

The Great Lakes Entomologist

Volume 29
Number 1 - Spring 1996 *Number 1 - Spring 1996*

Article 2

April 1996

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Recommended Citation

Jass, Joan and Klausmeier, Barbara 1996. "Terrestrial Isopods (Isopoda: Oniscidea) of Wisconsin," *The Great Lakes Entomologist*, vol 29 (1)

DOI: <https://doi.org/10.22543/0090-0222.1894>

Available at: <https://scholar.valpo.edu/tgle/vol29/iss1/2>

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TERRESTRIAL ISOPODS (ISOPODA: ONISCIDEA) OF WISCONSIN

Joan Jass & Barbara Klausmeier¹

ABSTRACT

Eleven species of terrestrial isopods are recorded from Wisconsin. Species treatments include morphological, habitat and life history data. Wisconsin county distribution records are presented.

Past authorities have concluded that the common terrestrial isopods encountered in North America are non-native species. The morphological similarities of these North American forms to their European cousins are so close as to make them practically indistinguishable (Garthwaite & Sassaman 1985). Additionally, some of our most common species are ones which in the Old World are considered synanthropes—species found in domestic rather than wild habitats, thus facilitating the explanation of their unintentional introduction by early immigrants. However, in North America, distributions of some of these species include sites far from supposed centers of introduction. One theory explaining this difference is that synanthropes stick close to civilized spots in Europe because of all the other competing species found out in the countryside. Here in the absence of such competition these species may find it easier to expand their ranges farther afield (Van Name 1936). More accurate mapping of the distributions of species found here may help to elucidate the nature and origin of the North American isopod fauna.

Hatchett published "Biology of the Isopoda of Michigan" (1947) which included a key and distribution records of both aquatic and terrestrial species as well as life history information. This admirable work was commended to us as a model for our own studies by William Rapp with the expectation that in Wisconsin we would find "all the species that Hatchett found in Michigan" (Rapp, pers.comm. 1987). We have attempted to follow this recommendation (Jass & Klausmeier 1987, 1990 and Jass, et al. 1991). In this paper we treat each terrestrial Wisconsin species by briefly summarizing its outstanding morphological and habitat preference characteristics, based largely on the literature. A table of Wisconsin life history data as well as county distribution records based on our collecting are included. Distribution data are presented in Figures 1, 2 and 3. Figure 1 names Wisconsin counties and the three species we have found in every one of them. Figures 2 and 3 plot the distributions of the other 8 species. Our field experience is that species may occur alone or in a mixed group of one or more other species; where appropriate we have added a list of associated species summarized from all our collecting data.

In 1883, Bundy reported "*Oniscus* sp. Abundant everywhere"—the assumption being that he was referring to the group Oniscidea, not a particular genus. Other than Bundy, the distribution of terrestrial isopods in Wisconsin

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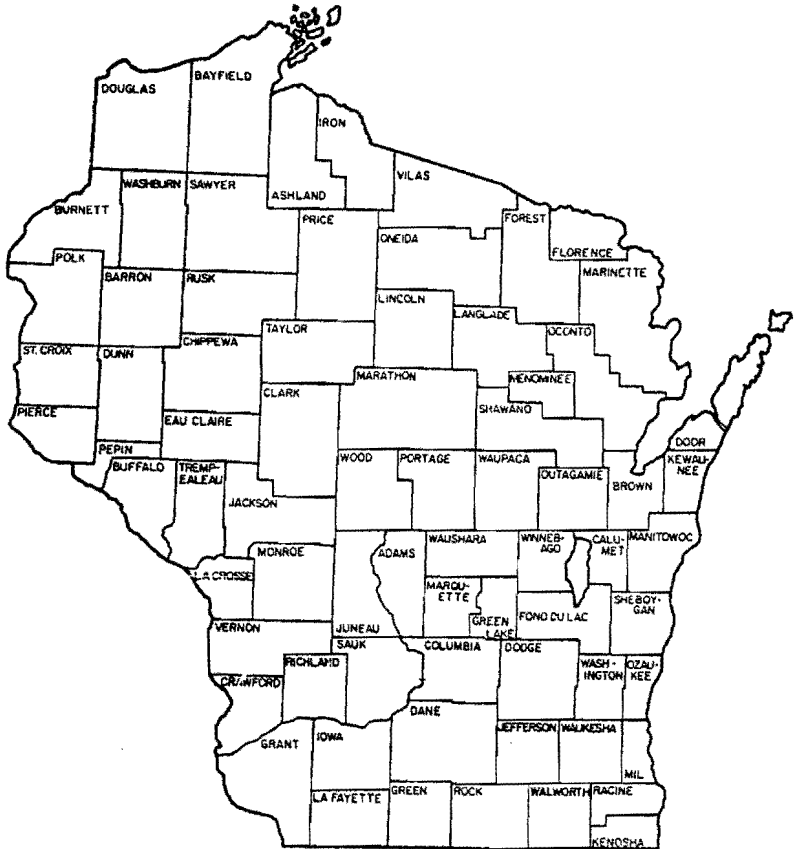


Figure 1. Wisconsin counties named. The MPM collection contains specimens from each county for: *Cylisticus convexus*, *Porcellio spinicornis* and *Trachelipus rathkei*.

has not been treated in the literature. Our collecting represents only a cursory survey compared to the more thorough studies of European, especially British, terrestrial isopods (Harding & Sutton 1985, Hopkin 1991). See Jass and Klausmeier (1990) for distribution records of these species in adjacent states.

It is our intent to encourage others to study Wisconsin isopods both by introducing the subject and by pointing out the deficiency of information regarding these common crustaceans. Field identification may be complicated

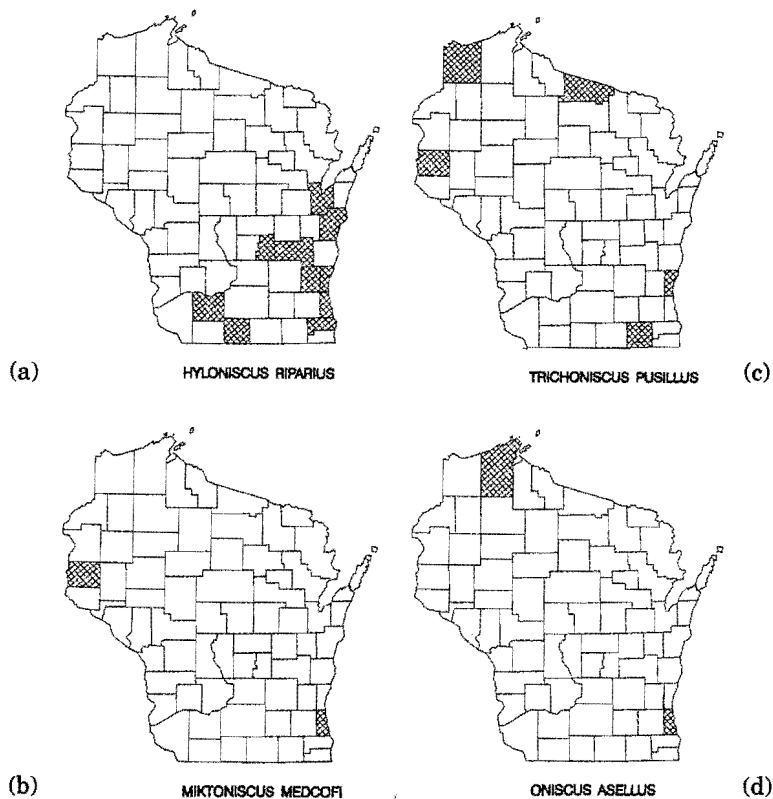


Figure 2. Shading indicates county records for these species in the families Trichoniscidae and Oniscidae, as represented by specimens in the Milwaukee Public Museum collection.

by the occurrence of mixed species groups in the same habitat, the wide variability of color patterns within a species, and the difficulty of observing some of the key morphological features without magnification. We recommend Sutton (1980) for its thorough introduction to terrestrial isopod biology and well-illustrated chapter on identification. We also offer common names, following Hopkin's (1988) study, which determined that these facilitated the education of a wider public to the diversity of this common but inconspicuous group of animals.

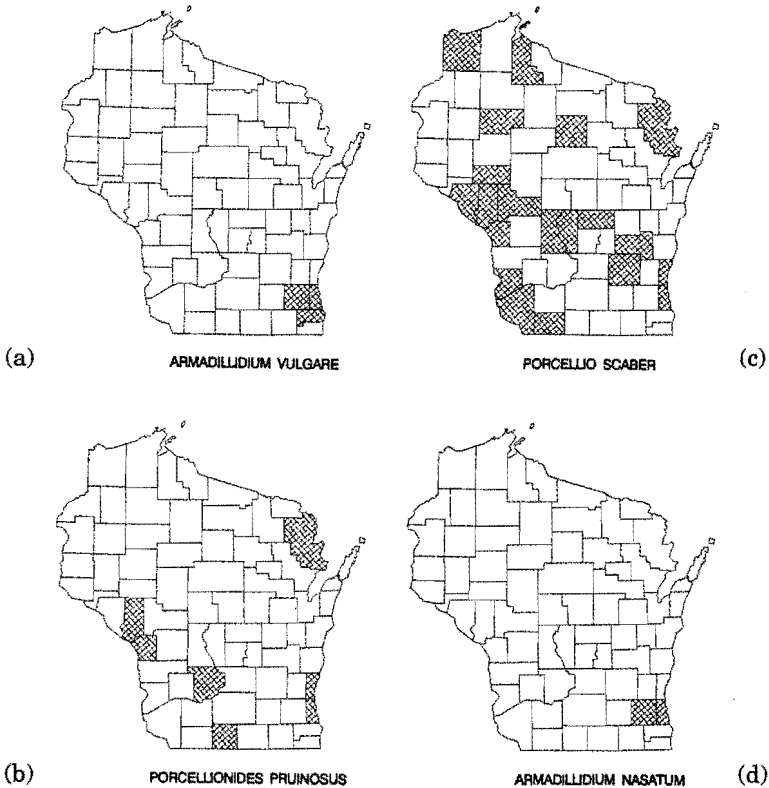


Figure 3. Shading indicates county records for these species in the families Armadillidiidae and Porcellionidae, as represented by specimens in the Milwaukee Public Museum collection.

SPECIES TREATMENTS

TRICHONISCIDAE

Hyloniscus riparius (Koch), riparian isopod

Distinguishing characteristics: mature length to 5.5 mm; eye of one ocellus; body surface shiny; color dark wine-red.

Characteristic habitat: leaf litter near wooded streams and river bottoms. Schultz (1965) redescribed and summarized the ecology of this species in the eastern United States.

Life history data: breeds April-June and August-September with 3 broods per year (Warburg et al. 1984). See Table 1 for Wisconsin data.

Wisconsin associates: *Trachelipus rathkei*, *Trichoniscus pusillus*

***Miktoniscus medcofi* (Van Name)**, Medcof's pigmy isopod

Distinguishing characteristics: mature length to 5 mm; eye of one ocellus; body surface dull with many tiny bumps; color pale.

Characteristic habitat: greenhouses, humus beneath well rotted logs.

Life history data: Schultz (1976) summarized knowledge of all members of this genus in North America. Detailed life history data is available only for the closely related *M. halophilus* which breeds spring-early summer and has only a few of the larger adults over-wintering to the following season. See Table 1 for Wisconsin data.

Wisconsin associates: *Trichoniscus pusillus*

***Trichoniscus pusillus* (Blake)**, common pigmy isopod

Distinguishing characteristics: mature length 5.5 mm; eye of three ocelli; color reddish. Most populations are composed of females only, since the species reproduces parthenogenetically.

Characteristic habitat: leaf litter of wooded river bottoms.

Life history data: breeds February-April, with two broods per year and a two year life span (Warburg et al. 1984). See Table 1 for Wisconsin data.

Wisconsin associates: *Cylisticus convexus*, *Hyloniscus riparius*, *Miktoniscus medcofi*, *Porcellio spinicornis*, *Trachelipus rathkei*

ONISCIDAE

***Oniscus asellus* Linnaeus**, woods isopod

Distinguishing characteristics: antennal flagellum three-segmented; no pseudotracheae; color gray with yellow spots; shape flat and elliptical; uropods extend beyond terminal abdominal segment; eye of many ocelli; mature length to 12 mm.

Characteristic habitat: dead wood, particularly under loose tree bark, where it characteristically clings motionless when disturbed.

Life history data: breeds May-September and has a potential 4.25 year life span (Warburg et al. 1984). See Table 1 for Wisconsin data.

ARMADILLIDIIDAE

***Armadillidium nasatum* Budde-Lund**, beaked pill isopod

Distinguishing characteristics: capable of rolling into a ball; uropods do not extend beyond terminal abdominal segment; very distinct process on forehead projecting prominently between antennae; eye of many ocelli; mature length to 13 mm.

Characteristic habitat: sunny spots in old quarries, gardens, exposed grassland (Hopkin 1991). Often observed when it moves into the open to avoid very wet soil conditions.

Life history data: see Table 1.

***Armadillidium vulgare* (Latreille)**, pill isopod

Distinguishing characteristics: capable of rolling into a ball; uropods do not extend beyond terminal abdominal segment; forehead without distinct process projecting prominently between antennae; eye of many ocelli; mature length to 14 mm.

Characteristic habitat: very dry habitats as well as a wide range of dry to moist habitats. *A. vulgare* is very abundant around the foundations of buildings, rarely occurring far from human habitations.

Life history data: breeds May-July, with 2-3 broods per year and a potential 3-4 year life span (Warburg et al. 1984). See Table 1 for Wisconsin data.

CYLISTICIDAE

***Cylisticus convexus* (DeGeer)**, convex isopod

Distinguishing characteristics: dorsal surface of body smooth and strongly convexed; able to roll the body into a ball except for uropods which extend beyond terminal abdominal segment; bright white legs; little or no gap between fifth abdominal segment and uropods; uropods often orange; antennal flagellum two-segmented; five pair of distinct (when alive) pseudotracheae; eye of many ocelli; mature length to 16 mm.

Characteristic habitat: moist habitats that must remain moist through dry periods, especially late summer. *C. convexus* often inhabits decayed logs after carpenter ants have left. (Schultz 1982)

Life history data: 2-3 broods per year and a potential three year life span (Hatchett 1947). See Table 1 for Wisconsin data.

Wisconsin associates: *Porcellio scaber*, *Porcellio spinicornis*, *Porcellionides pruinosus*, *Trachelipus rathkei*, *Trichoniscus pusillus*

PORCELLIONIDAE

***Porcellio scaber* Latreille**, rough isopod

Distinguishing characteristics: color variable; distinct tubercles (scabers) prominent on dorsal surface including head; head with three anterior lobes, the middle lobe almost as pronounced as the laterals; posterior margin of first thoracic segment fairly straight; two pair of distinct (when alive) pseudotracheae; pleopodal region widest near its anteriormost point; antennal flagellum two-segmented; uropods extend beyond terminal abdominal segment; eye of many ocelli; mature length to 16 mm.

Characteristic habitat: leaf litter and under logs in upland forests, also abundant around human habitations.

Life history data: breeds February-March with three broods per year (Warburg et al. 1984), and has a potential 2.5 year life span (Sutton et al. 1984). See Table 1 for Wisconsin data.

Wisconsin associates: *Cylisticus convexus*, *Trachelipus rathkei*

***Porcellio spinicornis* Say**, dark-headed isopod

Distinguishing characteristics: head and abdomen distinctly darker than thorax; abdomen also dark ventrally; double longitudinal row of yellow patches on dorsal surface; two pair of distinct (when alive) pseudotracheae; antennal flagellum two-segmented; uropods extend beyond terminal abdominal segment; eye of many ocelli; mature length to 15 mm.

Characteristic habitat: Limestone or sandstone seem important in the habitat selection of this species. However, it is mainly synanthropic, linked with the presence of mortar and with limestone walls.

Life history data: see Jass et al. (1991) for a detailed study of the life history of this species. See Table 1 for Wisconsin data.

Wisconsin associates: *Cylisticus convexus*, *Trachelipus rathkei*, *Trichoniscus pusillus*

***Porcellionides pruinosus* (Brandt)**, frosty isopod

Distinguishing characteristics: antennal segments white at distal and proximal ends giving appearance of joints banded with white; antennal flagellum two-segmented; frosty narrow body with abruptly narrow abdomen; two pair of distinct (when alive) pseudotracheae; uropods extend beyond terminal abdominal segment; eye of many ocelli; mature length to 12 mm; very quick.

Characteristic habitat: Many records are from manure piles, compost heaps and around buildings. *P. pruinus* also occurs under bark of decaying hardwood trees on pasture land. (Hopkin 1991)

Life history data: breeds March-October with 3-6 broods per year (Warburg et al. 1984). See Table 1 for Wisconsin data. A Wisconsin greenhouse population collected in December contained males, females and females with eggs.

Wisconsin associates: *Cylisticus convexus*, *Trachelipus rathkei*

TRACHELIPIDAE

Trachelipus rathkei (Brandt), mottled isopod

Distinguishing characteristics: wide variability in color—often mottled with three distinct double stripes along body length; pleopodal region widest near its midpoint; head with three anterior lobes, the middle lobe less pronounced than the laterals; margin of first thoracic segment strongly curved; 7th leg of male with prominent keel-like expansion on dorsal border of third segment from distal end; five pair of distinct (when alive) pseudotracheae; antennal flagellum two-segmented; uropods extend beyond terminal abdominal segment; eye of many ocelli; mature length to 12 mm.

Characteristic habitat: under dead bark, logs, boards, rocks, etc. Its wide distribution is correlated with fairly unspecific habitat requirements, though Rapp (1988) says it shows a preference for deciduous woodlands in North America.

Life history data: 1-3 broods per year (Hatchett 1947). See Table 1 for Wisconsin data.

Wisconsin associates: *Cylisticus convexus*, *Hyloniscus riparius*, *Porcellio scaber*, *Porcellio spinicornis*, *Porcellionides pruinus*, *Trichoniscus pusillus*

DISCUSSION

As Wisconsin's only terrestrial crustaceans, isopods are unique in the extent to which they are challenged by the difficulties of survival in a dry environment. The smallest species are the most vulnerable and thus are usually found only in fairly wet habitats such as river bottoms. The risk for loss of body moisture is greatest at the point where the isopod must interface with the dry air containing the oxygen it needs to breathe. Some of the larger species have a special adaptation to protect themselves at this point: pseudotracheae, which are abdominal organs acting as miniature humidity chambers for oxygen exchange. Even though species with pseudotracheae are better able to tolerate some dryness, the tendency is for all isopods to seek niches which are high in humidity.

The state's most abundant and widespread species, *Trachelipus rathkei*, is the least specific in its habitat requirements. This broad tolerance is at least in part related to its five pairs of pseudotracheae which give it the ability to survive a greater range of conditions of dryness/humidity. However, as important as the ability to tolerate dryness may be, no doubt the complete picture of a species' distribution in the state is due to a complicated mosaic of factors, including cold tolerance, habitat preference, and specific life history requirements.

Appendix 1 lists the number of pairs of pseudotracheae for each of Wisconsin's terrestrial isopods. Appendix 2 correlates average monthly precipita-

Table 1. Life history data for Wisconsin isopod populations.

Species	J	F	M	A	M	J	J	A	S	O	N	D
<i>Hyloniscus riparius</i>												
male					▲	▲	▲	▲	▲	▲	▲	▲
female				▲	▲	▲	▲	▲	▲	▲	▲	▲
female with eggs				▲	▲		▲	▲				
female with young							▲	▲	▲			
<i>Miktoniscus medcofi</i>												
male											▲	
female											▲	
female with eggs												
female with young												
<i>Trichoniscus pusillus</i>												
male												
female						▲			▲	▲	▲	
female with eggs						▲			▲			
female with young						▲				▲		
<i>Oniscus asellus</i>												
male				▲			▲		▲			
female				▲			▲		▲			
female with eggs				▲			▲					
female with young												
<i>Armadillidium nasatum</i>												
male								▲	▲	▲		
female								▲	▲	▲		
female with eggs												
female with young												
<i>Armadillidium vulgare</i>												
male		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
female		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
female with eggs					▲		▲					
female with young												
<i>Cylisticus convesus</i>												
male					▲	▲	▲	▲	▲	▲	▲	▲
female					▲	▲	▲	▲	▲	▲	▲	▲
female with eggs					▲	▲	▲	▲	▲			
female with young						▲	▲					
<i>Porcellio scaber</i>												
male					▲	▲		▲	▲	▲	▲	▲
female			▲	▲	▲	▲			▲	▲		
female with eggs					▲	▲	▲					
female with young						▲						
<i>Porcellio spinicornis</i>												
male			▲	▲	▲	▲	▲	▲	▲	▲	▲	
female			▲	▲	▲	▲	▲	▲	▲	▲	▲	
female with eggs					▲	▲	▲					
female with young						▲	▲					
<i>Porcellionides pruinosus</i>												
male				▲			▲			▲		
female			▲		▲	▲	▲	▲		▲		
female with eggs					▲							
female with young						▲						
<i>Trachelipus rathkei</i>												
male	▲		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
female				▲	▲	▲	▲	▲	▲	▲	▲	▲
female with eggs				▲	▲	▲	▲	▲	▲	▲	▲	▲
female with young					▲	▲	▲	▲	▲	▲		

tion and temperatures to isopod activity in Wisconsin. Unsurprisingly, the four months with average temperatures below freezing are also those with the least activity since isopods surviving through the winter generally do so by remaining below the frost line. During the rest of the year, the month with the most activity (July) is also that with the highest average temperature, while the poor collecting in November corresponds to the lowest non-freezing average. There may also be a secondary correlation with precipitation. Months in which we have collected 64% or more of the state's species have an average total precipitation of 2.40 inches or greater; months in which we have collected 45% or fewer of the species have 1.90 inches or less.

ACKNOWLEDGMENTS

We are grateful for the assistance of A. & J. Bergmann and E. Stropes.

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APPENDIX 1. Species grouped by the numbers of pairs of pseudotracheae

NONE	TWO PAIRS	FIVE PAIRS
<i>Hyloniscus riparius</i>	<i>Armadillidium nasatum</i>	<i>Cylisticus convexus</i>
<i>Miktoniscus medcofi</i>	<i>Armadillidium vulgare</i>	<i>Trachelipus rathkei</i>
<i>Oniscus asellus</i>	<i>Porcellio scaber</i>	
<i>Trichoniscus pusillus</i>	<i>Porcellio spinicornis</i>	
	<i>Porcellionides pruinosus</i>	

APPENDIX 2. Precipitation & temperatures* correlated with percent of species collected

	Mean Precipitation (inches)	Mean Temperature (°F)	Percent of Species Collected
Jan	1.20	14	09
Feb	1.20	17	18
Mar	1.65	29	45
Apr	2.50	42	64
May	3.50	55	64
Jun	4.15	65	64
Jul	3.45	70	82
Aug	3.45	68	64
Sep	3.75	60	73
Oct	2.40	48	64
Nov	1.90	33	45
Dec	1.25	20	09

*Source: WI Dept. Nat. Resources. *The Natural Resources of Wisconsin*.