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Notes on the Milliped *Pleurolooma flavipes* (Polydesmida: Xystodesmidae) in Wisconsin

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Abstract: The milliped *Pleurolooma flavipes* Rafinesque 1820 is one of the more widespread and better known North American millipeds. During the course of recent studies in Wisconsin, we have had opportunities to examine museum specimens and make field observations of this species. In this note, we report new locality records, discuss observations of mass aggregations, describe a color variation, and illustrate an individual with developmental abnormalities.

Distribution

P. flavipes has the largest range of any Xystodesmid, being found throughout the Midwest and east-central United States from southwestern North Dakota to Massachusetts, south to northern Louisiana and central western North Carolina (Shelley 1980). It has previously been reported from Wisconsin. Wheeler (1890) found *P. flavipes* to be "not uncommon in some parts of Wisconsin." In revising the genus *Pleurolooma*, Shelley (1980) recorded *flavipes* from Crawford, Dane, Milwaukee, Sauk, and Washburn counties. Additional records from Green, Ozaukee, Pepin, Walworth, and Waukesha counties were reported by Watermolen (1995), but specific locality information was not provided.

Collection information from Watermolen's (1995) records include: A female *P. flavipes* was collected 3 May 1917 near Big Bend, Waukesha County. A male specimen was collected 23 June 1982 at Abrahams Woods, Green County (T3N, R8E, Sec. 31). Ten specimens, seven males and three females, were collected 16 July 1996 at Albany State Wildlife Area, Green County (T3N, R9E, Sec. 17). Six male and one female specimen were collected at Riveredge Nature Center, Ozaukee County (T11N, R21E, Sec. 7) in May 1993. Specimens are maintained in the Milwaukee Public Museum invertebrate collection; one

male from Ozaukee County was deposited in the North Carolina State Museum of Natural Sciences' collection.

An additional male was collected at Lake Como, Walworth County on 8 July 1938 (Field Museum of Natural History), and four male specimens were collected at Lake Pepin, Pepin County on 15 May 1932 (National Museum of Natural History). Figure 1 depicts the distribution of *P. flavipes* in Wisconsin, including these new county records. Further field work will likely show that the species occurs throughout the remainder of southern Wisconsin.

Collection data from all available specimens and literature records indicate that *P. flavipes* is active in Wisconsin from May through October.

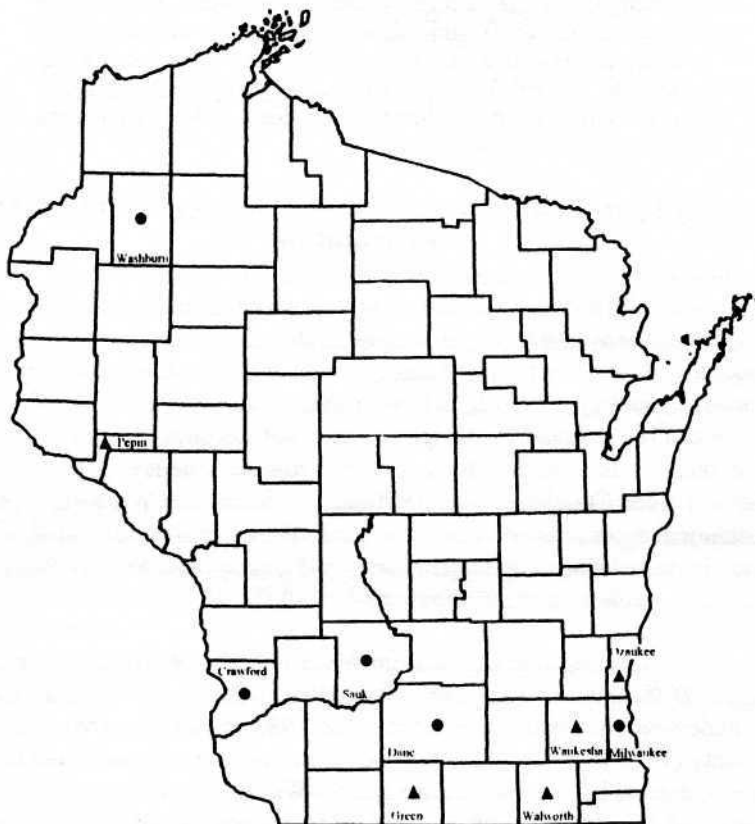


Figure 1. Distribution of *Pleurolooma flavipes* in Wisconsin. Dots are records reported by Shelley (1980); triangles are records reported herein. Symbols are county records plotted in the center of each county.

Habitat

P. flavipes occupies a variety of habitats (Shelley 1980), but has not previously been reported from coniferous swamps or prairies. The 1917 specimen from Waukesha County was collected from the roots of a wood anemone (*Anemone quinquefolia*) in a tamarack (*Larix laricina*) swamp. The Ozaukee County specimens were collected during a mass migration from a prairie planting (see below). Predominant plant species growing in the prairie plantings include stiff goldenrod (*Solidago rigida*), greyheaded coneflower (*Ratibida pinnata*), Indian grass (*Sorghastrum nutans*), and big bluestem (*Andropogon gerardi*).

Specimens collected in Albany State Wildlife Area, Green County were taken from under a pile of oak leaves (*Quercus* spp.) and were observed under a variety of logs and debris throughout the mixed hardwoods portions of the area. These observations are similar to Causey's (1951) collections from dry litter on an oak-hickory hillside.

Mass Aggregation

Mass aggregations and migrations have been observed in *P. flavipes* several times in Arkansas, Indiana, and West Virginia (e.g., Mauck 1901, Young 1957). Shelley (1980) urged that the next mass aggregation of *P. flavipes* discovered be sampled and analyzed scientifically. We observed a mass aggregation of this species in Ozaukee County in May and June 1993, but were unaware of Shelley's recommendation at that time and made limited observations. We report here, however, our observations with the hope of adding to the little that is known about this phenomenon (see Shelley 1980 for a review of previously published reports).

On the morning of 26 May 1993, a large number of *P. flavipes* were found leaving two small (approx. 2 acres) mesic prairie plantings and crossing an adjacent asphalt parking area at Riveredge Nature Center. It had rained the previous four days (approx. 21 mm total rainfall, UW-Milwaukee Field Sta., pers. comm.) and the parking lot was covered with water (5-15 mm deep). The millipeds walked holding their head and anterior segments slightly elevated. Prior to this time *P. flavipes* had not been observed in the prairie plantings or parking area, but was occasionally encountered in nearby mixed deciduous forests (primarily *Acer saccharum*, *Tilia americana* and *Fagus grandifolia*).

Unlike the observations by Bollman (1888) and Young (1958), the aggregation we observed was comprised primarily of adults.

On 5 June large numbers of *P. flavipes* were discovered in the nature center basement congregated beneath a fluorescent security light. A door, opening at grade adjacent to the prairie planting, apparently provided access to the building. Although individual milliped movement generally appeared random, individuals seemed to be associated in pairs separated by 5-7.5 cm. When left undisturbed, the millipeds were observed moving in a counter-clockwise circle directly beneath the security light, suggesting a behavioral effect from the fluorescent light. Two hundred sixty-four individuals were removed from the basement on 8 June (Fig. 2).

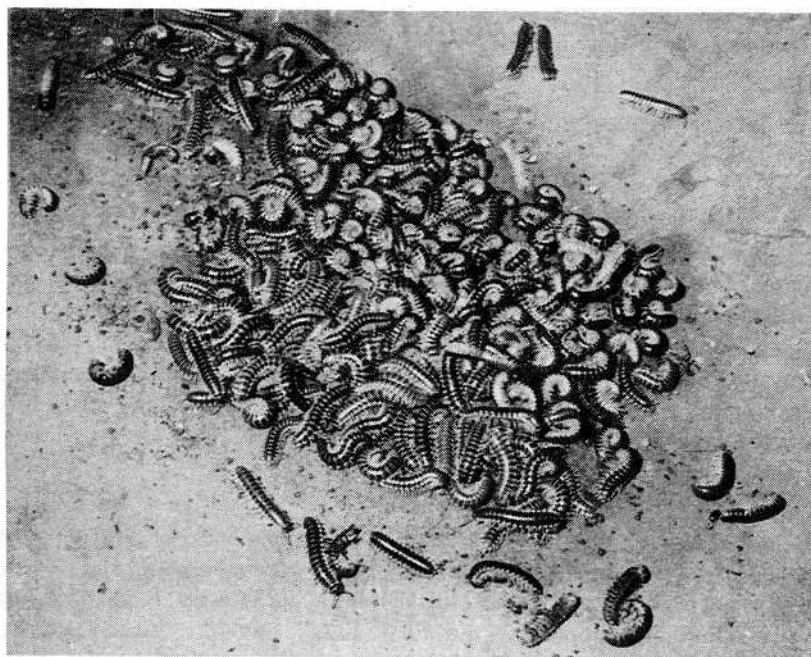


Figure 2. Large numbers of *Pleuroloma flavipes* were found in the nature center basement. Photograph taken by G.A. Larsen as millipeds were being swept out of the basement.

Millipeds were again observed crossing the parking lot on 14 June. There had been no rain the previous five days. Approximately 1.2 cm fell on 14 June, and water was again flowing across the pavement. Numerous millipeds were found dead where the water had puddled. About 150 individuals were removed from the nature center basement. Similar observations were made over the course of the following week with only a few millipeds crawling actively in the basement. However, on several occasions, more than 100 individuals were found coiled and inactive under a nylon tarp on the basement floor. Millipeds remained active and observable in the prairie plantings throughout this time. Activity gradually declined over the following week, until 29 June when only a few individuals were observed in the building and none were readily observable in either the prairie planting or parking area. A similar aggregation was observed at Riveredge again in June 1996. These two instances represent the only observations of this behavior at Riveredge during the past 25 years.

Large numbers of *P. flavipes* were also observed at Albany State Wildlife Area in Green County, Wisconsin in July 1996. Specimens were found under nearly every fallen log, actively crawling in the leaf litter, and ascending the concrete block foundation of an old building in the open sunlight. Although excessively abundant at the time of our visit, the millipeds did not appear to be aggregating. However, numerous dry, dead specimens were observed in an open, well-drained sandy area suggesting that an aggregation had occurred. Ants (*Formica* sp.) had moved several specimens to the tunnel openings atop their mounds.

Cloudsley-Thompson (1949) concluded that mass migrations were a result of drought preceded by a few years of extremely favorable conditions which enhanced reproduction. However, Shelley (1980) pointed out that this opinion is based mostly on fragmented literature reports, mostly short, unscientific notes. While there are no definitive data to confirm or disprove Cloudsley-Thompson's opinion, our observations seem to refute it.

Southeastern Wisconsin did not experience a drought in 1993. Spring precipitation preceding the Ozaukee County aggregation (March-May) was 118.1 mm above average, and the total annual precipitation in 1993 exceeded the yearly average by 88.1 mm (Anonymous 1994, Wis. Leg. Ref. Bureau 1995). A drought occurred in 1992, however, with spring (March-May) and summer (June-August) precipitation 54.9 mm and 79.1 mm below average, respectively (Anonymous 1993, Wis. Leg. Ref. Bureau 1995). Aggregation and migration behaviors were not observed in that year, even though the 1992 drought followed two years with above average precipitation during the growing season

(Popp 1992, Wis. Leg. Ref. Bureau 1995). Similarly, precipitation in June 1996, corresponding with the second observed aggregation at Riveredge and the exceptional numbers observed in Green County, was above average (pers. obs.).

Shelley (1980) believed that the tendency of *P. flavipes* to aggregate and migrate may help explain its wide distribution. Our observations suggest that this behavior can also be detrimental to significant portions of local populations (e.g., in the case of the Ozaukee County aggregation, numerous individuals drowned; in the Green County case, numerous individuals were apparently desiccated as they crossed the sandy area). Barber (1915) reported similar milliped mortality along an exposed vertical bank. To be an effective dispersal mechanism, the advantages of dispersing must exceed the risks of mortality. Our observations suggest that the advantages of aggregation and migration may not always exceed the risks of mass mortality.

Color Variation

P. flavipes is a highly variable species in dorsal color pattern, with local gene pools displaying phenotypic differences from neighboring populations (Shelley 1980). Shelley (1980) described three color patterns: 1) individuals with black middorsum and yellowish paranota (dorsolateral projections or "keels"), 2) individuals with a middorsal row of yellowish spots, and 3) individuals with stripes along the posterior margins of each segment and the anterior edge of the collum (first segment) connecting the paranotal spots and the same color as the latter markings. In the third pattern, the stripes and paranotal spots are yellowish and the remainder of the dorsum is brown to black. Specimens collected and observed in Green County in 1996 display a variation of this third pattern and appear to be amelanistic (lack dark pigment).

Coloration of living specimens we examined is as follows: dorsum pale gray, with narrow, darker gray middorsal line (most apparent on segments 10-19, absent in preserved material); paranota, caudal margins of segments, and anterior edge of collum creamish white. Specimens of this color variation were observed coexisting with individuals with black middorsum and yellowish paranota. Representative specimens were deposited in the Milwaukee Public Museum collection.

Teratomorphic (Abnormally Developed) Specimen

In examining over 200 specimens of *P. flavipes*, Mauck (1901) found no variation in the number of segments (7) found in the antennae. A single male specimen collected in Green County in 1996 had a bifurcated antennae on its right side. The proximal three segments appear normal, but the fourth segment consists of two separate segments each providing the base for two normally appearing, though reduced, series of four additional segments (Fig. 3). Antennae in all other specimens we examined were longer than those observed by Shelley (1980), extending to the caudal edge of the fifth segment rather than the third.

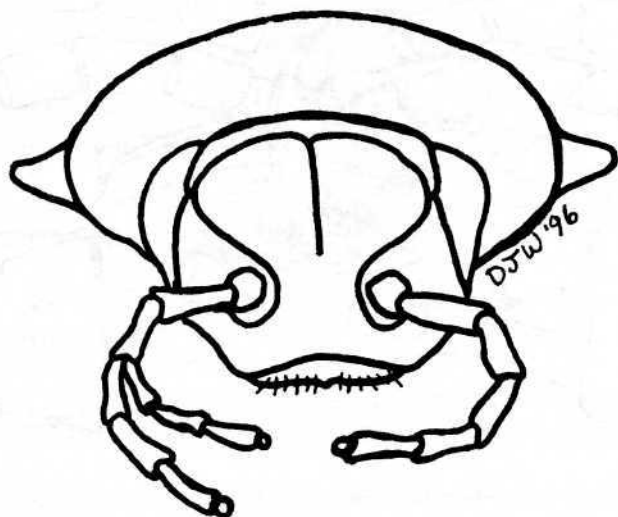


Figure 3. Diagram of bifurcated antenna on right side of *Pleuroloma falvipes* specimen from Green County. Setation omitted.

Shelley (1980) described the broadly curved solenomerite of the gonopod, overlapping or nearly overlapping the tibial process, as the most consistent feature of *P. flavipes*. He noted an aberrant condition, in which the prefemoral process was bent, in only a few males. The specimen with the bifurcated antenna also had an unusually shaped right gonopod (Fig. 4). The solenomerite and tibial process are normally formed, but the entire gonopod curves deeply away from the center of the body and does not extend cephalad

from the aperture as described and illustrated by Shelley (1980, 1988). The gonopod is slightly longer than the left gonopod and somewhat thickened at the base. The prostatic groove is not visible and appears absent from the dorsal face of the solenomerite. The left gonopod appears normal in all aspects.

We cannot speculate on whether these abnormalities are genetically-caused, environmentally induced, or the result of a combination of factors.

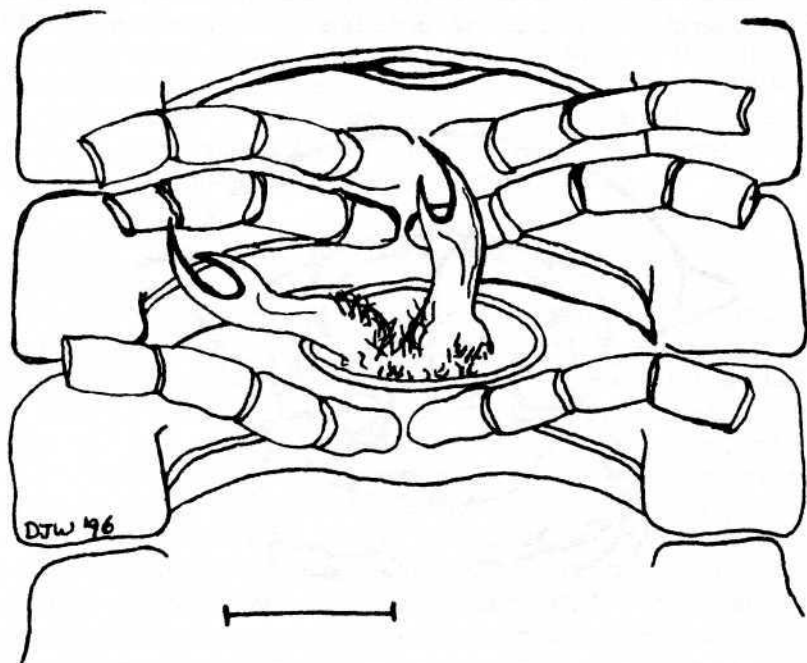


Figure 4. Gonopods of *Pleuroloma flavipes* specimen from Green County *in situ*, showing teratomorphic right gonopod. Setation omitted. Scale bar = 2 mm.

Conclusions

The milliped fauna of Wisconsin remains poorly known. Distribution and habitat use for many species remains undocumented, and ecology and behavior are largely unstudied. We urge others to initiate investigations and report their observations.

Acknowledgments

R.M. Shelley, North Carolina State Museum of Natural Science, confirmed our identification of the Ozaukee County *P. flavipes*. J.P. Jass, Milwaukee Public Museum, allowed us to examine specimens and shared the Wheeler (1890) reference. J. Schimpf and J. Pardee, Wisconsin Department of Natural Resources, helped collect the Green County specimens. Weather data for 1993 were provided by the UW-Milwaukee Field Station. W. Tans, Wisconsin Department of Natural Resources, commented on an early draft of the manuscript. J. Bleser prepared Figure 1. We appreciate the assistance of each these individuals.

Literature Cited

- Anonymous. 1994. Meteorological data for 1993. Pp. 38-42 *In Ann. Rept. Univ. Wisconsin-Milwaukee Field Sta.*, Milwaukee.
- Anonymous. 1993. Meteorological data for 1992. Pp. 46-50 *In Ann. Rept. Univ. Wisconsin-Milwaukee Field Sta.*, Milwaukee.
- Barber, H.S. 1915. Migrating armies of myriopods. *Proc. Entomol. Soc. Washington* 17: 121-123.
- Bollman, C.H. 1888. A preliminary list of the myriopods of Arkansas with descriptions of new species. *Entomol. Amer.* 4(1):1-8.
- Causey, N.B. 1951. The milliped assembly *Zinaria butleri* isogen (*Xystodesmidae*). *Proc. Arkansas Acad. Sci.* 4:73-88.
- Cloudsley-Thompson, J.L. 1949. The significance of migration in Myriapods. *Ann. Mag. Nat. Hist.* 2(12):947-962.
- Mauck, A.V. 1901. On swarming and variation in a myriapod (*Fontaria virginiensis*). *American Nat.* 35:477-478.
- Popp, J.W. 1992. UWM Field Station meteorological data: 1989-1991. *Univ. Wisconsin-Milwaukee Field Sta. Bull.* 25(1):1-13.

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- Shelley, R.M. 1980. Revision of the milliped genus *Pleurolooma* (Polydesmida: Xystodesmidae). *Canadian J. Zool.* 58:129-168.
- Shelley, R.M. 1988. The millipeds of eastern Canada (Arthropoda: Diplopoda). *Canadian J. Zool.* 66:1638-1663.
- Watermolen, D.J. 1995. Wisconsin millipeds: A preliminary checklist and catalog of records. *Wisconsin Entomol. Soc. Spec. Publ.* (3):1-6.
- Wheeler, W.M. 1890. Hydrocyanic acid secreted by *Polydesmus virginienensis*, Drury. *Psyche* 5:442.
- Wisconsin Legislative Reference Bureau. 1995. Wisconsin normal temperature and precipitation by month and region. P. 674 In *State of Wisconsin 1995-1996 Blue Book*. Wisconsin Legislature, Madison.
- Young, F.N. 1957. A large aggregation of larval millipeds, *Zinaria butleri* (McNeill), in Brown County, Indiana. *Proc. Indiana Acad. Sci.* 67:171-172.