The Great Lakes Entomologist

Volume 28
Number 2 - Summer 1995 *Number 2 - Summer 1995*
Article 1

June 1995

Aquatic Hydrophilidae and Hydraenidae of Wisconsin (Coleoptera). II. Distribution, Habitat, Life Cycle and Identification of Species of Hydrobiini and Hydrophilini (Hydrophiudae: Hydrophilinae)

William L. Hilsenhoff
University of Wisconsin

AQUATIC HYDROPHILIDAE AND HYDRAENIDAE OF WISCONSIN (COLEOPTERA). II. DISTRIBUTION, HABITAT, LIFE CYCLE AND IDENTIFICATION OF SPECIES OF HYDROBIINI AND HYDROPHILINI (HYDROPHILIDAE: HYDROPHILINAE)[1]

William L. Hilsenhoff[2]

ABSTRACT

Nine genera and 30 species of Hydrobiini and 3 genera and 12 species of Hydrophilini were found in Wisconsin, including a new species of *Laccobius*. Life cycles of all species of lentic Hydrobiini were similar; adults overwinter in terrestrial habitats, return to aquatic sites in spring to mate, oviposit adjacent to these sites, and eventually die. The riparian larvae complete development, pupate, and emerge sometime during the summer depending on the species and habitat, and teneral adults disperse to suitable aquatic habitats. Adults enter overwintering sites in late summer or early autumn. Lotic species of *Cymbiodyta* have a similar life cycle, with larvae probably developing along stream banks. Other lotic species, *Crenitis digesta*, *Hydrobius melaenus*, and *Sperchopsis tessellata*, apparently are semivoltine with both larvae and adults overwintering along margins of streams. In Hydrophilini, life cycles of *Hydrochara* and *Hydrophilus* are the same as described above for lentic Hydrobiini, except larvae are aquatic, developing in lentic habitats. Life cycles of *Tropisternus* also differ in having aquatic larvae; they differ further in having adults that overwinter in aquatic habitats, especially streams, deep ponds, and lakes, which they enter in late summer and autumn. *Tropisternus ellipticus* is lotic, with larvae and adults inhabiting streams, and larvae completing development in mid-summer. Keys to species of adults are included along with information about each species, which includes distribution and abundance in Wisconsin, range in North America, habitat, life cycle, and notes on identification.

Part I (Hilsenhoff 1995) contains a Materials and Methods section, a key to genera, and a map of Wisconsin that divides the state into nine regions and assigns a number to each county. Areas of the state and county records in the "Distribution and Abundance" section under each species refer to this map. Part I covers species of Hydraenidae and three genera of Hydrophilidae, *Helophorus* (Helophorinae), *Hydrochus* (Hydrochinae), and *Berosus* (Hydrophilinae: Berosini); until recently (Newton and Thayer 1992), Berosini had subfamily status.

---

[1]Research supported by the College of Agricultural and Life Sciences and the Graduate School at the University of Wisconsin-Madison.

[2]Department of Entomology, University of Wisconsin, Madison, WI 53706.

HYDROPHILINAE: HYDROBIINI

While adults of Hydrobiini are aquatic and variously adapted for swimming by having long setae on their meso- and metatarsi, their larvae are riparian, living near the land-water interface (Richmond 1920). Larvae of *Enochrus*, *Hydrobius*, and *Sperchopsis*, which probably live in closer contact with the water than other Hydrobiini larvae, were sometimes collected while sampling aquatic habitats. In these genera, however, much fewer larvae were collected in relation to numbers of adults than in genera of Berosini and Hydrophilini, which have aquatic larvae. Richmond (1920) described eggs and larvae of *Anacaena*, *Cymbiodyta* (2 species), *Enochrus* (5 species), *Hydrobius*, *Laccobius*, and *Paracymus*, and added notes on their habitat and life history. Upon emergence, adults apparently return to nearby aquatic habitats or disperse widely, but remain only a short time in aquatic habitats before flying to terrestrial overwintering sites. Most species were univoltine.

Most Hydrobiini adults were collected with a D-frame aquatic net, and only *Hydrobius fuscipes* adults were collected in significant numbers by bottle traps (Hilsenhoff 1991). Substantial numbers of many species were collected by light traps, which is noted under those species.

Anacaena Thomson, 1859

Anacaena needs revision in North America. Berge Henegouwen (1986) revised *Anacaena* in Europe, finding five species; he reported one, *A. lutescens*, also occurred at Alexandria, Minnesota. Since 1926, when Winters synonymized *A. infuscatus* Motschulsky, 1859 with *A. limbata* (Fabricius, 1792), reports of *Anacaena* from the northern United States and Canada have been attributed to *A. limbata*. Apparently only one species occurs in Wisconsin; it probably is parthenogenetic since no males were found among more than 1,000 adults that were sexed. Females fit Berge Henegouwen's description of *A. lutescens*, except that the shiny area at the apex of the metafemur is slightly smaller than he illustrated; they differed greatly from his description of *A. limbata*. Berge Henegouwen reported males of *A. lutescens* were rare, and speculated that the species may be parthenogenetic in acid situations. He also suggested *A. lutescens* may be a species complex. I refer to Wisconsin specimens as *A. lutescens*, but believe a future revision may show them to be a related, but as yet undescribed species.

Anacaena lutescens (Stephens, 1829)

Distribution and Abundance: Abundant statewide (Table 1). County records: 1–72. Range: Uncertain.

Habitat: Adults were collected from all types of lentic habitats, especially from shallow ponds and marshes; they also occurred frequently along margins of streams. Only three were collected at lights.

Life Cycle: Adults occurred 27 March–27 October, with most overwintering adults being collected in April and May (41%). Teneral adults (725) occurred 11 June–23 September, 31% in July and 66% in August. Adults apparently overwinter in terrestrial habitats, mate and lay eggs in the spring, and then die as suggested by rapidly declining numbers in June. Low numbers in July (7%), large numbers in August (31%), and declining numbers in September (9%) probably represent recently emerged adults that soon will enter terrestrial overwintering sites to complete a univoltine life cycle.

Identification: The small size, black head, piceous pronotum with

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

Table 1. Numbers of Hydrobiini adults collected 1962–1994 from nine areas of Wisconsin (Fig. 1 in Hilsenhoff 1995), McKenna Pond (McK), and Leopold Memorial Reserve (LMR).

Species	*NW*	*NC*	*NE*	*WC*	*C*	*EC*	*SW*	*SC*	*SE*	*McK*	*LMR*	*TOTAL*
Anacaena lutescens	619	441	498	142	205	376	196	476	599	378	18	3948
Crenitis digesta	2	1	1	1	3	0	2	1	5	0	0	16
Cymbiodyta acuminata	31	16	14	0	15	28	4	4	3	0	0	115
C. blanchardi	0	0	0	0	0	1	1	4	0	0	0	6
C. chamberlaini	0	0	0	0	0	1	11	21	0	0	0	33
C. minima	14	8	1	0	8	8	9	11	10	131	1	201
C. semistriata	0	0	1	0	0	0	0	4	0	0	0	5
C. toddi	0	0	0	0	1	1	1	0	1	0	0	4
C. vindicata	41	69	35	3	0	3	10	11	10	1	0	183
Enochrus cinctus	5	4	5	5	12	12	39	257	37	7	3	386
E. collinus	0	2	0	0	2	3	1	3	3	0	1	15
E. consortus	0	1	2	3	8	1	5	12	7	169	2	210
E. diffusus	0	0	0	0	0	1	0	1	4	1	0	7
E. hamiltoni	37	26	13	40	32	55	115	98	120	441	23	1000
E. horni	17	28	14	13	23	83	53	109	108	6963	26	7437
E. ochraceus	189	198	95	223	207	110	263	434	387	11446	99	13651
E. perplexus	2	1	0	2	2	0	2	3	1	4	0	17
E. pygmaeus nebulosus	0	0	0	3	1	0	12	52	1	13	0	82
E. sayi	0	0	3	1	2	0	9	152	3	88	8	266
Helocombus bifidus	8	6	3	1	5	6	3	5	9	5	0	51
Hydrobius fuscipes	92	138	101	33	44	108	61	154	70	102	20	923
H. melaenus	3	8	2	5	0	5	4	48	1	0	0	76
Laccobius agilis	2	1	6	2	3	2	1	11	0	0	0	28
L. fuscipunctatus	0	0	0	0	0	0	17	110	0	0	0	127
L. minutoides	0	2	7	3	4	0	0	0	0	0	0	16
L. reflexipenis	0	1	1	0	0	0	0	0	0	0	0	2
L. spangleri	1	5	5	1	3	2	17	21	8	16	0	79
L. truncatipenis	0	0	0	0	1	0	0	0	0	0	0	1
Paracymus subcupreus	57	70	42	21	52	33	58	114	138	956	34	1575
Sperchopsis tessellata	4	0	1	4	4	0	7	6	0	0	0	26

broadly pale lateral margins, and brown elytra are distinctive; in recently emerged adults the pronotum and elytra are similar in color. The transverse mesosternal carina is sharply peaked, unlike in adults of *Crenitis digesta*.

Crenitis Bedel, 1881

One species was found in Wisconsin; others occur farther south and in mountainous regions.

***Crenitis digesta* (LeConte, 1855)**

Distribution and Abundance: Rare statewide (Table 1). County records: 2, 3, 9, 17, 26, 38–39, 50, 61, 70.

Habitat: All adults were collected from streams, except one from a swamp.

Life Cycle: Adults occurred 27 April–24 October, most before June 21; teneral adults (4) were found 27 April–21 June, and again 17 September. Apparently both adults and larvae overwinter, with eggs being laid from spring into summer and larvae completing development in late summer, autumn, or the following spring. Because the habitat adjacent to spring-fed streams is often cold, the life cycle may be semivoltine instead of univoltine.

Identification: Adults are slightly larger than most *Paracymus* and *Anacaena*, which they resemble. They can be readily identified by characters in the key (Hilsenhoff 1995).

Cymbiodyta Bedel, 1881

Smetana's revision (1974) provided descriptions of all species, a species key, and additional information on distribution, bionomics, and identification. Except for one Palearctic species, all species are restricted to North America. Seven species were collected in Wisconsin, and Smetana's distribution records suggest no other species occurs here. Three species were predominantly lentic and four almost exclusively lotic; the normal, but not exclusive, habitat is noted in the key below. Identifications of lotic species from lentic habitats, and vice versa, should be carefully checked. Adults resemble those of *Enochrus*, but their maxillary palpi are quite different. The pseudobasal segment curves inward and the last two segments are subequal in length. In *Enochrus*, the pseudobasal segment curves outward and the penultimate segment is distinctly longer than the apical segment.

Both lentic and lotic species apparently have a similar univoltine life cycle. Adults enter aquatic habitats in early spring to mate, and oviposit at the margins. Larvae complete development in adjacent riparian habitats and pupate mostly in mid-summer, with adults emerging shortly thereafter. After returning to aquatic habitats for a short period, adults enter terrestrial overwintering sites, which likely are adjacent riparian habitats.

Key to Species of Adult *Cymbiodyta* in Wisconsin

1. Clypeus with orange spot in front of each eye, which may be obscure; apex of last abdominal sternum distinctly emarginate; lotic.....2
   Clypeus entirely black; rarely, adults of *toddi* and *semistriata* have orange clypeal spots, but their sternal apex is never emarginate.....3

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

2(1). Elytra and pronotum piceous to black; apical abdominal notch almost as wide as apex of metatibia; larger, 5.0–6.3 mm long .... *chamberlaini*
Elytra reddish brown to brown; apical abdominal notch narrow, < half width of metatibia at apex; smaller, 3.9–4.6 mm long .... *blanchardi*
3(1). Elevated middle of mesosternum formed into a large tooth; lentic; 3.8–5.0 mm long..... *acuminata*
Elevated middle of mesosternum with at most a small tooth 4
4(3). Small, 3.0–3.8 mm long; elevated middle of mesosternum narrowly transverse, often with a small tooth; anterior of pronotum broadly testaceous; lentic..... *minima*
Larger, > 4.0 mm long; elevated middle of mesosternum an arcuate, transverse ridge; anterior of pronotum narrowly testaceous..... 5
5(4). Non-pubescent area of metafemur confined to no more than apical fifth; apex of last abdominal sternum shallowly emarginate; inner margin of parameres abruptly narrowed before rounded apex (Fig. 1); lentic; 4.2–5.5 mm long..... *vindicata*
Non-pubescent area of metafemur confined to about apical fourth; apex of last abdominal sternum evenly rounded; inner margin of parameres not abruptly narrowed before apex (Figs. 2–3); lotic 6
6(5). Parameres sinuate laterally before sharply pointed apex (Fig. 2); pronotum not rapidly narrowed from base to apex; 5.0–5.4 mm long.. *toddi*
Parameres convex laterally before rounded apex (Fig. 3); pronotum rapidly narrowed from base to apex; 4.4–5.0 mm long.... *semistriata*

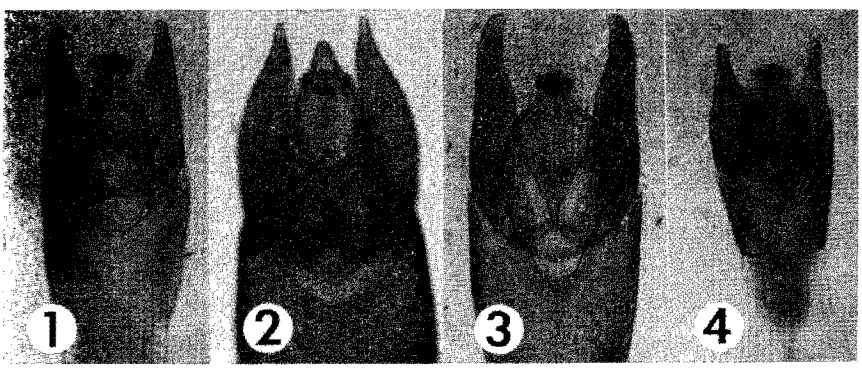
***Cymbiodyta acuminata* Fall, 1924**

Distribution and Abundance: Fairly common in northern two-thirds, uncommon in southern third (Table 1). County records: 2–3, 6, 8–9, 11–12, 14, 17–19, 34, 40, 42, 45, 47–48, 51, 54, 57, 59, 63, 67. Range: AK-ME-NY-WA.

Habitat: Adults were collected from shallow ponds, marshes, and margins of swamps, which often are dry by late summer.

Life Cycle: Adults were found 27 March–22 August, 31% in April and 40% in June. Teneral adults (8) occurred 19 July–22 August.

Identification: The very large tooth on the mesosternum is diagnostic.



Figures. 1–4. Male genitalia (same scale) of *Cymbiodyta* (ventral view). 1. *C. vindicata*. 2. *C. toddi*. 3. *C. semistriata*. 4. *C. minima*.

***Cymbiodyta blanchardi* Horn, 1890**

Distribution and Abundance: Rare in east-central, southwest, and south-central areas (Table 1). County records: 46, 56–57. Range: ON-PQ-GA-MO-WI.

Habitat: Six adults were collected from small, spring-fed streams or springs.

Life Cycle: Adults occurred 28 February–30 April, and 11 August–1 November; the August specimen was teneral.

Identification: The broad orange spot in front of each eye, which may be obscure in dark specimens, is also found in *C. chamberlaini*, but the smaller size and brown elytra distinguish *C. blanchardi*.

***Cymbiodyta chamberlaini* Smetana, 1974**

Distribution and Abundance: Uncommon in southwest and south-central areas, rare in east-central area (Table 1). County records: 46, 50–51, 54, 56–58, 60–61. Range: WI-VT-FL-TX.

Habitat: Almost all adults were collected from small streams or springs; one was found in a river slough and another in a pond.

Life Cycle: Twenty-six adults occurred 21 March–12 May; three teneral adults were found 5 August–13 October along with five mature adults.

Identification: Separation from *C. blanchardi* is discussed under that species. The orange spot in front of the eye is frequently obscure in mature adults. Such adults could be confused with those of the smaller *C. vindicata*, which infrequently occur in lotic habitats. Elytra of *C. vindicata* are more coarsely punctate, with punctures laterad of the second stria separated by about the width of a puncture or less, while in *C. chamberlaini* punctures are often separated by twice their width.

***Cymbiodyta minima* Notman, 1919**

Distribution and Abundance: Uncommon statewide (Table 1). County records: 2–4, 6, 8–10, 12–15, 19, 33, 36–37, 39, 44–45, 47–48, 51, 54, 57–58, 60–61, 64, 66–68, 71–72. Range: BC-ME-AL-AR-MB-WA.

Habitat: Adults were collected from shallow ponds, marshes, swamps, and occasionally from margins of streams. Sixty-nine percent were collected by blacklight traps, almost all at McKenna Pond.

Life Cycle: Adults occurred 4 April–1 October, 91% from May–August, with peak numbers in July. Teneral adults (73) were found 10 July–3 September; 64% of adults collected July–September were teneral.

Identification: Adults are smaller than those of other species. Their small size, broadly testaceous anterior pronotal band, extremely shallow apical notch on the last abdominal sternum, and very small tooth on the mesosternal crest of most individuals is distinctive. The apically narrow and parallel parameres with rounded tips (Fig. 4) are diagnostic for males.

***Cymbiodyta semistriata* (Zimmermann, 1869)**

Distribution and Abundance: Very rare statewide (Table 1). County records: 18, 33, 57, 60. Range: ON-NB-SC-CO-WI.

Habitat: All adults were collected from small, spring-fed streams.

Life Cycle: Adults occurred 12 April–29 September; one found 11 June

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

was teneral. The early occurrence of a teneral adult suggests both adults and larvae may overwinter in habitats adjacent to small streams.

Identification: Adults of *C. toddi* are very similar. Males have distinctive genitalia (Figs. 3), but females are not easily separable from *C. toddi* females, which are more elongate, somewhat longer, and do not have a pronotum that is rapidly narrowed from base to apex.

***Cymbiodyta toddi* Spangler, 1966**

Distribution and Abundance: Very rare statewide (Table 1). County records: 38, 42, 56, 67. Range: MB-NY-GA-OK-ND.

Habitat: All adults were collected from small streams with warmer water.

Life Cycle: Adults occurred 3 May–21 August; one collected 3 August was teneral.

Identification: Separation of adults from those of *C. semistriata* is discussed under that species.

***Cymbiodyta vindicata* Fall, 1924**

Distribution and Abundance: Common in northern third to uncommon in southern third (Table 1). County records: 1–5, 8–9, 11–15, 17–19, 22, 24, 30, 32–33, 36, 44, 47, 50, 54, 56–58, 60–61, 64–66, 72. Range: BC-NF-FL-MS-ND-WA+CO.

Habitat: Adults were collected from a variety of lentic habitats and occasionally from streams; most frequently they were found in swamps and other boggy situations.

Life Cycle: Adults occurred 25 February–19 October, 94% April–August; teneral adults were found 26 June–19 October, 76% in August.

Identification: The low, arcuate, transverse mesosternal ridge of adults differs significantly from the narrowly arcuate ridge of *C. minima* and the distinctly toothed ridge of *C. acuminata*, the two other lentic species. Specimens collected from lotic habitats should be identified with care.

***Enochrus* Thomson, 1859**

Gundersen (1977) described six new species and seven new subspecies from the Nearctic region, designated several lectotypes, and subsequently revised Nearctic *Enochrus* (1978). In the subgenus *Lumetus* Gundersen synonymized *E. conjunctus* (Fall, 1901), *E. collinus* Brown, 1931, and *E. horni* Leech, 1950, with *E. hamiltoni* Horn, 1890, and recognized only two other species, *E. diffusus* and *E. reflexipennis* (Zimmermann, 1969). The latter is an East Coast species. He treated *E. hamiltoni* as a polymorphic species with three color forms, "light", "typical", and "dark". Unfortunately his "light" form "(horni-form, totally light)" does not conform with Leech's (1950) description of *E. horni* "pronotum black discally", and his "typical" form "(hamiltoni-form, only pronotal center dark)" differs somewhat from the color of the lectotype he designated. The color forms are sympatric in Wisconsin and differ from each other and from *E. diffusus* in size, color, and the shape of the clypeal emargination. I have chosen to recognize the three color forms in Wisconsin as species, namely *E. collinus*, *E. horni*, and *E. hamiltoni*.

When Leech (1950) described *E. horni*, he believed it was "an inland species" that differed from *E. hamiltoni*, which he believed to be "a brackish-water species, rarely occurring at any distance inland." He also suggested that

Horn's type series of *E. hamiltoni* "was composite", consisting of more than one species. Leech (1950) illustrated the clypeus of an *E. hamiltoni* adult from Staten Island, NY, as not being emarginate, but in Gundersen's lectotype of *E. hamiltoni* from New Jersey, which I examined, the clypeus is emarginate as in Figure 11 and distinctly different from that of *E. horni* and similar to that of *E. diffusus* as illustrated by Figs. 9 and 10 and Leech's Figs. 6B and 6C. Miller (1964) designated cotype 4 as the lectotype from four cotypes of *E. diffusus* because it was the only specimen that fit the accepted concept (Leech 1950) of the species. I believe names I assigned to Wisconsin specimens of *Lumetus* are correct, but suspect additional species occur in other areas of North America. The subgenus *Lumetus* needs further revision and Gundersen (personal communication) concurs.

Enochrus is the most abundant and widely-distributed hydrophilid genus in Wisconsin, primarily because *E. horni* and *E. ochraceus* are among the most abundant species of Hydrophilidae. Ten species were collected; two others may occur in Wisconsin. All are predominantly lentic and have a similar univoltine life cycle, which is not repeated below. Adults apparently overwinter in terrestrial habitats and fly to breeding sites in spring, usually in April and May. There they mate, oviposit, and die. Larvae begin development in riparian habitats in spring, but most do not pupate, emerge, and enter aquatic habitats until mid- to late summer. After emergence they disperse widely, as evidenced by numerous adults in blacklight traps; they probably enter terrestrial overwintering sites within a week or two after emergence. County records marked with an asterisk are from Gundersen (1967).

Key to Species of Adult *Enochrus* in Wisconsin

1. Apex of last abdominal sternum at least slightly emarginate, with a fringe of stiff golden setae in emargination 2
   Apex of last abdominal sternum not emarginate, lacking stiff golden setae, and having only a fringe of fine, dark setae 9
2(1). Mesosternal crest small and rounded; small, 3.0–4.3 mm long..... ..... *ochraceus*
   Mesosternal crest medium to large, with a definite anterior angle... 3
3(2). Black or piceous, with no more than lateral margins of elytra, pronotum, and clypeus paler; large, > 6.0 mm long 4
   Pronotum and elytra testaceous to dark brown, if black, emargination on apex of last abdominal sternum is obscure; smaller, < 6.0 mm long..... 6
4(3). Mesosternal crest truncate, undercut at posterior end (Fig. 5); protarsal claw of male not toothed basally; 6.5–7.9 mm long .. *cinctus*
   Mesosternal crest triangular, not undercut posteriorly (Fig. 6); protarsal claw of male enlarged basally to form a tooth..... 5
5(4). Pronotum pale laterally; clypeal emargination evenly arcuate; 6.8–8.3 mm long ..... *consortus*
   Pronotum uniformly black; clypeal emargination straight in middle third; 6.8–8.2 mm long (Gundersen 1978) ..... *consors*
6(3). Prosternum not carinate 7
   Prosternum distinctly carinate..... 8
7(6). Emargination on last abdominal sternum very deep; pronotum and elytra testaceous to dark brown; 3.0–4.4 mm long (Smetana 1988) ..... *blatchleyi*
   Emargination on fifth abdominal sternum inconspicuous, shallow; pronotum and elytra mostly black; 4.7–5.4 mm long .... *perplexus*

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

8(6). Prosternum distinctly paler than metasternum; posterior and anterior parts of mesosternal crest subequal, forming an obtuse angle (Fig. 7); 4.0–5.0 mm long ..... *sayi*
Prosternum same color as metasternum; posterior part of mesosternal crest shorter than anterior part, and meeting at an acute or right angle to form a blunt tooth (Fig. 8); 3.8–4.8 mm long ..... *pygmaeus nebulosus*

9(1). Black dorsally, with a uniform testaceous border around lateral third of pronotum and in basal half of elytra; 4.5–5.4 mm long .. *collinus*
Pronotum and elytra testaceous to dark brown, often with infuscations, and with pronotum very broadly testaceous laterally 10

10(9). Center of clypeal emargination arcuate (Fig. 9); disc of pronotum with a large black or piceous spot; anterior portion of elytron with dark mark at humerus in dorsal view; smaller, 4.3–5.6 mm long.. *horni*
Center of clypeal emargination straight for at least 1/4 width of emargination (Figs. 10–11); disc of pronotum similar to color of elytra and with 4 black spots usually visible; anterior portion of elytron with at most an obscure infuscation at humerus in dorsal view; larger, 4.9–6.9 mm long 11

11(10). Straight center of clypeal emargination more than 1/3 width of emargination (Fig. 10); tooth of anterior protarsal claw of male everted so that in ventral view the apical half is in full view; pronotum and elytra testaceous; larger, 5.9–6.9 mm long ..... *diffusus*
Straight center of clypeal emargination 1/4 to 1/3 width of emargination (Fig. 11); tooth of anterior protarsal claw of male slightly everted and partly hidden for entire length in ventral view; pronotum and elytra testaceous to brown, darker on disc; smaller, 4.9–6.1 mm long ..... *hamiltoni*

***Enochrus blatchleyi* (Fall, 1924)**

Distribution and Abundance: Not yet found in Wisconsin. Range: FL-TX-MO+IL+MB+MA+CT.

Identification: Adults are similar in size and color to those of *E. pygmaeus nebulosus*, *E. sayi*, and *E. ochraceus*, but lack the prosternal carina of the former two and the low, rounded, mesosternal crest of the latter. The mesosternal crest is very sharply peaked and the apical abdominal emargination is about as deep as wide, separating adults from other Wisconsin hydrophilids.

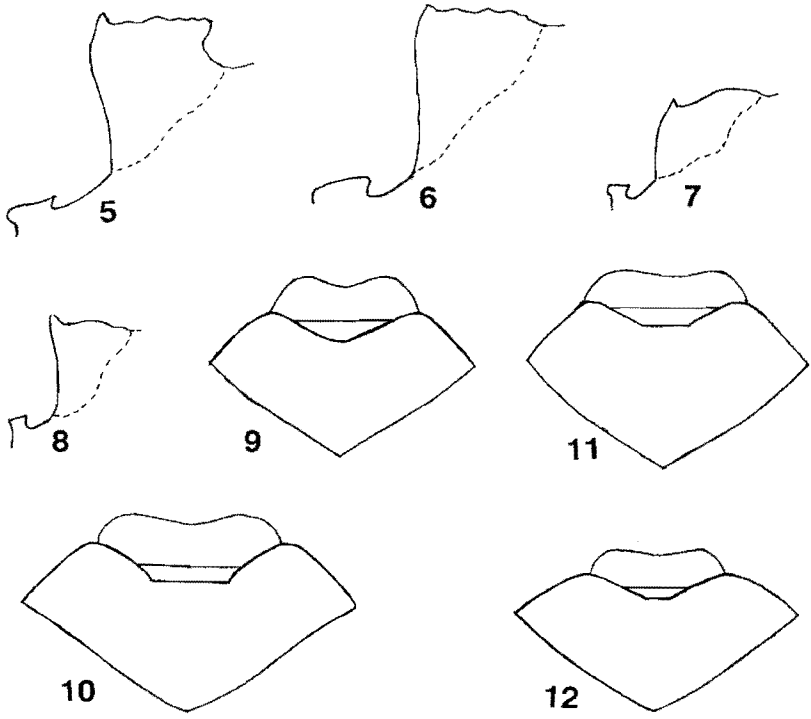
***Enochrus cinctus* (Say, 1824)**

Distribution and Abundance: Common in southern third to uncommon in northern third (Table 1). County records: 1, 3, 7, 11, 14, 17, 21–23*, 27, 29, 33, 37–42, 44, 46–52, 54, 56–61, 63–64, 66–68, 71–72. Range: SK-NB-FL-TX-SD.

Habitat: Most adults were collected from shallow ponds and marshes; 244 were collected by blacklight traps, almost all of which were teneral.

Life Cycle: Adults occurred 20 April–17 September, with less than 2% being found in April and September. Teneral adults (273) were found 19 June–17 September, 99% July–August; 97% of adults collected after June were teneral.

Identification: Because of their large size, black color, and emarginate abdominal apex, adults resemble only those of *E. consortus* and *E. consors*.



Figures. 5–12. Mesosternal crest (same scale) of *Enochrus* (right lateral view). 5. *E. cinctus*. 6. *E. consortus*. 7. *E. sayi*. 8. *E. pygmaeus nebulosus*. Figures. 9–12. Clypeus and labrum (same scale) of *Enochrus* (anterodorsal view). 9. *E. horni*. 10. *E. diffusus*. 11. *E. hamiltoni*. 12. *E. collinus*.

The truncate mesosternal process with an anterior spine and undercut posterior portion is diagnostic. The testaceous borders of the pronotum and elytra are more distinct and wider than in *E. consortus*; *E. consors* lacks pale borders.

***Enochrus collinus* Brown, 1931**

Distribution and abundance: Rare statewide (Table 1). County records: 9, 11, 39, 45, 47–48, 54, 57, 61, 68, 72. Range: MB-PQ-VT-MN.

Habitat: Adults were collected from ponds, marshes, and a bog.

Life Cycle: Adults occurred 31 March–16 September, 88% before mid-June. No teneral adults were collected.

Identification: The predominantly black elytra and pronotum are distinctive. Some adults of *H. hamiltoni* are dark brown, but their clypeal emargination is broadly straight at the center (Fig. 11); in adults of *E. collinus* the clypeus is narrowly straight (Fig. 12) to arcuate (Fig. 9) in the center. Adults

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

resemble those of *E. perplexus*, but are slightly smaller and lack any trace of an apical emargination on the last abdominal sternum.

***Enochrus consors* (LeConte, 1863)**

Distribution and Abundance: Not yet found in Wisconsin. Range: PQ-MA-FL-LA-MN.

Identification: Adults resemble those of *E. consortus*, but lack a pale margin on the pronotum and have black or piceous apical segments on the maxillary palpi.

***Enochrus consortus* Green, 1946**

Distribution and Abundance: Uncommon in southern third to rare in northern third (Table 1); most (81%) were collected by blacklight traps at McKenna Pond. County records: 9, 17–18*, 25–26, 32–33, 36, 38–39, 46, 50–51, 54, 57–58, 60–61, 64, 67–71. Range: MB-ON-ME-FL-LA-MN.

Habitat: Adults inhabited ponds, marshes, and margins of lakes and streams.

Life Cycle: Adults occurred 20 April–6 October, 94% from June–August. Teneral adults (15) were found 10 July–22 September, and unlike *E. cinctus*, comprised only 6% of the 175 adults collected at lights.

Identification: The key separates adults from those of *E. cinctus* and *E. consors*. Apical segments of maxillary palpi are mostly pale, rarely dark brown in the middle.

***Enochrus diffusus* (LeConte, 1855)**

Distribution and Abundance: Very rare in southeastern third (Table 1). County records: 44, 61, 65, 71. Range: BC-MB-NY-SD-NM-CA.

Habitat: Four adults were collected from ponds, one from a marsh, and one by a blacklight trap.

Life Cycle: Adults were collected 11 May–6 October, with teneral adults (3) being found 3 July and 21 September.

Identification: Adults are very similar to those of *E. hamiltoni*, but are distinctly larger and lack a darkening of the pronotal disc and clypeus. In males the protarsal claws are about 40% longer than in *E. hamiltoni* (> 144μ long), and the dorsal strut of the aedeagus usually extends past the tip of the penis a distance equal to more than twice its width, but this character is variable in *E. hamiltoni* and may not be reliable. Ventrally the metafemora are testaceous or rufotestaceous over much of the anterodistal surface; in most *E. hamiltoni* the metafemora are solidly dark on the ventral surface.

***Enochrus hamiltoni* (Horn, 1890)**

Distribution and Abundance: Fairly common north to common south (Table 1). County records: 1–4, 6–8, 10–18, 20–21, 23–29, 31–33, 35–72. Range: uncertain.

Habitat: Except for 39% collected at blacklight traps in the south, especially at McKenna Pond, adults were found mostly in shallow ponds and marshes; a few occurred in other lentic habitats and along margins of streams.

Life Cycle: Adults occurred 17 March–13 October, 98% April–August and 60% June–July. Teneral adults (157) were found 2 June–11 October, with peak numbers (82%) occurring July–August.

Identification: Most adults are readily separated from those of *H. horni* by the key. They are relatively broader and somewhat larger than adults of *H. horni*. Discs of the pronotum and elytra are usually darkened, but never black, and the piceous humeral mark on each elytron is lacking or obscure when viewed from directly above. The shape of the clypeus is the most important character for separating these two species. Adults most resemble those of *H. diffusus*, but are smaller. The color of the pronotum and elytra is quite uniform, ranging from light to dark brown, and the clypeus usually is mesally infuscate. Protarsal claws of males are < 130μ long.

***Enochrus horni* Leech, 1950**

Distribution and Abundance: Fairly common north to common south (Table 1). County records: 1–3, 6, 10, 12–19, 21, 23, 25–35, 37–49, 51–69, 71–72. Range: BC-PQ-NY-CA.

Habitat: About 91% of adults were collected by blacklight traps in southern Wisconsin, almost all at McKenna Pond. Other collections were mostly from ponds, but some adults were found in marshes, sloughs, seeps, and margins of streams.

Life Cycle: Adults occurred 27 March–27 October, with more than 99% occurring April–August and 96% being found June–August. Teneral adults (796) occurred 2 June–5 October, with 97% occurring from late June–August. Adults of *E. horni* and *E. hamiltoni* frequently occurred together.

Identification: Characters in the key separate adults from those of *E. hamiltoni*, and are discussed under that species. The black disc of the pronotum is usually evident, even in teneral specimens.

***Enochrus ochraceus* (Melsheimer, 1846)**

Distribution and Abundance: Abundant statewide (Table 1). County records: 1–21, 23–27, 29–72. Range: NT-NF-FL-NM-MB+CA+WA.

Habitat: Most adults (79%) were collected by blacklight traps, especially at McKenna Pond. Net collections were mostly from ponds, but adults occasionally occurred in other lentic habitats and along margins of streams.

Life Cycle: Adults occurred 3 April–7 November, with 71% being found June–August and only 1% after September. Almost all teneral adults (716) occurred 11 June–17 October, with 94% occurring before September. Two teneral specimens 27 April and one 3 May apparently overwintered as larvae.

Identification: Adults are distinctive among small hydrophilids, having a brown pronotum and elytra, a low, rounded, longitudinal, mesosternal crest, and elongate maxillary palpi with the second (pseudobasal) segment curved outward. They are larger than adults of *Anacaena lutescens* and *Crenitis digesta*, and smaller than adults of other *Enochrus*, all of which have a peaked mesosternal crest. The maxillary palpi, which normally project forward and are easily seen, are especially helpful for separating adult *E. ochraceus* from similar-sized adults of species in other genera, such as *Cymbiodyta minima*.

***Enochrus perplexus* (LeConte, 1855)**

Distribution and Abundance: Rare statewide (Table 1). County records: 5–6, 12, 16, 26–27, 33, 38–39, 54, 58, 61, 63, 68, 70*. Range: MB-NS-FL-CA-ND.

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

Habitat: Most adults were collected from ponds; three occurred in other habitats, a marsh, a bog, and the margin of a stream.

Life Cycle: Adults occurred 20 April–17 September; teneral adults (6) were found 3 July–27 August.

Identification: Adults of *E. consortus* and *E. cinctus* are also mostly black, but are larger and have a distinct apical emargination on the last abdominal sternum. Separation from *E. collinus* is discussed under that species.

***Enochrus pygmaeus nebulosus* (Say, 1824)**

Distribution and Abundance: Uncommon in south-central and southwest areas, rare elsewhere (Table 1). County records: 23*, 28, 33, 37, 52–54, 56, 60–64, 71. Range: MB-PQ-FL-NM-WY; two other subspecies occur to the south and west.

Habitat: Most adults inhabited ponds; a few occurred along margins of streams. Almost 70% of the adults were collected by blacklight traps.

Life Cycle: Adults occurred 19 June–17 November; teneral adults (11) were found 16 July–17 November.

Identification: The only other *Enochrus* having a carinate prosternum and occurring in Wisconsin is *E. sayi*, adults of which can be distinguished by the key. In addition to the prosternum, the anteromesal area of the epipleura is more darkly pigmented than in adults of *E. sayi*.

***Enochrus sayi* Gundersen, 1977**

Distribution and Abundance: Uncommon in southern third, rare farther north (Table 1). County records: 23, 28, 36, 39, 49, 52, 54, 56–58, 60–61, 63, 70–71. Range: ON-CT-FL-TX-NB-WI.

Habitat: Almost all adults inhabited ponds. Nearly 80% were collected by blacklight traps.

Life Cycle: Adults occurred 9 April–8 October; teneral adults (67) were found 19 June–8 October.

Identification: The elongate posterior portion of the mesosternal crest with a small tooth at the anterior end (Fig. 7) differs significantly from the peaked tooth-like angle on the crest of *E. pygmaeus nebulosus* (Fig. 8), the other Wisconsin species with adults having a carinate pronotum.

Helocombus Horn, 1890

The only species in this monotypic genus occurs in Wisconsin.

***Helocombus bifidus* (LeConte, 1855)**

Distribution and Abundance: Uncommon statewide (Table 1). County records: 2–3, 6–8, 10, 12, 14–15, 18–21, 27, 33–35, 39, 42, 44–46, 48–49, 52, 57, 60–61, 63, 66–68, 70. Range: ON-NB-FL-MN.

Habitat: Most adults were collected from shallow lentic habitats, especially ponds and marshes; 36 of 42 collections were single specimens. Five teneral adults were collected at blacklight traps, and 19 teneral adults in the University of Wisconsin Insect Research Collection (UWIRC) were likely also collected in light traps.

Life Cycle: Adults were found 3 April–3 October, all except two before September. Teneral adults (32) occurred 29 June–29 August. Adults probably

overwinter in terrestrial sites, invade lentic habitats in spring to mate, and oviposit in adjacent riparian areas. Larvae complete development in early to mid-summer and pupate; emerging adults return briefly to water before entering overwintering sites.

Identification: Adults are easily recognized because of impressed elytral striae (10 per elytron) and a black dorsal color with rather narrow testaceous borders on the pronotum and elytra. The only similar hydrophilid with impressed elytral striae is *Hydrobius fuscipes*, which is more convex, and has a greenish pronotum and elytra. Perkins and Spangler (1981) described the larva.

Hydrobius Leach, 1815

Two species were collected; a third species, *H. tumidus* LeConte, 1855, occurs as far north as southern Illinois (Wooldridge 1967).

Key to Species of Adult *Hydrobius* in Wisconsin

1. Oval, elytra 1.5 times as long as wide; rows of elytral punctures impressed; pronotum and elytra greenish-olive; mostly lentic; 6.0–9.0 mm long.... ..... *fuscipes*

   Globose, elytra slightly longer than wide; rows of elytral punctures not impressed; pronotum and elytra rusty-olive; lotic; 8.2–9.7 mm long..... ..... *melaenus*

***Hydrobius fuscipes* (Linnaeus, 1758)**

Distribution and Abundance: Common statewide (Table 1). County records: 1–4, 6, 8–27, 29–49, 52–55, 57–68, 70–72. Range: AK-NF-VA-CA.

Habitat: Adults were collected from ponds, marshes, swamps, and other lentic habitats; several also were found along margins of streams. Blacklight traps accounted for 13% of adults, mostly at McKenna Pond. About half of the Hydrophilidae in the UWIRC were this species; most were collected in mid-August, probably at light traps, and many were teneral.

Life Cycle: Adults occurred 4 March–1 November, almost all (98%) before September and most before July (74%). Teneral adults (227) were found 2 June–1 November, 95% June–August, with peak numbers from mid-July–August. After June, 74% of all adults were teneral. Adults apparently enter terrestrial overwintering sites shortly after emergence and fly back to aquatic habitats early in the spring to mate and oviposit in adjacent riparian areas. Larvae complete development, pupate, and emerge mostly in mid-summer to complete a univoltine life cycle.

Identification: The greenish elytra with impressed striae separate this species from other aquatic Hydrophilidae.

***Hydrobius melaenus* (Germar, 1824)**

Distribution and Abundance: Uncommon statewide (Table 1). County records: 2, 10, 12, 14, 18, 26, 32, 46, 48, 53–54, 57, 60–61, 65. Range: ON-NS-NC-IN-WI.

Habitat: Adults and larvae were collected from under banks of small, spring-fed streams.

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

Life Cycle: Adults occurred 9 January–26 November, but were scarce in June (4%) and not found in July. Teneral adults were found 10–26 August, and larvae occurred from October–July. Adults and larvae overwinter under banks of spring-fed streams, with adults probably mating and ovipositing in spring and then apparently dying. Occurrence of small and large larvae together, and larger larvae from late October–July, suggest slow development in the cold habitat along spring-fed streams, and a semivoltine life cycle.

Identification: Because of their globose shape, adults resemble those of *Sperchopsis tessellata*, which occur in a similar habitat. Adults of *S. tessellata* are brown above instead of rusty-olive, and have alternate elytral intervals raised to form low ridges; elytra of *H. melaenus* adults are smooth.

Laccobius Erichson, 1837

The genus was revised by Cheary (1971), who privately published and distributed his Ph.D. dissertation to give status to new species he described (Hardy et.al 1981). Cheary's descriptions were very brief, but he illustrated pronotal patterns and male genitalia for all species. Earlier, Willson (1967) described two new species from Michigan (*L. arenarius* and *L. spangleri*) in a M.S. thesis that was never published; authorship for these species was later attributed to Cheary (Hardy et. al. 1981). Gentili (1985) provided a key (in Italian and English), and illustrated dorsal, lateral, and ventral views of male genitalia for the five known species that occur in Wisconsin. He also synonymized *L. arenarius* with *L. truncatipenis*, although Cheary (1971) believed they were distinct species, with *L. truncatipenis* confined to the Pacific Northwest. Gentili did not study the holotype and paratypes of *L. arenarius* from Michigan, but he did study specimens from Saskatchewan, so I followed his synonymy as did Smetana (1988). Gentili (1986) also published a key (in Italian and English) to 22 species that occur south of Canada, but did not include illustrations.

Adults of *Laccobius* are distinctive because of their small size, tan color, and lack of a sutural elytral stria. Males, which are readily recognized by a modification of the second and third protarsomeres, have distinctive genitalia; photomicrographs (Figs. 13–18) show the distinctive parameres (which are splayed outward due to mounting) and their distinctive ventral membranous lobes. Females are less distinctive and sometimes difficult to identify. Six species were recognized from Wisconsin, one of which is new. All probably have a similar univoltine life cycle, which is not repeated below. Adults overwinter in terrestrial habitats and fly to breeding sites in spring where they mate, oviposit, and eventually die. Larvae complete development in riparian habitats from early summer to late October, depending on the species and breeding site.

Key to Species of Adult *Laccobius* in Wisconsin

1. Distinct pale area in front of each eye; dark discal area of pronotum separated laterally from anterior margin by pale areas 2
   Area in front of each eye at most somewhat pale laterally; dark discal area of pronotum reaching anterior margin behind eyes; 2.6–3.6 mm long ..... *agilis*
2(1). Most punctures on disc of elytra arranged in longitudinal rows 3
   Most punctures on disc of elytra not arranged in longitudinal rows 5
3(2). Rows of punctures quite regular in size and spacing; punctures larger,

with a light brown pigment that is confined mostly to the punctures; 2.5–3.1 mm long ..... *minutoides*

Rows of punctures with irregular alignment and spacing; punctures smaller, with area around punctures deeply infuscate 4

4(3). Infuscate areas around punctures often contiguous on disc of elytra; anterior of elytra infuscate mesally, contrasting sharply with golden pronotum; 2.2–3.1 mm long ..... *fuscipunctatus*

Infuscate areas around punctures rarely contiguous on disc of elytra; elytra similar in color to pronotum, with infuscations confined to punctures; 2.3–3.4 mm long (Smetana 1988) ..... *reflexipenis*

5(2). Pigmented elytral punctures extending almost to margin anterolaterally; elytra apically with at most a small area with one or two indistinctly pigmented punctures; 2.6–3.6 mm long ..... *spangleri*

Anterolateral margin of elytra broadly pale and lacking pigmented punctures; a distinct, round, pale area anterior to apex of elytra caused by obsolete pigmentation of several punctures; 2.5–3.1 mm long (Willson 1967) ..... *truncatipenis*

***Laccobius agilis* (Randall, 1838)**

Distribution and Abundance: Uncommon statewide (Table 1). County records: 2, 8, 12, 20, 22, 26–27, 35, 38, 46–47, 54, 58–59, 61. Range: BC-NF-PA-CO-CA.

Habitat: Adults were collected from ponds, spring ponds and seeps, and margins of streams.

Life Cycle: Adults occurred 6 April–1 October, 61% from April–June and 32% August–September; teneral adults (3) were found 20 September and 1 October.

Identification: Because adults lack a distinct pale spot in front of each eye, they differ from those of other Wisconsin species; some individuals have an indistinct pale spot laterally. The male genitalia are unusually long, with parameres that have a distinctively shaped apex (Fig. 13).

***Laccobius fuscipunctatus* NEW SPECIES**

Distribution and Abundance: Common along Wisconsin River in southwest and south-central areas (Table 1). County records: 54, 56–58, 60–61.

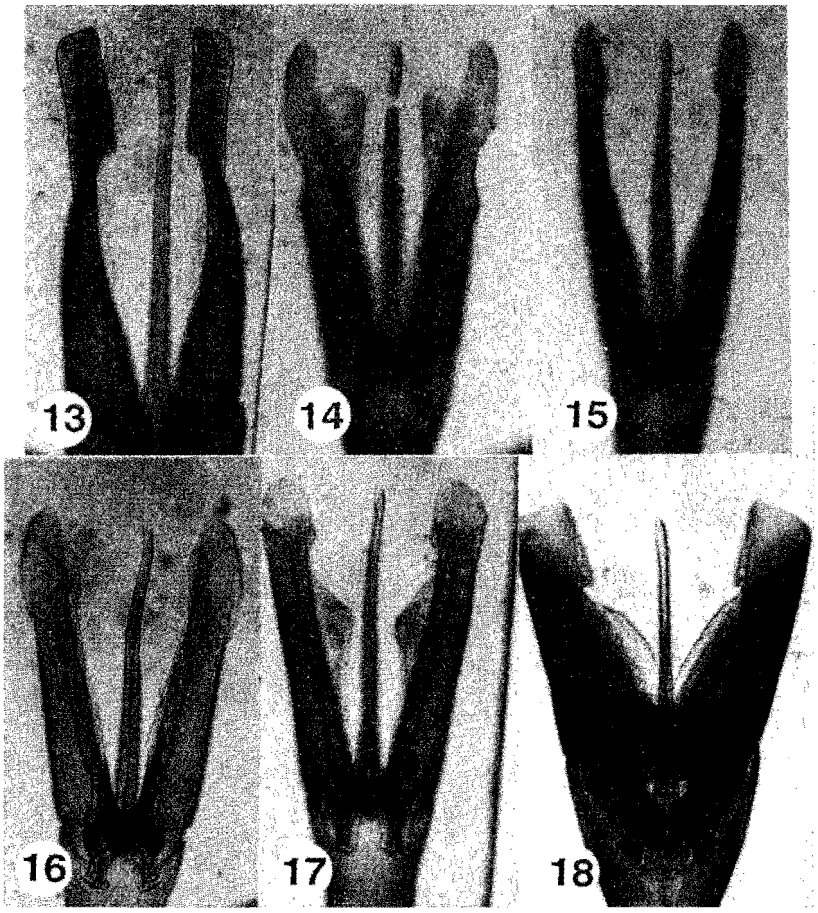
Habitat: Adults were collected from sandy river pools, bank vegetation, and a spring pond; 81% were collected by blacklight traps.

Life Cycle: Adults occurred 20 April–7 September, 80% in July. Teneral adults (19) were found 3 July–1 September, 95% in July. Most adults emerged earlier than those of other species.

Identification: Adults most resemble those of *L. reflexipenis*, but the rows of elytral punctures are more in line and more deeply infuscate (metallic blue-black), with infuscations of punctures often confluent. Parameres are deeply bilobed ventrally, with elongate ventral lobes that meet and appear to from a spatulate median lobe (Fig. 14–lobes not joined because of mounting).

Description: Form broadly oval. Head, pronotal spot, and scutellum piceous with metallic reflections that cause these areas to appear bright golden-orange, except when viewed at an angle. Head with a pale spot in front of each eye extending to inner margin of eye. Pronotum with dark spot small, only as wide as head, and almost reaching basal and apical margins at middle; broadly testaceous laterally. Elytra infuscate basally and medially, much darker than pronotum; anterolateral margins broadly testaceous and lacking

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875



Figures. 13–18. Male genitalia (same scale, parameres splayed outward) of *Laccobius* (ventral view). 13. *L. agilis*. 14. *L. fuscipunctatus*. 15. *L. minutoides*. 16. *L. reflexipenis*. 17. *L. spangleri*. 18. *L. truncatipenis*.

infuscate punctures; punctures small and arranged in rows that are somewhat irregular in alignment and spacing of punctures; each puncture with a large, infuscate, metallic spot with bluish-black reflections; spots often confluent on disc; some scattered punctures between rows. Ventrally, head, thorax, coxae, and abdomen rufopiceous, except epipleurae and lateral half of prothorax, which are flavotestaceous; all appendages flavotestaceous, except antennal club and extreme tips of palpi are slightly infuscate. Male genitalia unique, with parameres having broad, laterally incised, membranous, mesoventral lobes that appear to unite to form a ventral, spatulate lobe. Length 2.2–3.1 mm; width 1.3–1.9 mm.

Type Specimens: HOLOTYPE MALE (length 2.8 mm), allotype female (length 2.8 mm), 65 paratypes: Hwy 14 BLT, Wisconsin R., Iowa Co. WI, 23 July 1986 K.S.. The type series was collected with a blacklight trap by Kurt Schmude. The holotype, allotype, and 20 paratypes were deposited in the University of Wisconsin Aquatic Insect Collection. Additional paratypes are in the U.S. Museum of Natural History (15), Canadian National Collection (15), and Museum of Comparative Zoology at Harvard University (15).

***Laccobius minutoides* d'Orchymont, 1942**

Distribution and Abundance: Rare in northern two-thirds to very rare in southern third (Table 1). County records: 15–18, 21, 30–31, 33–34, 37. Range: ON-NB-SC-OK.

Habitat: All adults were collected from margins of streams.

Life Cycle: Eight mature adults were found 2 May–11 June, 1 mature adult 12 August, and 8 teneral adults 26–27 August.

Identification: The regular spacing and size of punctures in rows on the elytral disc and the pale infuscations of punctures that blend with the background color are distinctive. Females could be confused only with those of *L. reflexipenis*, but are more spherical in shape; males have distinctive narrow parameres (Fig. 15).

***Laccobius reflexipenis* Cheary, 1971**

Distribution and Abundance: Very rare in north-central and northeast areas (Table 1). County records: 16, 22. Range: NT-NB-VA-MO-MN.

Habitat: One adult was collected from the margin of a stream on 15 May, and another from a pond on 4 August.

Identification: Rows of punctures on the elytral disc are smaller and more irregular than in *L. minutoides*, with several punctures between rows in the vicinity of the scutellum. Elytral punctures are similar in size, but not as well aligned as those of *L. fuscipunctatus*; their infuscations are dark brown instead of metallic bluish-black, and are infrequently confluent. Parameres in dorsal view are similar to those of *L. spangleri*, but in ventral view have a ventral lobe with a uniquely shaped apex (Fig. 16).

***Laccobius spangleri* Cheary, 1971**

Distribution and Abundance: Fairly common in southern third, uncommon farther north (Table 1). County records: 3, 12, 15, 18–19, 23, 26, 34–35, 39, 44, 50, 54–58, 60–61, 63, 65, 67. Range: SK-NF-VA-KS-ND.

Habitat: Most adults were collected from margins of small streams and ponds, while others were found in spring ponds and medium-sized streams; 32% were collected by blacklight traps.

Life Cycle: Adults occurred 13 April–18 October, becoming most numerous in July and August when 56% were collected; teneral adults (12) were found 26 July–18 October, with 7 occurring in August and 3 in October. Adults emerged a little later than those of other Wisconsin species.

Identification: Because most elytral punctures are not arranged in rows and both the elytra and pronotum are broadly dark brown, adults resemble those of *L. agilis*. The pale area in front of each eye is broad and distinct in *L. spangleri* and lacking, or obscure and narrow, in *L. agilis*. Separation from *L.*

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

truncatipenis is discussed under that species. Parameres have a distinctive ventral lobe (Fig. 17).

***Laccobius truncatipenis* Miller, 1965** = *L. arenarius* Cheary, 1971

Distribution and Abundance: Very rare in central area (Table 1); County record: 37. Range: NT-ON-MI-IL-WY-CA.

Habitat: The only adult, a male, was collected from the margin of a stream on 4 May.

Identification: Adults are most similar to those of *L. spangleri*, from which they can be separated by the key. The Wisconsin specimen fits perfectly Willson's (1967) description of *L. arenarius* and his figures of the male genitalia (Fig. 18), which differ greatly from all other Wisconsin species.

Paracymus Thomson, 1867

In 1966 Wooldridge competed a study of Nearctic *Paracymus* in which he described five new species and keyed all species. Only *P. subcupreus* was found in Wisconsin, but *P. despectus* undoubtedly also occurs here. Two other species, *P. confluens* Wooldridge, 1966, and *P. confusus* Wooldridge, 1966 occur farther south and east and probably do not occur in Wisconsin. Adults of the former can be recognized by their 7-segmented antennae. Adults of *P. confusus* are very similar to those of *P. subcupreus*; males differ by having the apical protarsomere not widened apically. The key below separates adults of *P. subcupreus* from *P. despectus*.

Key to Species of Adult *Paracymus* in Wisconsin

1. Antenna 8-segmented; pronotum and elytra without reticulate microsculpture; larger, 1.7–3.0 mm long ..... *subcupreus*
   Antenna 9-segmented; pronotum and elytra with reticulate microsculpture; smaller 1.2–1.7 mm long (Smetana 1988) ..... *despectus*

***Paracymus despectus* (LeConte, 1863)**

Distribution and Abundance: Not yet found in Wisconsin. Range: AB-PQ-MA-IL-MN.

Habitat: Smetana (1988) suggests "shallow water with plenty of organic debris" is the normal habitat.

Identification: The reticulate microsculpture and very small size are distinctive.

***Paracymus subcupreus* (Say, 1825)**

Distribution and Abundance: Common statewide (Table 1). County records: 1–6, 8–21, 23–27, 29–32, 34–51, 53–72. Range: BC-NT-NS-FL-CO.

Habitat: Adults were collected from a wide variety of shallow lentic habitats and occasionally from margins of streams. Blacklight traps accounted for 50% of collections; 61% of adults were found at McKenna Pond.

Life Cycle: Adults occurred 27 March–1 November, and teneral adults (266) 11 June–17 October, except one 15 May and another 1 November. Less than 9% of adults were found before June, when substantial numbers (17%)

appeared; peak numbers occurred in August (46%), with a rapid decline thereafter. Adults apparently overwinter in terrestrial habitats, with some returning to lentic habitats in early spring, and most returning in late spring. After larvae complete development in riparian habitats and pupate, adults emerge to complete a univoltine life cycle. Peak adult emergence occurred from July into September (94% of teneral adults).

Identification: Separation from other *Paracymus* is discussed above. The greenish elytral reflections and shiny metafemora readily separate adults from those of *Anacaena lutescens*, which they resemble.

Sperchopsis LeConte, 1861

The only species occurs in Wisconsin.

Sperchopsis tessellata (Ziegler, 1844)

Distribution and Abundance: Uncommon western two-thirds, rare eastern third (Table 1). County records: 2–3, 8, 18, 26, 28–29, 36–39, 49–50, 53, 60–61. Range: PQ-NS-FL-MS-AR-WI.

Habitat: Adults were collected from small, cool streams that often had sandy bottoms. They usually occurred in slightly larger streams than *Hydrobius melaenus*; only one was found in the same stream as that species.

Life Cycle: Adults occurred 16 April–4 June (40%) and 18 August–23 October (60%). Three teneral adults were collected 18 August, and larvae were found in May and June (2nd and 3rd instar), and November (3rd instar). Like *H. melaenus*, this species apparently is semivoltine with adults emerging in late summer, overwintering along margins of streams, mating and ovipositing in spring, and then dying; larvae, which begin development in spring, spend the following winter adjacent to streams and pupate the next summer.

Identification: The brown, globose adults of this monotypic genus are distinctive; their separation from *Hydrobius melaenus* is discussed under that species. Spangler (1961) described the larva and contributed notes on biology and distribution.

HYDROPHILINAE: HYDROPHILINI

Three genera and 12 species of Hydrophilini were collected in Wisconsin, *Hydrophilus triangularis*, *Hydrochara* (5 species), and *Tropisternus* (6 species). *Dibolocelus ovatus* also may occur in Wisconsin, but no specimens were collected. Both adults and larvae of Hydrophilini are aquatic. Adults are excellent swimmers, and most were collected with bottle traps, especially those of *Hydrophilus* and *Hydrochara* (Hilsenhoff 1991). Larvae were more frequently collected with a net, except those of *Hydrophilus*. Unlike adults in other subfamilies and tribes, those of Hydrophilini were only occasionally collected at lights. One adult of *Hydrophilus*, 0.5% of *Hydrochara*, and less than 4% of *Tropisternus* adults were collected by light traps.

Dibolocelus Bedel, 1891

One species occurs in the eastern United States.

***Dibolocelus ovatus* (Gemminger and Harold, 1868)**

Distribution and Abundance: This species has not yet been collected in Wisconsin, but occurs in southern Michigan (Willson 1967) and south of Lake Michigan in Illinois (Wooldridge 1967). Range: MI-ON-NY-FL-TX.

Habitat: Adults occur in deep lentic habitats, and are attracted to lights.

Identification: Adults resemble those of *Hydrophilus triangularis*, but are broader and more convex. Separation is discussed under *H. triangularis*. Immature stages were described by Archangelsky and Durand (1992). The aquatic larvae resemble those of *H. triangularis*, but differ in having lateral setiferous lobes on abdominal segments 1–8.

Hydrochara Berthold, 1827

In 1980 Smetana completed a worldwide revision. Subsequently Hilsenhoff and Tracy (1982) discovered and described a new species from Wisconsin, keyed species in the western Great Lakes region, and provided notes on identification of females as well as males. Male genitalia of all species are large, distinctive, and easily extruded; they provide the easiest way to identify males. Separating females of the three most common species is difficult, but most can be reliably identified.

All species are univoltine. Adults overwinter in terrestrial habitats and return to breeding sites in early spring to mate and oviposit. Larvae complete development in lentic habitats between late June and September, depending on habitat and species, and pupate in nearby terrestrial sites. A general absence of mature adults from aquatic sites after early July suggests overwintering adults die and newly emerged adults enter overwintering sites soon after emergence. Descriptions of the life cycle are not repeated below.

Key to Species of Adult *Hydrochara* in Wisconsin

1. Terminal segment of maxillary palp entirely testaceous 2
   Terminal segment of maxillary palp with a dark ring near tip 3
2(1). Anterior half of profemur usually pale; penultimate segment of maxillary palp of female > 1.4 mm long; penis broadly concave dorsally (Fig. 19); 16.0–18.8 mm long ..... *spangleri*
   Profemur almost entirely black or rufopiceous; penultimate segment of maxillary palp of female < 1.3 mm long; penis convex dorsally with a narrow groove (Fig. 20); 14.8–18.1 mm long ..... *obtusata* (most)
3(1). Metasternal portion of sternal keel strongly dilated, about twice as wide as mesosternal portion; 15.0–18.5 mm long ..... *leechi*
   Metasternal portion of sternal keel at most weakly dilated, not more than 1.5 times as wide as mesosternal portion 4
4(3). Metasternal portion of sternal keel narrow, 1.0–1.2 times width of mesosternal portion, and parallel-sided in region of sulcus; parameres broad at apex and distinctly curved inward before apex (Fig. 21); 14.8–18.6 mm long ..... *soror*
   Metasternal portion of sternal keel dilated, at least 1.25 times width of mesosternal portion, and distinctly narrower at posterior end of sulcus than near middle of sulcus; parameres narrowed toward tip and only slightly incurved (Figs. 20, 22) 5
5(4). A distinct mesal carina on metasternal keel between metatrochanters in males, less distinct and occasionally absent in females; penultimate segment of maxillary palp of female < 1.3 mm long; penis dorsally

convex and narrowly grooved entire length (Fig. 20); 14.8–18.1 mm long ..... *obtusata* (some)

No carina on metasternal keel between metatrochanters in males or females; penultimate segment of maxillary palp of female > 1.3 mm long; penis dorsally depressed and concave near base (Fig. 22); 15.1–18.9 mm long ..... *simula*

***Hydrochara leechi* Smetana, 1980**

Distribution and Abundance: Very rare in south (Table 2). County record: 61 (3 specimens in the UWIRC collected at Madison 20 July 1915 and 28 May 1916; none collected since). Range: ND-PA-TX-NM.

Habitat: The three adults were probably collected at lights.

Life Cycle: The life cycle is likely similar to that of other species.

Identification: The greatly widened metasternal portion of the ventral keel is distinctive. Parameres are similar to those of *H. soror* (Fig. 21), but the penis is concave dorsally before the apex.

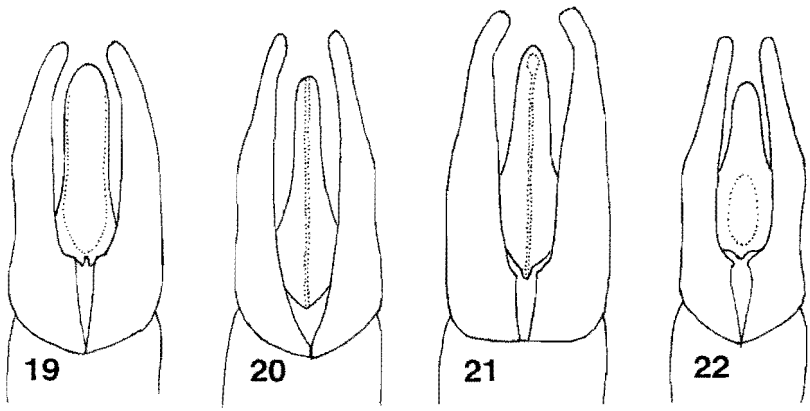
***Hydrochara obtusata* (Say, 1823)**

Distribution and Abundance: Very common statewide (Table 2). County records: 1–3, 5–21, 23–27, 29–30, 32–34, 36–40, 42–61, 63–72. Range: NT-PQ-NJ-SD-WA.

Habitat: Adults were collected from shallow ponds and marshes, and occasionally from other lentic habitats; six were collected by light traps.

Life Cycle: Adults occurred 27 March–18 October, with 89% being found before July and less than 2% after August. Teneral adults (42) occurred 27 June–10 October, with 95% occurring July–September.

Identification: In a random sample of 150 adults, 84% of females and 69% of males lacked a dark apical ring on the maxillary palpi and keyed to *H. obtusata* at couplet 2. Females with an apical ring on the maxillary palpi are



Figures. 19–22. Male genitalia (same scale) of *Hydrochara* (dorsal view). 19. *H. spangleri*. 20. *H. obtusata*. 21. *H. soror*. 22. *H. simula*.

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

Table 2. Numbers of Hydrophilini adults and *Hydrophilus* larvae collected 1962–1994 from nine areas of Wisconsin (Fig. 1 in Hilsenhoff 1995), McKenna Pond (McK), and Leopold Memorial Reserve (LMR).

Species	*NW*	*NC*	*NE*	*WC*	*C*	*EC*	*SW*	*SC*	*SE*	*McK*	*LMR*	*TOTAL*
Hydrochara obtusata	105	21	55	27	82	231	176	146	242	76	50	1211
H. simula	42	34	46	45	21	50	95	73	158	28	13	605
H. soror	0	0	0	0	0	2	169	41	97	0	12	321
H. spangleri	0	0	0	1	1	2	12	1	1	0	180	193
Hydrophilus triangularis	3	0	1	1	2	5	5	74	13	193	8	305
H. triangularis larvae	5	0	2	2	17	4	0	8	4	40	0	82
Tropisternus columbianus	0	0	0	7	8	13	40	74	33	39	0	214
T. ellipticus	0	0	0	1	0	1	10	5	10	0	0	27
T. glaber	79	56	23	72	118	37	91	126	87	216	26	931
T. lateralis nimbatus	161	85	57	545	248	159	464	800	162	705	1481	4867
T. mixtus	507	311	286	293	603	307	247	736	341	4618	1393	9642
T. natator	3	2	8	9	22	63	146	259	50	13	49	624

very similar to those of *H. simula* and *H. soror*, but most can be identified by characters in the key. Occasional females lack a carina at the apex of the metasternal keel, but this area of the keel is not as narrow and convex as in *H. simula*, and has smaller and more widely spaced punctures medially. The metasternal keel is subequal in width at each end of the sulcus and widest near the middle of the sulcus; in *H. simula* it is widest near the posterior end of the sulcus and in *H. soror* it is parallel-sided and narrow along the entire length of the sulcus.

***Hydrochara simula* Hilsenhoff and Tracy, 1982**

Distribution and Abundance: Common statewide (Table 2). County records: 2–3, 5–8, 10–12, 17–19, 21, 23–26, 29–35, 38–40, 42–43, 45–49, 51–52, 54, 57, 60–61, 63–68, 70–72. Range: Unknown (included as *H. obtusata* in Smetana 1980).

Habitat: Most adults were collected from shallow ponds and marshes; a few occurred in swamps and other lentic habitats or were collected by light traps.

Life Cycle: Adults occurred 27 March–17 September, 92% before July. Teneral adults (17) were found 29 June–16 September, most occurring August–September.

Identification: Male genitalia are distinctive. Separation of females from *H. obtusata* and *H. soror* is discussed under *H. obtusata*. The apical portion of the metasternal keel in both sexes is strongly convex ventrally, with many punctures occurring mesally where a carina occurs in *H. obtusata* and *H. soror*; occasionally these punctures form a narrow groove. The penultimate segment of the maxillary palpi is distinctly longer than in *H. obtusata*.

***Hydrochara soror* Smetana, 1980**

Distribution and Abundance: Locally common in southern half (Table 2). County records: 41, 49–52, 54–57, 60, 63, 66, 71–72. Range: WI-CT-FL-TX-KS.

Habitat: Almost all adults were collected from shallow lentic habitats in flood-plains of rivers; three were collected by light traps.

Life Cycle: Almost 97% of adults occurred 20 May–30 June. Teneral adults (4) were found 6 July–5 August.

Identification: The fine carina on the keel between the metatrochanters is lacking in *H. simula*, similar in *H. obtusata* females, and pronounced in *H. obtusata* males. The penultimate segment of maxillary palpi of females is thinner than in *H. obtusata* and shorter than in *H. simula*; it is about 1.25 mm long. The penis is convex dorsally with a narrow groove, as in *H. obtusata*, but the broad, apically-incurved parameres are distinctive (Fig. 21).

***Hydrochara spangleri* Smetana, 1980**

Distribution and Abundance: Uncommon in the southern half (Table 2). County records: 32–33, 36, 41, 49–50, 52, 57, 60–61, 72. Range: WI-OH-FL-TX-NE.

Habitat: Adults were collected from shallow lentic habitats in flood-plains of rivers; 91% were found in shallow ponds at the Leopold Memorial Reserve in the flood-plain of the Wisconsin River.

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

Life Cycle: Adults occurred from 20 April–9 August, most in late June and early July when all teneral specimens (19) were collected.

Identification: Adults are most easily recognized by the pale apical half of the profemur and the lack of a dark apical ring on the maxillary palpi. Most *H. obtusata* adults also lack this dark palpal ring, but the penultimate segment is distinctly shorter and stouter than in *H. spangleri*. The metasternal keel is narrow and parallel-sided, as in *H. soror*, and not widened near the middle as in *H. obtusata*.

Hydrophilus O.F. Müller, 1764

A single species occurs in the northern United States and Canada.

Hydrophilus triangularis Say, 1823

Distribution and Abundance: Fairly common in southern third to uncommon in northern third (Table 2). County records: 4, 6–8, 24, 27–28, 34–36, 38–40, 44–49, 54, 56–59, 61–62, 64, 66–67, 69–72. Range: BC-PQ-FL-CA.

Habitat: Adults were collected from permanent ponds and marshes.

Life Cycle: Adults occurred 24 April–6 October, 61% being found in June. Teneral adults (4) occurred 3–17 August and larvae (79) 24 May–18 August, with third instar larvae being found as early as 5 June. Adults apparently overwinter in terrestrial habitats and return to lentic habitats in mid- to late spring to mate and oviposit. Aquatic larvae probably complete development and pupate in terrestrial sites from mid-June through August, with emergence occurring about 10 days later to complete a univoltine life cycle.

Identification: Because of their large size, adults can be confused only with those of *Dibolocelus ovatus*, from which they can be separated by the generic key (Hilsenhoff 1995). The first abdominal sternum is entirely pubescent and the remaining sterna are mostly glabrous. In *D. ovatus* the first two abdominal sterna are pubescent and the last three are glabrous only in the middle. Larvae of *H. triangularis* are also distinctive because of their large size, rounded head, 4-segmented antennae in the second and third instars, and lack of setiferous lobes on abdominal segments.

Tropisternus Solier, 1834

Spangler (1960) revised *Tropisternus*, a New World genus, elevating four subgenera to genus, one of which contains all Wisconsin species. Because this valuable revision was not published, I continue to use *Tropisternus* as did Smetana (1988). Six species were found in Wisconsin; a seventh, which occurs in Michigan and northern Illinois, may also occur in southern Wisconsin.

Life cycles were predominantly univoltine and are not repeated below. Adults overwintered in aquatic habitats, mated and laid eggs in mid- to late spring; larvae completed development in aquatic habitats and adults emerged from terrestrial pupal cells in mid- to late summer.

Key to Species of Adult *Tropisternus* in Wisconsin

1. Pronotum and elytra with a pale border; legs mostly testaceous; 8.0–10.6 mm long ..... *lateralis nimbatus*

Pronotum and elytra without a pale border; legs black or piceous with testaceous or rufous markings 2

2(1). Densely setose area at base of metafemur large, trapezoidal, extending along posterior margin from apex of trochanter a distance subequal to width of basal metatarsomere (Fig. 23) 3

Densely setose area at base of metafemur smaller, triangular, not extending along posterior margin from apex of trochanter (Figs. 24–25) 4

3(2). Elytra with dense, dual punctation on disc, appearing rugose from base to apex; apical half of metafemur rufotestaceous, except narrowly black along posterior margin; 9.4–11.2 mm long ..... *mixtus*

Elytra with dual, rugose punctation absent on disc; apical half of metafemur mostly piceous; 8.6–10.3 mm long (Spangler 1960) ..... *blatchleyi modestus*

4(2). Densely setose area at base of metafemur extending to apex of trochanter (Fig. 24); sternal apex with a spine or low carina 5

Densely setose area at base of metafemur confined to anterior half of area adjacent to trochanter (Fig. 25); sternal apex with a pronounced carina; 9.3–11.3 mm long ..... *columbianus*

5(4). Apex of fifth abdominal sternum with a distinct spine; mediolateral series of punctures on pronotum linear 6

Apex of fifth abdominal sternum with a small carina; mediolateral series of punctures on pronotum reduced to a setiferous pit; 9.9–11.9 mm long ..... *ellipticus*

6(5). Mesosternal portion of keel wide (> 1.2 mm), depressed or flat medially, coarsely punctate apically; sternal keel usually extending to middle of third abdominal sternum; 9.8–12.0 mm long..... *natator*

Mesosternal portion of keel narrow (< 1.0 mm), slightly convex, finely punctate apically; sternal keel extending slightly beyond posterior margin of second abdominal sternum; 9.6–12.1 mm long..... *glaber*

***Tropisternus blatchleyi modestus* d'Orchymont, 1938**

Distribution and Abundance: Not yet found in Wisconsin. Range: NY-MD-AR-IL-MI. Another subspecies, *T. blatchleyi blatchleyi* occurs farther south.

Identification: The densely setose area at the base of the metafemur is similar to that found in *T. mixtus* (Fig. 23), but adults are readily recognized by their darker femora and distinctly wider mesosternal keel. In the much more southern *T. blatchleyi blatchleyi* the apex of the metafemur is rufotestaceous.

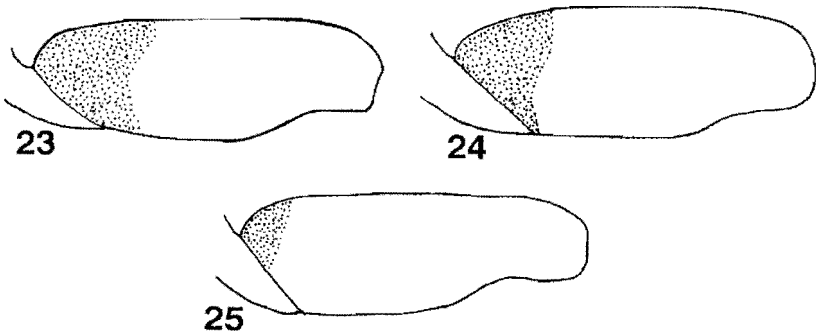
***Tropisternus columbianus* Brown, 1931**

Distribution and Abundance: Common in southern third to uncommon in central third (Table 2). County records: 28, 32, 36–37, 40, 46–51, 54–59, 61–67. Range: BC-ON-OH-TX-CA.

Habitat: Adults were collected from shallow ponds and other lentic habitats from May into September, with earlier and later collections often from spring seeps or spring ponds.

Life Cycle: Adults occurred 31 March–9 November, most being collected in June (42%) and September (29%). Teneral adults (6) were found 18 August–27 September, five occurring in September. Adults probably overwinter in spring ponds and seeps; most fly to shallow lentic habitats in late spring.

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875



Figures. 23–25. Left metafemur and apex of trochanter of *Tropisternus* (ventral view with densely punctate setose area stippled). 23. *T. mixtus*. 24. *T. glaber*. 25. *T. columbianus*.

Identification: Adults are easily recognized by the abbreviated, densely setose area at the base of the metafemur, which extends only half-way to the apex of the trochanter (Fig. 25). They have a carina instead of a spine at the apex of the abdomen, which is more pronounced than in adults of *E. ellipticus*, the only other species lacking a spine.

***Tropisternus ellipticus* (Leconte, 1855)**

Distribution and Abundance: Uncommon in southern third, rare in central third (Table 2). County records: 28, 44, 54–57, 61–62, 68, 70–72. Range: BC-WI-TX-CA.

Habitat: Almost all adults were collected from streams, spring ponds, or ponds adjacent to streams.

Life Cycle: Adults (26%) occurred 4 March–30 May; the remainder (74%) were found 5 August–8 November, most in August and November. The only teneral adult occurred 6 August. Adults apparently overwinter in the lotic habitats in which larvae develop.

Identification: Adults most resemble those of *T. glaber*, which also occur in lotic habitats in spring and autumn. The anterolateral setiferous pit on the pronotum, instead of a row of punctures, and the low carina instead of a spine or strong carina at the apex of the last abdominal sternum, separate adults of *T. ellipticus* from those of all other species of *Tropisternus*.

***Tropisternus glaber* (Herbst, 1797)**

Distribution and Abundance: Common statewide (Table 2). County records: 1–61, 64–68, 70–72. Range: ON-NS-NJ-SD.

Habitat: In late spring and summer, adults were collected mostly from ponds, but also were found in marshes and other lentic habitats. In autumn they occurred along margins of streams and in deeper lentic habitats.

Life Cycle: Adults occurred 2 March–11 December; most collections before May and after September were from lotic habitats where they overwin-

ter. Most (83%) were collected May–September; 13% were found after September. Adults returned to lentic breeding sites mostly in May and June; teneral adults (25) occurred 29 June–26 October, almost all before October, indicating most larvae develop in late spring and summer.

Identification: Because of a similar densely setose area at the base of the metafemur, adults may be confused with those of *T. ellipticus* and *T. natator*. Separation is discussed under those species.

***Tropisternus lateralis nimbatus* (Say, 1823)**

Distribution and Abundance: Very common in northern third, abundant elsewhere (Table 2). County records: 1–21, 23–72. Range: AB-NS-FL-NM-WY. Other subspecies occur south of the United States or west of the Great Plains.

Habitat: Adults were collected primarily from ponds, but occasionally were found in other lentic habitats and along margins of streams; 3% were collected by light traps. Most overwintered in deep lentic habitats.

Life Cycle: Adults occurred 22 March–12 December. Only 5% were collected before June, after which numbers increased rapidly to reach a peak in September; 35% of adults were found September–October, when adults, many of which had recently emerged, were entering overwintering sites. Teneral adults (264) first occurred a month earlier than in other species of *Tropisternus*. Peak emergence was in August (36% of teneral adults), with significant emergence equally distributed 31 May–July, and September–7 November. Overwintering eggs may account for the early emergence, but adults are the principal overwintering stage as evidenced by an extended emergence period with a peak in August. The early emergence of many adults and significant number of late-emerging adults (19% of teneral specimens after September) suggests a substantial second generation in some years.

Identification: The continuous pale border on the pronotum and elytra, and the predominantly testaceous legs are diagnostic.

***Tropisternus mixtus* (LeConte, 1855)**

Distribution and Abundance: Abundant statewide (Table 2). County records: 1–72. Range: MB-NS-WV-NE.

Habitat: Most adults were collected from ponds and other shallow lentic habitats, except in autumn, when most overwintering adults were found along margins of streams. Five percent of adults were collected by light traps.

Life Cycle: McKenna Pond, a breeding site, was sampled regularly from 1977–1981, when 4,236 adults were collected. Adults first appeared in McKenna Pond 3 April and reached peak numbers (1,812) in July, with 82% occurring June–August and less than 0.5% occurring after September; most teneral adults (97 of 99) were found 28 June–31 August, suggesting a typical univoltine life cycle. Other collections statewide had peak adult numbers in June, August, and September, with 57% occurring June–August, 22% in September, and 17% after September, the latter almost all in streams; teneral adults (239) were found 28 June–19 November, 73% occurring before September and 19% in September. Late emerging adults probably resulted from a partial second generation or retarded development in cold habitats.

Identification: Because of the pale apical half of the metafemur, adults resemble many adults of *T. glaber*; they can be distinguished by the distinctly wider setose area at the base of the metafemur (Figs. 23–24) and by the narrower apex of maxillary palpi.

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875

***Tropisternus natator* d'Orchymont, 1938**

Distribution and Abundance: Uncommon in northern third to very common in southern third (Table 2). County records: 4, 14, 21, 23–24, 26, 28–30, 35–72. Range: ON-PQ-GA-TX-SD.

Habitat: In spring and summer, adults were collected from ponds and river sloughs; in late summer and autumn, they were found in overwintering sites along margins of streams, lakes, and deeper ponds.

Life Cycle: Adults occurred 4 March–12 December, with 65% collected May–September and 31% collected after September. Teneral adults (47) were found 28 June–8 November, 89% occurring by October 10.

Identification: Adults resemble those of *T. glaber*, but are darker ventrally with the ventral pale area of the metafemur limited to the anterior apical edge; in most *T. glaber* adults the pale area is more extensive, often extending to near the posterior margin. The apex of the metasternal keel is usually more strongly curved ventrally than in *T. glaber* and distinctly longer. The wider and more coarsely punctate mesosternal keel, which is flatter and often somewhat sulcate, is the best character for separating *T. natator* from *T. glaber*.

LITERATURE CITED

Archangelsky, M., and M.E. Durand. 1992. Description of the preimaginal stages of *Dibolocelus ovatus* (Gemminger and Harold, 1868) (Coleoptera, Hydrophilidae: Hydrophilinae). Aquatic Insects 14:107–116.

Berge Henegouwen, A. van 1986. Revision of the European species of *Anacaena* Thomson (Coleoptera: Hydrophilidae). Entomol. Scand. 17:393–407.

Cheary, B.S. 1971. The biology, ecology and systematics of the genus *Laccobius* (*Laccobius*) (Coleoptera: Hydrophilidae) of the new world. Privately printed, Riverside, CA. xv + 177 pp.

Gentili, E. 1985. I *Laccobius* americani–I *Laccobius* del Canada. Mus. A. Stoppani Sem. Arcivesc. Milano, 6° Annuario (n.s.) 1983:31–45.

_____. 1986. I *Laccobius* americani–II genere *Laccobius* a sud del Canada. Mus. A. Stoppani Sem. Arcivesc. Milano, 7° Annuario (n.s.) 1984:31–40.

Gundersen, R.W. 1967. Taxonomic revision of the genus *Enochrus*, subgenera *Enochrus* and *Methydrus* for the Nearctic region (Hydrophilidae: Coleoptera). Ph.D. Diss., Univ. Minnesota. 253 pp.

_____. 1977. New species and taxonomic changes in the genus *Enochrus* (Coleoptera: Hydrophilidae). Coleopts. Bull. 31:251–272.

_____. 1978. Nearctic *Enochrus*. Biology, keys, descriptions and distribution (Coleoptera: Hydrophilidae). St. Cloud State University, St. Cloud, MN. 54 pp.

Hardy, A.R., B.S. Cheary, and S.E. Malcolm. 1981. A clarification of the authorship of some names in *Laccobius* Erichson (Coleoptera: Hydrophilidae). Pan-Pacific Entomol. 57:303–305.

Hilsenhoff, W.L. 1991. Comparison of bottle traps with a D-frame net for collecting adults and larvae of Dytiscidae and Hydrophilidae (Coleoptera). Coleopts. Bull. 45:143–146.

_____. 1995. Aquatic Hydrophilidae and Hydraenidae of Wisconsin (Coleoptera). I. Introduction, key to genera of adults, and distribution, habitat, life cycle, and identification of species of *Helophorus* Fabricius, *Hydrochus* Leach, and *Berosus* Leach (Hydrophilidae), and Hydraenidae. Great Lakes Entomol. 28:25–53.

_____, and B.H. Tracy. 1982. A new species of *Hydrochara* (Coleoptera: Hydrophilidae) from the western Great Lakes region. Great Lakes Entomol. 15:99–102.

Miller, D.C. 1964. Notes on *Enochrus* and *Cymbiodyta* from the Pacific northwest (Coleoptera: Hydrophilidae). Coleopts. Bull. 18:69–78.

Newton, A.F. Jr., and M.K. Thayer 1992. Current classification and family-group names in Staphyliniformia (Coleoptera). Fieldiana. Zoology New Ser. No 67. 92 pp.

Perkins, P.D., and P.J. Spangler. 1981. A description of the larva of *Helocombus bifidus* (Coleoptera: Hydrophilidae). Pan-Pac. Entomol. 57:52–56.

Richmond, E.A. 1920. Studies on the biology of the aquatic Hydrophilidae. Bull. Amer. Mus. Nat. Hist. No. 42. 93 pp. + 16 pl.

Smetana, A. 1974. Revision of the genus *Cymbiodyta* Bed. (Coleoptera: Hydrophilidae). Mem. Entomol. Soc. Can. No. 93. iv + 113 pp.

_____. 1980. Revision of the genus *Hydrochara* Berth. (Coleoptera: Hydrophilidae). Mem. Entomol. Soc. Can. No. 111. 100 pp.

_____. 1988. Review of the family Hydrophilidae of Canada and Alaska (Coleoptera). Mem. Entomol. Soc. Can. No. 142. 316 pp.

Spangler, P.J. 1960. A revision of the genus *Tropisternus* (Coleoptera: Hydrophilidae). Ph.D. Diss., Univ. Missouri. v + 364 pp.

_____. 1961. Notes on the biology and distribution of *Sperchopsis tessellatus* (Ziegler) (Coleoptera: Hydrophilidae). Coleopts. Bull. 15:105–112.

Willson, R.B. 1967. The Hydrophilidae of Michigan with keys to species of the Great Lakes region. M.S. Thesis, Michigan State Univ. vi + 100 pp.

Winters, F.C. 1926. Notes on the Hydrobiini (Coleoptera-Hydrophilidae) of boreal America. Pan-Pac. Entomol. 3:49–58.

Wooldridge, D.P. 1966. Notes on Nearctic *Paracymus* with descriptions of new species (Coleoptera: Hydrophilidae). J. Kansas Entomol. Soc. 39:712–725.

_____. 1967. The aquatic Hydrophilidae of Illinois. Trans. Illinois Acad. Sci. 60:422–431.

https://scholar.valpo.edu/tgle/vol28/iss2/1
DOI: 10.22543/0090-0222.1875