

The Insects of Virginia No. 8

THE AQUATIC HYDROPHILIDAE OF VIRGINIA (COLEOPTERA: POLYPHAGA)

by

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PUBLICATIONS in this series are intended to serve as scientific contributions for a better understanding of the **living environment** in Virginia.

Recognizing the basic economic importance of faunistic studies, our goal is to survey methodically the local insect fauna through preparation of inventories designed to show the geographic and seasonal occurrence of insects in the Commonwealth, and to provide keys, descriptions, and illustrations to facilitate their recognition.

Insofar as possible, these studies will include data on biology and life cycles to aid in the formation of control recommendations and information on ecological interactions — including host relationships, parasites, and predators — and the potential of various species as possible biological control agents. Knowledge gained from such studies will be used to evaluate the impact of future changes in our environment.

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ABSTRACT

Forty-nine species of aquatic Hydrophilidae are discussed. Of this number, 37 species are recorded from Virginia and 12 are listed as probably occurring in the state. Keys are given for all taxonomic groups. Original citation, diagnosis, range, Virginia records and habitat preference are given for each species discussed.

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Finally, I wish to express my deep appreciation to my wife Linda. Without her understanding and forbearance during numerous collecting trips, this work would not have been possible.

INTRODUCTION

This is the first of a series of articles on the aquatic Coleoptera of Virginia. It covers the major polyphagous family, amounting to approximately one quarter of the species of aquatic beetles which are found in Virginia. Additional articles covering the remaining aquatic families will be published as time and the accumulation of specimens permit. Because the entire aquatic coleopteran fauna will be treated in this series, it is felt that the presentation of a brief general discussion of aquatic Coleoptera and a key to the families of aquatic Coleoptera is appropriate at this time.

Aquatic beetles may be found in most nonmarine aquatic situations of Virginia. Many species are restricted to shallower water by the need to replenish their air supply regularly. Several of the larger species may be found at the margins of estuaries, ponds and lakes, in swampy areas, streams, springs, woodland pools, puddles, borrow pits and many other minor aquatic situations. One of the largest collections of aquatic beetles the author has made in Virginia came from a flooded tire-track in a meadow.

The aquatic Coleoptera form a major component of the normal aquatic fauna. Most species are predacious, at least in the larval stages, and in many groups in the adult stage as well; however, in some groups the adults are herbivorous or omnivorous. The larvae of the larger forms of Dytiscidae and Hydrophilidae may attack and devour small fish, while the smaller species play a role as micro-predators.

The aquatic beetle families may be used as biological indicators of habitat type in some aquatic situations (Leech and Chandler, 1956), and they may also play a significant role as water quality indicators.

There is no accurate list available of the aquatic beetles of Virginia, however, it is possible to estimate their numbers on the basis of the North American fauna. There are 10 truly aquatic families in Virginia, and these families are represented in the North American fauna by roughly 800 species. If we assume that about 25% of these species are represented in Virginia (this is roughly the percentage for the family Hydrophilidae), then we can expect about 200 species of aquatic beetles to occur in Virginia.

A key to the families of aquatic Coleoptera is presented below. The key is limited to those families with aquatic adults and does

not include families which may have aquatic larvae, littoral species or those families which occasionally turn up in aquatic collections from neighboring habitats. The key will work adequately for about 99+ % of the specimens encountered in aquatic collections in Virginia. If the user experiences difficulty in identifying a specimen, it is suggested that a more comprehensive key, such as in Leech and Chandler (1956) or Arnett (1960), be consulted.

**KEY TO THE FAMILIES OF COLEOPTERA OF VIRGINIA WITH
AQUATIC ADULTS**

- 1. First visible abdominal sternum completely divided by the hind coxae; the hind coxae immovably fused to the metasternum or with large coxal plates which cover much of the abdomen ----- 2
 - First visible abdominal sternum not completely divided by the hind coxae; the hind coxae not fused to metasternum ----- 6
- 2. Eye divided by side of head, appearing as a dorsal and a ventral pair of eyes; meso- and metathoracic legs broad and flattened, modified for swimming --
----- Gyrinidae
 - Eyes not divided; legs not broad and flattened ----- 3
- 3. Hind coxae appearing as greatly expanded plates which cover much of the abdomen ----- Halophilidae
 - Hind coxae not expanded into plates covering the abdomen ----- 4
- 4. Fore and middle tarsi pseudotetramerous, with the third segment deeply bilobed; the prosternum not in the same plane as the prosternal process ----- Dytiscidae
 - All tarsi distinctly 5-segmented; the prosternum and its process in the same plane ----- 5
- 5. Scutellum visible; or if covered, hind tarsi with a single claw; anterior tibia without a recurved spur--
----- Dytiscidae
 - Scutellum concealed; hind tarsi with 2 claws; anterior tibia with a strong recurved spur ----- Noteridae

- 6(1). Antennae short, with a cupule (Fig. 1); the segments distal to the cupule forming a club; maxillary palps usually longer than the antennae ----- 7
 Antennae without a cupule, without a pubescent club; maxillary palps usually shorter than the antennae ----- 10
7. With 6 or 7 visible abdominal sterna; antennae with 5 pubescent segments beyond the cupule ----- Hydraenidae
 Abdomen with 5 visible sterna (with a sixth membranous one present in the Hydrochidae); antennae with 3 pubescent segments beyond the cupule ----- 8
8. Pronotum with 5 longitudinal grooves ----- Helophoridae
 Pronotum without 5 longitudinal grooves ----- 9
9. Prothorax at base, narrower than the elytra; second segment of hind tarsi shorter than or equal to the third ----- Hydrochidae
 Prothorax at base, usually as wide as the elytra (or scutellum an elongate triangle); second segment of hind tarsi longer than the third ----- Hydrophilidae
- 10(6). Antennae short, apical segments forming a short pectinate club; front coxae transverse, with a trochantin ----- Dryopidae
 Antennae slender, never clubbed; front coxae globular, without a trochantin ----- Elmidae

THE HYDROPHILIDAE

The family Hydrophilidae, or water scavenger beetles, is a coleopteran family which may be divided, on the basis of habitat preference, into two groups, the primarily terrestrial species (the subfamily Sphaeridiinae) and the primarily aquatic species (all other subfamilies). Most species are black or brown, have a highly polished dorsal surface and are convex in appearance. They range in size from less than 2 mm to as large as 35-40 mm. The maxillary palps are often longer than the antennae and may easily be mistaken for them. The antennae are clubbed, have a cupule, are composed of from seven to nine segments and usually are folded under the head.

The four subfamilies of aquatic species in Virginia comprise one of the most important groups of aquatic Coleoptera, being excelled

in numbers of species and abundance only by the Dytiscidae. The single terrestrial subfamily, the Sphaeridiinae, is small and its members are usually found living in dung, moist earth or decaying vegetation, although some species may be rarely found in aquatic situations. This subfamily is not included in this work and it is doubtful if a satisfactory treatment of the Virginia species can be accomplished without a revision of the subfamily for the Nearctic region. The subfamily was last treated by Horn (1890), and individuals with specimens of Sphaeridiinae for identification should refer to his work.

The larvae of the Hydrophilidae are predacious, and the larvae of smaller species fill the micropredator niche in many aquatic habitats, while the larvae of larger species are among the largest invertebrate predators in the aquatic environment. Some of the larger Hydrophilidae occasionally are economically important in fish culture (Wilson, 1932 a, b). Adult hydrophilids are generally considered to be scavengers, feeding on plant and animal tissues which are in the process of decay; however, some groups have been shown to be primarily herbivorous. McCoy (1969) records that a hydrophilid (*Hydrophilus triangularis*) forms a significant part of the diet of bullfrogs.

With many of Virginia's aquatic species, recorded distribution throughout the state is a reflection of the intensity of collecting in a given area rather than the actual distribution of the species themselves. On the whole, Virginia has been rather poorly collected with respect to its aquatic beetle fauna. The counties in the vicinity of Washington, D. C., have been intensively collected over a number of years by federal employees stationed at the National Museum and by Mr. J. D. Sherman, a New York publisher who collected in the area of Ash Grove (Fairfax Co.) Virginia. The Tidewater area has been extensively collected by the author, and limited collections have been made in other areas of the state by various collectors.

Recent reviews of aquatic Hydrophilidae have been published by Leech and Chandler (1956) for the California fauna; Young (1954) for Florida; Wooldridge (1967) for Illinois; Malcolm (1971) for Maine, and LaRivers (1954) for Nevada. In addition, Wooldridge (1966) has published a partial review of the nearctic *Paracymus* and reviews of several other nearctic genera are nearing completion or are in thesis form.

Publications dealing with the Hydrophilidae of Virginia have been quite limited. Cross (1972) records *Paracymus nanus* (Fall) for

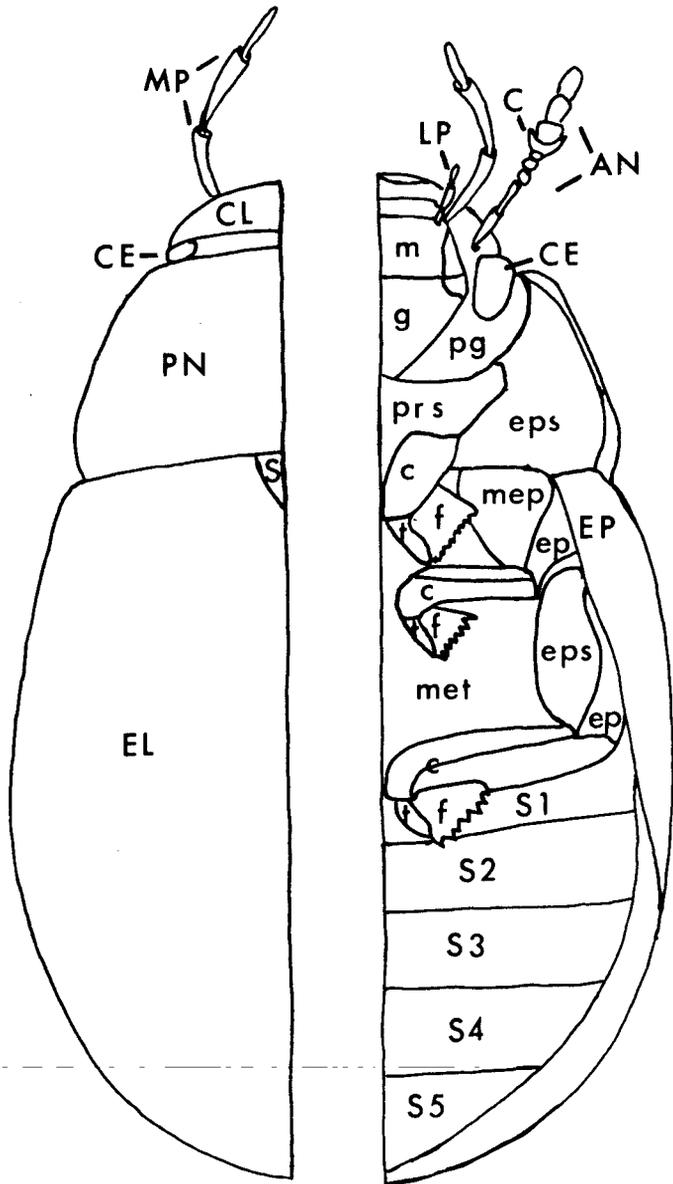


Figure 1. Dorsal (left) and ventral (right) view of *Helochares maculicollis* Muls. to illustrate the principal taxonomic characters of the Hydrophilidae. AN—antenna; C—cupule; c—coxa; CE—compound eye; CL—clypeus; EL elytron; EP—epipleuron; ep—epimeron; eps—episternum; f—femur; g—gula; LP—labial palp; m—mentum; mep—mesepisternum; met—metasternum; MP—maxillary palp; pg—postgena; PN—pronotum; prs—prosteronum; S1, S2, etc.—first abdominal sternum, 2nd abdominal sternum, etc.; S—scutellum.

the first time in the state. Matta (1973) has recently published a preliminary checklist of the aquatic Hydrophilidae of Virginia, and in a review of the aquatic Coleoptera of the Dismal Swamp, Matta (1974) discusses 18 species of Hydrophilidae which occur in the swamp.

Virginia compares favorably with other geographic regions in terms of numbers of species present. Wooldridge (1967) records 35 species for Illinois, Young (1954) 42 species for Florida, Malcolm (1971) records 38 for Maine, LaRivers (1954) records 22 for Nevada, and Leech and Chandler (1956) record 59 for California. There are 37 species of aquatic hydrophilids recorded from Virginia, with 12 species probably present but as yet unrecorded.

METHODS AND MATERIALS

Collecting

The author prefers a long-handled aquatic net for most collecting. The net is passed over the bottom and margins of the collecting site in short sweeps with an erratic bumping motion, much like a toad hopping. Several sweeps are made through an area and then the contents of the net are examined. It is often helpful to dump the material on a white, rubberized ground sheet for sorting. Beetles are picked up with the fingers or a pair of tweezers and placed in 70% isopropyl alcohol where they remain until pinned.

The most consistently productive areas for collecting are shallow margins of permanent pools which have a heavy growth of aquatic vegetation or accumulated detritus; however, almost any body of water, if persistently collected, will yield some water beetles. Streams, backwaters, marshes, pools, springs, seepage areas and a variety of other aquatic habitats all contribute their own varied fauna, and none should be ignored by the collector.

Mounting and Measurements

Standard techniques are used in the mounting of specimens. When mounting smaller specimens, one must be careful not to obscure the sternum with glue or the cardpoint. In many cases if the sternum is obscured the specimen cannot be identified without removal from the point.

In many species the male extends the genitalia upon being placed in alcohol, with many others the genitalia can be easily teased out with a pin or fine-pointed tweezers, and in a few species the genitalia must be dissected from the abdomen. Genitalia separated from

the insect are placed, with a drop of glycerine, in microvials attached to the pin on which the insect is mounted.

Measurements were made with a standard 50-division reticule in a 10X ocular. Using the 1X objective on an AO Spencer dissecting microscope, one division on the scale equals 0.1 mm.

Format of the Present Work

All species of Hydrophilidae recorded in the literature as being from Virginia are included in this review. In addition, species which are recorded from neighboring states and those which are presently recorded from both the north and south of Virginia, even though not from a neighboring state, are included. Distribution records for Virginia are usually given by county; however, additional information is given if few records of a species are available. Virginia material in the National Museum of Natural History (USNM) or the Virginia Polytechnic Institute and State University (VPI&SU) collection have the appropriate citation.

The diagnosis is intended to present characters which will aid in distinguishing the species and to point out forms which may be confused with the one under discussion, and not as a description of the species. Length is generally given as a range which will include most specimens collected in Virginia.

Habitat preference is given for each species wherever possible. In describing habitat the author has relied primarily on his own collection notes for most species; however, literature references are included where appropriate.

ANATOMY

For a general discussion of the anatomy of the Coleoptera the reader is referred to any introductory text in entomology, or if a more detailed discussion is desired, to Arnett (1960). Figure 1 is included as a ready reference to most external characters used in the keys.

**KEY TO THE GENERA OF AQUATIC HYDROPHILIDAE
IN VIRGINIA**

- 1. First 2 visible abdominal segments on each side
with a common excavation covered with a bilobed
plate ----- *Chaetarthria*, p. 15
- Abdomen not as above ----- 2

2.	First segment of middle and hind tarsi elongate, longer than the second; not generally aquatic ---- ----- subfamily Sphaeridiinae	
	First segment of middle and hind tarsi shorter than second, or tarsi 4-segmented -----	3
3.	Meso- and metasternum with a median keel which is produced into a posterior spine -----	4
	Meso- and metasternum without a keel -----	7
4.	Length over 20 mm -----	5
	Length under 20 mm -----	6
5.	Prosternum sulcate but closed in front, hood shaped ----- <i>Hydrophilus</i> , p. 14	
	Prosternum bifurcate so that the mesosternal keel could touch the head ----- <i>Dibolocelus</i> , p. 13	
6.	Metasternal spine extending well beyond the poste- rior margin of the first abdominal segment; body rarely exceeding 12 mm ----- <i>Tropisternus</i> , p. 10	
	Metasternal spine not attaining the posterior mar- gin of the first abdominal segment; body length usually longer than 12 mm ----- <i>Hydrochara</i> , p. 15	
7(3).	Scutellum a long triangle; head strongly deflexed; middle and hind tibia fringed with long swimming hairs; elytron always linearly deeply punctate -----	8
	Scutellum not greatly elongate; head not strongly deflexed; middle and hind tibia without a fringe of swimming hairs; the elytra may or may not be linearly punctate -----	9
8.	Elytra yellowish brown with fuscus spots; eyes pro- tuberant, front tibia slender; length variable ---- ----- <i>Berosus</i> , p. 16	
	Elytra black, without color markings; eyes not pro- tuberant; front tibia wide at apex; length less than 2.0 mm ----- <i>Derallus</i> , p. 21	
9(7).	Maxillary palpi shorter or not much longer than the antennae, robust; the last segment as long or longer than the penultimate -----	10

	Maxillary palpi longer than the antennae, slender; with the last segment usually shorter than the pen- ultimate -----	16
10.	Elytra without sutural stria; abdomen usually with 6 visible sterna; trochanter of hind leg about one- third as long as the femur; hind tibia curved --- ----- <i>Laccobius</i> , p. 21	21
	Elytra with sutural stria, at least on the apical half; abdomen with five visible sterna; hind trochanters small; hind tibia not curved -----	11
11.	Length 4.5 mm or longer; elytra striate or with rows of punctures -----	12
	Length 3 mm or less; elytra with confused puncta- tion or impunctate (punctures subserially arranged on <i>Crenitus</i>) -----	13
12.	Segments 2-5 of middle and hind tarsi with a fringe of long fine swimming hairs which arise from a series of punctures or a long narrow groove along the upper inner edge of the tarsi (this character is difficult to see on some dried specimens); lateral margins of elytra even ----- <i>Hydrobius</i> , p. 24	24
	Hind tarsi not as above; lateral margins of elytra weakly serrate, at least basally ----- <i>Sperchopsis</i> , p. 26	26
13(11).	Eyes protuberant; form oblong subdepressed----- ----- <i>Crenitis</i> , p. 26	26
	Eyes not protuberant -----	14
14.	Hind tarsal segments united longer than the tibia; mesosternum slightly protuberant; elytra narrowed posteriorly almost from the humerus --- <i>Crenitulus</i> , p. 30	30
	Hind tarsi at most as long as the tibia; form short and convex -----	15
15.	Prosternum not carinate; hind femora densely pu- bescent ----- <i>Anacaena</i> , p. 31	31
	Prosternum longitudinally carinate; hind femora at most sparsely pubescent at base ----- <i>Paracymus</i> , p. 27	27

- 16(9). Tarsal formula 5-5-5, the basal segment may be very small ----- 17
 Tarsal formula 5-4-4 ----- 18
17. Mesosternum with a projecting longitudinal lamina; pseudobasal segment of maxillary palp with concavity on outer side ----- *Enochrus*, p. 31
 Mesosternum with a projecting longitudinal lamina; pseudobasal segment of maxillary palp with concavity on inner side (see Figure 1) ---- *Helochares*, p. 39
- 18(16). Mesosternum with a compressed conical process; maxillary palpi very long and slender; tarsal claws toothed at base in male, less prominently toothed in female ----- *Helocombus*, p. 40
 Mesosternal carina transverse or elevated at the middle, forming a pyramidal, dentiform or transverse protuberance; maxillary palpi not as long, tarsal claws in both sexes simple ----- *Cymbiodyta*, p. 40

Genus *TROPISTERNUS* Solier

This genus contains several species which are very frequently encountered in collections. The genus as a whole presents some difficult taxonomic problems, and in order to simplify the key, only those species which are actually recorded from the state are included. Two additional species may occur in northwestern Virginia, *Tropisternus glaber* (Herbst), which will run out to *T. natator* (D'Orchymont) in the key and *T. mixtus* (LeConte) which will run out to *T. b. blatchleyi* D'Orchymont. These species are discussed in the text of the appropriate species description. Brimley (1938) records both *T. glaber* and *T. mixtus* from North Carolina, but these records are probably in error.

KEY TO THE VIRGINIA SPECIES OF *TROPISTERNUS*

1. Elytra with yellow markings ----- 2
 Elytra completely black ----- 3
2. Yellow markings of the elytra confined to a single narrow stripe on the lateral margin ---- *lateralis nimbatus*
 Elytral markings an alternating pattern of yellow and dark green stripes ----- *collaris striolatus*

- 3(1). Pubescent area at base of hind femur trapezoidal in shape; primarily a brackish water species --- *quadristriatus*
 Pubescent area not trapezoidal, either reduced or with the distal margin curved; fresh water species ----- 4
4. Pubescent area of hind femur reduced, not extending more than one-fifth the length of the femur; legs mostly blackish; average size larger, 9-11 mm ----- *natator*
 Pubescent area larger, covering one-third of hind femur; legs with more reddish coloration; average size smaller, 7-9 mm ----- *blatchleyi blatchleyi*

TROPISTERNUS BLATCHLEYI BLATCHLEYI D'Orchymont

Tropisternus blatchleyi D'Orchymont, 1922, Ann. Soc. Ent. Belgique, 62:26.

Diagnosis: Length 7-9 mm. The smaller size and lack of a lateral pale stripe on the elytra separate this subspecies from all other *Tropisternus* recorded from Virginia except *T. quadristriatus*. The form of the pubescent area on the hind femur, as well as the habitat preference of *T. quadristriatus*, will serve to separate these two species. *Tropisternus mixtus*, which is not recorded from Virginia but may occur here, will run out to *blatchleyi* in key, but according to Wooldridge (1967), it is larger and has more yellow in the legs. *T. b. modestus* may occur in Northern Virginia. It may be recognized by the presence of coarse punctures near the ends of the elytra which are not present in *T. b. blatchleyi*.

Range: Virginia to Florida.

Virginia Records: Dismal Swamp, counties of Campbell, Caroline, Culpeper, Fairfax, Hanover, Patrick, and Stafford, and the City of Chesapeake and City of Virginia Beach. Collections range from February to December.

Habitat Preference: This subspecies seems to prefer shallow lentic situations with thick aquatic vegetation, but may be found in most lentic habitats. It is occasionally found in running water but then only in heavily vegetated areas.

TROPISTERNUS LATERALIS NIMBATUS (Say)

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

Diagnosis: Length 8.5-10 mm. This subspecies may be distinguished from all other Virginia *Tropisternus* by the presence of a single yellow stripe located at the margin of each elytron. The

species is found throughout the North and South American continents but *nimbatus* is the only subspecies in eastern North America.

Range: Found from Canada to Florida and west to Nebraska and eastern Mexico.

Virginia Records: Dismal Swamp, counties of Caroline, Hanover, Highland, Page, Patrick, Rockbridge and Smyth and the City of Chesapeake and City of Virginia Beach. Collections range from March to December.

Habitat Preference: This subspecies is quite abundant in Virginia and can be found in most shallow standing waters. It prefers areas with dense rooted vegetation and may occur in running water if the vegetation at the margin is thick enough.

TROPISTERNUS COLLARIS STRIOLATUS (LeConte)

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

Diagnosis: Length 8.5-11 mm. The variably striped elytra and the bifurcate prosternal carina make for ready identification of this species. It is noticeably larger and more robust than *T. lateralis nimbatus*, the only other *Tropisternus* with yellow on the elytra.

Range: New York to northern Florida.

Virginia Records: Dismal Swamp, counties of Campbell, Fairfax and Hanover and the City of Chesapeake and City of Virginia Beach. Collections range from February to December.

Habitat Preference: Normally found in association with other *Tropisternus*, particularly in shallow standing water with dense aquatic vegetation.

Remarks: Some specimens of this subspecies, particularly those from the Dismal Swamp, appear somewhat darker than the typical *striolatus*; however, they are not as dark as *Tropisternus collaris viridis* Young & Spangler.

TROPISTERNUS NATATOR D'Orchymont

Tropisternus natator D'Orchymont, 1938, Bull. et Ann. Soc. Ent. Belgique. 78:436.

Diagnosis: Length 9-11 mm. This species may be recognized by its relatively broader form, wide mesosternal keel, and solid black elytra. *T. glaber*, which is not recorded from Virginia, will run

out to *T. natator* in the key but may be distinguished by its relatively narrower mesosternal keel.

Range: As now defined, this species ranges from Maine to Michigan and south to Florida.

Virginia Records: Dismal Swamp, counties of Hanover, Patrick, and Smyth and the City of Virginia Beach. Collections range from June to October.

Habitat Preference: This species is uncommon in Virginia and is usually found in association with other members of the genus. It prefers shallow weedy pools or marshes, but is occasionally collected at the margins of large backwaters of streams or rivers.

TROPISTERNUS QUADRISTRIATUS Horn

Tropisternus quadristriatus Horn, 1871, Trans. Amer. Ent. Soc. 3:331.

Diagnosis: Length 9-10.5 mm. The trapezoidal shape of the pubescent area on the hind femur, the yellow markings of the legs which extend up to the pubescent area, and the habitat preference will separate this species from *T. b. blatchlei*, the only other hydrophilid recorded from Virginia with which it might be confused.

Range: Present on both the east and west coasts, in the east ranging from Maine to Florida.

Virginia Records: Recorded from Northampton County, Smith Island (USNM), and from the City of Portsmouth, where it has been collected from Craney Island several times between June and September.

Habitat Preference: This species is confined to the margins of estuaries and to brackish water pools. According to Spangler (personal communication), it is very rarely collected in freshwater ponds near the coast. The author has collected this species from brackish water pools in a large stand of *Phragmites communis* Linn. on Craney Island (Portsmouth).

Genus *DIBOLOCELUS* Bedel

One species of this genus is found in eastern United States. Leng & Mutchler (1918) record a second species from southern Florida, but this has not been substantiated by recent records. Members of this genus are shorter, broader, and more convex than the closely related *Hydrophilus*.

DIBOLOCELUS OVATUS (Gemminger & Harold)

Hydrophilus ovatus Gemminger & Harold, 1868, Catalog. Coleopt. 2 476.

Diagnosis: Length 31-33 mm. The smaller size, ovate appearance and bifurcate prosternal carina will serve to separate this species from *Hydrophilus triangularis*, the only Virginia hydrophilid with which it may be confused.

Range: New York to Michigan and south to Florida.

Virginia Records: A single specimen has been collected from the Stumpy Lake area of City of Chesapeake, Va. (III-29-73; A. G. Michael). In addition, a specimen collected in Washington, D. C. is in the National Museum of Natural History.

Habitat Preference: Young (1954) indicated that in Florida the species is occasionally taken in deep canals with considerable vegetation. Its preference for deep water is probably responsible for the infrequency of collection in Virginia.

Genus *HYDROPHILUS* Geoffrey

This genus is represented in Virginia by a single species, the largest hydrophilid in our fauna.

HYDROPHILUS TRIANGULARIS (Say)

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

Diagnosis: Length 33-37 mm. The large size will separate this species from all Hydrophilidae except the largest specimens of *Dibolocelus ovatus*. It may be separated from that species by the more acuminate form and the closed, hood shaped prosternal process.

Range: New Hampshire to California south to Florida and Texas.

Virginia Records: Collected from the Dismal Swamp, 31 October 1955, J. E. Hatch; Frederick County, 1 mile north of Winchester on Route 11, 8 June 1973, J. F. Matta; Montgomery County, Blacksburg, 4 October 1941, J. M. Grayson; 18-19 May 1966, from light trap (VPI&SU) and the City of Fredericksburg (USNM).

Habitat Preference: Large deep ponds seem to be the preferred habitat. Specimens are occasionally found coming to light. The author has collected a single specimen in a muskrat run leading into a large pool in a stream.

Remarks: McCoy (1969) indicates that in a study of the contents of bullfrog stomachs in an Oklahoma farm pond, this species made up 48% of food taken by the bullfrogs sampled.

Genus *HYDROCHARA* Berthold

A single species of this genus is recorded from Virginia. It might possibly be mistaken for a large *Tropisternus*, but an examination of the metasternal spine should readily separate this genus.

HYDROCHARA OBTUSATA (Say)

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

Diagnosis: Length 14-18 mm. The extremely convex form and intermediate size, larger than any *Tropisternus* yet smaller than *Dibolocelus*, serve to identify this species.

Range: Maine to Florida.

Virginia Records: Dismal Swamp, the counties of Culpeper, Fauquier, Greenville, King George, Patrick (VPI&SU), and Stafford and the City of Portsmouth and City of Virginia Beach. Collections range from March to September.

Habitat Preference: In Virginia, this species seems to be most abundant in rather deep woodland pools which have a thick layer of rotting leaves on the bottom. Malcolm (1971) records the species as being abundant in farm ponds in Maine.

Remarks: While scattered records occur in eastern Virginia, the species seems to be abundant only in woodland pools in the Tide-water area. This may merely reflect the limited collecting that has been done in other areas.

Genus *CHAETARTHRIA* Stephens

A single species of this genus is recorded from Virginia. The members of the genus are littoral rather than aquatic in habitat preference but may be found in aquatic collections.

CHAETARTHRIA PALLIDA (LeConte)

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

Diagnosis: Length 1.5-2.0 mm. The peculiar common excavation of the first and second abdominal segments serves to separate this species from all other Virginia hydrophilids.

Range: New York to Florida.

Virginia Records: Fairfax Co. (USNM)

Habitat Preference: The members of the genus *Chaetarthria* are normally found in moist sand at the edge of running water.

Remarks: Because of their semiaquatic nature, special collecting techniques have been developed for collecting *Chaetarthria*. These include splashing water on the sand with the net or a bucket and netting the beetles as they wash into the water, or pushing the sand into the water and collecting the beetles as they float to the surface.

Genus *BEROSUS* Leach

The genus *Berosus* is composed of a distinctive group of convex species, normally yellow brown to dark brown in color, with the elytra striate and punctate. Most species are strong swimmers and are able to dive from the surface of the water, a characteristic shared only by the Hydrophilinae and *Laccobius*. They are normally associated with shallow water which has rooted aquatic vegetation, but may occasionally be found in areas with no living vegetation but with accumulated detritus. There are five species recorded in Virginia, but four additional species have been recorded from adjacent states and may occur here. The subfamily Berosinae has been recently reviewed by Van Tassel (unpublished doctoral dissertation).

KEY TO THE VIRGINIA SPECIES OF *BEROSUS*

1. Emargination of fifth abdominal segment with two small teeth ----- 5
 Emargination of fifth abdominal segment with one tooth or lobe or truncate ----- 2
2. Emargination of fifth abdominal sternum truncate or with a slightly rounded projection; less than 3 mm in length ----- *exiguus*
 Emargination of fifth abdominal segment with a single tooth, length greater than 3 mm ----- 3
3. Apices of elytra produced, each usually with a tubercle before the apex ----- *aculeatus*
 Apices of elytra rounded but never produced; tubercle never present ----- 4
4. Each elytron with ten black spots, eyes very large, width $\frac{1}{2}$ interocular distance or more ----- *pantherinus*

- Each elytron with at most six brown spots, eyes smaller, only about $\frac{1}{3}$ interocular distance in width ----- *peregrinus*
5. Striae of elytra very fine, usually not impressed on base; male pronotum, female pronotum and elytra alutaceous ----- *infuscatus*
 Striae larger, usually impressed at base, male pronotum usually shining, female alutaceous at sides only ----- 6
6. Setigerous punctures of intervals, 3, 5, and 7 larger than strial punctures; female elytra usually strongly alutaceous ----- *fraternus*
 Setigerous punctures of intervals, 3, 5, and 7 as large as or smaller than the strial punctures; female elytra shining or only lightly alutaceous ----- 7
7. Apices of elytra slightly divergent, forming a rounded angle ----- *corrini*
 Apices of elytra evenly rounded at suture, not forming an angle or with a small tooth at suture in some females --- 8
8. Punctures of pronotum and elytra with anterior margins moderately to strongly scabrous, no minute spines present at the apex of the female elytra ----- *ordinatus*
 Punctures of pronotum and elytra not scabrous, a minute spine present continuous with the suture in many females ----- *striatus*

BEROSUS ACULEATUS LeConte

Berosus aculeatus LeConte, 1855, Proc. Acad. Nat. Sci. Phila. 7:863.

Diagnosis: Length 4.0-5.0 mm. The elongate, acutely pointed elytral apices, which often bear a small tubercle, serve to separate this species from other Virginia *Berosus*. It may be easily confused with *B. peregrinus*, but in *aculeatus* the elytral apices are longer and the tubercle usually present.

Range: Eastern North America from Canada to Florida.

Virginia Records: Dismal Swamp, counties of Culpeper, Fauquier Patrick, and Stafford and the City of Chesapeake and City of Portsmouth. Collected only in July and August.

Habitat Preference: This species appears to be most abundant in the Piedmont area along the margins of slow moving streams

or in the backwaters associated with the faster streams. It appears less frequently in the coastal areas, generally in shallow areas having dead vegetation and other detritus on the bottom.

***BEROSUS CORRINI* Wooldridge**

Berosus corrini Wooldridge, 1964, Coleopt. Bull. 18:99.

Diagnosis: Length 6.0 mm. The larger size, hooded mesosternal crest and shining elytra will separate *B. corrini* from other Virginia *Berosus*.

Range: North Carolina, south to Florida, and west to Mississippi.

Virginia Records: While there are no Virginia records of this species, it is recorded from North Carolina, and may eventually be found in southeastern Virginia.

***BEROSUS EXIGUUS* (Say)**

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

Diagnosis: Length 2.1-2.2 mm. This small size in combination with the generic characters will allow ready identification of this species.

Range: New York to Florida.

Virginia Records: Collected from the Dismal Swamp (9 and 30 July 1970, J. F. Matta) and the City of Portsmouth (11 July 1970 J. F. Matta) and City of Virginia Beach (28 October 1970, J. F. Matta).

Habitat Preference: This species is occasionally found in the debris at the margins of large rainwater pools but does not appear to be common in Virginia. It was collected in large numbers in the debris at the margin of the upper portion of Currituck Sound, Currituck Co., North Carolina. This is a slightly brackish area.

***BEROSUS FRATERNUS* LeConte**

Berosus fraternus LeConte, 1855, Proc. Acad. Nat. Sci. Phila. 7:366.

Diagnosis: Length 5.5 mm. The strongly impressed elytral striae and rounded elytral apices in addition to other characters presented in the key will separate this species from other species of *Berosus* occurring in Virginia.

Range: Northern United States and Canada south to Tennessee and southern California.

Virginia Records: The author has seen no Virginia material; however, since *fraternus* has been recorded from states surrounding Virginia, it undoubtedly occurs here.

Habitat Preference: This is apparently a lentic species which is usually associated with waters containing large quantities of detritus.

BEROSUS INFUSCATUS LeConte

Berosus infuscatus LeConte, 1855, Proc. Acad. Nat. Sci. Phila. 7:365.

Diagnosis: Length 6.0 mm. The presence of two small teeth at the apical emargination of the fifth abdominal sternum and the fine, lightly impressed elytral striae, along with the alutaceous male pronotum and female pronotum and elytra, will separate *B. infuscatus* from other Virginia *Berosus*.

Range: Virginia to Florida, west to California and Mexico.

Virginia Records: Dismal Swamp and City of Chesapeake, City of Virginia Beach, and the cities of Norfolk and Portsmouth. Collections range from May to November.

Habitat Preference: The commonest species of *Berosus* in southeastern Virginia, this species occurs in a wide variety of lentic situations. Young (1954) records it from brackish waters in the Florida Keys; however, it has not yet been collected in brackish waters in Virginia.

BEROSUS ORDINATUS LeConte

Berosus ordinatus LeConte, 1855, Proc. Acad. Nat. Sci. Phil. 7:365.

Diagnosis: Length 6.0 mm. The scabrous margins of the elytral punctation will separate *B. ordinatus* from other Virginia *Berosus*.

Range: Massachusetts to Florida, west to Minnesota and Alabama.

Virginia Records: Not recorded from Virginia; however, since the state is in the center of its range, it may be expected here.

Habitat Preference: The species is apparently not common, and no information is available to the author concerning habitat preference.

BEROSUS PANTHERINUS LeConte

Hydrophilus peregrinus Herbst, 1797, Natursystem Insketen. 7:314.

Diagnosis: Length 5.0 mm. The large eyes and the presence of ten black spots on each elytron will serve to distinguish this species from other *Berosus* species.

Range: As now defined *B. pantherinus* ranges from West Virginia to Illinois and south to Texas.

Virginia Records: Not recorded from Virginia; however, since it is recorded from West Virginia and northeastern Tennessee, it is probable that it will occur in the western tip of the state, probably associated with ponds near the Clinch and Holston rivers and their tributaries.

BEROSUS PEREGRINUS (Herbst)

Hydrophilus peregrinus Herbst, 1797, Natursystem Insekten. 7:314.

Diagnosis: Length 4.5 mm. This species is similar to *B. aculeatus* but may be separated by the lack of a tubercle at the apex of each elytron (usually present in *aculeatus*), the pointed but not prolonged elytral apices, and the larger and more irregularly spaced pronotal punctation.

Virginia Records: Recorded from the Dismal Swamp (6 May 1970, J. F. Matta), the counties of Culpeper (Kelly's Ford, 30 May 1972 & 12 August 1972, J. F. Matta), and Stafford (Horse Pen Run, 11 August 1972, J. F. Matta) and the City of Norfolk, 10 June 1971, J. F. Matta.

Habitat Preference: Wooldridge (1967) notes that *peregrinus* prefers small streams but can be found in quiet situations. In the Dismal Swamp region it has been collected from the margin of Washington Ditch—a slow-flowing nonacid stream—and from a woodland pool.

BEROSUS STRIATUS (Say)

Hydrophilus striatus Say, 1825, Jour. Acad. Nat. Sci. Phila. 5:188.

Diagnosis: Length 6.5 mm. The presence of a minute tooth at the apex of each elytron of the female will separate this species from all other *Berosus* occurring in Virginia; however, on occasional specimens the tooth is reduced or absent.

Range: Canada to Florida, west to California.

Virginia Records: The city of Portsmouth: a large pool beside Route 13, 1 mile south of the Norfolk city line, 11 July 1970, J. F. Matta.

Habitat Preference: Found at the margin of deeper waters, particularly those with large amounts of detritus at the margins. It appears to prefer sand bottom habitats.

Genus *DERALLUS* Sharp

Only one species of *Derallus* occurs in eastern United States, although two additional species are known from Mexico and South America.

DERALLUS ALTUS (LeConte)

Berosus altus LeConte, 1855, Proc. Acad. Nat. Sci. Phila. 7:366.

Diagnosis: Length 1.8 mm. The small size, dark color, convex form, and the rows of punctures on the elytra, as well as the generic characters, serve to make this species distinct from all other Hydrophilidae.

Range: New Jersey to Florida and the West Indies, west to Texas.

Virginia Records: City of Chesapeake (15 June 1972, J. F. Matta) and City of Virginia Beach (15 July 1972, J. F. Matta).

Habitat Preference: The majority of the Virginia material has been collected from the Northwest River in grass and debris at its margins. It has also been collected, but with less frequency, in brackish waters (2-5% seawater) in Currituck Sound, North Carolina, in the grass and debris at the margin of the sound.

Genus *LACCOBIUS* Erichson

This genus is primarily northern in distribution; however, two species and possibly a third are found in Virginia. Identification is based primarily on male genitalia, and the identification of unasociated females is quite difficult.

KEY TO THE *LACCOBIUS* MALES OF VIRGINIA *

1. Parameres of male genitalia with a strongly recurved lobe on the ventral inner surface (Fig. 2, b) ----- *reflexipenis*

* (Modified from Malcolm, 1971).

Parameres not as above ----- 2

2. Parameres spatulate at their tips, broadening slightly towards the tip (Fig. 2, a) ----- *agilis*
Parameres not spatulate, narrow throughout their length (Fig. 2, c) ----- *minutoides*

LACCOBIUS AGILIS (Randall)

Hydrophilus agilis Randall, 1838, Bost. J. Nat. Hist. 2:19.

Diagnosis: Length 2.5-2.7 mm. The form of the male genitalia is used to identify this species (see Fig. 2, a).

Range: Maine to Oregon, south to Virginia.

Virginia Records: Recorded from Stafford County (11 August 1972, J. F. Matta).

Habitat Preference: This species occurs at the margins of running water in Virginia. Wooldridge (1967) indicated that it prefers the margins of lakes and streams where the bottom is sandy.

LACCOBIUS MINUTOIDES D'Orchymont

Laccobius minutoides D'Orchymont, 1942, Bull. Mus. Roy. Hist. Nat. Belgique. 18:10.

Diagnosis: Length 2.6-2.7. This species must be identified on the basis of the male genitalia (see Fig. 2, c).

Range: Maine to Missouri south to South Carolina.

Virginia Records: Recorded from the counties of Fairfax (Ash Grove, D'Orchymont, 1942), Fauquier (USNM), Greene, Lee (Pennington Gap, USNM) and Stafford. Collection dates range from May to August.

Habitat Preference: This species is also found at the margins of streams.

LACCOBIUS REFLEXIPENIS (Malcolm)

Laccobius reflexipenis Malcolm, 1971, The Water Beetles of Maine . . . Univ. Maine Tech. Bull. 48:40.

Diagnosis: Length 2.5-2.7 mm. The form of the male genitalia must be used to identify this species (see Fig. 2, b).

Range: Maine to Maryland, west to Missouri and Wyoming.

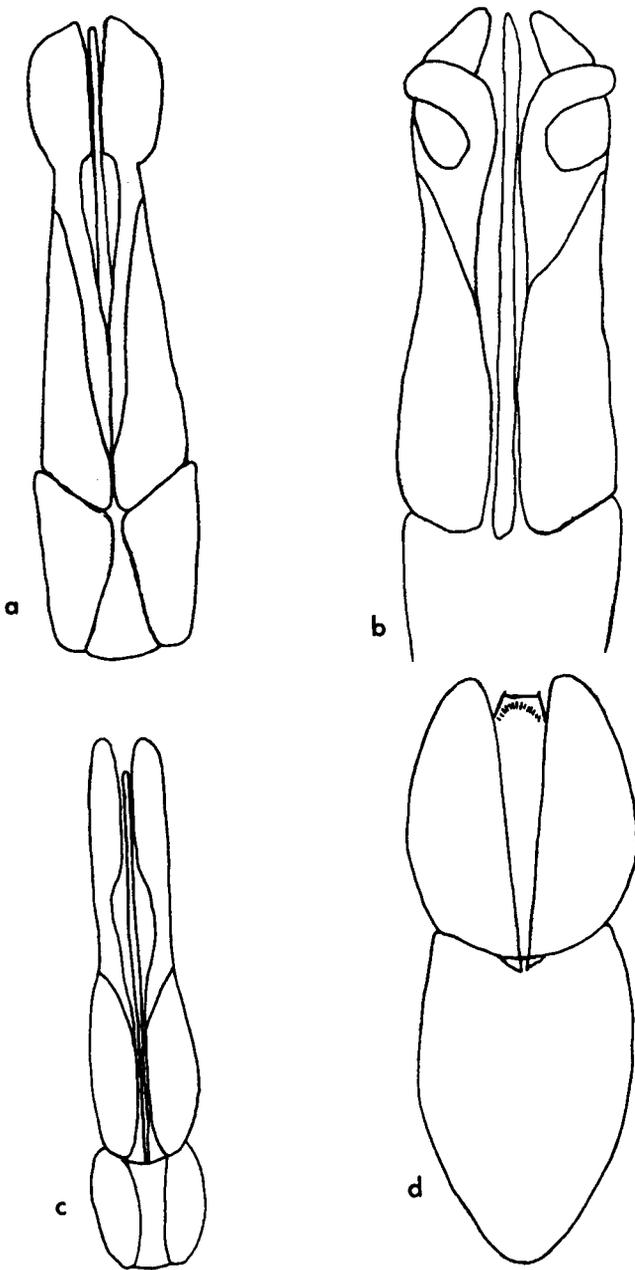


Figure 2. Male genitalia: a) *Laccobius agilis*; b) *L. reflexipenis* (after Malcolm, 1971); c) *L. minutoides*; d) *Crenitulus suturalis*.

Virginia Records: No Virginia records are available; however, Dr. Paul Spangler has collected a specimen in Wolfville, Maryland, and the species probably occurs in northern Virginia.

Habitat Preference: The author has no information on the habitat of this species.

Genus *HYDROBIUS* Leach

Three species of this genus occur in eastern United States, and all three are found in Virginia. The genus is easily recognized; the convex form, moderately large size, and fringe of long swimming hairs on the hind tarsi are characteristic. Often the swimming hairs are flattened against the tarsi and are difficult to see. The author has found that a drop of alcohol placed on the tarsus makes the hairs stand out and will remove all doubt about their presence.

KEY TO THE VIRGINIA SPECIES OF *HYDROBIUS* *

1. Elytra with well-marked striae; form oblong ----- *fuscipes*
Elytra with rows of punctures but without well-marked
striae; form more convex ----- 2
2. Hind femur densely punctate and pubescent at base and
along the upper border; normally associated with lotic
situations ----- *metaenus*
Hind femora closely punctate but not pubescent at base;
normally associated with lentic situations ----- *tumidus*

HYDROBIUS FUSCIPES Linnaeus

Dytiscus fuscipes Linnaeus, 1767, Systema Nat. Ed. 12, Vol. 1, p. 411.

Diagnosis: Length 7.0-8.0 mm. The deeply impressed striae serve to separate this species from other members of the genus.

Range: Canada; Maine to California, south to Virginia.

Virginia Records: Richmond (Winters, 1926).

Habitat Preference: Winters (1926) records the species as being common in standing water from early spring to fall. Wooldridge (1967) indicated that it prefers standing water with much debris. It is apparently rare in Virginia which probably represents the extreme southern limit of its range. A large series of this species

* (Modified from Winters, 1926).

has been collected from a mountain bog at Cranberry Glades, West Virginia. The apparent rarity may be due to a failure to collect the proper habitats in Virginia.

HYDROBIUS MELAENUS (Germar)

Sphaeridium melaenum Germar, 1824, Insectorum Species Illustratae p. 96.

Diagnosis: Length 7.0-8.0 mm. Its globose form in addition to the characters presented in the key, make this species an easily recognized one. It is much more convex than any other hydrophilid in its size range, except *H. tumidus*.

Range: The author has seen records from Maine to Indiana and south to Virginia. Brimley (1938) records it from North Carolina, and it undoubtedly also occurs in the Piedmont regions of South Carolina.

Virginia Records: *H. melaenus* is recorded from the counties of Alexandria, Campbell, Fairfax, Greene and Hanover. Collections range from June to September.

Habitat Preference: This is a running-water species and is often found under logs or in other areas in which some protection is afforded from the direct force of the current.

Remarks: This species appears in the older literature as *Hydrobius globosus* Say; however, as is shown by D'Orchymont (1919) Germar's name has priority.

HYDROBIUS TUMIDUS LeConte

Hydrobius tumidus LeConte, 1855, Proc. Acad. Nat. Sci. Phila. 7:372.

Diagnosis: Length 8.0 mm. *H. tumidus* may be distinguished from *H. melaenus* by its less convex form and from *H. fuscipes* by the lightly impressed striae and more compact form.

Range: Recorded from Maine, west to Indiana, and south to northern Florida.

Virginia Records: The City of Virginia Beach (Seashore State Park, 27 March 1971, H.F.P.)

Habitat Preference: Young (1954) states that it is probably characteristic of woodland detritus ponds. The only specimen collected from Virginia is from a woodland pool in Seashore State Park.

Genus *SPERCHOPSIS* LeConte

A monotypic genus which is widely distributed in eastern North America.

SPERCHOPSIS TESSELLATUS Ziegler

Sperchopsis tessellatus Ziegler, 1884, Proc. Acad. Nat. Sci. Phila. 2:44.

Diagnosis: Length 7.0 mm. The generic characters and the dark-brown coloration sufficiently characterize this species.

Range: Canada to Florida and west to Illinois.

Virginia Records: Bath County (12 June 1973, J. F. Matta); Fredericksburg (Spangler, 1961); Mount Vernon (Spangler, 1961); Page County (Skyline, USNM).

Habitat Preference: This is definitely a lotic species. It may be found at the margins of sand-bottom streams, generally under overhanging roots and in similar areas.

Remarks: The biology and larval stages and distribution of this species are discussed by Spangler (1961).

Genus *CRENITIS* Bedel

The author has seen no Virginia *Crenitis*, and no records appear in the literature. Leng (1920) records *Crenitis monticola* (Horn) from Pennsylvania, however, and this species may occur in Virginia. Winters (1926) has indicated that all members of the genus are confined to mountainous areas.

CRENITIS MONTICOLA (Horn)

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

Diagnosis: Length 2.5-3.5 mm. The generic characters will suffice for the identification of this species.

Range: New Hampshire to Pennsylvania.

Virginia Records: None.

Habitat Preference: Winters (1926) indicates that this species occurred in the debris of a mountain spring in Woodstock, Vermont.

Genus *PARACYMUS* Thomson

The minute glossy black beetles which comprise this genus present a severe taxonomic problem because of their small size and lack of definitive characters. Positive identification must be based on male genitalia. Their tendency to "play dead," their small size, and their thigmotropic habit result in many specimens being lost simply because the collector does not see them. While four species are recorded in Virginia and surrounding areas, it is possible that others are present, and Wooldridge's (1966) revision of the genus should be consulted if problem specimens are found.

A KEY TO THE VIRGINIA SPECIES OF *PARACYMUS* *

1. Mesosternum with the lamina bisecting the transverse ridge and continuing anterior to it ----- 2
Mesosternum with the lamina reduced, not reaching the transverse ridge ----- 3
2. Punctuation coarse and close, male genitalia as in Figure 3, c ----- *confluens*
Punctuation fine, especially on the pronotum, male genitalia as in Figure 3, b ----- *nanus*
3. Pronotal punctuation more reduced than that of elytra, average length 2.0-2.1; male genitalia as in Figure 3, a ----- *confusus*
Punctuation of pronotum and elytra similar, average length 2.3-2.5 m; male genitalia as in Figure 3, d ----- *subcupreus*

PARACYMUS CONFLUENS Wooldridge

Paracymus confluens Wooldridge, 1966, J. Kans. Ent. Soc. 39:716.

Diagnosis: Length 2.2 mm. The complete laminate mesosternum and the larger size will separate *P. confluens* from other *Paracymus* found in Virginia. The form of the male genitalia is also of use (Fig. 3, c).

Range: Washington, D. C. to Massachusetts, west to Michigan.

Virginia Records: None; however, Wooldridge (1966) records three specimens from Washington, D. C.

* (Modified from Wooldridge, 1966).

Habitat Preference: No information is available to the author concerning this species. If it is typical of the genus then one would expect to find it in detritus pools or shallow weedy pools.

PARACYMUS CONFUSUS Wooldridge

Paracymus confusus Wooldridge, 1966, J. Kans. Ent. Soc. 39:719.

Diagnosis: Length 2.0 mm. The incomplete mesosternal lamina and eight-segmented antennae separate this species from all Virginia *Paracymus* except *subcupreus*. It may be separated from *subcupreus* by the smaller average size and the form of the male genitalia (Fig. 3, a).

Range: Mexico and California to Florida and the West Indies; north to Idaho and Virginia.

Virginia Records: Dismal Swamp, counties of Caroline, Orange (Somerset, Wooldridge, 1966) and Smyth and the City of Chesapeake and City of Virginia Beach. Collections range from June to August.

Habitat Preference: Associated with detritus at the margin of lentic situations. Large numbers were removed from a flooded tire-track in a meadow in Smyth County.

PARACYMUS NANUS (Fall)

Creniphilus ellipsus var. *nanus* Fall, 1910, Trans. Amer. Ent. Soc. 36:99.

Diagnosis: Length 1.8 mm. The completely laminate mesosternum and small size will separate this species from other Virginia *Paracymus*. The male genitalia are illustrated in Figure 3, b.

Range: Virginia to Florida and the Bahamas west to Louisiana.

Virginia Records: Accomac County (Cross, 1972) and the City of Virginia Beach (23 September 1972, J. F. Matta).

Habitat Preference: This species is apparently confined to the coastal plain. Specimens in the Old Dominion University Collection are from shallow rainwater pools of the Back Bay National Wildlife Refuge. Specimens have also been collected at the margin of Currituck Sound, Currituck Co., North Carolina.

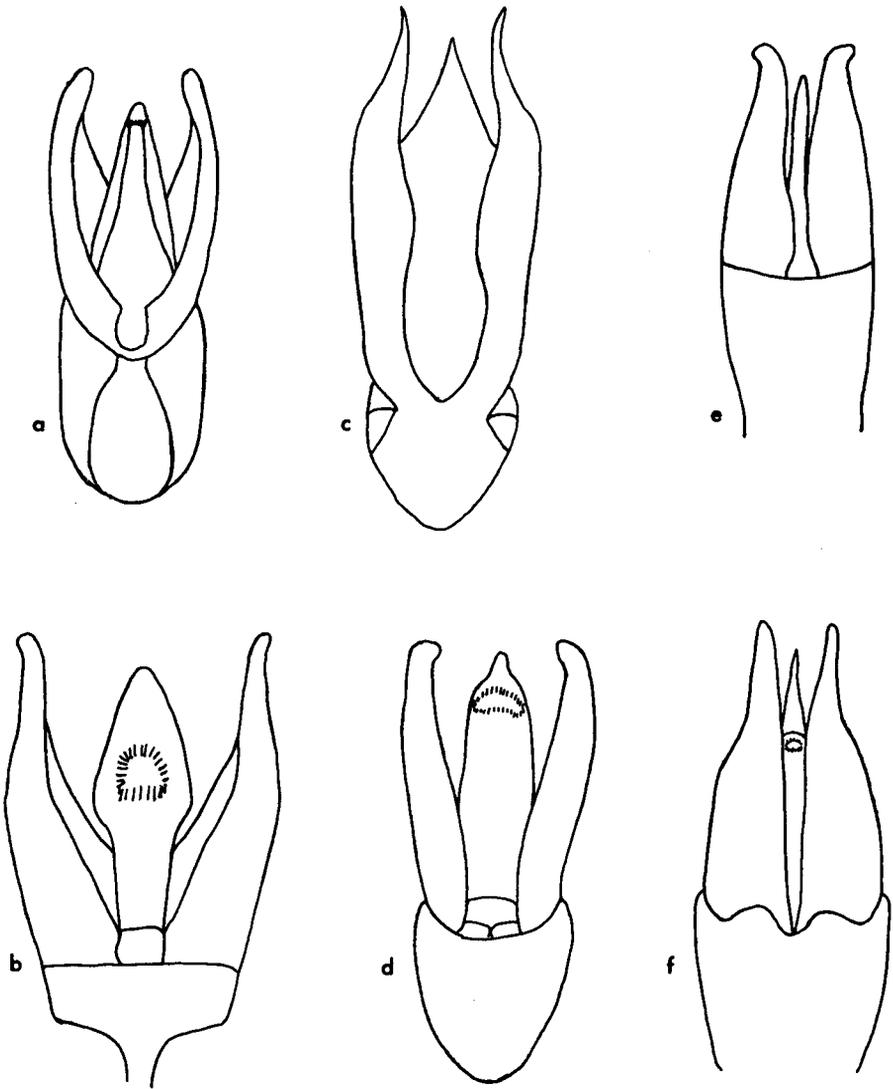


Figure 3. Male genitalia: a) *Paracymus confusus*; b) *P. nanus*; c) *P. confluens* (after Wooldridge, 1966); d) *P. subcupreus*; e) *Enochrus consors*; f) *E. sublongus*.

PARACYMUS SUBCUPREUS (Say)

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

Diagnosis: Length 2.3 to 2.5 mm. The mesosternal lamina is incomplete in this species and does not bisect the transverse projection. This, in combination with the larger size will serve to separate it from other species of *Paracymus* in Virginia. In addition, the dorsum usually has a cupreous reflection which other species sometimes lack. The male genitalia are illustrated in Fig. 3, d.

Range: This species (as redefined by Wooldridge, 1966) ranges from Maine to British Columbia and south to Florida and Colorado.

Virginia Records: Dismal Swamp (30 July 1970, J. F. Matta), counties of Page (Luray, 5 July 1972, J. F. Matta) and Smyth (Hungry Mother State Park, 6 August 1972, J. F. Matta).

Habitat Preference: Our most abundant *Paracymus*, the species prefers shallow lentic situations and usually is found in accumulated leaf litter and other detritus at the margins of pools.

Remarks: This and other small species of Hydrophilidae often will "play dead" in the masses of debris scooped up in the collecting net and are consequently quite difficult to pick out; however, they begin to move and attempt to take flight as the material dries. Specimens of *P. subcupreus* separated from the debris are quick to take flight.

Genus *CRENITULUS* Winters

This monotypic genus is included in *Anacaena* by Arnett (1960) but would appear to be sufficiently distinct to justify separate generic rank. It is most easily confused with the genus *Paracymus*, but the distinctive narrowing of the body in *Crenitulus* should be sufficient to separate the two.

CRENITULUS SUTURALIS (LeConte)

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

Diagnosis: Length 1.7-2.1 mm. The small size, piceous nonmetallic dorsum, distinctive shape and the yellow lateral margins of the elytra serve to make this an easily identified species. The narrowing of the body from the base of the elytra to apices makes a good character for field identification. The male genitalia are illustrated in Figure 2, d.

Range: Canada to Florida.

Virginia Records: Counties of Caroline, Green, Nelson and Smyth and the cities of Richmond (Winters, 1926) and Virginia Beach. Collections range from June to August.

Habitat Preference: Most abundant in the Piedmont and mountainous regions. Young (1954) indicates that it is abundant in streams in Florida and is more rarely found in lentic situations. Most Virginia material was collected in lentic situations associated with streams, flood pools, backwaters, and swampy margins.

Remarks: Extensive collecting in the Tidewater area has produced only one specimen of *C. suturalis*—the Virginia Beach record—which was collected from the grassy margin of an impounded marsh in the Back Bay National Wildlife Refuge.

Genus *ANACAENA* Thomson

Only a single species of this genus has been recorded from the northeastern United States, and while it is recorded as common in several states, it does not appear to be abundant in Virginia.

ANACAENA LIMBATA (Fabricius)

Hydrophilus limbatus Fabricius, 1792.

Diagnosis: Length 2.5 mm. The generic characters are sufficient to characterize this species.

Range: Alaska and Canada, south to California and Virginia.

Virginia Records: Page County (Big Meadows Swamp, 5 July 1972, J. F. Matta).

Habitat Preference: The Virginia specimens are from the grassy margins of a stream flowing from Big Meadows Swamp in the Shenandoah National Park.

Remarks: This species may be more abundant in Virginia than the present records indicate since collections from the northwestern area of the state are quite limited.

Genus *ENOCHRUS* Thomson

This genus is one of the major components of the hydrophilid fauna in Virginia. The eleven species which are recorded from the state show a variety of habitat preferences which range from wood-

land pools to fast flowing streams to brackish water areas. In some collections the *Enochrus* are the principal coleopteran present, but few aquatic collections are made which do not contain at least one species of the genus.

They are poor swimmers and are unable to dive, but must crawl down a stem or piece of detritus to leave the water surface. Dislodged from the bottom, the bubble of air under the elytra causes them to float to the surface. Most species are most likely to be found in weedy areas with large quantities of accumulated detritus. Many also seem to show a preference for algae.

KEY TO THE VIRGINIA SPECIES OF *ENOCHRUS*

1. Last abdominal sternum usually distinctly emarginate, with a fringe of stiff golden cilia in the emargination; or if the emargination is indistinct, the fringe is present ----- 2
 Last abdominal segment not marginate, with no fringe ----- 10
2. Prosternum carinate ----- 3
 Prosternum not carinate ----- 4
3. Epipleura pale except for medial edges, mesosternal crest an elongate triangle, protarsal claws of male not distinctly enlarged ----- *Enochrus* sp.
 Epipleura dark, mesosternal crest a short triangle, protarsal claws of male distinctly enlarged -----
 ----- *pygmaeus nebulosus*
- 4(2). Color dark or black with only the sides of the thorax and the corners of the clypeus paler ----- 5
 Color yellow or brown, the center of the thorax may be darker, and occasional specimens of *ochraceus* may be dark ----- 8
5. Last abdominal sternum with the notch poorly defined ----- *perplexus*
 Last abdominal sternum with the notch defined but sometimes shallow ----- 6
6. Mesosternal crest undercut at the posterior end; protarsal claws of male not enlarged ----- *cinctus*

- Mesosternal crest not undercut; protarsal claws of male greatly enlarged ----- 7
7. Edge of thorax and elytra brown to yellow; palpi yellow or brown; clypeal emargination smoothly rounded ----- *consortus*
 Edge of thorax and elytra darker, palpi darker, clypeal emargination straight at center ----- *consors*
- 8(4). Mesosternal crest larger, triangular or rectangular with a definite anterior angle ----- *blatchleyi*
 Mesosternal crest small and rounded, with no definite anterior angle ----- 9
9. Epipleura pale; abdominal notch small but deep ----
 ----- *sublongus*
 Epipleura dark; abdominal notch larger and shallower ----- *ochraceus*
- 10(1). Center of elytra black; fringe of golden cilia at tip of the abdomen ----- *perplexus*
 Center of elytra brown to yellow, cilia absent ----- 11
11. Center of pronotum yellow; posterior edges of elytra reflexed and expanded ----- *reflexipennis*
 Center of pronotum dark; elytra not reflexed ----- 12
12. Preclypeus visible in emargination of clypeus; dorsal surface yellow brown; an inland species ----- *horni*
 Preclypeus not visible; dorsal surface darkened brown; coastal species ----- *hamiltoni*

***ENOCHRUS BLATCHLEYI* Fall**

Philydrus blatchleyi Fall, 1924, J. New York Ent. Soc. 32:85.

Diagnosis: Length 3.5 mm. The brown coloration, size, lack of a prosternal carina and well-developed mesosternal crest should be sufficient to characterize this species.

Range: Massachusetts to Florida, west to Illinois and Texas. (Gunderson, 1967).

Virginia Records: The author has seen no Virginia records but *blatchleyi* should occur here.

Habitat Preference: Young (1954) indicates that his species is characteristic of detritus ponds.

ENOCHRUS CONSORS LeConte

Philydrus consors LeConte 1863, Smiths. Misc. Coll. 6:24.

Diagnosis: Length 7.0-8.0 mm. In addition to the characteristics presented in the key the form of the male genitalia may be used to separate this species from the closely related *E. consortus* (see Figure 3, e).

Range: Canada to Florida, west to Minnesota and Louisiana.

Virginia Records: This species is not recorded from Virginia, but it should occur here. It is recorded from North Carolina (Brimley, 1938).

Habitat Preference: Young (1954) indicates that it is most often taken in permanent lentic situations where algae and emergent vegetation are abundant.

ENOCHRUS CONSORTUS Green

Enochrus consortus Green 1946, Trans. Amer. Ent. Soc. 72:62.

Diagnosis: Length 6.0-7.5 mm. The larger size, piceous pronotum and elytra, with pale lateral margins, and the toothed protarsal claw of the male are characteristic of this species and will serve to separate it from all other Virginia *Enochrus*. The male genitalia are also useful in identifying this species (see Figure 4, e).

Range: Maine to Florida, west to Washington.

Virginia Records: Dismal Swamp, the counties of Culpeper (Kelly's Ford) and Stafford (Horse Pen Run) and the City of Virginia Beach (Gundersen, 1967). Collections range from May to August.

Habitat Preference: This species is not common in Virginia but appears to be found most often in pools having a layer of detritus on the bottom. It is definitely a lentic species, although it may be found in pools adjacent to streams.

ENOCHRUS HAMILTONI (Horn)

Philydrus hamiltoni Horn, 1890, Trans. Amer. Ent. Soc. 17:243, 249.

Diagnosis: Length 4.5-6.0 mm. The size, yellow-brown coloration, shallowly excavated clypeus, and the lack of an emargination

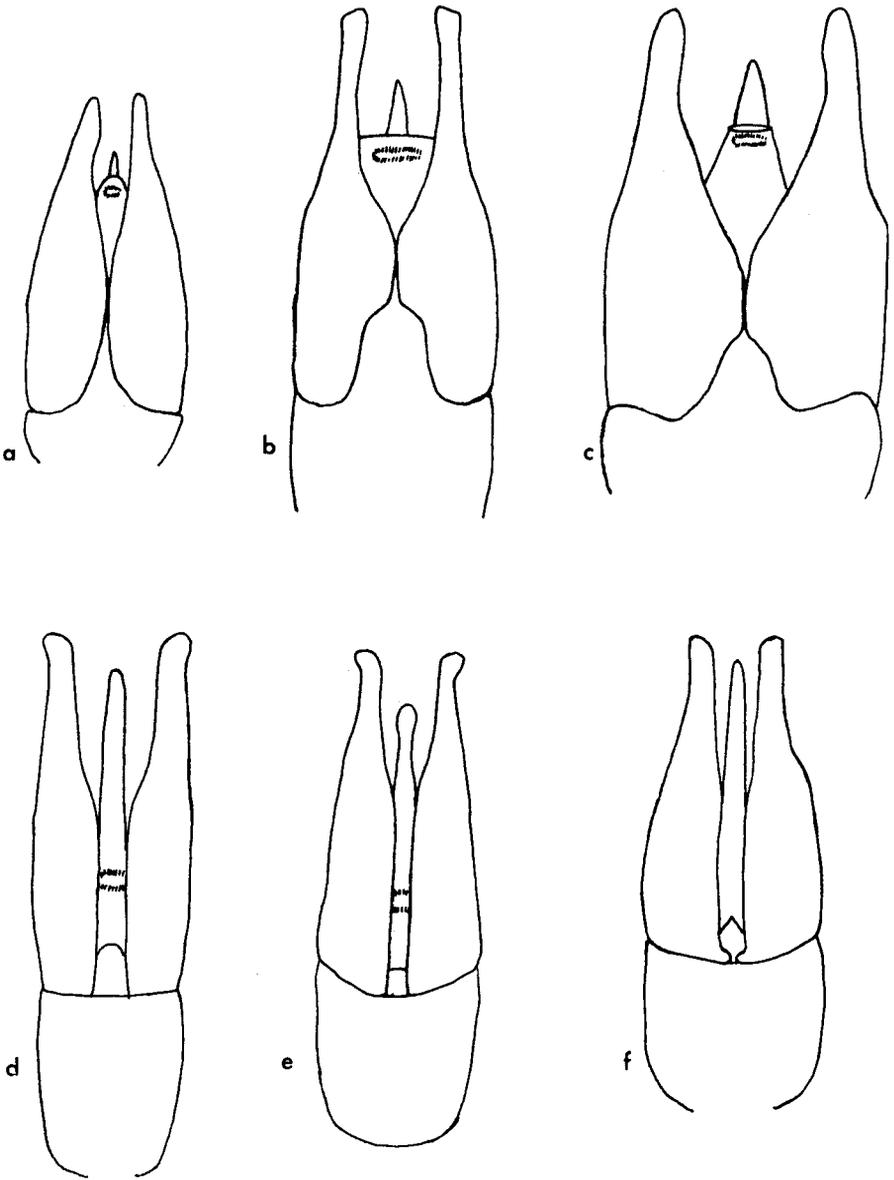


Figure 4. Male genitalia: a) *Enochrus pygmaeus nebulosus*; b) *E. hamiltoni*; c) *E. ochraceus*; d) *E. cinctus*; e) *E. consortus*; f) *E. perplexus*.

on the fifth abdominal sternum will separate *E. hamiltoni* from other Virginia *Enochrus*. Male genitalia are illustrated in Figure 4, b.

Range: Canada to Florida on the East Coast. Oregon to Mexico on the West Coast.

Virginia Records: The City of Norfolk (13 March 1971, D. Bryant) and City of Virginia Beach (15 July through 20 November, J. F. Matta).

Habitat Preference: This is a salt-marsh and brackish-water species. It may be found along the margins of estuaries and marshes in areas protected from wave action in which detritus accumulates.

ENOCHRUS HORNI Leech

Enochrus horni Leech, 1949, Wasmann Coll. 7:250.

Diagnosis: Length 4.5-6.0 mm. The exposed preclypeus, coloration, lack of a notch or line of hairs in the fifth abdominal sternum, and the general habitat preference will serve to separate *E. horni* from other Virginia *Enochrus*.

Range: Canada to Pennsylvania, west to California.

Virginia Records: The author has seen no Virginia specimens, but *horni* may occur here.

Habitat Preference: An inland species. Leech (1949) indicates that it rarely occurs close enough to the coast to be taken with *E. hamiltoni* which it closely resembles. It is apparently a species of inland detritus pools.

ENOCHRUS OCHRACEUS (Melsheimer)

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

Diagnosis: Length 2.7-3.8 mm. The small size and yellow-brown color will distinguish this common species from most other Virginia *Enochrus*. The dark-colored epipleura and the form of the male genitalia (Fig. 4, c) must be used to separate it from the closely allied *Enochrus sublongus*.

Range: Maine to Florida, west to Texas.

Virginia Records: Dismal Swamp, the counties of Culpeper, Page, Patrick, Pittsylvania, Smyth, Stafford, and Warren and the City of Richmond, City of Chesapeake and City of Virginia Beach. Collections range from February to November.

Habitat Preference: This small species is widespread and locally abundant. Large numbers have been collected among rotting leaves in drying woodland pools at Seashore State Park in Virginia Beach. Though preferring lentic situations, it is also frequently found at the margins of streams and rivers.

ENOCHRUS PERPLEXUS (LeConte)

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

Diagnosis: Length 4.0-5.5 mm. The piceous elytra without pale lateral margins, the untoothed male protarsal claw, and the lack of a distinct notch at the margin of the fifth abdominal sternum will separate *E. perplexus* from other Virginia *Enochrus*. The male genitalia are illustrated in Figure 4, f.

Range: Canada to Florida and west to Texas.

Virginia Records: Counties of Culpeper, Lee, Nansemond, Nelson, and Smyth and the City of Virginia Beach. Collections range from March to October.

Habitat Preference: Numerous specimens of this species have been collected from a temporary pool in a meadow near Hungry Mother State Park. Specimens have also been taken from woodland pools and from lentic situations associated with streams. This species flies readily when removed from water.

ENOCHRUS PYGMAEUS NEBULOSUS (Say)

Hydrophilus nebulosus Say, 1824, Appendix 2:277.

Diagnosis: Length 3.5-5.0 mm. The carinate prosternum and the shape of the mesosternal crest will separate this species from other Virginia *Enochrus*. The male genitalia are illustrated in Figure 4, a.

Range: The *pygmaeus* complex occurs throughout the Nearctic region. The Virginia subspecies ranges from Canada to Virginia, west to Missouri and Texas.

Virginia Records: Counties of Augusta, Culpeper, Fairfax, Frederick, Nelson, Page, Smyth, and Stafford. Collections range from August to October.

Habitat Preference: The Virginia material was all collected in association with running water but generally in lentic situations such as rock pools, backwaters and sheltered areas. Specimens were usually associated with rotting leaves and other plant debris.

Remarks: See Leech (1948) for a review of the *pygmaeus* complex and a discussion of the involved synonymy and Gundersen (1967) for a recent review of the complex.

ENOCHRUS CINCTUS (Say)

Hydrophilus cinctus Say, 1824, Appendix 2:276.

Diagnosis: Length 6.0-7.0 mm. The large size and untoothed male protarsal claw will separate this species from most Virginia *Enochrus*. In addition, the yellow-brown maxillary palps will serve to separate it from small specimens of *E. consortus*, and the presence of a distinct notch in the fifth abdominal sternum will separate it from larger specimens of *E. perplexus*. The male genitalia are illustrated in Figure 4, d.

Range: Canada to Florida, west to Kansas.

Virginia Records: Dismal Swamp (19 June 1970, J. F. Matta), counties of Campbell (Kelly's Ford, 12 May 1971, J. F. Matta) and Stafford (11 August 1972, J. F. Matta) and the City of Virginia Beach (15 July 1972, J. F. Matta).

Habitat Preference: This species prefers lentic situations and has been collected most often in detritus-filled pools and woodland pools. Several specimens have also been collected in lentic situations which occurred in association with streams.

ENOCHRUS REFLEXIPENNIS (Zimmermann)

Philhydrus reflexipennis Zimmermann, 1869, Trans. Amer. Ent. Soc. 2:250.

Diagnosis: Length 3.0-4.0 mm. According to Young (1954) this species may be recognized by the explanate margins of the elytra and by the form of the male genitalia.

Range: New Jersey to Florida.

Virginia Records: No Virginia records are available, but *reflexipennis* should occur here.

Habitat Preference: This species occurs in saltwater marshes and brackish pools.

ENOCHRUS SUBLONGUS (Fall)

Philhydrus sublongus Fall 1926, Bull. Brooklyn Ent. Soc. 21:125.

Diagnosis: Length 2.3-2.6 mm. The pale epipleura will separate this species from the closely related *E. ochraceus*. The male genitalia are illustrated in Figure 3, f.

Range: Virginia to Florida, west to Mississippi.

Virginia Records: Dismal Swamp (6 August 1970, J. F. Matta) Orange County (Somerset, Gundersen, 1967) and the City of Chesapeake (15 June 1972, J. F. Matta) and City of Virginia Beach (15 July 1972, J. F. Matta).

Habitat Preference: Young (1954) indicated that the species is characteristic of streams but is occasionally found in lentic situations. The species does not appear to be abundant in Virginia, but all specimens collected were from lentic situations.

ENOCHRUS sp. n.

A single specimen of this species has been collected from Patrick Co., Virginia. Gundersen (1967) recognized it as a new species in his unpublished Ph.D. Thesis. He recorded it from Somerset, Va.

Genus *HELOCHARES* Mulsant

Two species of this genus are found in eastern North America; however, *H. sallei* Sharp appears to be restricted to the gulf coast of Florida.

HELOCHARES MACULICOLLIS Mulsant

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

Diagnosis: Length 5.0-6.0 mm. The 5-segmented tarsi, elytral striae and short maxillary palps will separate this species from all other Hydrophilidae in its size range.

Range: Virginia and Washington, D. C. to Florida, west to Missouri.

Virginia Records: The counties of Gloucester, James City, Nelson, and Rockbridge and the City of Norfolk and City of Virginia Beach. Collections range from April to October.

Habitat Preference: Most of the material in the author's collection is from the impounded areas on the Back Bay National Wildlife Refuge. The species seems to prefer marshy areas and the borders of small ponds.

Genus *HELOCOMBUS* Horn

This monospecific genus may be recognized by the striate elytra, long maxillary palps and four segmented tarsi.

HELOCOMBUS BIFIDUS (LeConte)

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

Diagnosis: Length 6.0-7.5 mm. The long maxillary palps, broadly toothed male protarsal claw and deeply striate elytra will separate this species from all other Hydrophilidae. *Helochares maculicollis*, which it superficially resembles due to the striate elytra may be distinguished by the shorter maxillary palps and the five-segmented posterior tarsi.

Range: Labrador to Florida.

Virginia Records: Dismal Swamp (9 July 1970, J. F. Matta) and the City of Hampton (Fort Monroe, USNM).

Habitat Preference: This species appears to prefer woodland situations. It is rare in Virginia and appears to be common only in the southern areas of the United States.

Genus *CYMBIODYTA* Bedel

Members of this genus superficially resemble those of *Enochrus* but may be easily separated on the basis of the four-segmented tarsi and the form of the mesosternal ridge. This ridge is variable in form but is never laminate as in *Enochrus*. The genus is not abundant in Virginia, and it is rare to find more than two or three specimens in a day's collecting.

KEY TO THE VIRGINIA SPECIES OF *CYMBIODYTA*

1. Mesosternal ridge pyramidal, body form broadly oval -- *rotunda*
Mesosternal ridge smoothly curving or with a minute
central elevation, body form more elongate ----- 2
2. Pale patches (reddish brown to yellow) on clypeus in
front of the eyes ----- *blanchardi*
Clypeus without pale patches ----- *vindicata*

CYMBIODYTA BLANCHARDI (Horn)

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

Diagnosis: Length 5.0-6.3 mm. The pale patches below the eyes in combination with the generic characters will allow the ready recognition of this species in most cases; however, occasional specimens have these patches partially or almost completely obscured.

Range: Maine to Florida.

Virginia Records: Dismal Swamp, the counties of Hanover, Orange, Pittsylvania, Smyth, and Stafford. Collections range from March to December.

Habitat Preference: While this species is found throughout the state and in many situations it appears most abundant in upland lentic situations with dense growths of emergent vegetation.

CYMBIODYTA ROTUNDA (Say)

Hydrophilus rotunda Say, 1825, Acad. Nat. Sci. Phila. 5:188.

Diagnosis: Length 6.5-7.0 mm. The distinctive broadly globose form—somewhat reminiscent of *Hydrobius*—and the habitat will separate this species from other Virginia *Cymbiodyta*.

Range: Maine to North Carolina.

Virginia Records: The author has seen no Virginia records; however, since it is recorded from both north and south of the state, it should occur here.

Habitat Preference: This species is apparently confined to woodland seepage areas and is consequently rarely collected.

CYMBIODYTA VINDICATA (Fall)

Cymbiodyta vindicata Fall, 1924, J. New York Ent. Soc. 32:86.

Diagnosis: Length 4.0-5.5 mm. The body form and absence of a pale patch on the clypeus in front of each eye will separate this species from other *Cymbiodyta* recorded from Virginia.

Range: Maine to Florida.

Virginia Records: Counties of Culpeper, Orange, Page, Pittsylvania, and Smyth and the city of Richmond (Winters, 1927). Collected only in July and August.

Habitat Preference: Most specimens were found at the margins of flowing streams.

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