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## Semiaquatic Hemiptera of Wisconsin

William L. Hilsenhoff  
*University of Wisconsin*

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SEMIAQUATIC HEMIPTERA OF WISCONSIN<sup>1</sup>William L. Hilsenhoff<sup>2</sup>

## ABSTRACT

Twenty-six species in five families of semiaquatic Hemiptera were collected in Wisconsin and as many as four more may occur. Keys to all of these species are provided along with notes on their distribution, abundance, and identification. Most species were distributed statewide, except that *Gerris insperatus* and *Rhagovelia obesa* were most common in the north, and *Gerris marginatus*, *Rhagovelia oriander*, and *Neogerris hesione* were most common in the south. *Metrobates*, *Neogerris*, *Rheumatobates*, *Trepobates*, *Mesovelia*, and *Rhagovelia* apparently overwintered as eggs since adults were absent in the spring. Adults of other genera were collected from early spring to autumn.

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In 1981 Bennett and Cook published a study of the semiaquatic Hemiptera of Minnesota, and most of the species they found in Minnesota are the same ones I have collected in Wisconsin. I have made no extensive effort to collect semiaquatic Hemiptera, but have collected almost 11,000 specimens over the past 20 years, enough to provide a rather clear picture of the distribution and abundance of most species that occur in Wisconsin. My studies are limited to the five families of Gerromorpha in this region that are capable of walking on water, and do not include the riparian family Saldidae, which was thoroughly studied in Minnesota by Bennett and Cook (1981). Studies of the aquatic Nepomorpha in Wisconsin were completed earlier (Hilsenhoff 1984).

The systematics of the semiaquatic Hemiptera have been thoroughly discussed by Andersen (1982) and in somewhat less detail by Polhemus and Chapman (1979) and Bennett and Cook (1981). Polhemus and Chapman (1979) reviewed the morphological and behavioral adaptations of the various genera and their life cycles, biology, and preferred habitat. Bennett and Cook (1981) also reviewed these same subjects, and I will not repeat this information.

The distribution and abundance of the various species in Wisconsin is summarized in Table 1. The collecting effort in the nine areas of the state (Fig. 1) was not equal, with more collections being made in the south-central region because of its proximity to Madison. Numbers of lotic species in the northeast were unusually high because of collections made in a study of the Pine-Popple River (Hilsenhoff 1972), and numbers of lentic species were low in the southwest because of a general absence of lentic habitats in this unglaciated part of the state. County records corresponding to numbers in Figure 1 are reported under each species along with information on general abundance, distribution, habitat, life cycles, and identification. Keys are provided to adults of all species that have been collected or are likely to be collected in Wisconsin.

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<sup>2</sup>Department of Entomology, University of Wisconsin, Madison, WI 53706.

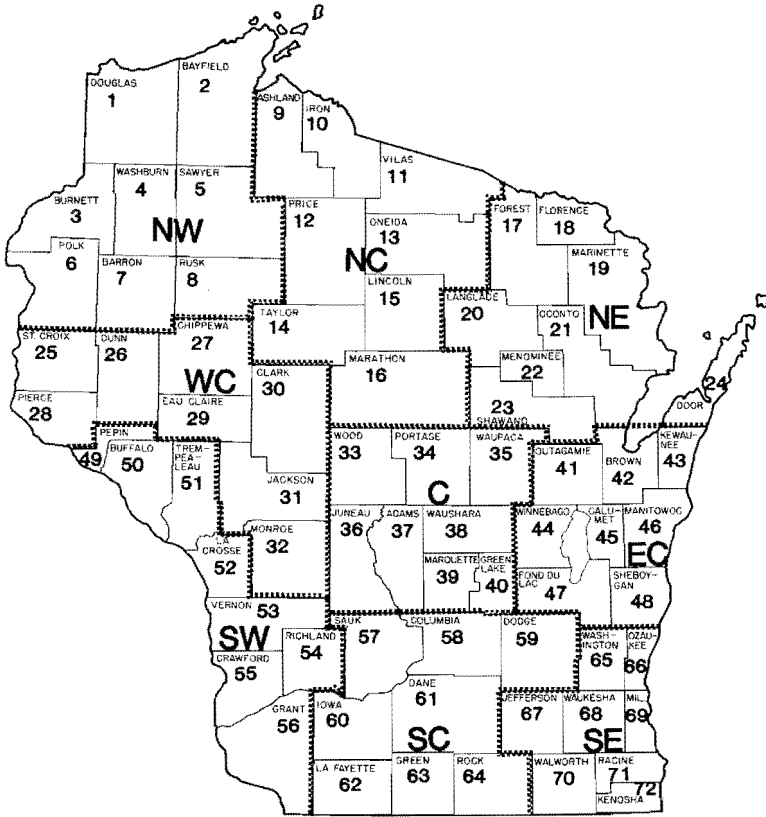


Figure 1. Location of the nine 8-county areas of Wisconsin and number assigned to each county.

Key to Families of Semiaquatic Hemiptera in Wisconsin

- 1. Claws of at least protarsi inserted before apex ..... 2
- 1'. Claws of all tarsi inserted at apex ..... 3
- 2(1). Metafemur very long, greatly surpassing apex of abdomen ..... Gerridae
- 2'. Metafemur short, not, or only slightly surpassing apex of abdomen ..... Veliidae
- 3(1'). Head as long as entire thorax, very slender with eyes set about halfway to base; length 7.5–10.0 mm. .... Hydrometridae: *Hydrometra martini*
- 3'. Head short and stout, eyes near posterior margin ..... 4
- 4(3'). Lower part of head grooved to receive rostrum; legs without bristles ..... Hebridae
- 4'. Lower part of head not grooved; legs with scattered stiff, black bristles. .... Mesoveliidae

Table 1. Numbers of each species of semiaquatic Hemiptera collected in nine areas of Wisconsin (Fig. 1) between 1962 and 1984.

	NW	NC	NE	WC	C	EC	SW	SC	SE	Total
<i>Gerris buenoi</i>	85	85	138	32	50	41	17	131	95	672
<i>G. comatus</i>	43	84	53	12	75	50	33	84	54	488
<i>G. insperatus</i>	9	38	33	27	6	4	1	3	1	122
<i>G. marginatus</i>		1					26	50	19	97
<i>G. remigis</i>	54	99	216	23	76	54	132	105	28	787
<i>Limnoporus dissortis</i>	11	22	28	3	3		12	10	1	90
<i>Metrobates hesperius</i>	118	178	523	22	63	115	50	74	11	1154
<i>Neogerris hesione</i>					1			4		5
<i>Rheumatobates palosi</i>	179	18	122	10	14	74	11	56	6	490
<i>Trepobates knighti</i>								2		2
<i>T. pictus</i>				46				2		49
<i>T. subnitidus</i>	142	28	28	98	22	107	9	181	8	623
<i>Hebrus buenoi</i>									1	1
<i>H. barmeisteri</i>			1	2	5		2	9	9	28
<i>Merragata brunnea</i>	24	6	34	35	21			131	50	301
<i>M. hebroides</i>	6	35	126	39	44	98	100	195	312	955
<i>Hydrometra martini</i>	8	5	9	2	1		2	30	4	61
<i>Mesovelia mulsanti</i>	89	139	89	69	185	130	154	378	151	1384
<i>Microvelia albonotata</i>		2								2
<i>M. americana</i>	62	38	116	21	47	11	84	86	85	550
<i>M. buenoi</i>	12	25	39	4	14	28	5	29	24	180
<i>M. forminalis</i>			1						1	2
<i>M. kizei</i>	4	3	4	2	1		3	97	4	118
<i>M. pulchella</i>	134	202	16	65	80	29	100	650	223	1499
<i>Rhagovelia obesa</i>	78	173	273	43			11	2		580
<i>R. orander</i>		2	5		8	126	106	260	139	646

## GERRIDAE—WATER STRIDERS

Almost half of the species of semiaquatic Hemiptera found in Wisconsin are Gerridae. They are the largest and perhaps the most important semiaquatic Hemiptera. Adults of all species can be identified and so can the nymphs of most, if not all species. Calabrese (1974) provided keys to all nymphal instars of *Gerris* and *Limnoporus*. Nymphs of the other genera are sufficiently similar to adults in at least the last two instars that they too can be identified with reasonable certainty. Because of their large size, Gerridae are often readily visible on the water's surface, but they move rapidly when disturbed. To collect them one must stalk them and then sweep them from the water with a net; they are infrequently captured unless a specific effort is made to catch them.

Adults of all species of *Gerris* were collected from April to November, and from my collections and what is generally known about their life cycles, I assume that they are mostly bivoltine in Wisconsin. *Limnoporus dissortis* adults were collected from April to September, most of them in late summer, which suggests a univoltine life cycle. Adults of *Metrobates*, *Rheumatobates*, and *Trepobates* were collected only from July to October, which indicates that they overwinter as an egg. A peak abundance of adults in August and early September, with only occasional nymphs being found in September, suggests that they are mostly univoltine with some completing a second generation. All *Neogerris hesione* were collected in September, but their rarity makes it impossible for me to speculate on their life cycle in Wisconsin. Drake (1915) stated that they probably overwinter as an egg.

Two additional species of *Gerris*, *G. alacris* Hussey, 1921 and *G. argenticollis* Parshley, 1916 may occur in southern Wisconsin. Both have been reported from northwestern Indiana and they are included in the key to species. *Trepobates inermis* Esaki, 1926 has also been reported from Indiana (Kittle 1977), but farther south and east, and is unlikely to occur in Wisconsin. Kuitert (1942) reported a specimen of *Gerris conformis* (Uhler, 1878) from Wisconsin in the University of Kansas Collection. The only label data for this specimen is "Wisconsin" and I believe the specimen was mislabeled.

## Key to Species of Adult Gerridae in Wisconsin

1. Inner margin of eyes concave behind middle; length 4.7 mm or greater . . . . 2
- 1'. Inner margin of eyes convexly rounded; length 4.8 mm or less . . . . . 10
- 2(1). Second tarsal segment of prothoracic leg twice length of first segment; pronotum shining; head with a broad, transverse, basal pale mark; length 4.7–6.5 mm . . . . . *Neogerris hesione*
- 2'. Second protarsal segment less than 1½ times length of first segment; pronotum dull; head with narrow, broadly V-shaped pale mark at base. . . . . 3
- 3(2'). Pronotum black, contrasting sharply with red-brown mesonotum, and having broad yellow median and lateral stripes; length 11.5–15.5 mm. . . . . *Limnoporus dissortis*
- 3'. Pronotum similar in color to mesonotum, with lateral stripes lacking in species greater than 9 mm long. . . . . *Gerris* 4
- 4(3'). *Gerris*—Large, longer than 11 mm; prominent connexival spines curve slightly outward; length 11.0–16.0 mm. . . . . *G. renigis*
- 4'. Smaller, less than 11 mm long; connexival spines usually curve slightly or distinctly inward. . . . . 5
- 5(4'). Pronotum with a narrow lateral pale stripe . . . . . 6
- 5'. Pronotum without a lateral pale stripe. . . . . 7
- 6(5). First genital segment of male as broad as long; notch in last abdominal sternum of male subrectangular, wider than long; connexival spines of female not reflexed dorsally; antennal segment 2 slightly longer than 3, their combined length slightly longer than 1; length 6.8–8.6 mm . . . . . *G. buenoi*
- 6'. First genital segment of male twice as long as wide; notch in last abdominal sternum of male narrow with side diverging posteriorly; connexival spines of female reflexed dorsally; antennal segment 2 and 3 equal, their combined length equal to segment 1; length 7.0–8.5 mm . . . . . *G. argenticollis*
- 7(5'). First genital segment of male with a conspicuous ventral brush of long hairs on each side; connexival spines of female not reaching apex of first genital segment and with long (0.1 mm), dark setae at and near tip; length 8.5–10.6 mm. . . . . *G. comatus*
- 7'. First genital segment of male without a conspicuous ventral brush of long hairs; connexival spines of female with setae at tip short (< 0.05 mm), if slightly longer, tips of spines reach or surpass apex of first genital segment . . . . . 8
- 8(7'). Male with omphalium strongly protuberant; connexival spines of female short, not reaching midpoint of first genital segment; length 7.0–10.0 mm. . . . . *G. alacris*
- 8'. Male with omphalium not protuberant; connexival spines of female longer, projecting past midpoint of first genital segment. . . . . 9
- 9(8'). Male with first genital segment impressed on each side ventrally to form a broad median carina; connexival spines of female project to or past tip of first genital segment and are covered at tip with setae about 0.05 mm long; length 9.1–10.8 mm. . . . . *G. marginatus*
- 9'. Male with first genital segment plump, evenly rounded ventrally, with a posterior convexity; connexival spines of female do not project posteriorly to

- tip of first genital segment and are covered at tip with setae about 0.03 mm long; length 8.7–10.1 mm ..... *G. insperatus*
- 10 11. First antennal segment subequal to remaining three together; length 4.2–4.8 mm ..... *Metrobates hesperius*
10. Third antennal segment much shorter than remaining three together ..... 11
- 11 10. Third antennal segment with stiff bristles; length 2.7–3.5 mm ..... *Rheumatobates palosi*
11. Third antennal segment with fine pubescence only ..... *Trepobates* 12
- 12 11. *Trepobates*—Without a lateral mesonotal streak posterior to black postocular stripe on pronotum; mesonotum mostly black; length 3.4–3.9 mm ..... *T. subnitidus*
12. With a lateral mesonotal streak posterior to black postocular stripe on pronotum; mesonotum with yellow stripes or large yellow areas ..... 13
- 13 12. Mesonotal streak posterior to black postocular stripe on pronotum short; antennal segment 3 of males with long hairs; females often with long connexival spines and never with a mesonotal projection; length 3.2–3.9 mm ..... *T. knighti*
13. Mesonotal streak posterior to black postocular stripe on pronotum extends entire length of mesonotum; males without long hairs on antennal segment 3; mesonotum of females with a large posterior projection; connexival spines of female not projecting; length 3.2–4.0 mm ..... *T. pictus*

*Gerris buenoi* Kirkaldy, 1911

**Distribution and Abundance.** Very common throughout Wisconsin in all types of lotic habitats and occasionally in streams. County records: 1–6, 8–44, 46–50, 53–55, 58–61, 63–72.

**Identification.** The only other *Gerris* with a lateral pale stripe on the pronotum is the more southern *G. argenticollis*, which has not been collected in Wisconsin. *Gerris buenoi* is readily distinguished from that species by characters in the key.

*Gerris comatus* Drake and Hottes, 1925

**Distribution and Abundance.** Common statewide in a wide variety of lotic and lentic habitats with open water. County records: 1, 3–20, 23–25, 27–28, 30–31, 33–44, 46–52, 54–72.

**Identification.** The large tufts of long setae ventrally on both sides of the first genital segment of the male are distinctive, but some females can be confused with *G. marginatus*. In *G. comatus* females the setae at and near the end of the connexival spines are about twice as long as those of *G. marginatus* and also blacker in mature individuals. The connexival spines also do not extend to the apex of the first genital segment as they do in *G. marginatus*. Although the connexival spines of *G. comatus* tend to curve inward, this inward curve is an artifact of preservation and may be present or absent in both species. *Gerris insperatus* females have very short setae on the connexival spines and should be easily separated from *G. comatus*. Micropterous *G. comatus* are fairly common; apterous individuals are rare. I did not find micropterous females of *Gerris insperatus* and *G. marginatus*.

*Gerris insperatus* Drake and Hottes, 1925

**Distribution and Abundance.** Common north, uncommon to rare south. Most were collected from streams but some were collected from ponds. County records: 1–2, 8–15, 17–19, 22, 27, 29–34, 39, 42–44, 53, 57, 61, 70. The predominantly northern distribution in Wisconsin and also in Minnesota (Bennett and Cook 1981) is interesting since the species is reported to range south into Mexico (Calabrese 1974).

**Identification.** The ventrally rounded first genital segment of the male with its posterior convexity is distinctive. The female is difficult to separate from the more southern *G. marginatus*, but the setae at the tip of the connexival spines are shorter in *G. insperatus* and the spines do not project posteriorly as far as the tip of the first genital segment. In *G. marginatus* they project to or slightly beyond the tip of the first genital segment. I have one brachypterous female that I believe is this species.

*Gerris marginatus* Say, 1832

**Distribution and Abundance.** Fairly common south, but rare north and central. A male was collected as far north as Vilas County. It inhabits all types of lentic and lotic habitats. County records: 11, 37, 51–58, 60–64, 67–68, 70–72.

**Identification.** Ventrally, the first genital segment of the male is concave on each side of the middle, thus forming a broad carina. Separation of females from *G. comatus* and *G. insperatus* is discussed under those species.

*Gerris remigis* Say, 1832

**Distribution and Abundance.** Very common on streams and spring ponds throughout the state. County records: 1–3, 5–6, 8–22, 24–26, 28, 31–40, 42–46, 48–58, 60–64, 67–71.

**Identification.** This large, dark strider is easily identified by characters in the key.

*Limnopus dissortis* (Drake and Harris, 1930)

**Distribution and Abundance.** Fairly common in all types of lotic and lentic habitats throughout the state. It is difficult to capture and many were seen that could not be collected. County records: 1–4, 9, 11–13, 15, 17–20, 28, 31, 33, 35, 37, 51, 53–61, 70.

**Identification.** Its very large size and the red-brown coloration readily distinguish it from other Gerridae.

*Metrobates hesperius* Uhler, 1871

**Distribution and Abundance.** Common statewide on larger streams and occasionally on impoundments and lakes. County records: 1, 3–5, 7, 9, 12, 14–18, 20–21, 23, 26–27, 30, 33, 35, 39–41, 43, 48–49, 51, 53, 56–57, 60–61, 63–64, 66–68, 70.

**Identification.** The short, broad body and very long first antennal segment readily separate this species.

*Neogerris hesione* (Kirkaldy, 1902)

**Distribution and Abundance.** Rare in southern half where it was found on ponds and small impoundments. County records: 39, 58, 64.

**Identification.** The shining nota, broad instead of linear pale mark on the pronotal disc, and wide transverse basal pale mark on the head separate it from *Gerris*, but in the field the common apterous form may readily be mistaken for *Gerris* nymphs.

*Rheumatobates palosi* Blatchley, 1926

**Distribution and Abundance.** Common in quiet open waters of lakes, large ponds, and streams statewide. County records: 2, 4, 6, 8, 11, 14–15, 17–18, 20, 24, 26–28, 30, 33, 35, 38–39, 41–44, 46–49, 53–54, 57–58, 61, 63–64, 70–71.

**Identification.** The small size, elongate shape, and bristles on the third antennal segment readily distinguish this species.

*Trepobates knighti* (Drake and Harris, 1928)

**Distribution and Abundance.** Rare in small open streams in extreme southern Wisconsin. County records: 62, 64.

**Identification.** Identification of the three species of *Trepobates* that occur in Wisconsin and *T. inermis*, which occurs to the southeast of Wisconsin, has presented many problems. Kittle (1977) did much to solve these identification problems. Of the four species, the thoracic nota of *T. inermis* and *T. pictus* are predominantly yellow, in *T. subnitidus* they are mostly black, and in *T. knighti* the coloration is intermediate. Unfortunately there are dark and light specimens of all species. *Trepobates knighti* can be mostly easily separated from *T. subnitidus* and *T. pictus* by a short yellow mark on the mesonotum just posterior to the postocular dark stripe on the pronotum, a characteristic also shared by *T. inermis*. Males of *T. knighti* have long hairs on the third antennal segment, a character shared only by *T. inermis*, but the pubescence on abdominal segment 8 is darker than in *T. inermis*. Females of *T. knighti* often, but not always, have elongate connexival spines, a characteristic not found in other species.

*Trepobates pictus* (Herrich-Schaffer, 1848)

**Distribution and Abundance.** This species is apparently rare statewide, with all collections being made from woodland streams. County records: 14, 27, 30, 57.

**Identification.** The large amount of yellow on the mesonotum and the broad yellow stripe that is located directly behind the postocular dark stripe of the pronotum and extends the entire length of the mesonotum are distinctive. Females have a pointed posterior mesonotal projection that is distinctive.

*Trepobates subnitidus* Esaki, 1926

**Distribution and Abundance.** Common statewide where it frequents sheltered bays of lakes, larger ponds, and larger streams. County records: 2-8, 11-12, 14, 18, 23-24, 27, 30, 32-33, 35-36, 38-39, 41, 43-44, 46-47, 52-54, 56, 58-61, 63-64, 67-69.

**Identification.** Most individuals have a black mesonotum with four yellow spots dorsally, one near each corner. In some individuals the posterior spots extend mesally and then anteriorly to form a right-angle shaped mark on each side of the middle. This is the characteristic pattern of *T. knighti*, but in *T. subnitidus* there is no yellow mark on the mesonotum posterior to the postocular black stripe of the pronotum. *Trepobates pictus* and *T. inermis* have much more extensive yellow marks on the pronotum and mesonotum.

## HEBRIDAE—VELVET WATER BUGS

Because of their very small size, Hebridae are not often noticed running on the surface of the water. One genus, *Hebrus*, is mostly riparian, while the other, *Merragata*, is found in shallow shoreline areas. I have made no special effort to collect Hebridae, but have collected them while sweeping through shallow water with an aquatic net. Because I did not collect in riparian habitats, my collections of *Hebrus* undoubtedly do not reflect the true abundance of this genus. Collections were made from April to November, and suggest a multivoltine life cycle with overwintering adults.

## Key to Species of Adult Hebridae in Wisconsin

1. Antennae 5-segmented, with last segment not thickened . . . . . *Hebrus* 2
- 1'. Antennae 4-segmented, with last segment distinctly widened . . . . . *Merragata* 3
- 2(1). *Hebrus*—Vertex of head with distinct median longitudinal groove; head black except for posterior margin; length 1.9-2.2 mm . . . . . *H. buenoi*



- 2'. Vertex of head without median longitudinal groove; head brown or tan; length 1.8–2.1 mm ..... *H. burmeisteri*
- 3(1)'. *Merragata*—Pronotum with deep, median longitudinal groove; macropterous, membrane with 4 white spots on a darker background; length 1.7–2.2 mm ..... *M. hebroides*
- 3'. Pronotum lacking deep, median longitudinal groove; usually brachypterous, macropterous form with opaque white membrane; length 1.4–1.8 mm ..... *M. brunnea*

*Hebrus buenoi* Drake and Harris, 1943

**Distribution and Abundance.** The single collection probably does not reflect its true abundance, and since it was collected in much of Minnesota (Bennett and Cook 1981) it is probably distributed throughout Wisconsin. County record: 71.

**Identification.** The median longitudinal groove on the vertex of the head is distinctive. The head and pronotum are black; in *H. burmeisteri* they are tan or brown, although in some specimens the pronotum is dark brown.

*Hebrus burmeisteri* Lethierry and Severin, 1896

**Distribution and Abundance.** It probably occurs statewide at the edges of shallow lentic habitats, and very likely is more common than my collections indicate. County records: 17, 25, 31, 39, 50, 56, 58, 60–61, 65, 67–69, 72.

**Identification.** Its separation from *H. buenoi* is discussed under that species.

*Merragata brunnea* Drake, 1917

**Distribution and Abundance.** Fairly common statewide in margins of lentic habitats. County records: 1–3, 6, 13, 19–22, 25, 27, 35–36, 38, 57–58, 61, 63–64, 67–68, 70–72.

**Identification.** The pronotum lacks the deep, median longitudinal groove of *M. hebroides*. Most (97%) are brachypterous, while all *M. hebroides* I have collected are macropterous. In macropterous forms, the hemelytral membrane is an opaque white; in *M. hebroides* the membrane has four white spots. Both species of *Merragata* are readily separated from *Hebrus* and *Microvelia* by their enlarged fourth antennal segment.

*Merragata hebroides* White, 1877

**Distribution and Abundance.** Very common south, less common north in shallow margins of lentic habitats. County records: 2, 4–5, 10, 12, 15–19, 21–24, 27–28, 30, 34–35, 37–40, 42–44, 46–49, 51–52, 54, 56–72.

**Identification.** Its separation from *M. brunnea* is discussed under that species.

HYDROMETRIDAE—MARSH TREADERS

There is only one species in Wisconsin and it has been collected mostly by sweeping through shallow lentic habitats with an aquatic net. It is, however, large enough to be seen walking among vegetation on the water's surface and several have been collected with a net after being sighted. It overwinters as an adult and has been collected in Wisconsin from 1 May to 8 October. Its multivoltine life history was thoroughly documented by Sprague (1956).

*Hydrometra martini* Kirkaldy, 1900

**Distribution and Abundance.** Uncommon throughout the state. County records: 3–4, 6, 9–10, 12–13, 18–20, 25, 33, 56, 58, 60–61, 68–69.

**Identification.** They are readily identified by their small size and stick-like appearance. About 13% were macropterous, almost all of the rest were apterous.

#### MESOVELIIDAE—WATER TREADERS

Three species probably occur in Wisconsin, only one of which has been collected. The other two species, *M. cryptophila* Hungerford, 1924 and *M. douglasensis* Hungerford, 1924, which may be a junior synonym of *M. amoena* Uhler, 1894 (Polhemus and Chapman 1979), both occur in Michigan (Hungerford 1924). The former has also been collected in Minnesota (Bennett and Cook 1981). Both species occur in bogs among floating *Chamaedaphne*, but my efforts to collect them from such habitats in northern Wisconsin have thus far been unsuccessful. The third species, *M. mulsanti*, is abundant. It overwinters as an egg and has several summer generations. They are readily seen running among the vegetation.

#### Key to Species of Adult Mesoveliidae in Wisconsin

1. Pro- and mesofemur with a row of black spines on ventral margin; larger species 2.7–4.0 mm long ..... *M. mulsanti*
- 1'. Pro- and mesofemur without a row of black spines; smaller species ..... 2
- 2: 1'. Two broad longitudinal bands on head with a slender line between them; length of first antennal segment no more than  $\frac{3}{4}$  width of head through eyes; length 1.8–2.2 mm ..... *M. douglasensis*
- 2'. Two slender longitudinal bands on head; length of first antennal segment  $\frac{1}{10}$  width of head through eyes; length 1.9–2.7 mm ..... *M. cryptophila*

#### *Mesovelia mulsanti* White, 1879

**Distribution and Abundance.** Abundant throughout Wisconsin, with adults present from June to November and peak numbers in August and September. They occur in sheltered lotic and lentic habitats with emergent vegetation, *Lemna*, or mats of algae. County records: 1–31, 33–40, 42–72.

**Identification.** The yellow-green coloration and black bristles on the legs are distinctive. They can be separated from the two small *Mesovelia* species by characters in the key. Males and females of *M. mulsanti* are always larger than the same sex in the other species. Most adults are apterous, but macropterous forms are common.

#### VELIIDAE—SMALL WATER STRIDERS

This is probably the most abundant family of aquatic Hemiptera in Wisconsin, but because of their small size they are easily overlooked and not often collected. There are two species of *Rhagovelia* and six species of *Microvelia* in Wisconsin. *Rhagovelia* was revised by Bacon in 1956; the most recent keys to *Microvelia* are in Smith and Polhemus (1978). Both species of *Rhagovelia* are lotic, living below riffles and in eddies of streams where they are easily seen skating in schools on the surface of the water. The species of *Microvelia* are mostly lentic, being found on sheltered margins of ponds, marshes, bogs, and even slower streams. Two species, however, *M. americana* and *M. fontinalis*, are lotic, living under the banks of streams and spring ponds, or in springs. Most of the species of *Microvelia* overwinter as adults and are found from April to October, but adults of the common *M. pulchella* have not been collected before June, which suggests they may overwinter as an egg in Wisconsin. All are probably multivoltine. *Rhagovelia* adults have not been collected before July, and they probably overwinter as an egg at this latitude. Bacon (1956) suggested that they overwinter as adults, but Cheng and Fernando (1971)

presented evidence that *R. obesa* overwinters as an egg in southern Ontario. They are probably mostly univoltine, with some completing a second generation. Most *Microvelia* are apterous, but macropterous individuals occur with regularity; I have seen no macropterous *Rhagovelia* from Wisconsin.

## Key to Species of Adult Veliidae in Wisconsin

1. Mesotarsi with plumose hairs and leaf-like claws; greater than 3.3 mm long ..... *Rhagovelia* 2
- 1'. Mesotarsi without plumose hairs, less than 3.3 mm long ..... *Microvelia* 3
- 2(1). *Rhagovelia*—Posterior margin of pronotum of apterous males and females rounded and not projecting past mesonotum; length 3.7–4.4 mm. .... *R. obesa*  
 Posterior margin of pronotum in apterous males acute and projecting posterior past mesonotum and metanotum, in apterous females formed into a long projecting process; length 3.4–4.1 mm. .... *R. oriander*
- 3(1'). *Microvelia*—Apterous adults ..... 4
- 3'. Macropterous adults ..... 9
- 4(3). Pronotum covering entire dorsum of thorax; length 2.0–2.3 mm ..... *M. fontinalis*
- 4'. Two or three nota on dorsum of thorax ..... 5
- 5(4'). Dorsum of thorax appearing 3-segmented ..... 6
- 5'. Dorsum of thorax appearing 2-segmented ..... 7
- 6(5). Large, length 2.4–3.1 mm ..... *M. americana*
- 6'. Small, length 1.4–1.8 mm ..... *M. pulchella*
- 7(5'). Thoracic and abdominal terga with extensive pale marks in addition to those on connexivum; large, length 2.2–2.5 mm ..... *M. albonotata*
- 7'. Thoracic and abdominal terga black or dark brown, with a yellow mark anteriorly on pronotum and occasionally yellow spots on connexivum... 8
- 8(7'). Thoracic and abdominal terga black, dark brown when teneral, and without pale spots on connexivum; pruinosity distinct and confined to lateral edges of last three abdominal terga; larger, length 1.6–1.9 mm ..... *M. buenoi*
- 8'. Thoracic and abdominal terga dark brown, often with indistinct yellow spots on connexivum; last three abdominal terga indistinctly pruinose, except for a narrow medial line; small, length 1.2–1.5 mm ..... *M. hinei*
- 9(3'). Very large, 2.7–3.2 mm long; vertex of head uniformly dark ..... *M. americana*
- 9'. Smaller, less than 2.7 mm long; if near 2.7 mm long, vertex of head with dark median stripe ..... 10
- 10(9'). Large, more than 2.2 mm long; vertex of head with dark median stripe... 11
- 10'. Smaller, less than 2.2 mm long; if near 2.2 mm, vertex of head not striped ..... 12
- 11(10). Last antennal segment as long as width of head through eyes; 2.2–2.6 mm long ..... *M. albonotata*
- 11'. Last antennal segment as long as  $\frac{3}{4}$  width of head through eyes; 2.2–2.5 mm long ..... *M. fontinalis*
- 12(10'). Very small, 1.5–1.6 mm long; thorax dark brown, head lighter and usually with a pale area on each side of vertex, leaving a dark stripe on vertex ..... *M. hinei*
- 12'. Larger, 1.8–2.1 mm long; head color similar to thorax and without a dark stripe on vertex ..... 13
- 13(12'). Head and thorax black, or nearly so; pale marks absent or obscure on connexivum; venter black, except in teneral individuals; length 1.8–2.1 mm .. *M. buenoi*  
 Head and thorax brown; distinct pale marks on connexivum; venter pale; length 1.8–2.0 mm ..... *M. pulchella*

*Microvelia albonotata* Champion, 1898

**Distribution and Abundance.** Apparently rare in Wisconsin, with the only collection from the margin of a spruce-tamarack swamp in the north. County record: 13

**Identification.** The relatively large size, an extremely long fourth antennal segment that is equal to the distance between the outer edge of the eyes, and a pale dorsum of the head with a median dark stripe and another dark stripe just above each eye, are distinctive characters that separate both apterous and macropterous forms from all other *Microvelia*. In the apterous form the extensive pale areas dorsally and ventrally on the thorax and the pale first abdominal tergum are distinctive. The wings of the macropterous form have large clear areas in each of the six cells. In all forms the base of the femur is distinctly paler than the tarsus, tibia, and apical portion of the femur. This characteristic is shared only by the smaller *M. buenoi* and *M. pulchella*.

*Microvelia americana* (Uhler, 1884)

**Distribution and Abundance.** Very common along margins of streams and spring ponds throughout the state. County records: 1, 3-6, 8-9, 11-23, 26-32, 34-35, 37-40, 45-46, 48-50, 53-61, 63-64, 67-68, 70, 72.

**Identification.** Its large size separates it from other species. The three thoracic nota of apterous individuals readily separate it from *M. albonotata* and *M. fontinalis*, the only species that approach it in size. Only 1.2% of Wisconsin specimens were macropterous. None of the cells in the wings have clear areas. Their large size, a uniformly dark vertex of the head, and their antennae separate macropterous forms from the smaller *M. albonotata* and *M. fontinalis*. The fourth antennal segment is much shorter than in *M. albonotata* and the second antennal segment is about  $\frac{2}{3}$  the length of segment 4, while in *M. fontinalis* it is only slightly more than half as long.

*Microvelia buenoi* Drake, 1920

**Distribution and Abundance.** Common throughout the state in a variety of lentic habitats. County records: 1-2, 4, 11-18, 20-21, 23, 25, 32-33, 38-40, 44-45, 47, 49-50, 56, 58-62, 64, 66-72.

**Identification.** Apterous individuals that are not teneral are readily identified by the black coloration dorsally. They are easily separated from the much paler *M. pulchella*, which is about the same size. The two other species in Wisconsin in which the thorax has two dorsal sclerites are of a different size and coloration. *Microvelia hinei* is distinctly smaller and dark brown rather than black. *Microvelia albonotata* is larger and has extensive pale markings dorsally. The macropterous form, however, is common and comprised 22% of Wisconsin specimens. It is similar and the same size as *M. pulchella*, but blacker. In *M. buenoi* the middle cell of the hemelytra is clear or with two clear areas separated by a narrow opaque band. In *M. pulchella* this cell is opaque or with one or two very small clear areas distally. *Microvelia hinei* is distinctly smaller and the vertex of the head is pale with a median dark stripe. In *M. buenoi* pale marks on the connexivum are lacking, or they may be obscure in some teneral specimens. They are readily visible in all *M. pulchella* and *M. hinei*.

*Microvelia fontinalis* Torre-Bueno, 1916

**Distribution and Abundance.** Apparently rare in Wisconsin, occurring in streams, springs, and spring ponds (Bennett and Cook 1981). I have not collected intensively in springs, which may account for its apparent rarity. County records: 17, 70.

**Identification.** The two Wisconsin specimens are both apterous females, 2.0-2.1 mm long. This is the only Wisconsin species with a single dorsal thoracic sclerite. The dark brown color with orange spots on the anterior of the pronotum and the middle of the first abdominal tergum is distinctive. Macropterous forms most closely resemble the larger *M.*

*americana*, but the second antennal segment is shorter and there is a dark median stripe on the vertex of the head, which is not easy to see in dark individuals.

*Microvelia hinei* Drake, 1920

**Distribution and Abundance.** Fairly common statewide in lentic habitats. County records: 4, 6, 10–11, 13, 17, 20, 29, 31, 38, 51, 55–56, 58, 61, 67–68.

**Identification.** This is the smallest Wisconsin species. Only *M. pulchella* and *M. buenoi* approach it in size, but the dark brown color and paler vertex of the head with a median dark stripe are distinctive. Some teneral specimens have extensive pale areas on the connexivum and dorsum of the abdomen. Macropterous forms comprised 8.1% of the population in Wisconsin. They too can be identified by their small size, dark brown coloration with yellowish connexival spots, and the pale vertex of the head with a dark median stripe. In very dark individuals the vertex of the head is not pale, but the dark median stripe can still be seen. The middle cell of the hemelytra has two small clear areas separated by a broad infuscation through the middle.

*Microvelia pulchella* Westwood, 1834

**Distribution and Abundance.** Abundant throughout Wisconsin in lentic habitats. County records: 3–5, 7–19, 22–29, 33–40, 43–44, 47, 49–50, 52–58, 60–61, 63–64, 66–70, 72.

**Identification.** Apterous individuals have three sclerites dorsally on the thorax, which separates them from all other species except the much larger *M. americana*. The pale venter, brown dorsal coloration that sometimes has extensive mesal yellow marks, and the yellow connexival spots are distinctive. Macropterous forms made up only 2.7% of the population, and were most similar to *M. buenoi* and *M. hinei*. Their separation is discussed under those species. All males have distinctly curved metatibiae, which separates them from all other species.

*Rhagovelia obesa* Uhler, 1871

**Distribution and Abundance.** Common on streams north, rare south. County records: 1, 3, 7, 9–10, 12–20, 22, 25–26, 53, 57. Its distribution in Minnesota (Bennett and Cook 1981) and Wisconsin is that of a boreal species, but it has been recorded from many more southern states (Bacon 1956).

**Identification.** Only apterous forms have been collected. The pronotum is rounded in both sexes and does not project past the mesonotum.

*Rhagovelia oriander* Parshley, 1922

**Distribution and Abundance.** Common on streams in southern half, rare north. County records: 13, 19, 33, 35–36, 40–41, 43, 45–46, 48, 50–51, 54, 56–57, 60–63, 66–68, 70.

**Identification.** Only apterous forms were collected. The pronotum of the male is pointed posteriorly and extends over the meso- and metanotum. In the female the pronotum is greatly enlarged posteriorly to form a projecting elevated process.

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