

THE HYDROPHILIDAE OF MICHIGAN  
WITH KEYS TO SPECIES OF  
THE GREAT LAKES REGION

Thesis for the Degree of M. S.  
MICHIGAN STATE UNIVERSITY  
RONALD BAIR WILLSON

1970

5 <sup>3</sup>  
~~1279~~ 177

~~2620702~~

~~446~~ 136

~~OCT 06 '87~~

~~14 11'05~~

200 C 229

~~DEC 04 1992~~

~~446497~~

~~322-NK~~

MAR 29 1996

~~11-4457649~~

**THE HYDROPHILIDAE OF MICHIGAN**  
**WITH KEYS TO SPECIES OF**  
**THE GREAT LAKES REGION**

**By**

**Ronald Bair Willson**

**A THESIS**

**Submitted to**  
**Michigan State University**  
**in partial fulfillment of the requirements**  
**for the degree of**

**MASTER OF SCIENCE**

**Department of Entomology**

**1970**

661284/  
3-26-70

# ABSTRACT

## THE HYDROPHILIDAE OF MICHIGAN WITH KEYS TO SPECIES OF THE GREAT LAKES REGION

by Ronald B. Willson

A collection of over 10,000 specimens of Michigan Hydrophilidae was examined and found to contain 7 subfamilies, 22 genera, and 45 species. An additional genus, Helochares, and 10 additional species are not known from Michigan, but are recorded from the peripheral Great Lakes Region.

Four genera, Helophorus, Hydrochus, Cercyon, and Berosus are not discussed at the species level. For each species the following information is provided: keys for identification; discussion of taxonomic characters; maximum and minimum length of the material examined; habitat associations, including phototropic responses; North American range; and their distribution within the state of Michigan.

Two new species of Laccobius are described, Laccobius spangleri Willson, and Laccobius arenarius Willson.



## ACKNOWLEDGEMENTS

I wish to extend my appreciation to the members of my Guidance Committee: Dr. Roland L. Fischer, Department of Entomology, who served as major professor and provided much encouragement and financial assistance for field collections; Dr. Gordon E. Guyer, Chairman, Department of Entomology, for financial assistance in the making of field collections and his review of this manuscript; Dr. Fredric Stehr, Department of Entomology, for his critical review of this manuscript; and Dr. Eugene Roelofs, Department of Fisheries and Wildlife, for his availability for consultation and his critical review of this manuscript.

Expressions of thanks go also to the following organizations for their assistance in my field work during the summer of 1964: Michigan Technological University, Drs. Eric A. Bourdo and Kenneth Kraft; Isle Royale National Park, Dr. William Dunmire; Michigan Department of Conservation.

For the loan of specimens I wish to thank the U. S. National Museum, Dr. Paul J. Spangler, University of Michigan, Dr. Richard D. Alexander, University of Minnesota, Dr. H. C. Chiang, and from their personal collections, Drs. Robert C. Graves and Robert Gordon.

My gratitude to Dr. Paul J. Spangler, U. S. National Museum and Mr. Hugh B. Leech, California Academy of Science, for their many letters providing invaluable technical assistance and encouragement concerning this work.

My thanks to the fellow students, Robert W. Matthews, Julian P. Donahue, Toby Schuh, and a nonstudent compatriot, Mogens Nielsen, for the large numbers of specimens they provided for this study.

Lastly, I would like to express my appreciation to my wife Melodee, for without her hard work and devotion this work would not have been possible.

## TABLE OF CONTENTS

|                                                              | Page |
|--------------------------------------------------------------|------|
| ACKNOWLEDGEMENTS . . . . .                                   | ii   |
| INTRODUCTION . . . . .                                       | 1    |
| BIOLOGY . . . . .                                            | 2    |
| <br>SYSTEMATICS                                              |      |
| <u>Helophorus</u> sp. . . . .                                | 11   |
| <u>Hydrochus</u> sp. . . . .                                 | 11   |
| <u>Phaenonotum estriatum</u> (Say) . . . . .                 | 13   |
| <u>Cryptopleurum minutum</u> (Fabricius) . . . . .           | 14   |
| <u>C. americanum</u> Horn . . . . .                          | 15   |
| <u>Sphaeridium bipustulatum</u> Fabricius . . . . .          | 17   |
| <u>S. lunatum</u> Fabricius . . . . .                        | 18   |
| <u>S. scarabaeoides</u> (Linnaeus) . . . . .                 | 19   |
| <u>Oosternum pubescens</u> (LeConte) . . . . .               | 20   |
| <u>Cercyon</u> sp. . . . .                                   | 20   |
| <u>Hydrochara obtusata</u> (Say) . . . . .                   | 22   |
| <u>Dibolocelus ovatus</u> (Gemminger & Harold) . . . . .     | 23   |
| <u>Hydrophilus triangularis</u> (Say) . . . . .              | 24   |
| <u>Tropisternus mexicanus striolatus</u> (LeConte) . . . . . | 27   |
| <u>T. lateralis nimbatus</u> (Say) . . . . .                 | 28   |
| <u>T. ellipticus</u> (LeConte) . . . . .                     | 29   |
| <u>T. columbianus</u> Brown . . . . .                        | 29   |
| <u>T. mixtus</u> (LeConte) . . . . .                         | 30   |
| <u>T. blatchleyi</u> d'Orchymont . . . . .                   | 31   |
| <u>T. modestus</u> d'Orchymont . . . . .                     | 32   |
| <u>T. natator</u> d'Orchymont . . . . .                      | 32   |
| <u>T. glaber</u> (Herbst) . . . . .                          | 33   |
| <u>Chaetarthria pallida</u> LeConte . . . . .                | 34   |

|                                                    | Page |
|----------------------------------------------------|------|
| <u>Berosus</u> sp. . . . .                         | 35   |
| <u>Laccobius agilis</u> (Randall) . . . . .        | 38   |
| <u>L. minutoides</u> d'Orchymont . . . . .         | 39   |
| <u>L. spangleri</u> Willson, new species . . . . . | 40   |
| <u>L. arenarius</u> Willson, new species . . . . . | 44   |
| <u>Helocombus bifidus</u> (LeConte) . . . . .      | 50   |
| <u>Cymbiodyta acuminata</u> Fall . . . . .         | 52   |
| <u>C. blanchardi</u> Horn . . . . .                | 53   |
| <u>C. minima</u> Notman . . . . .                  | 54   |
| <u>C. fimbriata</u> (Melsheimer) . . . . .         | 54   |
| <u>C. vindicata</u> Fall . . . . .                 | 55   |
| <u>C. toddi</u> Spangler . . . . .                 | 56   |
| <u>Helochares maculicollis</u> Mulsant . . . . .   | 57   |
| <u>Enochrus pygmaeus nebulosus</u> (Say) . . . . . | 60   |
| <u>E. species</u> . . . . .                        | 61   |
| <u>E. blatchleyi</u> (Fall) . . . . .              | 62   |
| <u>E. ochraceus</u> (Melsheimer) . . . . .         | 62   |
| <u>E. cinctus</u> (Say) . . . . .                  | 63   |
| <u>E. consortus</u> Green . . . . .                | 64   |
| <u>E. consors</u> (LeConte) . . . . .              | 65   |
| <u>E. perplexus</u> (LeConte) . . . . .            | 65   |
| <u>E. diffusus</u> (LeConte) . . . . .             | 66   |
| <u>E. horni</u> Leech . . . . .                    | 67   |
| <u>Hydrobius fuscipes</u> (Linnaeus) . . . . .     | 69   |
| <u>H. globosus</u> (Say) . . . . .                 | 69   |
| <u>Sperchopsis tessellatus</u> (Ziegler) . . . . . | 71   |
| <u>Paracymus despectus</u> (LeConte) . . . . .     | 73   |
| <u>P. confluens</u> Wooldridge . . . . .           | 74   |
| <u>P. confusus</u> Wooldridge . . . . .            | 75   |
| <u>P. subcupreus</u> Complex . . . . .             | 75   |
| <u>P. communis</u> Wooldridge . . . . .            | 77   |
| <u>Crenitis digestus</u> (LeConte) . . . . .       | 78   |
| <u>C. monticola</u> (Horn) . . . . .               | 79   |
| <u>C. longulus</u> (Fall) . . . . .                | 79   |

|                                               |            |
|-----------------------------------------------|------------|
| <u>Anacaena suturalis</u> (LeConte) . . . . . | Page<br>80 |
| <u>A. limbata</u> (Fabricius) . . . . .       | 81         |
| FIGURES 1-19 . . . . .                        | 83         |
| MAPS 1-10 . . . . .                           | 87         |
| LITERATURE CITED . . . . .                    | 97         |

## INTRODUCTION

The only comprehensive work on the Hydrophilidae for the Midwest is the massive work of Blatchley (1910) which is hopelessly outdated. The primary scope of this work is to review the species of the aquatic forms of the Hydrophilidae known to occur in the Great Lakes Region (Map 1) with special emphasis upon the Michigan fauna. The specific levels for Helophorus, Hydrochus, and Cercyon have been excluded from this presentation because these genera are in need of a North American review and a regional study will only add to the complexity of the problem. Specific treatment of Berosus is also excluded due to the loan of all available Michigan specimens to Eileen VanTassell for her North American revisionary study of the group.

Since very little work has been done on the ecology of the Hydrophilidae, habitat associations are made for all species wherever possible. Hydrophilids vary in their phototropic response, with some easily collected at light, while others apparently never fly to light. In a very relative manner, the degree of attraction to light is discussed for each species.

## BIOLOGY

Members of the Hydrophilidae or "water scavenger beetles" are found in or along the margins of most bodies of water. Members of the subfamily Sphaeridiinae are associated with dung, compost, and other moist situations of this type and are not considered truly aquatic.

The aquatic species are most commonly found in lentic waters and usually associated with abundant vegetation. An overabundance of vegetation, especially filamentous and flocculant algae, may inhibit their locomotor abilities and prevent easy access to the surface for renewal of air supply. The specific habitats vary with the species, but members of the family may be found in virtually every body of water in the state, lentic or lotic, permanent or temporary.

Adults of the Hydrophilidae walk, swim, and fly with varying amounts of success, depending on the species. The subfamilies Helophorinae, Hydrochinae, and Hydrobiinae, which are smaller beetles, are considered to be poor swimmers, primarily due to their lack of structural adaptations. The Berosinae, also small beetles, are highly modified with swimming hairs along the middle and hind legs, and are very fast, free-swimming beetles that dart into heavy vegetation when disturbed. The Hydrophilinae show the most extreme modifications for aquatic life among the Hydrophilidae. They are very compact and streamlined, bearing a longitudinal sternal keel which increases body rigidity. The middle and hind tarsi are flattened into oar-like

structures that are fringed with swimming hairs. The tibiae have fewer and smaller spines and setae, reducing the drag effect.

Most hydrophilids fly readily and for considerable distances. One may collect these beetles at a light source, miles from any water.

Locomotion in the larvae is usually restricted to crawling about on vegetation and bottom sediments. Many may swim and the Hydrophilinae do so frequently.

Both larvae and adult beetles must rise to the water's surface for oxygen replenishment. The adults carry a reservoir of air with them when submerged. The venter and antennal club of the beetle is covered with a water resistant hydrophuge pubescence which aids in trapping an air bubble which covers these parts of the body. The arched elytra form a pocket for the air supply from which the tracheal system gains access to the air. The ventral bubble and the bubble of air beneath the elytra are connected by a groove between the pro- and mesothorax. As the oxygen is removed, it is replaced from the surrounding water by diffusion into the ventral bubble, allowing the beetle to remain submerged for a long period of time. When renewal of the air supply is necessary the beetle rises to the surface and extends the antennae through the surface film. Since the antennal club is unwettable, it is surrounded by a tube of air that makes a connection between the ventral air bubble and the atmospheric air and exchange of the air is made. The adult respiration has been described by Leech (1956), Miller (1965), and Wilson (1923b).

The larvae as described by Miller (1963) have a similar mechanism. They have a pair of posterior abdominal spiracles that open externally into the stigmatic atrium, a transverse slit which is



kept closed when submerged. The posterior end of the abdomen bears a pair of cerci, which when submerged, extend posteriorly. For fresh air the larva protudes the anal end to the surface, the surface tension spreading the cerci apart, so that they lie horizontally upon the surface rather than protruding through the surface and into the air. This action spreads the lips of the stigmatic atrium and the spiracles are exposed to atmospheric air. When the abdomen is withdrawn from the surface, the surface tension pulls the cerci together again, thus closing the atrium.

Adult hydrophilids beetles are predominately scavengers in feeding habits, utilizing living or dead plant matter, dead animals, and detritis. Spangler (1960) found that Tropisternus would feed on the leaves of Ulmus, Acer, and Plantago, from which they consumed the epidermal layer, thus leaving the skeletonized leaf. I have observed Tropisternus mixtus (LeConte) feed on the flocculant detritis and ooze that accumulates in aquaria bottoms as well as filamentous algae when both were readily available in the same aquarium. The larger members of the family, the Hydrophilinae, apparently require some animal proteins. Young (1958) found that Tropisternus sp. lived for a considerable period of time on diets of commercial dog food while others of the same species limited to a vegetable diet died within a short time.

The larvae, in contrast to the adults, are strictly predaceous and when given the opportunity, cannibalistic. Prey consists of virtually any soft-bodied organism that can be subdued. Wilson (1923a) upon examination of the alimentary canals of 52 Hydrophilus triangularis (Say) larvae from Fairport, Iowa, found the following approximate composition: 38% snails (Physa and Planorbis) 30% chironomid larvae,

8% fish, 3% gyrid larvae, 2% tadpoles, and 2% Hydrophilus larvae. The additional 15% was scattered among additional invertebrate taxa, none having over 1.5% of the total.

Stridulation is not uncommon among the Hydrophilidae and is known in the following genera: Sperchus, Hydrophilus, Hydrobius, Limnoxenus, Tropisternus, Berosus, Laccobius, Derallus, and Hemiosus. VanTassel (1965) has made an excellent beginning on the understanding of stridulation in Berosus, the results of which are perhaps typical for the family. Two basic patterns are known which include erratic haphazard stress chirps when the beetle is confined or irritated and an evenly spaced tremolo which is considered to be a premating sound. Both sexes emit stress chirps and at least the females produce the premating tremolo.

The sound-producing organs are the "plektrum" or file of teeth situated on the latero-sternite of the first abdominal sternum and the "pars-stridens," or roughened patch on the underside of the elytra. Sound is produced by moving the plektrum upward and forward against the pars-stridens.

Premating tremolos for species studied by Van Tassell appear to be distinct specifically, both in frequency, number of individual chirps, and length of time for tremolo. She states that this "indicates that low-intensity sound production may have considerable significance as an isolating mechanism in the Coleoptera."

Most mating and oviposition takes place in the spring. The female spins a silken egg case in the water into which the eggs are laid. The opening is plugged with a silken cap which is armed with a tube or ribbon of silk called the "mast." This mast invariably

protrudes through the water's surface and is thought to provide for the access of air in egg respiration (Vlasblom & Wolverkamp, 1957 in Miller, 1963). Upon hatching, the larvae must reach the atmospheric air supply, which is accomplished by swallowing air contained within the egg case to increase buoyancy or by crawling up the egg case mast to reach the water's surface.

At maturity the larvae crawl out of the water and away from the water's edge. A site is selected for excavation of a pupal cell. This selection is apparently influenced greatly by the soil moisture and texture, since the larvae may wander for hours before finding an acceptable spot. Once sealed within the cell, the pupa is formed and the adult subsequently emerges.

Very little information is available concerning the quiescent state of overwintering in the Hydrophilidae. There are observations of Tropisternus swimming under the ice. Richmond (1920) indicates that at least some species overwinter in the soil a few feet from the water. I have collected Tropisternus sp. and Sperchopsis tesselatus (Zimmermann) in apparent quiescence, the former in mud of a pond bottom and the latter under a concrete block that was partially submerged along a river margin. The overwintering form is the adult stage, but possibly some larvae do also.

A great variety of predators utilize the Hydrophilidae for food, but for few, if any, are they a major food source. Larval cannibalism is common, especially at the time of eclosion from the egg case. Predation upon the larvae by other aquatic insects such as anisopterous odonates, hemipterans, and dytiscids is common. Shore birds and other waterfowl frequently are found to contain hydrophilid adults and

larvae, but usually in trace amounts when compared with the total food volume. Raccoon (Stains, 1956) and turtle (Wilson, 1923b) excreta have been found to contain hydrophilid remains. Also, frogs, toads, and centrarchid fishes frequently consume these beetles.

Mites, nematodes, and fungi attack various Hydrophilidae as parasites. Diptera and Hymenoptera are also parasites of the prepupal larvae and pupae.

Wilson (1923b) notes that in the pupal stages, soil moisture changes can produce mortality. The drying of the soil may trap the teneral adults within the cell or result in desiccation, while flooding will drown the pupae.

The positive phototropism exhibited by many species definitely results in the death of large numbers. It is not uncommon to have well over 1000 Hydrobius fuscipes (Linnaeus) in a light trap from a single night. Hydrophilus triangularis (Say) frequently will fly to the light of business establishments at which they perish in large numbers much as with the large belostomatid or electric light bug, Lethrocerus americanus (Leidy).

Water pollution has become a factor in hydrophilid mortality with toxic wastes playing the major role. In addition, those pollutants which are not directly toxic may alter the physical and biological environment to such a point that emmigration from the habitat is necessary. Young (1961) states "the most striking effect of pollution is in the changes in species composition and frequencies in the natural associations of beetles which normally occur in streams, empoundments or other natural situations."

Though not a mortality factor, the colonial protozoan Epistylis sp. is an epizooite on many Hydrophilidae. It was found commonly on Laccobius and to a lesser extent on Crenitis, Paracymus, Anacaena, Cymbiodyta, and Tropisternus. In many instances the Epistylis growths were so extensive and dense upon individual beetles that a normal existence must have been impossible.

#### KEY TO THE SUBFAMILIES OF MICHIGAN HYDROPHILIDAE\*

1. Pronotum with 5 longitudinal grooves; pronotum as wide as base of elytra.....HELOPHORINAE  
 Pronotum without 5 longitudinal grooves; pronotal width variable.....2
2. Pronotum narrower than base of elytra, with 5 more-or-less distinct pits or fovae and surface strongly granulate; scutellum very small; eyes protuberant; general appearance elmid-like.....HYDROCHINAE  
 Pronotum as wide as base of elytra (except some Berosinae), without 5 pits or fovae, and smooth, not coarsely granulate; eyes not protuberant (except some Berosinae).....3
3. Basal segment of hind tarsi shorter than 2nd; antennae as long as or shorter than maxillary palpi; antennal club asymmetrical; antepenultimate (2nd) segment of maxillary palpi similar to 3rd and 4th.....4

---

\*Modified from Leech (1948).

Basal segment of hind tarsi longer than 2nd; antennae usually longer than maxillary palpi; antennal club symmetrical; antepenultimate segment of maxillary palpi bulbous, 3rd and 4th linear.....SPHAERIDIINAE

4. Meso- and metasterna with a continuous, medial, longitudinal keel which projects posteriorly between the metacoxae as a spine; meso- and metatarsi strongly flattened...HYDROPHILINAE

Meso- and metasterna without a medial longitudinal keel; meso- and metatarsi not strongly flattened.....5

5. First two abdominal sternites with a common excavation which is covered by a fringe of long golden hairs arising from the anterior margin of the 1st abdominal sternite; small convex beetles 1-2.5 mm. in length.....CHAETARTHRIINAE

First two abdominal sternites without a common excavation, covered by a fringe of long golden hairs; size and form variable.....6

6. Head decidedly deflexed; eyes protuberant; scutellum a long triangle; antennae 7-segmented; middle and hind tibiae with a fringe of long swimming hairs.....BEROSINAE, Berosus

Head not decidedly deflexed; eyes not protuberant; scutellum as long as wide or but little longer; antennae usually 9-segmented, rarely 7 or 8; middle and hind tibiae without a fringe of swimming hairs.....7

7. Hind tibiae distinctly arcuate; hind trochanters large, about one-third the length of femora; fifth sternite truncate, usually exposing the sixth; sutural striae absent; small beetles, 3.5 mm in length or less, usually associated with sandy margins of lakes and streams.....BEROSINAE, Laccobius

Hind tibiae straight; hind trochanters smaller, less than one-third the length of femora; fifth sternite entire, normally covering the sixth; sutural striae present at least basally; size and habitat variable.....HYDROBIINAE

## HELOPHORINAE

## Genus HELOPHORUS Fabricius 1775

A genus of brown, elongate, and somewhat flattened beetles, readily distinguished by the wide pronotum bearing five longitudinal grooves. The antennae have four or five segments to the base of the cupule. Many species have a darker, inverted "V" marking on the discal portion of the elytra.

Species of Helophorus are abundant along the margins of most lotic and lentic waters in the Great Lakes Region. They are sometimes found in sand and fine gravel along the water's edge, but more commonly in the grassy margins of quiet waters. Large numbers of Helophorus can be collected at black or incandescent light.

At present it is impossible to make satisfactory determinations to species for the genus. The species are numerous and poorly defined, with Blatchley's (1910) work the only comprehensive reference available for this region. David V. McCorkle is currently revising the North American species of Helophorus. A portion of this study appears in Hatch (1965) and treats the Pacific Northwest species, which includes approximately half of the Nearctic species. Until this revision is completed no attempt will be made to treat the Great Lakes species of Helophorus.

## HYDROCHINAE

## Genus HYDROCHUS Leach 1817

The species of Hydrochus are narrowly elongate beetles which superficially resemble elmids. The pronotum is narrower than the base of the elytra, impressed with five fairly distinct foveae, and



the entire surface strongly granulate. The head and pronotum have a metallic sheen and the scutellum is very small. The antennae are seven-segmented with no more than three segments before the cupule.

Members of this genus are found in lentic water clinging to and crawling on vegetation and debris. Light trap specimens are common but with very small numbers for any one night.

Hydrochus is badly in need of a revisionary study. As with Helophorus, Blatchley (1910) is the only comprehensive work available for the midwest species. As a result, no attempt is made to treat this genus at the specific level.

#### KEY TO THE GENERA OF SUBFAMILY SPHAERIDIINAE

1. Elytra extended below the surface of the body, the epipleural fold largely vertical.....PHAENONOTUM  
     Elytra not extended below the lower surface of the body.....2
2. Elytra enflexed tightly against the body, without a distinct epipleural fold except at extreme base; prosternum elevated at middle forming a flat plate.....CRYPTOPLEURUM  
     Elytra not inflexed tightly against the body, the epipleural fold distinct and horizontal; prosternum carinate at middle.....3
3. Larger, 3.7 to 7.0 mm. long; last abdominal segment exposed beyond apices of elytra; antennae 8-segmented; scutellum elongate triangular.....SPHAERIDIUM  
     Smaller, 1.5 to 3.5 mm. long; last abdominal segment not exposed beyond apices of elytra; antennae 9- or 10-segmented; scutellum an equilateral triangle.....4

4. Prosternum with a low ill-defined median carina; northeastern species minute, 1.2 to 1.5 mm. in length; reddish in color.....OOSTERNUM
- Prosternum with a well-defined mesal carina; northeastern species larger, usually dark in color.....CERCYON

Genus PHAENONOTUM Sharp 1882

This genus of strongly convex beetles is characterized by the following: antennae 9-segmented, the club loosely articulated; elytra extended below the lower surface of the body, the epipleurae in large part vertical; elytra confusedly punctate, without a trace of striae; prosternum narrow anterior to the coxae and not carinate between them; metasternum obtusely elevated along the median line, prolonged between and in front of middle coxae, meeting the mesosternal elevation which forms but a very small part of the intercoxal carina.

Phaenonotum estriatum (Say)

1835. Cyclonotum estriatum Say, Boston Jour. Nat. Hist. I: 171.

DISCUSSION: A broadly oval, strongly convex, shining black species. The elytra confusedly punctate, non-striate. Elytra extended below the lower surface of the body and the epipleurae in most part vertical. Length 3.0 to 3.5 mm. A very distinct species which is difficult to confuse with any others.

HABITAT: I have only taken this species in a Sphagnum bog mat. Rarely collected at a light source.

RANGE: Maryland to Michigan and Indiana, south to Texas and Florida. I have seen specimens from Florida, Illinois, South Carolina, and Texas.

MICHIGAN DISTRIBUTION: (10 specimens examined) Infrequently collected in the state and known from the following localities:  
 CLINTON CO.: Bath, Burke Lake, 3 Sept 1964, R. B. Willson (5).  
 KALAMAZOO CO.: Gull Lake Bio. Sta., 29 Aug 1966, R. L. Fischer (2).  
 MUSKEGON CO.: 8-16-41, R. R. Dreisbach (1). WAYNE CO.: Palmer Park, VII-1-10 (2).

Genus CRYPTOPLEURUM Mulsant 1844

Very small beetles inhabiting dung, compost, fungi, and other damp situations. Prosternum elevated anterior to the coxae, forming a rather large pentagonal area, extending between and rather widely separating the coxae, the apex notched to receive the mesosternum. Mesosternum forming a broad pentagonal plate that widely separates the coxae and is closely united with a broad process of the metasternum. Metasternal episterna in great part concealed in front by the elytra, the epipleura scarcely distinct.

KEY TO THE SPECIES OF CRYPTOPLEURUM

1. Elytral intervals distinctly punctate their entire length;  
     elytral striae not conspicuously coarsely punctate...C. minutum  
     Elytral intervals punctate basally only, the sides and apices  
     nearly smooth; elytral striae conspicuously coarsely  
     punctate.....C. americanum

Cryptopleurum minutum (Fabricius)

1775. Sphaeridium minutum Fabricius, Syst. Ent., 68

DISCUSSION: Shining black or dark brown in color, broadly oval and convex in form; the elytra deeply striate, but less so than americanum; striae punctate, the intervals closely punctate; metasternal

area sharply limited by a well-elevated, sinuous, oblique line extending from the anterior outer angles to the coxal articulation; entire metasternal surface coarsely and closely punctate; length 1.5 to 2.0 mm.

**HABITAT:** I have seen specimens from rotting fungi and milfoil (Achillea millefolium L.). Hatch (1965) reports it from cattle dung, compost, and grass cuttings, and Blatchley (1910) from rotting fungi and carrion. I have seen no specimens taken at light.

**RANGE:** New England and Maryland west to British Columbia and Oregon. I have seen specimens from Massachusetts and Quebec.

**MICHIGAN DISTRIBUTION:** (12 specimens examined) Infrequently encountered in the state and known from the following localities:

INGHAM CO.: Ag. Coll., 1-27-90 (1 in greenhouse). KALAMAZOO CO.: Galesburg, F. S. Sleeper & G. Dinnmock (2); Gull Lake Bio. Sta., 29 June 1966, T. Schuh (3). MIDLAND CO.: 4-27-42 to 5-19-57, R. R. Dreisbach (5). OAKLAND CO.: VIII-10-1933, A. W. Andrews (1).

Cryptopleurum americanum Horn

1890. Cryptopleurum americanum Horn, Trans. Amer. Ent. Soc., 17: 311.

**DISCUSSION:** A broadly oval, convex, shining black species; elytra deeply striate with the striae closely and coarsely punctate near base, less so at apex; elytral intervals moderately coarsely punctate near the base, comparatively smooth at apex and sides. The metasternal area is less sharply defined by the oblique line than is minutum and the punctures well separated. Length 1.75 mm.

**HABITAT:** I have no information as to habitat for this species. It is probable that it is similar to that of minutum.

**RANGE:** Midwestern states: Ohio, Indiana, and Michigan.

MICHIGAN DISTRIBUTION: (1 specimen examined) The single Michigan specimen is from MIDLAND CO.: 9-Sept, Hoffman.

Genus SPHAERIDIUM FABRICIUS 1775

Oval, glabrous beetles that are primarily inhabitants of dung. The elytra are evenly punctate and have a distinct horizontal epipleural fold; the scutellum elongate triangular. Males have the protarsal claws and last protarsal segment enlarged. The prosternum is carinate and the last abdominal segment is exposed beyond the apices of the elytra.

KEY TO THE SPECIES OF SPHAERIDIUM\*

1. Length 3.7 to 5.5 mm; pronotum with its base more strongly bisinuate, the hind angles not obtuse; apical portion of mesosternal intercoxal process finely margined on each side and with a fine median carina; claw joint of male protarsus with its anterior face subtruncate at apex.....S. bipustulatum
- Length 5.5 to 7.0 mm; pronotum with its base feebly bisinuate, the hind angles slightly obtuse; apical portion of the mesosternal intercoxal process neither margined nor carinate; claw joint of male protarsus with its anterior face strongly angulate at apex and prolonged over the basal portion of the large claw.....2

---

\*Modified from Brown (1940).

2. Apical pale area of each elytron not or scarcely prolonged anteriorly along the lateral margin of the elytron; discal red spot of each elytron very obscure and indistinct or entirely lacking, rarely well defined; pronotum without pale lateral margins; legs darker, the femora brown or blackish, sometimes paler at base; median lobe of aedeagus parallel, its apex obtusely rounded and produced at middle into a small angle.....S. lunatum

Apical pale area of each elytron prolonged anteriorly along the lateral margin at least to the middle of the elytron; discal red spot of each elytron well defined, rarely obscure and indistinct; pronotum usually with lateral margins pale; legs paler, each femur usually yellow with a median area and the anterior margin dark, sometimes dark except at base; median lobe of aedeagus gradually narrowed in apical half, its apex acute.....S. scarabaeoides

Sphaeridium bipustulatum Fabricius

1781. Sphaeridium bipustulatum Fabricius, Species Insectorum, Hamburg and Kilonii, 2nd Vol.: 78.

DISCUSSION: The smaller size and subtruncate apex of the male protarsal claw joint easily separates bipustulatum from the other North American species of Sphaeridium. The pronotum may or may not have the lateral margins pale. The apical pale area of each elytron is prolonged anteriorly along the lateral margin at least to the midpoint. The discal red spot on each elytron is usually indistinct or lacking. Each femur usually yellow or pale with a darker medial area and anterior margin. Length 3.7 to 5.5 mm.

**HABITAT:** Most specimens examined were from dung, although two individuals were collected under beach drift along Lake Michigan.

I have seen no specimens collected at light.

**RANGE:** New England, across southern Canada and northern United States to British Columbia, with the southern limits at least to Kansas. I have seen specimens from South Dakota and Quebec.

**MICHIGAN DISTRIBUTION:** (7 specimens examined) Very few Michigan specimens have been seen, but this is apparently due to a lack of collecting. This species is known from the following locations: INGHAM CO.: Aurelius, 20 July 1938, (2); East Lansing, 1 Aug 1936, (1), 19 May 1963, J. P. Donahue (1). OCEANA CO.: Hart, 23 May 1965, E. Metzler (2). ROSCOMMON CO.: 5-31-57, R. & K. Dreisbach (1).

Sphaeridium lunatum Fabricius

1792. Sphaeridium lunatum Fabricius, Ent. Syst., I: 78.

**DISCUSSION:** The characters in the key should suffice for separation of this species. There are some color intergrades between lunatum and scarabaeoides which cannot be accurately determined when color characters are used alone.

**HABITAT:** Dung.

**RANGE:** Nova Scotia to British Columbia, with the southern limits of distribution undefined. I have seen specimens of lunatum from Oregon.

**MICHIGAN DISTRIBUTION:** Not yet recorded from the state, but Brown (1940) recorded lunatum from Point Pelee, Ontario, so it most probably occurs in the state.

Sphaeridium scarabaeoides (Linnaeus)

1758. Dermestes scarabaeoides Linnaeus, Systema Naturae, ed.

10, Holmiae, 356.

DISCUSSION: The characters given in the key will suffice to determine this species. In a few instances there tend to be color intergrades with lunatum, so when any doubt exists, genitalia should be examined.

HABITAT: Common in cow and sheep dung. The larvae feed on dipterous larvae within the dung. I have seen no light collected specimens.

RANGE: Generally distributed across southern Canada and the northern United States. I have seen additional specimens from California, Montana, Nebraska, Oklahoma, Oregon, South Dakota, and Wisconsin.

MICHIGAN DISTRIBUTION: (11 specimens examined) Probably occurs commonly throughout the state, but is infrequently collected due to its habitat. Scarabaeoides is known from the following Michigan localities: CHEBOYGAN CO.: 8/7/1931, C. W. Sabrosky (3). HURON CO.: 17-6-49, R. R. Dreisbach (1). INGHAM CO.: Ag. Coll., 6-30 May 1928 (3); Aurelius, 20 July 1938 (2). IONIA CO.: Portland, 30 May 1959, G. C. Eickwort (1). WAYNE CO.: Detroit, LV-19-1903 (1).

## Genus OOSTERNUM Sharp 1882

This group of very small beetles is closely allied to the genus Cercyon. It differs mainly by the middle of the prosternum being differentiated from the sides, forming a plate like a low roof, with a fine, but not acute, median longitudinal carina.



Oosternum pubescens (LeConte)

1855. Cercyon pubescens LeConte, Proc. Acad. Nat. Sci. Phila.,  
7: 374.

DISCUSSION: Small, 1.2 to 1.5 mm. in length; head black, pronotum and elytra reddish-brown; elytra striate, the intervals alternately subcostiform at apex; dorsal surface sparsely pubescent.

HABITAT: Horn (1890b) records this species as abundant in horse dung and Blatchley (1910) found it frequently at carrion and in fungi.

RANGE: North Central States as far south as Tennessee.

MICHIGAN DISTRIBUTION: (2 specimens examined) The only Michigan specimens known are from: OAKLAND CO.: VII-10-1930, A. W. Andrews (2).

## Genus CERCYON Leach 1817

Members of this genus occur in dung and rotting vegetation, and are generally found in moist terrestrial situations. The prosternum is carinate and scarcely separates the procoxae. The mesosternum is elevated between and in front of the mesocoxae, the elevated portion being linear, lanceolate, or oval. The metasternum does not project at all between the mesocoxae, but forms an acute angle or a broadly rounded edge in accordance with the form of the mesosternum and the width of the latter at its base. The mesosternum is entirely free from the metasternum. Characteristic coloration of most species is black or dark brown with the elytral apices distinctly paler.

The genus Cercyon is badly in need of a North American revisionary study. Most of the eastern species need redefining before any semblance of order can be accomplished. No attempt is made here to treat this genus at the specific level as it would only add to the confusion and complexity of the genus.

#### KEY TO GENERA OF SUBFAMILY HYDROPHILINAE

1. Prosternum carinate, not sulcate; length 13 to 18 mm;  
     metasternal spine short, not extending much past  
     metatrochanters.....HYDROCHARA  
     Prosternum sulcate, not carinate; metasternal spine  
     longer, projecting well beyond metatrochanters.....2
2. Size medium, not over 12 mm in length.....TROPISTERNUS  
     Size large, over 25 mm in length.....3
3. Prosternal process bifurcate, not closed in front and  
     hood-like; form broader and more convex.....DIBOLOCELUS  
     Prosternal process sulcate and closed in front, hood-like;  
     form more linear and less convex.....HYDROPHILUS

#### Genus HYDROCHARA Berthold 1872

Medium-sized beetles of the Hydrophilinae which have the prosternum carinate rather than grooved; ultimate segment of the maxillary palpi shorter than penultimate; clypeus truncate, not broadly emarginate, exposing the preclypeus as does the southern genus Neohydrochara; and metasternal spine short, not extending much past the metatrochanters.

Hydrochara obtusata (Say)

1823. Hydrophilus obtusatus Say, Jour. Acad. Nat. Sci. Phila.,  
3: 202.

DISCUSSION: In addition to the generic characters, the anterior portion of the mesosternal keel has a distinct tooth, and the abdominal sternites are entirely pubescent except for a small medial portion of the fifth which is glabrous. Size 14 to 18 mm. in length.

One Michigan specimen examined (Shiawassee Co., T5N, R1E, Sec. 21, 13 July 1966, J. P. Donahue) has an aberrant pronotal structure. The lateral one-third of each side is greatly inflated and bulbous, while the medial one-third appears normal. As a result there are two sub-median longitudinal folds or sulci dividing the pronotum into thirds, with the lateral portions considerably elevated.

HABITAT: Inhabits shallow, densely vegetated, lentic waters. Commonly collected at light.

RANGE: Quebec and New England to North Dakota, south to Texas and Florida. I have seen specimens from Illinois, Indiana, Louisiana, Mississippi, Missouri, Nebraska, Ohio, Rhode Island, South Carolina, Tennessee, Texas, and Quebec.

MICHIGAN DISTRIBUTION: (approximately 520 specimens examined)  
Common throughout the state and recorded from the following counties:  
Alger, Allegan, Arenac, Baraga, Barry, Bay, Berrien, Charlevoix, Cheboygan, Chippewa, Clare, Clinton, Eaton, Genesee, Grand Traverse, Huron, Ingham, Ionia, Jackson, Kalamazoo, Kalkaska, Kent, Keweenaw, Keweenaw - Isle Royale, Lenawee, Livingston, Luce, Mackinac, Manistee, Marquette, Menominee, Midland, Missaukee, Monroe, Montcalm, Newaygo,

Oakland, Ontonagon, Otsego, Ottawa, Roscommon, Schoolcraft, Shiawassee, Vanburen, Washtenaw, Wayne, and Wexford.

Genus DIBOLOCELUS Bedel 1892

This genus is much like Hydrophilus, in which it was once considered a subgenus. Elevation to generic rank was based primarily upon the sulcate prosternum being open in front, not closed and hood-like. General form is noticeably broader and more convex than Hydrophilus.

Dibolocelus ovatus (Gemminger & Harold)

1868. Hydrophilus ovatus Gemminger and Harold, Catalog. Coleopt.  
2: 476.

DISCUSSION: Only Hydrophilus triangularis (Say) could be confused with ovatus and these are easily separated by the generic characters. In addition, ovatus has the first two abdominal sternites entirely pubescent and the last three with a narrow medial portion glabrous, while triangularis has the 1st sternite entirely pubescent, the last four being broadly glabrous, with only the extreme lateral margins pubescent. Size is rather uniform, 31 to 32 mm. in the specimens examined.

HABITAT: All Michigan specimens examined were collected at light, thus no habitat information is available for this species. Young (1954) indicates that in Florida they are found in deep canals with considerable vegetation. Specimens collected at light are infrequent, but this is apparently due to the rareness of the species here, rather than its phototropic response.

RANGE: New York to Michigan, south to Florida and Texas. I have seen specimens from Florida, Indiana, Louisiana, South Carolina, and Texas.

MICHIGAN DISTRIBUTION: (21 specimens examined) Rare in the state. The most northern collection site at Ionia is probably approaching the northern limits of the species. It is known from the following localities in Michigan (Map 3): BERRIEN CO.: Sodus, 5 & 24 Aug 1959, VII-14-1960, W. T. VanVelzen (3). CALHOUN CO.: Baker Sanctuary, nr. Bellevue, VI-9-1963, J. J. Jackson (1). CLINTON CO.: Bath, V-26-1956 & 15 Aug 1956, H. Niemczyk (2). INGHAM CO.: East Lansing, 24 September 1960, G. C. Eickwort (1); 8 May 1963, M. Bonnhum (1). IONIA CO.: Ionia, 15 Aug 1965 (1). KALAMAZOO CO.: Gull Lake Bio. Sta., 3 Aug 1957 to VIII-23-1964, various coll. (11). OAKLAND CO.: Holly Rec. Area, nr. Holly, 7 Aug 1966, E. Metzler (2).

Genus HYDROPHILUS Geoffroy 1762

Larger beetles, over 25 mm. in length, with the prosternum sulcate and closed anteriorly, thus appearing hood-like. The ultimate segment of the maxillary palpi is shorter than the penultimate.

Hydrophilus triangularis (Say)

1823. Hydrophilus triangularis Say, Jour. Acad. Nat. Sci. Phila., 3: 201.

DISCUSSION: In addition to the generic characters, the first abdominal segment is entirely pubescent and the last four are broadly glabrous with only the extreme lateral margins pubescent. Elytral apices not toothed. Length 30 to 36 mm.

**HABITAT:** This species is most frequently encountered at light and I have no specimens with habitat data other than large numbers being washed ashore along the Lake Michigan shoreline in Illinois. Young (1954) gives the habitat of triangularis in Florida as weedy ponds and similar situations.

**RANGE:** New England to California, south to Florida and Texas. I have seen specimens from Arkansas, Illinois, Kansas, Nebraska, New York, Oklahoma, Oregon, Tennessee, and Texas, as well as British Columbia and Ontario.

**MICHIGAN DISTRIBUTION:** (Approximately 40 specimens examined) Found throughout the state and known from the following counties: Allegan, Berrien, Clinton, Delta, Ingham, Kalamazoo, Kent, Lenawee, Marquette, Menominee, Midland, and Ottawa. In addition, Andrews (1915) records triangularis from Charity Island, Arenac Co. and (1921) from Whitefish Point, Chippewa Co.

#### Genus TROPISTERNUS Solier 1834

Smaller members of the Hydrophilinae, usually black, but some have paler margins or streaks on the elytra. Prosternum sulcate with the anterior portion closed and hood-like or not. Metasternal spine long, extending well beyond the metatrochanters. Ultimate segment of the maxillary palpi as long or longer than the penultimate. Males with the inner meso- and meta-tarsal claws with a distinct tooth, the females untoothed.

Spangler (1960) figures genitalia of all the Great Lakes Region species. This unpublished thesis was relied upon heavily in the presentation of this genus.

## KEY TO THE SPECIES OF TROPISTERNUS\*

1. Prosternal groove open anteriorly, not closed and hood-like;  
     each elytron with six metallic green vittae (Subgenus  
     Tropisternus).....T. mexicanus striolatus  
     Prosternal groove closed anteriorly, hood-like; elytra with-  
     out metallic green vittae (Subgenus Pristoternus).....2
2. Head, pronotum, and elytra with a yellow lateral border.....  
     .....T. lateralis nimbatus  
     Head, pronotum, and elytra without a yellow border, entirely  
     black above.....3
3. Antero-lateral and medio-lateral series of pronotal  
     punctures forming an oblique row or series, not  
     coalesced.....4  
     Antero-lateral and medio-lateral series of punctures of  
     pronotum coalesced, reduced to a setigerous pit; body  
     strongly convex.....T. ellipticus
4. Last abdominal sternite without a free median spine; basal  
     pubescent area of hind femora greatly reduced, not ex-  
     tending to tip of trochanter (Fig. 7).....T. columbianus  
     Last abdominal sternite with a free median spine; basal  
     pubescent area of hind femora larger, extending at  
     least to tip of trochanter (Fig. 3, 4).....5
5. Pubescent portion of hind femora larger, extending distad  
     of trochanter a distance equal to one-half the length  
     of trochanter (Fig. 8).....6

---

\*Modified from Spangler (1960).

- Pubescent portion of hind femora smaller, extending to apex  
of trochanter (Fig. 9).....8
6. Elytra with dense, dual punctation, appearing rugose from  
base to apex.....T. mixtus  
Elytra without, or with dual punctation in apical half only,  
not appearing rugose.....7
7. Elytra uniformly, finely punctate; reddish-yellow markings  
of femora and tibiae distinct.....T. blatchleyi  
Elytra not uniformly, finely punctate, dual punctation in  
apical half; reddish-yellow markings of femora and  
tibiae obscured.....T. modestus
8. Mesosternal portion of keel very wide, depressed  
longitudinally.....T. natator  
Mesosternal portion of keel narrow, flat, not depressed  
longitudinally, almost impunctate.....T. glaber

Tropisternus mexicanus striolatus (LeConte)

1855. Hydrophilus striolatus LeConte, Proc. Acad. Nat. Sci.  
Phila., 7: 368.

DISCUSSION: This is the only species of the subgenus  
Tropisternus approaching the Great Lakes Region. It is distinguished  
by the prosternal protuberance being bifurcate and not closed ante-  
riorly. Each elytron with six metallic green vittae. Length 8.5 -  
11.5 mm.

HABITAT: Young (1954) states that in Florida T. mexicanus  
viridis Young and Spangler "occurs frequently in any stagnant lentic  
situation." and seems to prefer mats of algae and acid situations.  
Light trap specimens are numerous in out-of-state collections.



RANGE: New Jersey to Illinois and Missouri, south to eastern Texas and Georgia. I have seen specimens from Arkansas, Georgia, Illinois, Louisiana, Missouri, South Carolina, Tennessee, and Texas.

MICHIGAN DISTRIBUTION: Not yet collected in the state.

Tropisternus lateralis nimbatus (Say)

1823. Hydrophilus nimbatus Say, Jour. Acad. Nat. Sci. Phila.,  
3: 201.

DISCUSSION: Easily distinguished from all other Great Lakes Tropisternus by the yellow lateral margin of head, pronotum, and elytra. See Leech (1948) and Spangler (1960) for a discussion of the T. lateralis subspecies.

HABITAT: Considered to be a "pioneer species," it is characteristic of temporary water situations such as ponds, fountains, and borrow pits. I have also found it commonly in well vegetated lentic waters. Light trap specimens are abundant. Hatch (1924) collected this species at sugar in the evening.

RANGE: Quebec and New England to Alberta, south to Idaho, Wyoming, Colorado, Arizona, and Mexico, east to Florida.

MICHIGAN DISTRIBUTION: (281 specimens examined) Occurs abundantly throughout the state and my records include the following counties: Allegan, Berrien, Calhoun, Charlevoix, Chippewa, Clinton, Delta, Genesee, Houghton, Ingham, Ionia, Iosco, Jackson, Kalamazoo, Kent, Keweenaw, Keweenaw - Isle Royale, Lenawee, Macomb, Marquette, Mecosta, Menominee, Midland, Muskegon, Oakland, Otsego, Ottawa, and Wexford. Andrews (1915) reported it from Charity Island, Arenac County.

Tropisternus ellipticus (LeConte)

1855. Hydrophilus ellipticus LeConte, Proc. Acad. Nat. Sci.

Phila., 7: 368.

DISCUSSION: An extremely convex species with the antero-lateral and medio-lateral series of pronotal punctures coalesced and reduced to a setigerous pit. Elytra finely, densely punctate. Sternal keel with mesosternal portion narrow, convex, and smooth except at apex. Pubescent area of hind femora reduced, extending to apex of trochanter. Length 8.0 to 9.0 mm.

HABITAT: I have no habitat information for this species. Light trap specimens from collections in western states are abundant.

RANGE: Washington to South Dakota and Iowa, to Missouri, Texas, Mexico, and Central America. I have seen specimens from Arizona, California, Kansas, Oregon, South Dakota, Texas, and Mexico.

MICHIGAN DISTRIBUTION: Not recorded for the state.

Tropisternus columbianus Brown

1931. Tropisternus columbianus Brown, Can. Ent. 63(5): 117.

DISCUSSION: The only species of Great Lakes Tropisternus without a free medial spine on the last abdominal sternite. Basal pubescent area of hind femora greatly reduced, not extending to tip of trochanter (Fig. 7). Elytra finely and densely punctate. Mesosternal portion of sternal keel narrow, with a few coarse punctures in the male, nearly smooth in females except at apex. Length 8.5 - 10.0 mm.

HABITAT: Michigan records seem definitely to be associated with temporary water situations or newly created waters. No light trap specimens were seen.

RANGE: Southwestern British Columbia to Michigan and Ohio, southwest to Iowa, Kansas, and Arizona. I have seen additional specimens from California and Oregon.

MICHIGAN DISTRIBUTION: (6 specimens examined) Apparently it reaches its northeastern maxima of distribution in Michigan and is extremely uncommon in the state, although there does appear to be a permanent population in the Ingham County area. Found from the following localities: INGHAM CO.: East Lansing (MSU Campus), 4 and 21 October, 1962, R. B. Willson (2); 14 Oct 1966, R. B. Willson (1); Mason, Willow Creek, 24 April 1966, R. B. Willson (3). Spangler (per. comm.) has seen specimens of T. columbianus from Petosky, Emmet County, Michigan.

Tropisternus mixtus (LeConte)

1855. Hydrophilus mixtus LeConte, Proc. Acad. Nat. Sci. Phila., 7: 368.

DISCUSSION: Basal pubescent area of hind femora large, extending distad of trochanter a distance equal to one-half the length of the trochanter (Fig. 8). Elytra with a dual punctation from slightly distad of base to apex, resulting in a coarse or rugose surface. Mesosternal portion of sternal keel broad, flat, and with numerous setiferous punctures; female sparsely and finely punctate except at apex. Length 7.8 - 10.2 mm.

HABITAT: Very common in vegetated lentic waters. Infrequently collected at light.

RANGE: Maine to Minnesota and South Dakota, south to Nebraska, east to New Jersey. I have seen specimens from Illinois, Massachusetts, Minnesota, New Hampshire, New York, and Ohio.

MICHIGAN DISTRIBUTION: (over 450 specimens examined) Commonly found throughout the state and is known from the following Michigan counties: Alger, Allegan, Arenac, Baraga, Barry, Bay, Berrien, Calhoun, Cheboygan, Chippewa, Clare, Clinton, Delta, Dickinson, Eaton, Genesee, Gladwin, Gogebic, Gratiot, Houghton, Ingham, Ionia, Iron, Isabella, Kalamazoo, Kent, Keweenaw, Keweenaw - Isle Royale, Livingston, Luce, Mackinac, Macomb, Marquette, Mecosta, Menominee, Midland, Missaukee, Montcalm, Oakland, Ontonagon, Otsego, Ottawa, Roscommon, Saginaw, Schoolcraft, Shiawassee, St. Joseph, Van Buren, Washtenaw, Wayne, and Wexford. Hatch (1924) recorded T. mixtus from Beaver and Hog Islands, Charlevoix County.

Tropisternus blatchleyi d'Orchymont

1922. Tropisternus blatchleyi d'Orchymont, Ann. Soc. Ent.

Belgique, 62: 15.

DISCUSSION: Basal pubescent area of hind femora large, extending distad of apex of trochanter a distance equal to one-half the length of trochanter. Elytra uniformly finely punctate. Sternal keel with mesosternal portion broader, with numerous coarse setiferous punctures, female more finely, sparsely punctate. Length 7 - 9 mm.

HABITAT: I have no habitat information for this species. Light trap specimens seem to be frequent in collections from the southern states.

RANGE: New Jersey to Illinois and Missouri, south to Texas and Florida. I have seen specimens from Alabama, Arkansas, Florida, Illinois, Kansas, Louisiana, Tennessee and Texas.

MICHIGAN DISTRIBUTION: Not yet recorded for the state, but probably occurs in the southern tier of counties. Spangler (1960)

records it from LaPorte, Indiana which is just 11 miles south of Berrien County, Michigan.

Tropisternus modestus d'Orchymont

1938. Tropisternus modestus d'Orchymont, Bull. et Ann. Soc. Ent.

Belgique, 78: 437.

DISCUSSION: Basal pubescent area of hind femora large, extending distad of apex of trochanter a distance equal to one-half the length of trochanter. Elytra with basal half finely punctate, apical half more coarsely, densely punctate. Length 8.5 to 9.2.

HABITAT: I have no habitat information for this species.

RANGE: Massachusetts to Michigan and Iowa, south to Arkansas and Virginia. I have seen a single specimen from Massachusetts.

MICHIGAN DISTRIBUTION: (4 specimens examined) Apparently very rare in the state and is known only from the following localities:  
 BERRIEN CO.: Stevensville, 19 June 1963, R. B. Willson (1). CALHOUN CO.: 4 mi. S. Olivet, Indian Creek, 5 Oct 1963, R. B. Willson (1).  
 CHEBOYGAN CO.: Douglas Lake, 26 July 1933, W. C. Frohne (1). NEWAYGO CO.: N. Shore Nichols Lake, 19-VIII-1926, Langlois and Moody (1).  
 Spangler (1960) recorded modestus from ALCONA CO.: Harrisville State Park.

Tropisternus natator d'Orchymont

1938. Tropisternus natator d'Orchymont, Bull. et Ann. Soc. Ent.

Belgique, 78: 436.

DISCUSSION: Basal pubescent area of hind femora reduced, extending to apex of trochanter (Fig. 9). Elytra coarsely densely punctate. Mesosternal portion of sternal keel wide, depressed

longitudinally, and with coarse, dense, setigerous punctures. Length 9.3 - 11.8 mm.

**HABITAT:** Commonly found in most vegetated lentic waters. Attraction to light is apparently infrequent to rare.

**RANGE:** Maine to Minnesota and South Dakota, south to Texas and east to Florida. I have seen additional specimens from Indiana, Massachusetts, Mississippi, Missouri, New Jersey, Ohio, Pennsylvania, and Wisconsin.

**MICHIGAN DISTRIBUTION:** (over 200 specimens examined) Commonly found throughout the Lower Peninsula. The single collection site in the Upper Peninsula at Cedarville, Mackinac County is apparently approaching the northern distribution limit (Map 4). Tropisternus natator is known from the following Michigan counties: Alcona, Bay, Berrien, Calhoun, Cheboygan, Clare, Clinton, Eaton, Emmet, Genesee, Ingham, Ionia, Jackson, Kalamazoo, Kent, Livingston, Mackinac, Midland, Missaukee, Montcalm, Muskegon, Newaygo, Oakland, Ottawa, Shiawassee, Van Buren, and Washtenaw.

Tropisternus glaber (Herbst)

1797. Hydrophilus glaber Herbst, Natursystem Insecten, 7: 298.

**DISCUSSION:** Basal pubescent area of hind femora reduced, extending to apex of trochanter. Elytra finely, densely punctate with the apical half more coarsely so. Sternal keel with mesosternal portion narrow and with a few fine punctures. Length 9 - 11 mm.

**HABITAT:** Common in vegetated margins of slow rivers, ponds, and lakes. Attraction to light is infrequent to rare.

**RANGE:** Maine to Minnesota and South Dakota, Nebraska, east to

New Jersey. I have seen specimens from Illinois, New Hampshire, Wisconsin, and Quebec.

MICHIGAN DISTRIBUTION: (approximately 110 specimens examined)  
Found commonly throughout the state and is recorded from the following counties: Alger, Allegan, Baraga, Barry, Bay, Berrien, Calhoun, Chippewa, Clare, Clinton, Crawford, Eaton, Houghton, Isabella, Kalamazoo, Kent, Livingston, Menominee, Midland, Oakland, Schoolcraft, St. Joseph, Van Buren, and Wexford. Hatch (1924) recorded glaber from High Island, Charlevoix County and Andrews (1915) from Charity Island, Arenac County, but both records may well pertain to T. natator which was described by d'Orchymont at a later date.

#### Genus CHAETARTHRIA Stephens 1833

These are tiny beetles, 1.2 to 2.3 mm. in length, strongly convex, and yellowish to black in color. The most distinguishing character of the genus is a fringe of long golden hairs arising from the anterior margin of the first abdominal sternite and covering it and the second. The members of this genus inhabit the sand margins of streams and rivers.

#### Chaetarthria pallida LeConte ?

1861. Cyllidium pallida LeConte, Proc. Acad. Nat. Sci. Phila.,  
13: 342.

DISCUSSION: The generic characters should suffice for determination of this species. Length 1.5 to 2.0 mm. Dr. David C. Miller is currently examining the North American Chaetarthria, and the result may well be that additional species occur in Michigan.

**HABITAT:** Occurs on sand and mud margins of streams and rivers. Species of the genus are apparently positively phototropic and fly to light, but I have seen no light-trapped specimens.

**RANGE:** California to Michigan and south to Florida.

**MICHIGAN DISTRIBUTION:** Michigan specimens have been examined, but are currently in the hands of Dr. Miller and the data are not available at this time.

#### Genus *BEROSUS* Leach 1817

The genus Berosus is relatively common throughout the state, its species associated with shallow, well vegetated, lentic waters. Members of the genus are commonly collected at light. The head is decidedly deflexed and the eyes are protuberant. The antennae are seven-segmented. The meso- and metatibiae and tarsi are fringed with long swimming hairs. The scutellum is an elongate triangle. The fifth abdominal sternite (except in pugnax LeConte among the Great Lakes species) is emarginate along the hind margin and bears one or two small teeth.

Specific discussions of Berosus are not possible at the moment, since all the Michigan material is currently on loan to Eileen VanTassell for her North American revisionary study.

#### Genus *LACCOBIUS* Erichson 1837

This genus is comprised of small, broadly elliptical beetles, usually associated with the sandy margins of streams, lakes, and ponds. Striae are lacking, including the sutural, with the punctation ranging from random to definite longitudinal rows. The hind tibiae are distinctly arcuate. Metatrochanters are large, about one-third



as long as the femora, and their apices are distinct from the femora. The hind margin of the fifth sternite is truncate, exposing the sixth sternite.

In the past this genus has been included in the Hydrobiinae, but Eileen VanTassell (per. comm.) has indicated that she will place it with the Berosinae in her revisionary study of the subfamily. Balfour-Browne (1959) also discussed the close relationship of Laccobius to the Berosinae, rather than the Hydrobiinae.

Until d'Orchymont (1942) revised the genus, a single species, Laccobius agilis (Randall) was known from east of the Mississippi. His revision added another, Laccobius minutoides d'Orchymont, for the northeastern United States. The present work includes descriptions of two additional species for the Great Lakes Region, Laccobius spangleri sp. nov. and Laccobius arenarius sp. nov. Mr. Hugh B. Leech and Dr. Paul J. Spangler are working on a revision of the genus and will quite likely add additional species to the known fauna of the north central United States.

Except for a few fairly distinct species, accurate determinations can be made only by genitalic examination of the males, which are easily recognized by their protarsal enlargement.

The abbreviations in parentheses are used to indicate the site of deposition of type material: Michigan State University (MSU); University of Michigan (UM); United States National Museum (USNM); Robert Gordon (RG).

## KEY TO THE SPECIES OF LACCOBIUS

1. Pronotum with pale margins narrow, incising into the dark central area at the posterior and medial edges, but never anteriorly; pale clypeal maculation anterior to each eye almost always absent, if present, obscure and indistinct; overall dorsal pigmentation darker; genitalia as in Figure 1.....L. agilis
- Pronotum with pale margin wide, incising deeply into the reduced dark central area at the posterior and anterior edges, rarely incising along the medial edge, the darker central area extending as a pair of broad antero-laterally directed wings; a conspicuous pale clypeal maculation anterior to each eye always present; overall dorsal pigmentation lighter.....2
2. Elytral punctation strongly impressed and in very regular longitudinal rows, even in the scutellar area; form more broadly elliptical; aedeagus with parameres elongate, almost parallel, each somewhat twisted before the tip (Fig. 2).....L. minutoides
- Elytral punctation less strongly impressed and not arranged in regular longitudinal rows, definitely not so in the scutellar area; form narrower.....3
3. Aedeagus with parameres elongate, each with a ventral membranous shelf (Fig. 3, 4); parameres pigmented light brown with white tips; pale margin of pronotum usually incising less deeply along the anterior edge of darker central area; elytral pigmentation somewhat darker.....L. spangleri new species

Aedeagus with parameres short and stout, appearing truncate in dorsal view (Figs. 5, 6); no ventral membraneous shelf on the parameres which are pigmented dark brown to black with light tips; pale lateral margin of pronotum incising deeper along the anterior margin; elytral pigmentation lighter.....L. arenarius new species

Laccobius agilis (Randall)

1838. Hydrophilus agilis Randall, Boston Jour. Nat. Hist., 2: 19.

DISCUSSION: Length 3.0 to 3.3 mm.; the characters presented in the key are diagnostic; Genitalia as in Figure 1.

There is considerable variation in L. agilis and there may well be more than one form represented in Michigan. Most specimens appear to be typical agilis, but others have minor genitalic variations and appear to be consistently smaller in size. Several specimens from Illinois (University of Michigan Collection) have a large, definite, and distinct pale clypeal area anterior to the eye, while most specimens examined lack this pale area, only a very few having an obscure and indistinct trace of it.

HABITAT: Found in sandy margins of most bodies of water. A single female specimen is known to have been collected at light.

RANGE: New England and southern Canada to British Columbia, south at least to Colorado and Kentucky. I have seen specimens from Colorado, Idaho, Illinois, Kentucky, North Dakota, Oregon, and Ontario.

MICHIGAN DISTRIBUTION: (226 specimens examined) Commonly found throughout the state and known from the following Michigan counties: Alcona, Baraga, Berrien, Charlevoix, Cheboygan, Chippewa,

Clinton, Delta, Dickinson, Ingham, Kalamazoo, Livingston, Luce, Mackinac, Marquette, Menominee, Ontonagon, Ottawa, and Schoolcraft.

Laccobius minutoides d'Orchymont

1942. Laccobius minutoides d'Orchymont, Bull. Mus. Roy. Hist. Nat. Belg., 18(30): 1-18.

DISCUSSION: Well characterized by the strongly impressed elytral punctation in regular longitudinal rows, the rows persisting in the scutellar area; pale lateral margins of the pronotum wide and deeply incised into the dark central area at the posterior and anterior edges; the conspicuous pale clypeal area anterior to each eye always present; Aedeagus with parameres elongate, almost parallel, each somewhat twisted before the apex (Fig. 2).

HABITAT: Usually found in sandy margins of streams and rivers; more rarely along lentic waters. No light trap specimens have been seen.

RANGE: Northeastern United States. I have seen specimens from Pennsylvania and Wisconsin.

MICHIGAN DISTRIBUTION: (21 specimens examined) Occurs sparingly in the state and apparently nearing or reaching its northern limits of distribution in the Upper Peninsula of Michigan. Specimens are known from the following localities: BERRIEN CO.: Napier, Wolf Creek, 17 Sept 1964, R. B. Willson (1). CALHOUN CO.: 4 mi. s. Olivet, Indian Creek, 5 Oct 1963, R. W. Matthews & R. B. Willson (3). CLINTON CO.: Bath, 22-VII-1965, T. Hlavac (5). DELTA CO.: 5 mi. w. Escanaba, Ford River, 18 June 1964, R. B. Willson (1). GENESEE CO.: 11 & 25 Aug 1963, R. B. Willson (7). INGHAM CO.: East Lansing, 2 Oct 1964, R. B. Willson (2). LIVINGSTON CO.: Hell Creek at Toma

Rd., VI-30-1951, F. N. Young (1). SCHOOLCRAFT CO.: 8 mi. w. Seney, Driggs River, 27 July 1964, R. B. Willson (1). d'Orchymont (1942) listed Oakland and Washtenaw Counties in his distribution of minutoides.

Laccobius spangleri Willson, new species

DESCRIPTION:

Size: Length 2.7 mm., greatest width 1.6 mm.

Head: Irridescent dark brown with a pale yellow triangular maculation extending between the anterior margin of the eye and clypeus; lightly punctate and distinctly alutaceous between the punctures.

Pronotum: Irridescent dark brown, almost black; lateral margins pale yellow, extending inwardly at least one fourth on the posterior margin, less so on anterior margin; sparsely punctate, less so along the lateral margins; alutaceous between punctures, more distinct laterally; posterior margin with a distinct basal marginal line.

Scutellum: Same color as head and pronotum; closely punctate and alutaceous between the punctures.

Elytra: Yellow-brown, lighter along lateral margins; a suffused dark brown maculation midway to apex and bordering the suture, another macula lies anteriorly and laterally to the first; lightly punctate, punctures brownish-black except those along lateral margins, around scutellum, and a circular area on each elytron adjacent to the suture and just anterior to the tip; punctures scattered randomly, with a tendency to form longitudinal rows.

Venter: Black; procoxae dark reddish-brown, meso-metacoxae black; trochanters and basal two-thirds of femora brownish-yellow; apical third of femora, tibiae, and tarsi pale yellow; palpi pale yellow, apex of ultimate segment of maxillary palpi slightly darker; antennae pale yellow, the club beyond the cupule slightly darker.

Aedeagus: Median lobe filiform, expanded slightly at apex; parameres elongate, brown, their tips pale, almost white, bending downward; flared tips of parameres with inner margins straight, parallel, thence bending laterally and gradually tapering to base; a small posteriorly directed flange at the junction of the bend and flared portion of paramere; parameres in lateral view strongly convex ventrally at a point anterior to the middle, strongly concave at the same point dorsally, the tips curving ventro-mesally (Fig. 4); ventrally, each paramere with a membraneous sheath, starting at the bend of the tips, extending medially to a point where they overlap, then gradually tapering to the base (Fig. 3).

VARIATION: Specimens vary considerably in coloration. The head, scutellum, and pronotum may be black, black with greenish highlights along the margins, dark green, brown, or brown with very strong reddish highlights. The ground color of the pronotum infrequently extends almost to the lateral margin. In many specimens there is a trace of an inward extension of the pale yellow lateral margin into the medial portion of the pronotum. The anterior pale yellow extension may be complete, but is sometimes indistinct or interrupted at its extremity and terminating as an isolated yellow spot. Elytral coloration varies from pale yellow to dark yellow-brown. Elytral

maculae vary in number and size, the sutural and anterior maculae always present. Length 2.3 to 3.2 mm.

Holotype: Male, MICHIGAN, Germfask, Schoolcraft Co., Seney National Wildlife Refuge, F-Pool, 27 July 1964, R. B. Willson.

Deposited in Michigan State University collection.

Allotype: Not designated.

Paratypes: All male.

IOWA. Ia., 3 (MSU).

KANSAS. SEDGEWICK CO.: 8-IV-1911, 2 (UM).

MICHIGAN. ALGER CO.: Chatham, Slapneck Creek, 24 July 1964, R. B. Willson, 2 (MSU); 3 mi n Chatham, 21 July 1964, R. B. Willson, 1 (MSU); 6 mi n Chatham, 21 July 1964, R. B. Willson, 2 (MSU); Eben Junction, Slapneck Creek, 21 July 1964, R. B. Willson, 1 (MSU); 2 mi n Sundell, Laughing Whitefish Falls, 21 July 1964, R. B. Willson, 1 (MSU). BARAGA CO.: 5 mi s L'Anse, 12 July 1964, R. B. Willson, 3 (MSU). CALHOUN CO.: 4 mi s Olivet, Indian Creek, 5 October 1963, R. B. Willson, 1 (MSU). CHARLEVOIX CO.: Beaver Island, 23-VIII-1922, M. H. Hatch, 1 (UM); Beaver Island, 7-IX-1922, M. H. Hatch, 1 (UM). CHIPPEWA CO.: McCarron, Charlotte River, 2 Aug 1964, R. B. Willson, 2 (MSU); Trout Lake, 5 Sept 1963, R. B. Willson, 1 (MSU). EATON CO.: Grand Ledge, 23-7, Hubbard & Schwartz, 1 (USNM). INGHAM CO.: E. Lansing, Red Cedar River, 23 Aug 1963, R. B. Willson, 1 (MSU). KALAMAZOO CO.: Gull Lake Bio. Sta., 6 July 1965, B. & T. Hlavac, 1 (MSU). KEWEENAW CO.: Allouez, Hill Creek, 7 July 1964, R. B. Willson, 6 (MSU); Mohawk, Gratiot River, 7 July 1964, R. B. Willson, 5 (MSU). LUCE CO.: 11 mi. sw Newberry, Helmer Creek, 1 Aug 1964, R. B. Willson, 2 (MSU). MACKINAC CO.: Cedarville, Mud Lake, 5 Aug 1964, R. B. Willson,

2 (MSU); Cedarville, (Lake Huron), 5 Aug 1964, R. B. Willson, 1 (MSU).  
 MARQUETTE CO.: Marquette, 23-7, Hubbard & Schwartz, 1 (USNM);  
 Marquette, 8 (USNM). OTTAWA CO.: Allendale, Worley Drain, 17 July  
 1963, R. B. Willson, 4 (MSU). SCHOOLCRAFT CO.: same data as holotype,  
 1 (MSU); Germfask, Seney Refuge, 25 July 1964, R. B. Willson, 2 (MSU);  
 Germfask, Seney Refuge, 26 July 1964, R. B. Willson, 1 (MSU).

NORTH DAKOTA. PEMBINA CO.: 25-VIII-1962, Robert Gordon and  
 R. L. Post, 4 (RG). WILLIAMS CO.: Little Muddy River, 23-V-1964,  
 Robert Gordon, 1 (RG).

W.T. (no other data), 3 (UMinn).

HABITAT: Field notes indicate a preference for sand, sand-silt, or sand-gravel margins of lotic waters; more rarely found in lentic waters. Most of the observed mixed populations of spangleri and arenarius occurred in the lentic waters. Found rarely with minutoides, another stream species, and commonly with agilis.

DIAGNOSIS: Externally, spangleri is readily separated from agilis by the pale yellow maculation anterior to each eye, and the extensions of the pale yellow lateral margins of the pronotum. It is distinguished from minutoides by the lack of strongly impressed and very regular longitudinal rows of elytral punctures. Spangleri differs from arenarius in the following characters: pale yellow maculation anterior to each eye smaller; elytral punctation less random, a stronger tendency to form irregular rows of punctures; elytral pigmentation darker. Genitalic examinations of males should be made for all determinations.



The aedeagus is somewhat similar to the western species, L. carri d'Orchymont and L. nevadensis Miller, in its length and the membraneous ventral shelf of the parameres extending medially. The ventral shelf of carri curves dorsally to enclose the median lobe as an inner sheath. In nevadensis, the inner margins of the ventral shelf are almost straight, they neither overlap one another nor enclose the median lobe. Spangleri differs from the above for the ventral shelf of each paramere is sharply expanded medially and overlap, but do not extend dorsally to enclose the median lobe.

Miller (per. com.), upon examination of males of spangleri, wrote "They seem closest, both in genitalia and externally, to my L. nevadensis . . ." "They differ however in having the genitalia lighter in color and somewhat less stout, and in the greater extent of the ventral shelf on the genitalia. Also your species has the lateral dark 'wings' of the pronotum more variable and less clearly marked."

Comparison of a topotypical female nevadensis, determined by Miller, to spangleri confirms Miller's remarks on the pronotal wings being more variable and less clearly marked in spangleri. The elytral punctation of spangleri shows less of a tendency to form irregular longitudinal rows than does the nevadensis topotypical female.

It gives me great pleasure to name this species for Dr. Paul J. Spangler, U. S. National Museum. Dr. Spangler has provided considerable aid and advice to me in my studies of the Hydrophilidae.

Laccobius arenarius Willson, new species

DESCRIPTION:

Size: Length 2.9 mm., greatest width 1.8 mm.

Head: Irridescent brown with a pale yellow triangular maculation extending between the anterior margin of the eye and clypeus; lightly punctate and distinctly alutaceous between the punctures.

Pronotum: Medial third with an irridescent brown maculation with broad antero-lateral extensions or wings, diminishing in darkness laterally, which extend halfway to the margins; lateral margins pale yellow, extending inwardly at least one-third on posterior and anterior margins; lightly punctate, more closely along lateral margins, punctures the same size as those of the head; alutaceous between the punctures, more distinctly so along the lateral and anterior margins; posterior margin with a distinct basal marginal line.

Scutellum: Same color as head and pronotal maculation; sparsely punctate and alutaceous between the punctures.

Elytra: Pale yellow, except for a suffused brown maculation midway to apex and bordering the suture, a smaller macula lies anteriorly and laterally to the first, with two additional laterad of the larger and nearer the margin; lightly punctate, punctures dark brown except those along the lateral margins, around scutellum, and a circular area on each elytron adjacent to the suture and just anterior to the tip; punctures scattered randomly, with but little tendency to form longitudinal rows.

Venter: Black; legs (excluding coxae, protrochanters, and basal half of profemora) pale yellow-brown; procoxae reddish-black, meso- and metacoxae black; protrochanters and basal half of profemora dark yellow-brown; palpi and antennae pale yellow-brown, antennal club darker yellow-brown.

Aedeagus: Median lobe filiform; parameres short, stout, chestnut brown in color with the tips pale; truncate in dorsal view, each paramere with a small mucronate tooth on the inner angle (Fig. 5); flared tip of paramere with a dorso-mesally directed flange; outer margin of parameres almost straight and parallel; inner margins of flared tips straight and parallel, thence bending sharply laterally, gradually tapering to the base of the parameres, producing an oblan- ceolate sinous when parameres meet; parameres in lateral view strongly convex ventrally, resembling a deer hoof in general outline (Fig. 6).

VARIATIONS: Specimens vary considerably in color. The iridescent brown head, pronotal, and scutellar areas vary with strong greenish or reddish highlights. The darker pronotal maculation may be sharply defined or somewhat suffused along its borders. The pronotal wings extending from the central macula vary in anterior-posterior distance, but not in the distance they extend to the lateral margin. The elytral coloration varies from pale yellow-brown to dark yellow-brown, which is chiefly due to the size and number of maculae. Darker specimens are the result of an increased number of maculae which tend to coalesce. The large brown sutural macula and the anterior macula are always present. Length 2.5 to 3.1 mm.

Holotype: Male, MICHIGAN, Germfask, Schoolcraft Co., Seney National Wildlife Refuge, F-Pool, 27 July 1964, R. B. Willson. Deposited in Michigan State University collection.

Allotype: Not designated.

Paratypes: All male. MICHIGAN. ALCONA CO.: Barton City, Jewel Lake, 22 June 1963, R. B. Willson, 1 (MSU). CHARLEVOIX CO.: Beaver Island, 23-VIII-1922, M. H. Hatch, 3 (UM); Beaver Island,

7-IX-1922, M. H. Hatch, 3 (UM); Beaver Island, 25-VIII-1922, M. H. Hatch, 11 (UM); Garden Island, 18 July 1920, S. Moore, 1 (UM).  
 CHEBOYGAN CO.: 19 July 1932, D. Douglass, 1 (UM); Douglas Lake, 7/14/1931, 1 (UM); Black Lake, VII-17-1952, P. J. Spangler, 1 (USNM).  
 CHIPPEWA CO.: McCarron, Charlotte River, 2 Aug 1964, R. B. Willson, 3 (MSU). LUCE CO.: 11 mi sw Newberry, Helmer Creek, 1 Aug 1964, R. B. Willson, 1 (MSU). MACKINAC CO.: Cedarville, (Lake Huron), 5 Aug 1964, R. B. Willson, 7 (MSU); St. Ignace, 6 July 1924, A. W. Andrews, 2 (UM). SCHOOLCRAFT CO.: same data as holotype, 12 (MSU); same locality as holotype, 29 July 1964, R. B. Willson, 2 (MSU); Germfask, Seney Refuge, 26 July 1964, R. B. Willson, 1 (MSU).  
 OAKLAND CO.: VI-30-1925, A. W. Andrews, 1 (UM).

NORTH DAKOTA. TOWNER CO.: 21-V-1964, Robert Gordon, 3 (RG).

CANADA. ALBERTA: Medicine Hat, 24-V-1923, 1 (UM).

HABITAT: The majority of collections are from margins of lentic waters in sand or sand-silt and sand-gravel mixtures.

DIAGNOSIS: Externally, arenarius is readily separated from agilis by the pale yellow maculation anterior to each eye and the inward extensions of the pale yellow lateral margins of the pronotum along the posterior and anterior margins. It is distinguished from minutoides by the lack of strongly impressed and very regular longitudinal rows of elytral punctures. Arenarius differs from spangleri in the following characters: pale yellow maculation anterior to each eye slightly larger; elytral punctation more random; elytral pigmentation lighter. Genitalic examination is necessary for separation of the above species, for on an individual basis the above characters will not always hold up. With genitalic examination of males,

arenarius cannot be confused with any of the known North American species of Laccobius.

#### KEY TO THE GENERA OF THE HYDROBIINAE

1. Maxillary palpi long and slender, much longer than antennae;  
     ultimate segment of maxillary palpus shorter than  
     penultimate.....2  
     Maxillary palpi short and stout, little longer or shorter  
     than antennae; ultimate segment of maxillary palpus  
     longer than penultimate.....5
2. Middle and hind tarsi four-segmented.....3  
     Middle and hind tarsi five-segmented.....4
3. Elytra striate; mesosternum with a compressed conical pro-  
     cess; male tarsal claws toothed.....HELOCOMBUS  
     Elytra nonstriate except for sutural (for Great Lakes  
     Region only, some western species are striate); meso-  
     sternum with a transverse ridge or carina; tarsal claws  
     simple, untoothed in both sexes.....CYMBIODYTA
4. Anterior margin of pseudobasalsegment of maxillary palpi  
     concave; mesosternum at most only feebly protuberant,  
     without a median longitudinal carina.....HELOCHARES  
     Anterior margin of the pseudobasal segment of maxillary  
     palpi convex; mesosternum with a median longitudinal  
     carina.....ENOCHRUS
5. Elytra striate or with rows of punctures; larger species,  
     over 4 mm. in length.....6

- Elytra confusedly punctate, nonstriate except for sutural;  
 small species, less than 3.8 mm. in length.....7
6. Swimming hairs fringing inner margin of middle and hind  
 tarsal segments 2-5; lateral margins of elytra entire,  
 head broader than long; preclypeus not visible.....HYDROBIUS
- No swimming hairs on segments 2-5 of middle and hind tarsi;  
 lateral margins of elytra weakly serrate, at least  
 basally; head longer than broad, a preclypeus visible....  
 .....SPERCHOPSIS
7. Prosternum carinate; mesosternum with a transverse ridge and  
 a longitudinal carina immediately posterior to it; hind  
 femora sparsely, coarsely punctate.....PARACYMUS
- Prosternum simple, not carinate; mesosternum with a trans-  
 verse ridge, a dentiform protuberance, a small tubercle,  
 or smooth, but with no longitudinal carina.....8
8. Mesosternum with a transverse ridge or simple.....CRENITIS
- Mesosternum with a dentiform protuberance or a minute  
 tubercle.....ANACAENA

Genus HELOCOMBUS Horn 1890

Maxillary palpi long and slender with the ultimate segment  
 shorter than the penultimate. Anterior margin of the pseudobasal seg-  
 ment concave. Mesosternum with a compressed conical process. Tarsal  
 claws distinctly toothed in the males and widely dilated in the females.  
 Elytra deeply striate, their intervals without a series of coarser  
 punctures. Tarsal formula 5-4-4. Helocombus has a single North  
 American species, bifidus (Leconte).

Helocombus bifidus (LeConte)

1855. Philydrus bifidus LeConte, Proc. Acad. Nat. Sci. Phila.,  
7: 371.

DISCUSSION: The generic characters will suffice to separate this species from other Great Lakes hydrophilids. There is a wide variation in color of bifidus, ranging from black to a pale yellow brown. I have seen this entire color range from a single collection site several times.

HABITAT: Usually associated with shallow, densely vegetated, lentic waters with a soft silty or marl bottom. I have taken this species several times in shallow grassy sites such as vernal ponds and recently-submersed shorelines. These temporary water habitats contrast sharply with the permanent water conditions mentioned above. This species is infrequently found and when located, is never abundant within any given situation. Large numbers are collected at light sources, apparently due to their excellent flight abilities and a strong phototropism which will draw the beetles long distances.

RANGE: Labrador to Florida and west at least to Michigan. I have seen specimens from Arkansas, Indiana, Massachusetts, Rhode Island, Ontario, and Quebec.

MICHIGAN DISTRIBUTION: (326 specimens examined) Found throughout the state, but with a much lower frequency in the Upper Peninsula, which probably starts to approach its northern limits (Map 5). It is known from the following Michigan counties: Allegan, Alpena, Arenac, Benzie, Berrien, Charlevoix, Chippewa, Clinton, Crawford, Gladwin, Gratiot, Huron, Ingham, Ionia, Jackson, Kalamazoo, Kalkaska, Kent, Lenawee, Livingston, Mackinac, Macomb, Manistee, Marquette, Menominee,

Midland, Missaukee, Montcalm, Newaygo, Oakland, Ottawa, Sanilac, Schoolcraft, Shiawassee, Tuscola, VanBuren, Washtenaw, and Wayne.

Genus CYMBIODYTA Bedel 1881

The genus Cymbiodyta superficially resembles Enochrus in size, color, and general form, but is distinguished from it by the following characters: meso- and metatarsi four-segmented; mesosternal protuberance in the form of a transverse ridge; maxillary palpi long and slender, the ultimate segment shorter than the penultimate; anterior margin of the pseudobasal segment of maxillary palpi nearly always concave; elytra nonstriate, except for sutural, and are confusedly punctate; tarsal claws in both sexes are simple, untoothed.

Three species, Cymbiodyta vindicata, toddi, and fimbriata are indistinguishable externally and their determinations must be based upon male genitalia examination. The females can only be identified by association with the males.

KEY TO THE SPECIES OF CYMBIODYTA

1. Mesosternal ridge with a large medial tooth.....C. acuminata  
     Mesosternal ridge without a large medial tooth.....2
2. Head black, with a pale clypeal maculation anterior to each  
     eye.....C. blanchardi  
     Head unicolorous black.....3
3. Smaller, 3 to 4 mm. in length; elytra lacking a coarser  
     series of punctures; mesosternal ridge with an extremely  
     small median tooth.....C. minima



- Larger, over 4 mm. in length; elytra with a coarser series of punctures; mesosternal ridge without a small median tooth.....4
4. Median lobe of genitalia truncate at apex (Fig. 12)...C. vindicata  
Median lobe of genitalia angulate at apex (Figs. 10, 11).....5
5. Apices of parameres narrower and slightly divergent  
(Fig. 11).....C. toddi  
Apices of parameres broader and convergent (Fig. 10)..C. fimbriata

Cymbiodyta acuminata Fall

1924. Cymbiodyta acuminata Fall, Jour. N. Y. Ent. Soc., 32: 87.

DISCUSSION: Form oblong oval; head unicolorous black; pronotum and elytra dark reddish brown to black with lateral margins paler; mesosternal ridge bearing a large medial tooth which easily separates this species from all other Great Lakes Cymbiodyta. Length 3.8 to 4.5 mm.

HABITAT: I have collected this species in two distinct habitats, culvert pools and iron seeps. Apparently it is a cold water species and should be found in springs and smaller creeks and streams. No light attraction records.

RANGE: British Columbia and Washington east through Manitoba, Alberta, North Dakota, at least to Michigan.

MICHIGAN DISTRIBUTION: (6 specimens examined) Apparently a northern species and found only in the Upper Peninsula of Michigan (Map 6) from the following localities: BARAGA CO.: Bovin, 12 July 1964, R. B. Willson (2-culvert pool). KEWEENAW CO.: Isle Royale, McCargo Cove, 2 July 1964, R. B. Willson (1-iron seep). LUCE CO.: Dollarville, 31 July 1964, R. B. Willson (1-culvert pool). MENOMINEE

CO.: 5 mi. E. Stephenson, 16 June, 1964, R. B. Willson (1-iron seep).

SCHOOLCRAFT CO.: Germfask, 26 July 1964, R. B. Willson (1-iron seep).

Cymbiodyta blanchardi Horn

1890. Cymbiodyta blanchardi Horn, Trans. Amer. Ent. Soc., 17: 258.

DISCUSSION: Form broadly oval; head black with a pale clypeal area anterior to each eye; pronotum and elytra dark reddish - brown to black, with paler margins; mesosternal ridge nearly straight, not toothed at middle. Genitalia as in figure 13. Length 4.5 to 5.8 mm.

A single atypical specimen (taken with a typical) which was examined had a length of 3.7 mm. The paler pronotal margin is extremely pale and covers the lateral one-third of each side, resulting in a conspicuous dark brown discal spot. The paler clypeal area is much expanded and paler than the typical. Elytra are pale yellow-brown in color. The aedeagus of this specimen is identical to those of typical C. blanchardi.

HABITAT: Apparently confined to stream and brook margins, springs, and seeps. Definitely lotic. No light attracted specimens were seen.

RANGE: Massachusetts to Michigan, south to Florida. I have seen additional specimens from New York and Pennsylvania.

MICHIGAN DISTRIBUTION: (7 specimens examined) Very uncommon in the state, with records from the Southern Lower Peninsula as follows:

CLINTON CO.: Bath, 3 Sept 1964, R. B. Willson (1). GENESEE CO.: Flint, 12 April 1963, R. B. Willson (2). INGHAM CO.: Ag. Coll., 5-12-90, (1); 5-14-90, (1). TUSCOLA CO.: nr Murphy Lake, 25-X-1963, R. C. Graves (2). Hatch (1924) records blanchardi from Beaver and High Islands, Charlevoix Co.

Cymbiodyta minima Notman

1919. Cymbiodyta minima Notman, Bull. Brooklyn Ent. Soc., 14: 33.

DISCUSSION: Form elongate oval, nearly parallel sided; head entirely black; pronotum and elytra dark reddish-brown to black, with lateral margins paler. Teneral specimens are common and a pale yellow-brown. Elytra lacking the series of coarser punctures characteristic of the other Great Lakes species of Cymbiodyta. Mesosternal ridge with an extremely small median tooth. Length 3.2 to 3.8 mm.

HABITAT: Found mostly in shallow, well vegetated, lentic waters and never very numerous within a particular situation. Commonly collected at light.

RANGE: New England and New York west to Washington. I have seen additional material from Massachusetts and Quebec.

MICHIGAN DISTRIBUTION: (approximately 88 specimens examined) Found throughout the state (May 7). The sparser population of the Upper Peninsula may be approaching its northern limits of distribution. Found in the following counties: Alcona, Baraga, Calhoun, Cheboygan, Chippewa, Clare, Clinton, Emmet, Genesee, Ingham, Jackson, Kalamazoo, Lapeer, Livingston, Midland, Missaukee, Montcalm, Oakland, Ottawa, Roscommon, and Schoolcraft.

Cymbiodyta fimbriata (Melsheimer)

1844. Philhydrus fimbriata Melsheimer, Proc. Acad. Nat. Sci.

Phila., 1844-1845 (1846), II: 101.

DISCUSSION: Indistinguishable from C. vindicata externally. Males with the median lobe of aedeagus angulate at apex, the parameres with apices convergent (Fig. 10). Length 4.2 to 5.1 mm.

HABITAT: The only Michigan specimen is from a sandy stream margin vegetated with sparse Eleocharis and overhanging grass. Out-of-state light trap specimens are rare.

RANGE: Eastern North America. I have seen specimens from Missouri, Oklahoma, and Washington D. C.

MICHIGAN DISTRIBUTION: (1 specimen examined) A single male specimen is known from the state: LUCE CO.: 11 mi. SW Newberry, Helmer Creek, 1 Aug 1964, R. B. Willson (1).

Cymbiodyta vindicata Fall

1924. Cymbiodyta vindicata Fall, Jour. N. Y. Ent. Soc., 32: 86.

DISCUSSION: Mesosternal transverse ridge without a medial tooth; head a unicolorous black; pronotum and elytra black, sometimes dark reddish-brown, with margins paler. Males with median lobe of aedeagus truncate at apex, the apices of the paramers convergent (Fig. 12). Length 4.2 to 5.0.

HABITAT: Commonly found along stream margins, although frequently collected in well vegetated lentic situations. Light attraction is moderate to infrequent.

RANGE: Massachusetts and New York west to British Columbia, the southern limits not yet well defined. I have seen specimens from Massachusetts, Missouri, and British Columbia.

MICHIGAN DISTRIBUTION: (approximately 66 specimens examined) Common in the Upper Peninsula, less so in the Lower Peninsula (Map 8). Considering all the light trap material examined and the aquatic collecting done in southern half of the Lower Peninsula I expected many more records of vindicata. The sparser southern population indicates an approach to the southern limit of the species distribution. This

species is known from the following Michigan counties: Alger, Baraga, Chippewa, Clinton, Delta, Genesee, Gogebic, Houghton, Iron, Keweenaw-Isle Royale, Luce, Marquette, Roscommon, Schoolcraft, Shiawassee.

Cymbiodyta toddi Spangler

1966. Cymbiodyta toddi Spangler, Ent. News, 77(8): 211.

DISCUSSION: Indistinguishable from C. vindicata externally.

Males with the median lobe of aedeagus acute, the apices of the parameres slightly divergent (Fig. 11). Length 5.0 to 5.2 mm.

HABITAT: Michigan specimens are from a Typha-margined ditch and Elodea mats along a stream margin. Spangler (1966) collected most of his specimens among dead leaves and decaying vegetation. No light trap records.

RANGE: Kansas, Missouri, Nebraska, Oklahoma, and Michigan. I have seen specimens from Kansas and Oklahoma.

MICHIGAN DISTRIBUTION: (2 specimens examined) Uncommon in the state, recorded from the following localities: OTTAWA CO.: Allendale, Worley drain, 17 July 1963, R. B. Willson (1). SAGINAW CO.: M-57, 4 mi. North Chapin 11-X-1963, R. C. Graves (1).

Genus HELOCHARES Mulsant 1844

This genus is close to Enochrus, but differs in the following characters: Maxillary palpi long and slender, with the anterior margin of the pseudobasal segment concave; all tarsi five-segmented; mesosternum feebly protuberant or simple, no distinct carina or lamina present; clypeus deeply emarginate. The subgenus Hydrobaticus is represented in the Great Lakes Region and is distinguished by each elytron with ten striae, including the sutural.

Helochares maculicollis Mulsant

1844. Helochares maculicollis Mulsant, Ann. Soc. Agr. Lyon., 7: 379.

DISCUSSION: Brownish-yellow to dark brown in color, the pronotum with a conspicuous darker discal area. The elytra striate and intervals five and nine with a series of coarser punctures. Prosternum carinate, mesosternum with a slight tubercle. Length 4.0 to 5.5 mm.

HABITAT: Young (1954) refers to this species as lentic and sometimes very numerous along muddy borders of ponds and marshes.

RANGE: Virginia to Ohio and Missouri, south to Texas and Florida. I have seen additional specimens from Louisiana and Texas.

MICHIGAN DISTRIBUTION: Not yet recorded for the state.

Genus ENOCHRUS Thompson 1859

The genus Enochrus is distinguished by the following characteristics: Maxillary palpi long and slender, the ultimate segment shorter than the penultimate and the anterior margin of the pseudo-basal segment concave; middle and hind tarsi five-segmented, the basal segment minute; mesosternum with a median longitudinal carina; elytra nonstriate; males with at least one of the protarsal claws toothed, the females being untoothed, the only exception being perplexus (LeConte) where both sexes have the protarsal claws untoothed.

Mr. Ralph Gundersen is currently revising the North American species of Enochrus and has the bulk of the Michigan material on loan. He kindly sent me data on the Michigan distribution which are included here. Due to the loan of specimens I cannot make comprehensive references to my field notes for habitat information on some species.

## KEY TO THE SPECIES OF ENOCHRUS

1. Fifth abdominal sternite with an apical emargination fringed with golden hairs.....Subgenus METHYDRUS 2
- Fifth abdominal sternite entire, without an apical emargination fringed with golden hairs.....Subgenus LUMETUS 8
2. Prosternum carinate.....3
- Prosternum not carinate.....4
3. Mesosternal carina sharply and acutely angulate (Fig. 15);  
     prosternal carina pronounced (Fig. 14)....E. pygmaeus nebulosus  
     Mesosternal carina with lower edge somewhat rounded and with  
     a distinct tooth at the anterior angle (Fig. 17); pro-  
     sternal carina less pronounced (Fig. 16).....Enochrus species
4. Mesosternal carina low, not toothed or produced; color  
     usually brownish-yellow, sometimes darker, length 2.7  
     to 3.7 mm.....E. ochraceus  
     Mesosternal carina well developed with the anterior angle  
     produced.....5
5. Mesosternal carina with the lower edge oblique and the  
     anterior angle strongly produced; protarsal claws of male  
     distinctly toothed; color brown to black; length 3.0 to  
     5.0 mm.....E. blatchleyi  
     Mesosternal carina with the lower edge nearly parallel with  
     the longitudinal axis of the body, the anterior angle dis-  
     tinct but not mucronate; color black or dark brown with  
     the edges of pronotum and elytra sometimes lighter; length  
     5.6 to 9.5 mm.....6

6. Pronotum without a basal marginal line; male protarsal claws simply enlarged at base, not acutely angulate; mesosternal carina with the posterior margin undercut and strongly angulate in profile (Fig. 18); lateral margin of pronotum and usually the elytra, pale; maxillary palpi brownish-yellow.....E. cinctus
- Pronotum with a distinct basal marginal line; male protarsal claws acutely angulate at base; mesosternal carina with the posterior margin undercut very little if at all near base, appearing at most only weakly angulate in profile (Fig. 19).....7
7. Apical angles or lateral margins of pronotum pale; maxillary palpi pale; median lobe of aedeagus slender and parallel sided.....E. consortus
- Pronotum entirely black, without lighter margins; maxillary palpi black or very dark brown; median lobe of aedeagus narrowly triangular.....E. consors
8. Protarsal claws of male not toothed; black to dark brown in color, the elytra and pronotum paler laterally; more elongate in general form; aedeagus with median lobe almost as long as parameres.....E. perplexus
- At least one protarsal claw of males toothed; color variable, from a light yellow-brown to a dark brown, usually with a darker discal area on the pronotum; aedeagus with the median lobe considerably shorter than the parameres.....9



9. Median section of clypeal emargination straight; posterior edge of hind femur raised and protuberant, more evident in the male; dorsal color yellow to pale brown; aedeagus with supporting strut of the median lobe extending beyond the apex of the median lobe.....E. diffusus

Median section of clypeal emargination simply arcuate; posterior middle edge of the hind femur not raised and protuberant; dorsal surface yellow-brown to dark brown; aedeagus with external supporting strut of median lobe extending little or not at all beyond apex of median lobe.....E. horni

Enochrus pygmaeus nebulosus (Say)

1792. Hydrophilus pygmaeus nebulosus Say, Keating's Expedition under Major Long, 2: 276.

DISCUSSION: Length 3.9 to 4.1 mm. The characters provided in the key will separate this species. Figures 14 and 15 illustrate the meso- and prosternal carinas.

HABITAT: I have no information as to habitat for nebulosus. The species flies to light but never in large numbers or with any consistency.

RANGE: Massachusetts to Michigan and Nebraska, south to Louisiana and Mississippi. I have examined material from Arkansas, Illinois, Kentucky, Missouri, Nebraska, New York, Oklahoma, Pennsylvania, South Carolina, and Texas.

MICHIGAN DISTRIBUTION: (13 specimens examined, additional records from Gundersen Illustrated on Map 9) Found scattered throughout

the Lower Peninsula, not yet recorded from the Upper Peninsula. The specimens on hand are from ALLEGAN CO.: Allegan St. Forest, VII-30-1964, R. & J. Matthews (1). BERRIEN CO.: Galien, 19 June 1963, R. B. Willson (1); Stevensville, 10 July 1963, R. B. Willson (1). CHEBOYGAN CO.: Douglas Lake, 21 July 1931, C. W. Sabrosky (1). GENESEE CO.: Flint, 21 July 1963, R. B. Willson (5); 25 Aug 1963, R. B. Willson (1); KALAMAZOO CO.: Gull Lake Bio. Sta., 28 Sept 1963, R. B. Willson (1); 30 July 1963, R. L. Fischer (1). WAYNE CO.: Detroit, VII-24-1911 (1). Additional records provided by Gundersen are from: BERRIEN CO.: Dunes St. Park. CHARLEVOIX CO.: Beaver Island; Boyne City. WASHTENAW CO.

Enochrus species

DISCUSSION: The presence of this species in Michigan was brought to my attention by Ralph Gundersen (per. comm.) who will describe it in his revisionary study of the genus. Length 3.7 to 4.0 mm. The characters provided in the key will separate this species from pygmaeus nebulosus. Figures 16 and 17 illustrate the meso- and prosternal carinas.

HABITAT: Field notes indicate a preference for shallow, weedy, lentic waters. Flies to light, but not in large numbers.

RANGE: New York to Michigan and Nebraska, south to Texas and Florida. I have seen specimens from South Carolina.

MICHIGAN DISTRIBUTION: (3 specimens examined) Occurs sparingly throughout the state and the specimens on hand are from the following localities: JACKSON CO.: Jackson, 4 Aug 1964, R. Worden (1). OAKLAND CO.: VII-30-1930, A. W. Andrews (1). WAYNE CO.: Detroit, VII-24-1911 (1). Additional records provided by Gundersen

are from CLINTON CO.: Park Lake. EATON CO.: Grand Ledge. HOUGHTON CO.: Houghton. KALAMAZOO CO.: Gull Lake Bio. Sta. OTTAWA CO.: Allendale. WASHTENAW CO.: Ann Arbor.

Enochrus blatchleyi (Fall)

1924. Philhydrus blatchleyi Fall, Jour. N. Y. Ent. Soc., 32: 85.

DISCUSSION: This species is of doubtful occurrence in the Great Lakes Region. Mr. Ralph Gundersen is currently revising the genus and informs me that he has seen a single specimen of blatchleyi labeled "Michigan". I definitely feel that this is an error in labeling, but since the specimen does exist it is included here.

Mesosternal carina with anterior angle mucronate; protarsal claws of male toothed; color dark brown to black; length 3.0 to 4.5 mm.

HABITAT: The only information available to me on habitat is that of Young (1954), who recorded it from detritus ponds in Florida.

RANGE: Florida, Arkansas.

Enochrus ochraceus (Melsheimer)

1844. Philydrus ochraceus Melsheimer, Proc. Acad. Nat. Sci. Phila., 2: 101.

DIAGNOSIS: Mesosternal carina low and weakly developed, the anterior edge untoothed and not produced; dorsal color brownish-yellow, rarely darker; length 2.7 to 3.7 mm. Easily separated from the species of the pygmaeus group, which are of comparable size, by its non-carinate prosternum and the mesosternal carina being low, not produced anteriorly.

HABITAT: Young (1954) refers to ochraceus as "definitely a lentic species, characteristic of detritus pond conditions." My field data show very little correlation, the habitats ranging from stream

margins and vegetated ponds to vernal pools.

**RANGE:** New Hampshire to Minnesota, south to Nebraska, Texas, and Florida. I have seen specimens from Arkansas, Florida, Massachusetts, Nebraska, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, and Texas.

**MICHIGAN DISTRIBUTION:** (Approximately 400 specimens examined)  
Extremely common throughout the state. Specimens are known from the following counties: Alcona, Alger, Arenac, Baraga, Barry, Berrien, Calhoun, Charlevoix, Cheboygan, Chippewa, Clare, Clinton, Delta, Eaton, Emmet, Genesee, Gladwin, Gogebic, Gratiot, Hillsdale, Houghton, Ingham, Ionia, Iron, Isabella, Jackson, Kalamazoo, Kalkaska, Kent, Keweenaw, Keweenaw - Isle Royale, Lenawee, Livingston, Macomb, Marquette, Menominee, Midland, Missaukee, Montcalm, Muskegon, Newaygo, Oakland, Ottawa, Schoolcraft, Shiawassee, Van Buren, Washtenaw, Wayne.

*Enochrus cinctus* (Say)

1824. *Hydrophilus cinctus* Say, Keating's Expedition under Major Long,  
2: 276.

**DISCUSSION:** Length 5.6 to 7.5 mm.; mesosternal carina thick, with the posterior margin undercut and strongly angulate in profile (Fig. 18); pronotum without a basal marginal line; male protarsal claws enlarged at base, but not acutely angulate; lateral margin of pronotum and elytra usually pale, maxillary palpi brownish-yellow.

**HABITAT:** This species is strictly lentic, and inhabits very diverse situations within this category. Commonly collected at light; most of the Michigan specimens were collected by this method.

**RANGE:** Maine to North Dakota, south to Kansas, Louisiana, and Florida. I have seen additional specimens from Illinois, Indiana,

Oklahoma, Texas and Quebec.

MICHIGAN DISTRIBUTION: (Approximately 255 specimens examined: Map 10) Common throughout the Lower Peninsula, much less so in the Upper. Specimens are known from the following Michigan counties: Allegan, Bay, Calhoun, Cheboygan, Clare, Clinton, Eaton, Genesee, Gratiot, Houghton, Huron, Ingham, Ionia, Jackson, Kent, Keweenaw, Lapeer, Lenawee, Livingston, Macomb, Manistee, Marquette, Mecosta, Midland, Newaygo, Oakland, Ottawa, Roscommon, Sanilac, Schoolcraft, Shiawassee, VanBuren, Washtenaw, and Wayne.

Enochrus consortus Green

1946. Enochrus consortus Green, Trans. Amer. Ent. Soc., 72: 61-64.

DISCUSSION: Length 7.0 to 9.3 mm.; mesosternal carina thinner than that of cinctus, with the posterior margin undercut very little if at all near the base, appearing at most weakly angulate in profile (Fig. 19); pronotum with a distinct basal marginal line; male protarsal claws each with an acute tooth; dorsal surface black with at least the apical margins of the pronotum paler, sometimes the elytral margins also; pseudobasal segment of the maxillary palpi black with its apex slightly paler, the two terminal segments brown. Aedeagus with the median lobe linear, sides parallel, and the ventral surface not longitudinally impressed.

HABITAT: Apparently a lentic species and associated with very dense vegetation. Frequently collected at light.

RANGE: Maine to Minnesota, south to Louisiana and Florida. I have seen additional material from Massachusetts, Missouri, and South Carolina.

MICHIGAN DISTRIBUTION: (Approximately 77 specimens examined)

Found throughout the state and is known from the following counties: Alger, Baraga, Berrien, Calhoun, Cheboygan, Delta, Gladwin, Houghton, Ingham, Kalamazoo, Kent, Livingston, Luce, Mackinac, Macomb, Manistee, Marquette, Midland, Ottawa, St. Joseph, Washtenaw, and Wayne.

Enochrus consors (LeConte)

1863. Philhydrus consors LeConte, Smiths. Miscell. Coll., 6(167): 24.

DISCUSSION: Length 7.0 to 8.0.; mesosternal lamina thinner than that of cinctus, with the posterior margin undercut very little if at all near base, and at most weakly angulate in profile; pronotum with a distinct basal marginal line; male protarsal claws each with an acute tooth; dorsal surface a unicolorous black; maxillary palpi black except at the extremities of the segments; aedeagus with the median lobe narrowly triangular and with the ventral surface longitudinally impressed.

HABITAT: Young (1954) records consors from "permanent lentic situations where algae and emergent plants are abundant." I have not seen any specimens collected at light.

RANGE: New England to Minnesota, south to Louisiana and Florida. I have seen specimens from Alabama and Florida.

MICHIGAN DISTRIBUTION: I have seen a single specimen of consors from Michigan: KALAMAZOO CO., Gull Lake Biological Station 23 July 1961, R. L. Fischer. Mr. Gundersen (per. comm.) has records of this species from CHEBOYGAN CO. and VANBUREN CO.: South Haven.

Enochrus perplexus (LeConte)

1855. Philydrus perplexus LeConte, Proc. Acad. Nat. Sci. Phila., 7: 371.

DISCUSSION: Length 3.3 to 4.2 mm.; perplexus can possibly be confused with darker members of the E. horni complex, but differs in having a more elongate form, untoothed anterior protarsal claws in males, pronotum dark with paler margins, no distinct darker discal area, and the anterior angle of the mesosternal carina less prominent. Aedeagus of perplexus with the median lobe extending well beyond the supporting strut, while in horni the median lobe extends little if at all beyond the strut.

HABITAT: I have no habitat information for this species. It apparently flies to light infrequently, if at all.

RANGE: Canada and New England, south to Florida and Texas. I have examined additional specimens from Illinois, Mississippi, Oklahoma, and Texas.

MICHIGAN DISTRIBUTION: (15 specimens examined) Occurs throughout the state but is not commonly found. Specimens are from the following counties: Allegan, Baraga, Berrien, Chippewa, Clare, Clinton, Ingham, Kalamazoo, Livingston, Luce, Midland, Ottawa, Washtenaw, and Wayne.

Enochrus diffusus (LeConte)

1855. Philhydrus diffusus LeConte, Proc. Acad. Nat. Sci. Phila., 7: 371.

DISCUSSION: Length 6.3 mm.; diffusus is separated from horni by those characters provided in the key (from Leech, 1950). Michigan specimens of the horni complex in part have the truncate clypeal emargination, but none of the other characters mentioned.

HABITAT: I have no habitat information for this species.

**RANGE:** At this time the actual range of diffusus is unknown. Horn (1890) gave California, North and South Dakota, Wyoming, Nebraska, and Illinois as its distribution while more recent studies by Leech (1950) and Miller (1964) record it only from British Columbia to California. I have seen specimens from Medicine Hat, Alberta.

**MICHIGAN DISTRIBUTION:** Not recorded from the state but is included here to prevent confusion with those specimens of the horni complex having the truncate clypeal emargination. Also, it is not yet known whether Horn's (1890) record from Illinois is valid or not.

Enochrus horni complex

1950. Enochrus horni Leech, The Wasmann Collector, 7(6): 250-253.

**DISCUSSION:** Length 4.6 to 5.6. Michigan specimens seem to be a blend of horni and diffusus. The clypeal emargination ranges from arcuate to truncate. Color varies from a pale yellow-brown to a dark brown, the former with an infusate darker discal pronotal area, the latter with a black, well defined discal pronotal area. I have found no distinct genitalic differences nor any other constant characters on which to base separation, but at this time prefer to treat the Michigan population as complex. Perhaps Gundersen's revisional study which covers this species' entire range can resolve the variation complexities.

**HABITAT:** Definitely lentic and occupying very diverse situations within that category. Commonly collected at light in large numbers.

**RANGE:** British Columbia through Canada to eastern Quebec and New England, south to Illinois, Colorado, and California. I have seen specimens from Illinois and Ontario.

**MICHIGAN DISTRIBUTION:** (Approximately 200 specimens examined)  
Very common throughout the state and known from the following Michigan



counties: Alcona, Alger, Arenac, Baraga, Calhoun, Delta, Gogebic, Ingham, Jackson, Keweenaw, Keweenaw - Isle Royale, Lenawee, Livingston, Luce, Macomb, Manistee, Marquette, Newaygo, Oakland, Roscommon, Schoolcraft, St. Joseph, and Wayne.

The Arenac County records are from Charity Island, collected by Andrews (1915). The following corrections are made to his list: Two specimens of Cymbiodyta blanchardi Horn are E. horni; of the three specimens listed as Helochaeres maculicollis Mulsant, at least one and probably all three are horni, since maculicollis does not occur in the state; four specimens listed as Philhydrus hamiltoni are E. horni; and of the three specimens recorded as Philhydrus ochraceus Melshimer, one is horni.

#### Genus HYDROBIUS Leach 1815

Maxillary palpi short and stout with the ultimate segment longer than penultimate. Elytra deeply striate or with rows of punctures, their alternate intervals with a series of coarser punctures. Long swimming hairs fringe the inner margin of meso- and metatarsal segments 2-5. Lateral margin of elytra entire.

#### KEY TO THE SPECIES OF HYDROBIUS

1. Oblong, convex, dark brown species; elytra with deeply impressed, punctate striae; habitat lentic.....fuscipes
- Slightly oblong, strongly convex, shining black species; elytra without striae but with distinct rows of punctures; habitat lotic.....globosus

Hydrobius fuscipes (Linnaeus)

1758. Dytiscus fuscipes Linnaeus, Systema Naturae, ed., 10: 411.

DISCUSSION: Oblong, convex in form and dark brown in color. Elytral striae deeply impressed and punctate, though a very few specimens have slightly impressed rows of punctures. Length 6.5 to 8.5 mm.

HABITAT: Found commonly in most vegetated lentic waters and quiet margins of streams and rivers. Attraction to light is common and usually in great numbers.

RANGE: Distributed throughout the northern United States and Canada. I have seen specimens from Colorado, Illinois, Indiana, Iowa, Massachusetts, New Hampshire, New York, Oklahoma, Oregon, Washington, Wisconsin as well as British Columbia, Ontario, Quebec, and Europe.

MICHIGAN DISTRIBUTION: (approximately 1100 specimens examined) Extremely common throughout the state. Recorded from the following counties: Alcona, Alger, Allegan, Alpena, Baraga, Berrien, Calhoun, Charlevoix, Cheboygan, Chippewa, Clare, Clinton, Crawford, Dickinson, Emmet, Genesee, Gladwin, Gratiot, Ingham, Ionia, Iron, Isabella, Jackson, Kalamazoo, Kalkaska, Kent, Keweenaw, Keweenaw - Isle Royale, Leelanau, Lenawee, Livingston, Luce, Mackinac, Macomb, Manistee, Marquette, Menominee, Midland, Missaukee, Montcalm, Newaygo, Oakland, Oceana, Otsego, Ottawa, Presque Isle, Roscommon, Schoolcraft, Shiawassee, St. Clair, VanBuren, Washtenaw, Wayne, Wexford.

Hydrobius globosus (Say)

1824. Hydrophilus globosus Say, Expedition of Major Long, II: 276.

DISCUSSION: Only slightly oblong, almost round, strongly convex in form and shining black in color. Elytra nonstriate except

for sutural, but with distinct rows of punctures. Length 6.5 to 8.0 mm.

**HABITAT:** Strictly lotic, found most commonly in accumulated debris trapped in rocky streams or among exposed roots at stream margins. I have collected larvae under rocks in riffles. The habitat is close to that of Sperchopsis tessellatus (Zimmermann), but I have yet to collect the two species from the same site -- they always occur separately. I have seen no light trap specimens.

**RANGE:** Horn (1890) gives the range as "New England and Middle States." I have seen specimens from District of Columbia, Maryland, Massachusetts, New York, Ohio, Pennsylvania as well as Ontario and Quebec.

**MICHIGAN DISTRIBUTION:** (35 specimens examined) Occurs throughout the state but is considered rare due to its habitat. Recorded from the following localities in Michigan. ALGER CO.: 6 mi. N. Chatham, 21 July 1964, RBW (4); Eben Junction, Slapneck Creek, 21 July 1964, RBW (1). BARAGA CO.: 8 mi S. L'Anse, Ogemaw River, 10 July 1964, RBW (7). CHIPPEWA CO.: 4 mi W. Paradise, S. Br. Betsy River, 30 July 1964, RBW (9). GENESEE CO.: Flint, Flint River, 17 April 1966, RBW (2). INGHAM CO.: T2N, R2W, Sec. 7, Columbia Creek at Waverly Road, October, 1965, J. Robinson. KENT CO.: Harvard, 10 Aug 1963, F. J. Ignatoski (1). LAPEER CO.: Lapeer State Game Area, 28-v-1960, G. A. Buck (1RCG). LENAWEE CO.: Lenawee Co., vii-1928, (1UM). MONTMORENCY CO.: Montmorency Co., July 1935, J. Metzelaar (1UM). OAKLAND CO.: Oakland Co., 7 Sept 1931, A. W. Andrews (1); 23 Aug 1931, A. W. Andrews (1); Pontiac, 1 July 1909, (1); vii-1-09, A. W. Andrews (1UM); Highland, ix-3-1921, T. H. Hubbell (1). ONTONAGON CO.: 5 mi N.

Bruce Crossing, 23 June 1964, RBW (2). Hatch (1924) reported globosus from Charlevoix Co., Beaver Island.

Genus SPERCHOPSIS LeConte 1862

Sperchopsis is distinguished by the following characters:

Lateral margins of the elytra are weakly serrate, at least basally; alternate intervals of elytra elevated and without series of coarse punctures; the head is longer than broad and a preclypeus is visible; swimming hairs absent on segments two through five of the meso- and metatarsi.

Sperchopsis tessellatus (Ziegler)

1844. Sperchus tessellatus Ziegler, Proc. Acad. Nat. Sci. Phila.,  
2: 44.

DISCUSSION: The broadly oval, strongly convex form, dark reddish-brown to paler coloration with irregular dark markings, and striate elytra with alternate intervals elevated and without a series of coarser punctures, easily distinguishes this species from all other Great Lakes species. Length 7 to 7.5 mm.

HABITAT: Usually associated with accumulated litter and debris trapped in rocky riffles and along the margins of swift-flowing streams and rivers, as well as wave-swept lake shores.

I have not seen specimens collected at light.

RANGE: Nova Scotia to Florida, west to Mississippi, Missouri, and Wisconsin. I have seen additional material from New Jersey and Pennsylvania.

MICHIGAN DISTRIBUTION: (approximately 40 specimens examined)  
Occurs throughout the state, but is not collected very frequently

which is most probably due to its unique habitat. It is known from the following counties: Arenac, Barry, Berrien, Chippewa, Clinton, Ingham, Kalamazoo, Marquette, Mecosta, Oakland, Oceana, Ogemaw, Roscommon, and Shiawassee. Spangler (1961) has the following additional Michigan counties recorded for tesselatus: Eaton, Emmet, Mason, and Ontonagon.

#### Genus PARACYMUS Thompson 1867

This genus is comprised of small, black, strongly convex beetles, frequently having a metallic sheen or luster to the dorsum. The prosternum is carinate, the mesosternum has a transverse ridge anterior to the mesocoxae and a longitudinal carina between and posterior to the mesocoxae. The metafemora are sparsely and coarsely punctate.

Species of the subcupreus group, those having the antennae 8-segmented, can only be identified by examination of the male genitalia. The females are virtually unidentifiable at the species level. For a fuller treatment of the subcupreus group, Wooldridge's (1966) study of the genus should be consulted.

#### KEY TO THE SPECIES OF PARACYMUS\*

1. Elytra and pronotum microreticulate and indistinctly punctate; size smaller, 1.4 to 1.6 mm. long, and strongly convex; antennae 9-segmented.....P. despectus
- Elytra and pronotum not microreticulate; size larger, usually over 2.0 mm. and less strongly convex; antennae 7- or 8-segmented.....2

---

\*Taken in part from Wooldridge (1966).

2. Mesosternal longitudinal carina laminate; prosternal carina more pronounced; antennae 7-segmented; first abdominal segment without a longitudinal carina.....P. confluens
- Mesosternal longitudinal carina nonlaminate; prosternal carina less pronounced; antennae 8-segmented; first abdominal segment with a longitudinal carina.....3
3. Punctation of elytra and pronotum nearly equally distributed over the entire surface, although size of punctures may vary.....4
- Pronotal punctation more reduced than that of elytra; punctures widely scattered in many places on pronotum....
- .....P. confusus
4. Male protarsal claws both appearing thickened in distal view; dorsum often distinctly metallic, especially the pronotum; aedeagus with parameres slender, their tips rounded and slightly convergent.....P. subcupreus
- Male protarsal claws not appearing thickened in distal view; aedeagus with paramere tips blunt and slightly divergent.....P. communis

Paracymus despectus (LeConte)

1863. Hydrobius despectus LeConte, Smiths. Misc. Coll., 6(167): 25.

DISCUSSION: This species small size, 1.4 to 1.6 mm. in length, strongly convex, almost globular form, and microreticulate surface of the elytra and pronotum are diagnostic. The 9-segmented antennae may be difficult to discern due to the smallness and compactness of the species.

**HABITAT:** The only specimens seen with habitat information are from a Sphagnum mat surrounding a bog lake. Young (1954) reports the species from variable situations in Florida, ranging from small, sand-bottomed streams to cypress swamps. No light trap specimens.

**RANGE:** New England west to Michigan and Illinois, south possibly as far as Florida. I have seen additional specimens from Massachusetts.

**MICHIGAN DISTRIBUTION:** (5 specimens examined) Quite uncommon in the state and known from the following localities: CLINTON CO.: Bath, 20 April 1964, R. B. Willson (2). DELTA CO.: 7-3-55, R. R. Dreisbach (1). GLADWIN CO.: 6-14-53, R. R. Dreisbach (1). WAYNE CO.: Palmer Park, VII-1-10 (1).

Paracymus confluens Wooldridge

1966. Paracymus confluens Wooldridge, Jour. Kan. Ent. Soc., 39(4): 716.

**DISCUSSION:** The seven-segmented antennae and laminate longitudinal carina of the mesosternum distinguish this species from all other Great Lakes Paracymus; prosternal carina pronounced; first abdominal sternite without a longitudinal carina; aedeagus with parameres narrow, widest just before middle, and tapering to sharply acute apices which are divergent; median lobe of aedeagus broad, becoming acutely triangular in apical one-third. Length 1.9 to 2.2 mm.

**HABITAT:** Apparently a bog species, found in Sphagnum mats overlying both acid and alkaline bogs. No records for this species at light.

**RANGE:** Northeastern North America: Wooldridge (1966) lists it from District of Columbia, Illinois, Massachusetts, Michigan and New Jersey.

MICHIGAN DISTRIBUTION: (20 specimens examined) Known from the following localities in the state: CLINTON CO.: Bath, Rose Lake, 20 April 1964, R. B. Willson (2); Bath, Burke Lake, 3 September 1964, R. B. Willson (17). EMMET CO.: Petoskey, T35N, R5W, Sec. 34, 23 July 1966, T. Schuh, E. Evans (1). Wooldridge (1966) records confluens from Livingston Co.: E. S. George Reserve.

Paracymus confusus Wooldridge

1966. Paracymus confusus Wooldridge, Jour. Kan. Ent. Soc., 39(4): 719.

DISCUSSION: Mesosternal longitudinal carina low, non-laminate; antennae eight-segmented; pronotal punctation more reduced than that of elytra. Punctures widely scattered in many places on pronotum. Aedeagus with parameres in dorsal view evenly rounded from base to tips, the tips rounded and converging; median lobe broadly conical in outline. Length 2.0 to 2.1 mm.

HABITAT: No information available.

RANGE: British West Indies and Florida to Mexico and California, British Columbia, Colorado, Illinois, and Virginia. I have seen specimens from Oregon.

MICHIGAN DISTRIBUTION: Not recorded from Michigan. Occurs in Macoupin and Madison counties in southwestern Illinois, so may approach the Berrien County area in Michigan.

Paracymus subcupreus Complex

1825. Hydrophilus subcupreus Say, Jour. Acad. Nat. Sci. Phila., 5: 189.

DIAGNOSIS: Dorsum often metallic, especially the pronotum; mesosternal carina low and indistinct; antennae 8-segmented; punctation of pronotum and elytra nearly equally distributed over the entire surface, although size of punctures may vary; male protarsal claws both



appearing thickened in distal view. Aedeagus with parameres narrow, sides nearly parallel; curving gradually, not abruptly, under penis from tip to base; tips converging and rounded. Median lobe slender, acutely conical flaring into a broad cone just before base.

Wooldridge (1966) records the length of subcupreus as 2.4 to 2.6 mm. The Michigan specimens have a much wider variation in length, 1.7 to 2.6 mm. The smaller specimens have the venter brown; the larger specimens have the venter black. There is an apparent intergrade between the two types in both size and color. I have found no differences, either external or genitalic, to provide a basis for separation. As a result, I prefer to leave subcupreus as a Complex.

**HABITAT:** Very common throughout the state in shallow, well vegetated waters, and not infrequent in lentic situations of sand and rock with little vegetation. Common in all bog mats I have collected in. Infrequently collected at light.

**RANGE:** Maine to British Columbia, south to Colorado and Florida. I have seen additional specimens from California and Florida.

**MICHIGAN DISTRIBUTION:** (approximately 675 specimens examined)  
Common throughout the state and known from the following counties:  
Alcona, Alger, Baraga, Barry, Bay, Berrien, Cheboygan, Calhoun, Chippewa, Clare, Clinton, Delta, Genesee, Gladwin, Gogebic, Gratiot, Houghton, Ingham, Iosco, Iron, Isabella, Kalamazoo, Kalkaska, Keweenaw, Keweenaw-Isle Royale, Lake, Lapeer, Luce, Mackinac, Marquette, Menominee, Midland, Missaukee, Muskegon, Oakland, Ontonagon, Ottawa, Roscommon, Schoolcraft, and Wayne.

Paracymus communis Wooldridge

1966. Paracymus communis Wooldridge, Jour. Kan. Ent. Soc., 39(4): 718.

DISCUSSION: Mesosternal longitudinal carina short and low; antennae eight-segmented; punctation of pronotum and elytra nearly equally distributed over entire surface, although size of punctures may vary; male protarsal claws not appearing thickened in distal view, as is the case with subcupreus; aedeagus with parameres blunt and diverging at tip in dorsal view, the margins curved and slightly diverging. Median lobe acutely conical, narrowly rounded at the tip.

HABITAT: No information available.

RANGE: Illinois to Missouri, Texas, California, Colorado, Wyoming, and Kansas.

MICHIGAN DISTRIBUTION: Not recorded for Michigan. Occurs in Madison and Pike counties in western and southwestern Illinois, so may approach the Berrien County area of Michigan.

## Genus CRENITIS Bedel 1881

Smaller beetles, under four millimeters in length. The maxillary palpi are short and stout, subequal to the antennae in length. Elytra are non-striate except for the sutural striae. The Prosternum is non-carinate and the mesosternum has a low transverse ridge or plain.

## KEY TO THE SPECIES OF CRENITIS

1. Mesosternum with a low transverse ridge; antennae 9-segmented; head and pronotum distinctly microreticulate; pronotum with a basal marginal line impressed at least at the angles.....C. digestus group
- Mesosternum plane; antennae 8-segmented.....2

2. Pronotum minutely microreticulate; elytra brownish, pronotum with pale margins laterally and anteriorly; 2.5 to 3.5 mm. in length.....C. monticola
- Pronotum not microreticulate; elytra black with indefinitely paler margins; pronotum with lateral margins paler; 2.2 to 2.6 mm. in length.....C. longulus

Crenitis digestus group

1855. Hydrobius digestus LeConte, Proc. Acad. Nat. Sci. Phila., 7: 373.

DISCUSSION: Length 2.4 to 3.3 mm.; antennae 9-segmented; head and pronotum distinctly microreticulate; dorsal coloration from a unicolorous black to a dark brown with narrowly paler margins of the pronotum and elytra; pronotum with a basal marginal line faintly evident at the posterior angles; mesosternum with a transverse ridge.

The Michigan material definitely seems to be a complex, but not enough specimens are on hand to sufficiently clarify the situation. This species group as well as the entire genus are in need of a critical review.

HABITAT: Apparently confined to creek margins and other flowing waters. I have not examined any specimens collected at light.

RANGE: Horn (1890a) recorded the distribution as New Hampshire westward through Canada and southward to New Mexico. I have seen additional specimens from Massachusetts, New Hampshire, and Pennsylvania.

MICHIGAN DISTRIBUTION: (17 specimens examined) Rarely encountered in the state and known only from the following localities: ALGER CO.: Eben Junction, Slapneck Creek, 21 July 1964, R. B. Willson (2); Chatham, summer 1902 (3). BARAGA CO.: 8 mi S. L'Anse, Ogemaw River, 10 July 1964, R. B. Willson (1). CLINTON CO.: Bath, 18 April

1964, R. B. Willson (7). KEWEENAW CO.: Allouez, Hill Creek, 8 July  
 1964, R. B. Willson (1); Isle Royale, Moskey Basin, 3 July 1964,  
 R. B. Willson (2). MARQUETTE CO.: Marquette (1).

Crenitis monticola (Horn)

1890. Creniphilus monticola Horn, Trans. Amer. Ent. Soc., 17: 271.

DISCUSSION: I have not seen specimens of this species and the characters used in the key were extracted from Horn's (1890a) description.

HABITAT: No information.

RANGE: New England and Pennsylvania.

MICHIGAN DISTRIBUTION: Not recorded for the state.

Crenitis longulus (Fall)

1924. Paracymus longulus Fall, Jour. N. Y. Ent. Soc., 32: 88.

DISCUSSION: I have not seen specimens of this species and the characters used in the key are those given by Fall (1924) in his original description.

HABITAT: No data available.

RANGE: Described from Mitchell, Indiana (Fall, 1924) and recorded by Gordon and Post (1965) from South Dakota. This latter record is doubtful. South Dakota is apparently within the range of digestus, which the above authors did not record for the state. Also, their record of longulus is the first since Fall's original description.

MICHIGAN DISTRIBUTION: Not recorded for the state.

Genus ANACAENA Thompson 1859

Small beetles, with the maxillary palpi short and stout, subequal in length to the antennae. The elytra are non-striate except

for the sutural striae. Prosternum non-carinate, but the mesosternum has a dentiform protuberance of a small tubercle.

Two species of Anacaena occur in the Great Lakes Region, limbata (Fabricius) which is extremely common and suturalis (LeConte) which is extremely rare and seldom collected.

#### KEY TO THE SPECIES OF ANACAENA

1. Dorsal surface unicolorous, shining, black, with the punctation sparse and fine; form oblong, narrowed posteriorly; mesosternum with a minute tubercle; hind femora longitudinally strigose and sparsely punctate.....A. suturalis  
 Pronotum and elytra dark brown to yellow-brown with paler margins, not strongly shining; form broadly elliptical, not narrowed posteriorly; mesosternum with a dentiform protuberance; hind femora densely punctate and pubescent.....A. limbata

#### Anacaena suturalis (LeConte)

1866. Limnebius suturalis LeConte, Proc. Acad. Nat. Sci. Phila., 1: 366.

DISCUSSION: The characters given in the key will distinguish this species from limbata. Length is 1.5 to 2.0 mm. The generic placement of this species has resulted in considerable confusion. LeConte (1866) described suturalis as a Limnebius; Horn (1890a) treated it as a Creniphilius; Leng (1920), in his catalog, listed it as a Paracymus; Winters (1926) created the genus Crenitulus for the species, which was sunk by d'Orchymont (1942) in favor of Anacaena. In some keys it will run to Crenitis.

HABITAT: Young (1954) reports the habitat of this species in Florida as "often abundant in streams in uplands and flatwoods; more rarely found in lentic situations." I have yet to collect this species in the state and it is apparently very rare.

RANGE: Great Lakes Region to Florida and Texas. I have examined specimens from Georgia.

MICHIGAN DISTRIBUTION: I have not seen any Michigan specimens, but Leech (1948) includes the Great Lakes region in its distribution and LeConte (1866) described it from "Pennsylvania, New York, and Lake Superior".

Anacaena limbata (Fabricius)

1792. Sphaeridium limbata Fabricius, Entomologica Systematica I: 82.

DIAGNOSIS: Characters included in the key are diagnostic for this species. It may superficially resemble Paracymus subcupreus in shape and coloration, but is easily separated by the non-carinate prosternum and the densely punctate and pubescent metafemora.

Length 2.1 to 2.8 mm.

HABITAT: One of the most widely distributed and common species in the Great Lakes Region, occurring in most lentic environments as well as the margins of lotic situations. Attraction to light is infrequent to rare.

RANGE: Alaska to California and New York. I have examined specimens from California, Oregon, and Ontario.

MICHIGAN DISTRIBUTION: (over 1300 specimens examined) Very common throughout the state and is known from the following Michigan counties: Alcona, Alger, Baraga, Bay, Barry, Berrien, Calhoun, Cheboygan, Chippewa, Clare, Clinton, Delta, Emmet, Genesee, Gladwin,

Gogebic, Gratiot, Houghton, Huron, Ingham, Iosco, Iron, Isabella,  
Jackson, Kalamazoo, Kalkaska, Keweenaw, Keweenaw - Isle Royale,  
Lapeer, Livingston, Luce, Mackinac, Menominee, Midland, Missaukee,  
Muskegon, Oakland, Ontonagon, Ottawa, Roscommon, Schoolcraft,  
Shiawassee, and Tuscola.

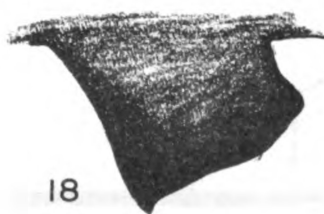
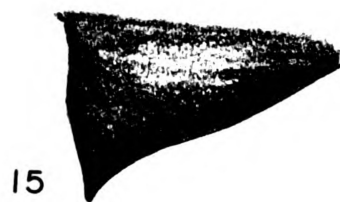
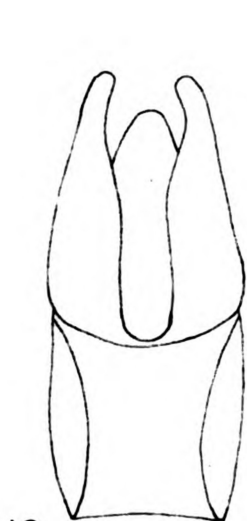
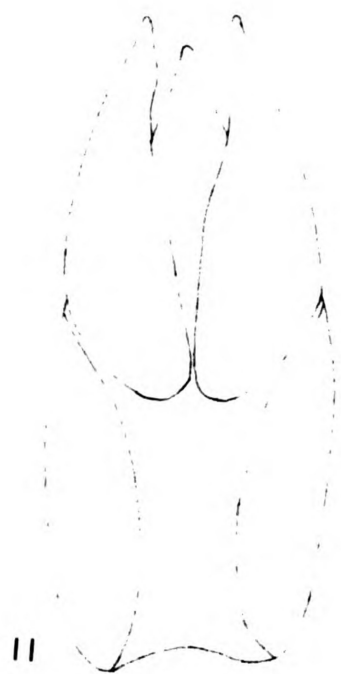
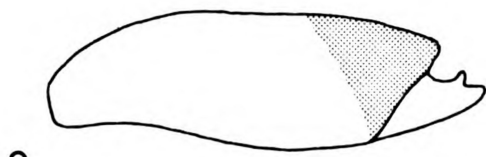
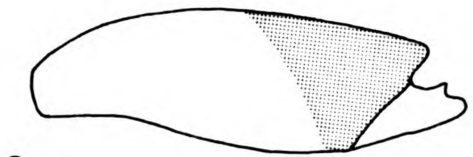
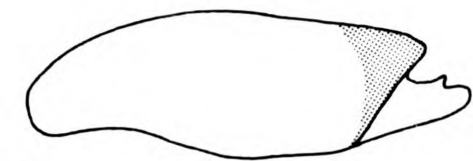
## PLATE I

- Figure 1. Aedeagus (dorsal) of Laccobius agilis (Randall).
- Figure 2. Aedeagus (dorsal) of Laccobius minutoides d'Orchymont.
- Figure 3. Aedeagus (ventral) of Laccobius spangleri Willson,  
new species.
- Figure 4. Aedeagus (lateral) of Laccobius spangleri Willson,  
new species.
- Figure 5. Aedeagus (dorsal) of Laccobius arenarius Willson,  
new species.
- Figure 6. Aedeagus (lateral) of Laccobius arenarius Willson,  
new species.

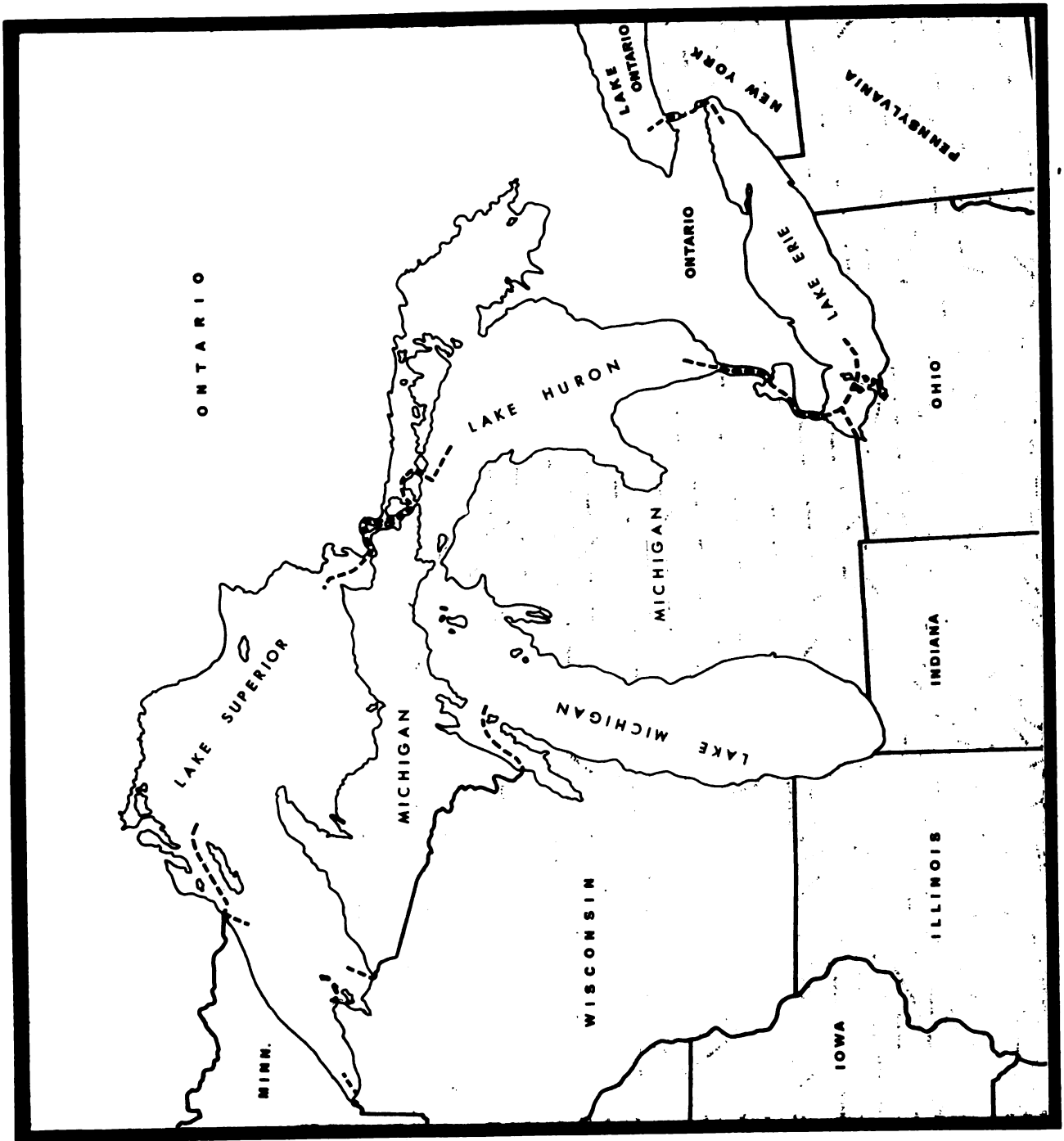


## PLATE II

- Figure 7. Hind femur of Tropisternus columbianus Brown.
- Figure 8. Hind femur of Tropisternus mixtus LeConte.
- Figure 9. Hind femur of Tropisternus natator d'Orchymont.
- Figure 10. Aedeagus (dorsal) of Cymbiodyta fimbriata (Melsheimer).
- Figure 11. Aedeagus (dorsal) of Cymbiodyta toddi Spangler.
- Figure 12. Aedeagus (dorsal) of Cymbiodyta vindicata Fall.
- Figure 13. Aedeagus (dorsal) of Cymbiodyta blanchardi Horn.
- Figure 14. Prosternal carina of Enochrus pygmaeus nebulosus (Say).
- Figure 15. Mesosternal carina of Enochrus pygmaeus nebulosus (Say).
- Figure 16. Prosternal carina of Enochrus species.
- Figure 17. Mesosternal carina of Enochrus species.
- Figure 18. Mesosternal carina of Enochrus cinctus (Say).
- Figure 19. Mesosternal carina of Enochrus consortus Green.







Map 1. Approximate geographical coverage of species identification keys.



Map 2. Michigan county name reference map.



Map 3. Distribution of *Dibolocelus ovatus* (G. & H.) in Michigan.











Map 5. Distribution of Helocombus bifidus (LeConte) in Michigan.





Map 7. Distribution of *Cymbiodyta minima* Notman in Michigan.







## LITERATURE CITED

- Balfour-Browne, Frank. 1958. British water beetles, Volume III. Ray Society, London. 210 pp.
- Blatchley, W. S. 1910. An illustrated descriptive catalogue of the Coleoptera, or beetles, known to occur in Indiana. Indiana Dept. of Geol. and Nat. Res., Bull. No. 1, 1386 pp.
- Brown, W. J. 1931. New species of Coleoptera (II). Can. Ent., 63: 115-122.
- \_\_\_\_\_. 1940. Notes on the American distribution of some species of Coleoptera common to the European and North American continents. Can. Ent. 72: 182-187.
- Fabricius, J. C. 1775. Systema Entomologicae. Flensburg. 832 pp.
- \_\_\_\_\_. 1781. Species insectorum. Hamburg and Kilonii, 2nd volume.
- \_\_\_\_\_. 1792. Entomologia systematica emendata et aucta, secundum, adjectis synonymis, locis, observationibus, descriptionibus. Hafniae (Proft), 1 (Part 1): 330 pp.; (Part 2): 538 pp.
- Fall, H. C. 1924. New species of North American Hydrobiinae. Jour. N. Y. Ent. Soc., 32: 85-89.
- Gemminger, Max and Edgar von Harold. 1868. Catalogus Coleopterorum. Munich and Paris, 2: 425-752.
- Gordon, Robert D. and Richard L. Post. 1965. North Dakota water beetles. Agricultural Experiment Station, North Dakota State University, North Dakota Insects. Publ. 5.
- Green, J. W. 1946. A new species of Enochrus. Trans. Amer. Ent. Soc., 72: 61-64.
- Hatch, Melville H. 1924. A list of Coleoptera from Charlevoix County, Michigan. Pap. Mich. Acad. Sci. Art. and Lett. IV: 543-586.
- \_\_\_\_\_. 1965. The beetles of the Pacific Northwest, Part IV: Macroductyles, Palpicornes, and Heteromera. Univ. of Washington Press, Seattle. 268 pp.
- Herbst, J. R. 1797. Natursystem Insecten...Berlin (Pauli), 7: 346 pp.

- Horn, G. H. 1890a. Notes on some Hydrobiinae of boreal America. Trans. Amer. Ent. Soc., 17: 237-278.
- \_\_\_\_\_. 1890b. A revision of the Sphaeridiini inhabiting boreal America. Trans. Amer. Ent. Soc., 17: 279-314.
- LeConte, John L. 1855. Synopsis of the Hydrophilidae of the United States. Proc. Acad. Nat. Sci. Phila., 7: 366-375.
- \_\_\_\_\_. 1861. New species of Coleoptera inhabiting the Pacific district of the United States. Proc. Acad. Nat. Sci. Phila., 1861: 338-359.
- \_\_\_\_\_. 1863. New species of North American Coleoptera, Part I. Smiths. Miscell. Coll., 6(167): 1-86.
- \_\_\_\_\_. 1866. Additions to the coleopterous fauna of the United States. No. I. Proc. Acad. Nat. Sci. Phila., 18: 361-394.
- Leech, H. B. 1949. New species and subspecies of Nearctic water beetles (Coleoptera: Dytiscidae and Hydrophilidae). Wasmann Coll., 7(6): 243-256.
- Leng, C. W. 1920. Catalogue of the Coleoptera of America North of Mexico. Mount Vernon, N. Y. 470 pp.
- Linnaeus, Carlos von. 1758. Systema naturae, ed. 10. Holmiae.
- Melsheimer, F. E. 1844. Descriptions of new species of Coleoptera of the United States. Proc. Acad. Nat. Sci. Phila., 2: 26-43.
- Miller, David C. 1963. The biology of the Hydrophilidae. The Biologist. 45(3-4): 33-38.
- \_\_\_\_\_. 1964. Notes on Enochrus and Cymbiodyta from the Pacific Northwest (Coleoptera: Hydrophilidae). Coleop. Bull., 18(3): 69-78.
- \_\_\_\_\_. 1965. New Laccobius (Coleoptera: Hydrophilidae) from the Pacific Northwest, with notes on previously named species. Jour. N. Y. Ent. Soc., 73(2): 56-62.
- Mulsant, M. E. 1844. Descriptions de quelques Palpicornes inédits. Ann. Soc. d'Agric. (Lyon), 7: 372-382.
- Notman, Howard. 1919. Coleoptera collected at Mooers, New York. Bull. Br. Ent. Soc., 14(4): 129-141.
- d'Orchymont, Armand. 1922. Le genre Tropisternus II. Ann. Soc. Ent. Belg., 62: 11-48.
- \_\_\_\_\_. 1938. Contribution à l'étude des Palpicornia XII. Ann. Soc. Ent. Belg., 78: 426-438.

- \_\_\_\_\_. 1942a. Contribution à l'étude de la tribu Hydrobiinae Bedel spécialement de sa sous-tribu Hydrobiae (Palpicornia, Hydrophilidae). Mem. Mus. Roy. Hist. Nat. Belg. 24: 1-68.
- \_\_\_\_\_. 1942b. Revision des Laccobius Américains (Coleoptera, Hydrophilidae). Bull. Mus. Nat. Hist. Belg. 18: 1-18.
- Randall, John W. 1838. Descriptions of new coleopterous insects inhabiting Maine. Boston Jour. Nat. Hist., 2: 1-52.
- Richmond, Avery E. 1920. Studies on the biology of the aquatic Hydrophilidae. Bull. Amer. Mus. Nat. Hist., 42(1): 1-94, 16 pls.
- Say, Thomas. 1823. Descriptions of coleopterous insects collected in the late expedition to the Rocky Mountains performed by order of Mr. Calhoun, Secretary of War, under the command of Major Long. Jour. Acad. Nat. Sci. Phila., 3: 139-216.
- \_\_\_\_\_. 1824. Appendix Vol. II. In, Keating's Expedition to the source of St. Peter's River under Major Long. Philadelphia. pp. 268-378.
- \_\_\_\_\_. 1825. Descriptions of new species of coleopterous insects inhabiting the United States. Jour. Acad. Nat. Sci. Phila., 5: 160-204.
- \_\_\_\_\_. 1835. Descriptions of new North American coleopterous insects, and observations on some already described. Boston Jour. Nat. Hist., 1(2): 151-203.
- Spangler, Paul J. 1960. A revision of the genus Tropisternus (Coleoptera: Hydrophilidae). University of Missouri, Ph.D. Thesis, 1960, Zoology.
- \_\_\_\_\_. 1961. Notes on the Biology and distribution of Sperchopsis tessellatus (Ziegler) (Coleoptera: Hydrophilidae). Coleop. Bull., 15: 105-112.
- \_\_\_\_\_. 1966. A new cryptic species of Cymbiodyta from the mid-western United States (Coleoptera: Hydrophilidae). Ent. News., 78(8): 211-216.
- Staines, H. J. 1956. The raccoon in Kansas, natural history, management, and economic importance. Univ. Kans. Mus. Nat. Hist. and State Biol. Surv. of Kansas, Miscell. Publ. no. 10, 76 pp.
- VanTassell, Eileen R. 1965. An audiospectrographic study of stridulation as an isolating mechanism in the genus Berosus (Coleoptera: Hydrophilidae). Ann. Ent. Soc. Amer. 58(4): 407-413.





- Wilson, Charles Branch. 1923a. Life history of the scavenger water beetle, and its economic relation to fish breeding. Bull. Bureau. Fish., 39 (942): 9-37.
- \_\_\_\_\_. 1923b. Water beetles in relation to pondfish culture, with life histories of those found at Fairport, Iowa. Bull. Bur. Fish., 39 (953): 231-345.
- Winters, F. C. 1926. Notes on the Hydrobiini (Coleoptera - Hydrophilidae) of Boreal America. Pan. Pac. Ent., 3 (2): 49-58.
- \_\_\_\_\_. 1927. Key to the subtribe Helocharae d'Orchymont (Coleoptera - Hydrophilidae) of Boreal America. Pan. Pac. Ent., 4 (1): 19-29.
- Wooldridge, David P. 1966. Notes on Nearctic Paracymus with descriptions of new species (Coleoptera: Hydrophilidae). Jour. Kans. Ent. Soc., 39 (4): 712-725.
- Young, Frank N. 1954. The water beetles of Florida. Florida Univ. Press. 238 pp.
- \_\_\_\_\_. 1958. Notes on the care and rearing of Tropisternus in the laboratory (Coleoptera: Hydrophilidae). Ecol., 39 (1): 166-167.
- \_\_\_\_\_. 1961. Effects of pollution on natural associations of water beetles. Purdue Univ. Engineering. Bull., Engineering series no. 106, 15 (2): 373-380.
- Ziegler, Daniel. 1844. Descriptions of new North American Coleoptera. Proc. Acad. Nat. Sci. Phila., 2: 43-47, 266-272.

MICHIGAN STATE UNIV. LIBRARIES



31293100143811