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Aquatic Hemiptera of Wisconsin

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AQUATIC HEMIPTERA OF WISCONSIN[1]

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ABSTRACT

About 59,000 aquatic Hemiptera were collected in Wisconsin, most of them in the last 15 years. These include three species of Belostomatidae, 48 species of Corixidae, one species of Naucoridae, four species of Nepidae, nine species of Notonectidae, and one species of Pleidae. The riparian *Gelastocoris oculatus* was also found. Species keys for adults are provided along with notes on identification, habitat, biology, distribution, and abundance. Most species reached peak abundance in late summer and autumn and overwintered as adults, but seven species apparently overwintered as eggs. Most lentic species flew to streams or larger lentic habitats to overwinter. Populations of all species declined rapidly after mating and oviposition in the spring.

Species in six families of aquatic Hemiptera have been collected in Wisconsin, and their distribution, abundance, habitat preference, and identification are discussed here. Species in all families are predators, except Corixidae, which mostly feed on algae and detritus. In addition, species in five families of semiaquatic Hemiptera have been collected and will be treated in a subsequent publication. The usually riparian *Gelastocoris oculatus* (Fabricius, 1798) is also known to occur in Wisconsin from a female collected by C. E. Brown in Milwaukee County in 1900 (Todd 1955), from one in the University of Wisconsin Insect Collection collected in 1910 by A. C. Burrill and labeled "Rice L. Wis." (presumably Barron Co.), and from two specimens collected by Dr. Walter Suter from the margin of a pond in Kenosha County in 1970.

Most collections of aquatic Hemiptera were made in the last 15 years when I sampled lentic and lotic habitats throughout the state. All specimens have been deposited in the University of Wisconsin Insect Collection. Not all that were captured were retained. When thousands of corixids were captured at a site, only about 300 representative individuals were kept. Similarly, only 25 to 50 of easily recognized species of *Notonecta* or *Plea* were retained from each site.

Most species appeared to have two generations each year in Wisconsin, reaching peak abundance in late summer and early autumn. Except for *Trichocorixa naias*, *Hesperocorixa scabricula*, the four species of *Buenoa*, and *Notonecta borealis*, all of which apparently overwinter as eggs, most aquatic Hemiptera overwinter as adults. Their numbers become somewhat depleted by spring and decline precipitously after mating and oviposition in April or May. Individuals usually enter overwintering sites in September and October, and many species that breed in shallow lentic habitats fly to streams to overwinter, congregating along the banks in areas with reduced current. Many collections were made at such overwintering sites, but five or more lentic sites were also sampled in every Wisconsin county during this 15-year period, some of them several times.

Collections made in the last 25 years are summarized in Table 1. In this table the state is divided into nine 8-county regions as depicted in Figure 1. From the total number of insects collected in each region it will be noted that the sampling effort was not uniform, and this must be considered when comparing numbers of a species collected from the various regions. McKenna Pond, a shallow 0.8 ha pond in Dane County, is listed separately in Table 1 because it was sampled at weekly or biweekly intervals throughout

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Table 1. Numbers of each species of aquatic Hemiptera collected in nine areas of Wisconsin and McKenna Pond between 1962 and 1983 and total number of collections.

	North			Central			South			McK.	Total	Total
	West	Cent	East	West	Cent	East	West	Cent	East	Pond	Number	Coll.
BELOSTOMATIDAE												
Belostoma flumineum	122	53	43	75	117	96	133	162	125	379	1305	557
Lethocerus americanus	29	19	11	9	8	3	3	13	1	6	102	94
CORIXIDAE												
Callicorixa audeni	135	303	299	9	4	2					752	176
Cenocorixa dakotensis	1									1	2	2
C. utahensis	1					5					6	2
Corisella edulis	1					1	4	15			21	11
C. tarsalis		1	1			122	5	69	9	5	212	31
Cymatia americana						5		1			6	4
Hesperocorixa atopodonta	1027	883	548	250	420	152	306	166	49	72	3873	513
H. kennicottii	87	174	20	5	46	154	34	14	5	7	546	109
H. laevigata	1		3		4	4		86			98	19
H. lobata	80	3	61	4							148	38
H. lucida	2	1		1			3	2			9	6
H. michiganensis	650	842	726	67	151	24	53	33	3	13	2562	333
H. minorella	1673	1542	1639	243	142	24	22	16	10	9	5320	387
H. obliqua							4	18	17	20	59	25
H. scabricula	91	10	30	55	19	13	21	119	3	12	373	78
H. semilucida			1		3	10	29	1	1		45	21
H. vulgaris	479	184	192	452	350	394	151	557	638	585	3982	626
Palmacorixa buenoi	6	5	9	3	50	24	11	58	17		183	58
P. gillettei	2	11	9		4	2	204	18	6		256	37
P. nana		19	23	2	1	22	2	1	13		83	22
Ramphocorixa acuminata							12	4	1		17	6
Sigara alternata	659	388	323	613	778	490	1176	2129	868	630	8054	750
S. bicoloripennis	104	41	91	83	36	62	56	2	4		479	97
S. compressoidea	252	527	195	74	268	7		18	6		1347	144
S. conocephala	3	3	125	9	54	56	12	9		3	274	49
S. decorata	43	21	5	31	67	43	39	50	5	24	328	102
S. decoratella	96	45	84	54	98	74	51	119	46	6	673	145
S. defecta	142	20	23	19	56	4	12	15	17	5	313	78
S. dolabra	17	8	22								47	19
S. lineata	203	36	13	13	13						278	70

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S. grossolineata	45	301	220	58	176	319	277	454	181	10	2041	405
S. johnstoni	76	57	18	18	37						206	74
S. knighti	14	73	45	8							140	31
S. lineata	13	728	1011	121	281	3	300	848	1		3306	107
S. mackinacensis	105	50	30	19	39						243	80
S. macropala	11		41	4	25						181	19
S. mathesoni	28	212	192	75	89	43	202	418	204		1463	133
S. mullettensis	52	84	24	23	23	65		1	15		287	84
S. penniensis	76	30	24	6	7				3		146	58
S. signata	480	394	160	108	200	6		2			1350	305
S. solensis	42	67	83	39	49	1002	2	25	18	1	1328	113
S. transfigurata		4	2								6	4
S. trilineata	58	372	292	26	614		37	260	9		1668	131
S. variabilis	4	9	3	2	7		16				41	19
Trichocorixa borealis	54	8	24	13	291	170	42	401	268	1	1272	141
T. calva			1	1	37	11	199	101	241	12	603	107
T. kanza					2		3	47		2	54	13
T. naias	54	51	56	110	77	121	149	254	161	71	1104	208
NAUCORIDAE												
Pelocoris femoratus					4		2	62	23		91	14
NEPIDAE												
Nepa apiculata					1		2	7	1		11	10
Ranatra fusca	88	104	101	100	94	74	62	97	74	33	827	410
R. kirkaldyi						1		4			5	2
R. nigra		1		1		2	2	42	4		52	13
NOTONECTIDAE												
Buenoa confusa	20	3	5	2	31	28	5	30	19	167	310	60
B. limnocastoris	19		1	1						1	22	6
B. macrotibialis	40				14			1		1	56	8
B. margaritacea	1			3			70	172	1	16	263	21
Notonecta borealis	1		12								13	5
N. insulata	29	4	50	15	4	5	12	10	1	2	132	58
N. irrorata	73	26	38	5	41	6	126	55			370	114
N. lunata	53	134	46	69	220	251	266	273	121	4	1437	320
N. undulata	761	208	562	324	306	262	226	445	335	334	3763	582
PLEIDAE												
Neoplea striola	153	193	67	100	295	265	344	1214	1134	732	4497	398
TOTAL	8356	8252	7604	3322	5653	4427	4675	8914	4657	3164	59024	8662

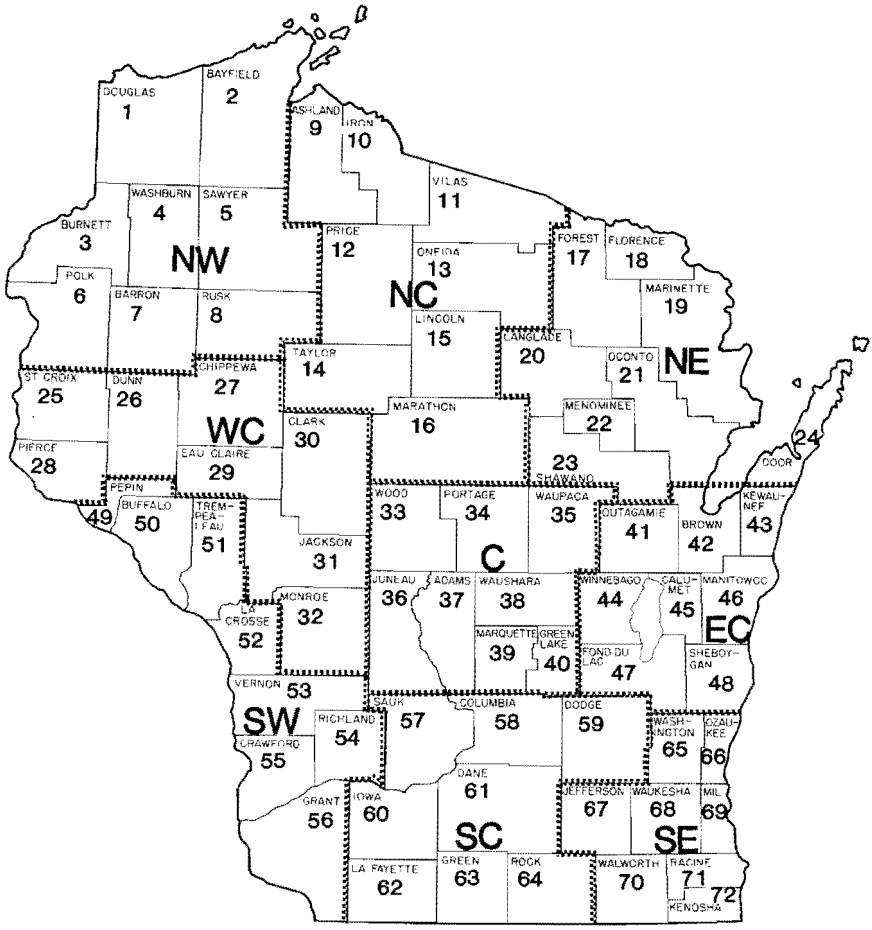

Figure 1. Location of the nine 8-county areas of Wisconsin and number assigned to each county.

much of a 6-year period as part of another study. Lentic habitats in unglaciated areas of western and southwestern Wisconsin are under-represented in the collections because only hard-to-find man-made ponds or river-bottom ponds occur there.

Keys to adults of species that occur or may occur in Wisconsin follow a brief discussion of each family. Reference to a recent revision of each family is also cited to provide supplemental illustrations and keys to species. Lengths were measured from the front of the head to the tip of the hemelytra, and literature values were used for species not collected. The distribution, abundance, habitat preference, and identification of each species that was collected is discussed separately. Each Wisconsin county has been numbered, generally from northwest to southeast (Figure 1), to facilitate listing of county records.

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BELOSTOMATIDAE

Three species of "giant water bugs," have been collected in Wisconsin, and a fourth, *Belostoma lutarium* (Stål, 1856), may occur in southern Wisconsin. This species is found regularly in southern Illinois and there is one record from southeastern Michigan. All of the species breed primarily in lentic habitats, but frequently are collected in late autumn and early spring from overwintering sites along stream banks. Because all species are attracted to lights, they are sometimes called "electric light bugs". All species that occur in eastern North America can be identified by using keys by Lauck (1964) and Menke (1963).

Key to Species of Belostomatidae in Wisconsin

1. Length 18–25 mm. ..... *Belostoma* 2
1′. Length more than 45 mm ..... *Lethocerus* 3
2(1). *Belostoma*: Dense pile of fine setae extending to mesal edge of lateral abdominal sternites and extending onto mesal sternites; scutellum distinctly longer than hemelytral commisure; length 20–24 mm ..... *B. flumineum*
2′. Dense pile of fine setae on lateral abdominal sternites separated from middle sternites by a narrow strip devoid of setae; scutellum about as long as hemelytral commisure; length 18–24 mm ..... *B. lutarium*
3(1′). *Lethocerus*: Profemur grooved to receive protibia; head and pronotum unicolorous; length 47–60 mm ..... *L. americanus*
3′. Profemur flat on inner margin; a pale stripe extends from between eyes onto pronotum; length 54–65 mm. ..... *L. griseus*

Belostoma flumineum Say, 1831

Distribution and Abundance: Common throughout Wisconsin. County records: 1–8, 10, 12–72.

Habitat: It breeds in all types of shallow, weedy ponds and flies to streams to overwinter under the banks.

Identification: Very similar to *B. lutarium*, but it can be separated with certainty from this southern species by the dense pile of setae on the lateral sternites that completely covers these sternites, except for the lateral edge, and even extends onto the middle sternites. In *B. lutarium* there is a distinct bare strip mesally between the pile and the middle sternites.

Lethocerus americanus (Leidy, 1847)

Distribution and Abundance: Generally uncommon, but apparently more common in northern Wisconsin than in the south. County records: 1–15, 18–19, 23–25, 27, 30–31, 36, 38–39, 41–42, 47, 50, 52, 54, 57–58.

Habitat: It breeds primarily in lentic habitats ranging from small ponds to lakes. It overwinters in deep lentic habitats or flies to streams.

Identification: Nymphs as well as adults can be identified by their very large size and the grooved inner margin of the profemur.

Lethocerus griseus (Say, 1832)

Distribution and Abundance: Rare. I have not collected this species, but there are nine specimens in the University of Wisconsin Insect Collection, all of them from Dane County.

Habitat: I suspect that this southern species inhabits deeper waters of large ponds and littoral zones of lakes, making it almost impossible to capture with an aquatic net. Specimens in the collection were probably captured at lights.

Identification: The pale stripe between the eyes and extending onto the pronotum is quite distinctive. The broad, flat, inner margin of the profemur is conclusive.

CORIXIDAE

"Water boatmen" are the most abundant aquatic Hemiptera in Wisconsin and have the greatest diversity of species. Forty-nine species have been collected, and with additional collecting a few more may be found. They inhabit all types of lentic and slow lotic habitats, but do not venture into the swift currents of streams. Almost all species are able to fly, and most do so frequently during the warmer months. Most species that breed in shallow lentic habitats fly to larger bodies of water, especially to slow streams, to overwinter. Taking advantage of this, about 22,000 corixids were collected in Wisconsin and identified between 1962 and 1968, mostly from streams in late autumn. Their distribution and abundance was reported and keys to Wisconsin species and notes on identification were provided (Hilsenhoff 1970).

Since 1968 an additional 24,000 corixids were collected in Wisconsin and identified. Unlike previous collections that came mostly from streams, many of these corixids were collected from lentic habitats. *Cymatia americana* was the only species that had not been found previously, but much knowledge was gained about probable breeding sites. Several species were found to be more common than previously reported, especially those species that breed in lentic habitats and rarely fly to streams to overwinter.

By using the key below it should be possible to identify all species of Corixidae likely to occur in Wisconsin. Males can be identified positively by using secondary sexual characters, all of which are thoroughly illustrated by Hungerford (1948) in his monumental monograph on the Corixidae of the Western Hemisphere, or by Sailer (1948) as part of this monograph. Females, which average about 7% longer than males, are occasionally difficult to identify. Figure 2 illustrates morphological structures used in identification of this difficult family.

Key to species of Corixidae in Wisconsin

1. Rostrum without transverse grooves; pronotum without transverse dark bands; length 6.5–8.2 mm ..... *Cymatia americana*
1′. Rostrum with transverse grooves; pronotum with transverse bands, although they may be indistinct 2
2(1′). Entire hemelytral pattern effaced; palar claw serrate at base; vertex of male acuminate; length 5.3–6.0 mm. ..... *Ramphocorixa acuminata*
2′. Hemelytral pattern distinct, although limited areas may be effaced 3
3(2′). Small shining corixids, male with sinistral asymmetry; apex of clavus not, or scarcely exceeding a line drawn through costal margins at nodal furrows .. .. *Trichocorixa* 10
3′. Male asymmetry dextral; apex of clavus plainly exceeding a line drawn through costal margins at nodal furrows 4
4(3′). Markings on clavis transverse, those on corium transverse, longitudinal, or reticulate; dark areas predominate 5
4′. Markings on clavus and corium narrow and broken, usually open reticulate with many interconnections; light areas predominate or equal dark areas in prominance 7
5(4). Pruinose area at base of claval suture short and broadly rounded at apex, about 2/3 as long as postnodal pruinose area; prothoracic lobe truncate. ..... *Hesperocorixa* 14
5′. Pruinose area at base of claval suture narrowly rounded or pointed at apex and almost as long as postnodal pruinose area; prothoracic lobe rounded 6
6(5′). Corial pattern transverse with little contrast between dark and light markings; male strigil absent; mesoepimeron slightly wider than prothoracic lobe and with scent gland osteole near tip; metaxyphus slightly longer than wide; length 6.5–8.1 mm ..... *Callicorixa* 26
6′. Corial pattern longitudinal, reticulate, or transverse, with light and dark markings usually contrasting; male strigil present ..... *Sigara* 27

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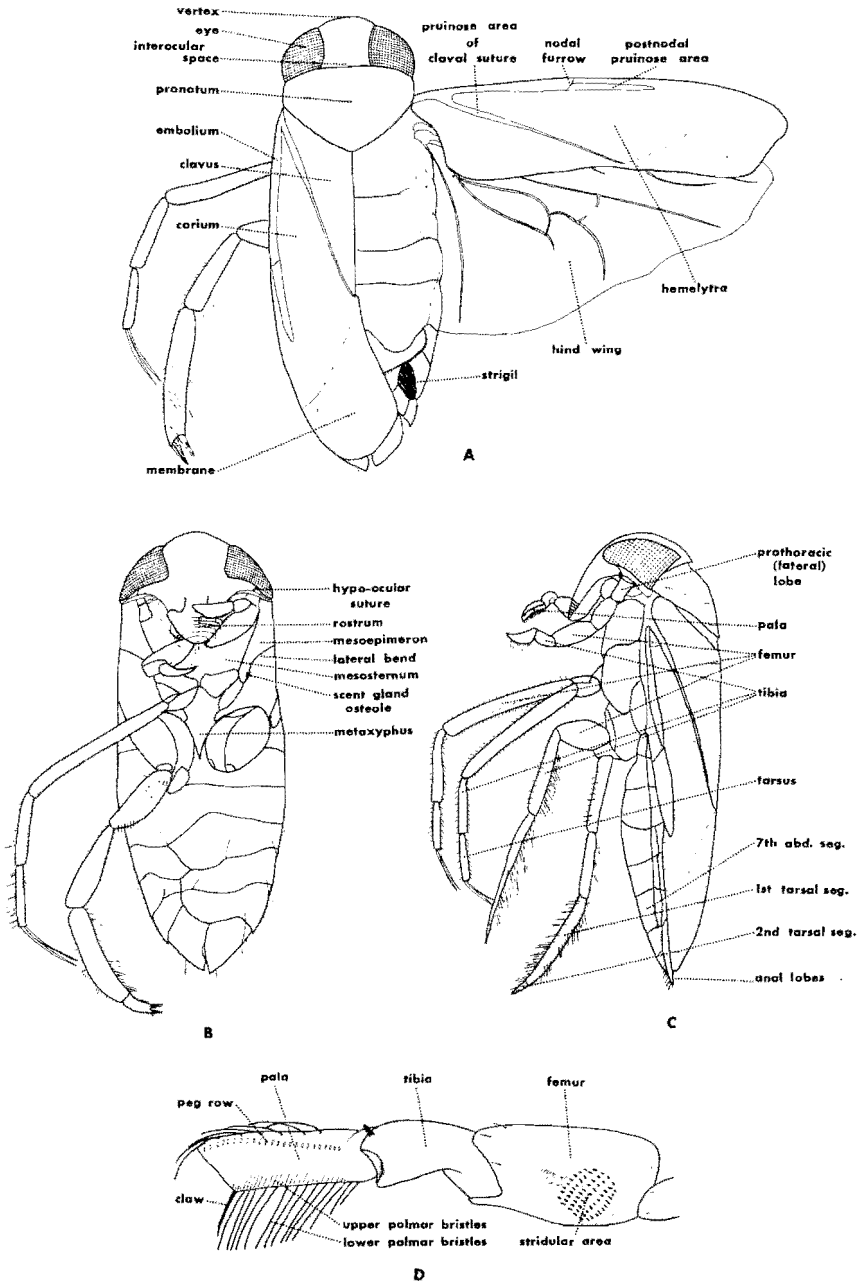

Figure 2. *Hesperocorixa obliqua* (modified from Hungerford 1948). A. Dorsal view of male. B. Ventral view of male. C. Lateral view of female. D. Prothoracic leg of male.

7(4′). Rear margin of head sharply curved, embracing an unusually short pronotum; interocular space much narrower than width of an eye ..... *Palmacorixa* 51
7′. Rear margin of head gently curved; interocular space about equal to width of an eye 8
8(7′). Prothoracic lobe tapering to a narrowly rounded apex; dark marks on anterior of clavis very narrow, often obscure ..... *Corisella* 53
8′. Prothoracic lobe truncate at apex; dark marks on anterior of clavis distinct 9
9(8′). Postocular space broader than antenna; anterior distal angle of prothoracic lobe produced and turned inward; length 7.6–9.2 mm..... *Dasycorixa hybrida*
9′. Postocular space narrower than antenna; apex of prothoracic lobe squarely truncate; smaller, less than 8.3 mm long ..... *Cenocorixa* 54
10(3). *Trichocorixa*—Male strigil small and round; nodal furrow of female absent or at apex of embolar groove..... 11
10′. Male strigil elongate; nodal furrow dividing embolium of female 12
11(10). Length of pronotal disc 1/2 or more its width; length 3.4–4.6 mm..... ..... *T. naias*
11′. Length of pronotal disc about 1/4 its width; extremely small, length 2.8–3.2 mm ..... *T. macroceps*
12(10′). Male strigil noticeably widened in region of bend to equal width of mesotarsus; length of apical area of embolar groove of female exceeding length of mesotarsus; length 4.1–5.2 mm..... *T. borealis*
12′. Male strigil not noticeably widened near bend and distinctly narrower than mesotarsus; length of apical area of embolar groove of female less than that of mesotarsus 13
13(12′). Strigil of male extremely narrow, little more than a heavy dark line; only fine pubescence on right side of seventh abdominal sternum of female; length 3.9–5.3 mm ..... *T.calva*
13′. Strigil of male 8–10 times as long as wide; 2 or 3 patches of bristle-like setae on right side of seventh abdominal sternum of female; length 4.5–5.5 mm ... . *T. kanza*
14(5). *Hesperocorixa*—Mesoepimeron at level of scent gland osteole as broad or broader than lateral lobe of prothorax..... 15
14′. Mesoepimeron plainly narrower than lateral lobe of prothorax 19
15(14). Tip of metaxyphus broadly truncated; length 7.9–9.2 mm.... *H. kennicottii*
15′. Tip of metaxyphus pointed..... 16
16(15′). Mesoepimeron at level of scent gland osteole equal to width of prothoracic lobe; length 8.3–9.9 mm ..... *H. atopodonta*
16′. Mesoepimeron at level of scent gland osteole distinctly wider than prothoracic lobe; less than 8.1 mm long 17
17(16′). Two stout spines dorsally on metafemur; length 6.7–7.8 mm .... *H. minorella*
17′. Many spines dorsally on metafemur 18
18(17′). Corial pattern crossbanded; length 6.4–7.9 mm ..... *H. michiganensis*
18′. Corial pattern longitudinal; length 7.0–8.1 mm..... *H. semilucida*
19(14′). Pronotum short, less than half as long as wide; length 9.7–12.7 mm .... *H. scabricula*
19′. Pronotum more than half as long as wide..... 20
20(19′). Pattern of corium effaced laterally; length 8.5–9.6 mm ..... *H. lucida*
20′. Pattern of corium not effaced..... 21
21(20′). Corium and membrane separated by a coalescing of pale figures 22
21′. Corium and membrane not separated by a coalescing of pale figures.... 23
22(21). Interocular space almost equal to width of an eye; metaxyphus as broad as long; male pala rounded apically; length 9.5–10.6 mm..... *H. lobata*
22′. Interocular space much narrower than width of an eye; metaxyphus longer than broad; male pala truncated apically; length 9.0–11.0 mm..... *H. interrupta*

23(21′). Metafemur with a row of about 10 spines ventrally on posterior distal margin; small, length 8.0–9.2 mm ..... *H. nitida*
23′. Metafemur with a row of 4 to 7 spines ventrally on posterior distal margin; large, more than 9.2 mm long 24
24(23′). Pronotum nonrastrate; hemelytral pattern somewhat reticulate; length 9.4–10.7 mm ..... *H. laevigata*
24′. Pronotum rastrate; hemelytral pattern not reticulate 25
25(24′). Male pala concave apically; usually with a row of 4 spines ventrally on posterior distal margin of metafemur; length 9.3–10.4 mm ..... *H. vulgaris*
25′. Upper distal angle of male pala acutely, obliquely produced; usually with a row of 5 spines ventrally on posterior distal margin of metafemur; length 9.4–10.3 mm ..... *H. obliqua*
26(6). *Callicorixa*—First metatarsal segment unicolorous; length 6.5–7.8 mm..... ..... *C. audeni*
26′. First metatarsal segment infuscated on distal third; length 6.9–8.1 mm .... *C. alaskensis*
27(6′). *Sigara*—Pronotum with a median pale longitudinal line 28
27′. Pronotum without a median pale longitudinal line 33
28(27). Tip of mesoepimeron as close or closer to scent gland osteole than to mesosternum 29
28′. Scent gland osteole remote from tip of mesoepimeron, farther than distance from tip to mesosternum 31
29(28). Hemelytra mostly black with wide pale markings that are transverse on clavis and somewhat longitudinal on corium; male pala thickened, with prominent keel on outside; length 5.7–6.6 mm ..... *S. variabilis*
29′. Markings on hemelytra narrower and arranged differently 30
30(29′). Male pala with strongly arched single row of pegs; female with anal lobes not notched on inner margin; length 6.3–7.2 mm ..... *S. johnstoni*
30′. Male pala with 2 rows of pegs; female with anal lobes notched on inner margin; length 5.4–6.5 mm ..... *S. knighti*
31(28′). Pronotum and hemelytra boldly cross-barred; vertex produced beyond eye curve in both sexes; length 5.5–5.8 mm ..... *S. transfigurata*
31′. Pattern less striking; vertex not noticeably produced 32
32(31′). Pattern of membrane effaced or indistinct; pale figures on corium and clavis transverse; length 5.2–5.8 mm ..... *S. compressoidea*
32′. Pattern of membrane usually distinct; pale figures on corium and distal half of clavis arranged more or less longitudinally; length 5.0–6.3 mm .... *S. mackinacensis*
33(27′). Large species, males greater than 6.8 mm long, females greater than 7.3 mm long 34
33′. Small species, males less than 6.7 mm long, females less than 7.2 mm long 37
34(33). Metaxyphus broad, truncated or notched at tip; length 8.1–9.5 mm..... ..... *S. decorata*
34′. Metaxyphus pointed apically 35
35(34′). Palae of both sexes with only 14–16 lower palmar hairs; pale marks on corium distinctly transverse, length 6.9–8.2 mm..... *S. decoratella*
35′. Palae with 18–22 lower palmar hairs; pale marks on corium never distinctly transverse, but at least somewhat longitudinal 36
36(35′). Interocular space plainly narrower than width of an eye; pale marks on corium and distal half of clavis arranged in a definite longitudinal series; length 6.9–7.9 mm ..... *S. penniensis*
36′. Interocular space equal to width of an eye; pale marks on clavis and some on corium transverse; length 7.3–8.5 mm ..... *S. conocephala*
37(33′). Small, less than 4.6 mm long; two black longitudinal stripes on corium; length 3.8–4.6 mm ..... *S. lineata*

37′. Larger, more than 4.6 mm long; if less than 5.0 mm long, without longitudinal stripes on corium 38
38(37′). Metaxyphus much longer (from widest point to tip) than wide 39
38′. Metaxyphus short, at most as long as wide 42
39(38). Clavus and corium with pale lines in a wavy longitudinal series; length 5.2–5.9 mm ..... *S. douglasensis*
39′. Markings on clavus and corium not in a wavy longitudinal series 40
40(39′). Mesoepimeron at level of scent gland osteole about equal in width to prothoracic lobe; length 6.0–6.8 mm ..... *S. dolabra*
40′. Mesoepimeron at level of scent gland osteole much broader than width of prothoracic lobe 41
41(40′). Dark, with little contrast between light and dark marks; pale bands on base of clavus more or less broken and confused; dorsal surface of metafemur with 2 or 3 rows of pegs; length 4.5–5.3 mm ..... *S. signata*
41′. Hemelytral pattern bold; pale bands on base of clavus entire, bands on corium plainly transverse; dorsal surface of metafemur with only 3 or 4 pegs; length 4.8–5.8 mm ..... *S. solensis*
42(38′). Scent gland osteole nearer base of mesoepimeron than tip 43
42′. Scent gland osteole near tip of mesoepimeron 46
43(42). Corium with 3 longitudinal dark stripes; length 5.1–6.0 mm ..... *S. trilineata*
43′. Corium without longitudinal dark stripes 44
44(43′). Head with median longitudinal brown line; mesoepimeron with deep incision at or near lateral bend; length 4.8–5.6 mm ..... *S. mathesoni*
44′. Head without line; mesoepimeron without deep incision near lateral bend 45
45(44′). Osteole almost in lateral bend of mesoepimeron, at least 4/5 from tip; metaxyphus with a truncated tip; length 4.8–5.9 mm ..... *S. grossolineata*
45′. Osteole not so close to lateral bend, 1/2–3/5 from tip; metaxyphus with a rounded tip; length 4.6–5.7 mm ..... *S. modesta*
46(42′). Corium with 3 bold, uninterrupted, longitudinal black stripes; male pala with 2 rows of pegs; anal lobes of female only very slightly notched on inner margin; length 5.5–6.8 mm ..... *S. mullettensis*
46′. Corial pattern transverse or indistinctly longitudinal; male pala with one row of pegs; if corial pattern is somewhat longitudinal, anal lobes of female distinctly notched on inner margin 47
47(46′). Pattern of membrane, and usually also inner basal angle of clavus, effaced or obscure; small, length 4.6–5.6 mm ..... *S. hubbelli*
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48(47′). Pronotum crossed by 5 or 6 dark bands; length 5.2–5.9 mm ..... *S. macropala*
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49(48′). Corium with 3 more or less distinct dark longitudinal bands; pala of male with pegs becoming widely separated distally; anal lobes of female notched on inner margin; length 5.4–6.8 mm ..... *S. defecta*
49′. Corium without 3 dark longitudinal bands; pegs of male pala evenly spaced; anal lobes of female not notched on inner margin 50
50(49′). Metaxyphus short, rounded apically; length 6.0–6.9 mm ..... *S. bicoloripennis*
50′. Metaxyphus about as long as wide, pointed apically; length 5.9–7.2 mm ..... *S. alternata*
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51′. Anterolateral depressions on pronotum weak or absent; male pala elongate 52
52(51′). Mesofemur of male with a longitudinal row of pegs on ventral surface; female less than 5.2 mm long; length 4.4–5.2 mm ..... *P. nana*

52′. Mesofemur of male without a row of pegs; female 5.4 mm or longer; length 4.9–6.5 mm ..... *P. buenoi*
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Callicorixa audeni Hungerford, 1928

Distribution and Abundance: Common northern third, rare central third, absent southern third. County records: 1–24, 26–30, 35, 37, 41, 47.

Habitat: It probably breeds in ponds and swamps, mostly in wooded areas, and often flies to larger streams in autumn to overwinter.

Identification: The black prothoracic lobe is distinctive, but some, especially teneral individuals, lack this feature. Males are distinctive, having no strigil and two rows of pegs on the pala. Females most resemble *Sigara alternata*, which may have a smokey prothoracic lobe, but *C. audenl* can be identified by their longer, more acutely pointed metaxyphus, a slightly wider mesoepimeron, and a distinct widening of the hemelytra at the nodal furrow.

Cenocorixa dakotensis (Hungerford, 1928)

Distribution and Abundance: Very rare. Two females have been collected, one from L. Minnesuing in Douglas Co. 20 Nov. 1968 and the other from McKenna Pond in Dane Co. 17 Apr. 1978.

Habitat: It probably breeds in lakes.

Identification: The dark last metatarsal segment separates it from other *Cenocorixa* in this region.

Cenocorixa utahensis (Hungerford, 1925)

Distribution and Abundance: Rare. A male was collected from L. Nebagamon in Douglas Co. 20 Nov. 1968 and four males and a female were collected from a shallow, open, mud-bottomed pond in Manitowoc Co. 20 Apr. 1983.

Habitat: It probably breeds in lakes.

Identification: Males can be separated from *C. bifida* by the uninterrupted peg row of the pala. Females have a shorter costal area anterior to the nodal furrow.

Corisella edulis (Champion, 1901)

Distribution and Abundance: Rare statewide, mostly found in southwest third. County records: 5, 42, 53–54, 58, 60–62, 64.

Habitat: All collections were from open lentic habitats in autumn, suggesting that it breeds in such habitats.

Identification: The larger size, effaced base of the clavis, and the pale metatarsi separate *C. edulis* from the more common *C. tarsalis*.

Corisella tarsalis (Fieber, 1851)

Distribution and Abundance: Generally uncommon southern half, rare north. County records: 16, 24, 46–47, 50, 53, 58, 60–61, 67–68, 71–72.

Habitat: It apparently breeds in open ponds, especially in agricultural areas, and only occasionally flies into streams.

Identification: The small size and infuscate metatarsus distinguish it from *C. edulis*.

Cymatia americana Hussey, 1920

Distribution and Abundance: Rare. Six individuals have been collected from four ponds. County records: 42, 46, 61.

Habitat: It apparently breeds in shallow, open ponds.

Hesperocorixa atopodonta (Hungerford, 1927)

Distribution and Abundance: Abundant northern three-fourths, common southern fourth. County records: 1-72.

Habitat: It probably breeds in all types of lentic habitats, and frequently overwinters in streams.

Identification: A mesoepimeron that is the same width as the prothoracic lobe and a conspicuous V-shaped yellow band bordering the apex of the corium readily separate it from other *Hesperocorixa*. The elongate metaxyphus separates it from similarly sized *Sigara*.

Hesperocorixa interrupta (Say, 1825)

Distribution and Abundance: The only Wisconsin record is a male collected at Beaver Dam (Dodge Co.) by W. E. Snyder in 1909 (Hungerford 1948). This southern species may no longer occur in Wisconsin.

Identification: While similar to *H. lobata*, it can be separated from that species by its narrower interocular space and longer, more pointed metaxyphus. Males have a truncate pala that differs markedly from the rounded pala of *H. lobata*, and they also have an elongate and large strigil. Characters in the key separate it from the smaller *H. nitida*.

Hesperocorixa kennicottii (Uhler, 1897)

Distribution and Abundance: Fairly-common most areas, but apparently absent from counties bordering on L. Michigan. County records: 1, 3–10, 12–18, 20–21, 26, 28, 33–37, 39, 41–42, 44, 50–53, 55–58, 60–62, 67.

Habitat: It probably breeds in ponds. Most were collected from overwintering sites in larger streams.

Identification: The golden-brown membrane almost devoid of markings, the wide pale mesoepimeron, and the truncate or broadly rounded metaxyphus easily separate *H. kennicottii* from other large corixids.

Hesperocorixa laevigata (Uhler, 1893)

Distribution and Abundance: Rare statewide. County records: 7, 24, 36–37, 44, 46, 58, 60–61.

Habitat: It was collected in spring and autumn from ponds and margins of slow streams, but none were collected during the breeding season.

Identification: The somewhat reticulate pattern and non-rastrate pronotum distinguish it from other *Hesperocorixa*.

Hesperocorixa lobata (Hungerford, 1925)

Distribution and Abundance: Uncommon northern third, absent elsewhere. County Records: 1–8, 12–13, 15, 18, 20, 22, 25–27.

Habitat: It apparently breeds in larger ponds and small lakes, and rarely enters streams to overwinter.

Identification: Separation from *H. interrupta* is discussed under that species, but their distribution does not overlap. No other large *Hesperocorixa* has figures coalescing along the edge of the membrane, although in *H. atopodonta* the membrane is bordered in yellow.

Hesperocorixa lucida (Abbott, 1916)

Distribution and Abundance: Rare statewide. County records: 1, 15, 32, 56, 58.

Habitat: Except for a female collected from a pond in mid-October, all were collected from margins of large rivers in autumn or spring.

Identification: The lack of markings on the clavis and effaced markings of the corium are distinctive.

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Hesperocorixa michiganensis (Hungerford, 1926)

Distribution and Abundance: Abundant north, much less so farther south, rare southeast. County records: 1–21, 23–44, 46–47, 50–53, 55–59, 61, 63–64, 67, 70–71.

Habitat: It overwinters mostly in larger streams where it can be collected in numbers in autumn and spring. Summer collections indicate that it breeds in a variety of ponds, especially those in open areas.

Identification: The wide, very pale mesoepimeron, elongate metaxyphus, and distinct transverse pale markings on the hemelytra separate this species from all others of similar size.

Hesperocorixa minorella (Hungerford, 1926)

Distribution and Abundance: Abundant north, much less common central, uncommon south. County records: 1–41, 43–44, 46–47, 49–53, 57–59, 61, 64–65, 67.

Habitat: Summer collections indicate it breeds in swamps and a wide variety of ponds. It overwinters mostly in larger streams.

Identification: The dark coloration, broad dark mesoepimeron, long metaxyphus, and two spines on the dorsal surface of the metafemur readily identify it.

Hesperocorixa obliqua (Hungerford, 1925)

Distribution and Abundance: Uncommon southern third, absent elsewhere. County records: 53–54, 58, 60–62, 64, 71–72.

Habitat: All collections have been from ponds and margins of lakes. It apparently breeds in shallow ponds and does not overwinter in streams.

Identification: The acute and obliquely produced upper distal angle of the male pala is distinctive, but females closely resemble *H. vulgaris*. The pale transverse lines of the corium are shorter and broader in *H. obliqua*, and seldom traverse the entire corium, while the longer lines in *H. vulgaris* extend entirely across the corium in the basal third. Almost all have a row of five spines ventrally on the posterior distal margin of the metafemur.

Hesperocorixa scabricula (Walley, 1936)

Distribution and Abundance: Fairly-common statewide. County records: 1–8, 11, 15, 18, 20–21, 23–36, 42, 46, 48, 52–53, 58, 60–61, 64, 68.

Habitat: It breeds in large ponds and small lakes, and does not fly to streams to overwinter. Except for two females collected in April 1983, after an exceptionally mild winter, all collections were made between 28 June and 4 November. Seventy percent of all individuals were collected in September and October. In July and August males slightly outnumbered females, but in September females outnumbered males 9 to 2 and in October and November they outnumbered males 30 to 1. I suspect that this species mates in late summer, oviposits in September and October, and overwinters primarily in the egg stage.

Identification: The combination of its very large size and very short pronotum readily distinguish this species.

Hesperocorixa semilucida (Walley, 1930)

Distribution and Abundance: Uncommon southern half, mostly found southwest. County records: 23, 38–39, 41, 48, 51, 54–56, 63, 71.

Habitat: It overwinters in larger rivers. Some were collected from ponds in spring, but none were collected during the summer.

Identification: In size, and in the shape of the mesoepimeron and metaxyphus, it resembles *H. minorella* and *H. michiganensis*, but the longitudinal arrangement of markings on the corium and clavis readily separate it from those species.

Hesperocorixa vulgaris (Hungerford, 1925)

Distribution and Abundance: Abundant south, common north. County records: 1–72.

Habitat: It breeds in a variety of shallow ponds and overwinters either in these ponds or in larger streams.

Identification: The concave apex of the male pala is distinctive. Females can best be separated from other large *Hesperocorixa* with a narrow mesoepimeron by the very

narrow and long transverse pale marks of the corium. Almost all have a row of four spines ventrally on the posterior distal margin of the metafemur.

Palmacorixa buenoi Abbott, 1913

Distribution and Abundance: Rare north, fairly-common east and southeast, uncommon farther west. County records: 1, 4–6, 12–14, 20–21, 24, 28–29, 34–43, 49–50, 52–53, 55–58, 61–62, 64–66, 71–72.

Habitat: It inhabits permanent ponds and margins of lakes and streams, probably breeding and overwintering in the same habitat.

Identification: Females are difficult to separate from *P. nana* and some cannot be identified with certainty. *P. buenoi* females are larger (5.4–6.5 mm) than those of *P. nana* (< 5.2mm), but there is some size overlap. The dark base of the pronotum is usually wider than in *P. nana* and the pronotum lacks the strong antero-lateral depressions found in *P. gillettei*.

Palmacorixa gillettei Abbott, 1912

Distribution and Aundance: Quite rare statewide. County records: 1, 7, 9, 11, 13–14, 18, 21, 35, 38, 41, 48, 53–54, 60–62, 67.

Habitat: It has been collected only from streams, which it apparently uses as a breeding and overwintering site.

Identification: Males are easily identified by their dilated and flattened palae. The strong antero-lateral depression of the pronotum and its wide, dark posterior border distinguish females.

Palmacorixa nana Walley, 1930

Distribution and Abundance: Uncommon statewide. County records: 12, 14–15, 17–18, 21, 30, 33, 41, 45–48, 53, 61, 66, 68, 70.

Habitat: It was collected mostly from margins of streams, but was also found in permanent ponds. It probably breeds and overwinters in the same site.

Identification: The row of pegs on the mesofemur separates males from those of *P. buenoi*, and females generally can be separated from *P. buenoi* by the very narrow, often interrupted, dark posterior border of the pronotum and by their smaller size (less than 5.2 mm).

Ramphocorixa acuminata (Uhler, 1897)

Distribution and Abundance: Rare, with collections from ponds in only three southern counties. County records: 50, 61, 72.

Habitat: It probably breeds in ponds in open areas.

Identification: The effaced pattern of the clavis and corium separate it from all other small Wisconsin corixids. The male is also recognizable because it has an acuminate vertex.

Sigara alternata (Say, 1825)

Distribution and Abundance: Abundant southern two-thirds, common north. County records: 1–72.

Habitat: It breeds in shallow, open ponds and frequently flies to streams to overwinter.

Identification: The pointed metaxyphus forms an angle of about 70° at the tip. This, the alternate dark and pale transverse markings on the clavis, and the interconnected transverse pale marks in the middle of the corium that leave longitudinal dark bands laterally, separate it from other species with a narrow mesoepimeron.

Sigara bicoloripennis (Walley, 1936)

Distribution and Abundance: Fairly-common northern three-fourths, rare southern fourth. County records: 1–9, 12–18, 20–21, 24–29, 34–37, 39–41, 43, 46, 49–55, 58, 61, 67, 70–72.

Habitat: It apparently breeds in shallow, open ponds and flies to larger streams to overwinter.

Identification: The very short, rounded metaxyphus, and the broader and elongate transverse pale marks on the corium distinguish it from *S. alternata*, and from *S. defecta*, which has very short pale marks.

Sigara compressoidea (Hungerford, 1928)

Distribution and Abundance: Common northern half, uncommon south. County records: 1–18, 20–22. 25, 27–41, 48, 57, 61, 64, 67, 70, 72.

Habitat: It apparently breeds in ponds and other lentic habitats, and overwinters mostly in streams.

Identification: The pale longitudinal line on the pronotum and the effaced membrane are distinctive. It could be confused only with *S. mackinacensis*, but lines on the basal third of the clavis are mostly entire and not zig-zag, and the corial pattern is transverse and not longitudinal.

Sigara conocephala Hungerford, 1926

Distribution and Abundance: Fairly-common east, especially northeast, uncommon to rare elsewhere. County records: 1, 4, 7, 9, 11, 13, 17–18, 25, 28, 37, 40, 44, 47–51, 58–59, 61.

Habitat: It probably breeds in ponds and overwinters mostly in streams.

Identification: The large size and produced vertex of the male are distinctive. The unusually long palae separate females from other large *Sigara*.

Sigara decorata (Abbott, 1916)

Distribution and Abundance: Fairly-common most areas. County records: 1, 3–4, 6–8, 10–12, 14, 16, 18, 20, 24–25, 28–30, 33–37, 39, 41–42, 44, 46–47, 50–58, 61–65, 67, 71.

Habitat: It apparently breeds in ponds and small lakes and overwinters mostly in streams and lakes.

Identification: The large size and broadly rounded to truncate metaxyphus readily distinguish this species from other large *Sigara*.

Sigara decoratella (Hungerford, 1926)

Distribution and Abundance: Fairly-common statewide. County records: 1–4, 6–9, 11–15, 17–19, 21, 23–30, 34–42, 44, 46–58, 61, 63–65, 67, 70–72.

Habitat: It probably breeds mostly in ponds and overwinters in streams.

Identification: The distinctly transverse pale marks that almost completely traverse the corium and the reduced number of lower palmer hairs distinguish *S. decoratella* from other large *Sigara*.

Sigara defecta Hungerford, 1948

Distribution and Abundance: Generally uncommon statewide. County records: 1–4, 6, 8–9, 12–15, 17–18, 21, 23, 25–26, 28–29, 34, 36–37, 39, 41, 44, 48, 50, 52–53, 57–61, 64–65, 67, 69–72.

Habitat: It probably breeds in open ponds and overwinters in streams or lakes.

Identification: The male pala is distinctive. Females most closely resemble *S. bicoloripennis* and *S. mullettensis*. Corial pale marks are distinctly transverse in *S. bicoloripennis* and distinctly longitudinal in *S. mullettensis*; they are indistinctly longitudinal in *S. defecta*. The anal lobes are distinctly notched mesally; they are only slightly notched in *S. mullettensis* and unnotched in *S. bicoloripennis*. *S. hubbelli*, which has not been collected in Wisconsin, has the markings on the membrane obscure and almost effaced.

Sigara dolabra Hungerford and Sailer, 1942

Distribution and Abundance: Quite rare extreme north, absent elsewhere. County records: 1–4, 11–13, 15–19.

Habitat: It apparently breeds in ponds and overwinters in streams.

Identification: The very long, pointed metaxyphus and a mesoepimeron as wide as the prothoracic lobe will distinguish this species from others of a similar size.

Sigara douglasensis (Hungerford, 1926)

Distribution and Abundance: Fairly-common extreme northwest, occasional south to central counties. County records: 1–13, 15, 17–18, 22–23, 31, 36–37, 39–40.

Habitat: It appears to breed in ponds and swampy areas and overwinter in streams.

Identification: The wavy longitudinal lines on the clavis and corium are distinctive.

Sigara grossolineata Hungerford, 1948

Distribution and Abundance: Generally common statewide. County records: 1–9, 11–30, 33–48, 50–72.

Habitat: It breeds and overwinters along margins of streams and in spring ponds.

Identification: It is closely related to *S. modesta* (Abbot 1916), which has not been collected in Wisconsin, but may occur in the south. In *S. modesta* the scent gland osteole is only 1/2 to 3/5 from the tip of the mesoepimeron to the lateral bend, and not close to the lateral bend as in *S. grossolineata*. Also, in *S. modesta* the dark pattern of the clavis is effaced along the margin bordering the pronotum, while in *S. grossolineata* the lines may become narrow, but they remain distinct.

Sigara johnstoni Hungerford, 1928

Distribution and Abundance: Uncommon to fairly-common northwest quarter, and in some central counties, absent south and east. County records: 1, 3–5, 7–18, 20, 26–27, 29–34, 36–37.

Habitat: It apparently breeds in ponds and overwinters in larger streams.

Identification: It most closely resembles the smaller *S. knighti*, but in that species the anal lobes of the female are notched and the male has a double peg row on the pala. A distinctive characteristic of *S. johnstoni* is the slightly notched metaxyphus. In some individuals the median pale line on the pronotum is obscure.

Sigara knighti Hungerford, 1948

Distribution and Abundance: Uncommon northern third, absent elsewhere. County records: 1–2, 4, 6, 9, 11–14, 17–20, 30.

Habitat: It apparently breeds mostly in spring ponds, but may breed in other habitats. It overwinters mostly in streams.

Identification: Males have two peg rows on their palae and females can be separated from *S. johnstoni* and *S. variabilis* by their mesally notched anal lobes.

Sigara lineata (Forster, 1771)

Distribution and Abundance: Common to abundant statewide in large, sandbottomed rivers; apparently absent from counties bordering L. Michigan. County records: 3, 7–16, 18–19, 21, 26, 29, 34, 36–37, 39, 41, 51, 53–55, 57–58, 60–61, 63, 66.

Habitat: It breeds and overwinters along margins of streams with a sandy substrate.

Identification: The very small size and striped hemelytra are distinctive.

Sigara mackinacensis (Hungerford, 1928)

Distribution and Abundance: Uncommon to fairly-common north and west-central, absent east and south. County records: 1, 3–15, 17–19, 21, 27, 29–33, 36–37.

Habitat: It probably breeds in swamps or ponds and overwinters mostly in larger streams.

Identification: The distinctly marked membrane separates it from *S. compressoidea*, the only species with which it may be confused.

Sigara macropala (Hungerford, 1926)

Distribution and Abundance: Fairly-common northwest, northeast and west central, but not found north central, east central, or south. County records: 1–4, 8, 18, 31, 34, 36.

Habitat: It breeds in lakes and large ponds, and overwinters in its breeding sites and only occasionally in larger streams.

Identification: The large dorsal extension of the male pala is distinctive. The reduced number of black bars on the pronotum distinguishes it from similar species.

Sigara mathesoni Hungerford, 1948

Distribution and Abundance: Fairly-common north, common south. County records: 1–4, 6–7, 9, 11–12, 15, 17–20, 24–28, 32, 34, 36–40, 43, 45–47, 52–68, 70.

Habitat: It breeds in spring ponds and spring-fed streams, and overwinters in its breeding sites or in larger streams.

Identification: The median brown stripe on the head and the deep incision at the lateral bend of the mesoepimeron are distinctive.

Sigara mullettensis (Hungerford, 1928)

Distribution and Abundance: Fairly-common most of northern two-thirds, not found southwest or in counties bordering Mississippi River. County records: 1–6, 8–18, 20–21, 24–25, 27, 29–30, 33–36, 38–39, 41, 44, 47–48, 59, 66–67.

Habitat: It apparently breeds in ponds and overwinters mostly in streams.

Identification: The double peg row of the male pala separates it from similar species. Females could be confused with *S. defecta*, which also tends to have a longitudinal corial pattern, but in that species the anal lobes are distinctly notched mesally. They are only slightly notched in *S. mullettensis*.

Sigara penniensis (Hungerford, 1928)

Distribution and Abundance: Uncommon northern two-thirds, generally absent from southern third. County records: 1, 3–8, 11–13, 15, 17–18, 21, 24, 30–33, 37–38, 66.

Habitat: It probably breeds in ponds and overwinters mostly in larger streams.

Identification: The large size, narrow interocular space, and longitudinal arrangement of the corial markings separate it from other *Sigara*.

Sigara signata (Fieber, 1851)

Distribution and Abundance: Common northern two-thirds, rare southern third. County records: 1–25, 27–41, 47, 58.

Habitat: It breeds in bogs, swamps, ponds, and a variety of lentic habitats, and overwinters mostly in streams.

Identification: The small size, long metaxyphus, and dark coloration make this species easy to recognize.

Sigara solensis (Hungerford, 1926)

Distribution and Abundance: Abundant east central, fairly-common elsewhere, except rare southwest. County records: 1, 3–18, 21, 24–26, 28–30, 34–35, 37–44, 47–48, 51, 55, 57, 59, 61, 64–67, 70.

Habitat: It apparently breeds in spring ponds and small lakes, and overwinters mostly in larger streams.

Identification: The long metaxyphus, wide mesoepimeron, and three or four pegs on the dorsum of the metafemur are distinctive.

Sigara transfigurata (Walley, 1930)

Distribution and Abundance: Very rare, restricted to the north. County records: 10–11, 16–17.

Habitat: It probably breeds in lakes and overwinters in them or in large streams.

Identification: The bold cross-bars, short pronotum, and somewhat produced vertex are distinctive.

Sigara trilineata (Provancher, 1872)

Distribution and Abundance: Found statewide, often common. County records: 4, 7–8, 11–19, 21, 26–29, 32–39, 50, 54, 57–61, 64, 66.

Habitat: It breeds and overwinters in streams.

Identification: The bold longitudinal stripes on the hemelytra and wide mesoepimeron separate it from other medium-sized *Sigara*.

Sigara variabilis (Hungerford, 1926)

Distribution and Abundance: Rare north, uncommon near Mississippi River, absent southeast. County records: 1, 5, 13, 16, 24, 26, 33–34, 36–37, 51–52, 55.

Habitat: It probably breeds in larger ponds and lakes, and overwinters in streams or its breeding sites.

Identification: The wide pale bands on the corium distinguish it from similar species. Females most resemble *S. johnstoni*, but have a slight mesal notch in the anal lobes and an unnotched metaxyphus.

Trichocorixa borealis Sailer, 1948

Distribution and Abundance: Generally common east, mostly uncommon west and north. County records: 3, 7–8, 12, 15–16, 24, 26, 29, 34–37, 39–44, 46–48, 50–61, 63–65, 67–72.

Habitat: It apparently breeds in lakes and ponds, and perhaps even along streams. It overwinters mostly in streams and lakes.

Identification: The rather broad, elongate strigil of the male is widened at the bend, but could be confused with the slightly narrower strigil of *T. kanza*. Females are distinctive, having a long postnodal pruinose area and a distinct outward projection at the anterior end of the polished prenodal area.

Trichocorixa calva (Say, 1832)

Distribution and Abundance: Common south, absent north. County records: 24, 32, 36–37, 39–43, 46–48, 50–72.

Habitat: It probably breeds in ponds and sloughs and overwinters in streams.

Identification: The extremely narrow strigil of the male is distinctive. Females resemble *T. kanza*, but lack patches of setae on the right side of the seventh abdominal sternum.

Trichocorixa kanza Sailer, 1948

Distribution and Abundance: Uncommon to rare southern third, absent elsewhere. County records: 39–40, 55–56, 61–62, 64.

Habitat: It probably breeds in ponds and overwinters in streams.

Identification: Males are very similar to *T. borealis*, but the strigil is narrower and not distinctly widened at the bend. The two or three small and distinct patches of setae on the right side of the seventh abdominal sternum of the female are distinctive.

Trichocorixa naias (Kirkaldy, 1908)

Distribution and Abundance: Fairly-common statewide. County records: 2–3, 6–7, 9–10, 12–19, 21, 23–26, 28–30, 33–36, 38–43, 45–48, 50–56, 58–72.

Habitat: It breeds in ponds and rarely flies to streams. Only two were collected before mid-June, suggesting that this species may overwinter as an egg.

Identification: The absence of a postnodal pruinose area in the female and the small rounded strigil of the male separate this species from other Wisconsin *Trichocorixa*. *Trichocorixa macroceps*, which has not been collected, is most similar, but it is smaller and has a very short pronotum.

NAUCORIDAE

Only one species of "creeping water bug" has been found in Wisconsin, and it is unlikely that any others will be found.

Pelocoris femoratus (Palisot de Beauvois, 1805)

Distribution and Abundance: Uncommon southern Wisconsin, absent north. County records: 36, 56–58, 61, 67, 71.

Habitat: It has been collected from spring ponds and backwaters or impoundments of streams where it breeds. It apparently overwinters in its breeding sites or along margins of streams.

Identification: The flat, oval shape, extremely broad profemur, and 8.2–10.2 mm size range easily distinguish it from all other aquatic Hemiptera.

NEPIDAE

There are only four species and two genera of "water scorpions" that occur in Wisconsin, and only one species that is widespread and frequently encountered. All the species live primarily in lentic habitats, but frequently fly to larger streams to overwinter. The family in North America was revised by Hungerford in 1922.

Key to species of Nepidae in Wisconsin

1. Body oval, more than 1/3 as wide as long; length 16–19 mm ..... *Nepa apiculata*
1′. Body slender, subcylindrical, stick-like; more than 23 mm long ..... *Ranatra* 2
2(1′). *Ranatra*—Antenna simple, distal end of penultimate segment without lateral prolongation; length 23–27 mm ..... *R. kirkaldyi*
2′. Penultimate segment of antenna with lateral prolongation distally 3
3(2′). Lateral prolongation at distal end of penultimate antennal segment almost as long as last antennal segment; length 28–40 mm ..... *R. fusca*
3′. Lateral prolongation at distal end of penultimate antennal segment less than half as long as last antennal segment; length 25–33 mm ..... *R. nigra*

Nepa apiculata Uhler, 1862

Distribution and Abundance: Rare south, absent north. County records: 40, 54, 57–58, 61, 63, 68.

Habitat: Almost all collections were from debris in streams in early spring or late autumn, suggesting it overwinters in such sites. No summer collections were made, so its breeding habit remains unknown.

Identification: The oval shape and long apical repiratory filament distinguish it from all other aquatic Hemiptera.

Ranata fusca Palisot de Beauvois, 1805

Distribution and Abundance: Fairly-common statewide. County records: 1–23, 25–61, 63–72.

Habitat: It breeds in many types of lentic habitats, from small ponds to lakes, and often flies to streams to overwinter.

Identification: The F-shaped antenna separates it from other *Ranatra*. It also tends to be larger than other Wisconsin species.

Ranatra kirkaldyi Bueno, 1905

Distribution and Abundance: Rare, but probably distributed statewide. County records: 44, 60.

Habitat: It breeds in lakes, sloughs, and other larger bodies of water that are difficult to sample, which probably accounts for its apparent rarity. Some may fly to streams to overwinter.

Identification: The simple antenna is distinctive. THe profemur is not narrowed in the middle as it is in *R. fusca* and *R. nigra*.

Ranatra nigra Herrich-Schaffer, 1853

Distribution and Abundance: Uncommon to rare statewide. County records: 15, 25, 33, 44, 51, 58, 61, 70–71.

Habitat: It breeds primarily in larger and deeper lentic habitats and overwinters in its breeding sites or in streams.

Identification: The short prolongation of the penultimate antennal segment separates it from the other two species in Wisconsin.

NOTONECTIDAE

Nine species and two genera of "backswimmers" have been found in Wisconsin. All inhabit lentic habitats, but at least two species of *Notonecta* fly to streams in the autumn to overwinter. Adult *Buenoa* have not been collected before 23 June, suggesting that, like *Notonecta borealis*, they overwinter as eggs. Identification of *Notonecta* species presents no problems, and all species can be easily identified in the field. Hungerford revised the genus in 1933, and in 1945 an additional species was described from New England by Hutchinson. *Buenoa*, especially females, are much more difficult to identify. Since most species of *Buenoa* inhabit deeper lentic habitats, they are difficult to collect and are probably under-represented in collections. Truxal revised *Buenoa* in 1953.

Key to species of Notonectidae in Wisconsin

1. Slender; antennae 3-segmented; length less than 8.5 mm ..... *Buenoa* 2
1′. Robust; antennae 4 segmented; length more than 8.5 mm ..... *Notonecta* 5
2(1). *Buenoa*—Terminal segment of rostrum as long as penultimate segment; wings without markings; pronotum broadest at base, where it is distinctly wider than head; profemur of male distinctly narrowed toward apex; length 7.0–8.2 mm ..... *B. margaritacea*
2′. Terminal segment of rostrum distinctly shorter than penultimate segment; wings almost always with dark marks, especially near humeral angle; pronotum narrower than head, except for inflated pronotum of male *B. limnocastoris*; profemur of male almost as broad at apex as at base 3
3(2′). Infuscations on wings, if present, limited to lateral edge anteriorly; no infuscations on dorsum; protibia of male almost as wide at base as profemur; metatarsal setae infuscate dorsally, but never black; length 6.0–7.0 mm ..... *B. macrotibialis*
3′. Lateral infuscations on wings near anterolateral angle and usually also in apical fourth; infuscations often present on dorsum; protibia of males about half as wide as profemur; metatarsal setae may be black dorsally 4
4(3′). Infuscation near anterolateral margin of wing linear, posterior infuscation small or absent; metatarsal setae black dorsally, or nearly so; prothorax of male not inflated, distinctly narrower than head; length 5.0–6.0 mm ..... *B. confusus*
4′. Infuscation near anterolateral angle of wing widest at base, posterior infuscation large, at least half width of wing; metatarsal setae infuscate dorsally, but not black; prothorax of male inflated, wider than head; length 5.8–7.5 mm ..... *B. limnocastoris*
5(1′). *Notonecta*—Hemelytra with an irregular pattern of black and orange marks: length 13.1–14.5 mm ..... *N. irrorata*
5′. Hemelytra with large white areas, never with orange 6
6(5′). Mesotrochanter acutely angulate posteriorly; small, length 9.0–10.2mm ..... *N. lunata*
6′. Mesotrochanter rounded posteriorly; larger, at least 10.5 mm long 7
7(6′). Sternal keel of abdomen completely covered with long setae; smaller, length 10.9–12.3 mm ..... *N. undulata*
7′. Middle of sternal keel bare on fourth abdominal sternum; larger, at least12.4 mm long 8
8(7′). Scutellum and most of hemelytra white or pale yellow; length 12.9–14.8 mm ..... *N. borealis*
8′. Scutellum black, and with dark markings on hemelytra; length 14.0–15.0 mm ..... *N. insulata*

Buenoa confusa Hungerford, 1953

Distribution and Abundance: Found statewide, but generally uncommon. County records: 1–3, 6–7, 10, 18–19, 22, 24–25, 33, 39, 46, 48, 50, 58–61, 68–72.

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Habitat: It inhabits weedy permanent ponds and is found in shallower habitats than other species of *Buenoa*. It probably overwinters as an egg.

Identification: The small size (6.0 mm or less) and black or nearly black metatarsal setae separate it from other *Buenoa*. Males do not have any of the distinctive characters found in other species of *Buenoa* in Wisconsin.

Buenoa limnocastoris Hungerford, 1923

Distribution and Abundance: Uncommon northwest, rare elsewhere. County records: 1–3, 19, 32, 61.

Habitat: It apparently breeds in deep ponds or small lakes and overwinters as an egg.

Identification: The inflated and rounded pronotum of the male is distinctive. Females resemble *B. macrotibialis* and the smaller *B. confusa*. They have an elongate infuscation along the margin of the wings in the basal third. This mark is broadest basally and narrowed posteriorly, while in *B. macrotibialis* this mark is uniformly narrow or absent.

Buenoa macrotibialis Hungerford, 1924

Distribution and Abundance: Generally uncommon north, rare south. County records: 1–3, 33, 58, 61.

Habitat: It apparently breeds in small lakes or large ponds and overwinters as an egg.

Identification: The very wide protibia of males is distinctive. Females can be separated from *B. limnocastoris* by their less pronounced wing markings as mentioned above, and from *B. confusa* by their larger size.

Buenoa margaritacea Torre-Bueno, 1908

Distribution and Abundance: Generally uncommon south and rare north. County records: 1, 25, 53, 58, 61, 71.

Habitat: It inhabits mostly larger ponds and probably overwinters as an egg.

Identification: Its large size, long apical segment of the rostrum, broad pronotum, and general lack of pigmentation make this species easy to identify.

Notonecta lunata Hungerford, 1926

Distribution and Abundance: Fairly-common north, common south. County records: 2–9, 11–21, 23–72.

Habitat: It is most abundant in larger ponds and frequently flies to larger streams to overwinter.

Identification: The small size, pale scutellum, and acutely angulate mesotrochanter are distinctive.

Notonecta borealis Bueno and Hussey, 1923

Distribution and Abundance: Rare extreme north, absent elsewhere. County records: 2, 18–19.

Habitat: It has been collected only from permanent woodland ponds. All adults were collected between 9 July and 16 August, which supports Hungerford's contention (1933) that *N. borealis* overwinters as an egg.

Identification: The large size, pale scutellum and hemelytra, and bare sternal keel on the fourth abdominal segment are distinctive.

Notonecta irrorata Uhler, 1879

Distribution and Abundance: Fairly common in many areas of Wisconsin, but not collected southeast. County records: 1–6, 8–11, 13–15, 17–19, 21–23, 27, 31, 33, 36–41, 43, 46, 48–49, 51–58.

Habitat: It has been found mostly in small ponds, especially in wooded areas and river bottoms, and frequently flies to streams to overwinter.

Identification: The black and orange hemelytral pattern is unique.

Notonecta insulata Kirby, 1837

Distribution and Abundance: Uncommon statewide. County records: 1–6, 8, 12, 15, 17–18, 20, 25, 27–28, 30, 34, 37, 42–43, 45, 50, 53–55, 57–58, 60–61, 68.

Habitat: It probably breeds in a variety of smaller ponds and overwinters either in these ponds or in deeper lentic habitats.

Identification: With its black scutellum and light hemelytra it resembles *N. undulata*, but it is distinctly larger and the hemelytra of live specimens are more cream-colored than white. The bare keel on the fourth abdominal sternum positively separates it from *N. undulata*.

Notonecta undulata Say, 1832

Distribution and Abundance: Common statewide. County records: 1–50, 52–72.

Habitat: It breeds in small, shallow weedy ponds and frequently invades temporary ponds. It overwinters mostly in ponds deep enough to not freeze to the bottom.

Identification: It is larger than *N. lunata* and smaller than the other species. Separation from the larger *N. insulata* has been discussed above. Teneral specimens have a pale scutellum and resemble *N. lunata*, but their mesotrochanter is rounded.

PLEIDAE

Only one species of "pygmy backswimmer" has been found in Wisconsin, and it is the only species known to occur in this region of North America.

Neoplea striola (Fieber, 1844)

Distribution and Abundance: Ranges from abundant south to fairly-common north. County records: 1–10, 12, 14–22, 24–30, 32, 34–72.

Habitat: It is frequently abundant in permanent, weedy ponds, especially those that contain *Lemna* (duckweed). It is flightless and remains in the ponds in which it breeds. It is able to survive occasional drying of its habitat.

Identification: Its very small size (2.0–2.2 mm), tan color, and hemispherical shape distinguish it from all other acquatic Hemiptera.

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