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THE BRACHYCENTRIDAE (TRICHOPTERA) OF WISCONSIN¹William L. Hilsenhoff²

ABSTRACT

Five species of *Brachycentrus* and three species of *Micrasema* were collected. Previous records for *Brachycentrus lateralis* in Wisconsin are incorrect and should be for *B. incanus*, but *B. lateralis* larvae were collected recently in Douglas County. *Brachycentrus americanus*, *B. numerosus*, *B. occidentalis*, *Micrasema kluane*, *M. rusticum* and *M. wataga* usually occurred statewide in unpolluted permanent streams, but were generally absent from southern and eastern agricultural counties where most streams are organically enriched. More than one species and genus frequently occurred in the same stream, with *Micrasema* larvae often being found in streams with less current than required by *Brachycentrus* larvae. Larval cases of each species were usually distinctive in the last two instars, but there were variations due to habitat and instar. *Brachycentrus americanus* had a semivoltine life cycle in the northern half of Wisconsin and was univoltine in the south. *Brachycentrus numerosus* and *B. occidentalis* were always univoltine, but all *Micrasema* species had semivoltine populations and may be semivoltine in all Wisconsin streams.

All larval and adult Brachycentridae in the University of Wisconsin Insect Collection were identified to determine the distribution, abundance, life cycles, and habitats of the various species. Completion of this study was made possible by a recent publication by Flint (1984) on *Brachycentrus* in North America and a Ph.D. thesis by Chapin (1978) on Nearctic *Micrasema*. Their publications allowed me to identify larvae and adult males of all species likely to occur in Wisconsin, with one exception. *Brachycentrus fuliginosus* Walker, 1852 is known only from a few adults collected in Michigan, Ontario, and Quebec and could possibly occur in Wisconsin, but its larva remains unknown. Efforts to find larvae that did not fit descriptions of related species were unsuccessful, and since no adults were collected it is likely that this species, if it occurs in Wisconsin, is rare.

Five species of *Brachycentrus* and three species of *Micrasema* were collected in Wisconsin (Fig. 1). All of them tended to be absent from streams that had been subjected to even small amounts of organic pollution, and probably for that reason they were mostly absent from agricultural counties in the south and east. Their presence indicates high quality water, and because of their relative abundance in many streams they are important in biological monitoring. Records of *Brachycentrus lateralis* (Say, 1823) from Woods Creek in Florence County (Longridge and Hilsenhoff 1972, 1973) are in error; all were subsequently found to be *Brachycentrus incanus* Hagen, 1861 (Flint 1984). However, *B. lateralis* larvae were recently discovered in the Brule River in Douglas County, which significantly extends the known range of this species. *Brachycentrus americanus* (Banks, 1899), *B. numerosus* (Say, 1823), and *B. occidentalis* Banks, 1911 are all common throughout the northwestern two-thirds of the state, except for their apparent absence from a few northcentral counties (Fig. 1). These counties are in the highest part of the state, and

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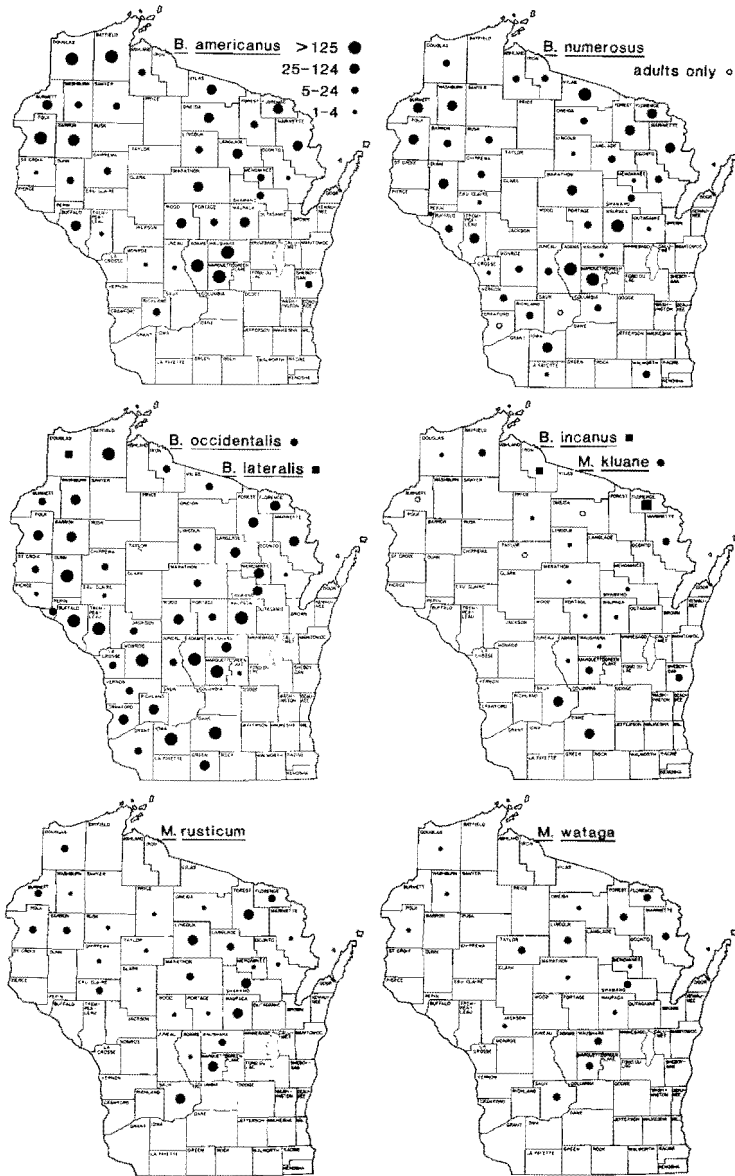


Fig. 1. Distribution and abundance of Brachycentridae larvae in Wisconsin with records of adults in counties where larvae were not also collected.

divide two major drainage basins. Here, a general lack of high volume, fast-flowing streams of the type in which *Brachycentrus* larvae usually occur, probably accounts for their absence.

Micrasema larvae are probably much more common than my collection records indicate because they are always closely associated with mosses and other plants from which they are not easily dislodged by ordinary collecting techniques. All three species; *M. kluane* Ross and Morse, 1973; *M. rusticum* (Hagen, 1868); and *M. wataga* Ross, 1938 were apparently more common in the Wisconsin River drainage than in the Mississippi River drainage (Fig. 1). Larvae of *Micrasema* tended to occur in streams with somewhat less current than those that contained *Brachycentrus*, although the two genera frequently occurred in the same streams (Table 1).

Schmid (1983) synonymized *Micrasema kluane* with the Palearctic species *M. gelidum* McLachlan, 1876, which earlier Botosaneanu (1974) had considered to be a senior synonym of the Nearctic species *M. scissum* McLachlan, 1884. This action, which was based on a study of adult males, made *M. gelidum* a circumboreal species with much intraspecific variation. He did not study larvae or review the thesis by Chapin (1978). Ross and Morse (1973), when describing *M. kluane*, pointed out significant differences between males of that species and males of *M. gelidum* (as *scissum*) and differences in larval habitat. Chapin (1978) reiterated these differences and also showed very significant differences between larvae of these two species. I therefore believe that *M. kluane* is a valid species and have continued to use that name for Wisconsin specimens.

Although streams have been sampled throughout the state, the sampling effort has not been uniform and low numbers from some counties may have been due to inadequate sampling. In 1970 and 1971 many larvae were collected when streams were sampled in nine large areas that had been selected to be representative of the state (Longridge and Hilsenhoff 1973). Most adults were collected from vegetation along these same streams and with light traps. However, streams in other areas were also sampled, and in 1979 and 1980 more than 1000 streams were sampled in spring and autumn. Only *B. americanus* and *M. rusticum* were significantly attracted to light traps, creating proportionately larger samples of adults of these two species. Because we were unable to identify larvae of *Micrasema* in 1971, an effort was made that year to collect and rear larvae from selected streams. Most adult *Micrasema*, except for the *M. rusticum* collected at lights, were reared. All *Micrasema* that were collected or reared prior to 1976 were identified by Chapin and recorded in his thesis (1978). Many *Micrasema* larvae and adults were also collected from Sauk County as part of a study of the Trichoptera of Otter Creek (Steven and Hilsenhoff 1984). Representative samples of larvae and adults of *Brachycentrus* from Wisconsin were identified by Flint and recorded in his recent publication (1984).

Life Cycles. In colder streams in the northern two-thirds of Wisconsin, *B. americanus* had a semivoltine life cycle, but it was univoltine in southern streams and as far north as Adams County in central Wisconsin. All three species of *Micrasema* exhibited semivoltinism and may be semivoltine in all streams. Semivoltine *M. wataga* populations were distinguished only as far south as Marquette County while semivoltine populations of the other two species were found in the southern counties of Dane and Sauk. A single, short emergence period and two distinct size classes of larvae were considered evidence of semivoltinism.

All species had relatively short emergence periods, with emergence occurring two to four weeks earlier in warmer and more southern streams. The first species to emerge was *B. numerosus*, with adult records from 29 March to 14 May. Populations of *B. americanus* and *B. occidentalis*, which frequently occurred in the same stream, were temporally separated by about two months, with *B. occidentalis* adults appearing from 13 April to 27 May and *B. americanus* from 11 June to 25 August. *Brachycentrus incanus* emerged after *B. occidentalis* and before *B. americanus*, with adult collection records ranging from 28 May to 31 June in Florence County. The first *Micrasema* to emerge was *M. kluane*, with adults present from 9 May to 7 July. The other two species emerged somewhat later, *M. rusticum* from 5 June to 9 July and *M. wataga* from 25 June to 18 July.

Table 1. Numbers and co-occurrence of species of *Brachycentrus* and *Micrasema* in Wisconsin.

Species	Number of			Percent of streams (column 3) in which species below also occurred								
	Adults	Larvae	Streams	<i>M. kluane</i>	<i>M. rusticum</i>	<i>M. wataga</i>	<i>B. americanus</i>	<i>B. incanus</i>	<i>B. lateralis</i>	<i>B. numerosus</i>	<i>B. occidentalis</i>	One other species
<i>Micrasema kluane</i>	203	215	19		17	22	44	0	5	6	50	67
<i>M. rusticum</i>	340	318	67	5		29	29	2	1	39	15	56
<i>M. wataga</i>	26	129	30	13	63		57	0	0	27	40	93
<i>Brachycentrus americanus</i>	1035	2280	135	7	15	13		1	1	17	40	56
<i>B. incanus</i>	14	40	3	0	33	0	67		0	67	0	67
<i>B. lateralis</i>	0	9	1	100	100	0	100	0		100	0	100
<i>B. numerosus</i>	131	1450	108	2	25	7	21	2	1		24	50
<i>B. occidentalis</i>	327	4591	205	4	5	6	26	0	0	13		37

Habitat. All species occurred only in permanent streams. *Brachycentrus*, probably because of its filter feeding habits, was found only in streams with a constant and significant flow. *Micrasema* larvae, which lived mostly among mosses and other plants, could withstand reduced flows and frequently occurred in relatively slow streams. *Brachycentrus americanus* often occurred in the same small streams as *B. occidentalis* (Table 1), but was found in larger streams also. Both species were found only in cold streams, mostly in those with a significant flow from springs. *Brachycentrus occidentalis* was usually the only species of brachycentrid in open streams that did not flow through any forested areas. *Brachycentrus numerosus* preferred larger and warmer streams than the above species, but at least 20% of the time it occurred in the same streams (Table 1). It was rarely found in streams that did not flow through forested areas. *Brachycentrus incanus* was collected only from Woods Creek and the Pine River in Florence County and the Potato River in Iron County. These are cool, medium-sized streams that flow through forested areas. *Brachycentrus lateralis* was collected only from the Brule River in Douglas County, a very large, cool trout stream. Here it occurred along with four other brachycentrid species. *Micrasema kluane* was found mostly in smaller streams, usually along with *B. americanus* and *B. occidentalis* (Table 1), but was able to live also in streams with flows too reduced for *Brachycentrus*. *Micrasema wataga* also occurred in smaller streams along with *B. americanus* and *B. occidentalis*, but it was frequently found in large streams as well. *Micrasema rusticum*, although sometimes found in small streams, exhibited a definite preference for large streams and was frequently collected from the same streams as *B. numerosus*.

Case Construction. Although cases built by most species were sufficiently distinctive in later instars to aid in larval identification, differences due to habitat and instar were often substantial. *Micrasema* cases were rounded in cross-section and tapered. The case of *M. rusticum* was always constructed of sand grains while that of *M. wataga* was of silk or silk with elongate transverse bits of vegetation that only infrequently contained a few sand grains. The case of *M. kluane* was either of sand like *M. rusticum*, completely of vegetation like *M. wataga*, or partly sand and partly vegetation. In *Brachycentrus* the type of case often varied with the instar. In the first two instars of all species the case was square in cross-section and made of elongate bits of vegetation laid transversely. *Brachycentrus occidentalis* was the only *Brachycentrus* that incorporated sand into its case, which it

frequently did, but in many streams the cases were of vegetation and silk as in the other species, and were very similar to cases of *B. americanus*. When the case was almost totally silk, that of *B. occidentalis* was somewhat square in cross-section while that of *B. americanus* was round. In cases that were mostly vegetation, *B. americanus* larvae frequently used extremely narrow pieces of vegetation while *B. occidentalis* rarely used vegetation that was not rectangular. The case of *B. numerosus* was distinctly more elongate than that of other species, and the bits of vegetation used in construction were more rectangular and less elongate than in the other two common species, especially *B. americanus*. Even when the case was mostly silk, which was unusual, it was distinctly square in cross-section. Cases I have seen of *B. incanus* and *B. lateralis* were similar to those of *B. numerosus*, but had a rougher and more uneven surface.

Identification. Males and larvae of all of the species can be readily identified by using the keys by Flint (1984) and Chapin (1978). Schmid (1983) also described and keyed adult males. Additionally he described and figured females of both genera and provided a key to female *Brachycentrus*, which allowed me to identify females as well as males. Since the larvae are so important in biological monitoring and because my larval key (Hilsenhoff 1982) does not separate *Brachycentrus incanus* from *B. lateralis*, a key to species of larvae in the western Great Lakes region is included below.

KEY TO SPECIES OF BRACHYCENTRIDAE LARVAE IN THE WESTERN GREAT LAKES REGION³

1. Metacoxa with a ventral, semicircular lobe bearing a row of long setae; mesonotum with 4 elongate sclerites; plates of metanotum heavily sclerotized (*Brachycentrus*) 2
- 1'. Metacoxa without a ventral lobe bearing setae; mesonotum with 2 very wide sclerites that may be longitudinally divided near lateral margin; plates of metanotum lightly sclerotized. (*Micrasema*) 6
- 2(1). *Brachycentrus*: head entirely dark 3
- 2'. Head with distinct light markings 4
- 3(2). First abdominal sternum with 2 mesal setae; a long carina on gena from mandible to past mesal margin of eye; metacoxal lobe surrounded by about 11 setae *B. americanus*
- 3'. First abdominal sternum with 4 mesal setae; a short carina on gena adjacent to mandible; metacoxal lobe surrounded by more than 30 setae *B. occidentalis*
- 4(2'). Pronotum without dark transverse stripes, pale anterior to lateral fold and dark with pale muscle scars posterior; only anterolateral margins of frontoclypeus with pale stripes *B. numerosus*
- 4'. Pronotum with a dark transverse band on anterior margin and just posterior of lateral fold; posterior third of frontoclypeus pale in addition to anterolateral margins 5
- 5(4'). Meso- and metatibia with 1 large basomesal seta; median dark stripe on frontoclypeus distinctly narrower than lateral pale marks *B. lateralis*
- 5'. Meso- and metatibia with 3 large basomesal setae; median dark stripe on frontoclypeus about as wide as lateral pale marks *B. incanus*
- 6(1'). *Micrasema*: head dark with pale stripes along frontal sutures and behind eyes; mesonotum with a single seta at SA-1. *M. kluane*
Head without pale stripes, but with dark muscle scars; mesonotum with a row of several setae at SA-1. 7
- 7(6'). Case of sand grains; distinct dark, rounded muscle scars on back of head, most nearly as large as eye; usually one or two pairs of pale spots on anterior of frontoclypeus *M. rusticum*

³Larvae of *Brachycentrus fuliginosus* are unknown.

Case of fibers of vegetation; muscle scars on back of head variable in size and shape, frequently contiguous, and often indistinct; frontoclypeus usually with a pale spot at posterior angle *M. wataga*

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