in the species accounts for those species newly documented from the state. Museum collection information, complete SWIMS data, and additional literature citations for all species are available upon request.

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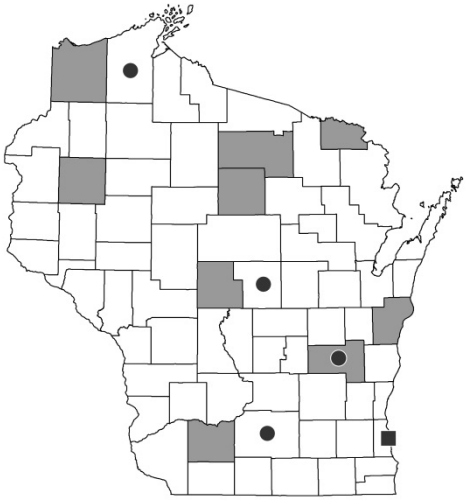
[1] SWIMS holds chemical, physical, and biological data and serves as the Wisconsin DNR's data repository for Clean Water Act-related work. For more information regarding SWIMS, see http://dnr.wi.gov/topic/surfacewater/swims/.

[2] Four hundred ninety-seven of the SWIMS records include identification to the genus level only and are therefore omitted from the maps.

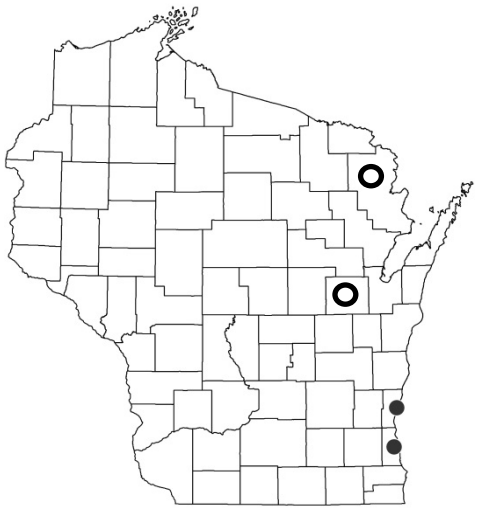
[3] A preliminary version of this report appeared in the Wisconsin Entomological Society's *Newsletter* (vol. 44, no. 4, pp. 1-5). I appreciate comments received from WES members.

***Caecidotea brevicauda brevicauda* (Forbes, 1876) –** Williams (1976) reported *Caecidotea b. brevicauda* from springs and spring-fed streams in Arkansas, Illinois, Kentucky, and Missouri. The SWIMS database records represent the first reported from Wisconsin: Grant County–Grant River, collected by James Amerhein on 27 October 2008; unnamed creek, collected by J. Amerhein on 21 October 2010; unnamed creek, collected by Jean Unmuth on 15 November 2010; Castle Rock Creek, collected by J. Unmuth on 07 October 2015; Kenosha County–Pike River, collected by Craig Helker on 02 November 2010; Richland County–unnamed creek, collected by Bradd Simms on 04 October 2006; Little Willow Creek, collected by Mike Gillbertson on 15 November 2006, and by J. Unmuth on 16 September 2015; Center Creek, collected by J. Unmuth on 03 October 2007, 27 September 2013, and 23 September 2014; Ash Creek, collected by J. Unmuth on 19 October 2009; unnamed creek, collected by J. Unmuth on 09 November 2010; Melancthon Creek, collected by J. Unmuth on 01 November 2010 and 10 October 2011; Pine River, collected by J. Unmuth on 23 October 2012; unnamed creek, collected by J. Unmuth on 19 September 2014. All of the collection locations are cool or cold-water streams. The Kenosha County record and two records from Richland County were identified only to the species level, but are included here as they almost certainly represent this subspecies.

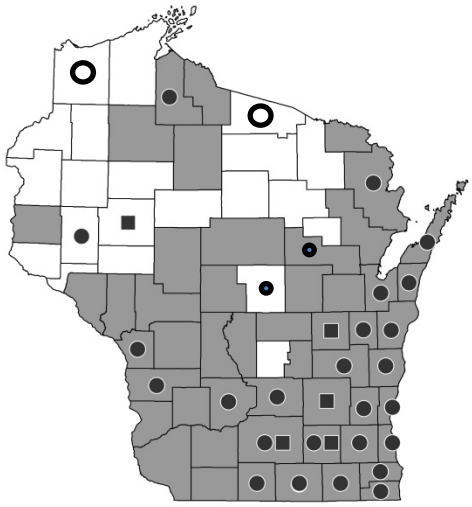


***Caecidotea communis* (Say, 1818) –** Jass and Klausmeier (1997) reported *C. communis* from three counties. The SWIMS database includes collection information from eight additional counties. There is a specimen from Milwaukee County in the USNM collection. The literature record from Dane County comes from Cahn (1915), Muttkowski (1918), Pearse (1918), and Pearse and Achtenberg (1920). In Wisconsin, *C. communis* occurs in warm, cool, and cold-water streams, primarily headwaters. Most SWIMS specimens were collected in October or November, but a small number were taken in April.

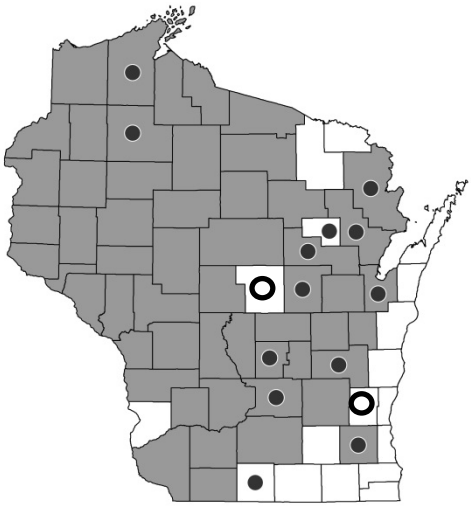
***Caecidotea forbesi* (Williams, 1970) –** The only available Wisconsin records for *C. forbesi* are those reported by Jass and Klausmeier (1990, 1997) from Milwaukee and Ozaukee counties and unpublished NHC observations from Marinette (24 May 2011) and Outagamie (17 May 2000) counties.



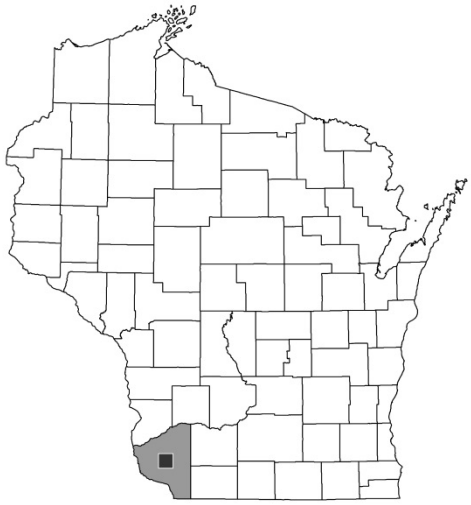
***Caecidotea intermedia* (Forbes, 1876) –** First reported from the state by Bundy (1882), literature records and MPM specimens (summarized in Jass and Klausmeier 1997) documented the occurrence of *C. intermedia* in 17 Wisconsin counties. The SWIMS database includes records from 33 additional counties. USNM specimens are available for Chippewa, Dodge, Jefferson, and Winnebago counties. A specimen from Dane County (mislabeled as Trempealeau County) is available at the MCZ. The records for La Crosse and Vernon counties reflect the presence of *C. intermedia* in Pool 8 of the Upper Mississippi River (Elstad 1986). Other new county records include: Brown (Howmiller 1971, Scudder Eikenberry et al. 2014, 2016), Door (Szczytko and Dimick 2005), Dunn (Northern States Power Company 1977), Kewaunee (Rheaume et al. 1996; Scudder Eikenberry et al. 2014, 2016), Manitowoc (Scudder Eikenberry et al. 2014, 2016), Portage (Hooper 1993), Shawano (Hooper 1993), and Sheboygan (Rheaume et al. 1996; Scudder Eikenberry et al. 2014, 2016). This species' occurrence in additional northcentral and northwest counties can be anticipated. Unpublished NHC records are available for Douglas (8 October 2009) and Vilas (20 July 1979) counties. The species occurs in Lake Superior (Barton and Hynes 1976), and Amin (1978) reported collecting a single juvenile in southwestern Lake Michigan. Collection sites include warm, cool, and cold-water habitats, both headwater streams and main stem rivers. Most SWIMS specimens were collected from September through November, with a smaller number taken in March through May.



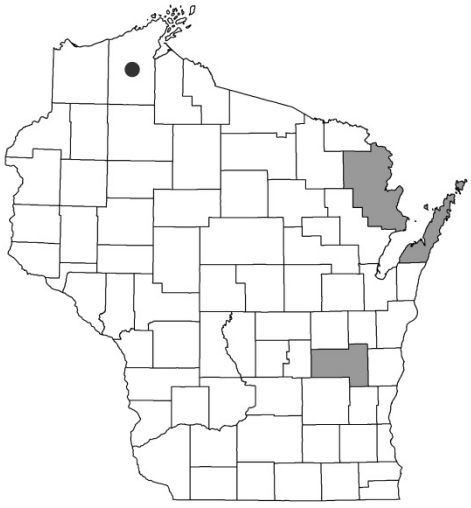
***Caecidotea racovitzai racovitzai* (Williams, 1970) –** Williams (1976) described *C. r. racovitzai* as "the dominant Great Lakes species," but noted that it had yet to be reported from Lake Michigan. Jass and Klausmeier (1990, 1997) documented *C. r. racovitzai* from eight Wisconsin counties. The SWIMS database includes records from 46 additional counties, but with the exception of counties along Green Bay, none of the counties abutting Lake Michigan. The literature records for Brown and Oconto counties come from Scudder Eikenberry et al. (2016). Other new county records include: Bayfield (Clamp 1988), Columbia (Magnuson et al. 1980), Sawyer (Clamp 1988), and Waupaca (Scott 2007). Unpublished NHC records are available from Portage and Washington counties. Collection sites include warm, cool, and cold-water habitats, both headwater streams and main stem rivers. Most SWIMS specimens were collected in October or November, with a smaller number taken in March and April.



***Lirceus fontinalis* Rafinesque, 1820 –** Williams (1976) found *Lirceus fontinalis* typically in springs but also in drain outlets, seeps, and streams in Georgia, Illinois, Indiana, Kentucky, Ohio, and Tennessee. The SWIMS database includes a single Wisconsin record attributable to *L.* cf *fontinalis*: Grant County–Furnace Branch, collected by J. Amerhein on 21 October 2010. Furnace Branch is a cold-water stream. Marilyn Schotte at the National Museum of Natural History confirmed the species identification in 2012, and eight specimens are now in the USNM collection (2059249).



***Lirceus lineatus* (Say, 1818) –** Bundy (1882) listed *L. lineatus* from Wisconsin, but did not provide a specific location. Howmiller (1971) reported collecting a portion of a single specimen in Green Bay that he believed might be this species. Jass and Klausmeier (1990) found no specimens in the MPM collection and failed to find this species in their field searches in southeastern Wisconsin, but speculated that it likely would be found in the state. SWIMS includes records from three counties: Door County–Geisel Creek, collected by Mary Gansberg on 15 April 2016; Fond du Lac County–unnamed creek, collected by John Masterson on 03 November 2010; Marinette County–Mud Brook, collected by Andrew Hudak on 07 October 2014. The literature record for Bayfield County comes from Clamp (1988). This species occurs in Lake Superior as well (Barton and Hynes 1976). Collection sites included warm and cold-water habitats.



Conclusions

Successful biological diversity conservation efforts rely on knowledge of what species occupy a given area, where the species occur within the area, and the factors that influence observed distributions. The above records and accompanying maps illustrate that aquatic isopods are more diverse and widely distributed in Wisconsin than previously published records suggest. Additional fieldwork, evaluation of museum collections, and further analyses of SWIMS data will allow a better understanding of what is needed for conservation purposes. Publication of these updated maps will hopefully stimulate interest in such work.

Acknowledgements

The literature review for this atlas was initiated as a result of the "Wisconsin's Species Diversity: The State of Scientific Knowledge" symposium sponsored by the Aldo Leopold Chapter of the Society for Conservation Biology in April 1997. I am indebted to the chapter's Non-Insect Invertebrates Working Group for providing the push needed to assess our knowledge of these taxa. This report is dedicated to Joan P. Jass, a friend and colleague who devoted a considerable part of her professional life to increasing our knowledge of Wisconsin crustaceans. Her work provides a foundation for this atlas. Terrell Hyde shared unpublished records from the Bureau of Natural Heritage Conservation's files. Dougal Walker prepared the distribution maps. I appreciate their assistance.

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