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Joan Jass

*Milwaukee Public Museum*, [jass@mpm.edu](mailto:jass@mpm.edu)

Barbara Klausmeier

*Milwaukee Public Museum*

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## Wisconsin Freshwater Isopods (Asellidae)

Joan Jass and Barbara Klausmeier  
Milwaukee Public Museum, Inc.  
Milwaukee, Wisconsin 53233  
email jass@mpm.edu

*Abstract:* Four species of freshwater isopods in the family Asellidae were collected from Wisconsin. There is very little published information on the asellid isopods of Wisconsin. In this paper we provide descriptions of the size range, habitat characteristics, distribution, and life history traits of Wisconsin asellids based on data from our field work and information from the literature. We include a provisional key for identification of the male asellids which have been collected from Wisconsin.

### Introduction

Freshwater isopods, crustaceans of the family Asellidae, are found throughout the Northern Hemisphere in virtually all types of aquatic habitats. Those North American species found in surface water habitats belong to the genera *Caecidotea*--17 species and *Lirceus*--1 species (Pennak 1989). Williams (1970) recorded only *Caecidotea intermedia* (his *Asellus intermedius*) from Wisconsin, but described two new asellids (*A. forbesi* and *A. racovitzae racovitzae*) from nearby sites in the adjoining states of Iowa and Michigan. Williams separated *A. racovitzae racovitzae* from the more southerly *A. r. australis* because of significant morphological differences. Jass and Klausmeier (1990) reported Wisconsin records for all three of these taxa. We now have collected four freshwater isopod species from Wisconsin: 1) *Caecidotea communis*, 2) *C. forbesi*, 3) *C. intermedia*, 4) *C. racovitzae racovitzae*.

The identification of asellids is difficult because of the pronounced morphological variation within species. Species-specific traits have been identified only for the abdominal appendages of the males. Identification difficulties also affect the availability of other data. For example, morphometric data are usually given in the literature for males only, because of the uncertainty of associating females with conspecific males where the potential for mixed species populations exists. Even those male characters accepted as diagnostic, features of the endopod of the second pleopod viewed at high magnification, show a great deal of individual variation (e.g., Williams 1970, Figure 10). In order to simplify identification of the four known Wisconsin asellids, we have developed a key to distinguish these taxa.

Very little is known about the life history traits of the asellid isopods. The seasonal timing of the presence of females with eggs and females with young in populations of freshwater isopods provides valuable basic information for the interpretation of the life histories of these species. We provide data on the presence of these life history stages in the collection of the Milwaukee Public Museum.

This paper provides a provisional key to the Wisconsin asellids and summarizes information on the size ranges of males, habitat characteristics, life history, and distribution of the species. We hope that the compilation and summary of this information will inspire further work on the Wisconsin asellids.

## Methods

During a study of amphipod crustaceans conducted May through October 1994, we used dipnets to sample freshwater habitats in 21 southeastern Wisconsin counties (Jass & Klausmeier 1995). In addition to the amphipods, asellid isopods were collected from many of these localities.

Using the available literature, we attempted to identify these asellids as well as all Wisconsin members of this family from earlier collections present in the Milwaukee Public Museum. We developed a key using morphological features to distinguish males of the four asellids of Wisconsin.

In order to provide basic information on the life history of Wisconsin asellids, we have recorded the presence of males, females, females with eggs, and females with young in over 500 collections from Wisconsin in the Milwaukee Public Museum collection. Ideally, interspecific comparisons of life history traits would be based on equal sample sizes for each species. However, of the 500-plus Wisconsin asellids in the Milwaukee Public Museum collection, roughly 80% of them belong to the most common species *Caecidotea intermedia*, with the remaining 20% divided among the three other, far less common species. A great deal of additional collecting effort would be required to acquire comparable-sized samples of the rarer asellids. Therefore, we present our data with the caution that further research (which we hope to encourage) may reveal a quite different picture of the comparative life histories of these isopods.

## Species Summaries

The resulting summaries of data from these Wisconsin asellid specimens include: size range of mature males in terms of body length, characteristic habitats, presence of mature males and females with eggs or young month-by-month throughout the collecting season, and Wisconsin counties with records (Figure 1). The concentration of asellid collections in counties of southeastern Wisconsin (Figure 1) is probably a function of collection intensity rather than an

accurate reflection of distribution. Life history data and county records are based on specimens in the Milwaukee Public Museum, except where the literature is cited. Supplemental life history information for *Caecidotea communis* and *C. r. racovitzai* is found in Smith (1988) and for *C. forbesi* and *C. intermedia* in Williams (1976). We provide a provisional key to the males of these species (Appendix 1).

*Caecidotea communis* ▾

*C. forbesi* ●

*C. Intermedia* •

*C.r.racovitzai* ▲



Fig. 1. Wisconsin county records based on specimens in the Milwaukee Public Museum collection (the majority of which were collected in a study of 21 counties in the southeastern quarter of the state).

### 1. *Caecidotea communis* (Say 1818)

Mature size: Males, 4.0-18.0 mm (Williams 1970).

For this species only, size data for females also are available. Smith (1977), reporting from a Massachusetts population study where the presence of any other asellid species had been ruled out, gave a range of 5.0-12.0 mm for female body length.

Characteristic habitat: in most permanent aquatic habitats where decaying vegetative debris is present.

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Table 1. Month of collection for various life history categories in Wisconsin collections of *Caecidotea communis*.

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MONTH	MALES	FEMALES	FEMALES WITH EGGS	FEMALES WITH YOUNG
Mar	X	X		
Apr	X	X	X	
May	X	X	X	X
Jun	X	X		
Jul	X	X		
Aug	X			
Sep	X			
Oct				

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Wisconsin counties with records: Bayfield, Fond du Lac, Portage.

### 2. *Caecidotea forbesi* (Williams 1970)

Mature size: Males, 6.0-18.5 mm (Williams 1970).

Characteristic habitat: typically in temporary ponds, flood pools, and sloughs, but also in marshes, small creeks, and occasionally lakes.

Wisconsin life history data: Mature males of this species were found during the month of May only. Because of the uncertainties of identifying females and immatures, at this time no attempt has been made to further detail the life history of this species in Wisconsin.

Wisconsin counties with records: Milwaukee, Ozaukee.

### 3. *Caecidotea intermedia* (Forbes 1876)

Mature size: Males, 4.0-16.0 mm (Williams 1970).

Characteristic habitat: typically in running waters (creeks, streams and rivers), but also in springs, ditches, ponds, lakes.

Table 2. Month of collection for various life history categories in Wisconsin collections of *Caecidotea intermedia*.

MONTH	MALES	FEMALES	FEMALES WITH EGGS	FEMALES WITH YOUNG
Mar	X	X	X	X
Apr	X	X	X	X
May	X	X	X	X
Jun	X	X		
Jul	X	X		
Aug	X			X
Sep	X			
Oct	X			

Wisconsin counties with records: Ashland (Williams 1970), Calumet, Columbia, Dane, Fond du Lac, Green, Jefferson, Kenosha (Amin et al.1980), Marinette, Milwaukee (Williams 1970), Ozaukee (Jaeger 1977), Racine (Amin et al.1980), Rock, Sauk (Bundy 1883), Walworth, Washington (Jaeger 1977), Waukesha.

### 4. *Caecidotea racovitzai racovitzai* (Williams 1970)

Mature size: Males, 4.0-15.0 mm (Williams 1970).

Characteristic habitat: prefers cooler water than *C. communis*, often found in streams which are fed by seepage or springs.

Table 3. Month of collection for various life history categories in Wisconsin collections of *Caecidotea racovitzai racovitzai*.

MONTH	MALES	FEMALES	FEMALES WITH EGGS	FEMALES WITH YOUNG
Mar	X		X	
Apr	X	X	X	
May	X			
Jun				
Jul	X	X	X	X
Aug				
Sep	X			
Oct	X	X		

Wisconsin counties with records: Fond du Lac, Green, Marinette, Marquette, Menominee, Shawano, Waukesha, Waupaca.

### Discussion

In spite of the almost ubiquitous appearance of this group in freshwater habitats, there is a scarcity of verifiable species data on asellid isopods. For example, although *Asellus communis* (*Caecidotea communis*) was the first North American species described in its genus, we present the first record of this taxon in Wisconsin. The North American literature does contain many older records which subsequently have been discounted because later, more detailed studies (Williams 1970) revealed the unreliability of traits formerly accepted as adequate for species identification. In some other crustacean groups with similar problems, Scanning Electron Micrographs of the female genital pore (e.g. Barnwell 1988) have provided the long-sought reliable trait for species separation of females. Thus far, a solution like this has not been found for asellids.

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#### APPENDIX 1. KEY FOR WISCONSIN *CAECIDOTEA* SPECIES (MALES ONLY)

Figure 2 (from Smith 1988)-left is a ventral view of the thoracic-abdominal region of a male isopod, PII being the second abdominal pleopod. Figure 2-right is PII removed, showing the endopod "E" and the spine-bearing exopod. The distal processes of the endopod are seen best on its ventral surface, with the aid of high magnification (X100+). Figure 3 shows ventral and dorsal views of two species from Smith (1988). Use of illustrations available in the literature (Lewis and Bowman 1981, Pennak 1989, Smith 1988 and 1995, Williams 1970 and 1976) is invaluable for species identification. Because of the difficulties stated above, identifications reached using our key should be regarded as tentative at best.

- 1 Endopod with two processes:
  - a cannula and a caudal process.....2
- 1' Endopod with three processes (seen on the ventral side only):
  - a cannula, a mesial process and a caudal process.....3
  
- 2 Cannula elongate, caudal process blunt.....*C.communis*
- 2' Cannula squared off, caudal process hooked.....*C.intermedia*
  
- 3 Gap separating cannula  
from caudal & mesial processes.....*C.r.racovitzai*
- 3' No gap separating cannula  
from caudal & mesial processes.....*C.forbesi*

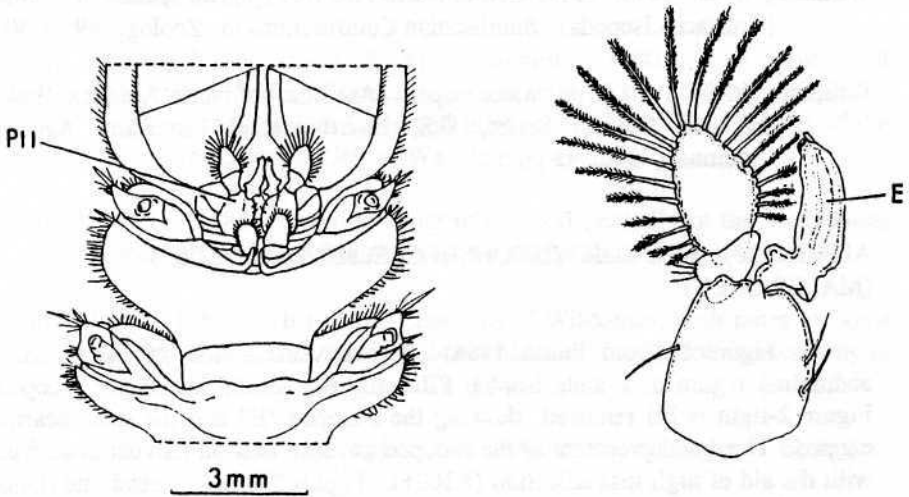


Fig. 2. Ventral view of portions of a male isopod, positioned with posterior end toward top of page to give proper orientation for use of key. Left—two posteriormost thoracic segments and portion of abdomen; PII=second abdominal pleopod. Right—PII enlarged; E=endopod (inner segment).

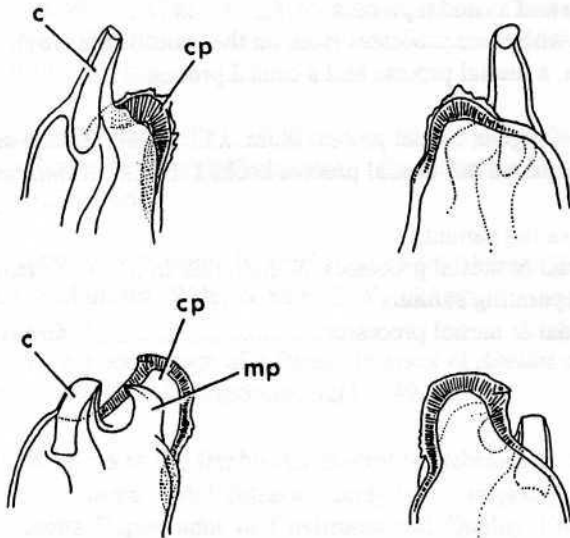


Fig. 3. Tip of the endopod of the male second pleopod, left side. Left figures—ventral view (side held closet to the body in living animal), right figures—dorsal view; c=cannula, cp=caudal process, mp=mesial process. Above—*Caecidotea communis*, below—*C.r. racovitzai*.