

# Identification Manual

for the

## Water Beetles

of

## Florida

(Coleoptera: Dryopidae, Dytiscidae, Elmidae, Gyrinidae, Haliplidae,  
Hydraenidae, Hydrophilidae, Noteridae, Psephenidae, Ptilodactylidae, Scirtidae)

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Department of Environmental Protection  
Division of Water Facilities  
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Development of this document was funded by a grant from the  
Clean Water Act 205(j)(1)

Final Report for  
DEP Contract Number WM621  
September 1996

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by

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Bureau of Water Resource Protection  
Florida Department of Environmental Protection  
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## INTRODUCTION

The beetles (order Coleoptera) comprise the largest group of living organisms in terms of numbers of species; an estimated 350,000 species have been described (Parker 1982). The largest family of animals in the world is the Curculionidae (weevils) with 4,238 genera comprising 44,885 species (O'Brien & Wibmer 1978). Bear in mind that these totals are over ten years old; new species continue to be described.

One of the earliest compilations of Florida's water beetles was that of Leng & Mutchler (1918). They reported 114 species in seven families (using today's taxonomy): the Dryopidae (as Parnidae), Dytiscidae (including the Noteridae), Elmidae (as Parnidae), Gyrinidae, Haliplidae, Hydrophilidae (which included species considered terrestrial) and Noteridae (as part of the Dytiscidae). Entomologist W.S. Blatchley spent his winters in Florida in the first third of the 1900's and expanded our knowledge of Florida's beetle fauna (see Blatchley listings in Bibliography). As Blatchley's work tapered off in the 1930's, the work of Frank N. Young began, leading to Young's (1954) masterpiece that added the family Hydraenidae (as Limnebiidae) to Leng & Mutchler's listings and dealt with about 195 species (which did not include the terrestrial Hydrophilidae). Of course, much taxonomic work has taken place since that publication; the present manual will identify adults of over 300 species and subspecies of water beetles and includes, in addition to the families mentioned above, the Psephenidae, Ptilodactylidae and Scirtidae, and keys to genera for most aquatic beetle larvae.

Beetles are an important part of most aquatic ecosystems. However, with the exception of the Elmidae (Brown 1972; Roback 1974; Sinclair 1964), beetles have not been used extensively for water quality evaluation. This is due in large part to the fact that most water beetle adults and larvae, with the exception of the elmids, some adult dryopids and larval psephenids, are air-breathers - they do not depend on dissolved oxygen in water for respiration. Some larvae that do utilize dissolved oxygen are often equipped with large gills (*Berosus*, *Coptotomus*). Although larvae and adults of most of the water beetle families live most of their lives in water, most leave the water to pupate near the water's edge or under objects on land that retain sufficient moisture to prevent desiccation. Beetles can colonize the smallest body of water (for example, a flooded hoof print), and most adults can leave it at a moment's notice. However, many beetles appear to live and/or reproduce in restricted aquatic habitats, such as some *Neoporus* species (Young 1967a); loss of those habitats may mean a loss of those species. And, if a high diversity of species is indicative of good water quality, then the high diversity of beetles in an aquatic environment is certainly important.

Beetles have long been popular with many insect collectors. There is a general tendency that the more specimens that are collected and studied, the better known the group may be. The water beetles are certainly better known than some other aquatic groups, such as the Chironomidae, at least in the adult stage. However, life in the water has led to morphological similarity; add to this the extremely small size of some species and the difficulties in obtaining some literature, such as privately printed publications or unpublished theses/dissertations, and beetle identification quickly becomes an exercise in frustration. It is anticipated that with the updated information and profuse illustrations presented in this manual, water beetle identification will be made easier.

Much work remains to be done with the larvae of aquatic beetles, especially at the species level (at this level, larval Chironomidae are better known). See page 1.7 for a short discussion on larval beetle rearing techniques.

## HOW TO USE THIS MANUAL

**Area and taxa covered:** This manual was written for use in the state of Florida. It will identify all aquatic genera and species known to me from the state, as well as many which may occur here but have not yet been recorded, of the families Dryopidae, Dytiscidae, Elmidae, Gyrinidae, Haliplidae, Hydraenidae, Hydrophilidae, Noteridae, Psephenidae, Ptilodactylidae and Scirtidae (larval genera only). Thus, it should identify most taxa encountered on what is commonly called the Southeastern Coastal Plain, remembering that the greater the distance one is from Florida, the less effective the manual will be. Most terrestrial Hydrophilidae (subfamily Sphaeridiinae) and the aquatic/semi-aquatic members of the families Chrysomelidae (leaf beetles), Curculionidae (weevils), Heteroceridae (variegated mud-loving beetles) and Limnichidae (minute marsh-loving beetles) are not included. The Chelonariidae are not considered aquatic (Spangler 1980) and are also not included. Although I have tried to include as many extralimital taxa as possible, biologists will no doubt find some species that are not covered in this manual.

**Illustrations and abbreviations:** The illustrations in this manual were taken from a myriad of sources; many were produced by the author, usually from Florida specimens. Thus, some illustrations differ in the amount of shading, structures included, etc. If the illustrations were not my own, the source of each figure was cited at least once within the manual. Some are somewhat schematic in that not all parts of a structure or organism were drawn; this is usually self-evident.

No abbreviations for body parts have been used.

**Taxonomy:** In general, I have not used the author's name(s) for genera and species within the text and keys; complete names are listed in Appendix A. This manual utilizes the family taxonomy described in Lawrence & Newton (1995). For a more detailed arrangement of subfamilies, genera and subgenera, etc., see Peck and Thomas (1996).

One problem has been that of unpublished Ph.D. theses/dissertations. In order for its name to be available, a new species must be described in a published work; theses and dissertations are not considered published works by Articles 8 and 9 of the International Code of Zoological Nomenclature (1985). This has led to the unfortunate situation of not being able to apply "real" names to several common species (especially with the hydrophilid genus *Hydrochus*). In such cases, number or letter designators were used (species 1, species A, etc.). Number and letter designators were also used for taxa whose descriptions are in preparation or in press.

**The Keys:** It is assumed that the reader is familiar with the use of dichotomous keys. Numbers in parentheses following the couplet number indicate the couplet that led to that position. Illustrations are usually arranged from left to right and/or top to bottom with regards to the order of statements in the couplet(s). If you are unfamiliar with water beetles, you'll have to start with the key for families that starts on page 1.12 at the end of this chapter. Then go to the generic keys in each chapter, and then the species keys for each genus (when applicable).

**The Layout:** This manual is divided into 13 sections and two appendices. This first chapter provides an introduction to the manual, specimen preparation techniques, illustrations of



important morphological characters, a partial glossary of beetle morphology and a key to families for larvae and adults.

Families are arranged alphabetically, as are genera within families. Each key to genera is followed by "generic units" in alphabetical order. Each genus unit consists of several parts:

A **Diagnosis**, or short descriptive summary of the genus' larval and adult morphological characters that will separate it from similar taxa. Diagnoses in this manual pertain to Florida taxa only!

A **Notes** section which contains additional information concerning the taxonomy and biology of the genus.

An **Additional References** section lists additional literature that may give more information, such as revisions or life history/ecology studies. It should be understood that the excellent work of Young (1954) is *always* considered to be an additional reference.

**Illustrations** of important body structures are included for each genus; for adults, each genus known from or expected to occur in Florida is illustrated in at least outline form (except for Scirtidae, which are terrestrial); habitus illustrations of most larvae are also included. A **Key** to species and a **Notes on species** section are included when possible.

### ACKNOWLEDGEMENTS

Although I am the sole author of this manual, and therefore accept all responsibility for the information contained herein, production of this identification guide would not have been possible without the aid of many friends and colleagues. The excellent beetle collection at the Florida State Collection of Arthropods (FSCA) in Gainesville was the source of much of the material examined for this study; much of the water beetle material in this collection was collected and donated by Dr. Frank N. Young. I am deeply indebted to FSCA curator Dr. Michael C. Thomas for all of his assistance; also extremely helpful during my visits to the FSCA were Dr. Paul Skelley and J. Eric Cronin.

Dr. William L. Peters, Jan Peters, Dr. Manuel L. Pescador, Dr. R. Wills Flowers, Andy Rasmussen and Jerome Jones of Florida A & M University (Tallahassee) provided access to the many collections kept at the university; these holdings were especially interesting because much of the material was from the under-collected Panhandle of Florida and yielded many new records.

Many biologists of the Florida Department of Environmental Protection (FDEP) also made material available. Especially useful was the excellent collection of Robert P. Rutter (FDEP, Punta Gorda). Russ Frydenborg (FDEP, Tallahassee), Peggy Morgan (FDEP, Tampa), Randy Payne (FDEP, Pensacola) and Doug Strom (FDEP, Port St. Lucie) also provided helpful material. Arwin Provonsha (Purdue University, West Lafayette, IN) kindly sent Florida material of *Pelodytes* from the Purdue collection for my inspection. William R. Karsteter (Environmental Planning and Analysis, Tallahassee) provided important material from northern and western Florida. Thanks also to Val Urban, St. Marks National Wildlife Refuge, for collecting permits.

I must also thank those colleagues who verified my determinations or provided identifications. These include: Dr. William L. Hilsenhoff (University of Wisconsin, Madison, WI), Dr. David Larson (Memorial University of Newfoundland, St. John's), Dr. Kurt Schmude (Lake Superior Research Institute, Superior, WI) and Dr. Frank N. Young (Indiana University, Bloomington, IN).

Many colleagues also provided reviews of the material written for this manual. I thank Dr. William L. Hilsenhoff (Elmidae), Dr. Paul Lago (University of Mississippi, University, MS) (Gyrinidae, Noteridae), Dr. David Larson (Dytiscidae), Dr. James Matta (Bloomsburg University, Bloomsburg, PA) (Dytiscidae, Haliplidae), Dr. Philip D. Perkins (Harvard University, Cambridge, MA) (Hydraenidae), Dr. Kurt Schmude (Elmidae) and Sam Testa (USDA-ARS-NSL, Oxford, MS) (Hydrophilidae). Bob Rutter's keen eye caught many typos.

While a copious amount of material was examined to produce this study, it was also necessary to obtain a great deal of literature dealing with these insects. Several workers provided almost complete collections of their reprints: Dr. Dewanand Makhan (University of Utrecht, the Netherlands), Dr. Robert E. Roughley (University of Manitoba, Winnipeg, MB), Dr. Paul Spangler (Smithsonian Institution, Washington, D.C.), Dr. Frank N. Young and Dr. James Zimmerman (Tucson, AZ). I am indebted to Dr. Jim Matta and Dr. Robert W. Sites (University of Missouri, Columbia, MO) for providing copies of several hard to find documents. Many thanks to Dr. Peter S. Cranston (CSIRO, Canberra, Australia) for supplying a copy of Lawrence et al. (1993). I am extremely grateful to Dr. David Larson and Dr. Kurt Schmude for providing me with figures and descriptions of new taxa that they are in the process of describing.

I want to give special thanks to the late Dr. Warren U. Brigham (Illinois Natural History Survey, Champaign, IL). Warren was extremely helpful in deciphering the haliplids; he provided copies of hard to get papers, identifications and verifications of my determinations, and reviewed the Haliplidae and Psephenidae chapters. He will be missed.

Judy Merrill and Dr. Barry Merrill (Merrill Consultants, Dallas, TX) were again extremely kind and provided laboratory equipment and computer hardware. Their unselfish giving has made it possible to make a tremendous expansion in our knowledge of Florida's aquatic insects.

Once again, Jim Hulbert (FDEP, Orlando) masterminded the state systems and made funds available for the production of this manual. Jim, like the Merrills, has made a difference in Florida benthology.

I thank my wife Linda for assembling the table of contents for this manual and proofing portions of the text. I am forever grateful for her love, support, encouragement and understanding throughout this project.

## **SPECIMEN PREPARATION AND HANDLING**

### **MATERIALS AND EQUIPMENT REQUIRED**

**Microscopes:** You will need a good dissecting (stereo) microscope for the majority of your work. A pair of 25X oculars is desirable in addition to the 10X oculars with which most scopes are usually equipped. It is absolutely necessary to utilize a measuring reticle (a glass disc etched with a grid or ruler line, which fits into one of the microscope's eyepieces); this accessory is needed to provide accurate length measurements (often the only way to separate some taxa) and to calculate ratios. Be sure to calibrate your reticle with a stage micrometer at all magnifications you will be using.

It may be necessary to use a compound microscope to examine the genitalia of extremely small species. Your compound microscope should also be fitted with a measuring reticle that has been calibrated with a stage micrometer.

**Microscope slides and mounting media:** It may be necessary to mount genitalia, larval antennae or other body parts on microscope slides for high powered observation. Utilize standard microscope slides and cover glasses. Slides may be temporary or permanent mounts (see also Pinning techniques below). Temporary mounts (generally all that is necessary) can be made with water, alcohol or glycerin. Permanent mounts can be made with water-soluble media, such as CMCx or Hoyer's, or with other, more permanent media such as Canada balsam or Euparal. Material mounted in water-soluble media can usually be mounted direct from water or alcohol; that mounted in balsam or Euparal must first be cleared in KOH, rinsed in water, then glacial acetic acid, then in 95% ethanol and then mounted. In most cases, temporary mounts are all that is needed. For permanent mounts, *always put labels with complete collection data on the slide!*

**Dissection equipment:** You will need the usual equipment such as vials, petri dishes or watch glasses, dissecting needles and forceps. You should have at least one pair of extremely fine (number 5) jeweler's forceps.

**Pinning equipment:** If you choose to mount some of your specimens on pins, you will need insect pins (sizes 1-3, with 2 being the most useful size), a pinning block (a block with 3 holes drilled to the standard heights at which one would place the specimen and its labels), points (small, triangular to elongate-oval pieces of heavy, stiff paper that have been punched with a purpose-made point punch; they can also be cut from index card stock with scissors), a point punch (optional) and insect boxes in which to store specimens (the more airtight the better).

## TECHNIQUES

**Preservation and storage:** Beetle larvae must be stored in suitably sized vials in 70-80% ethanol; adults may be preserved in 70-80% ethanol or pinned/point-mounted. I have found it a good idea to keep both fluid-preserved and pinned specimens; many characters, such as fine punctation, are easier to view on dried, pinned specimens. I also think pinned specimens are easier to handle - all one has to do is open a box, pull out a specimen and inspect it, and put in back in the box. With fluid preservative, one must get the vial, open the vial, pour it into a dish, pour it back into a vial, replace the cap (or, if neoprene "corks" are used, "burp" the stopper), dry the dish, etc. Pinned specimens must be kept in airtight boxes provided with a suitable fumigant, such as paradichlorobenzene (PDB), naphthelene (moth balls) or sections of "no-pest strips". Do not make a habit of breathing fumes from these sources!

Beetles that have been preserved in alcohol can be mounted on pins at a later time, but may be darker than specimens mounted from freshly collected material.

*Always put labels with complete collection data in the vial or on the pin!!* Code numbers may be fine for the person that collected the material, but how is a taxonomist to know where or when an organism was collected when the only information with the specimen is a string of letters or numbers or something like "Elmo's birdbath"?

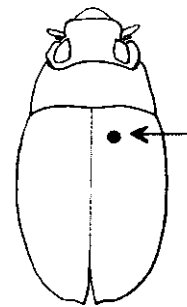
**Dissection techniques:** It is often necessary to remove or extrude the male genitalia for identification purposes. This can be accomplished in variety of ways depending on the size of the specimen. With large specimens, the genitalia can often be extruded by squeezing the abdomen and the elytra. Once the genitalia are exposed, gently pull them sufficiently far out to observe all

structures, but do not tear the tissues near the base; these exposed genitalia can be left in place. This technique works very well for some elmids, most gyrinids and medium to large dytiscids and hydrophilids. With smaller taxa, such as the tiny round *Desmopachria*, the beetle must be held with one pair of forceps while the genitalia are pulled out through the apex of the abdomen with very fine forceps or a minuten pin that has had its apex bent into a hook. Alternatively, one can attack through the back by parting the elytra and going through the dorsal abdominal tissues to find and extract the genitalia. Again, the genitalia can be left in place or can be completely removed (necessary for high powered microscope observation). Removed genitalia can be 1) mounted on microscope slides (see Microscope slides and mounting media, above); 2) if from a pinned specimen, glued to a point (see Pinning techniques, below); 3) if pinned, placed in a microvial of glycerin and mounted through the vial's cork on the pin with the specimen; or 4) if in fluid, placed in a microvial with the specimen and then placed in a larger vial/jar of preservative. With fluid preserved specimens, I often replace detached genitalia back in the abdominal cavity; these can easily be retrieved later if further examination is necessary.

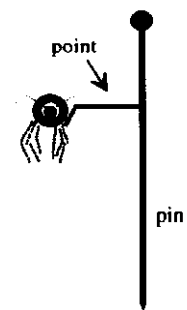
**Pinning techniques:** Beetles are pinned through the discal portion of the right elytron just anterior to the middle of the insect and just to the right of the suture. Although it makes a tempting target, do not pin through the scutellum; valuable ventral characters can be destroyed or obscured (not to mention the scutellum)! Utilize a pinning block to maintain uniformity in height of specimens and labels (7, 12 and 23 mm): Place your beetle or point over the 23 mm hole and push the pin through the specimen/point; use the 12 mm hole for the locality label and the 7 mm hole for the determination label.

Beetles too small to be pinned can be glued to point mounts. My rule of thumb has been that generally anything too small for a number 2 insect pin is point mounted; number 1 pins can be used for the "larger" small specimens, but tend to destroy/obscure too many characters. To point mount a specimen, bend down the end of the point and glue the beetle by its side to the bent portion of the point. I prefer to use clear nail polish, but regular white glue ("Elmer's ®") can be used. Be careful not to obscure important characters with the point or glue. Genitalia should be dissected from the beetle before it is pinned/pointed.

It is sometimes necessary to remove genitalia from a beetle that has been pinned or point mounted. If pinned, one can relax the beetle by placing it in hot water for several minutes until the legs move easily (without breaking off!). Large specimens can be relaxed by placing them in an airtight jar with wet sand in the bottom (add an agent, such as ethyl acetate, to prevent mold). Once the beetle is softened, genitalia can then be removed by the techniques mentioned above. If point mounted, dissolve the glue (water for most white glues; ethyl acetate or toluene for finger nail polish), relax the specimen and follow techniques mentioned above. As an example, I had to examine the genitalia of some small *Suphisellus* that were point mounted. I first applied a few drops of ethyl acetate to the bottom of the specimen where it was glued. Almost immediately, the legs became relaxed enough to move without breaking. Another drop or two removed the specimens from the point. I then placed the specimen in water in a small glass watch glass and microwaved it at low-medium power for about 2 minutes. The result was a nicely relaxed specimen from which it was easy to remove the genitalia (which were later glued



correct pin position



point mounted specimen

to the point holding the beetle, after it was replaced on the point). With some small specimens, it appears that merely soaking them in ethyl acetate will relax them sufficiently to allow genitalic dissection. Just remember to take your time and don't force anything; it may take several hours or overnight for large specimens to soften.

**Measurements:** Unless otherwise stated, length measurements of adult specimens are from the anterior margin of the head to the posterior margin of the elytra; they do not include the often protruding apical segments of the abdomen. Note that for some taxa (*Stenelmis*, etc.) measurements are for the pronotum and elytra only.

## IDENTIFICATION AIDS

**1. Maintain a voucher/reference specimen collection.** This is especially important for taxa that have been given letter/number designators. Utilize research collections, such as the Florida State Collection of Arthropods, to compare your material against other identified material. One caveat here, though: there are plenty of misidentified, mislabeled or misplaced beetles in such collections. Also, be aware that many taxa are very difficult to identify without comparative material of related species. Your best course of action is to have your identifications verified by a qualified expert!

**2. Maintain a reference library, and keep up with the literature.** The beetles are a large group, and larvae and adults of terrestrial taxa often end up in aquatic samples. There are several other texts that will allow you to key most beetles, terrestrial or aquatic, to family or even genus. A good general book on beetles is White (1983); here you can find many of the more common terrestrial beetles that may fall into a sample. Other general beetle texts include Dillon & Dillon (1961) (with some of the taxonomy outdated but with many figures of common taxa), and Downie & Arnett (1996) (again, with some taxonomy outdated). Although taxonomically outdated, Peterson (1967) is a useful source for additional information and figures of larval beetles. Lawrence et al. (1993) offers state of the art larval beetle identification to the family level via an interactive database with good graphics on CD-ROM. A good entomological text for both insect morphology and keys to families is Borror, Triplehorn & Johnson (1989) (earlier editions were authored by Borror & DeLong).

**3. Rear larvae!** The larvae of the aquatic Coleoptera are poorly known, especially at the species level. One can rear larvae from eggs laid by captive females (Alarie et al. 1989) and thus associate them with the adults. Adults are collected and kept in jars with pond water and a small piece of moss for an oviposition site; they are not fed. Eggs are collected daily and placed in separate containers; hatchlings are separated and placed in separate containers with a piece of moss. Larvae can be fed with microcrustaceans, mosquito or chironomid larvae. Matta & Peterson (1985) discussed a simpler method involving collection of last instar larval *Neoporus* (Dytiscidae). Last (third) instar *Neoporus* larvae can be distinguished by the bulging, white abdominal venter; after preserving some larvae in the field, living larvae are placed in small (5 cm) petri dishes, four or five to a dish (however, I've noted that putting several larvae in a dish sometimes results in cannibalism), along with several pieces of moist leaves or dead grass. There should be no free water in the dishes. Dishes are covered and then checked daily, and drops of water added if more moisture is needed. Larvae will pupate in or under the wet matter and eventually emerge as adults. Allow several days for the adults to harden.

## GLOSSARY OF SOME BEETLE TERMS

Workers in different beetle families often utilize seemingly different terms for what seem to be the same type of structures. For example, a ridge may be called a carina, a costa or a plica; a linear depression may be called a striga, a stria or a sulcus depending on its depth or width. This glossary should help to figure out some of them. Plural forms are given in parentheses. Following this glossary are pages illustrating important morphological structures for larvae and adults. For those needing more information/definitions, see Nichols (1989) or any good general entomology text (see Identification Aids).

**aedeagus, aedoeagus (aedeagi)** - central appendage of male genitalia; penis. May also refer to male genitalia assemblage as a whole; in this manual, it normally refers to the central appendage or median lobe.

**alutaceous** - microreticulate; covered with small mesh-like cracks, like the skin on the back of your hand.

**angular cilia/setae** - cilia, setae or small spines located near the distal posterior margin angle of a leg segment, usually a femur.

**attenuate** - gradually tapering apically.

**biramal** - with 2 branches; in hydrophilid larvae, refers to the condition when a finger-like antennal appendage (sensorium) is positioned adjacent to the last antennal segment.

**callus (calli)** - a lump or rounded swelling.

**cardo (cardines)** - basal portion of the maxilla proximal to the stipes.

**carina (carinae)** - a ridge or keel.

**carinate** - with a ridge or keel.

**cercus (cerci)** - paired processes arising posteriorly from 9th abdominal segment of larva; also termed **urogomphus (urogomphi)**.

**convex** - curved or bulging outward, as opposed to concave.

**costa (costae)** - an elevated ridge that is rounded at its crest.

**cupule** - cup-like antennomere at base of terminal club.

**disc, disk** - the central area of the pronotum or the elytra.

**discal** - refers to disc area of pronotum or elytra.

**emarginate** - notched, indented.

**epicranial suture** - Y-shaped suture on top of the head, with the arms (frontal sutures) diverging anteriorly.

**epipleuron** - lateral portion of the elytron that is curved, deflexed or inflexed beneath the horizontal midline of a beetle's body; the folded under, lateral portion of the elytron that is visible from a ventral view.

**fascia (fasciae)** - transverse band(s); transverse groupings of weakly joined spots are also termed fasciae.

**fasciate** - marked with transverse bands.

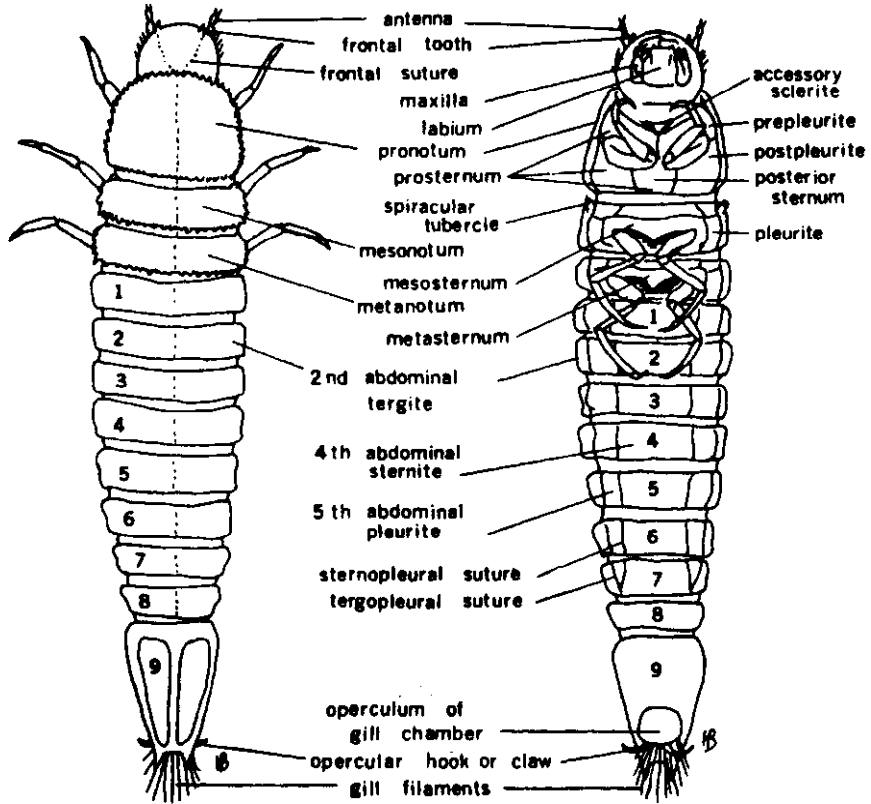
**filiform** - thread-like.

**fovea (foveae)** - a pit.

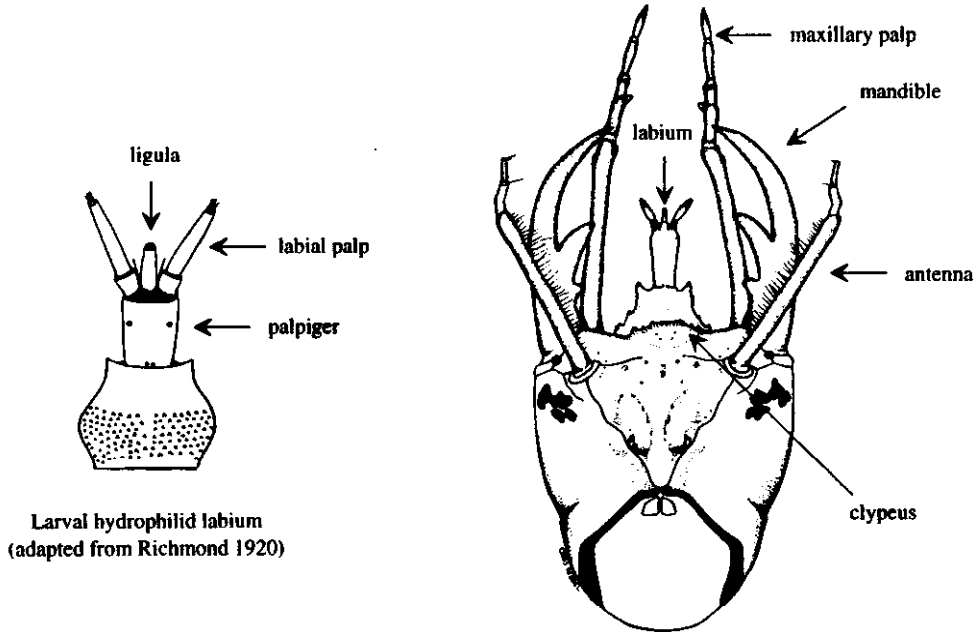
**glabrous** - naked, smooth; devoid of any pubescence.

**immaculate** - without spots or marks.

- interval** - space between elytral striae
- irrorate** - covered with small spots; freckled.
- maculate** - marked with spots or blotches (maculae).
- mala** - a lateral lobe of the maxilla that may represent a fused galea and lacinia.
- metasternal wing** - wing-like, lateral expansion of the metasternum.
- microreticulate** - covered with small mesh-like cracks, like the skin on the back of your hand.
- palpifer(s)** - small sclerite that bears the maxillary palpus distal to the stipes.
- paramere (parameres)** - lateral appendages of male genitalia.
- penultimate** - next to the last.
- pleuron (pleura)** - lateral region of a body segment between the tergum and sternum.
- plica (plicae)** - fold or wrinkle.
- plicate** - bearing a fold or wrinkle.
- pseudobasal** - appearing to be the basal segment, but in reality the second segment.
- pseudotetramerous** - in some dytiscid adults, refers to apparently four-segmented tarsi, but closer examination reveals a minute fourth segment hidden in the enlarged lobes of segment 3.
- pubescence** - soft, short, fine "hairs".
- rugose** - wrinkled.
- rugulose** - minutely wrinkled.
- seta (setae)** - hair-like outgrowths of the cuticle, arising from pits. **Primary setae** are those setae present in first instar larvae; **secondary setae** develop in later instars.
- siphon** - in dytiscid larvae, the dorsal elongation of the eighth (last) abdominal segment.
- spinula (spinulae), spinule(s)** - small spine, a non-articulated outgrowth of the cuticle.
- stipes (stipites)** - basal portion of the maxilla distal to the cardo.
- stria (striae)** - fine, impressed, longitudinal line(s).
- striga (strigae)** - a shallow, scratchlike mark.
- sulcus (sulci)** - a furrow or groove.
- sulcate** - grooved.
- suture** - median line formed where the left and right elytron meet.
- sutural angle** - inner apex of elytron along suture.
- sutural stria** - line (stria) adjacent to the elytral suture.
- teneral** - recently molted; chitinous exoskeleton not yet completely tanned/hardened. Teneral specimens tend to be softer, lighter in color and often of different proportions (wider) than fully mature specimens.
- tomentum** - a dense patch of fine, short setae; may be located on the tibia. Also refers to close covering of short, dense setae on the body surface that provides a plastron.
- trochantin** - small sclerite on outer side of the coxa, separated from the trochanter, that may be exposed or may be hidden beneath the pronotum or prosternum.
- truncate** - cut off squarely at the tip.
- umbone** - the elevated, knob-like anterolateral corner of the elytron; "shoulder".
- vermiculate** - marked with small spots that run together, resembling worm trails.
- vitta (vittae)** - longitudinal band(s) of color.
- vittate** - marked with longitudinal bands of color.



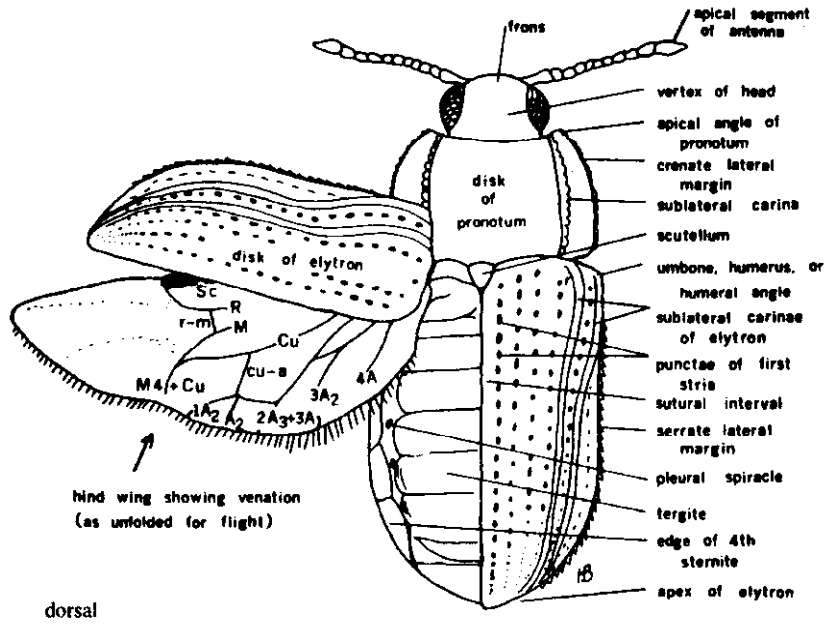
Larval morphology (elmid larva)  
 (adapted from Brown 1972)



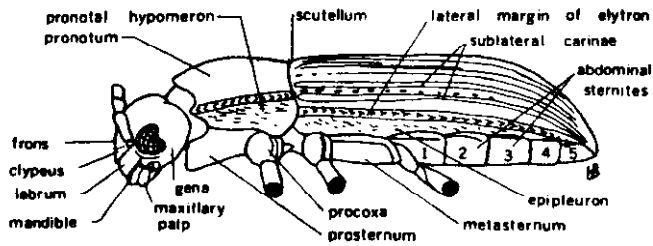
Larval hydrophilid labium  
 (adapted from Richmond 1920)

Larval hydrophilid head, dorsal  
 (adapted from Matta 1982)

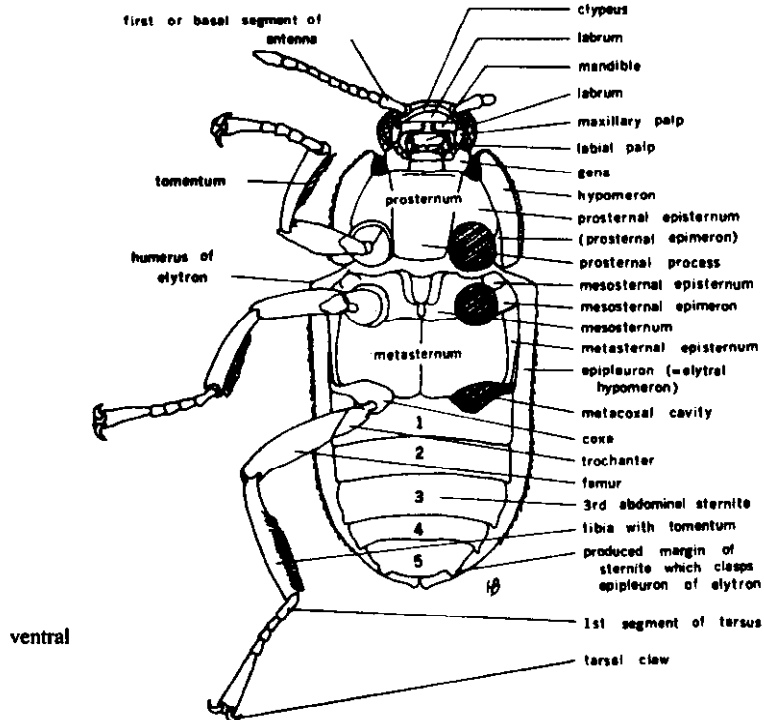




dorsal



lateral



ventral

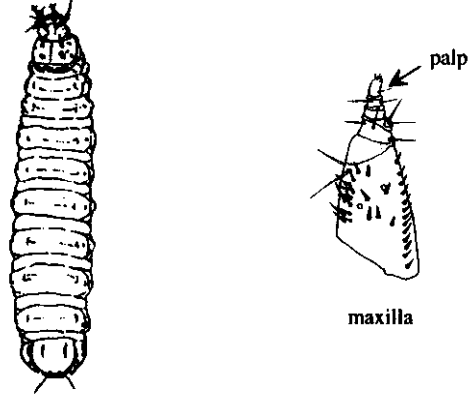
Adult morphology  
(adapted from Brown 1972)

**Key to the Water Beetle Families of Florida - Larvae**

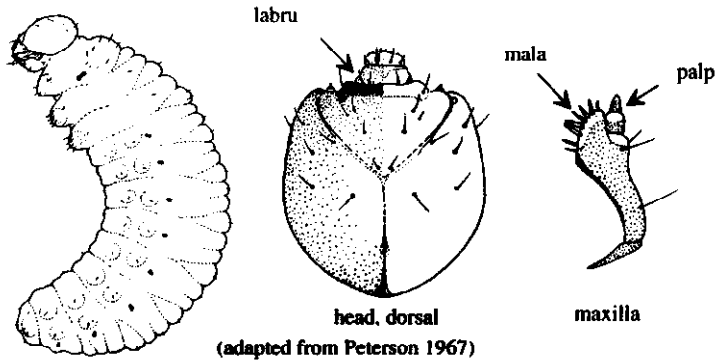
(Remember that terrestrial insects often fall into the water; if specimens do not key correctly, see references under Identification Aids.)

- 1 Thoracic legs absent ..... 2
- 1' Segmented thoracic legs present (may be rudimentary, but with at least 3 segments) ..... 3

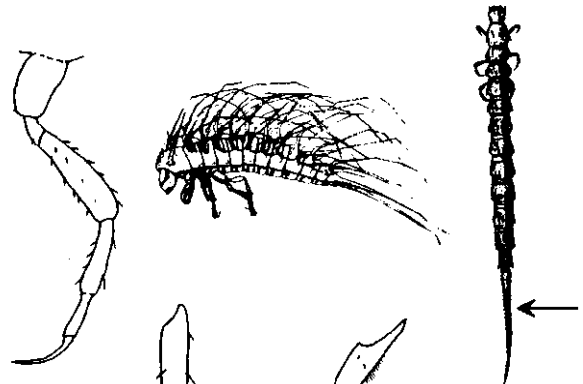
- 2(1) Abdomen with 8 complete segments, 9 and 10 rudimentary; labrum fused with clypeus; maxilla palpiform, without a well developed lateral lobe (mala) ..  
..... **Hydrophilidae** (in part)



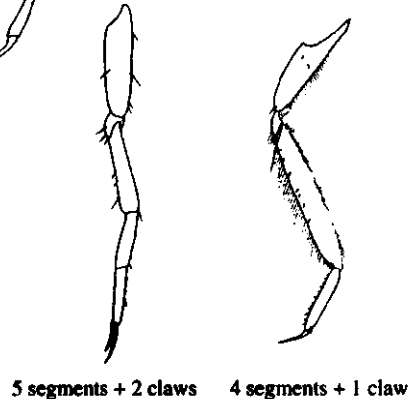
- 2' Abdomen with 9 complete segments; distinct, separate labrum present; maxilla with a mala .....  
..... **Curculionidae**  
(Not included in this manual.)



- 3(1') Legs with 5 segments plus a single claw; thorax and abdomen with short to very long dorsal spines/filaments or 10th segment very long ..... **Haliplidae**

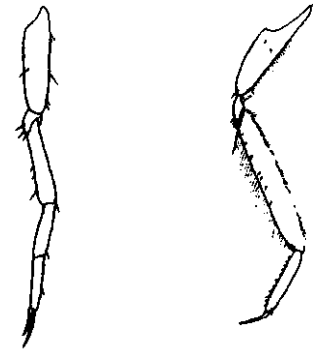


- 3' Legs with 5 segments plus 2 claws **OR** apparently 3-4-segmented, plus either with a single claw (common) or clawless (uncommon); dorsum of thorax and abdomen without short to long spines/filaments (lateral filaments may be present) and if 10 abdominal segments present, 10th is not much longer than 9th ..... 4



4(3') Legs with 5 segments and 2 claws ..... 5

4' Legs with 3-4 apparent segments and either with a single claw or clawless ..... 7

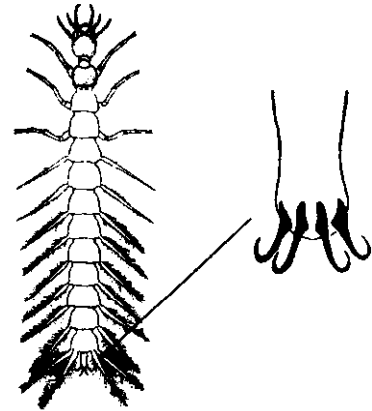


5 segments + 2 claws

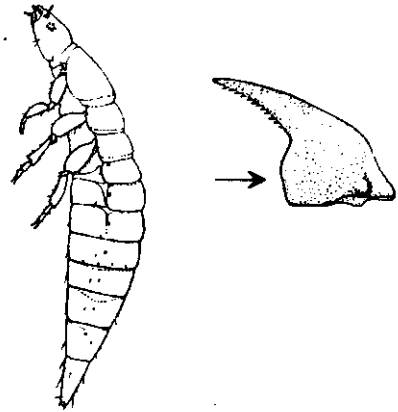
4 segments + 1 claw

5(4) Abdominal segment 10 with 2 pairs of stout hooks; lateral gills present on abdominal segments 1-9 ..... **Gyrinidae**

5' Last abdominal segment without hooks; if lateral abdominal gills present, at most only on segments 1-6 .. 6

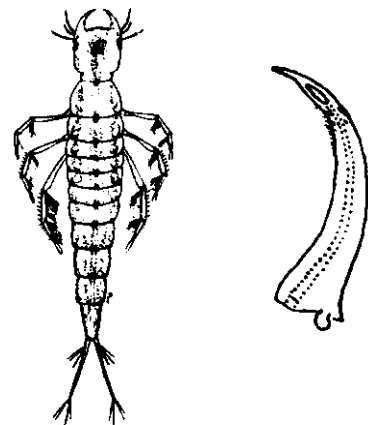


6(5') Legs short, stout, adapted for burrowing; mandible with an enlarged molar area; cerci rudimentary .. **Noteridae**



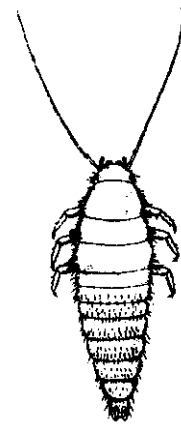
(adapted from Peterson 1967)

6' Legs longer, slender, adapted more for swimming; mandible sickle-shaped, without enlarged molar area; cerci rudimentary to very long ..... **Dytiscidae**  
 (Carabidae larvae that have fallen into the water may key here; they have 9-10 visible abdominal segments compared to Dytiscidae's 8)



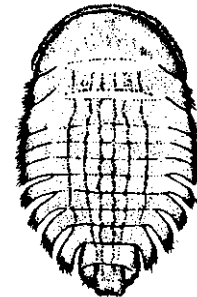
7(4') Antennae much longer than head and thorax combined, with multiple articulations ("segments") beyond the 3rd segment ..  
 ..... **Scirtidae**

7' Antennae shorter, at most barely longer than head, with at most 4 segments ..... 8

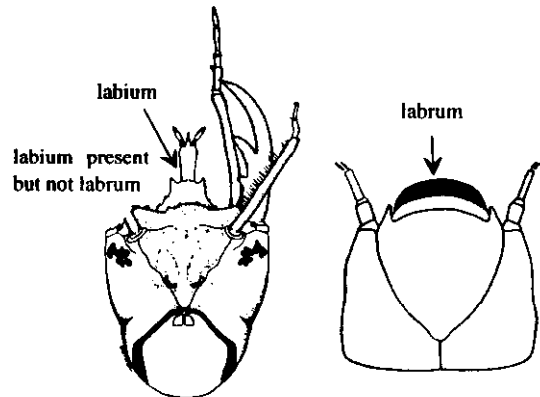


8(7') Body greatly flattened, with margins extended so as to resemble a suction cup ..... **Psephenidae**  
 (Larvae of Lampyridae may key here: they are more elongate and lack the distinct labrum present in Psephenidae.)

8' Body more or less cylindrical, may be obese ..... 9



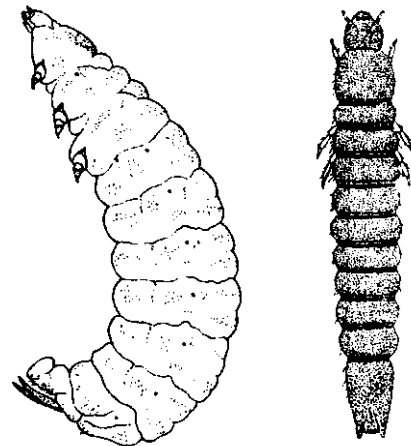
9(8') Labrum fused with clypeus, no distinct labrum present (but the ventral labium may be visible from dorsal aspect) ..... **Hydrophilidae**  
 (Larvae of Staphylinidae will key here: they possess maxillae with a well developed mala, lacking in hydrophilids. See couplet 2')



9' A distinct, separate labrum present ..... 10

10(9') Thorax and abdomen short and obese, without distinct sclerites; legs reduced, usually 3-segmented; spiracles on abdominal segment 8 often with large sclerotized hooks ..... **Chrysomelidae**  
 (Not included in this manual.)

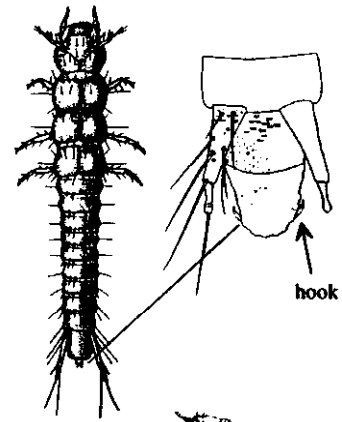
10' Thorax and abdomen mostly cylindrical with well defined sclerites (body may be slightly flattened); legs 4-segmented, not reduced; spiracles on 8th abdominal segment without large sclerotized hooks, but hooks may be present apically on segment 10 (fig. below) ..... 11



chrysomelid larva (*Donacia*)      elmid larva (*Stenelmis*)  
 (adapted from Peterson 1967)

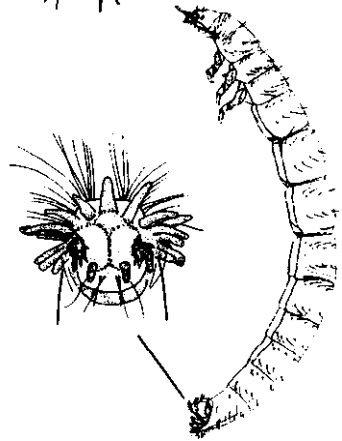
11(10') Abdominal segment 10 with a pair of recurved ventral hooks  
 ..... **Hydraenidae**

11' Abdominal segment 10 without a pair of recurved ventral hooks, although hooks may be present inside a ventral operculum ..... 12

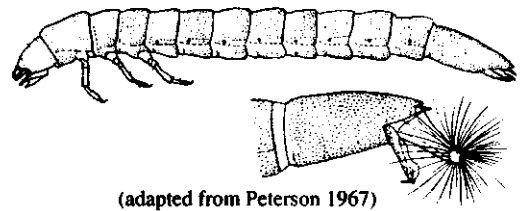


12(11') Terminal abdominal segment without an operculum but with clusters of lobe-like gills; antennal segments 1 and 2 very long, 3 short ..... **Ptilodactylidae**

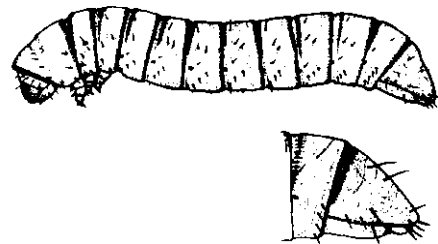
12' Terminal abdominal segment with a lid-like operculum that covers a chamber; antennae not as above ..... 13



13(12') Opercular chamber with retractable gill tufts and claws ..... **Elmidae**



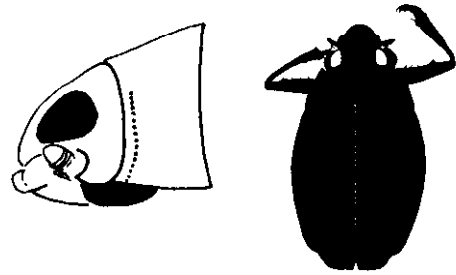
13' Opercular chamber without retractable gill tufts and claws ..... **Dryopidae**



**Key to the Water Beetle Families of Florida - Adults**

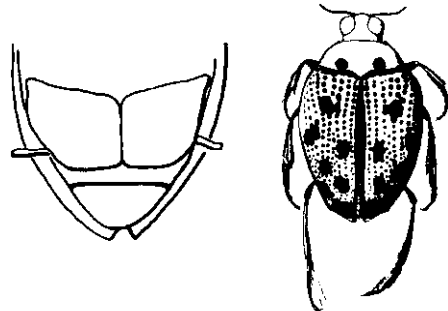
(Remember that terrestrial insects often fall into the water; if specimens do not key correctly, see references under Identification Aids.)

1 Eyes completely divided by lateral margin of head (very thin in *Spanglerogyrus*) so that beetles have 4 eyes; mid and hind legs very flattened and thin, paddle-like ..... **Gyrinidae**



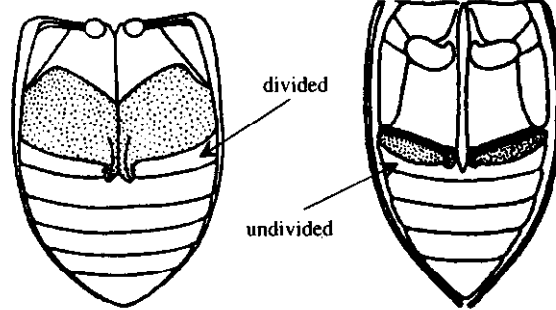
1' Eyes not divided, beetles with 2 eyes; mid and hind legs not very flattened and thin ..... 2

2(1') Hind coxae greatly expanded into large plates that cover basal abdominal sternites and base of hind femur ..... **Haliplidae**



2' Hind coxae not greatly expanded ..... 3

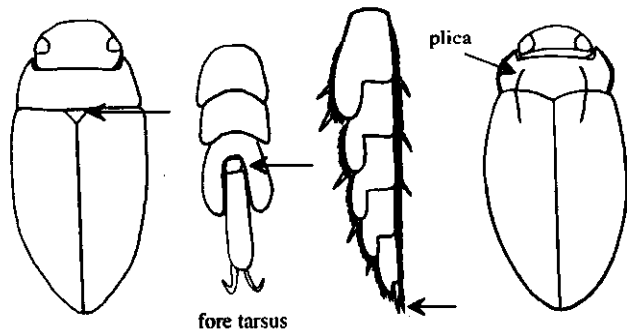
3(2') 1st abdominal sternite divided by hind coxae ..... 4



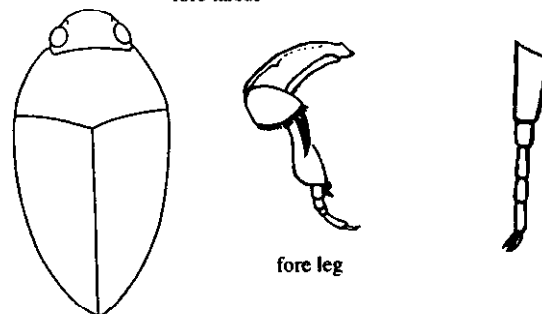
1st abdominal sternite (coxae shaded)  
(adapted from Young 1954)

3' 1st abdominal sternite not divided by hind coxae ..... 5

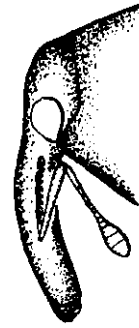
4(3) Scutellum fully visible, **OR** if scutellum hidden, then fore and middle tarsi pseudotetramerous (4th segment minute and concealed in lobes of 3rd) **or** hind tarsus with single, thick, straight claw, **or** pronotum with plicae ..... **Dytiscidae**



4' Scutellum not visible; fore and middle tarsi 5-segmented; hind tarsus with 2 equal, slender, curved claws; pronotum without plicae ..... **Noteridae**  
(Carabidae will key to this couplet. They lack swimming setae on the hind tibiae & tarsi, and possess a transverse suture anterior to the hind coxae.)

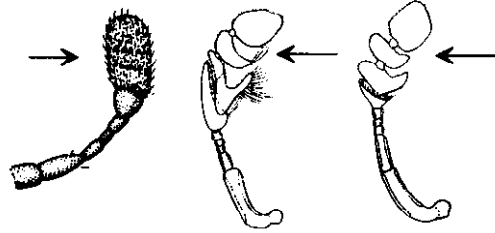


5(3') Head produced anteriorly into a short to long snout (rostrum); antennae  
 elbowed (strongly bent after basal segment) ..... **Curculionidae**  
 (Not included in this manual.)

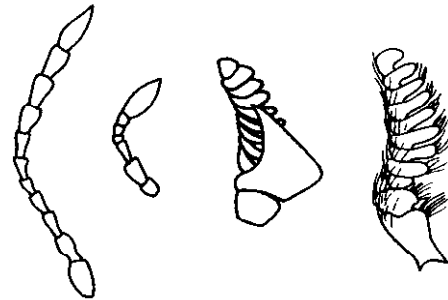


5' Head not produced into a rostrum; antennae not elbowed ..... 6

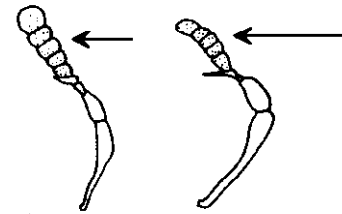
6(5') Antennae terminating in an abrupt multi-  
 segmented club; maxillary palpi usually as  
 long as or much longer than antennae (shorter  
 in subfamily Sphaeridiinae of Hydrophilidae)  
 ..... 7



6' Antennae filiform, serrate or pectinate, never  
 ending in a multi-segmented club ..... 8



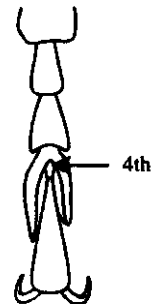
7(6) Abdomen with 5 visible sternites; antennal club with 3  
 pubescent segments (figs. in couplet 6); length 1.5-40.0 mm  
 ..... **Hydrophilidae**



7' Abdomen with 6-7 visible sternites; antennal club with 5  
 pubescent segments; length < 2 mm ..... **Hydraenidae**

hydraenid antennae  
 (adapted from Perkins 1980b)

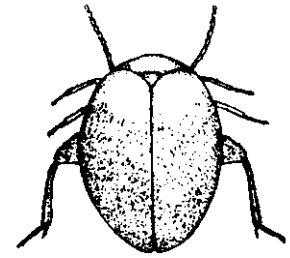
8(6') Tarsi apparently with 4 segments, but 3rd segment is deeply bilobed,  
 hiding minute 4th segment ..... **Chrysomelidae**  
 (Not included in this manual.)



8' Tarsi with 5 well defined segments ..... 9

(adapted from Leech & Chandler 1956)

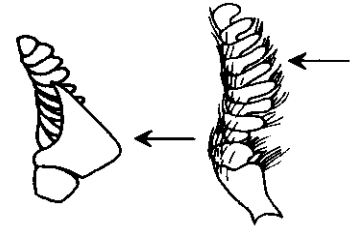
9(8') Body form elongate-oval to nearly round, head usually concealed by pronotum; fore coxae conical and projecting; tarsi with 4th segment strongly bilobed ventrally; hind femora often enlarged ..... **Scirtidae**  
 (Adults not included in this manual.)



*Scirtes*

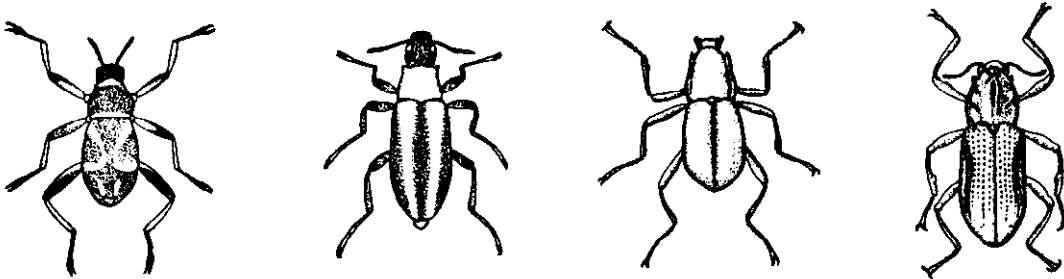
9' Body form never almost round, usually elongate; head concealed by pronotum or not; tarsi without ventral lobes in Florida taxa; hind femora not enlarged ..... 10

10(9') Antennae either with 2nd segment enlarged or with 8 apical segments pectinate ..... **Dryopidae**



10' Antennae mostly filiform, never pectinate or with enlarged 2nd segment ..... 11

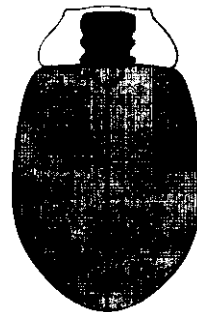
11(10') Typically hard-bodied; tarsal claws usually greatly enlarged ..... **Elmidae**



common elmids

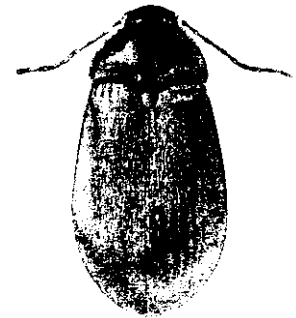
11' Typically soft-bodied; tarsal claws not greatly enlarged ..... 12

12(11') Thorax yellow with dark center; mandibles concealed; labrum not visible from in front ..  
 ..... **Psephenidae**



Psephenidae: *Ectopria*

12' Thorax unicolorous; mandibles not concealed; labrum visible from in front ..... **Ptilodactylidae**



Ptilodactylidae: *Anchytarsus*



## Family Dryopidae

**DIAGNOSIS:** Larvae are distinguished by the cylindrical body form; apparently 4-segmented legs with single-clawed tarsi; 9-segmented abdomen; and the posteriorly rounded last abdominal segment that has an opercular chamber without hooks or gills.

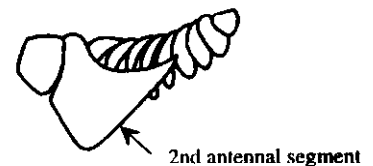
Adults are distinguished by the hard body; head partially retractable into prothorax; antennae with 6 or more apical segments forming a club; transverse anterior coxae with exposed trochantin; and first abdominal sternite not divided by hind coxae.

**NOTES:** The Dryopidae have often been lumped with the Elmidae and several other families into the superfamily Dryopoidea (Brown 1972; 1975). That arrangement has been modified; these families are now considered members of the superfamily Byrrhoidea (Lawrence & Newton 1995). The Dryopidae are a diverse, mostly tropical family; two genera occur in Florida. Adult dryopids may be aquatic (*Helichus*), semi-aquatic (*Pelonomus*) or terrestrial - some species are even arboreal (adults of all Florida taxa are aquatic/semi-aquatic). Spangler (1987) stated that all known dryopid larvae were terrestrial, although Brigham (1982) considered the larva of *Pelonomus* to be semi-aquatic. Although keyed in Brown (1972) and Brigham (1982), larvae of *Helichus* and *Pelonomus* are not considered separable at this time. Ulrich (1986) noted the numerous times dryopid larvae have been mistakenly described in the literature.

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Brigham 1982; Brown 1972; Hilsenhoff & Schmude 1992.

### Key to adults of Florida Dryopidae genera

1 Second segment of antenna enlarged and heavily sclerotized, forming a shield for the remaining bare antennal segments; bases of antennae very close together; eyes bare ..... *Helichus*



1' Second segment of antenna not enlarged and heavily sclerotized, not forming a shield; bases of antennae widely separated; eyes pubescent ..... *Pelonomus*



(adapted from Barr & Chapin 1988)

**Genus *Helichus***

**DIAGNOSIS:** As in the family diagnosis; larvae are insufficiently known to provide a generic level diagnosis that would allow separation of the two genera in Florida. Larvae are terrestrial and would not normally be collected in aquatic situations.

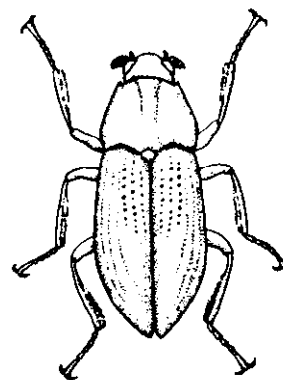
Adults are distinguished by the enlarged and heavily sclerotized second antennal segment that forms a shield for the remaining bare antennal segments; bases of antennae very close together; and bare eyes.

**NOTES:** *Helichus* is the most widespread of the North American dryopids. Of the seven Nearctic species, two are recorded from Florida; a third species may also eventually be found here. *Helichus* adults are found in streams where they live among rocks and gravel or cling to submerged wood. *Helichus* probably do not occur in the southern portion of the state; the most southerly record I've seen is from Alachua Co. Larvae are terrestrial; the immature stages of two Nearctic species were described by Ulrich (1986).

**ADDITIONAL REFERENCES:** Musgrave 1935; Ulrich 1986.



*H. suturalis*, larva  
(adapted from Ulrich 1986)



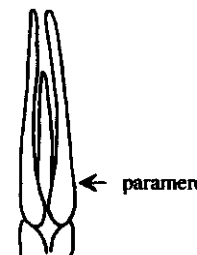
*H. lithophilus*, adult  
(adapted from Brown 1972)

**Key to adult *Helichus* of Florida**

- 1 Pronotum and elytra completely covered with a dense pubescence (scutellum and posterior margin of pronotum bare; pubescence less dense on discal portion of pronotum) (fig. above); genitalia with aedeagus much shorter than parameres ..... *H. lithophilus*
- 1' Elytra with sutural area bare or sparsely pubescent (with small "clumps" of setae), pubescence dense along lateral margins (fig. next page); aedeagus longer ..... 2

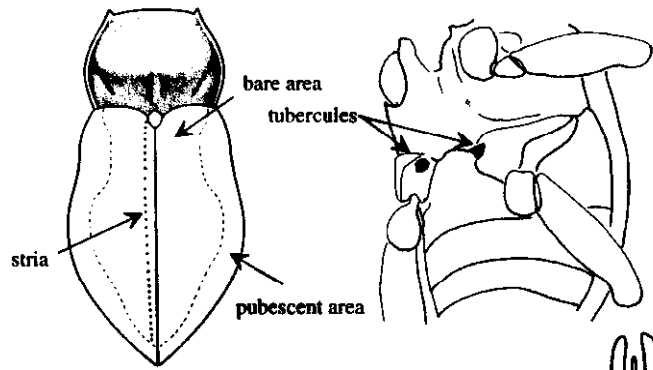


lateral view of genitalia (above)  
dorsal view of aedeagus (right)  
(adapted from Musgrave 1935)



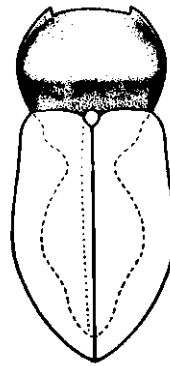
Dryopidae 2.3

- 2(1') First elytral stria distinct, with large, deep punctures often reaching to scutellum; male with thorn-like tubercule on hind coxa; genitalia as figured ..... *H. fastigiatus*

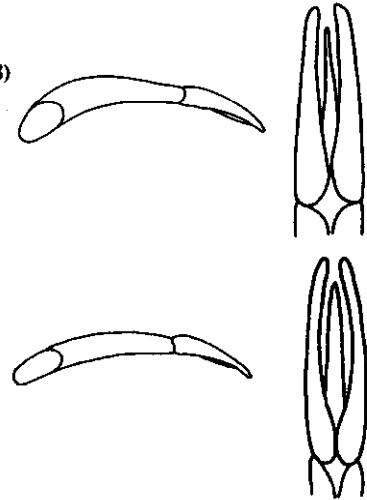


(adapted from Barr & Chapin 1988)

- 2' First elytral stria weak, at most with small punctures that do not reach scutellum; male without thorn-like tubercule on hind coxa; genitalia as figured ..... *H. basalis*  
(Not recorded from Florida, but may eventually be found in northern and/or western part of the state.)



(adapted from Barr & Chapin 1988)



(genitalia figs. adapted from Musgrave 1935)

Notes on species

- H. basalis* - Length 4.3-5.5 mm. This species has not been recorded from Florida, but may eventually be found in the northern and/or western part of the state. In the South, it is known from the Carolinas, Louisiana and Georgia.
- H. fastigiatus* - Length 4.5-5.5 mm. Pubescence of the sutural area varies from bare to sparsely pubescent; when present, the sparse pubescence occurs in small clumps. Young (1954) found this species clinging to logs in the slower portions of the current.
- H. lithophilus* - Length 4.4-5.8 mm. A densely pubescent species; when compared to *H. lithophilus*, *H. basalis* and *H. fastigiatus* appear to have had the pubescence rubbed off the central part of their elytra. Note that male *H. lithophilus* do not possess the thorn-like hind coxal tubercules as in *H. fastigiatus*. Although *lithophilus* means "stone-loving", Barr & Chapin (1988) and Hilsenhoff & Schmude (1992) found adults most often on submerged wood or roots; Young (1954) found the species "among rocks and gravel in the riffles of sand-bottomed streams, and more rarely clinging to submerged logs".

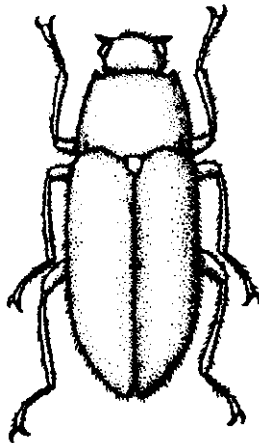
**Genus *Pelonomus***

**DIAGNOSIS:** As in the family diagnosis; larvae are insufficiently known to provide a generic level diagnosis that would allow separation of the two genera in Florida.

Adults are distinguished by the pubescent antennae without an enlarged second segment; bases of antennae close together; and pubescent eyes (the entire body is pubescent).

**NOTES:** Of the 12 species of this principally Neotropical genus, only one, *P. obscurus* (length 4.5-6.8 mm), occurs in North America. It occurs as far north as Delaware and southern Illinois and Indiana, and west to Kansas and Texas. Considered riparian or semi-aquatic, it is a common inhabitant of swamps, cypress hammocks and pond margins, where it is found on plants and debris. The species apparently occurs throughout the state (it is probably more abundant in the southern part of the state). Note also that the body of *Pelonomus* is generally much softer than that of *Helichus*. Bertrand (1955) described the larva of *Pelonomus*.

**ADDITIONAL REFERENCES:** Bertrand 1955.



*P. obscurus*, adult  
(adapted from Brown 1972)

## Family Dytiscidae

**DIAGNOSIS:** Larvae are distinguished by the prominent head, which is visible in a dorsal view; long, slender, curved mandibles that are grooved or hollow for injecting/sucking fluids; apparently five-segmented legs, with two tarsal claws; 8-segmented abdomen; and last abdominal segment with a pair of terminal spiracles.

Adults are distinguished by the undivided, streamlined eyes; filiform (thread-like, unclubbed) antennae; maxillary palpi shorter than antennae; fully visible scutellum, or, if scutellum hidden by bases of elytra, then fore and mid tarsi pseudotetramerous (4th segment small and almost hidden between the lobes of the 3rd segment), or hind tarsus with a single, thick, straight claw; first abdominal sternite completely divided by the hind coxae; and flattened, streamlined hind tarsi (and usually tibiae) lined with long, stiff swimming setae.

**NOTES:** Adult dytiscids are among the most commonly encountered aquatic beetles. They can be found in almost any aquatic situation, from rain puddles and birdbaths, springs, seeps, swamps, ditches, streams and rivers to ponds and lakes. They are notably absent from very deep water. Larvae are predacious; adults are predators and/or scavengers. Thirty-four genera including about 110 species are recorded from the state, and several more species are to be expected.

Identification of some dytiscid larvae, even to the generic level, remains difficult, especially with larvae of subfamily Hydroporinae; the larvae of five hydroporine genera that occur in Florida remain undescribed. These undescribed genera will probably key out between couplets 4-11 in the following larval key. For some genera, larvae are known based only on the description of a single species. There are three larval instars; some characters, such as secondary setae, differ between instars. The following key is based on characters from the last larval instar.

Much work remains to be done with the taxonomy of the Dytiscidae, especially the subfamily Hydroporinae. The large genus *Hydroporus* is being revised and has recently been divided into several genera by the elevation of subgenera and some species groups to the generic level (see Notes under *Hydroporus*). Note that identification of many species may be possible only with correctly identified comparative material; a series of male (and for some taxa, female) specimens is also desirable.

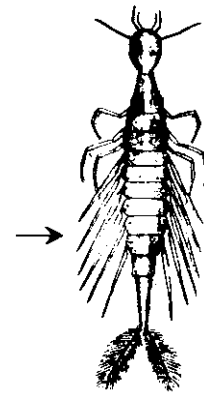
**ADDITIONAL REFERENCES:** Brigham 1982; Larson 1975; Michael & Matta 1977; White & Brigham 1995; Young 1969.

**Key to larvae of Florida Dytiscidae genera**

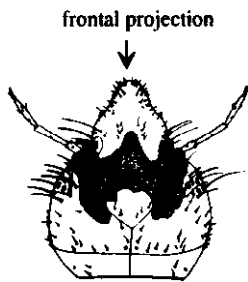
(Larvae of *Agaporomorphus*, *Anodocheilus*, *Bidessonotus*, *Brachyvatus*, *Laccodytes*, *Lioporeus*, and *Neobidessus* are undescribed)

1 First 6 abdominal segments each with a pair of long lateral gills ..... *Coptotomus*

1' Abdominal segments without lateral gills ..... 2



2(1') Anterior margin of head with a frontal projection or large "teeth" ..... 3



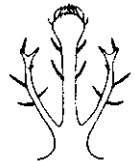
2' Anterior margin of head straight or simply convex (arched) ..... 15

3(2) Anterior margin of head with long "teeth" (center figure above); cerci absent .... *Cybister*  
(The larva of *Megadytes*, which may occur in southern FL, will also key here. See Notes.)

3' Anterior margin of head with simple, notched or branched frontal process; cerci present but may be reduced ..... 4

4(3') Frontal projection spatulate and with long lateral branches ..... *Derovatellus*

4' Frontal projection not as above ..... 5



5(4') Abdominal sternites 2-8 sclerotized (segments 2-4 may only have a sclerotized plate) ..... 6

5' Basal abdominal sternites unsclerotized, only last 2-3 segments sclerotized ventrally ..... 7

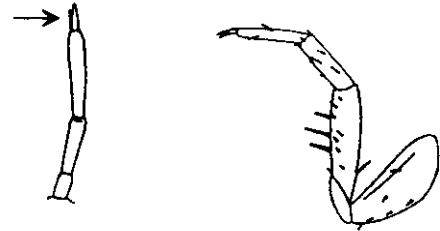


last 3 segments sclerotized

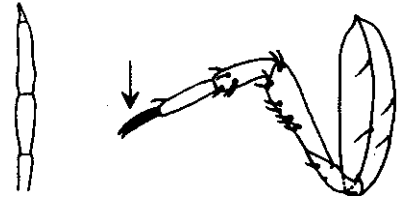
(adapted from Spangler & Folkerts 1973)

Dytiscidae 3.3

6(5) Apical segment of antennae bifurcate; fore and mid tarsal claws < 2/3 length of tarsus .. *Desmopachria*



6' Apical segment of antennae simple; fore and mid tarsal claws > 2/3 length of tarsus ..... *Hydrovatus*

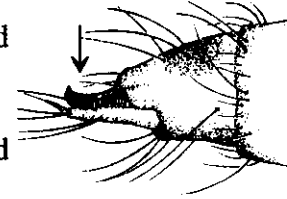


7(5') Frontal projection with a short lateral branch on each side ..... *Pachydrus*



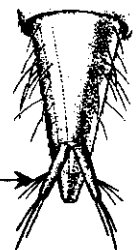
7' Frontal projection notched, undulated or smooth on side, without branches ..... 8

8(7') Last abdominal segment with tracheal trunks that extend beyond the segment's apex; maxillary palpus 4-segmented ..... *Celina*



8' Last abdominal segment without tracheal trunks that extend beyond the segment's apex; maxillary palpus 3-segmented ..... 9

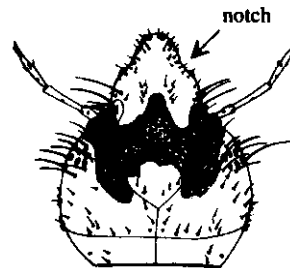
9(8') Cerci at most about 1/2 as long as the segment from which they arise ..... *Laccornis*



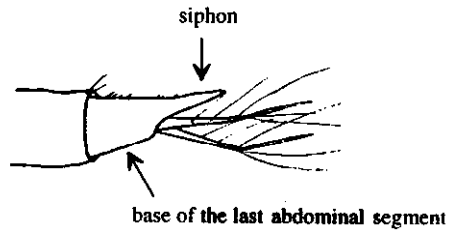
9' Cerci subequal to or longer than the segment from which they arise ..... 10

10(9') Frontal projection without lateral notches ..... 11

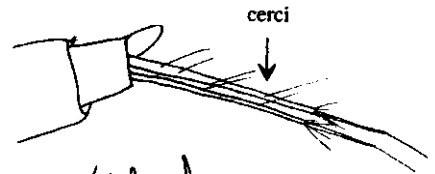
10' Frontal projection with lateral notches ..... 12



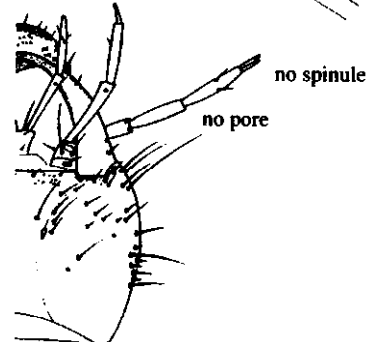
11(10) Basal segment of cerci shorter than last abdominal segment including the siphon; siphon equal to or longer than the base of the last abdominal segment ..... *Uvarus*



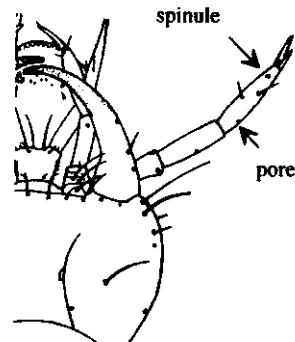
11' Basal segment of cerci longer than last abdominal segment including the siphon; siphon shorter than the base of the last abdominal segment ..... *Liodessus*  
(The larva of *Neochlypeodytes*, not expected to occur in FL, will also key here. See Perkins 1980a)



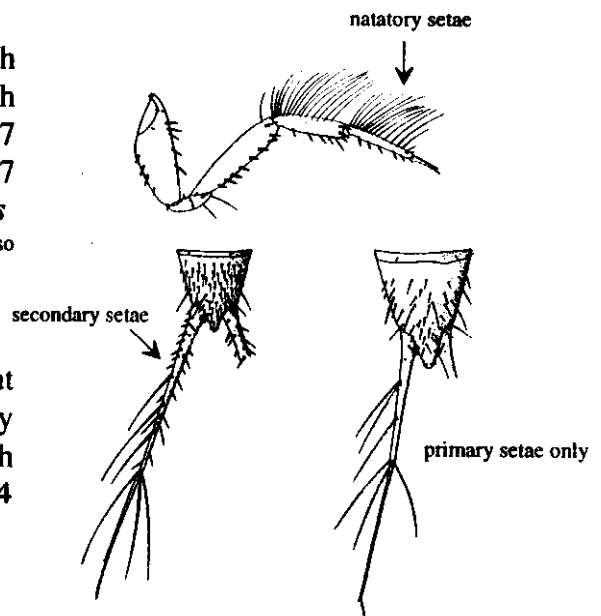
12(10') Antennal segment 3 without a laterobasal pore and without a ventroapical spinule; rare to uncommon in FL ..... *Hygrotus*



12' Antennal segment 3 with a laterobasal pore and a ventroapical spinule; common in FL ..... 13



13(12') For 3rd (last) instar larvae only: legs with natatory (swimming) setae; cercus with numerous secondary setae in addition to the 7 larger primary setae; abdominal segments 1-7 without spiracles ..... *Neoporus*  
(The larva of *Heterosternuta*, not expected to occur in FL, will also key here. *Heterosternuta* larvae lack natatory setae on the legs.)



13' For 3rd (last) instar larvae only: legs without natatory setae; cercus with 7 larger primary setae only; abdominal segments 1-7 with spiracles ..... 14

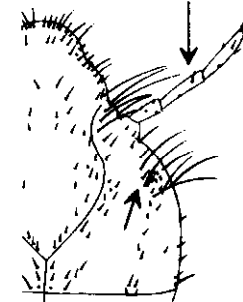


Dytiscidae 3.5

14(13') Antennal segment 2 without secondary setae; width of eye-spot group at least 2X the width of first antennal segment; thoracic tergum with a posterior transverse ridge ..... *Hydroporus*



14' Antennal segment 2 with a dorsomedian secondary seta; width of eye-spot group subequal to maximum width of first antennal segment; thoracic tergum without a posterior transverse ridge ... *Hydroporus oblitus* group



(adapted from Alarie 1991)

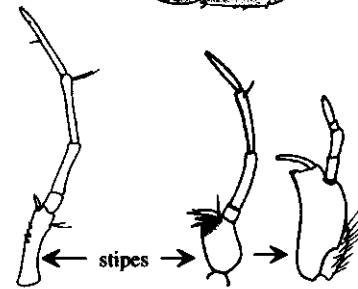
15(2') Fore and mid legs chelate (pincer-like) ..... *Matus*



15' Fore and mid legs simple ..... 16

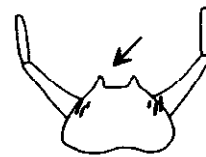
16(15') Maxillary stipes long and slender ..... 17

16' Maxillary stipes suboval or broadly rectangular ..... 19



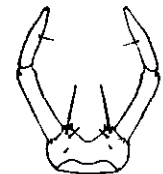
(adapted from Wilson 1923)

17(16) Labium with 2 projecting lobes near center; cerci without lateral setal fringe ..... *Hydaticus*



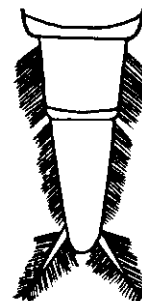
(adapted from Hilsenhoff 1975b)

17' Labium without projecting lobes near center; cerci with lateral setal fringe ..... 18



(adapted from James 1970)

18(17') Last 2 abdominal segments with well developed lateral fringe ..... *Dytiscus*  
(not recorded from FL, but to be expected in the northern part of the state)



18' Last 2 abdominal segments without lateral fringe (some lateral setae may be present) ..... *Hoperius*  
(not recorded from FL, but to be expected in the northern part of the state)



(adapted from James 1970) (adapted from Spangler 1973a)

Dytiscidae 3.6

- 19(16') Abdominal segments 7 and/or 8 with a lateral fringe of long swimming hairs ..... 20
- 19' Abdominal segments 7 and/or 8 without a lateral fringe of swimming hairs ..... 23
- 20(19) Ligula very short, armed with 4 spines ..... *Eretes*
- 20' Ligula long, may be simple or bifid, but without 4 spines ..... 21

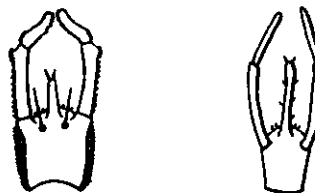
21(20') Ligula bifid apically ..... *Acilius*

21' Ligula simple ..... 22



22(21') Ligula not as long as first segment of labial palp ..... *Thermonectus*

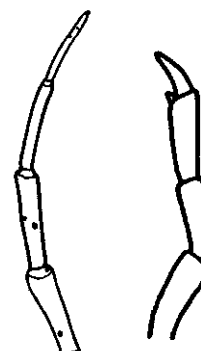
22' Ligula subequal to or longer than first segment of labial palp ..... *Graphoderus*



(adapted from Wilson 1923)

23(19') Last (4th) antennal segment > 2/3 length of 3rd segment .. *Rhantus*

23' Last (4th) antennal segment < 2/3 length of 3rd segment ..... 24



*Rhantus*  
(adapted from James 1970)

*Copelatus*  
(adapted from Spangler 1962a)

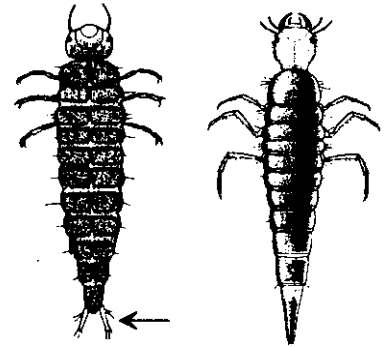
24(23') Last antennal segment double, although lesser lobe may be only a stout setae arising from apex of 3rd segment next to greater lobe (right fig. above); cerci subequal to or shorter than last abdominal segment ..... 25

24' Last antennal segment simple; cerci subequal to or much longer than last abdominal segment ..... 26

Dytiscidae 3.7

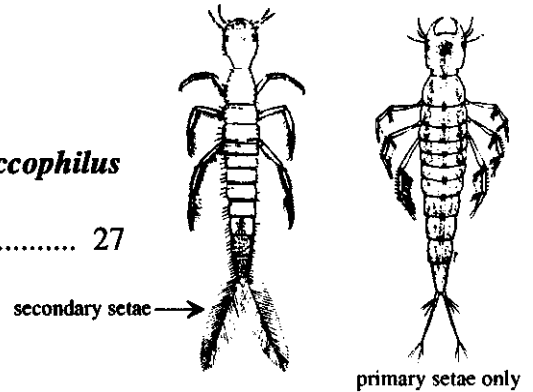
25(24) Cerci subequal to last abdominal segment ..... *Copelatus*

25' Cerci rudimentary ..... *Agabetes*

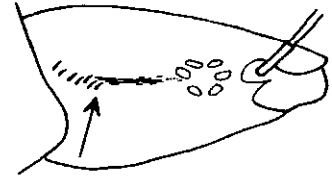


26(24') Cerci with numerous secondary setae ..... *Laccophilus*

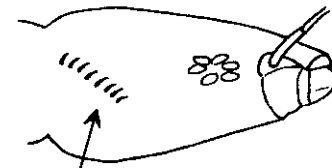
26' Cerci with 7 large primary setae in two whorls ..... 27



27(26') Lateral margin of head more or less compressed or keeled; temporal spines in a line that would intersect the ocelli or pass just below them ..... *Ilybius*



27' Lateral margin of head not keeled; temporal spines in a line that would run well below the ocelli ..... *Agabus*

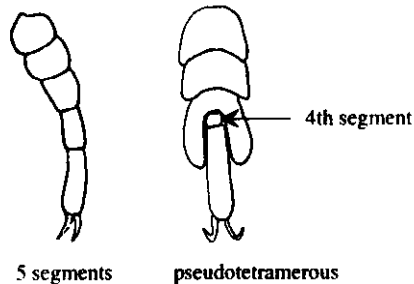


(adapted from Hilsenhoff 1975b)

Key to adults of Florida Dytiscidae genera

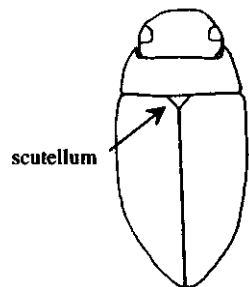
1 Fore and mid tarsi distinctly 5 segmented, the 4th segment approximately equal to the 3rd ..... 2

1' Fore and mid tarsi distinctly 4 segmented, or pseudotetramerous (with the 4th segment small and concealed between the enlarged lobes of the third so that 5th segment appears to be the 4th) ..... 21



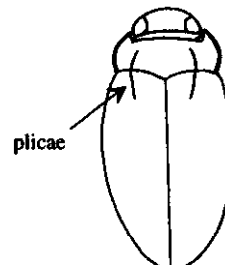
2(1) Scutellum covered by the pronotum (rarely a small tip may be visible) ..... 3

2' Scutellum entirely visible ..... 5



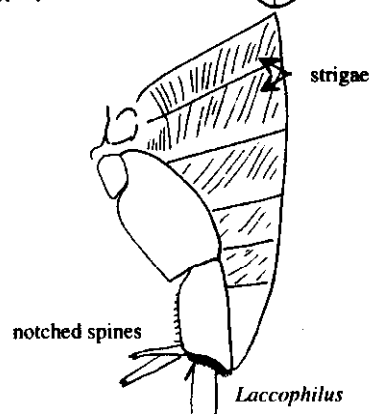
3(2) Hind tarsus with 2 equal claws; pronotum and elytra with plicae ..... *Bidessonotus*

3' Hind tarsus with a single claw; pronotum and elytra without plicae ..... 4



4(3') Moderately small, 2.5-5.3+ mm; hind tibial spines notched apically; basal abdominal sternite with longitudinal strigae ..... *Laccophilus*

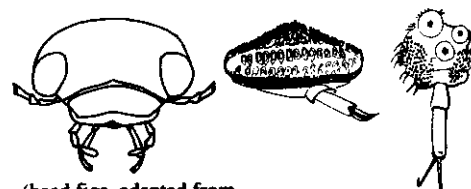
4' Very small, 1.9-2.1 mm; hind tibial spines sharply pointed apically; basal abdominal sternite mostly smooth ..... *Laccodytes*



5(2') Anterior margins of the eyes notched above the antennal bases; basal 3 segments of male fore tarsus widened, but not forming an oval to round plate .. 6



5' Anterior margins of the eyes not notched above the antennal bases; basal 3 segments of male fore tarsus widened, forming an oval to round plate ..... 14

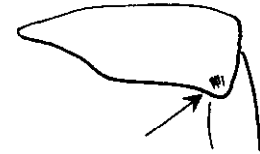


(head figs. adapted from Michael & Matta 1977)

Dytiscidae 3.9

6(5) Hind femur with a linear group of cilia on the posterior apical angle ..... 7

6' Hind femur without such a group of cilia ..... 8



7(6) Hind tarsal claws equal; hind margin of female last abdominal sternite entire ..... *Agabus*

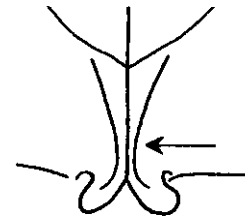
7' Hind tarsal claws unequal; hind margin of female last abdominal sternite notched ..  
..... *Ilybius*

8(6') Hind tarsal claws approximately equal ..... 9

8' Hind tarsal claws obviously unequal ..... 12

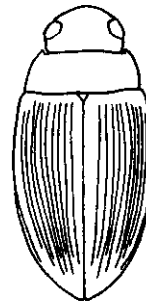
9(8) Hind coxal lines approach each other posteriorly, almost touching median line ..... 10

9' Hind coxal lines never almost touch median line ..... 11

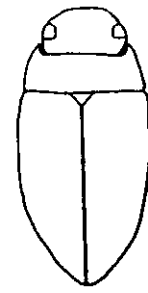


10(9) Each elytron with 6-11 striae; basal abdominal sternites with strigae (scratch-like lines); length > 3.5 mm ..... *Copelatus*

10 Elytra without striae; basal abdominal sternites without strigae; length < 3.0 mm ..  
..... *Agaporomorphus*

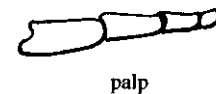


*Copelatus*



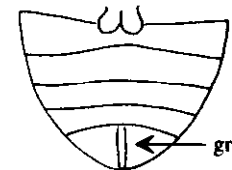
*Agaporomorphus*

11(9') Labial and maxillary palpi notched apically; last abdominal sternite without a pair of medial parallel grooves; elytra without dense sculpture of irregular grooves ..... *Coptotomus*



palp

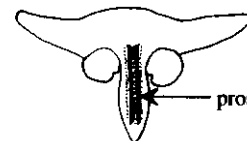
11' Labial and maxillary palpi simple; last abdominal sternite with a pair of medial parallel grooves; elytra with a dense sculpture of irregular grooves ..... *Agabetes*



grooves

12(8') Prosternum with a longitudinal medial furrow ..... *Matus*

12' Prosternum flat, convex or keeled, without a furrow ... 13



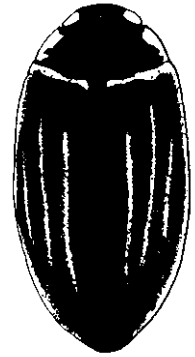
prosternal furrow

Dytiscidae 3.10

13(12') Prosternal process flat; pronotum widely margined laterally; dorsum unusually flat and without a color pattern; elytra with a lightly impressed pattern of coarse, unequal, irregular meshes ..... *Hoperius*  
 (Not recorded from FL but may eventually be found in the northern part of the state.)



*Hoperius*



*Rhantus*

13' Prosternal process convex or keeled; pronotum narrowly margined laterally; dorsum not as flat and in FL species usually marked with vittae and/or fasciae or spots; elytra lightly impressed with fine, unequal, irregular meshes (some females may also have an additional superimposed reticulate pattern) .. *Rhantus*

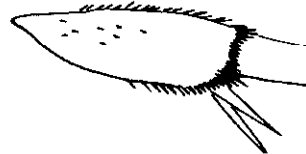
14(5') Larger, length > 20 mm; hind margin of first 4 segments of hind tarsi without a coarse fringe of golden yellow cilia (some cilia may be present on outer apical angle) ..... 15



(adapted from Michael & Matta 1977)

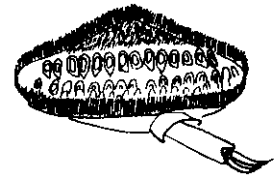
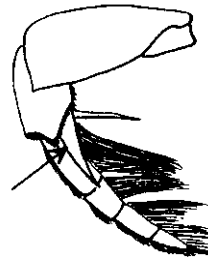
14' Smaller, length < 20 mm; hind margin of first 4 segments of hind tarsi with a coarse fringe of golden yellow cilia ..... 17

15(14) Shorter spur at hind tibial apex about as broad as the longer spur; first 3 segments of male fore tarsi forming a round plate ..... *Dytiscus*  
 (Not recorded from FL but may eventually be found in the northern part of the state)



(adapted from Miall 1895)

15' Shorter spur at hind tibial apex much broader than the longer spur; first 3 segments of male fore tarsi forming an oval plate ..... 16



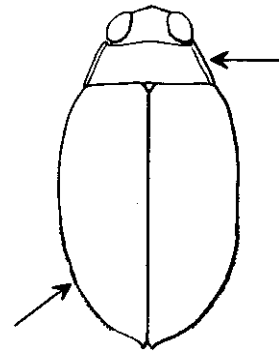
16(15') Larger, length > 25 mm; elytra with yellow borders; male hind tarsus with 1 apical claw, female usually with 1 claw or a long outer and a rudimentary inner claw ..... *Cybister*

16' Smaller, length < 25 mm; elytra without yellow borders; male hind tarsus with 2 apical claws, female with a long outer and a rudimentary inner claw ..... *Megadytes*

Dytiscidae 3.11

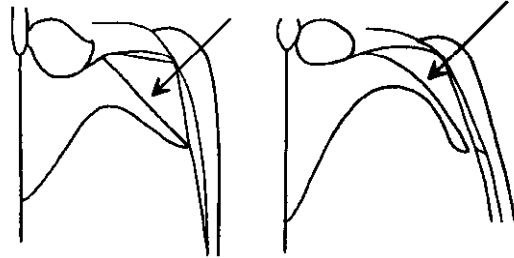
17(14') Posterolateral margin of elytra with a row of small spines; elytra pointed apically; pronotum margined laterally; prosternal process sharply pointed apically ..... *Eretes*

17' Posterolateral margin of elytra without spines; elytra not pointed apically; pronotum unmargined; prosternal process rounded apically ..... 18



18(17') Smaller spur at hind tibial apex sharply pointed; outer margin of metasternal wing straight ..... *Hydaticus*

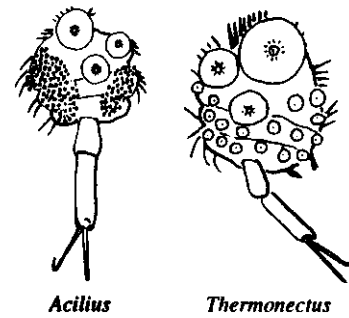
18' Smaller spur at hind tibial apex notched or blunt; outer margin of metasternal wing strongly arched ..... 19



(adapted from Hilsenhoff 1975a)

19(18') Body beneath, elytra and pronotum coarsely punctate; suction disc of male fore tarsus with 1 large basal, 2 smaller and many tiny suction cups ..... *Acilius*

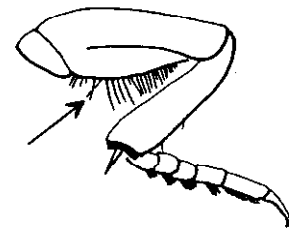
19' Body beneath almost smooth, with scarcely observable microreticulation (some females may have a sculpture of many small, short grooves dorsally); suction disc of male fore tarsus with a few large and many small suction cups ..... 20



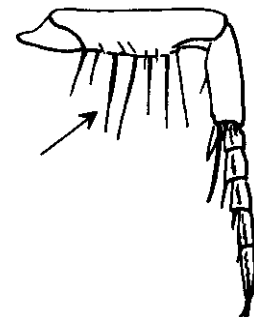
*Acilius*

*Thermonectus*

20(19') Elytra yellow, vermiculate (with small black spots that run together, resembling worm trails); hind margin of mid femur with a row of stiff setae that are about 1/2 as long as femur is wide; mid tarsi of male with a row of suction discs; female elytra without sculpture ..... *Graphoderus*

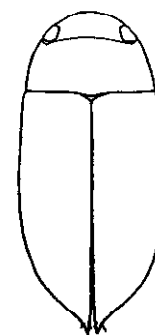


20' Elytra black with yellow spots or fasciae, or yellow with black spots; hind margin of mid femur with a row of stiff setae that are as long or longer than the femur is wide; mid tarsi of male without a row of suction discs; female elytra with sculpture of many short grooves ..... *Thermonectus*



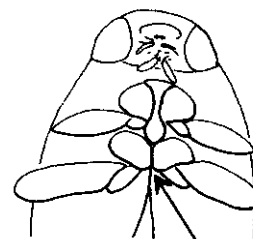
Dytiscidae 3.12

21(1') Scutellum exposed; body form somewhat cylindrical, with apices of elytra and last abdominal sternite produced into a sharp point ..  
 ..... *Celina*



21' Scutellum concealed; body form variable with apex of abdomen not produced into a sharp point, OR if elytra pointed, then body form more hemispherical (see *Hydrovatus*, couplet 31) ..... 22

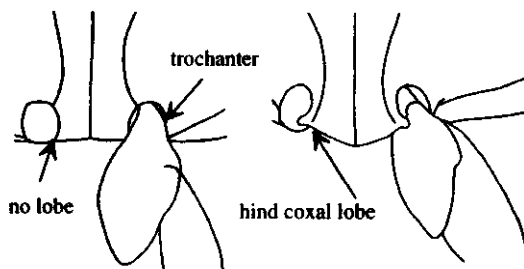
22(21') Middle coxae contiguous; prosternal process short, ending before mid coxae; mesepimeron extends between the metepisternum and the mesocoxal cavity ..... *Derovatellus*



contiguous middle coxae

22' Middle coxae not contiguous, divided by prosternal process or mesosternite and separated by at least 1/2 the width of a middle coxa; metepisternum reaches the mesocoxal cavity ..... 23

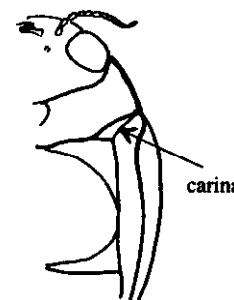
23(22') Hind coxal process without lateral lobes, bases of the hind trochanters entirely free ..... 24



(adapted from Michael & Matta 1977)

23' Hind coxal process produced laterally into lobes that cover the bases of the hind trochanters ..... 30

24(23) Epipleuron with a diagonal carina ..... 25



carina

24' Epipleuron without a diagonal carina ..... 27

25(24) Hind tarsal claws equal; hind tibiae slightly arcuate, narrow basally and widening gradually to apex; clypeus with 2 small tubercles; body pointed posteriorly ..... *Brachyvatus*



*Brachyvatus*

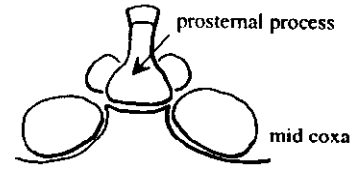
25' Hind tarsal claws unequal; hind tibiae straight, about as wide at the base as at the apex; clypeus without 2 small tubercles; body rounded or globose ..... 26



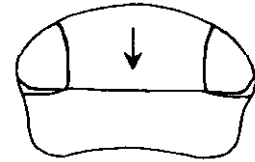
26(25') Length < 2.5 mm; mid coxae separated by about 1/2 the width of a middle coxa; prosternal process pointed apically ..... *Desmopachria*



26' Length > 4.0 mm; mid coxae separated by about the width of a middle coxa; prosternal process rounded apically ..... *Pachydrus*

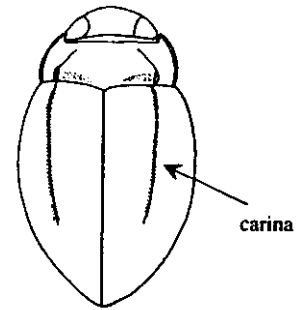


27(24') Head without a transverse line behind the eyes ...  
..... *Uvarus*



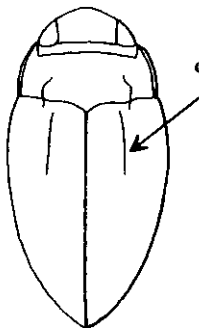
27' Head with a transverse line behind the eyes ..... 28

28(27') Each elytron with a strong carina beginning behind the pronotal plica and running most of the length of the elytron ..... *Anodocheilus*

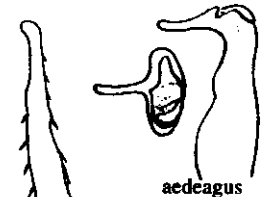
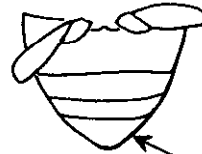


28' Elytra without strong carinae ..... 29

29(28') Elytron with a weak discal accessory stria; last abdominal sternite broad; male with truncate spur at apex of hind tibia; aedeagus apex resembles a bird's head ..... *Neobidessus*



discal accessory stria



aedeagus

truncate spur

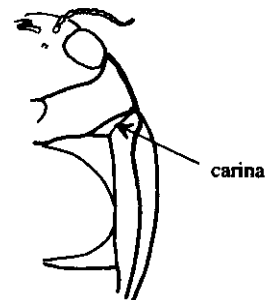
29' Elytron may have a weak sutural groove or basal elytral plicae, but no discal accessory stria; last abdominal sternite narrow; male with pointed spur at apex of hind tibia; aedeagus simple ..... *Liodessus*



aedeagus

30(23') Epipleuron with a diagonal carina ..... 31

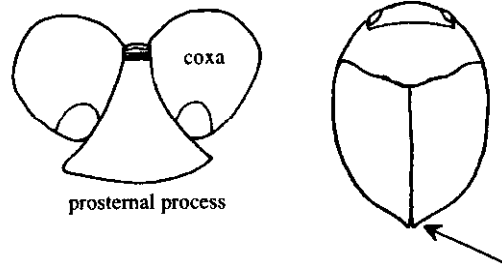
30' Epipleuron without a diagonal carina ..... 32



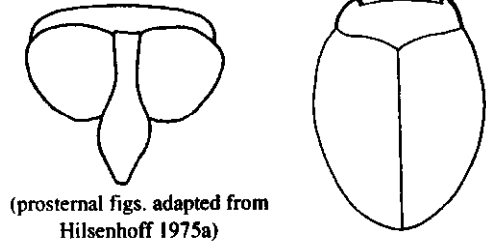
carina

Dytiscidae 3.14

31(30) Prosternal process broadly rounded at tip, as wide as procoxae; body form hemispherical with elytral apices pointed; central portion of hind coxal process depressed, lower than lateral lobes; fore and mid tarsi pseudotetramerous ..... **Hydrovatus**

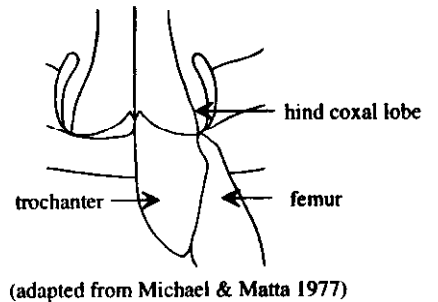


31' Prosternal process pointed at tip, about 1/2 as wide as procoxae; if body form hemispherical, elytral apices not pointed; central portion of hind coxal process on same plane as lateral lobes; fore and mid tarsi 4 segmented ..... **Hygrotus**



32(30') Base of hind femur contacting hind coxal lobe ..... **Laccornis**

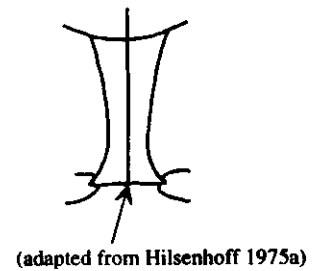
32' Hind femur separated from coxal lobe by part of the trochanter ..... 33



(adapted from Michael & Matta 1977)

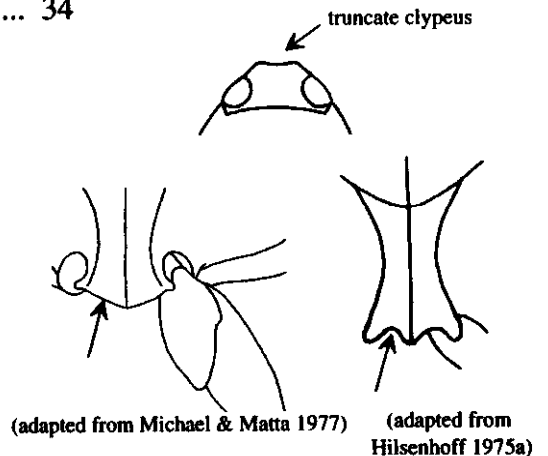
33(32') Posterior margin of hind coxal process essentially straight, the middle portion not advanced more posteriorly than the lateral lobes; anterior margin of clypeus rounded ..  
..... **Hydroporus**

33' Posterior margin of hind coxal process with central portion produced posteriorly (see figs. below); OR if posterior margin of hind coxal process appears almost straight, then anterior margin of clypeus truncate ..... 34

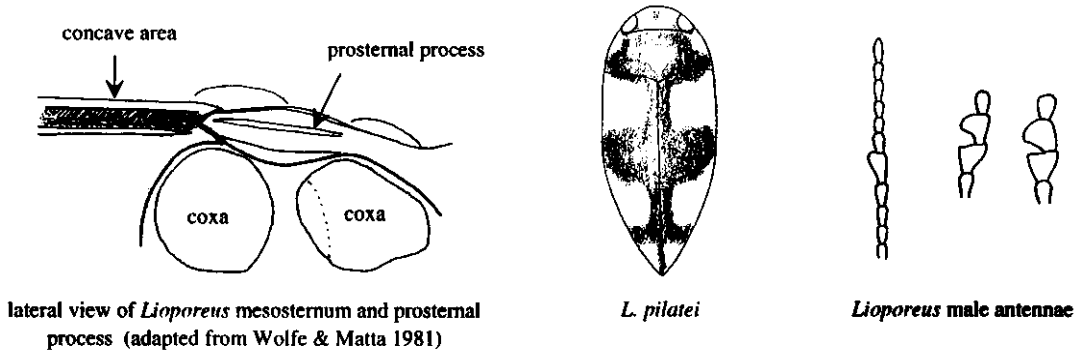


34(33') Middle portion of hind coxal process produced posteriorly more than lateral lobes, the hind margin from the produced central portion to the lobes not sinuate, OR anterior margin of clypeus truncate ..  
..... **Neoporus**  
(*Heterosternuta*, not known from FL, will key here; its aedeagus is apically bifid (simple in *Neoporus*). See Matta & Wolfe 1981)

34' Hind margin of hind coxal process from the produced central portion to the lateral lobes sinuate; anterior margin of clypeus rounded ..... 35



- 35(34') Metasternum weakly sulcate (concave) posterior to the apex of the prosternal process; elytra usually brightly marked; male with 4th and/or 5th antennal segment(s) broadened; male fore tibiae straight; a small suction cup on the basal segment of the male protarsus ..  
 ..... *Lioporeus*



- 35' Metasternum not sulcate posterior to the apex of the prosternal process; elytra without bright markings; male without broadened antennal segments; male fore tibiae sinuate; without a small suction cup on the basal segment of the male protarsus .....

..... *Hydroporus oblitus* group  
 (*Sanfilippodytes*, not known from FL, will key here. It can be distinguished by having the posterior margin of the hind trochanter not much shorter than the distance from its distal apex to the apex of the femur; in the *H. oblitus* group the trochanter's posterior length is not much greater than 1/2 the distance from its distal apex to the apex of the femur. See Fall (1923)(as *H. vilis* group), Rochette (1983) and Young (1953f)).

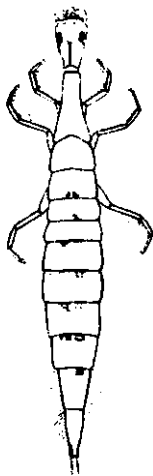
Genus *Acilius*

**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal process; maxillary stipes broadly rectangular; apically bifid ligula; and abdominal segments 7 and 8 without gills but with lateral fringe of setae.

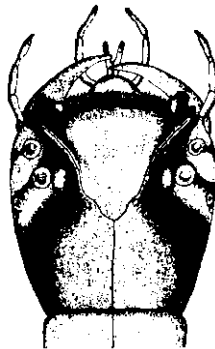
Adults are distinguished by the moderately large size; eyes without anterior emargination; five segmented fore and mid tarsi; three basal segments of male foretarsi forming a more or less round plate, with a large basal and two smaller suction cups; apically rounded prosternal process; densely punctate pronotum, elytra and venter; posterior margins of first four hind tarsomeres with dense fringe of golden cilia; and blunt outer apical spur on hind tibia.

**NOTES:** Two species are known from Florida. They are most often found in shaded woodland pools, but can be found in other temporary or permanent habitats, such as sand-bottomed streams. Matta & Peterson (1987) found the larvae of *A. fraternus dismalus* to be most commonly associated with debris/leaf litter, usually the dead blades of submerged grass tufts in temporary pools. *Acilius* larvae (and other members of the tribe Aciliini, which includes *Graphoderus* and *Thermonectus* in Florida) have at least two pair of eyes modified for looking at (and through) the water surface; they feed on crustaceans and other small invertebrates at the water surface (J. Matta, pers. comm.).

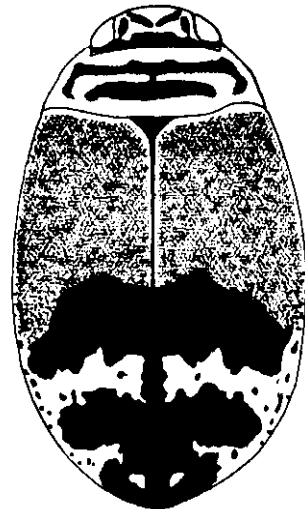
**ADDITIONAL REFERENCES:** Hilsenhoff 1975a, 1993a; Matta & Michael 1976; Matta & Peterson 1987; Wolfe 1980.



*Acilius* larva  
(adapted from Wilson 1923)



*A. fraternus dismalus*, larval head  
(adapted from Matta & Peterson 1987)

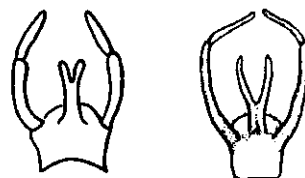


*A. mediatius*, adult

**Key to larval *Acilius* of Florida**

1 Ligula shallowly bifid ..... *A. mediatius*

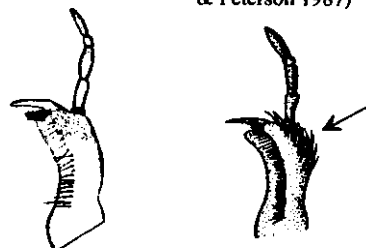
1' Ligula deeply bifid ..... *A. fraternus* ..... 2



(adapted from Matta & Peterson 1987)

2(1') Maxilla without dorsoapical setae ... *A. f. dismalus*

2' Maxilla with dorsoapical setae ..... *A. f. fraternus*



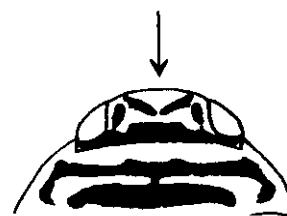
(adapted from Matta & Peterson 1987)

(adapted from Wolfe 1980)

**Key to adult *Acilius* of Florida**

1 Length 12.5 mm or less; with distinct M or V shaped mark on dorsum of head; males without ventral tufts of setae on 3 basal mesotarsal segments; females without elytral sulci..... *A. mediatius*

1' Length greater than 12.5 mm; without distinct M or V shaped mark on dorsum of head; males with ventral tufts of golden setae on 3 basal mesotarsal segments; females with or without sulci ..... *A. fraternus* ..... 2



2(1') Females never with sulci; dorsum with dark brown cast; postmedian pale fascia usually indistinct; coxal plates and metasternum piceous (black with reddish tinge); abdomen piceous with distal margins reddish brown .....  
..... *A. f. dismalus*

2' Females with or without sulci; dorsum with reddish brown cast; postmedian pale fascia usually distinct; coxal plates, metasternum and abdomen reddish brown ... *A. f. fraternus*



**Notes on species**

*A. fraternus* - Length 14-16 mm. Two subspecies occur in Florida: *A. f. dismalus*, a southeastern coastal plain subspecies, is the most widespread in the state; *A. f. fraternus* is known only from extreme western Florida.

*A. mediatius* - Length 10-12.5 mm. A smaller, brighter species than *A. fraternus*.

Genus *Agabetes*

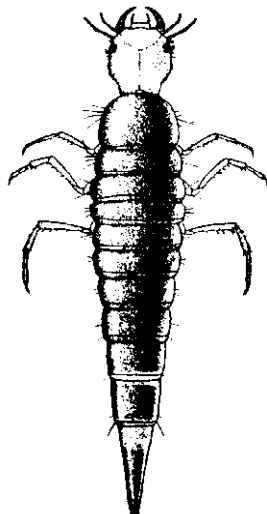
**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal process; broad maxillary stipes; mandible stout at base, slender and pointed apically with cluster of setae ventrobasally; antenna with last segment less than 2/3 length of third segment, with stout seta arising from apex of third segment subequal to fourth segment; abdominal segments 7 and 8 without a lateral fringe; and short stout cerci. Live larvae are easily distinguished by the reddish-yellow head contrasting with the very dark gray body segments.

Adults are distinguished by the emarginate eyes; palpi without an apical notch; unmarginated pronotum; visible scutellum; five segmented fore and mid tarsi; elytra with dense sculpture of short irregular grooves; equal hind tarsal claws; and last abdominal sternite with two medial parallel grooves.

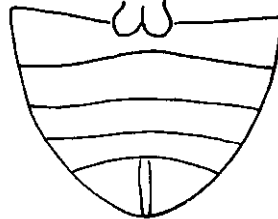
**NOTES:** One species, *A. acuductus* (length 6.0-7.5 mm), is known from North America. It is a species of woodland pools and ponds.

Young (1954) made reference to the apparent flightlessness of this species. However, Spangler & Gordon (1973) noted that it flew to UV light traps, and I have collected it at UV light near the Wakulla River.

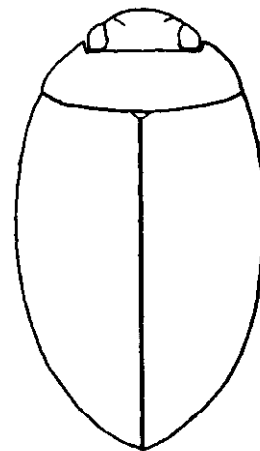
**ADDITIONAL REFERENCES:** Burmeister 1990; Spangler & Gordon 1973.



larva  
(adapted from Spangler &  
Gorden 1973)



abdominal sternites



adult

Genus *Agabus*

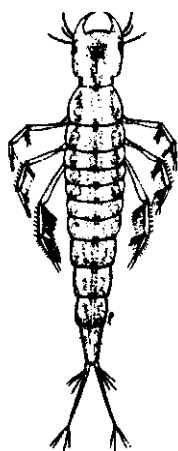
**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal process; broad maxillary stipes; anteroventral spines not paired with posteroventral spines on hind tarsus; abdominal sternites 1-6 membranous, 7-8 sclerotized; abdominal segments 7 and 8 without a lateral fringe; cercus with setae in two whorls, proximal whorl with 3 setae, distal whorl with 4 setae, with dorsal setae of proximal whorl distinctly posterior to other two setae.

Adults are distinguished by the emarginate eyes; visible scutellum; five segmented fore and mid tarsi; sternite 6 not emarginate medially; hind femur with a linear group of cilia on the posterior apical angle; and the equal hind tarsal claws.

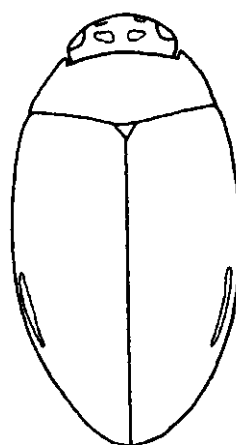
**NOTES:** *Agabus* is a primarily northern genus with over 90 species known from North America. Species in this genus are very similar and difficult to separate without reference material, so we might be considered fortunate in that only five species are known to occur in Florida. The genus is currently being revised by Dr. D.J. Larson. He has kindly made a manuscript available that describes a new species from Florida; it is included here as *Agabus* sp. A.

The larval key that follows is adapted from Matta (1986). Unless otherwise indicated, aedeagal and tarsal claw figures are adapted from a manuscript supplied by D.J. Larson.

**ADDITIONAL REFERENCES:** Hilsenhoff 1993c; Larson 1989, 1991, 1994; Matta 1986; Michael & Matta 1977; Nilsson & Larson 1990.



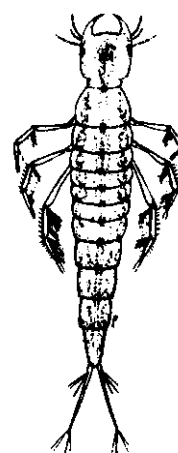
*A. punctatus*, larva  
(adapted from Matta 1986)



*A. johannis*, adult

**Key to larval *Agabus* of Florida**

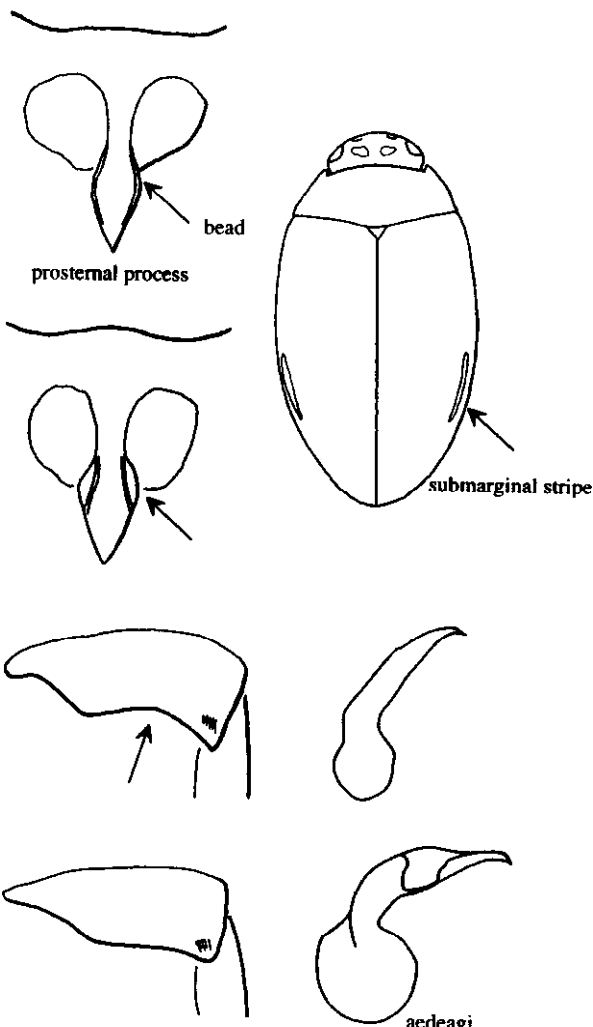
- 1    Legs without a fringe of swimming hairs ..... *Agabus* sp.  
       (The larvae of *A. johannis*, *A. stagninus* and *A. sp. A* will probably key here.)
- 1'    Legs with a fringe of swimming hairs ..... 2
- 2(1')    Midtibia with 3-4 anteroventral, 1 posteroventral and 2-3 dorsal spines ..... *A. aeruginosus*
- 2'    Midtibia with 6-7 anteroventral, 1 posteroventral and no dorsal spines ..... *A. punctatus*



larva with fringe of swimming hairs on legs

**Key to adult *Agabus* of Florida**

- 1    Prosternal process with narrow lateral bead; elytra without submarginal stripe; inner hind tibial spur longer than basal tarsal segment; males with a stridulatory organ of ridges on dorsal margin of mid femur and a raised suture between sterna 2 & 3; total length usually less than 8 mm ..... 2
- 1'    Prosternal process with lateral bead inflated behind fore coxae; elytra with submarginal pale stripe; inner hind tibial spur subequal to basal tarsal segment; males without stridulatory organ; total length 7.5 mm or greater ..... 3
- 2(1)    Posterior margin of hind femur strongly concave; long spur of hind tibia cylindrical, tapering to a fine point; male with setal brushes on ventral margin of mid femur and tibia; aedeagus distinctive .... *A. aeruginosus*
- 2'    Posterior margin of hind femur only slightly concave; long spur of hind tibia flattened, stout and abruptly pointed; male without setal brushes on ventral margin of mid femur and tibia; aedeagus distinctive ..... *A. punctatus*

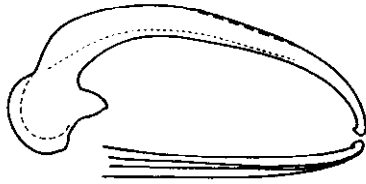


aedeagi  
 (adapted from Michael & Matta 1977)



Dytiscidae 3.21

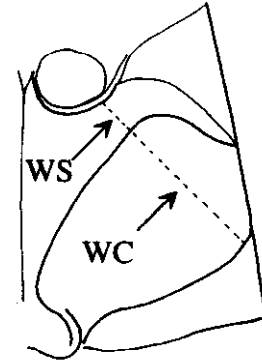
- 3(1') Aedeagus apex with a small, pointed ventral hook; male protarsal claws elongate, with a small tooth near the base; metasternal wing broader,  $WC/WS = 2.80-3.42$  (WC = width of metacoxa along continuation of line WS; WS = width of metasternal wing at closest point to middle coxa (not including the width of the ridge around the mid coxa)); body more flattened, body length/body depth 3.00-3.62 ..... *A. stagninus*



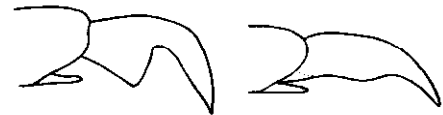
*A. stagninus* aedeagus, lateral view (above) and oblique dorsal view (below)



*A. stagninus*, anterior and posterior protarsal claws



- 3' Aedeagus apex rounded, without a ventral hook; male protarsal claws shorter and broader, anterior claw with a large tooth near base; metasternal wing narrower,  $WC/WS = 3.32-4.22$ ; body more convex, body length/body depth 2.76-3.21 ..... 4

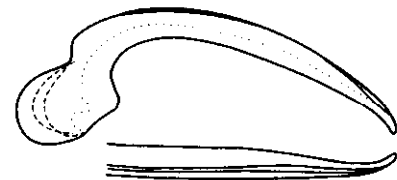


*A. johannis*, anterior and posterior protarsal claws

- 4(3') Aedeagus in lateral aspect widened medially and obliquely flattened on its ventral surface; female with apex of elytra with fine, somewhat equal-meshed reticulation with included small regular punctures ..... *A. johannis*



- 4' Aedeagus more slender, in lateral aspect parallel-sided medially or evenly narrowed to apex, not flattened on ventral surface; female with apex of elytra with fine irregular meshes that are generally transversely oriented, with included punctation very faint ..... *A. sp. A*



Notes on species

*A. aeruginosus* - Length 6.6-7.9 mm. In males, the foretarsus is not as thick as that of *A. punctatus* and has fewer adhesive setae and less glandular pubescence below; males also have a fringe of long hairs on the posterior margin of the middle femur and a fringe of

Dytiscidae 3.22

short hairs on the posterior margin of the middle tibia. The distinctive aedeagus easily separates this species.

- A. johannis* - Length 8.3-9.5 mm. This species has been confused with the undescribed *Agabus* sp. A. Known from central peninsular FL, NE FL and the Panhandle. Young (1954) noted that *A. johannis* was generally a lotic species, while the two other Florida *Agabus* (known at that time) were more often found in ponds and other standing water.
- A. punctatus* - Length 7.0-8.2 mm. In addition to the characters in the key, this species is on the average larger than *A. aeruginosus*. Males have the foretarsus thickened, with adhesive setae and a glandular pubescence below, and lack a fringe of long hairs on the posterior margins of the middle femur and tibia.
- A. stagninus* - Length 8.5-9.6 mm. A coastal species found from MS through the Panhandle and northern FL, and north to NJ and NY.
- A. sp. A* - Length 7.5-8.8 mm. An undescribed species previously confused with *A. johannis*. It is found throughout the Panhandle and northern FL. It will be described in a future paper (Larson & Wolfe, in ms).

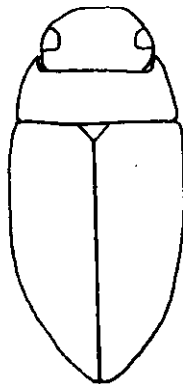
Genus *Agaporomorphus*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the emarginate eyes; pronotum unmarginated or nearly so; visible scutellum; elytra without well defined striae; five segmented fore and mid tarsi; hind coxal plate and abdominal sternites without fine strigae; hind coxal lines divergent anteriorly and almost touching median line anterior to coxal processes; inner side of hind femur apex without cilia; and equal hind tarsal claws.

NOTES: Only one species, *A. dodgei* (length 2.3-2.8 mm), of this basically Central and South American genus is recorded from Florida. The species has been collected from north to south Florida. Only females are known, indicating that *A. dodgei* may be parthenogenetic; some other species of the genus are also considered parthenogenetic. All specimens known to Young (1989b) were collected by UV light traps. I have seen single specimens from the Withlacoochee River and Lake Okeechobee; both were females and collected by dip net.

ADDITIONAL REFERENCES: Young 1989b.



*A. dodgei*

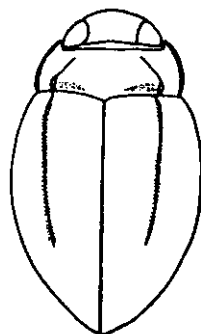
Genus *Anodocheilus*

DIAGNOSIS: Larvae are not described.

Adults are distinguished by their small size; thickened clypeal margin; transverse stria across the occiput posterior to the eyes; fore and mid tarsi pseudotetramerous; lack of a diagonal epipleural carina; hind tibiae weakly arcuate; and with the elytra each with a strong carina beginning behind the pronotal plicae and running most of the length of the elytra.

NOTES: A largely tropical genus with two species reaching the U.S.; one species, *A. exiguus*, is known from Florida. This small (length 1.5-1.7 mm) beetle is found throughout Florida except perhaps for the Keys. It is most abundant in lakes, ponds or swamp streams with sandy margins (Young 1954), although I have found large numbers in some ponds with mossy margins.

ADDITIONAL REFERENCES: Young 1974.



*A. exiguus*, adult

Genus *Bidessonotus*

DIAGNOSIS: Larvae are undescribed.

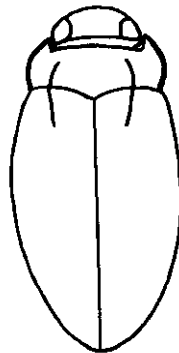
Adults are distinguished by the small size; transverse stria or ridge across the occiput posterior to the eyes; presence of pronotal and elytral plicae; lack of a diagonal epipleural carina; the five segmented fore and mid tarsi, with fourth segment small but not concealed by lobes of the third; hind tibia slightly arcuate; and the equal hind tarsal claws.

NOTES: Three species of this largely Neotropical genus occur in Florida. There is considerable sexual dimorphism in these species, with females being much stouter and males having the mid tibiae distinctly arched. With the exception of large females of *B. longovalis*, species level identification of females is usually not possible without associated males. Females of all three species usually bear a small preapical "tooth" on the outer margin of each elytron. Development of these "teeth" is variable and their size can not be considered as a good character for species separation.

*Bidessonotus* are most often "found in small pools or the edges of slow streams with considerable vegetation and debris in the water" (Young 1990a: 356).

The key that follows is adapted from Young (1954).

ADDITIONAL REFERENCES: Young 1990a.

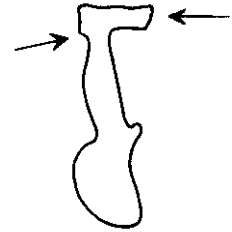
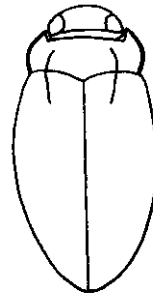


*B. longovalis*

Key to adult *Bidessonotus* of Florida

1 Elytral plicae distinctly longer than pronotal plicae; length 1.7-2.4 mm; aedeagus with smooth "toe" portion and distinctly produced "heel" .....

..... *B. longovalis*



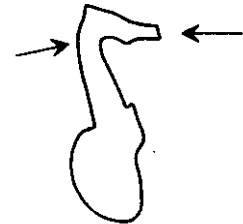
1' Elytral plicae subequal to or shorter than pronotal plicae; length usually < 2.2 mm; aedeagus not as above .....

2



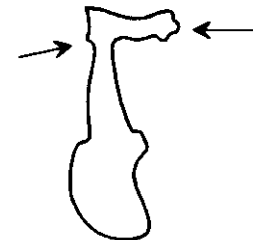
2(1') Size larger, 1.7-2.2+ mm; aedeagus with smooth "toe" portion and "heel" not distinctly produced .....

..... *B. inconspicuus*



2' Size smaller, usually < 2 mm; aedeagus with rounded projection on "toe" portion and "heel" distinctly produced .....

..... *B. pulicarius*



(aedeagal figures adapted from Young 1954)

Notes on species

*B. inconspicuus* - Length 1.7-2.2+ mm. Females are usually slightly smaller than males; the preapical elytral "tooth" is usually weakly developed in this species.

*B. longovalis* - Length 1.75-2.40 mm. Females are usually slightly smaller than males, and usually have a small but distinct preapical elytral tooth.

*B. pulicarius* - Length 1.7-2.0 mm. Females are usually slightly smaller than males, and usually have a well developed preapical elytral tooth.

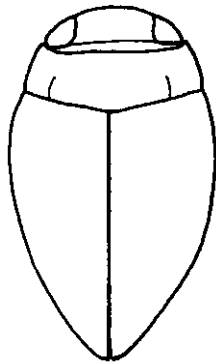
Genus *Brachyvatus*

DIAGNOSIS: Larvae are not described.

Adults are distinguished by their small size; thickened, bituberculate clypeal margin; transverse stria across the occiput posterior to the eyes; fore and mid tarsi pseudotetramerous; a diagonal epipleural carina; weakly arcuate hind tibiae; pronotal plicae; and lack of elytral plicae/striae.

NOTES: One species, *B. apicatus* (formerly called *B. seminulum*), is known from Florida. This small (length 1.6-1.7 mm) beetle has unmarked, reddish-brown elytra that taper posteriorly.

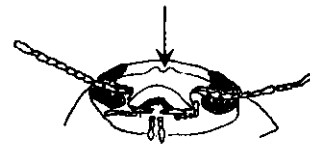
ADDITIONAL REFERENCES: Young 1967b, 1969.



*B. apicatus*, adult



ventral view showing  
epipleural carina



ventral frontal view of head  
showing clypeal tubercles

Genus *Celina*

**DIAGNOSIS:** Larvae are distinguished by the unnotched frontal projection; four segmented maxillary palp; ventral abdominal segments 2-6 without a sclerotized plate; and sclerotized, lateral tracheal trunks that extend past the end of the abdomen.

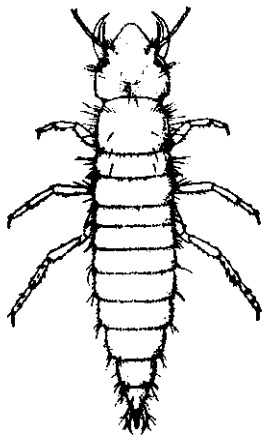
Adults are distinguished by the pseudotetramerous fore and mid tarsi; large, exposed scutellum; and the apically pointed elytra and last abdominal sternite.

**NOTES:** Six species are known from Florida; a seventh species, *C. palustris*, may also be found here (see Notes). Members of the genus are most often associated with mucky bottoms of ponds and other standing water; they are commonly associated with stands of *Typha*.

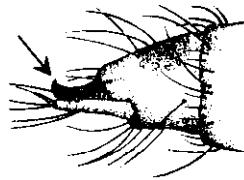
Spangler (1973c) described a *Celina* larva from Maryland presumed to be *C. angustata* based on its occurrence with adult *C. angustata*; they were not directly associated by rearing. However, two other species may occur in Maryland; thus, the larva described by Spangler may not be that of *C. angustata* and should be regarded as "*Celina* sp." Figure 19.69 in White, et al. (1984) of the abdominal apex of a *Celina* larva is mislabeled; the structures labeled as lateral tracheal extensions are the cerci.

The key that follows is adapted from Young (1979b). As with many other beetle genera, male specimens and access to a reference collection greatly enhance one's ability to identify material.

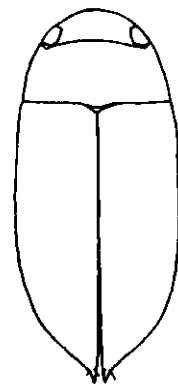
**ADDITIONAL REFERENCES:** Spangler 1973c; Young 1979b.



*Celina* sp., larva  
(adapted from Spangler 1973c)



lateral view of terminal abdominal segments of larva, showing dorsally recurved tracheal extensions  
(adapted from Spangler 1973c)



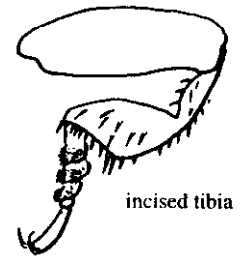
*C. imitatrix*, adult  
(adapted from Young 1979b)



**Key to adult *Celina* of Florida**

1 Size large, > 6 mm; pronotum coarsely punctate, with punctation of central portion about the same as along anterior and posterior margins; male with simple mid tibia ..... *C. grossula*

1' Size smaller, ≤ 5.6 mm; pronotum with fine punctation or almost impunctate, with distinct basal and apical transverse rows of coarser punctures (these rows may not be continuous across the pronotum); male with mid tibia incised ..... 2



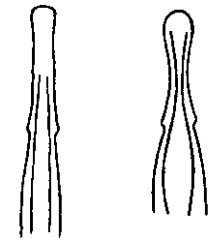
incised tibia

2(1') Disk (central portion) of pronotum with its microsculpture almost or completely concealing any coarser punctures; length 3.0-3.5 mm ..... 3

2' Disk of pronotum with microsculpture but also with distinct coarser punctures; length 3.2-5.6 mm ..... 4

3(2) Size larger, 3.0-3.5 mm; aedeagus long and slender ... *C. contiger*

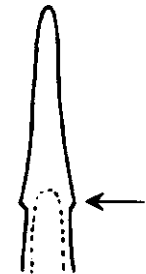
3' Size smaller, around 3.0 mm; aedeagus shorter ..... *C. palustris*



*contiger*      *palustris*  
ventral view of aedeagus tip  
(adapted from Young 1979b)

4(2') Size larger, 5.0-5.6 mm; elytral punctation distinctly coarse and irregular; aedeagus with minute preapical pseudo-denticles ..... *C. imitatrix*

4' Size smaller, usually < 5 mm; elytral punctation not distinctly coarse and irregular; aedeagus without preapical pseudo-denticles or with very minute preapical pseudo-denticles ..... 5



*C. imitatrix*, ventral view of aedeagus tip  
(adapted from Young 1979b)

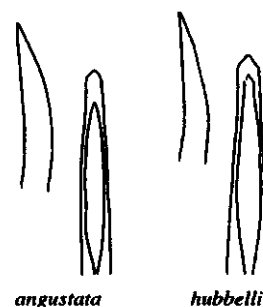
5(4') Size larger, 4.4 to rarely 5.3 mm; aedeagus elongate and narrow apically, sharply pointed; elytra dark brown or almost purple in contrast to lighter head and pronotum ..... *C. slossoni*

5' Size smaller, 3.2 to rarely 4.3 mm; aedeagus shorter, bluntly pointed; elytra brown or brownish yellow or with a light fascia across the bases ..... 6



*C. slossoni*, ventral view of aedeagus tip  
(adapted from Young 1979b)

- 6(5) Average size smaller, 3.2-3.9 mm; color usually nearly uniform brown or with elytra darker brown than head and pronotum, sometimes narrowly lighter across base and sides; aedeagus proportionately more elongate ..... *C. angustata*
- 6' Average size larger, 3.6 to rarely 4.3 mm; elytra brown with a distinct, broad lighter yellow-brown basal fascia; aedeagus proportionately less elongate ..... *C. hubbelli*



lateral & ventral views of aedeagus tip  
(adapted from Young 1979b)

### Notes on species

- C. angustata* - Length 3.2-3.9 mm. A widespread species, ranging from South America north to Massachusetts. There is apparently some intergradation between this species and *C. hubbelli*, with *C. angustata* being more common in coastal areas and peninsular Florida and *C. hubbelli* more common in the panhandle.
- C. contiger* - Length 3.0-3.5 mm. This small species is very similar to *C. palustris*, but has proportionately larger eyes and genitalia. In ventral view, the aedeagus of *C. contiger* appears to have a blunter, more truncate tip. These differences are difficult to discern without comparative material of both species.
- C. grossula* - Length 6.0-6.8 mm. The largest North American species in the genus.
- C. hubbelli* - Length 3.6-4.3 mm. Very similar to *C. angustata*, but specimens average larger and are differently colored when mature.
- C. imitatrix* - Length 5.0-5.6 mm. A large, relatively common species. These beetles apparently burrow in mucky bottoms. Specimens will key to *C. grossula* in Young (1954), but are easily separated using the preceding key. This species may also sometimes be confused with *C. slossoni*, but in all specimens I've examined, the aedeagus of *C. imitatrix* is thinner and less heavily sclerotized than that of *C. slossoni*.
- C. palustris* - Length about 3.0 mm. This species is tentatively recorded from Florida on the basis of some female specimens from Miami (Young 1979b).
- C. slossoni* - Length 4.4-5.3 mm. Young (1954) found this species to be "apparently commonest in the southern half of the state, but nowhere abundant".

Genus *Copelatus*

**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; broad, suboval maxillary stipes; inner margin of mandible serrate; and last antennal segment consisting of two unequal lobes.

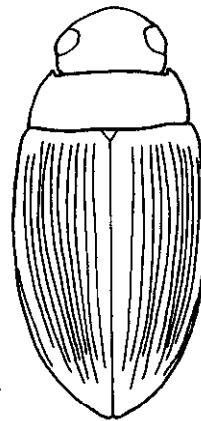
Adults are distinguished by the five segmented fore and mid tarsi; pronotum with distinct lateral margin; well developed elytral striae (in Florida species); hind coxal plate and basal abdominal sternites with fine strigae ("scratches"); hind coxal lines divergent anteriorly and almost touching median line anterior to coxal processes; inner side of hind femur apex without angular cilia; and equal hind tarsal claws.

**NOTES:** *Copelatus* is a largely tropical genus with six species known from Florida. Species are found in temporary pools/puddles and in water bodies with accumulated organic debris. The key that follows is adapted from Young (1963a); it works best with male specimens. Spangler (1962b) described the larva of *C. glyphicus*; larvae can not be identified to species.

**ADDITIONAL REFERENCES:** Spangler 1962b; Young 1953d, 1963a.



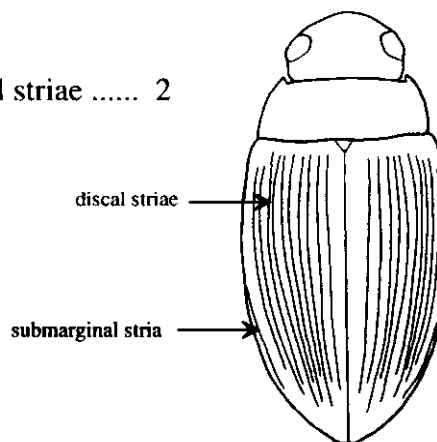
*C. glyphicus*, larva  
(adapted from Spangler 1962b)



*C. caelatipennis princeps*, adult

Key to adult *Copelatus* of Florida

1 Each elytron with a submarginal stria and 10 discal striae ..... 2



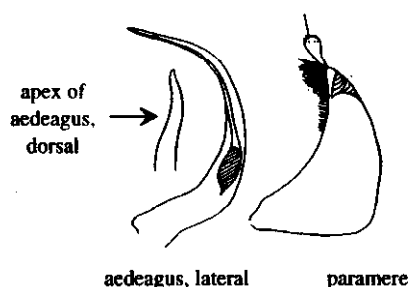
1' Each elytron with less than 10 distinct discal striae ..... 4

2(1) Base of elytra usually with lighter transverse fascia; aedeagus with clubbed apex, similar to a bird's head; body form narrow ..... *C. caelatipennis princeps*

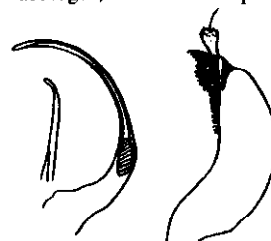


2' Elytral bases usually uniformly colored; aedeagus with simple curved apex (see couplet below); body form broader ..... 3

3(2') Aedeagus stout, not strongly curved to side, parameres broad; elytra with distinct punctures on intervals between striae; throughout Florida ..... *C. punctulatus*



3' Aedeagus slender, strongly curved to side, parameres slender; elytral intervals at most inconspicuously punctate; northern Florida ..... *C. glyphicus*



(genitalia figs. adapted from Young 1963a)

4(1') Each elytron with a submarginal stria and 8-9 discal striae; base of elytra without lighter transverse fascia; throughout Florida ..... *C. chevrolati*



9th stria present on *C.c. chevrolati*

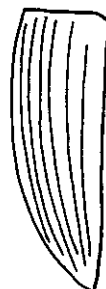
4' Each elytron with a submarginal stria and 5-6 discal striae (see couplet below); base of elytra with lighter transverse fascia; southern Florida ..... 5

5(4') Each elytron with a submarginal stria and 5 discal striae; elytra usually darker than pronotum, basal transverse fascia narrow; aedeagus as figured; length < 4.8 mm ..... *C. blatchleyi*



aedeagus paramere

5' Each elytron with a submarginal stria and 6 discal striae; elytra usually lighter than pronotum, basal transverse fascia broad; aedeagus as figured; length ≥ 5.0 mm ..... *C. cubaensis*



(genitalia figs. adapted from Young 1963a)

Notes on species

*C. blatchleyi* - Length 4.5-4.8 mm. Originally known only from the type series from the type locality at Key West, there are now additional specimens from Key West and the Bahamas in the FSCA.

*C. caelatipennis princeps* - Length 3.9-5.0+ mm. This species and *C. punctulatus* are apparently the most common members of the genus in Florida. Young (1963a) divided *C. caelatipennis* into three subspecies, of which only *C. c. princeps* is known to definitely occur in Florida. The subspecies *C. c. angustatus* Chevrolat occurs in Cuba and may occasionally make its way here; Young (1963a) cites examples of possible interbreeding between the two subspecies in material from Miami and West Palm Beach. The two may be separated by the absence of striae on the pronotal disc in *C. c. angustatus*. According to Young (1963a), *C. c. princeps* usually occurs only in clear, unpolluted water; the species tends to be a primary invader in newly formed water bodies, such as new ponds/ditches and temporary pools. This species tends to be narrower in body form than the other Florida species. However, note that teneral *Copelatus* specimens tend to be broader than fully hardened specimens.

- C. chevrolati* - Length about 6.0 mm; the largest species in the genus in Florida. There are two subspecies, *C. c. chevrolati* and *C. c. renovatus*, that may be separated by the number of elytral striae: *C. c. chevrolati* sports a short ninth stria apically near the suture (see figure in couplet 4); this stria is lacking in *C. c. renovatus*. I have seen both subspecies in one sample from Clay Co.
- C. cubaensis* - Length 5.0-5.3 mm. This species has apparently recently (since the 1960's) become established in south Florida (Dade Co.).
- C. glyphicus* - Length 4.2-5.0 mm. This species is very similar to *C. punctulatus*. The difference in dorsal punctation between the two species is often difficult to notice; male genitalia offer the best means of separation. *C. glyphicus* apparently does not occur in southern Florida; old records of this species from that area probably refer to *C. punctulatus* or other species.
- C. punctulatus* - Length 4.3-5.0 mm. One of the more common *Copelatus* species in the state. It was formerly considered a synonym of *C. glyphicus*, but was removed from synonymy by Young (1963a). See also *C. glyphicus* above.

Genus *Coptotomus*

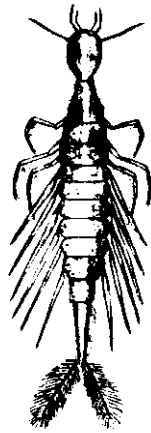
**DIAGNOSIS:** Larvae are distinguished by the short, raised, lobate process on the anterior margin of the head; broad maxillary stipes; abdominal segments 1-6 each with a pair of lateral filamentous gills; abdominal segments 7-8 and cerci with a lateral fringe of setae.

Adults are distinguished by the emarginate eyes; apically notched palpi; visible scutellum; five segmented fore and mid tarsi; and the equal hind tarsal claws.

**NOTES:** The genus was revised recently by Hilsenhoff (1980). Five species are known from eastern North America; four are found in Florida. *C. interrogatus* appears to be the most common species in the state.

*Coptotomus* are very common inhabitants of ponds and streams. Dr. J. Matta (pers. comm.) has noted that larval *Coptotomus* are found most often in rather deeper waters than is usual for dytiscids, especially weed-choked ponds. The following key is adapted from those in Hilsenhoff (1980, 1993b). Note that there is considerable variation in color patterns for these species.

**ADDITIONAL REFERENCES:** Hilsenhoff 1980, 1993b.



*Coptotomus* sp. larva  
(adapted from Wilson 1923)



*C. interrogatus* adult  
(adapted from Hilsenhoff 1980)

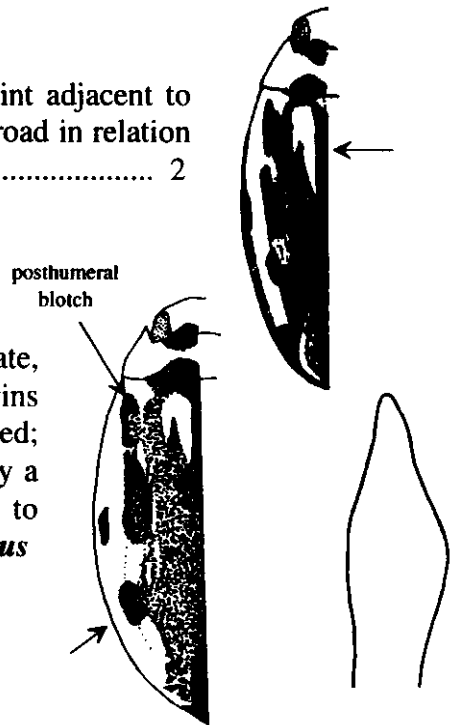
Key to adult *Coptotomus* of Florida

- 1 Metasternal wing > 0.33 mm wide at narrowest point adjacent to middle coxa; elongate pale marks at base of elytra narrow except for short, lateral, posteriorly directed extension at base; aedeagus as figured ..... *C. lenticus*

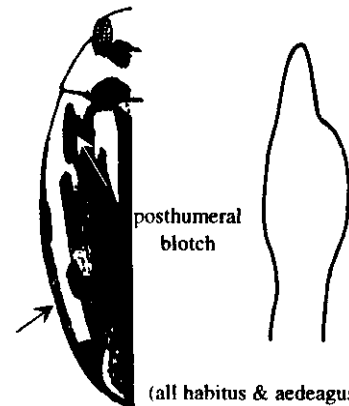


- 1' Metasternal wing < 0.30 mm wide at narrowest point adjacent to middle coxa; elongate pale marks at base of elytra broad in relation to their length ..... 2

- 2(1') Irrorate (speckled) area of disc rather uniformly irrorate, with irrorations distinct in posthumeral blotch; margins of elytra pale yellow or only slightly darkened; subsutural marks not connected or connected only by a series of dots; aedeagus broad, gradually narrowing to apex ..... *C. loticus*



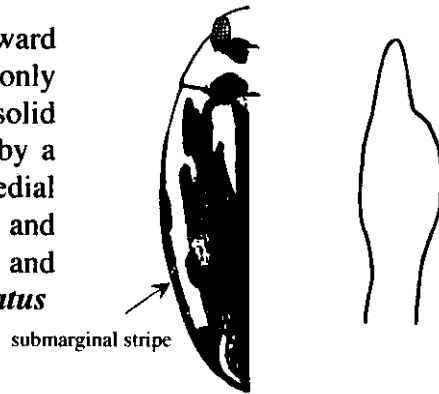
- 2' Irrorate area of disc with dark blotches laterally, posthumeral blotch solidly colored or nearly so; margin of elytra darkened in apical 2/3; subsutural marks usually connected by a dark line in at least apical 1/2; aedeagus narrow at tip, widened more abruptly ..... 3



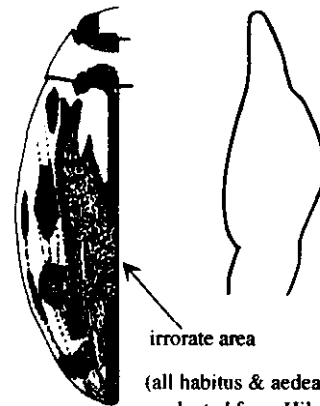
(all habitus & aedeagus figs. adapted from Hilsenhoff 1980, 1993b)



- 3(2') Submarginal stripe deep brown, extending forward to margin at basal 1/5 with area along margin only slightly lighter in color; irrorate area almost solid brown and separated from submarginal stripe by a yellow line that is rarely interrupted by a postmedial blotch; posterior mark of head lighter brown and medially notched; aedeagus narrow near tip and more abruptly widened ..... *C. interrogatus*



- 3' Submarginal stripe dark, often interrupted before basal 1/5 and separated from margin by a darkened area that is much lighter than the submarginal stripe; irrorations usually distinct on disc; yellow stripe separating irrorate area from submarginal stripe usually interrupted by a postmedial blotch; head with posterior margin broadly black; aedeagus less abruptly narrowed toward tip ..... *C. venustus*



(all habitus & aedeagus figs. adapted from Hilsenhoff 1980, 1993b)

### Notes on species

*C. interrogatus* - Length 5.7-7.6 mm. The smallest, darkest and apparently most common *Coptotomus* in Florida. Hilsenhoff (1980) synonymized *C. obscurus* with *C. interrogatus*; thus the taxon *C. interrogatus obscurus* as used in Young (1954) is now *C. interrogatus*. This species was previously considered to be widespread in the eastern U.S. However, Hilsenhoff (1980) showed that it was a southern and east coast species, and that many previous records of this species should be referred to other taxa. There are specimens of *C. lenticus* and *C. loticus* previously identified as different subspecies of *C. interrogatus* in the FSCA.

*C. lenticus* - Length 6.9-8.3 mm. This is the largest species found in the state. The dark bands on the pronotum are more separated in this species than in the other three found in Florida. As the name implies, it is more likely to be found in lentic situations. Eastern forms have a dark submarginal stripe on the apical 2/3 of the elytra not shown in the figure in couplet 1. I've seen Florida specimens from Alachua and Clay Counties.

*C. loticus* - Length 6.7-8.1 mm. Usually associated with lotic habitats, but known to occur in permanent ponds and lakes. There are specimens from Liberty and Santa Rosa Counties in the FSCA; I've also seen specimens from Calhoun and Leon Counties and from the New River in Bradford/Union Counties.

*C. venustus* - Length 6.4-7.5 mm. This species is easily confused with *C. interrogatus*; note also that the dark pronotal markings are close together in *C. venustus* and more widely separated in *C. interrogatus*. I've seen specimens from Alachua, Citrus, De Soto, Taylor and Wakulla Counties.

Genus *Cybister*

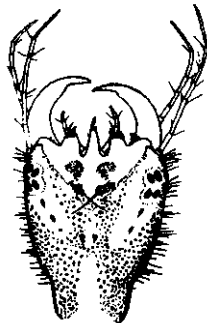
**DIAGNOSIS:** Larvae are apparently inseparable from *Megadytes*. Larvae of the two genera are distinguished by the dentate anterior margin of the head; four segmented maxillary palp; long and slender maxillary stipes; long ligula; abdominal segments 7 & 8 with a lateral fringe of setae; and the lack of cerci.

Adults of Florida species are distinguished by the large size; non-emarginate eyes; lateral yellow margin of prothorax and elytra; five segmented fore and mid tarsi; males with first three segments of foretarsi forming an oval plate; hind tibia with one large spur twice as broad as the other; and hind tarsus of males with single claw, females with single claw or with a long outer and a rudimentary inner claw.

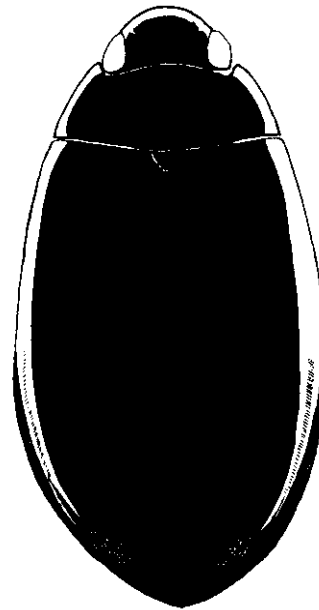
**NOTES:** Two species occur in Florida. These are the largest dytiscids in Florida; among the other water beetles in Florida, only members of the dytiscid genus *Megadytes* and the hydrophilid genera *Dibolocelus* and *Hydrophilus* approach *Cybister* in size.

These large beetles are found in the deeper parts of ponds, ditches and similar situations (Young 1954). Larvae may reach 75 mm in length and can inflict painful bites. Note that the larva labeled as "*Cybister* sp." in White & Brigham (1996: fig. 20.68) is not a *Cybister*! In extreme southern Florida, larvae of *Megadytes* may be encountered that may be indistinguishable from *Cybister* (see Notes under *Megadytes*). The key which follows is adapted from Young (1954). Identification of subspecies is very difficult; in most cases an identification to the species level is quite sufficient.

**ADDITIONAL REFERENCES:** Young 1953b.



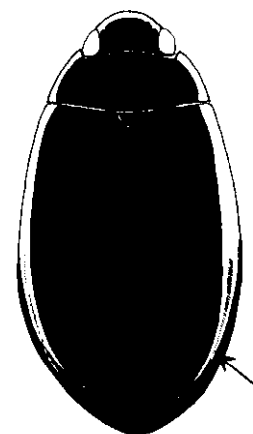
*C. fimbriolatus*, larval head  
(adapted from Wilson 1923)



*C. fimbriolatus crotchii*, adult male

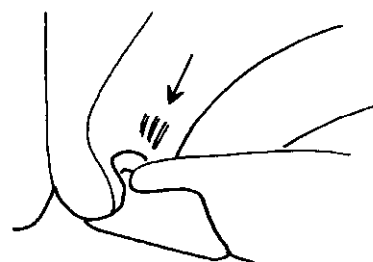
**Key to adult *Cybister* of Florida**

- 1 Average size smaller, 28-33 mm; lateral yellow margin of prothorax and elytra narrower, often separated from the elytra's lateral margin posteriorly by a dark stripe or area, the band usually ending before the apex in an irregular yellow spot; female with one large and one rudimentary apical claw on the hind tarsus; found throughout Florida  
 ..... *C. fimbriolatus* .... 2



- 1' Average size larger, 30-34 mm; lateral yellow margin of the prothorax and elytra broader and usually continuous to apex so that yellow margin seems continuous all around; females with one claw on hind tarsus; extreme southern Florida (Keys) ... *C. occidentalis*

- 2(1) Male usually with 3 distinct ridges in depression anterior to hind coxa; marginal yellow stripe of pronotum and elytra narrow and leaving the margin posteriorly (see couplet 1); throughout most of FL ..... *C. f. crotchii*



- 2' Male usually with 4 distinct ridges in depression anterior to hind coxa; marginal yellow stripe of pronotum and elytra broader, usually not very markedly separated from the margin posteriorly; northwestern FL (only?) ..... *C. f. fimbriolatus*

**Notes on species**

*C. fimbriolatus* - Length 26-33 mm. Two subspecies are found in FL, but are not always easy to separate; if in doubt, identify only to the species level. *C. f. crotchii* is more widespread, averages smaller (26-32 mm) and females have a less dense to absent sculpture of tiny ridges on the pronotum and elytra; in FL, *C. f. fimbriolatus* is known only from Calhoun and Jackson counties, averages larger (28-33 mm) and females have a dense sculpture of tiny ridges on the pronotum and elytra. Note that females are larger than males.

*C. occidentalis* - Length 30-34 mm. In Florida, known only from Big Pine Key. The species also occurs in the Bahamas and Cuba. Males have four stridulating ridges (used to make sounds) in front of the hind coxa.

Genus *Derovatellus*

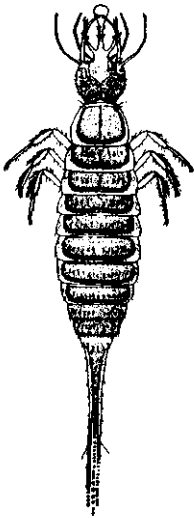
**DIAGNOSIS:** Larvae are distinguished by the spatulate-tipped frontal projection with long lateral branches that are curved medially and extend well beyond the midpoint of the central portion of the projection.

Adults are distinguished by the pseudotetramerous fore and mid tarsi; and the short prosternal process that does not reach the metasternum and ends before the contiguous middle coxae.

**NOTES:** One species, *D. lentus floridanus* (length 3.9-4.1 mm), of this mostly tropical genus occurs in Florida. The Florida subspecies differs only in its larger size from the typical *D. lentus* found throughout the Antilles and South America. Spangler (1966a) described the larva of *D. ibarraii* from Guatemala; it is assumed that the larva of *D. lentus* is similar.

Young (1954) reported an adult from a leaf-choked pool in a hammock; Spangler (1966a) found adults living in small, grassy depressions with less than 3" of water that were adjacent to a pond and in water-filled hoof prints in Guatemala.

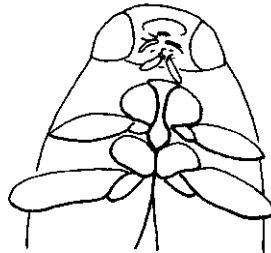
**ADDITIONAL REFERENCES:** Spangler 1966a, 1967.



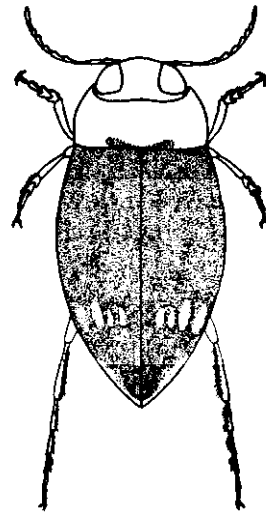
*D. ibarraii*, larva  
(adapted from Spangler 1966a)



*D. ibarraii*, larval frontal projection  
(adapted from Spangler 1966a)



*D. lentus floridanus*, venter showing  
contiguous middle coxae



*D. lentus*, adult  
(adapted from Spangler 1966a)

Genus *Desmopachria*

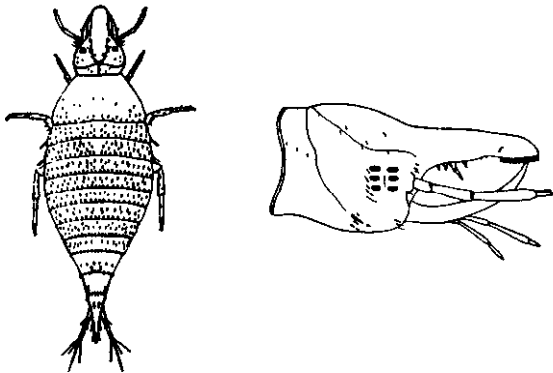
**DIAGNOSIS:** Larvae are distinguished by the frontal projection with short basolateral branches; distinct, separate ocelli; fore and middle tarsal claws < 2/3 length of tarsus; ventral abdominal segments 2-8 with sclerotized plate; and with a pleural suture extending through segment 6 (very faint on 6).

Adults are distinguished by very small size and semi-globose shape; prosternal process with acute apex; epipleuron with a diagonal carina near base; pseudotetramerous fore and mid tarsi; middle coxae separated by 1/2 width of a middle coxa; straight hind tibiae; and unequal hind tarsal claws.

**NOTES:** Seven species of this largely Neotropical genus are known from Florida. Identification of many species requires examination of the male genitalia; larvae can not be identified to species. The possibility of extralimital Caribbean species occurring in Florida can not be discounted.

Most species, with the exception of *D. mutchleri* and *D. seminola*, are rather uniformly colored (usually yellowish-brown to reddish-brown), but may have the head and pronotum lighter or darker in color than the elytra. Following the description of Barman (1973), the larva of *Desmopachria* will not key correctly in White & Brigham (1996).

**ADDITIONAL REFERENCES:** Barman 1973; Young 1980, 1981a, 1981b, 1989a, 1990b, 1995.



*D. convexa*, larva & lateral view of head  
(adapted from Barman 1973)

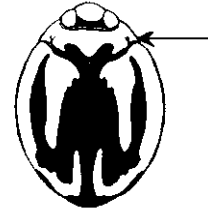


*D. mutchleri*  
(adapted from Young 1981b)

**Key to adult *Desmopachria* of Florida**

1 Pronotal base with plicae; elytra with pattern ..... 2

1' Pronotal base without plicae; elytra without pattern ..... 3



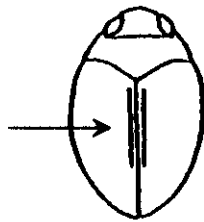
2(1) Vertex of head with dark basal markings (figure above); discal and sutural markings of elytra united, forming a large "W"; metacoxal plates coarsely and densely punctate ..... *D. mutchleri*

2' Vertex of head without dark basal markings; discal and sutural markings of elytra reduced; metacoxal plates finely and sparsely punctate ..... *D. seminola*

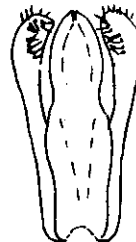


(adapted from Young 1980)

3(1') Elytra with an impressed stria on either side of suture, most noticeable at mid-length; male genitalia as figured ..... *D. striola*



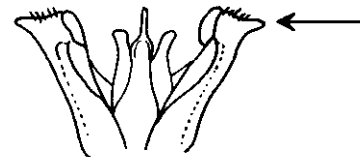
(adapted from Young 1980)



(adapted from Young 1990)

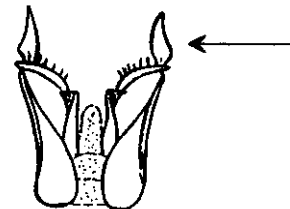
3' Elytra without impressed striae; male genitalia not as above ..... 4

4(3') Parameres of male genitalia without movable apical spur ..... *D. leechi*



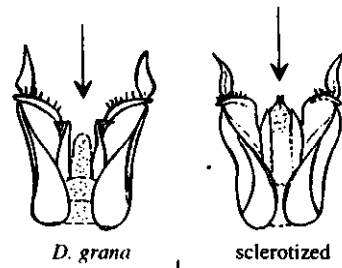
(adapted from Young 1981a)

4' Parameres of male genitalia with movable apical spur ..... 5

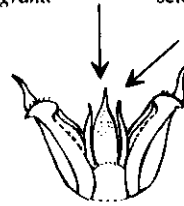


5(4') Tip of aedeagus unsclerotized ..... *D. grana*

5' Tip of aedeagus sclerotized ..... 6



6(5') Tip of aedeagus simple; aedeagal lobes separated from aedeagus ..... *D. aspera*



6' Tip of aedeagus bifid; aedeagal lobes appressed to aedeagus ..... *D. cenchramis*



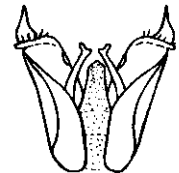
( figs. adapted from Young 1981b)

### Notes on species

*D. aspera* - Length 1.3-1.4 mm. This species is smaller and lighter in color than the similar species *D. cenchramis*; male genitalia must be used to distinguish the species.

*D. cenchramis* - Length 1.4-1.7 mm. Larger and darker than *D. aspera*. *D. cenchramis* is listed in the Federal Register (50 CFR Part 17) as a Category 2\* organism. This category lists taxa the U.S. Dept. of Interior Fish and Wildlife Service believes may be endangered or threatened, but for which insufficient data are available. The asterisk indicates that the species may possibly be extinct. I can report that *D. cenchramis* still exists in the northern Everglades, where I found it to be an uncommon organism on Hester-Dendy samplers; I have 8 specimens in my collection.

*D. grana* - Length 1.3-1.5 mm. The most common species of the genus in Florida. It is quite similar to the more northern *D. convexa* (Aubé), from which it is separated by its smaller size (length for *D. convexa* is 1.5-1.8+ mm) and its genitalia (note the foot-like aedeagal lobes); and *D. leechi* (see below).



*D. convexa* genitalia

*D. leechi* - Length 1.3-1.5 mm. Very similar to *D. grana*, but separable by the genitalia and by the coarse setate punctation of the last visible abdominal sternite.

*D. mutchleri* - Length 2.0-2.3 mm. A very distinctive species found in temporary or fluctuating water bodies.

*D. seminola* - Length about 2.1 mm. Originally described from near Marianna, Jackson Co.; there are additional specimens in the FSCA from Texas.

*D. striola* - Length 1.3-1.7 mm. Originally described from Panama, Young (1990) records it from as far north as Gainesville, Alachua Co.

Genus *Dytiscus*

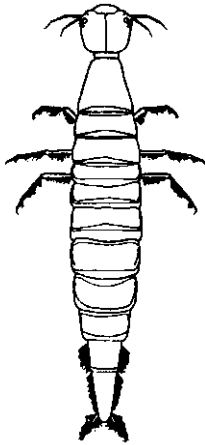
DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; maxillary stipes long and slender; labium without projecting lobes; abdominal segments 7 & 8 with a lateral fringe of swimming setae; and the presence of cerci with a lateral fringe of setae.

Adults are distinguished by the large size; non-emarginate eyes; five segmented fore and mid tarsi; males with first three segments of foretarsi forming a round plate; subequal hind tibial spurs; and posterior margins of first four hind tarsal segments without a fringe of flat, golden cilia.

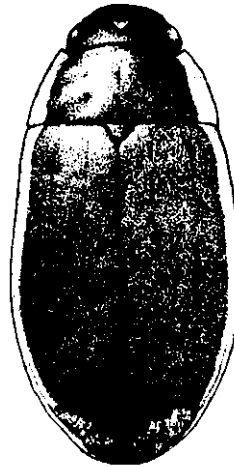
NOTES: This genus, with 12 Nearctic species, has not been recorded from Florida. However, one species, *D. carolinus* (length 22-26 mm), occurs just across the border in Alabama and Georgia; it should eventually be found in Florida. *D. carolinus* has previously been confused with *D. fasciventris* Say and is the only species of *Dytiscus* known to occur in the southeast US south of the Carolinas. As with many species of *Dytiscus*, females of *D. carolinus* possess elytra with sulci.

Adults have been found in ponds with a large amount of detritus.

ADDITIONAL REFERENCES: James 1970; Roughley 1990.



*D. fasciventris*, larva  
(adapted from James 1970)



*D. carolinus* adult male  
(adapted from Roughley 1990)



*D. carolinus*, elytron of adult female  
(adapted from Roughley 1990)



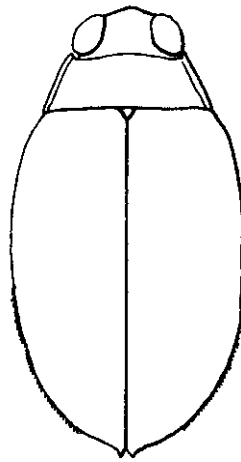
Genus *Eretes*

**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; short ligula armed with four spines; maxillary stipes broad; and abdominal segments without gills, segments 7 & 8 with a lateral fringe of setae.

Adults are distinguished by the moderate size; non-emarginate eyes; pronotum with lateral margin; prosternal process apically pointed; five segmented fore and mid tarsi; posterior margins of first four hind tarsal segments with a fringe of golden cilia; posterolateral margin of elytra with a row of small spines; elytra apically pointed.

**NOTES:** One widespread tropical species, *E. sticticus* (14-17 mm), is known from North America. Young (1954) recorded the species from Jackson Co., where it was found in a borrow pit in 1941. He noted upon returning to the pond in 1949 that conditions had changed, and *Eretes* was no longer to be found there.

**ADDITIONAL REFERENCES:** Leech & Chandler 1956.



*E. sticticus*, adult

Genus *Graphoderus*

**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; simple ligula that is subequal to or greater than the length of the first labial palp segment; broad maxillary stipes; and abdominal segments without gills, segments 7 & 8 with a lateral fringe of setae.

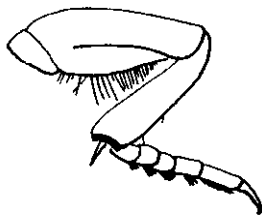
Adults are distinguished by the moderate size; non-emarginate eyes; pronotum without lateral margin; prosternal process rounded apically; five segmented fore and mid tarsi; hind margin of mid femur with a series of stiff setae that are about 1/2 as long as width of femur; outer margin of metasternal wing strongly arcuate; apex of outer spur of hind tibia notched; and posterior margins of first four hind tarsal segments with a fringe of golden cilia.

**NOTES:** Of the six North American species, only *G. liberus* (length 10-12 mm), is known from Florida. It has a brownish- yellow head and pronotum, and basically yellow elytra that are vermiculated (speckles that run together) with black. Young (1954) stated that *G. liberus* was a species of deeply shaded woods ponds, but it has been collected in exposed pools and ponds (Michael & Matta 1977). I've collected larvae and adults from an open pool in the middle of a peat bog in Maine.

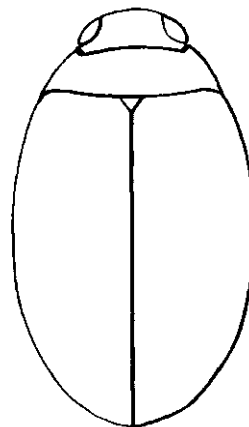
**ADDITIONAL REFERENCES:** Michael & Matta 1977; Wallis 1939a.



*G. prob. liberus*, larval labium, ventral aspect



*G. liberus*, middle leg



*G. liberus*, adult

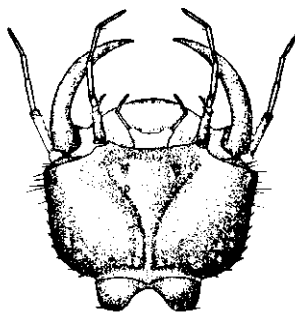
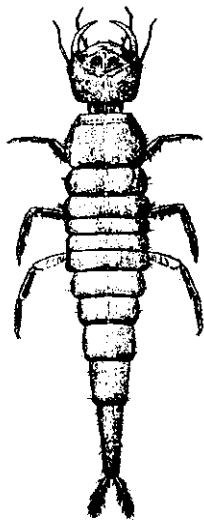
Genus *Hoperius*

**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; elongate maxillary stipes; antenna with last (fourth) segment more than  $2/3$  the length of the third segment; basal half of tarsal claw without small spines on lower margin; and abdominal segments 7 & 8 without a lateral fringe of setae.

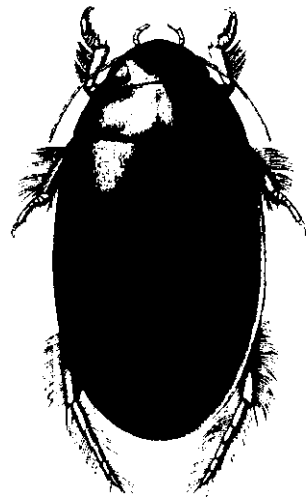
Adults are distinguished by the emarginate eyes; unnotched palpi; widely margined pronotum; flat prosternal process that fits into a triangular depression on the metasternum; five segmented fore and mid tarsi; flat dorsum; lightly reticulate elytra, with coarse, unequal, irregular meshes; and unequal hind tarsal claws.

**NOTES:** This genus has not been recorded from Florida, but its occurrence on the coastal plain in South Carolina and in southeast Texas indicates that it may eventually be found in northern FL. One species, *H. planatus* Fall (length 12-14 mm), is known from North America. It is an apparently rare (as an adult) species found in swamps and woodland ponds; Dr. J. Matta (pers. comm.) has noted that first and second instar larvae were extremely common in some open woodland pools in the Dismal Swamp of Virginia, larger larvae were less common and adults were infrequent.

**ADDITIONAL REFERENCES:** Jasper & Vogtsberger 1996; Spangler 1973a.



larval head, ventral



*H. planatus*, larva and adult  
(adapted from Spangler 1973a)

Genus *Hydaticus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; maxillary stipes long and slender; labium with two projecting lobes; and lack of a fringe on the cerci.

Adults are distinguished by moderately large size; non-emarginate eyes; males with round adhesion disc on foretarsi; five segmented fore and mid tarsi; outer margin of metasternal wings straight; posterior margins of first four hind tarsal segments with a fringe of golden cilia; and outer spur at apex of hind tibia with acute apex.

NOTES: Five species are known from the Nearctic region. Two species are known from Florida; *H. bimarginatus* is the most common. Young (1954) identified some specimens from Broward Co. as *H. rimosus* ? because of their color pattern; however, Roughley & Pengelly (1981) placed these specimens in *H. bimarginatus* according to their genitalia and the number of large spines on the metatibiae. *H. rimosus* is not known to occur in the continental US, but does occur in the Bahamas and Cuba. The following key to adults and figures are modified from Roughley & Pengelly (1981). It is not possible to separate the larvae at the species level.

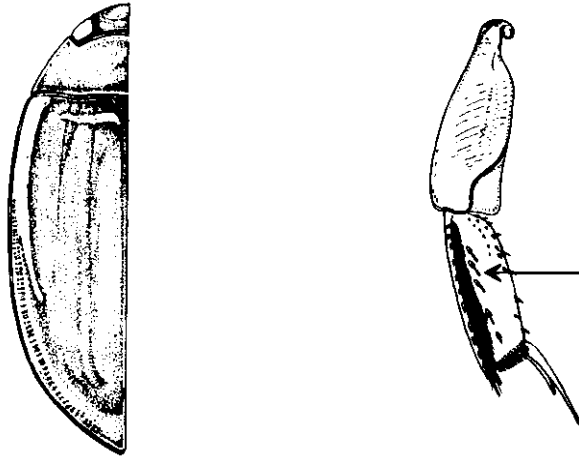
ADDITIONAL REFERENCES: Roughley & Pengelly 1981.



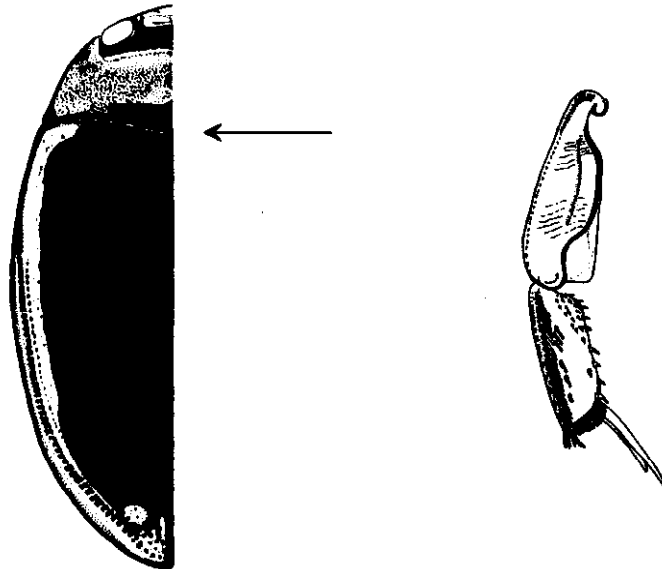
*H. bimarginatus*, adult  
(adapted from Roughley & Pengelly 1981)

Key to adult *Hydaticus* of Florida

- 1 Posterior margin of pronotum moderately sinuate, not recurved laterally; pronotum with posterolateral corners truncate; metatibia with row of spines on upper surface straight, parallel to outer tibial margin; general color reddish-brown ..... *H. cinctipennis*



- 1' Posterior margin of pronotum strongly sinuate, strongly recurved laterally; pronotum with posterolateral corners acute; metatibia with row of spines on upper surface curving inward basally, not parallel to outer tibial margin; general color black ..... 2

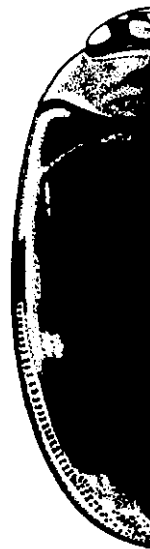


Dytiscidae 3.50

- 2(1') Aedeagus apically acute in side view; lower (posterior) surface of metatibiae with an average of more than 10 large spines (count spines on both metatibiae for an average); basal black band of pronotum usually restricted to basal 1/3; sublateral stripes of elytron without inward extensions of yellow; common ..... *H. bmarginatus*



- 2' Aedeagus apically truncate in side view; lower (anterior) surface of metatibiae with an average of less than 10 large spines (count spines on both metatibiae for an average); basal black band of pronotum often extends to anterior margin; sublateral stripes of elytron sometimes with inward extensions of yellow; not recorded from FL. . *H. rimosus*



**Notes on species**

*H. bimarginatus* - Length 10-13 mm. The most common species throughout the state, often found in temporary water bodies. It occurs in a wide variety of aquatic habitats, from saline to fresh; from puddles to swamps and ponds. The specimens from Broward Co. identified by Young (1954) as *H. rimosus* ? were placed in *H. bimarginatus* by Roughley & Pengelly (1981) according to their genitalia and the number of large spines on the metatibiae.

*H. cinctipennis* - Length 13-15 mm. Recorded from Baker and Walton Counties by Roughley & Pengelly (1981). The genitalia differ from the other species included in the key.

*H. rimosus* - Length 11-13 mm. This species is not known from the continental U.S., but does occur in the Bahamas and Cuba. It might eventually be found in southernmost Florida as a vagrant.



*H. cinctipennis* aedeagus  
(adapted from Roughley  
& Pengelly 1981)

Genus *Hydroporus*

**DIAGNOSIS:** Larvae are distinguished by the laterally notched frontal projection; antennomere 2 without a dorsomedian secondary seta; antennomere 3 with a primary laterobasal pore and a ventroapical spinula; maxillary stipes with 5 primary setae; legs without natatory (swimming) setae; presence of lateral spiracles on abdominal segments 1-7 (on 3rd instar larvae); and cerci without secondary setae.

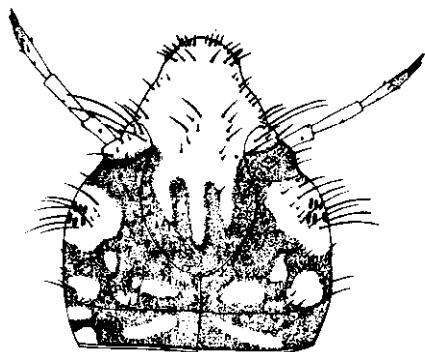
Adults are distinguished by the small size; pseudotetramerous fore and mid tarsi; lack of an epipleural carina; dorsum usually brown to black, without fasciate/vittate markings (pale spots present on one species); usually black venter; and the hind coxal process that is produced laterally to cover the base of the hind trochanters: this process is apically truncate and is at most only slightly produced medially.

**NOTES:** *Hydroporus* is undergoing revision by several workers, and groups of species once considered subgenera or species groups are being elevated to generic status (Hilsenhoff 1992, 1995a). Fall (1923) laid the groundwork for today's classification of *Hydroporus* in North America by dividing the genus into three subgenera (*Hydroporus*, *Oreodytes* and *Deronectes*); these were later elevated to generic status. Nearctic species previously placed in *Deronectes* were assigned to *Potamonectes* or *Stictotarsus*; Nearctic *Potamonectes* species have since been assigned to *Nebrioporus* and *Stictotarsus* (Nilsson & Angus 1992). Fall (1923) had divided his subgenus *Hydroporus* into four groups. The name *Hydroporus* is being retained for Fall's *niger-tenebrosus* group; his *vilis* group becomes *Sanfilippodytes*. Wolfe & Matta (1981) divided Fall's *pulcher-undulatus* group into three groups; their *pilatei-triangularis* group was elevated to generic status as *Falloporeus* (now *Lioporeus*); their *pulcher* group becomes the genus *Heterosternuta* (see Matta & Wolfe 1981) while their *undulatus* group becomes the genus *Neoporus*. Fall's one remaining group, the *oblitus* group, will also attain generic status, but the new generic name has not yet been published. Thus, Fall's (1923) genus *Hydroporus* is now treated as eight genera; *Hydroporus*, *Lioporeus*, *Neoporus* (into which most Florida species fall) and the *H. oblitus* group occur in Florida and are treated as separate genera in this manual. Some species are difficult to identify without comparative material.

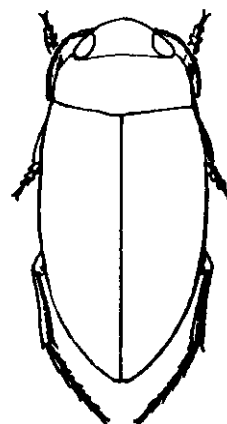
*Hydroporus* adults are found in streams, woodland pools, ditches and ponds.

**ADDITIONAL REFERENCES:** Alarie 1991; Fall 1923; Gordon 1969, 1981; Hilsenhoff 1992, 1995a; Matta & Wolfe 1981; Wolfe & Matta 1981.





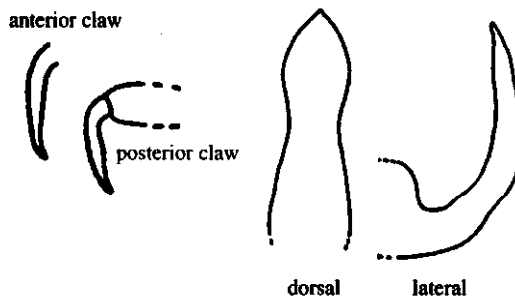
*H. niger*, larval head  
(adapted from Alarie 1991)



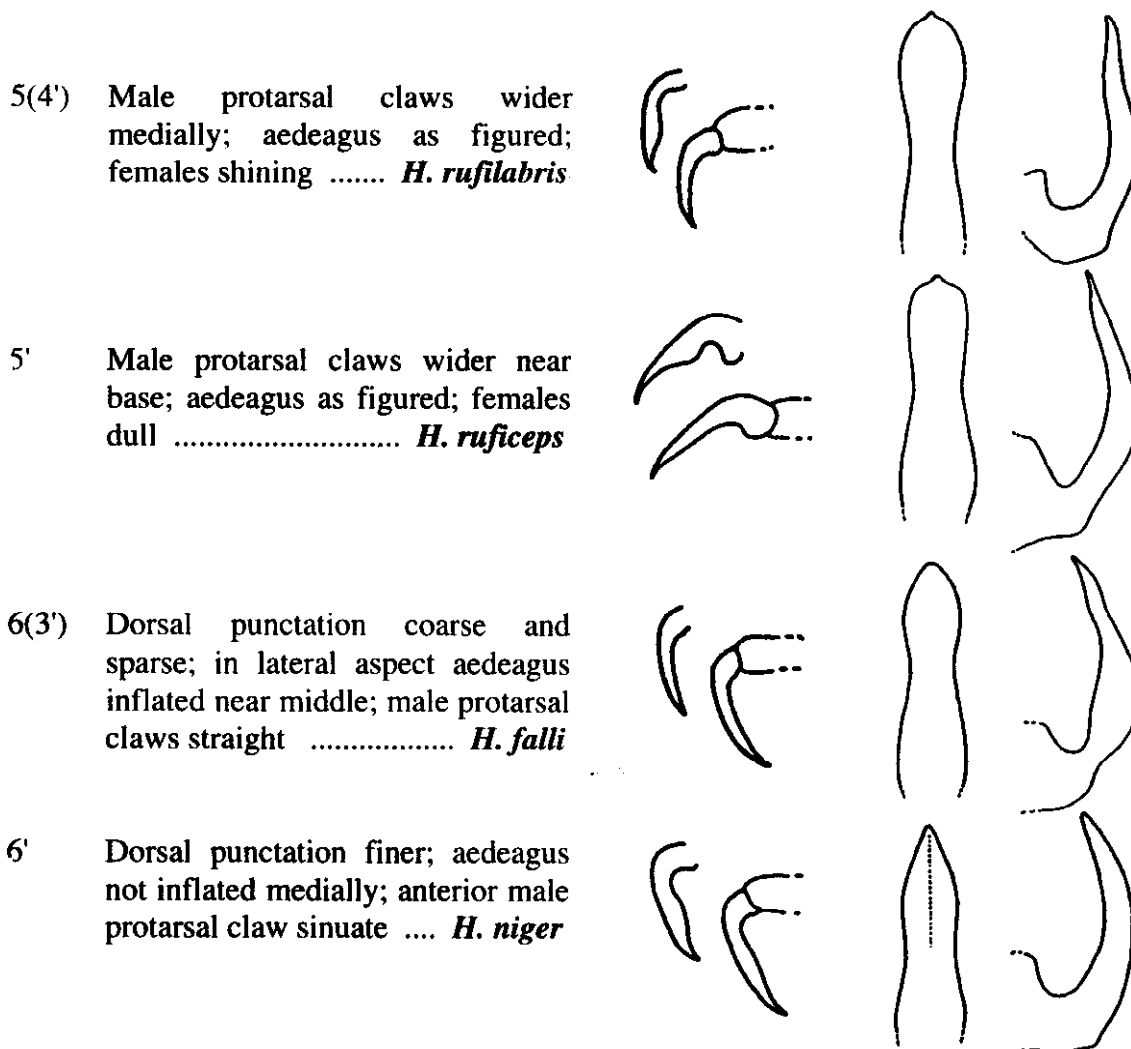
*H. brevicornis*, adult  
(adapted from Gordon 1969)

**Key to adult *Hydroporus* of Florida**

- 1 Pronotum rufous, darker than elytra (elytra sometimes pale basally but never paler than thorax); abdominal sternites mostly rufous ..... 2
- 1' Pronotum dark reddish-black to black, as dark or darker than elytra; abdominal sternites black except laterally ..... 3
- 2(1) Antennae short, with segments 4-10 about as long as wide; male protarsal claws nearly equal; protibiae sinuate on inner margin and constricted at base; form elongate-oval (see above) ..... *H. brevicornis*
- 2' Antennae normal, with segments 4-10 longer than wide; male protarsal claws distinctly unequal; protibiae not sinuate; form broader ovate ..... *H. dichrous*  
(probably does not occur in Florida)
- 3(1') Anterior and posterior male protarsal claws nearly equal in length ..... 4
- 3' Anterior and posterior male protarsal claws distinctly unequal ..... 6
- 4(3) Male protarsal claws slightly sinuate; elytra with faint spots subapically and near posterior margin; aedeagus as figured ..... *H. signatus youngi*
- 4' Male protarsal claws noticeably expanded (see following couplets); elytra without spots; aedeagus not as above ..... 5



(all figs. adapted from Gordon 1969)



(all figs. adapted from Gordon 1969)

**Notes on species**

*H. brevicornis* - Length 3.2-4.0 mm. Apparently a species of streams and springs; in Florida known from Bay, Calhoun, Gadsden and Liberty Counties. The short antennae barely reach the hind angles of the pronotum. The sinuate protibiae are unique among the members of this genus.

*H. dichrous* - Length 3.8-4.0 mm. Young (1954) gave a single doubtful record for Columbia Co. from a small pool under oak trees in a slightly elevated flatwoods area. Gordon (1969) examined Young's Florida material. He did not find any *H. dichrous* in the collection and concluded that because during his study he found no *H. dichrous* further south than NJ and PA, Young's specimen represented another species.

*H. falli* - Length 4.2-4.6 mm. This species is easily confused with *H. niger* which apparently does not occur in peninsular Florida; *H. falli* is found at least as far south as Lake and Pinellas Counties. Young (1954) indicated it was fairly common in open marshes and ponds near Gainesville.

- H. niger* - Length 4.4-5.0 mm. This species is easily confused with *H. falli*; unlike *H. falli*, *H. niger* apparently does not occur in peninsular Florida. Young (1954) recorded it from Bay Co.; it is listed from Bay and Gadsden Counties in Peck & Thomas (1996). Gordon (1969) did not record this species from Florida.
- H. ruficeps* - Length 4.9-5.3 mm. This species was recorded by Young (1954) based on a record from Jacksonville in Fall (1923). Dr. Young has informed me that this record is applicable to *H. deflatus*, a member of the *H. oblitus* group. However, Gordon (1969) recorded *H. ruficeps* from Atlantic Beach and two localities in Gadsden Co., and I've collected it from a roadside pool in Wakulla Co. The head is usually entirely rufous except for a darker area at each antennal base.
- H. rufilabris* - Length 4.0-4.7 mm. Gordon (1969) recorded this species from Gadsden Co. Females of this species are shining, unlike the dull females of *H. falli*, *H. niger*, *H. ruficeps* and *H. signatus*.
- H. signatus youngi* - Length 3.9-4.2 mm. Gordon (1981) described the form of *H. signatus* Mannerheim that occurs in Florida (Liberty Co.) as a new subspecies. The Florida subspecies has either a plain rufous head or more typically has two dark triangular spots between the eyes.

Genus *Hydroporus oblitus* group

**DIAGNOSIS:** Larvae are distinguished by the laterally notched frontal projection; antennomere 2 with a dorsomedian secondary seta; antennomere 3 with a primary laterobasal pore and a ventroapical spinula; maxillary stipes with 5 primary setae; legs without natatory setae; presence of lateral spiracles on abdominal segments 1-7 (on 3rd instar larvae); and cerci without secondary setae. [Note that this diagnosis is based on the larva of one species, *H. paugus*, which does not occur in Florida.]

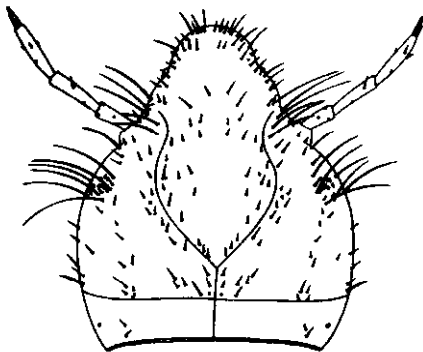
Adults are distinguished by the small size; somewhat flattened body form; sinuate male fore tibiae; pseudotetramerous fore and mid tarsi; lack of an epipleural carina; the hind coxal process that is produced laterally to cover the base of the hind trochanters, this process angulate medially and laterally sinuate; and the short, stout hind trochanters that are slightly greater in posterior length than half the distance from their distal apex to the apex of the femur.

**NOTES:** The *H. oblitus* group will be given generic status in an upcoming paper (Roughley & Larson, in prep.). Four species apparently occur in Florida, but due to the unsure taxonomy of this group, identifications are not positive. Until Roughley & Larson's paper is published, continue to use the generic name *Hydroporus* for these species. See Notes under *Hydroporus*.

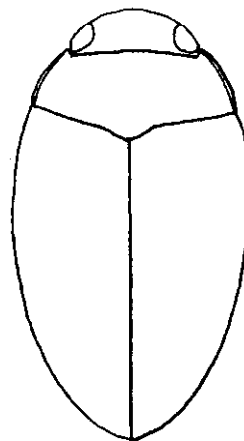
I've collected adults from a small, clear sand-bottomed stream, a hot tub and a birdbath.

The key that follows is adapted from Fall (1923); identification of these species is difficult without comparative material.

**ADDITIONAL REFERENCES:** Alarie 1991; Fall 1923.



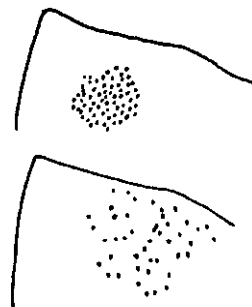
*H. paugus*, larval head  
(adapted from Alarie 1991)



*H. oblitus* complex sp. A, adult

Key to adults of the *Hydroporus oblitus* group in Florida

- 1 Size 4 mm or greater ..... *H. deflatus*
- 1' Size less than 4 mm ..... 2
- 2(1') Form more oblong, not distinctly wider medially, with the sides nearly straight and parallel; elytra barely as wide at their base as the base of the thorax ..... *H. filiulus?*
- 2' Form more oval, with elytra being widest at or about the middle of their length (fig. on preceding page); elytra as wide at their base as the contiguous base of the thorax .....  
..... *H. oblitus* complex ..... 3
- 3(2') General coloration dark reddish-brown; elytral punctation finer and dense ..... *H. oblitus* complex sp. A
- 3' General coloration dark yellowish-brown; elytral punctation coarser and sparse ..... *H. oblitus* complex sp. B



punctuation near elytral base  
(punctuation only partially drawn)

## Notes on species

- H. deflatus* - Length 4.2-4.7 mm. This species was included as *?ruficeps* in Young (1954) (Dr. F.N. Young, pers. comm.); note that the "real" *H. ruficeps* also occurs in FL (see *Hydroporus*). I've collected one male of *H. deflatus* in Wakulla Co. from a hot tub (it flew in while the tub was occupied!).
- H. filiulus* ? - Length 2.9-3.1 mm. This species is listed for Gadsden Co. in Peck & Thomas (1996), and I've seen a single adult from the Florida A & M Research Farm in Gadsden Co. that appears to be *H. filiulus*.
- H. oblitus* complex - Length 2.8-3.9 mm. The species *H. oblitus* ? is listed for Gadsden Co. in Peck & Thomas (1996). I've collected two different taxa in Florida that will key to *H. oblitus* in Fall (1923), but either (or both) may not be that species. I have females of *H. oblitus* complex sp. A from Clay Co. and from a birdbath in Wakulla Co. I've collected a single female of *H. oblitus* complex sp. B from Sugar Creek, a small sand-bottomed stream in Hamilton Co. near the Suwannee River. In addition to the characters in the key, note that *H. sp. B* is flatter than *H. sp. A*.

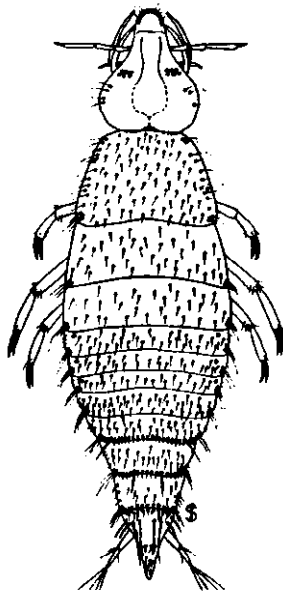
Genus *Hydrovatus*

**DIAGNOSIS:** Larvae are identified by the unnotched frontal projection; separate ocelli; three segmented labial palp; fore and middle tarsal claws 2/3 length of tarsus; body greatly widened at middle; ventral abdominal segments 2-8 with sclerotized plate; and with a pleural suture extending through segment 4.

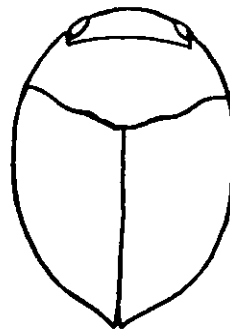
Adults are distinguished by the small size and broadly ovate shape; pseudotetramerous fore and mid tarsi; epipleuron with a diagonal carina near base; prosternal process broadly rounded at tip; broad apex of the joint hind coxal processes divided apically by two oval emarginations into three parts, with broad central region of processes depressed; and apically pointed elytra.

**NOTES:** Four species are known from Florida; *H. pustulatus compressus* is by far the most common. These beetles are commonly found at lake and pond margins.

**ADDITIONAL REFERENCES:** Spangler 1962b; Young 1956, 1963b.



larva  
(adapted from Spangler 1962b)



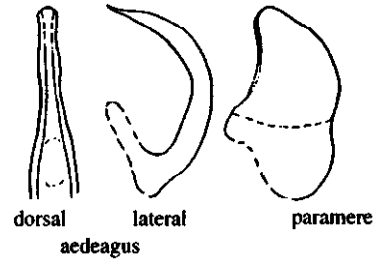
adult  
(adapted from Young 1963b)

**Key to adult *Hydrovatus* of Florida**

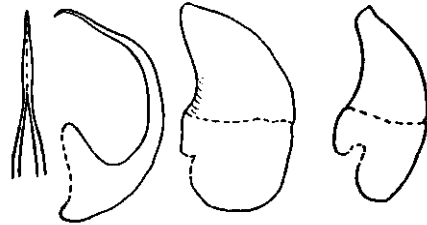
- 1 Size larger, total length 2.9-3.0+ mm ..... *H. peninsularis*
- 1' Size smaller, total length about 1.9-2.8 mm ..... 2

Note: males are necessary for accurate species identification

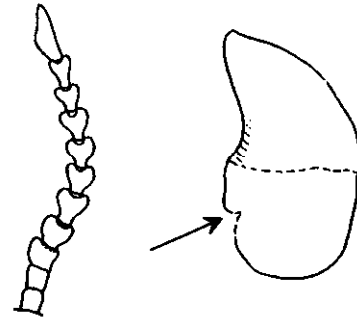
- 2(1') Total length 1.9-2.2 mm; aedeagus with blunter tip, right paramere with shallow baso-lateral excavation ..... *H. inexpectatus*



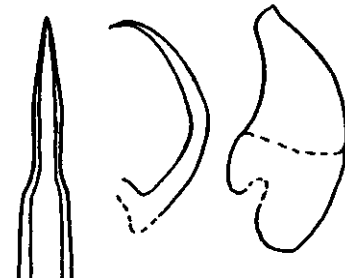
- 2' Total length usually greater than 2.2 mm; aedeagus with fine tip, right paramere with small notch or U-shaped basal excavation ..... 3



- 3(2') Male antennae with flattened central segments; right paramere with small baso-lateral notch ..... *H. platycornis*



- 3' Male antennae not modified; right paramere with U-shaped basal notch ..... *H. pustulatus compressus*



(all figures adapted from Young 1963b)

**Notes on species**

*H. inexpectatus* - Length 1.9-2.2 mm. This smallest Florida species is less convex than other North American species, but this difference is difficult to detect without direct comparison with other taxa. The small size and the male's bluntly tipped aedeagus and shallowly notched right paramere are diagnostic for this species, which is recorded from Dade to Alachua counties. The elytra usually bear weak sub-basal and postmedian fascia.

*H. peninsularis* - Length 2.9-3.1 mm. The largest species in the genus in Florida, recorded from the Gainesville area south to Lake Okeechobee. The elytra usually bear distinctive sub-basal fascia.

*H. platycornis* - Length 2.4-2.5 mm. The distinctive male antennae characterize this immaculate species recorded from Gainesville north to southern Georgia. Genitalia are illustrated in couplet 2' on the preceding page (three figures to the left).

*H. pustulatus compressus* - Length 2.2-2.4 mm; the most common species in the genus throughout Florida. There are two subspecies known from the eastern U.S.; *H. pustulatus compressus* replaces the more northern nominate subspecies *H. pustulatus pustulatus* on the southeast Coastal Plain. The sub-basal and postmedian fascia are weakly developed in most Florida *H. pustulatus compressus*, although teneral specimens may be as distinctly marked as "normal" *H. pustulatus pustulatus*.



*H. pustulatus pustulatus*



Genus *Hygrotus*

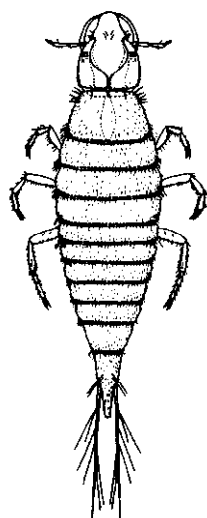
DIAGNOSIS: Larvae are distinguished by the laterally notched frontal projection; antennomere 3 without a primary pore and without a ventral spinule; maxillary stipes with six primary setae; legs with or without natatory setae; abdominal segments 2-6 not sclerotized ventrally; and cerci that are as long as or longer than segment 8.

Adults are distinguished by the small size; 4 segmented fore and mid tarsi; apically pointed prosternal process; epipleuron with a diagonal carina near base; and the hind coxal process that covers the base of the trochanter.

NOTES: *Hygrotus* is a large genus with 42 species recorded from North America; we are fortunate (in terms of identification) in that only three species are known from Florida. Although Alarie, Harper & Roughley (1990) offered a key for *Hygrotus* larvae, none of the Florida species are described as larvae.

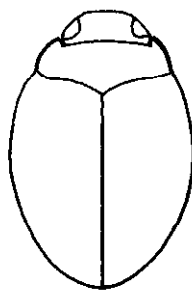
*Hygrotus* adults and larvae are recorded from algal mats, and adults are known to occur in canals, ditches, temporary freshwater ponds and shallow brackish ponds (Young 1954).

ADDITIONAL REFERENCES: Alarie, Harper & Roughley 1990; Anderson 1971, 1976, 1983; Spangler & Gillespie 1973; Young & Wolfe 1984.



*Hygrotus* larva

(adapted from Spangler & Gillespie 1973)



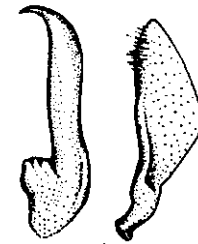
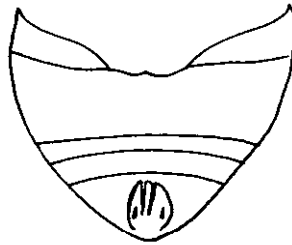
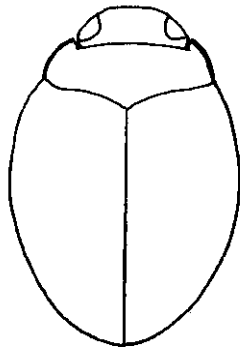
*H. marginipennis* adult



*H. nubilus*, adult

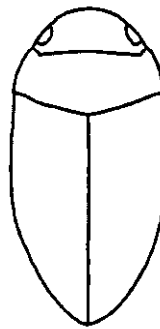
Key to adult *Hygrotus* of Florida

- 1 Body form ovate; male with large oval excavation on penultimate abdominal sternite; aedeagus as illustrated ..... *H. marginipennis*



aedeagus & paramere  
(adapted from Anderson 1971)

- 1' Body form more elongate-oval; male without excavation on penultimate abdominal sternite; aedeagus not as above ..... 2



*H. berneri*  
(adapted from Young & Wolfe 1984)

*H. nubilus*

- 2(1') Dorsum with vittate pattern (above right); venter black (except prosternum and mid coxae); aedeagus as illustrated below ..... *H. nubilus*



*H. nubilus*, aedeagus & paramere  
(adapted from Anderson 1983)



*H. berneri*, aedeagus & paramere  
(adapted from Young & Wolfe 1984)

- 2' Dorsum unpatterned; venter brownish-yellow, rarely blackish; aedeagus as illustrated above ..... *H. berneri*

Notes on species

*H. berneri* - Length 2.1-2.3 mm; known only from Dixie, Leon and Liberty Counties.

*H. marginipennis* - Length 2.2-2.7 mm; found throughout the peninsula at least N to Duval Co. Similar to the species *H. acaroides* and *H. farctus*, but differs mainly in the genitalia (see Anderson 1971).

*H. nubilus* - Length 3.8-4.7 mm. The largest member of the genus recorded from Florida; there are specimens in the FSCA from Jackson and Okaloosa Counties.

Genus *Ilybius*

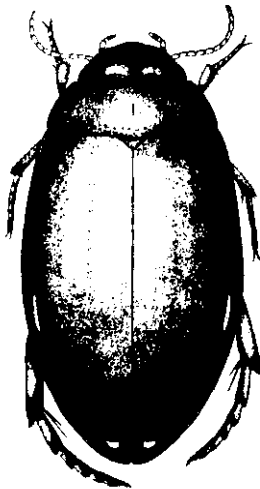
**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; broad maxillary stipes; anteroventral spines on hind tarsus more or less paired with posteroventral spines; abdominal sternites 1-6 membranous, 7-8 sclerotized; abdominal segments 7 & 8 without a lateral fringe of setae; cercus with setae in two whorls, with dorsal seta of basal whorl not posterior to other two setae; and last abdominal segment with long, thin setae in addition to spine-like setae.

Adults are distinguished by the moderate size; emarginate eyes; visible scutellum; five segmented fore and mid tarsi; female sternite 6 emarginate medially; hind femur with a linear group of cilia on the posterior apical angle; and the unequal hind tarsal claws.

**NOTES:** Of the 14 North American species, one species, *I. oblitus* (length 8.9-10.7 mm), is known from Florida. Young (1954) tentatively listed this species from Florida; it is now known to occur in Alachua and Gadsden counties. An additional species, *I. biguttulus*, has been reported from as far south as GA and SC; males of *I. biguttulus* have a distinct carina on the last abdominal sternite (reduced/obsolete in *I. oblitus*). Note also that *I. oblitus* has very narrow metasternal wings; those of *I. biguttulus* are wider (see below).

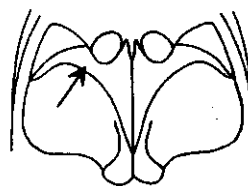
Michael & Matta (1977) noted that *I. oblitus* seemed to prefer ponds or pools without detritus or leaf litter; Larson (1987) noted that no North American species were typical inhabitants of temporary water bodies.

**ADDITIONAL REFERENCES:** Hilsenhoff 1993c; Larson 1987; Michael & Matta 1977; Wallis 1939b.

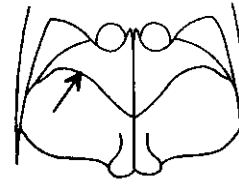


*I. angustior*, adult  
(adapted from Larson 1987)

(Note that this species does not occur in FL)



*I. oblitus*



*I. biguttulus*

metasternal wings  
(adapted from Brigham 1982)

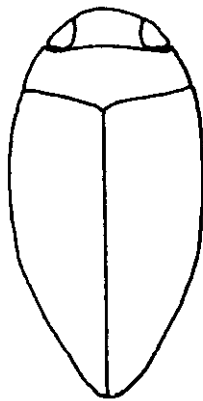
Genus *Laccodytes*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the small size; scutellum covered by pronotum; prosternal process with apical third dilated behind fore coxae and somewhat diamond shaped; five segmented fore and mid tarsi; simple, apically acute spines of hind tibiae; hind tarsus with a single straight claw; and mostly smooth abdominal sternites

NOTES: One species, *L. pumilio* (length 1.9-2.1 mm), is found in Florida. It has been recorded from as far north as the Gainesville area. It apparently prefers the heavily shaded edges of permanent woods ponds.

ADDITIONAL REFERENCES: Leng & Mutchler 1918.



*L. pumilio*, adult



prosternal process



hind tibia & tarsus

Genus *Laccophilus*

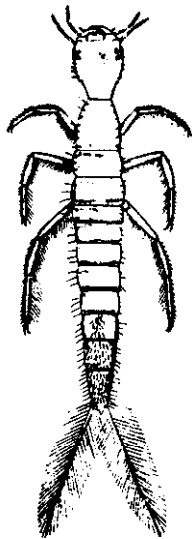
**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; broad maxillary stipes; untoothed mandible; simple last antennal segment that is less than 2/3 the length of the third segment; abdominal segments 7 & 8 without a longitudinal fringe of setae; and cercus with numerous secondary setae.

Adults are distinguished by the small size; scutellum covered by pronotum; lanceolate prosternal process; five segmented fore and mid tarsi; apically bifid or notched spines of hind tibiae; hind tarsus with a single straight claw; and basal abdominal sternite with longitudinal strigae (scratches).

**NOTES:** Of the 27 North American species, four occur in Florida. Although Hilsenhoff (1992) offered a key for *Laccophilus* larva, his key covers only Wisconsin species; only one Florida species was included in his key. Thus, without associating the larva with an adult, it is not possible to identify Florida *Laccophilus* larvae to species.

*Laccophilus* are most often found in temporary or newly formed water bodies, but also occur in small streams. The following key is adapted from that in Zimmerman (1970).

**ADDITIONAL REFERENCES:** Hilsenhoff 1992; Young 1953a; Zimmerman 1959; 1960; 1970.



*L. maculosus*, larva  
(adapted from Wilson 1923)



prosternal process  
(adapted from Zimmerman 1970)

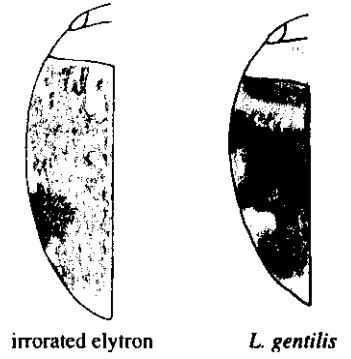


*L. proximus*, adult  
(adapted from Zimmerman 1970)

Key to adult *Laccophilus* of Florida

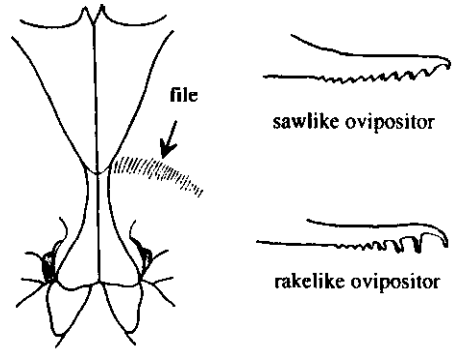
1 Elytra with irrorations (small black spots on a yellowish background); length greater than 3.6 mm ..... 2

1' Elytra without irrorations; length 3.5 mm or less ..... *L. gentilis*



2(1) Males with a metacoxal file; females with a sawlike ovipositor ..... 3

2' Males without a metacoxal file; females with a rakelike ovipositor ..... *L. vacaensis*



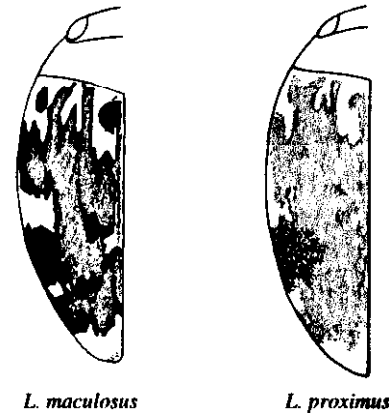
3(2) Elytra with an irregular black band across its posterior half ..... *L. fasciatus rufus*

3' Elytra without a black band ..... 4



4(3') Elytra with 3-4 large, well defined dark blotches along lateral margin; size larger, 5.0-5.8 mm ..... *L. maculosus*  
(not recorded from Florida, but may occur here)

4' Elytra with poorly defined lateral blotches, or none; size smaller, 3.8-4.4 mm ..... *L. proximus*



(all figs. adapted from Zimmerman 1970)

**Notes on species**

- L. fasciatus rufus* - Length 4.5-5.0 mm. Several subspecies occur in the U.S.; only *L. f. rufus* is found east of the Mississippi. In FL, it is apparently restricted to the northern part of the state; the southernmost record is from Alachua Co.
- L. gentilis gentilis* - Length 2.5-3.5 mm. The smallest species of the genus in the state, and the only one occurring here that does not have an irrorated pattern on the elytra.
- L. maculosus* - Length 5.0-5.8 mm. This species has not been recorded from Florida, but records from AL, GA and SC indicate that it may eventually be found in the northern part of the state.
- L. proximus* - Length 3.8-4.4 mm. This is the most common species of the genus in FL. It is one of the first species to invade temporary water bodies. Because of the variability of the darkness of the lateral blotches of the elytra, this species may sometimes be difficult to separate from *L. fasciatus*, *L. maculosus* and *L. vacaensis*.
- L. vacaensis vacaensis* - Length 4.0-5.3 mm (specimens recorded from FL are 4.2-4.6 mm). In FL, this species has only been recorded from the type locality on Vaca Key, Monroe Co. However, the species is also recorded from LA, TX and AZ, as well as Mexico and several localities in Central America. Thus, the possibility exists that this species is found throughout FL, but has been confused with the very similar *L. proximus*. Note also that in male *L. vacaensis* the fifth tarsomere of the front and mid legs is 2 1/2 to 3 times the length of the fourth; in other species of *Laccophilus* the fifth does not exceed twice the length of the fourth.

Genus *Laccornis*

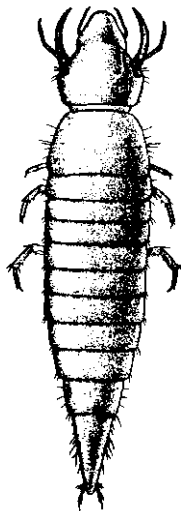
**DIAGNOSIS:** Larvae are distinguished by the broad and bluntly rounded frontal projection with poorly defined lateral notches or undulations; maxillary stipes with seven primary setae; antennomere 3 with a primary laterobasal pore; and the very short cercus, about 1/4 length of the last abdominal segment, with cerci bearing only primary setae (two whorls: one with four, the other with three setae).

Adults are distinguished by the pseudotetramerous fore and mid tarsi; lack of an epipleural carina; hind coxal process produced laterally, covering base of trochanter; and base of hind femur contacting hind coxal lobe.

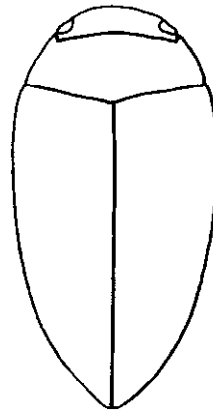
**NOTES:** Essentially a genus of cool climes, *Laccornis* has been recorded from Florida (as *L. deltoides* in Folkerts & Donovan 1974), but the actual identity of the specimen is not clear. Wolfe & Roughley (1990) referred Folkerts & Donovan's AL *L. deltoides* specimen to *L. nemorosus*, but the FL specimen (from Calhoun Co.) was not reexamined. Spangler & Gordon (1973) described the immature stages of "*L. difformis*"; Wolfe & Spangler (1985) assigned that material to *L. etnieri*. The following key, modified from that in Wolfe & Roughley (1990), will identify the species most likely to be found here; note that the males of the three species included possess an enlarged fourth antennomere.

*Laccornis* are inhabitants of woodland pools/ponds.

**ADDITIONAL REFERENCES:** Alarie 1989; Spangler & Gordon 1973; Wolfe & Roughley 1990; Wolfe & Spangler 1985.



*L. etnieri*, larva  
(adapted from Spangler & Gordon 1973)



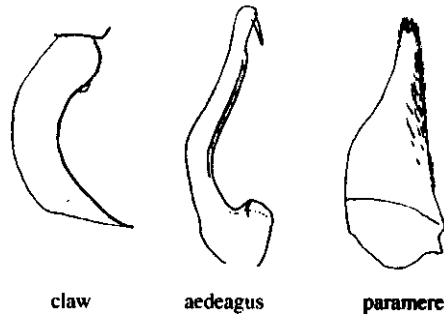
*L. deltoides*, adult



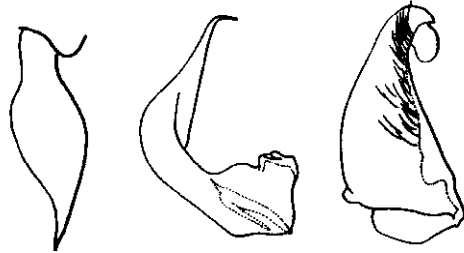
Key to adult male *Laccornis* likely to occur in Florida

1 Length 6.8 mm or greater; protarsal claw and genitalia as figured ..... *L. nemorosus*

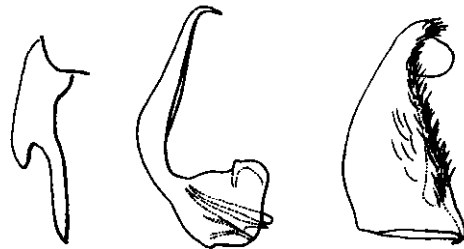
1' Length less than 6.6 mm; protarsal claw and genitalia not as figured ..... 2



2(1') Protarsal claw with apex placed medially; genitalia as figured ..... *L. difformis*



2' Protarsal claw with apex placed laterally; genitalia as figured ..... *L. schusteri*



Notes on species

*L. difformis* - Length 5.6-6.2 mm. Not recorded from FL. The holotype of this species was collected in GA, but the exact location is unknown. This species is apparently restricted to the Atlantic coast area; it has also been recorded as far south as SC.

*L. nemorosus* - Length 7.0-7.2 mm. This is probably the species referred to as *L. deltoides* by Folkerts & Donovan (1974). The largest *Laccornis* in North America, it has been recorded from AL.

*L. schusteri* - Length 5.4-6.1 mm. Not recorded from FL: known from TN. Wolfe & Roughley (1990) predicted that this species should eventually be found as far south as the Gulf Coast.

An additional species, *L. etnieri*, might also be found in extreme western FL. The protarsal claw of *L. etnieri* resembles that of *L. difformis*, but has a strong, almost right-angled, bend before the apex; the aedeagus resembles that of *L. difformis*, but the apex is not as angled or extended (see Wolfe & Spangler 1985).

Genus *Liodessus*

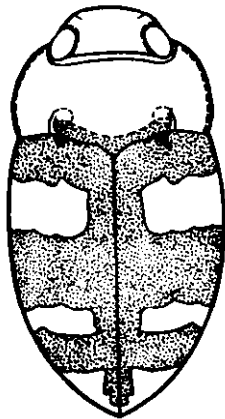
DIAGNOSIS: Larvae are separated by the 3 segmented maxillary palpus; frontal projection of nasale without notches or projections; body not greatly widened at middle; abdominal sternites 2-8 without a sclerotized plate; cercus with only primary setae; basal segment of cercus longer than last abdominal segment including siphon, with siphon shorter than base of eighth segment.

Adults are distinguished by the small size; a transverse stria or ridge across the occiput posterior to the eyes; simple clypeal margin; fore and mid tarsi pseudotetramerous; epipleuron without oblique carina; elytra with or without basal impressed striae/plicae; and abdominal sternum 6 (last visible sternite) narrow and subtriangular, with small basolateral impressions.

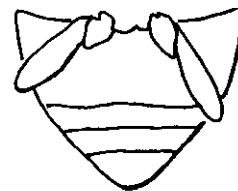
NOTES: Six species are known from North America north of Mexico; five of these are recorded from Florida. Species that are now considered *Liodessus* were treated by Young (1954), along with species from other genera, as *Bidessus*.

Larvae of *Liodessus* are inseparable from *Neoclypeodytes*; however, the latter genus is not known from or expected to occur in Florida. It is not possible to identify larvae to the species level. The adult key and figures that follow are adapted from Larson & Roughley (1990).

ADDITIONAL REFERENCES: Larson & Roughley 1990; Matta 1983.



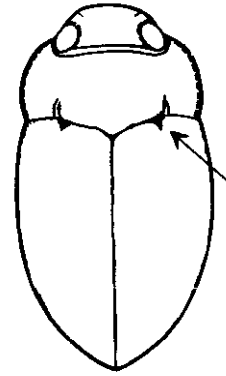
*L. flavicollis*, dorsal aspect  
(adapted from Larson & Roughley 1990)



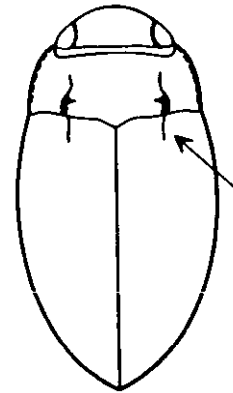
abdominal sternites

Key to adult *Liodes* of Florida

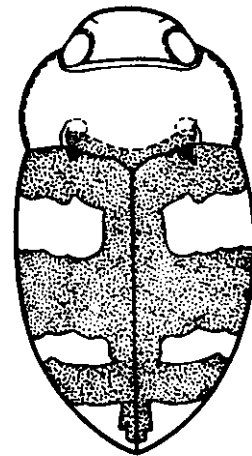
- 1 Basal plicae of elytra lacking or represented as a very small impression, not produced as a line ..... 2



- 1' Basal plicae of elytra well developed, originating near base of pronotal plicae ..... 3



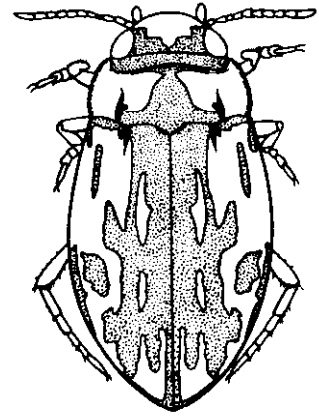
- 2(1) Elytra reddish-brown with pale transverse bands; rarely elytra entirely reddish-brown, then dorsal punctation very dense, with punctures separated by less than their diameter and surface conspicuously setose ..... *L. flavicollis*



(all figures adapted from Larson & Roughley 1990)

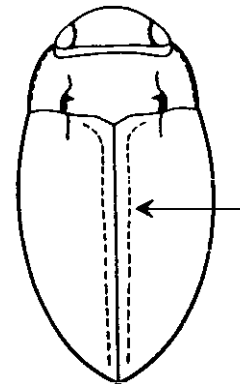
- 2' Elytra more or less uniformly dark brownish-yellow, without pale transverse bands; dorsal punctation coarse, with punctures separated by 1-2 times their diameter and surface less conspicuously setose ..... *L. hobbsi*  
(*L. fuscatus* may key here, but usually has reddish-brown elytra and different genitalia. See Notes on species.)

3(1') Pronotum usually with central dark spot; elytra yellow with longitudinal brown vittae, or dark brown with longitudinal paler spots; mid tibiae yellow with apical 1/3 darkened; metacoxal plate with fine punctation, often rugose; length of stria/length of elytron 0.07-0.14 ..... *L. affinis*



3' Pronotum without central dark spot; elytra brown to dark reddish-black; if pale markings present dorsally on elytra, then metacoxal plate coarsely punctate; mid tibiae with distal 2/3 darkened; length of stria/length of elytron 0.02-0.08 ..... 4

4(3') Elytra with a sutural groove at least basally; body with lateral margin of pronotum and elytra forming a more or less continuous curve; metasternum finely and inconspicuously punctate medially ..... *L. cantralli*



4' Elytra without a sutural groove; body with lateral margin of pronotum and elytra forming a discontinuous curve; metasternum distinctly punctate medially ..... *L. fuscatus*



(all figures adapted from Larson & Roughley 1990)

**Notes on species**

*L. affinis* - Length 1.7-2.0 mm. This species, as presently defined, occurs throughout North America and south to Chile and Argentina. There is great variation in size, color pattern and punctation; *L. affinis* may represent a complex of closely related species. Young (1954) noted two varieties in Florida. It is found in a variety of habitats, including brackish water.

- L. cantralli* - Length about 1.7 mm. This species was recorded for Florida in Downie & Arnett (1996); previous to their record, it was known only from Michigan in the U.S. I have not seen any material of this species from Florida; the FL record is considered doubtful by some other workers. The species occurs in small pools and depressions in moss mats.
- L. flavicollis* - Length 1.5-1.8 mm. This species is usually distinctly marked, but some individuals are almost completely dark, while others may have the pale areas longitudinally confluent along the elytral suture. This species apparently prefers deeper water.
- L. fuscatus* - Length 1.6-2.0 mm. Usually found in sphagnum moss at the margins of small pools/ponds. The elytral plicae are often very short; thus this species may key to *L. hobbsi* in the preceding key. In lateral view, the aedeagus is thinner and straighter medially than that of *L. cantralli* or *L. hobbsi*, and is not hooked at the tip (see below).
- L. hobbsi* - Length 1.5-1.7 mm. This species is known only from a few specimens collected from a shallow, filamentous algae-filled pool near Wilma, Liberty Co.



*L. cantralli*



*L. hobbsi*



*L. fuscatus*

Lateral aspect of aedeagi of 3 species  
(all figures adapted from Larson & Roughley 1990)

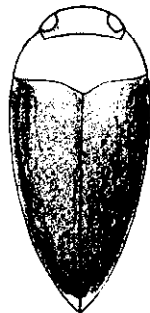
Genus *Lioporeus*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the male antennae with fourth and/or fifth segments broadened; pseudotetramerous fore and mid tarsi; lack of an epipleural carina; and with hind coxal process produced laterally, covering base of trochanter, with apex of process angulate at middle and distinctly sinuate laterad of middle.

NOTES: Two species occur in North America; both are found in Florida. Wolfe & Matta (1981) established the genus *Falloporus* for these species, but it was later shown (Wolfe 1983) that they belonged in the genus *Lioporeus*. Males of the two species are separated as follows: *L. pilatei* (length 3.7-4.4 mm) has antennal segments 4 & 5 broadened and the pronotum is more broadly infusate; it is recorded as far south as the Gainesville area. *L. triangularis* (length 3.4-4.3 mm) has only the 5th antennal segment broadened and the pronotum less broadly infusate (some specimens lack any prothoracic infuscation); in FL it is known only from Bay Co. .

ADDITIONAL REFERENCES: Wolfe & Matta 1981.



*L. triangularis*, adults, showing variation



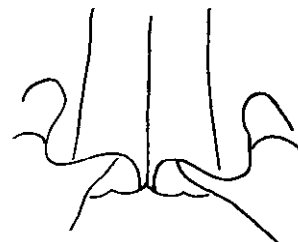
*L. pilatei*, adult



*L. triangularis*, male antenna



*L. pilatei*, modified 4th & 5th antennal segments of male



*L. triangularis*, hind coxal process

(all figures adapted from Wolfe & Matta 1981)

Genus *Matus*

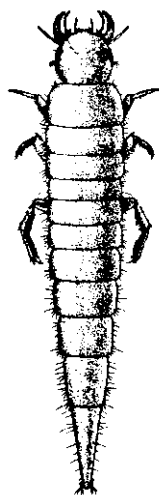
**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; broad maxillary stipes; simple last antennal segment that is less than 2/3 the length of the third segment; chelate fore and mid legs; and abdominal segments 7 & 8 without a lateral fringe of setae.

Adults are distinguished by the emarginate eyes; five segmented fore and mid tarsi; the median longitudinal furrow on the prosternum; the lobate hind corners of the basal four hind tarsal segments; and the unequal hind tarsal claws.

**NOTES:** Of the four North American *Matus* species, two are recorded from Florida; a third, *M. bicarinatus*, may also occur in northern part of the state.

*Matus* occur in shaded and unshaded ponds and pools, ditches, and the borders of flatwoods streams; larvae are often associated with sphagnum. Although larvae of two species are known (Spangler & Gordon (1973); Wolfe & Roughley (1985)), the larvae of species occurring in Florida have not been described and can not be placed to species. The following key to adults is adapted from Young (1953c).

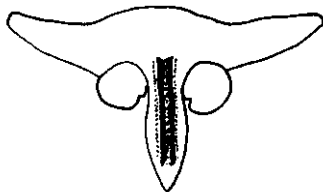
**ADDITIONAL REFERENCES:** Leech 1941; Spangler & Gordon 1973; Wolfe & Roughley 1985; Young 1953c.



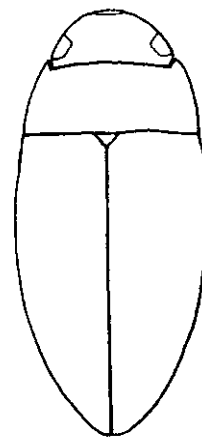
*M. bicarinatus*, larva  
(adapted from Spangler & Gordon 1973)



*M. bicarinatus*, larval foreleg  
(adapted from Spangler & Gordon 1973)



*M. ovatus blatchleyi*,  
adult prosternal process



*M. ovatus blatchleyi*, adult

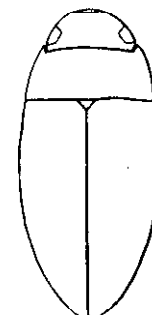
Key to adult *Matus* of Florida

- 1 Length less than 6 mm; body form short and broad, not strongly narrowed posteriorly; aedeagus as figured ..... *M. leechi*

*M. leechi*, aedeagus  
(adapted from Young 1953c)



- 1' Length 7 mm or more; body form elongate, narrowed posteriorly; aedeagus not as above ..... 2



*M. ovatus blatchleyi*

- 2(1') Body form evenly ovate; metacoxal plates with fine microreticulation; aedeagus as figured ..... *M. ovatus blatchleyi*

*M. ovatus blatchleyi*, aedeagus  
(adapted from Young 1953c)



- 2' Body form more elongate and tapered posteriorly; metacoxal plates without microreticulation; aedeagus as figured ..... *M. bicarinatus*  
(not recorded from Florida, but may eventually be found in the northern part of the state)

*M. bicarinatus*, aedeagus  
(adapted from Young 1953c)



*M. bicarinatus*  
(adapted from Leech 1941)

Notes on species

- M. bicarinatus* - Length 8.0-8.8 mm. Not recorded from FL, but may eventually be found in the northern portion of the state. Records of *M. bicarinatus* from FL previous to 1954 probably refer to *M. ovatus blatchleyi* (Young 1954). The aedeagus provides the best characters for separating this species from *M. ovatus blatchleyi*.
- M. leechi* - Length 5.5-5.9 mm. A short broad species, previously recorded only from Gulf and Liberty Counties. I've also seen material from the Chipola River basin in Jackson Co.
- M. ovatus blatchleyi* - Length 7.0-9.1 mm. Two subspecies of *M. ovatus* occur in the eastern U.S. Only *M. o. blatchleyi* is known to occur in FL; it is smaller and darker than the nominate subspecies (see Young 1953c).



Genus *Megadytes*

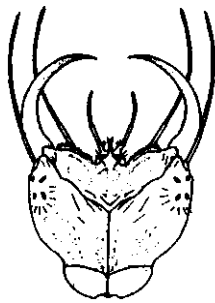
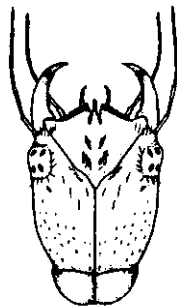
**DIAGNOSIS:** Larvae are apparently inseparable from *Cybister*. Larvae of the two genera are distinguished by the dentate anterior margin of the head; four segmented maxillary palp; long and slender maxillary stipes; long ligula; abdominal segments 7 & 8 with a lateral fringe of setae; and the lack of cerci.

Adults of the Florida species are distinguished by the large size; non-emarginate eyes; five segmented fore and mid tarsi; males with first three segments of foretarsi forming an oval plate; elytra without a marginal yellow stripe; hind tibia with one large spur twice as broad as the other; and hind tarsus of male with two claws, female with a long outer and rudimentary inner claw.

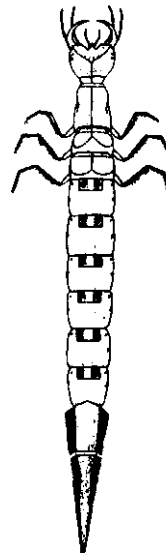
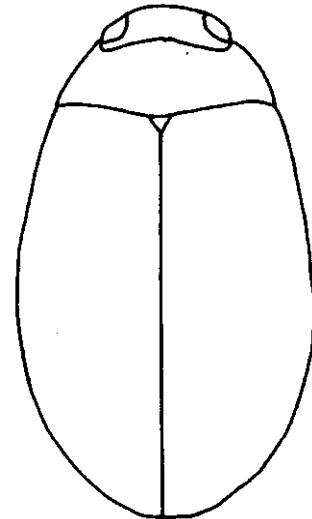
**NOTES:** One species, *M. fraternus* (length around 22 mm), has been found in southern Florida (Dade and Palm Beach counties). This species resembles a small *Cybister*, but has a scarcely discernible dull reddish-brown marginal/submarginal stripe instead of a yellow marginal stripe on the elytra; a yellow marginal stripe is found on the prothorax of both taxa. Males of *M. fraternus* also lack the stridulatory ridges found on male *Cybister*. Females often have the elytra sculptured with short linear impressions which leave only the apices smooth (Young 1954).

Although it has often been reported that larvae of *Megadytes* are unknown or undescribed, larvae of several species have been described (Cekalovic 1974; Ferreira-Jr 1993,1995). *Megadytes* larvae are currently inseparable from *Cybister* on the generic level; the larva of *M. fraternus*, the only known FL species, is undescribed. Once a larval/adult association is made, these taxa may be separable on the species level. However, note that the larva of *Cybister occidentalis*, also known from southern FL, is undescribed.

**ADDITIONAL REFERENCES:** Cekalovic 1974; Ferreira-Jr 1993,1995; Tremouilles & Bachmann 1980.

*M. fallax**M. marginithorax*

*Megadytes* larval heads  
(all larval figs. adapted from Ferreira-Jr 1995;  
note that these are South American species)

*M. fallax*, larva*M. fraternus*, adult

Genus *Neobidessus*

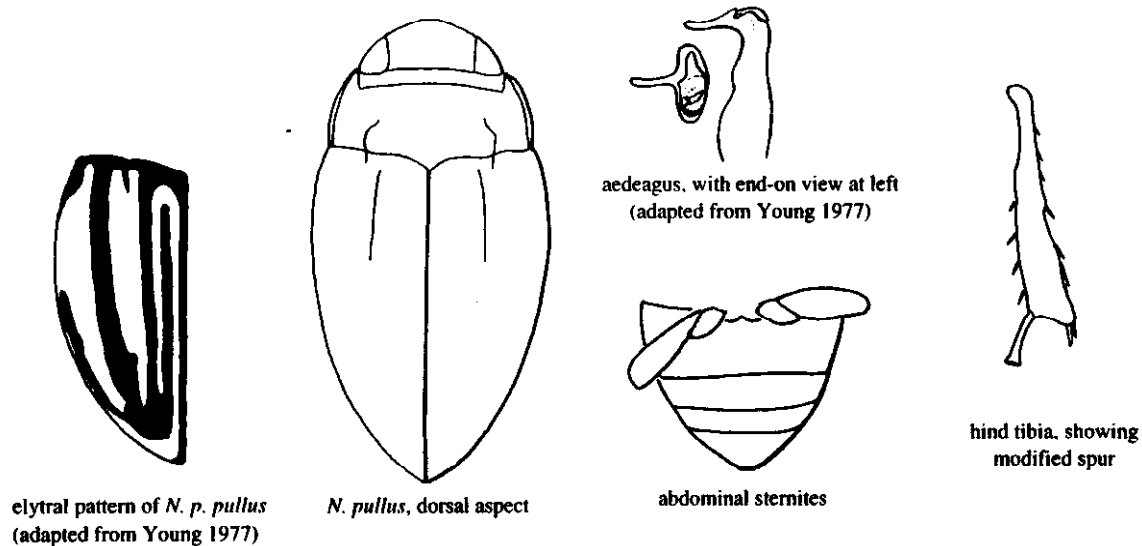
DIAGNOSIS: Larvae are not described.

Adults are distinguished by the transverse stria or ridge across the occiput posterior to the eyes; clypeal margin thickened; pronotum with plicae, which appear to extend on to elytra; elytra with weak accessory striae; fore and mid tarsi pseudotetramerous; hind tibiae arcuate; hind tarsal claws equal; anal sternite broad; male genitalia complexly modified.

NOTES: *Neobidessus* is a largely Neotropical genus with one species, *N. pullus*, occurring in Florida. The genus is very similar to *Liodessus*; the two are most easily separated by the male genitalia. Note also that males of *N. pullus* possess an apically truncated spur on the hind tibiae.

Following Young (1977), two subspecies of *N. pullus* occur in the state. *N. p. pullus* (length 1.76-2.24 mm; average 2.05 mm) occurs in western Florida and surrounding areas; it has light yellow brown elytra with dark brown longitudinal stripes that contrast sharply with the lighter background. *N. p. floridanus* (average length 1.88 mm) occurs throughout Florida (and in southern Georgia) and has the elytra usually uniformly brown to reddish-brown, or with the elytra vaguely striped, the stripes not contrasting strongly with their background. Intermediates occur, and it seems mostly an exercise in frustration to try to separate the two subspecies!

ADDITIONAL REFERENCES: Young 1977.



Genus *Neoporus*

**DIAGNOSIS:** Larvae are distinguished by the laterally notched frontal projection; antennomere 2 without a dorsomedian secondary seta; antennomere 3 with a primary laterobasal pore and a ventroapical spinula; maxillary stipes with 5 primary setae; legs with natatory (swimming) setae; absence of lateral spiracles on abdominal segments 1-7 (on 3rd instar larvae); and cerci with secondary setae.

Adults are distinguished by the small size; pseudotetramerous fore and mid tarsi; lack of an epipleural carina; dorsum usually with fasciate/vittate markings; usually yellow-brown to reddish venter; hind coxal process that is produced laterally to cover the base of the hind trochanters; this process is apicomediaally produced, with the produced portion extending farther posteriorly than the lateral corners of the metacoxal process; and simple aedeagus.

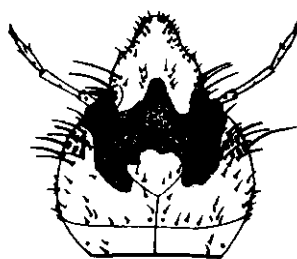
**NOTES:** *Neoporus* has recently been elevated to generic status (Hilsenhoff 1992; 1995a); see Notes under *Hydroporus*. The genus is currently being revised by Dr. G.W. Wolfe. Wolfe (1984) recognized 39 species for North America; two more have been described (Young 1984). *Neoporus* is the largest genus of water beetles in Florida, with 24 described species recorded and the possibility of at least three others eventually being found here. *Neoporus* are found in lotic and lentic situations; many species are apparently found only in limited habitats, such as in root masses in undercut banks, or in springs/seeps.

The following key is modified from those in Fall (1923), Young (1954) and Wolfe (1984), with additions. Many of the species are very difficult to identify without comparative material, especially those beyond couplet 16. Several species are known from or limited to small geographic areas; be sure to check the Notes on species for each taxon. Matta & Peterson (1985) provided figures of the heads of 8 *Neoporus* larvae, but data are insufficient to provide a species key for larvae.

**ADDITIONAL REFERENCES:** Alarie 1991; Fall 1923; Hilsenhoff 1992, 1995a; Matta & Peterson 1985; Wolfe 1984.



*N. carolinus*, larva  
(adapted from Matta & Peterson 1985)



*N. carolinus*, larval head  
(adapted from Alarie 1991)



*N. vittatipennis*, adult  
(adapted from Wolfe 1984)



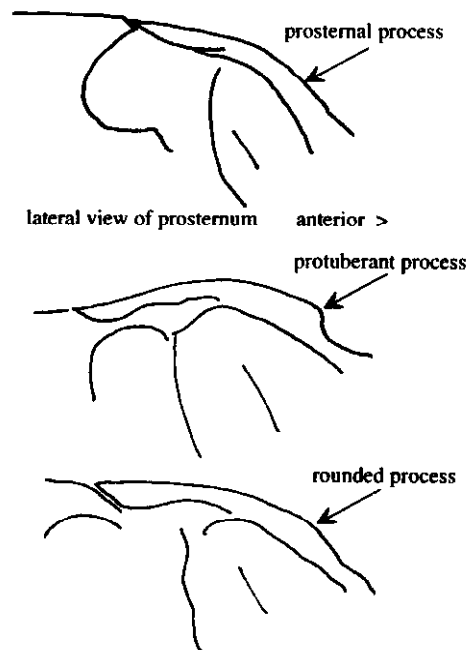
*N. hybridus*, adult  
(adapted from Wolfe 1984)

Key to adult *Neoporus* of Florida

1 Length greater than 5.6 mm ..... *N. aulicus*

1' Length less than 5.0 mm ..... 2

2(1') Prosternum completely non-protuberant; length usually < 3.1 mm (2.2-3.3 mm); elytral color pattern generally consisting of 4-5 narrow, generally brownish vittae (see couplets 4-5); lateral pronotal border evenly narrow ..... 3

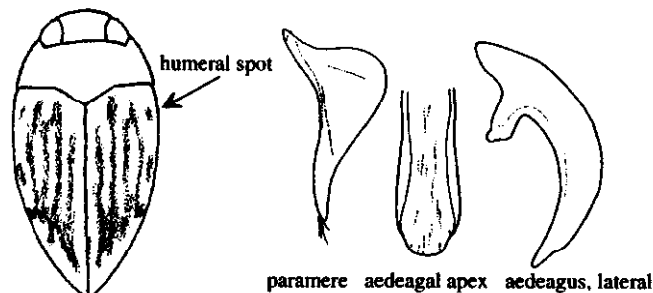


2' Prosternum protuberant BUT protuberance sometimes reduced and/or rounded (see couplet 6); length usually > 3.0 mm (if smaller, then elytra clearly fasciate, not vittate); color pattern usually fasciate; lateral pronotal border usually wide, usually distinctly widened anteriorly (if narrow, then clypeus truncate anteriorly; see couplet 7) ..... 6

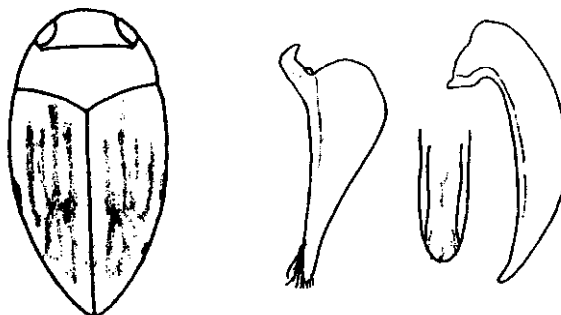
3(2) Size smaller, 2.3-2.7 mm ..... 4

3' Size larger, 2.6-3.3 mm ..... 5

4 (3) Humeral spot always present (may be obscure); prosternal process narrow; elytral vittae broader and rather suffused, not as longitudinally shortened; aedeagal apex very blunt, truncate at tip and sinuate at each apical corner ..... *N. mellitus*

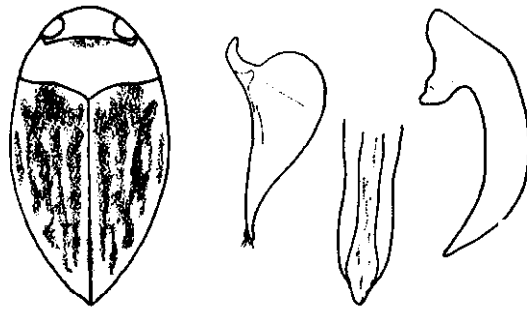


4' Humeral spot never present; prosternal process broader and more oval; elytral vittae narrower, reduced in length; aedeagus apex evenly rounded ..... *N. latocavus*  
(not recorded from Florida but may occur here)

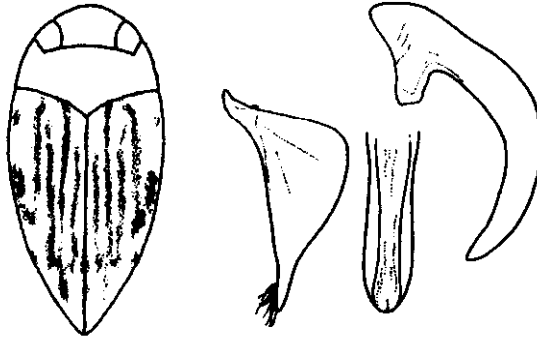


(adapted from Wolfe 1984)

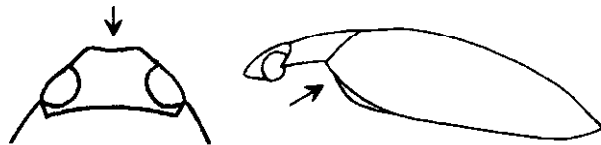
5 (3') Body shape rather broad and distinctly more oval ( $L/W = 1.8$ ); elytral vittae rather suffused and broadly coalesced; aedeagus as figured, parameres incised at base ..... *N. dixianus*



5' Body shape more elongate ( $L/W > 1.95$ ); elytra vittae usually distinct, not as suffused, and less coalesced; aedeagus as figured ..... *N. vittatipennis*



6 (2') Clypeus distinctly truncate anteriorly; lateral margin of elytra distinctly ascending at base ..... 7



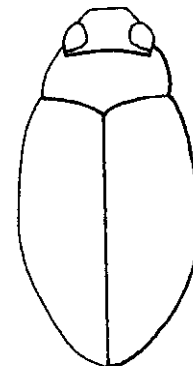
(figs. adapted from Wolfe 1984)

6' Clypeus rounded anteriorly; lateral margin of elytra straight or if slightly ascending, clypeus not truncate ..... 8

7 (6) Length  $< 3.8$  mm; body form evenly oval, widest at middle; integument highly polished ..... *N. hybridus*



*N. hybridus*  
(adapted from Wolfe 1984)



*N. venustus*  
(color pattern omitted)

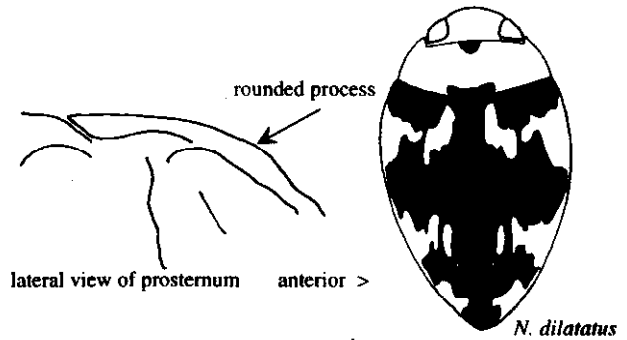
7' Length  $> 4.0$  mm; form obovate, widest behind middle; integument alutaceous ..... *N. venustus*

8 (6') Male protarsal claws distinctly unequal ..... 9

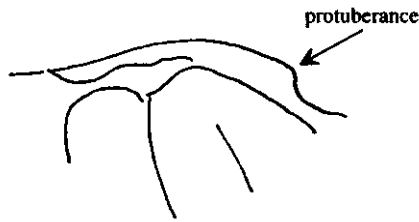
8' Male protarsal claws equal ..... 13



9 (8) Prosternal protuberance reduced and rounded in lateral view, without transverse rugae (anterior file); body form relatively broad; elytral markings distinctly fasciate ..... *N. dilatatus*



9' Prosternal protuberance not reduced, angulate in lateral view, with transverse rugae usually visible; form narrow or broad; elytral markings distinctly fasciate or not ..... 10



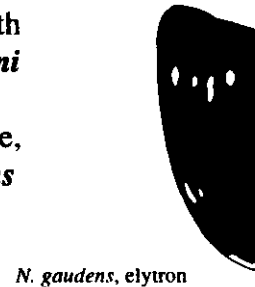
10 (9') Form elongate/narrow, twice as long as wide ..... 11



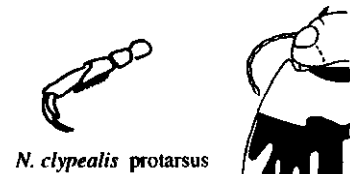
10' Form broader, less than twice as long as wide ..... 12

11(10) Length 3.4-3.6 mm; elytra typically yellow-brown with sub-vittaform brown markings ..... *N. shermani*

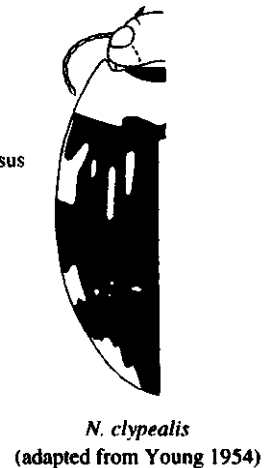
11' Length 3.7-4.2 mm; elytra typically brown with small, pale, somewhat elongate spots ..... *N. gaudens*



12(10') Male anterior protarsal claw very short, about 1/2 length of posterior claw; female with front angles of pronotum sinuate; color mostly reddish-brown/blackish with brownish yellow fasciae ..... *N. clypealis*



12' Male anterior protarsal claw longer, about 2/3 length of posterior claw; female pronotum not sinuate anteriorly; color mostly reddish-yellow with basal, median and subapical infuscation more or less longitudinally connected ..... *N. mixtus*  
(not recorded from Florida but may occur in western part of state)

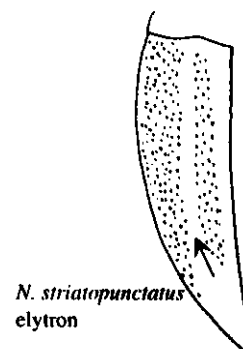


13(8') Length smaller, 2.9-3.5 mm ..... 14

13' Length larger, 3.3-4.6 mm, usually > 3.5 mm ..... 18

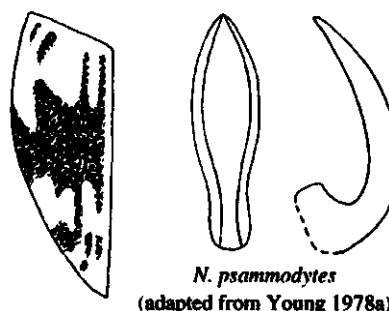
14(13) Elytra with coarse dorsal punctation divided into longitudinal bands by smooth lines between the 2 usual series of dorsal punctures ..... *N. striatopunctatus*

14' Elytral punctation fine or if appearing coarse than not divided into longitudinal bands by smooth lines between the 2 usual series of dorsal punctures ..... 15



15(14') Elytra light brownish yellow with darker maculae; in ventral view, aedeagus widened medially ..... *N. psammodytes*  
(not recorded from Florida, but its presence in SW GA indicates that it may occur in FL)

15' Elytral dark brown/reddish brown with small yellowish elongate spots; aedeagus not widened medially (see figs. couplets 16-17) ..... 16

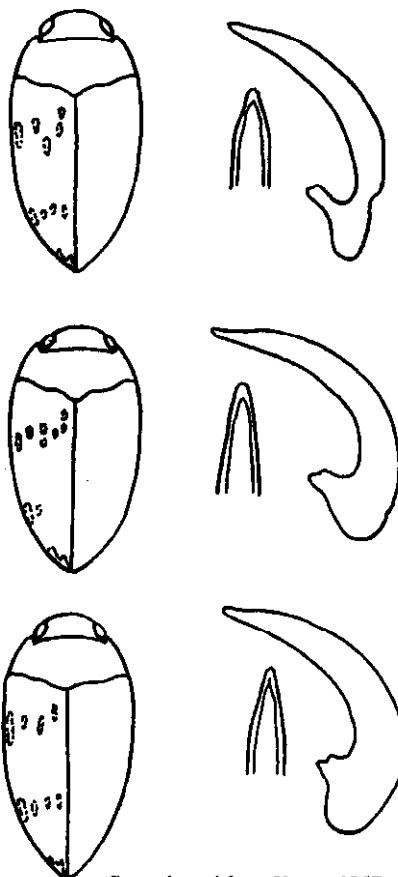


16(15') Base of aedeagus narrow; length 2.9-3.2 mm; body form as figured; elytra more coarsely, densely and deeply punctate .... *N. rheocrinus*

16' Base of aedeagus wider; length 2.9-3.5 mm; body as in couplet 17; elytra more finely punctate ..... 17

17(16') Length 2.9-3.0 mm; body form and aedeagus as figured ..... *N. helocrinus*

Length 3.0-3.5 mm; body form and aedeagus as figured ..... *N. blanchardi*



(figs. adapted from Young 1967a)

Dytiscidae 3.84

18(13') Form very broad, very obtuse anteriorly; elytra with weak transverse fasciae; pronotal margins very broad ..... *N. camicoides*



*N. camicoides*

18' Form not as broad, more ovate; if appearing broad, then elytra without markings; pronotal margins not as broad ..... 19

19(18') Dorsal and ventral integument polished and strongly shining, with microsculpture between punctures greatly reduced; pronotal margins somewhat more horizontal than usual, appearing wider in lateral view than in dorsal view; male fore and mid tarsi narrower than usual ..... *N. effeminatus*

19' Dorsal and ventral integument not polished and strongly shining, with evident microsculpture between punctures; pronotal margins not appearing wider in lateral view than in dorsal view; male fore and mid tarsi normal ..... 20

20(19') Elytra with obvious fasciate markings ..... 21

20' Elytra unmarked or with markings very obscure ..... 23



← fasciate markings

21(20) Elytral punctation fine and dense; size 3.8-4.0 mm .. *N. lynceus*

21' Elytral punctation coarse and sparse; size 3.2-4.0 mm ..... 22

22(21') Smaller, length 3.2-3.8 mm; dorsal and ventral punctation finer ..... *N. asidytus*

22' Larger, length 3.6-4.0 mm; dorsal and ventral punctation coarser ..... *N. carolinus*

23(20') Elytra dark brown, rugulose, closely punctate, but with a dense pubescence that obscures the punctation; disk of pronotum considerably flattened; epipleurae of elytra more nearly vertical than usual, so that they are largely visible from the side; abdominal segments and elytra acuminate ..... *N. floridanus*

23' Elytra, pronotum and epipleurae not as above; form more oval ..... 24

24(23') Size smaller, length 3.2-3.8 mm; northern and western FL ..... *N. baelus*

24' Size larger, > 3.8 mm ..... 25

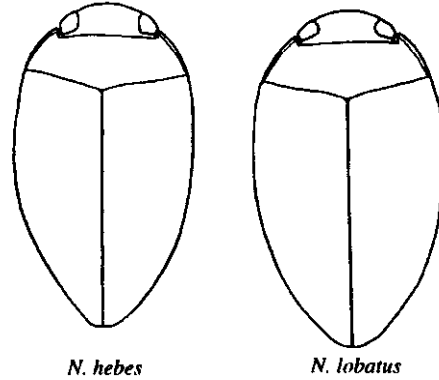


25(24') Elytra light yellowish-brown with reddish cast; dorsum with coarse punctation; length 3.9-4.1 mm; known only from Everglades (Broward & Dade Counties) ..... *N. uniformis*

25' Elytra dark reddish brown; punctation finer; length 3.8-4.6 mm; central and northern FL ..... 26

26(25') Anterior outline blunt; punctation coarser .....  
..... *N. hebes*

26' Anterior outline not as blunt; punctation finer .....  
..... *N. lobatus*



**Notes on species**

*N. asidytus* - Length 3.2-3.8 mm. A characteristic species of northern and western FL streams in flatwoods areas; the type series was collected from a drying-up pool in a flatwoods stream. *N. asidytus* is very similar to *N. carolinus* in elytral color pattern, but is more finely punctate and averages smaller in size. Also known from SC, MS and southern GA. See Young (1984).

*N. aulicus* - Length 5.6-6.0 mm. The largest *Neoporus*, it is coarsely punctate dorsally. It normally is rusty-brown colored, the elytra with two transverse fasciae and apical spot brownish-yellow.

*N. baelus* - Length 3.2-3.8 mm. Similar to but smaller than *N. hebes*; Young's (1954) records for *hebes* from Franklin, Liberty and Walton Counties were referred to *N. baelus* by Young (1984). Found in pools, *Nuphar* ponds, swamps and swamp streams, ditches and streams in flatwoods areas of northern Florida.

*N. blanchardi* - Length 3.0-3.5 mm. *N. blanchardi* is finely punctate and usually appears smooth and polished. This species, along with *N. helocrinus* and *N. rheocrinus*, makes up the *N. blanchardi* group in Florida; *N. psammodytes* is another member of this group that may occur in Florida. *N. blanchardi* averages larger than *N. helocrinus* and *N. rheocrinus*. Young (1984) stated that "*blanchardi* has not been found in Florida except in the Apalachicola River area. *H. rheocrinus* and *helocrinus* seem to be derivatives of *blanchardi* isolated in the northern peninsular region". Without a good series and reference specimens, one may have to be content with an identification of "*N. blanchardi* group" for these species.

*N. carolinus* - Length 3.6-4.0 mm. Young (1984) noted that this species seemed to be more frequently associated with small, rather swift streams in upland woodlands. Difficult to separate from *N. asidytus* without comparative material.

- N. cimicoides* - Length 4.2-4.6 mm. Usually easily recognized by its distinctive shape, *N. cimicoides*, with weak transverse elytral fasciae, is larger than the unmarked *N. baelus* and *N. hebes*.
- N. clypealis* - Length 4.0-4.5 mm. A very common species in northern Florida. The pronotum of *N. clypealis* often bears a posterior infusate area that is expanded so that it is confluent with the apical infusate spot.
- N. dilatatus* - Length 3.8-4.4 mm. The rounded prosternal process and fasciate elytra identify this species usually found in clear, rather swift streams of upland areas. Following Peck & Thomas (1996), Young's (1954) record of *H. spurius* (LeConte) is considered to be *N. dilatatus*.
- N. dixianus* - Length 2.9-3.3 mm. This species is found from the Suwannee River drainage on westward in Florida. Wolfe (1984) noted that some specimens had the disc of the elytra almost totally infusate.
- N. effeminatus* - Length 3.8-4.0 mm. Young (1954) noted that this species was apparently endemic to Florida, where it may be a localized form of sluggish streams and ditches of peninsular flatwoods. Recorded from Brevard, Flagler, Levy and Osceola Counties.
- N. floridanus* - Length about 3.8 mm. Known only from Kingsley Lake in Clay Co.
- N. gaudens* - Length 3.7-4.2 mm. Similar to *N. carolinus*, but much more elongate, more finely punctate and with the male protarsal claws distinctly unequal.
- N. hebes* - Length 3.8-4.5 mm (Fall (1923) gives 3.8-4.05 mm; Young (1984) gives 4.0-4.5 mm). Similar to *N. baelus*, but larger. This species can also be confused with *N. cimicoides* (which usually bears transverse fascia) and *N. lobatus* (which is not as blunt anteriorly, is more rounded laterally and has finer punctation). Young (1954) noted that "*hebes* shows indications of intergrading with *cimicoides* on one hand and *lobatus* on the other."
- N. helocrinus* - Length 2.9-3.0 mm. Similar to *N. rheocrinus* but smaller in average size, much less convex, more regularly attenuate behind and with dorsal punctation finer
- N. hybridus* - Length 4.2-4.4 mm. In this species and *N. venustus* the middle projection of the metacoxal process is reduced. However, the truncate clypeus and sharply upturned basal margins of the elytra will identify these two taxa; *N. venustus* is larger.
- N. latocavus* - Length 2.6-2.7 mm. This species is not recorded from Florida, but has been collected near Midway in Bullock Co., AL.
- N. lobatus* - Length 3.6-4.6 mm (Fall (1923) gives 3.6-4 mm; Young (1984) gives 4.0-4.6 mm). A widespread species through peninsular and northern FL. See also *N. hebes* above.
- N. lynceus* - Length 3.8-4.0 mm. Young (1954) stated "Fall (1923) believes that *lynceus* is probably only a small southern form of *undulatus*, but several distinct species may be involved". Young noted five forms of the "*lynceus* complex". Hopefully, ongoing revisionary work will better delimit these taxa.
- N. mellitus* - Length 2.2-2.5 mm. Wolfe (1984) noted that he had only found this species along the margins of streams from undercut banks or in dangling roots. He recorded it from Florida in Walton Co., in addition to material ranging from Louisiana to Vermont.
- N. mixtus* - Length 4.1-4.4 mm. Not recorded from Florida, but Young (1954) noted that it "probably occurs in streams in the western uplands of Florida".
- N. psammodytes* - Length 2.9-3.3 mm. This species is not recorded for Florida, but has been collected in a stream near Blakely, Early Co., GA. Unlike other members of the *N.*

*blanchardi* group, it does not appear to favor root masses as a habitat, being found instead in the silty-sandy margins of heavily shaded streams.

*N. rheocrinus* - Length 2.9-3.2 mm. Similar to *N. blanchardi* but smaller in average size, more convex, less regularly acuminate behind, and conspicuously more coarsely, densely and deeply punctate on the pronotum and elytra. It has been found only in small streams in San Felasco Hammock west of Gainesville, in mats of mosses and roots along stream margins where water trickled into the stream from small springs and seepages (Young 1967a). See also *N. blanchardi* and *N. helocrinus*.

*N. shermani* - Length 3.4-3.6 mm. An elongate stream species; in Florida known from Gadsden and Liberty Counties.

*N. striatopunctatus* - Length 3.1-3.3 mm. In Florida, recorded from Liberty Co., where it was collected at a spring.

*N. uniformis* - Length 3.9-4.1 mm. Lighter in color, more coarsely punctate, more shining and smaller than typical *N. lobatus*. Young (1954) noted that this species was "known only from the rock rim of the Everglades and Everglades Keys from Broward County to southern Dade County".

*N. venustus* - Length 4.2-4.4 mm. See *N. hybridus*. I have specimens from the New and Santa Fe Rivers (Suwannee River basin); also recorded from Gadsden Co. in Peck & Thomas (1996).

*N. vittatipennis* - Length 2.6-3.0 mm. Wolfe (1984) noted this species to be most abundant in lentic habitats where it preferred dangling roots along the margins of swamps and streams. I have seen it commonly in Hester-Dendy samples. Very common in northern Florida sand-bottomed streams.

Additional species, described and undescribed, may occur, especially in the northern and western parts of the state.

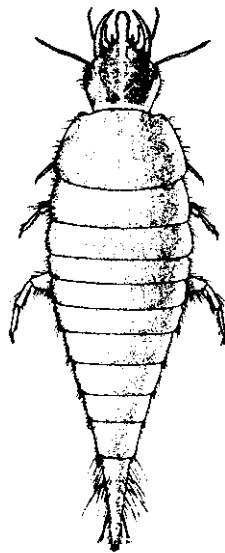
Genus *Pachydrus*

DIAGNOSIS: Larvae are distinguished by the frontal process with short lateral branches; and antenna with simple apical segment.

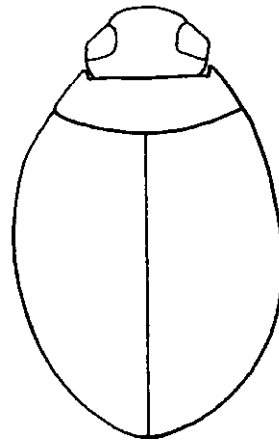
Adults are distinguished by the globose form; pseudotetramerous fore and mid tarsi; short prosternal process that is broader than long and has a rounded apex; mid coxae separated by about the width of a mid coxa; epipleura with a diagonal carina; hind coxal process without a lateral lobe; straight hind tibia; and unequal hind tarsal claws.

NOTES: One species, *P. princeps* (length 4.2-5.0 mm), of this essentially Neotropical genus occurs in Florida. The species is often associated with the roots of water hyacinths (Young 1954) and has been collected throughout the peninsula and in southern Georgia.

ADDITIONAL REFERENCES: Spangler & Folkerts 1973.



*P. princeps*, larva  
(adapted from Spangler & Folkerts 1973)



*P. princeps*, adult

Genus *Rhantus*

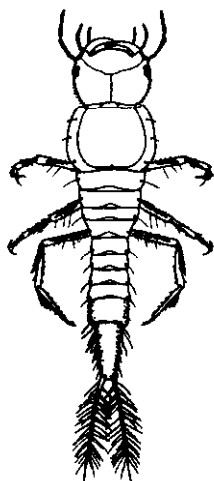
**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; broad maxillary stipes; mandible almost three times as long as broad; antenna with last (fourth) segment more than 2/3 the length of the third segment; basal half of tarsal claw with small spines on lower margin; and abdominal segments 7 & 8 without a lateral fringe of setae.

Adults are distinguished by the emarginate eyes; unnotched palpi; margined pronotum; convex/carinate prosternal process that fits into a triangular depression on the metasternum; five segmented fore and mid tarsi; lightly reticulate elytra, with fine, unequal, irregular meshes (sometimes overlain with a secondary reticulation in some females); and unequal hind tarsal claws.

**NOTES:** Ten species occur in North America; only one species, *R. calidus* (length 11.5-13.5 mm), is known to occur in Florida. *R. binotatus*, a species unknown from Florida but which occurs in the Carolinas, is smaller (10-12 mm) and has two spots on the pronotum. Also note that males of *R. binotatus* possess unequal claws on the mid tarsi; male *R. calidus* have equal mesotarsal claws.

Young (1954) noted that *R. calidus* occurred in a wide variety of habitats (permanent and temporary, lentic and lotic), but seemed to favor swamps and similar situations.

**ADDITIONAL REFERENCES:** Hilsenhoff 1993b; James 1970; Michael & Matta 1977; Zimmerman & Smith 1975.



*R. binotatus*, larva  
(adapted from James 1970)



*Rhantus calidus*, adult

Genus *Thermonectus*

**DIAGNOSIS:** Larvae are distinguished by the lack of a frontal projection; broad maxillary stipes; simple ligula that is shorter than the first segment of the labial palp; and abdominal segments without gills, segments 7 & 8 with a lateral fringe of setae.

Adults are distinguished by the moderate size; non-emarginate eyes; five segmented fore and mid tarsi; hind margin of mid femur with a series of stiff setae that are as long or longer than the width of the femur; females with small scratches on the basal portion of the elytra; apex of outer spur of hind tibia notched; and posterior margins of first four hind tarsal segments with a fringe of golden cilia.

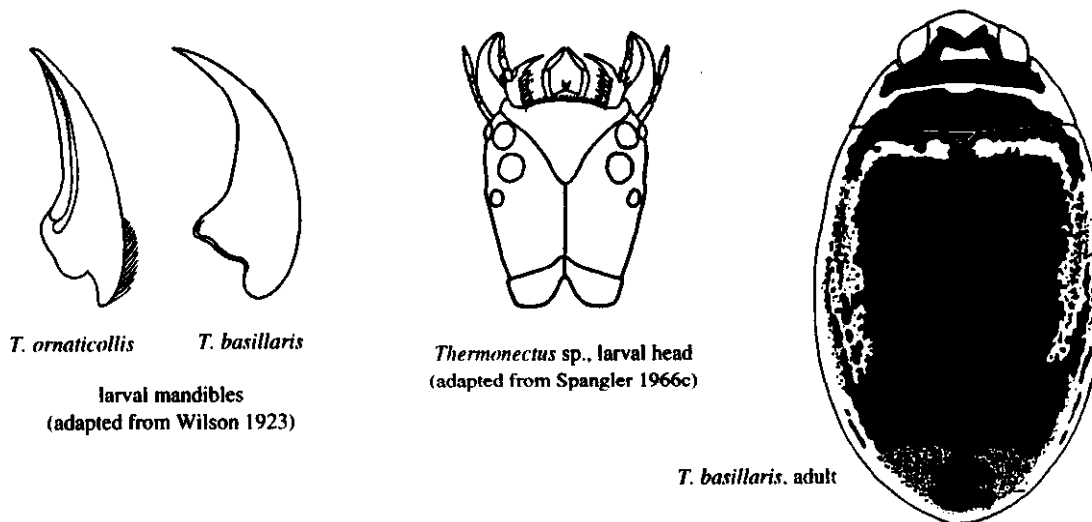
**NOTES:** Two species occur in Florida; *T. basillaris* is the more common. It is distinguished by its smaller size (9.0-11.5 mm); dark brown to black elytra with irregular marginal yellow markings that are divided by black lines and specks; an indefinite subbasal pale band on the elytra; and a normally dark brown to black venter. Young (1954) noted that specimens from the Keys were lighter in color than those from the rest of the state. Female elytra of both species are often adorned dorsally with a series of strigae.

A second species, *T. ornatcollis*, is larger (11.5-13.0 mm), has yellow elytra adorned with black speckles (the subbasal pale band is lacking), and usually an orange venter.

Larvae of the two species can be separated by the presence of a basal fringe of hairs on the outer margin and a row of fine teeth in the groove near the apex of the mandible of *T. ornatcollis* that are lacking in *T. basillaris*.

*Thermonectus* species, especially *T. basillaris*, are commonly found in temporary water bodies. Young (1954) noted that *T. ornatcollis* were characteristically found in ponds with grassy margins, and that *T. basillaris* had been found in brackish water situations, including an open bay in the Keys.

**ADDITIONAL REFERENCES:** Michael & Matta 1977; Wilson 1923.



Genus *Uvarus*

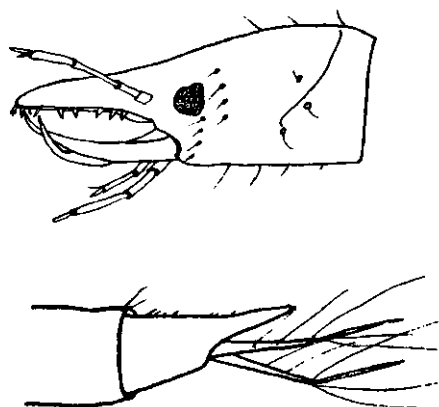
**DIAGNOSIS:** Larvae are separated by the 3 segmented maxillary palpus; frontal projection of nasale without notches or projections; body not greatly widened at middle; abdominal sternites 2-8 without a sclerotized plate; cercus with only primary setae; basal segment of cercus shorter than last abdominal segment including siphon, with siphon equal in length or longer than base of eighth segment.

Adults are distinguished by their very small size (around 2 mm or less); lack of a transverse stria or ridge across the occiput posterior to the eyes; simple clypeal margin; fore and mid tarsi pseudotetramerous; hind tibiae weakly arcuate; and hind tarsal claws equal.

**NOTES:** Of the 10 species known from North America, 5 occur in Florida. Species now placed in *Uvarus* were treated by Young (1954), along with species from other genera, as *Bidessus*.

Most species are found in small streams, ditches, ponds and cypress swamps.

**ADDITIONAL REFERENCES:** Matta 1983.



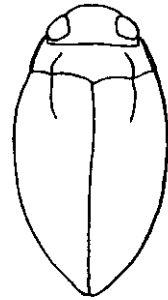
*U. granarius*, larva, lateral view of head and abdominal segments 7 & 8 (adapted from Matta 1983)



*U. lacustris*

Key to adult *Uvarus* of Florida

- 1 Body form ovate; elytra yellow-brown; dorsum finely punctate ..... *U. lacustris*

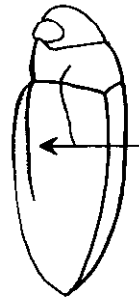


- 1' Body form broadly ovate; elytra reddish-brown or fuscous with weak reddish-brown markings; dorsum more coarsely punctate ..... 2



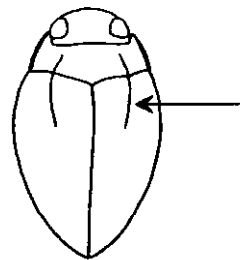
Note: these species are best separated using comparative material

- 2(1') Side margins of elytra carinate, greatly expanded; length around 1.5 mm ..... *U. inflatus*

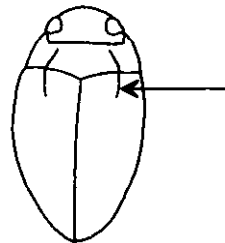


- 2' Side margins at most weakly carinate, not greatly dilated; length 1.3-2.0 mm ..... 3

- 3(2') Elytral plicae much longer than pronotal plicae; length 1.5-1.8 mm ..... *U. granarius*



- 3' Elytral plicae slightly longer than or subequal to pronotal plicae; length 1.3-2.0 mm ..... 4





4(3') Length 1.3-1.6 mm; aedeagus more robust ..... *U. rogersi*



4' Length 1.6-2.0 mm; aedeagus thinner ..... *U. falli*



### Notes on species

*U. falli* - Length 1.6-2.0 mm. Some specimens may have vague basal and postmedial reddish-brown markings on the elytra, or the elytra are uniformly fuscous. Young (1954) recorded the species from Alachua, Levy and Madison counties; there are additional specimens from Jefferson Co. in the FSCA and I've seen material from the Santa Fe River. The elytra of this species may appear weakly carinate laterally.

*U. granarius* - Length 1.5-1.7 mm. A species with uniformly reddish-brown elytra; widespread in the eastern U.S.

*U. inflatus* - Length 1.5 mm. This species possesses distinctive elytra that are strongly carinate above the anterolateral margin. Young (1954) recorded this species only from the type locality in Bay Co.; there are additional specimens from Liberty Co. in the FSCA. I've collected it from moss-lined roadside ditch/pools in the Apalachicola National Forest southwest of Tallahassee. Young (1984) noted that this species is now known from as far north as New Jersey.

*U. lacustris* - Length 1.5-2.0 mm. The slimmer shape and yellowish-brown elytra, clouded with fuscous at the base, readily distinguish this widespread (in the eastern U.S.) species in Florida.

*U. rogersi* - Length 1.3-1.6 mm. A species apparently confined to the Panhandle-Big Bend area of Florida, but, like *U. inflatus* above, it may be more widespread. *U. rogersi* is abundant in moss-lined roadside ditch/pools in the Apalachicola National Forest southwest of Tallahassee.

**Family Elmidae**

**DIAGNOSIS:** Larvae are distinguished by the cylindrical or subcylindrical body form; apparently 4-segmented legs with single-clawed tarsi; abdominal sternites without external gills; apicoventral operculum on the 9th abdominal segment enclosing a chamber with gill tufts and a pair of hooks; and terminal abdominal segment apically bifid or notched posteromedially.

Adults are distinguished by the hard body; filiform, unclubbed antennae (although apical segment is enlarged in *Macronychus*); rounded anterior coxae with concealed trochantin; 5-segmented tarsi on all legs; and first abdominal sternite not divided by hind coxae.

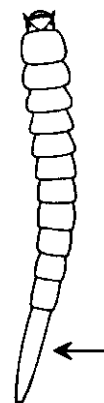
**NOTES:** The Elmidae have often been lumped with the Dryopidae and several other families into the superfamily Dryopoidea (Brown 1972; 1975). That arrangement has been modified; these families are now considered members of the superfamily Byrrhoidea (Lawrence & Newton 1995). Seven, possibly eight, genera including at least 19 species are known from Florida.

As the common name of "riffle beetles" implies, these insects are most often found in streams and rivers, but several taxa occur in lakes and ponds. Larvae and adults feed on decayed plant materials and algae. They are the most truly aquatic of our water beetles. Larvae possess gills and adults utilize a plastron (a covering of fine, dense hydrofuge setae that holds a layer of air across which gases can be exchanged) that enables them to remain submerged all the time; most other aquatic beetle adults must go to the surface to replenish an air supply. The elmids offer the best candidates among the aquatic beetles for indicators of water quality; Brown (1972) noted "they cannot tolerate excessive pollution by such wetting agents as soaps and detergents".

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Brown 1972; Sinclair 1964; White 1982.

**Key to larvae of Florida Elmidae genera**

- 1 Last abdominal segment extremely long, at least 4 times as long as wide ..... *Dubiraphia*
- 1' Last abdominal segment not extremely long, < 4 times as long as wide ..... 2

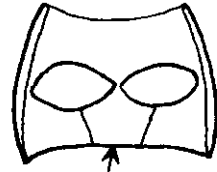


2(1') Posterolateral margins of abdominal segments 1-8 produced into spine-like processes; body rather robust ..... *Ancyronyx*

2' Posterolateral margins of abdominal segments 1-8 not produced; body more elongate-cylindrical ..... 3

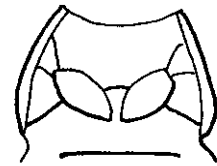


3(2') Prothorax with a posterior sternum, procoxal cavities closed posteriorly ..... 4



sternum

3' Prothorax without a posterior sternum, procoxal cavities open posteriorly ..... 5



4(3) Last abdominal segment with a pair of posterolateral spines; dorsal tubercles not arranged in parallel rows ..... *Stenelmis*

4' Last abdominal segment may be slightly notched medially, but without a pair of posterolateral spines; dorsal tubercles partially arranged in longitudinal parallel rows ..... *Microcyloepus*



*Stenelmis*

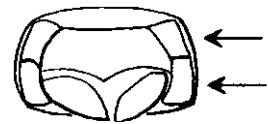


*Microcyloepus*

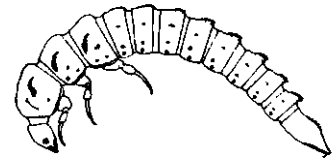
5(3') Pleuron of middle thoracic segment composed of one sclerite ... 6



5' Pleuron of middle thoracic segment composed of two sclerites (anterior sclerite is very narrow in *Gonielmis*) ..... 7



- 6(5) Dorsum of each segment with dorsal and lateral humps; prothorax not expanded laterally ..... *Promoresia*



*Promoresia*



- 6' Dorsum without humps; prothorax expanded laterally, appearing hood-like ..... *Optioservus*  
(Not recorded from Florida, but may occur in western part of the state)

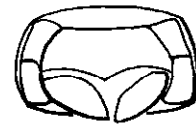


*Optioservus*

- 7(5') Abdominal segments 1-7 with pleura and with dorsal humps bearing scale-like setae; last abdominal segment slightly notched at apex, not spined; anterior mesopleural sclerite narrow ..... *Gonielmis*

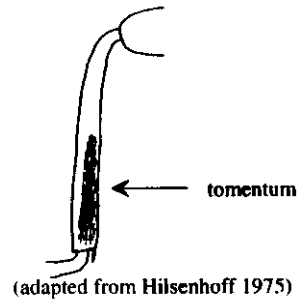


- 7' Abdominal segments 1-6 with pleura, without dorsal humps, each with a posterior fringe of fine setae; last abdominal segment with 2 long narrowly separated spines; anterior mesopleural sclerite wider ..... *Macronychus*



**Key to adults of Florida Elmidae genera**

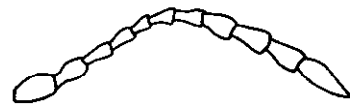
- 1 Anterior tibia with a fringe of tomentum (elongate patch of fine, dense setae) ..... 2
- 1' Anterior tibia without tomentum ..... 7



- 2(1') Antennae short, with only 7 segments, apical segment enlarged ..... *Macronychus*

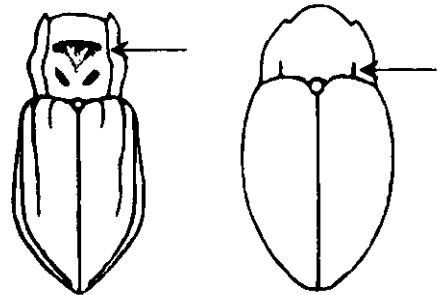


- 2' Antennae longer, filiform, with 10-11 segments .... 3



(adapted from Barr & Chapin 1988)

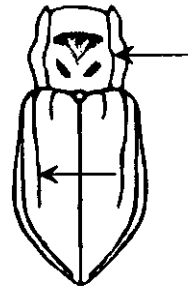
- 3(2') Pronotum with sublateral carinae for entire length or confined to basal third ..... 4



(adapted from Barr & Chapin 1988)

- 3' Pronotum without carinae ..... 6

- 4(3) Pronotum with sublateral carinae for entire length and transverse impression anterior to middle; elytra with carinae ..  
..... *Microcylloepus*



- 4' Pronotum with sublateral carinae confined to basal third, without transverse impression; elytra smooth ..... 5

- 5(4') Body more elongate; lateral and posterior margins of pronotum smooth; tarsi and claws large ..... *Promoresia*



*Promoresia tardella*

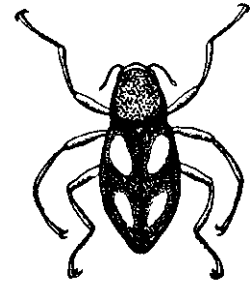
- 5' Body plump; lateral and posterior margins of pronotum serrate; tarsi and claws not as conspicuously enlarged ..... *Optioservus*  
(Not recorded from Florida, but may occur in western part of the state)



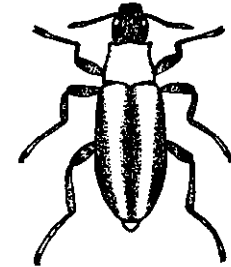
*Optioservus ovalis*

Elmidae 4.5

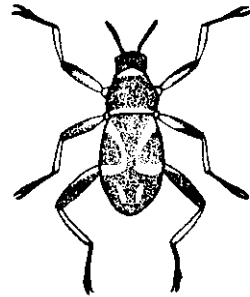
6(3') Each elytron black with 2 oblique yellowish spots; lateral margin of 4th abdominal segment with a prominent tooth that is bent upward to clasp epipleuron; N FL only ..... *Gonielmis*



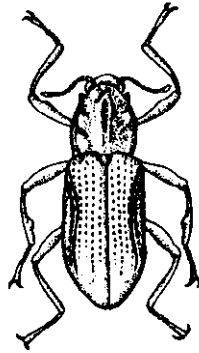
6' Each elytron black/dark brown with an entire vitta (vitta sometimes interrupted near middle and appearing as 2 spots); lateral margin of 4th abdominal segment without a prominent tooth; throughout FL ..... *Dubiraphia*



7(1') Dorsum smooth; elytra with pair of C-shaped yellow/orange vittae and elongate apical spots ..... *Ancyronyx*



7' Dorsum sculptured; elytra immaculate, bimaculate or vittate, not marked as above ..... *Stenelmis*



Genus *Ancyronyx*

**DIAGNOSIS:** Larvae are distinguished by the robust, somewhat flattened shape; procoxal cavities that are closed posteriorly; and the posterolateral margins of abdominal segments 1-8 that are produced into spine-like processes.

Adults are distinguished by the long-legged, spidery shape, with black body marked by a pair of C-shaped yellow/orange vittae; 11-segmented, filiform antennae; and globular hind coxae.

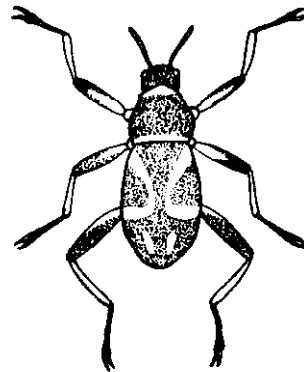
**NOTES:** One species, *A. variegata* (length 3.0-3.5 mm), occurs in North America; in Florida it is recorded from streams and rivers from Alachua Co. and northward.

Usually found on submerged wood or roots, *A. variegata* is commonly collected on Hester-Dendy samplers. Sinclair (1964) noted that *A. variegata* was "sensitive to sewage and industrial wastes".

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Brown 1972.



*A. variegata*, larva  
(adapted from Bertrand 1955)



*A. variegata*, adult  
(adapted from Hilsenhoff 1975)

Genus *Dubiraphia*

**DIAGNOSIS:** Larvae are distinguished by the long and slender last abdominal segment (at least four times as long as wide), with the operculum confined to the posterior third.

Adults are distinguished by the tomentum on the anterior tibiae; smooth pronotum without sublateral carinae; prosternal process posteriorly much narrower than the head; vittate/maculate elytra; lateral margins of abdominal sternites not produced into a prominent upturned tooth; and transverse hind coxae.

**NOTES:** Eleven species are described from North America; to date only one, *D. vittata* (length about 2.3 mm), is known from Florida. Young (1954) referred to this species as *Simsonia quadrinotata*.

Barr & Chapin (1988: 124) noted that "the genus is badly in need of revision because of numerous undescribed taxa and systematic problems, particularly in the Southeast". They recorded 4 described species and 3 probable new species from Louisiana. However all material I've seen from Florida, ranging from the Lake Okeechobee area to the Panhandle, is apparently *D. vittata*. Material from the Steinhatchee and Withlacoochee Rivers in northern FL was identified as *D. vittata* by Dr. W.L. Hilsenhoff; he noted that dark beetles with constricted vittae may represent a new species, but male genitalia indicated they were a dark morph of *D. vittata*. It is possible that Florida *D. vittata* may be the same taxon that Barr & Chapin (1988) referred to as "*Dubiraphia* n. sp. A?".

In general, material from southern Florida is indistinguishable from northern Florida specimens. The elytral vittae are quite variable, ranging from narrow to wide; in some specimens the vittae are interrupted and the elytra appear quadrinotate (leading to misidentifications as *D. quadrinotata*, which apparently does not occur in FL). All Florida specimens possess similar genitalia, with a wider aedeagus and more extensive striated area than the similar *D. minima* (which also apparently does not occur in FL). I have found it necessary to slide mount the genitalia to separate the two taxa - be sure not to squash the genitalia with the cover slip (note that even if squashed, the aedeagi of *D. minima* and *D. quadrinotata* are considerably thinner than that of *D. vittata*.)

Although usually found in running water, Young (1954) noted that *Dubiraphia* were frequently found in ponds and lakes; Hilsenhoff & Schmude (1992) noted that several *Dubiraphia* species were found in ponds and wave-swept shallows of lakes. Brown (1972) noted that *D. vittata* was sensitive to chlorides.

Given the taxonomic uncertainty associated with *Dubiraphia*, workers should retain specimens from different water bodies/sites; future revisionary work may reveal that more than one species is present.

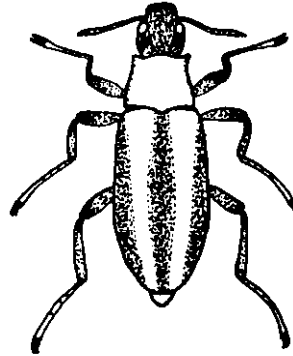
**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Hilsenhoff 1973; Hilsenhoff & Schmude 1992.



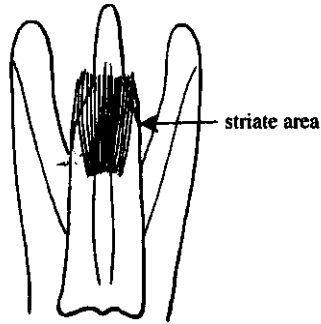
Elmidae 4.8



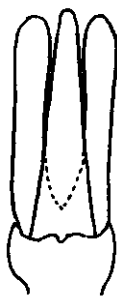
*Dubiraphia* sp., larva  
(adapted from Barr & Chapin 1988)



*D. vittata*, adult  
(adapted from Hilsenhoff 1975)



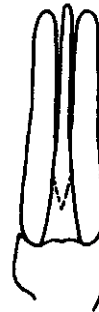
FL *D. vittata* genitalia  
(slightly pressed by cover slip)



*D. vittata*



*D. quadrinotata*



*D. minima*

Hilsenhoff & Schmude (1992) noted that the genitalia figures in Hilsenhoff (1973) were of slide-mounted material and thus widened and lengthened. They provided the figures adapted above of unmounted genitalia.

Genus *Gonielmis*

**DIAGNOSIS:** Larvae are distinguished by the prothorax that lacks a posterior sternum; mesopleuron with two parts; dorsum of each thoracic segment with 2 longitudinal dark spots on each side; abdominal segments 1-7 with pleura; abdominal segments 1-7 with dorsal humps bearing conspicuous scale-like setae; and last abdominal segment more than twice as long as its height.

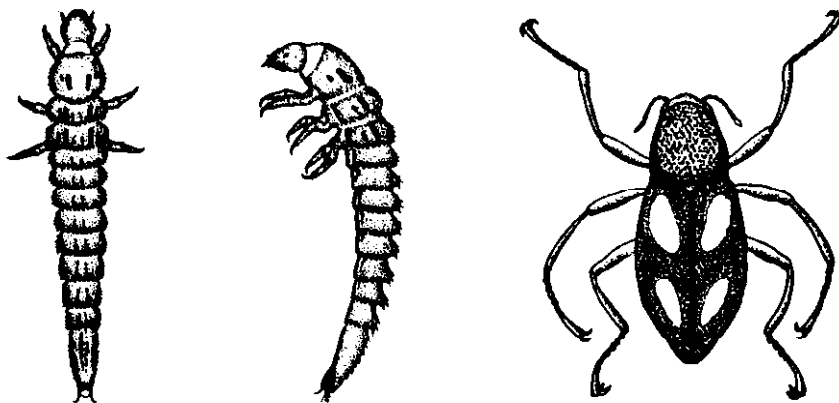
Adults are distinguished by the elongate, spindle-shaped body; tomentum on the anterior tibia; pronotum without sublateral carinae; each elytron black with two oblique yellow spots; 4th abdominal sternite with a prominent tooth on its posterolateral margin; and transverse hind coxae.

**NOTES:** *Gonielmis* is a monotypic genus with its single species, *G. dietrichi* (length 2.5-2.6 mm), found in Florida streams from Leon Co. (Ochlockonee River drainage) and westward; I have not seen the species from the Suwannee River drainage.

*Gonielmis* adults are easily confused with *Promoresia* adults, while larvae have been mistaken for *Optioservus*. With adults, pay close attention to the lack of pronotal carinae in *Gonielmis*; for larvae be aware that the anterior part of the divided mesopleuron in *Gonielmis* can be scarcely discernable.

Brown (1972) noted that *G. dietrichi* was "tolerant of moderate organic enrichment, turbidity, and siltation, but sensitive to paper mill effluent".

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Brown & White 1978.



*G. dietrichi*, larva and adult  
(adapted from Brown 1972)

Genus *Macronychus*

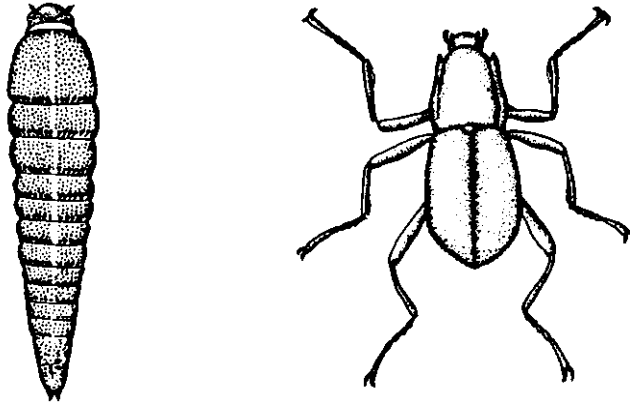
**DIAGNOSIS:** Larvae are distinguished by the prothorax that lacks a posterior sternum; mesopleuron with two parts; abdominal segments 1-6 with pleura and no dorsal or lateral humps; posterior margin of each segment with a fringe of long setae; and last segment with 2 long, narrowly separated apical spines.

Adults are distinguished by the unicolorous, shiny dark brown to black body with long, spider-like legs; short, 7-segmented antennae with enlarged apical segment; anterior tibiae with tomentum; pronotum with 2 basal sublateral carinae; each elytron with one sublateral carina and silver/gold band of dense pubescence along sublateral margin; and globular hind coxae.

**NOTES:** One species, *M. glabratus* (length 3-4 mm), occurs in the eastern U.S.; in Florida it has been collected as far south as Oak Creek near Tampa.

*Macronychus glabratus* occurs in streams and rivers and, less often, ponds and lakes. Adults and larvae are most often associated with wood, and are often found with *Ancyronyx variegata*. Brown (1972) noted that *M. glabratus* was "sensitive to sewage and many industrial wastes, such as those from plating, textile, and viscose rayon plants".

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; LeSage & Harper 1976.



*M. glabratus*, larva & adult  
(adapted from Brown 1972)

Genus *Microcylloepus*

**DIAGNOSIS:** Larvae are distinguished by the prothorax with a posterior sternum; dorsal tubercles partially arranged in parallel longitudinal rows; and the last abdominal segment without posterolateral projections.

Adults are distinguished by the small size; mandible with a lateral lobe; anterior tibiae with tomentum; pronotum with a transverse impression at anterior 2/5 and a medial longitudinal depression, distinct sublateral carinae and serrulate lateral margins; 5th abdominal sternite with tooth on posterolateral margin; and transverse hind coxae.

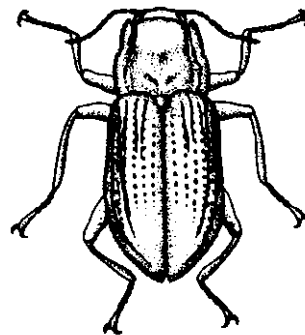
**NOTES:** Basically a Neotropical genus, *Microcylloepus* is represented by five species in the U.S.; one species, *M. pusillus* (length 1.65-2.20 mm) is found throughout Florida. This species was formerly divided into several subspecies, three of which Young (1954) recorded from the state. However, Barr & Chapin (1988) could not confidently assign much Louisiana material to subspecies. Hilsenhoff & Schmude (1992) and Shepard (1990) considered these "subspecies" to be color morphs, a position also adopted in this manual.

*Microcylloepus pusillus* occurs in streams and has also been collected from the roots of water hyacinths in Florida lakes. Brown (1972) noted that *M. pusillus* was "tolerant of siltation and turbidity, but sensitive to sewage and such industrial wastes as those from rayon plants and plating mills".

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Hilsenhoff & Schmude 1992; Shepard 1990.



*M. pusillus*, larva  
(adapted from Bertrand 1955)



*M. pusillus*, adult  
(adapted from Brown 1972)

Genus *Optioservus*

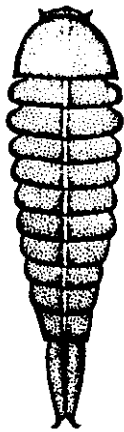
DIAGNOSIS: Larvae are distinguished by the prothorax without a posterior sternum; laterally expanded, hood-like pronotum; single mesopleural sclerite; and dorsum without humps.

Adults are distinguished by the plump body form; anterior tibiae with tomentum; pronotum with short basal sublateral carinae and serrate lateral and posterior margins; tarsi and claws not conspicuously enlarged; and transverse hind coxae.

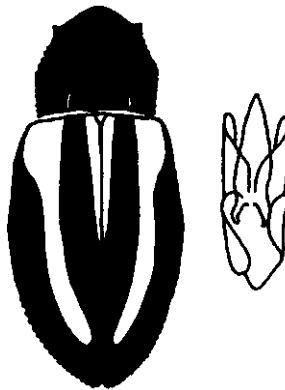
NOTES: *Optioservus* has not been collected in Florida, but its occurrence in southern Alabama (*O. ovalis*, pronotal/elytral length 2.2-2.6 mm) and southeastern Louisiana (*O. trivittatus*, pronotal/elytral length 1.7-2.2 mm) indicates that the genus may eventually be found in the Panhandle. Adults of the two species can be separated by elytral color patterns illustrated below. Note that adults can be confused with *Gonielmis dietrichi* and *Promoresia* species; be sure to observe prothoracic characters.

In Louisiana, Barr & Chapin (1988) found *O. trivittatus* in "small streams with sand and gravel substrates and brown-stained, acidic waters". Brown (1972) noted that *O. trivittatus* was "relatively tolerant of sewage and chlorides".

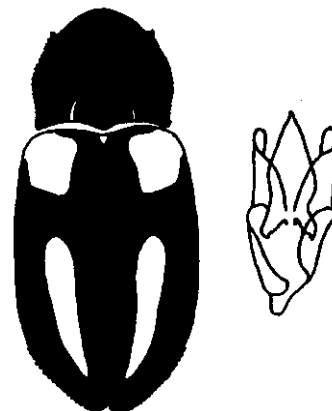
ADDITIONAL REFERENCES: Barr & Chapin 1988; White 1978.



*Optioservus* sp., larva  
(adapted from Brown 1972)



*O. trivittatus*, adult and genitalia  
(adapted from White 1978; 1982)



*O. ovalis*, adult and genitalia  
(adapted from White 1978; 1982)

Genus *Promoresia*

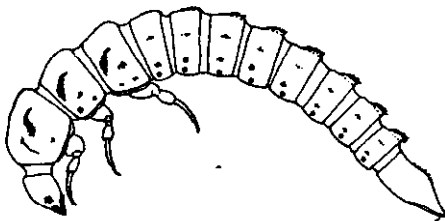
**DIAGNOSIS:** Larvae are distinguished by the prothorax without a posterior sternum; single mesopleural sclerite; dorsum with median and sublateral humps; and last abdominal segment about twice as long as its height.

Adults are distinguished by the more elongate body form; anterior tibiae with tomentum; pronotum with short basal sublateral carinae and smooth lateral and posterior margins; long and prominent tarsi and claws; and transverse hind coxae.

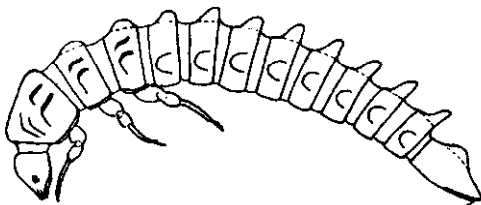
**NOTES:** Two species of *Promoresia* occur in the Nearctic; based on larvae, at least one of these, *P. tardella* (length 1.7-2.7 mm) occurs in Florida; the other, *P. elegans* (length 2.1-2.8 mm) may also eventually be collected in the state. Adults of the two species may be separated by their elytral patterns (spots more elongate in *P. elegans*) and genitalia (aedeagus constricted near base in *P. elegans*); larvae may be separated by the size of the dorsal and lateral humps (much larger in *P. tardella*) as figured below.

Larvae that apparently are *P. tardella* were collected in February from Econfina Creek in Bay Co.; I have not seen adults of this genus from Florida. Note that adults and larvae of *P. elegans* are very similar to *Gonielmis dietrichi*, but can be separated with careful observation of characters stated in the key.

**ADDITIONAL REFERENCES:** Brown & White 1978.



*P. elegans*, larva, adult & genitalia  
(adapted from Brown & White 1978 and White 1982)



*P. tardella*, larva, adult & genitalia  
(adapted from Brown & White 1978 and White 1982)



Genus *Stenelmis*

**DIAGNOSIS:** Larvae are distinguished by the elongate body; tooth at each corner of the anterior margin of the head; prothorax with a posterior prosternum; dorsal tubercles not arranged in parallel rows; and the last abdominal segment with a pair of posterolateral spines.

Adults are distinguished by the lack of a tomentum on the anterior tibiae; and transverse hind coxae. Males of some species possess a spinose ridge medially on the inner margin of the mid tibia.

**NOTES:** *Stenelmis* is a speciose genus with over 30 species present in North America. Dr. K. L. Schmude has recently revised the genus and has described several new species (Schmude 1992); results await publication. Schmude's study found that elytral markings in *Stenelmis* are extremely variable and that many literature records are incorrect. Thirteen species are found in Florida, two of them undescribed (designated *S. sp. C* and *sp. D* in this manual). Dr. Schmude has graciously made specimens, descriptions, figures (all genitalia figures below are adapted from his illustrations) and other information available that allowed construction of the following key. Note that in specimens preserved in formaldehyde the lateral flange of the aedeagus may be invaginated or folded under the aedeagus.

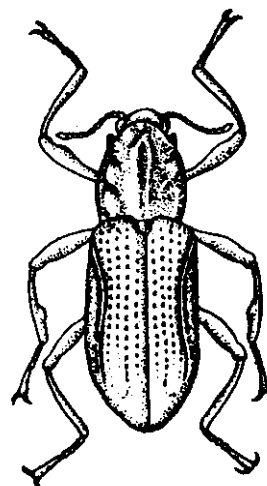
In contrast to more northern, maculate/vittate conspecifics, many Florida *Stenelmis* species are immaculate. Male genitalia provide the most reliable way to identify many species, although females may be identified by prothoracic and elytral sculpturing, especially when associated with males.

Although commonly referred to as "riffle beetles", *Stenelmis* occur in lakes and ponds in addition to streams.

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Hilsenhoff & Schmude 1992; Sanderson 1938; Schmude & Hilsenhoff 1991; Schmude 1992; Schmude, Barr & Brown 1992.



*Stenelmis* sp., larva  
(adapted from Bertrand 1955)



*Stenelmis* sp., adult male  
(adapted from Brown 1972)

**Key to adult *Stenelmis* of Florida**

Note: specimens must be clean in order to observe color patterns!

1 At least the basal portion of palpi brown to black; genitalia as figured ..... *S. musgravei*

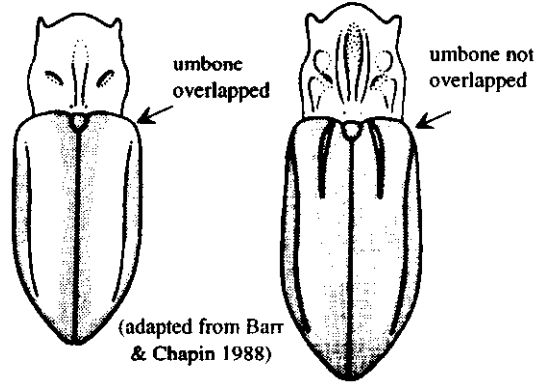
1' Palpi yellow-brown; genitalia not as figured ..... 2

2(1') Antennae bicolored, with distal 5-8 segments black, proximal segments yellow-brown; each elytron usually with a pair of spots; genitalia as figured ..... *S. antennalis*

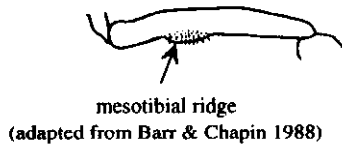
2' Antennae completely yellow-brown; elytra with or without spots or vittae; genitalia not as figured ..... 3

3(2') Elytral vittae overlap the umbone (anterolateral corner) ..... 4

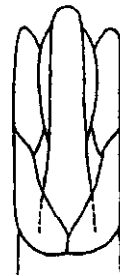
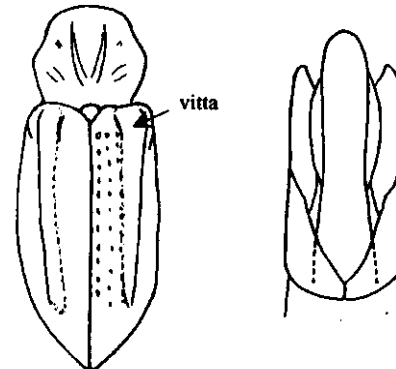
3' Elytral vittae, if present, do not overlap the umbone ..... 5



4(3) Vitta covers most of elytral disc, extending outside of lateral carina; pronotum with dark basomesal triangles; middle tibia of male with mesotibial ridge; genitalia as figured ...  
..... *S. sp. C*



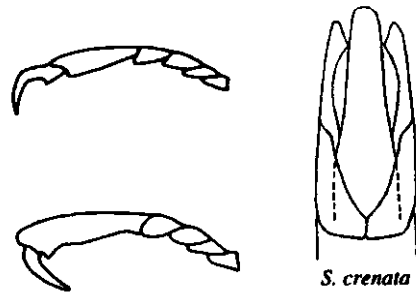
4' Vitta extends from stria 3 to lateral margin; pronotum without dark basomesal triangles; male without mesotibial ridge; genitalia as figured ..... *S. sp. D*





Elmidae 4.16

5(3') Tarsomere 5 shorter than or subequal to the preceding 4 tarsomeres; genitalia as figured ..  
..... *S. crenata*



5' Tarsomere 5 distinctly longer than preceding 4 tarsomeres ..... 6

(adapted from Barr & Chapin 1988)

6(5') Surface of femur punctate, not noticeably granulate; aedeagus distinctively arrowhead-shaped ..... *S. grossa*



6' Surface of femur noticeably granulate; aedeagus not distinctively arrowhead-shaped ..... 7

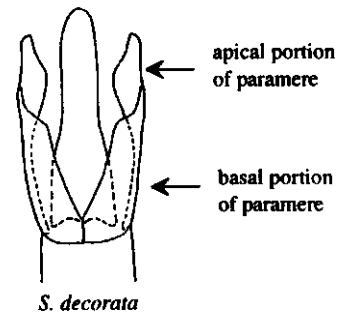
7(6') Middle leg of male with a mesotibial ridge (ridge may be weak) ..... 8



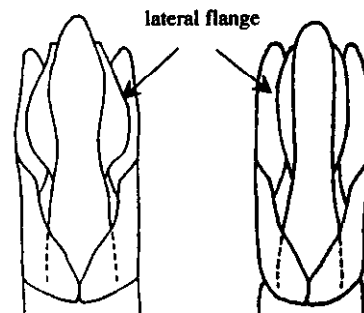
mesotibial ridge  
(adapted from Barr & Chapin 1988)

7' Middle leg of male without a mesotibial ridge ..... 11

8(7) Aedeagus without lateral flange; basal portion of parameres much longer than apical portion .... *S. decorata*



8' Aedeagus with lateral flange (but may be folded under aedeagus); basal portion of parameres subequal to apical portion ..... 9



Elmidae 4.17

9(8') Aedeagus with wide lateral flange that is apically truncate ..  
 ..... *S. convexula*



9' Aedeagus with lateral flange smaller to almost absent, and apically rounded (see couplet below) ..... 10

10(9') Larger, pronotal/elytral length 2.9-3.9+ mm; aedeagus wider medially, with a shorter, wider lateral flange ..... *S. fuscata*



*S. fuscata*



*S. hungerfordi*

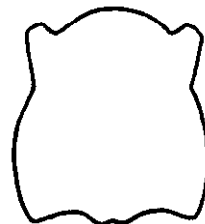
10' Smaller, pronotal/elytral length 2.5-3.1 mm; aedeagus narrow medially, with a longer but narrower lateral flange ..... *S. hungerfordi*

11(7') Apex of aedeagus pointed ..... *S. xylonastis*



11' Apex of aedeagus rounded ..... 12

12(11') Anterolateral angles of pronotum strongly divergent; pronotum prominently sculptured and without dark basomesal triangles; larger, pronotal/elytral length 3.0-3.7 mm; genitalia as figured ..... *S. sinuata*



12' Anterolateral angles of pronotum not strongly divergent; pronotum weakly sculptured and with dark basomesal triangles; smaller, pronotal/elytral length 2.6-3.3 mm; genitalia as figured ..... *S. lignicola*  
 (Some *S. hungerfordi* may key here; see Notes)



## Notes on species

- S. antennalis* - Pronotal/elytral length 2.4-3.3 mm. Known from Nassau Co. westward through the Panhandle. Note that the aedeagus has a lateral flange, contrary to that illustrated by Young (1954). Rarely, *S. hungerfordi* may have darkened apical antennomeres. I examined three such specimens from the Santa Fe River in Gilchrist Co. (determined and generously loaned by Dr. K.L. Schmude). The darkened antennomeres were not as dark as those of *S. antennalis* (which are normally shining black); these specimens lacked the bimaculate elytra present on *S. antennalis* and were otherwise typical *S. hungerfordi* (note that *S. hungerfordi* may also be weakly bimaculate).
- S. convexula* - Pronotal/elytral length 2.7-3.5 mm. Common and known from northern and western FL south to Alachua Co. Elytral color pattern varies from vittate to immaculate, with the immaculate form the most common in FL. In most specimens, the pronotum and anteromedial portion of the elytra are shiny, smooth and convex, with barely perceptible discal costae (longitudinal ridges that begin at about 1/2 width of the base of the elytron).
- S. crenata* - Pronotal/elytral length 2.7-3.8 mm. Young (1954) stated that *S. crenata* was found "only in clear, cool streams in deep ravines in the western uplands". However, this species occurs at least as far south as the Peace River in Polk Co. (specimens determined by Dr. K.L. Schmude).
- S. decorata* - Pronotal/elytral length 2.6-3.5 mm. In Florida this species is recorded from Jefferson Co. west through the Panhandle. This is the only species known from FL that lacks a lateral flange on the aedeagus. However, other species may appear to lack a lateral flange if they were preserved in formaldehyde; the flange shrivels or folds under the aedeagus. In such cases, the longer basal portion of the parameres in *S. decorata* is distinctive.
- S. fuscata* - Pronotal/elytral length 2.9-3.9+ mm. Occurs throughout the state south through the Everglades. Throughout most of this species' range (from FL and MS north to NC and WI), it sports narrowly bimaculate elytra; most Florida specimens are immaculate. Specimens from the southern part of the state are smaller and narrower than northern specimens.
- S. grossa* - Pronotal/elytral length 2.7-4.1 mm. In Florida, known from Escambia and Jefferson Counties. The femora almost appear bare when compared to the granulose appearance of the femora of other FL *Stenelmis* species; note that femoral granularity is best seen on dry specimens. The aedeagus of this species is distinctive.
- S. hungerfordi* - Pronotal/elytral length 2.5-3.1 mm. This species is common through peninsular Florida; I have not seen material from farther west than Taylor Co. Some male specimens may lack a mesotibial ridge and could be confused with *S. lignicola*. The pronotum of *S. hungerfordi* is more coarsely sculptured, with deeper oblique lateral depressions, than that of *S. lignicola*; and discal costae are better developed in *S. hungerfordi* (discal costae are barely noticeable in most *S. lignicola*). *S. hungerfordi* appears to be most common in calcareous streams and rivers. Some specimens may be faintly bimaculate. See also *S. antennalis* above.
- S. lignicola* - Pronotal/elytral length 2.6-3.3 mm. In Florida this species occurs from the Suwannee River basin west through the Panhandle. This recently described (Schmude, Barr & Brown 1992) species has been misidentified as several other species, including *S.*

*convexula*, *S. crenata*, *S. fuscata*, *S. hungerfordi* and *S. sinuata*. As its name indicates, it is most often found on wood. It is one of four Florida species in which the male lacks a mesotibial ridge. See also *S. hungerfordi* above.

*S. musgravei* - Pronotal/elytral length 2.3-3.0 mm. The only Florida *Stenelmis* with dark palpi, it is known from Alachua Co. west through the Panhandle. It is extremely variable in coloration; some specimens may have several antennomeres darkened. This species is often associated with travertine deposits in calcareous streams.

*S. sinuata* - Pronotal/elytral length 3.0-3.7 mm. In Florida, known from Putnam Co. west through the Panhandle. This species is usually easily recognized by its larger size and laterally sinuate pronotum. Note also that the projected apical angles of the pronotum are truncate (in most other *Stenelmis* these lobes are more pointed). It is one of four Florida species in which the male lacks a mesotibial ridge.

*S. xylonastis* - Pronotal/elytral length 2.7-3.6 mm. Another recently described (Schmude, Barr & Brown 1992) species that in Florida occurs from the Ochlockonee River basin and westward. It is one of four Florida species in which the male lacks a mesotibial ridge.

*S. sp. C* - Pronotal/elytral length around 2.5 mm. An undescribed species that will be described by Dr. K.L. Schmude (paper in preparation). I've seen specimens from Big Juniper Creek in Santa Rosa Co. and from the Styx River in AL, just across the AL/FL border. Because the elytral vittae overlap the umbone, this species may be confused with *S. lateralis* Sanderson, not known from Florida but reported from Louisiana (Barr & Chapin 1988 and confirmed by Schmude 1992); note that the aedeagus of *S. lateralis* lacks lateral flanges.



*S. lateralis* genitalia

*S. sp. D* - Pronotal/elytral length 2.8-3.2 mm. An undescribed species that will be described by Dr. K.L. Schmude (paper in preparation). This species was found on cypress roots in Lake Jackson on the AL/FL border near Floral; there is also a single record from Marion Co. It is one of four Florida species in which the male lacks a mesotibial ridge.

## Family Gyrinidae

**DIAGNOSIS:** Larvae are distinguished by the apparently five-segmented legs with two tarsal claws; lateral gills present on all abdominal segments; lack of spiracles; and presence of four apical hooks on the tenth abdominal segment.

Adults are distinguished by the divided compound eyes (resulting in a pair of dorsal and a pair of ventral compound eyes); short clubbed antennae, with third segment enlarged and ear-like; fore legs adapted for grasping; greatly flattened, paddle-like mid and hind legs; and first abdominal sternite completely divided by the hind coxae.

**NOTES:** Three genera of this unique family occur in Florida. A fourth genus, *Spanglerogyrus* (represented by *S. alibiventris* Folkerts, length about 2.9 mm), is known only from the Red Hills region of south-central Alabama (a relictual area that extends through Monroe and Butler Counties); although unlikely, it may eventually be found in the Panhandle. *Spanglerogyrus* is distinguished by its very small size and the narrow lateral strip that barely divides the compound eyes (see Folkerts 1979); other FL gyrinids are larger and the eyes are divided by a wider strip. Larvae of *Spanglerogyrus* are undescribed.

With their surface-dwelling and gyrating behavior, gyrinids are a familiar and quite noticeable component of many water bodies. Adults frequently occur in huge aggregations in late summer/autumn; Hilsenhoff (1990a) found 13 species in a single school. Adults apparently feed on anything they can subdue or find on the water's surface; larvae are predacious.

**ADDITIONAL REFERENCES:** Folkerts 1979; Hilsenhoff 1990a, 1990b; Oygur & Wolfe 1991; Sanderson 1982; Wall 1974; Wood 1962.

### Key to larvae of Florida Gyrinidae genera

1 Head somewhat semi-circular, with a distinctly narrowed collar ..... *Dineutus*

1' Head more rectangular, without distinctly narrowed collar ... 2

2(1') Frontal projection with 2-4 teeth in a transverse row ..  
..... *Gyrinus*

2' Frontal projection without teeth (based on early instar larvae from Missouri) ..... *Gyretes*



*Dineutus*



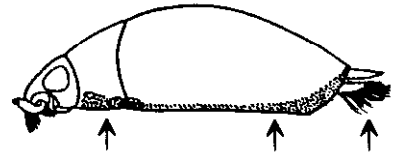
*Gyrinus*



*Gyretes*

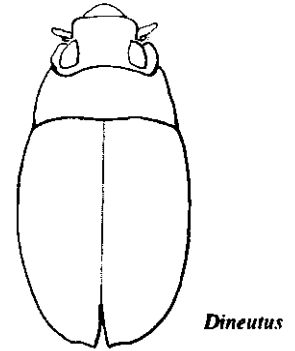
Key to adults of Florida Gyrinidae genera

1 Lateral margins of pronotum and elytra pubescent; elytra shining, without striae; scutellum concealed; last 2 abdominal sternites with median longitudinal row of long setae ..... *Gyretes*

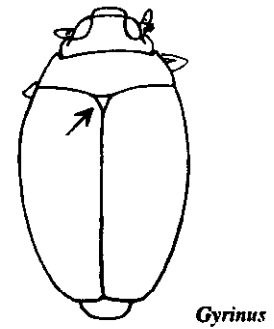


1' Lateral margins of pronotum and elytra without pubescence; elytra dull or shining, with or without striae; scutellum exposed or concealed; last 2 abdominal sternites without median longitudinal row of long setae ..... 2

2(1') Size larger, 8.0-15.5 mm; scutellum concealed; elytra smooth or with barely impressed striae ..... *Dineutus*



2' Size smaller, 3.4-7.0 mm; scutellum exposed; elytra with distinct striae ..... *Gyrinus*



Genus *Dineutus*

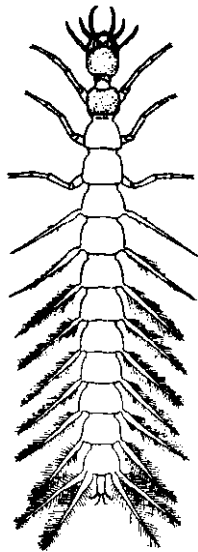
**DIAGNOSIS:** Larvae are distinguished by the broader head capsule with a distinctly narrowed collar; an anteromedian frontal projection that may or may not be apically notched, with a smaller lateral tooth on each side; and the mandible without an inner tooth.

Adults are distinguished by the large size ( $\geq 8$  mm); dorsal and ventral compound eyes widely separated; non-pubescent pronotum and elytra; concealed scutellum; elytra smooth or with indistinct striae; and last 2 abdominal sternites without a median longitudinal row of setae.

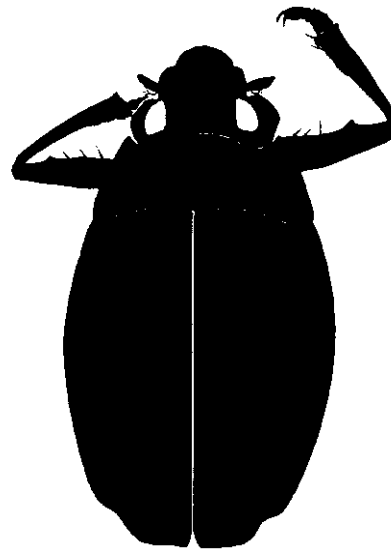
**NOTES:** Of the 14 species of *Dineutus* found in the U.S., nine (possibly ten) occur in Florida. Adults are readily distinguished from the other two gyrid genera in Florida by their larger size and concealed scutellum. *Dineutus* are usually seen circling about on the water's surface, often in huge rafts. When disturbed or handled, *Dineutus* adults produce a defensive secretion that smells like apples, hence the common names "mellow bugs" or "apple bugs" (Benfield 1972).

Adult *Dineutus* apparently feed on anything, dead or alive, that lands on the water's surface that they can hold; larvae are predacious. In the following key, all genitalia and foreleg figures are adapted from Wood (1962).

**ADDITIONAL REFERENCES:** Roberts 1895; Wood 1962, 1968.



*Dineutus* sp. larva  
(adapted from Peterson 1967)



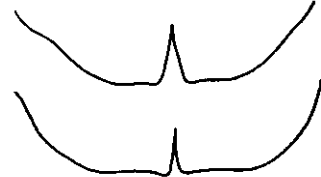
*D. discolor*, adult male

Key to adult *Dineutus* of Florida

1 Inner apical angle of elytra rounded ..... 2

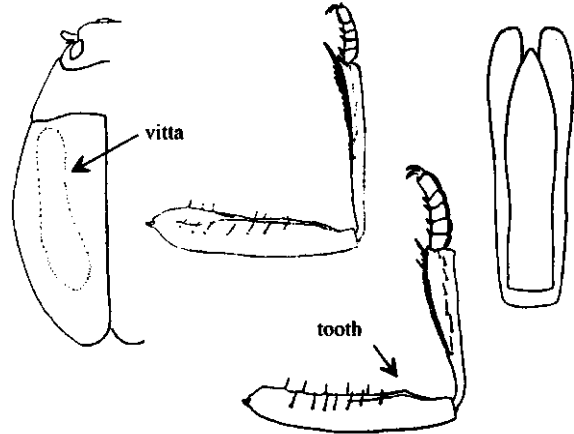


1' Inner apical angle of elytra angulate or produced into a point ..... 4



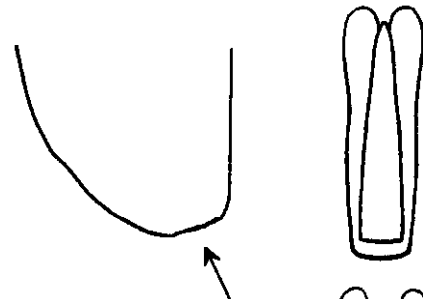
(adapted from Sanderson 1982)

2(1) Size larger, > 12 mm; each elytron with a slightly curved, bronzy metallic vitta; anterior femur of male without a tooth; genitalia with broad aedeagus .. *D. ciliatus*

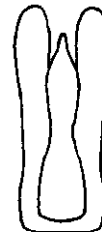


2' Size smaller, < 11 mm; elytra without metallic vittae; anterior femur of male with tooth; aedeagus narrower (figs. below) ..... 3

3(2') Elytral apices finely serrate (with many small teeth; you may have to use 20-30X and a light background to see the small serrations); aedeagus almost as long as parameres and gradually narrowed to apex ..... *D. carolinus*



3' Elytral apices not serrate; aedeagus shorter than parameres and abruptly narrowed at apex ..... *D. emarginatus*



4(1') Elytral apices serrate (with many small teeth; you may have to use 20-30X and a light background to see the small serrations) ..... 5



4' Elytral apices not serrate ..... 6



Gyrinidae 5.5

5(4) Size larger, > 9 mm; venter chestnut brown and shining or dark brown with last segment reddish-brown; aedeagus pointed and about as long as parameres; throughout Florida ..... *D. serrulatus*



*serrulatus*



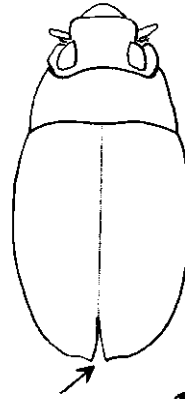
*americanus*

5' Size smaller, ≤ 9 mm; venter black; aedeagus blunter and much shorter than parameres; extreme south FL only ..... *D. americanus*

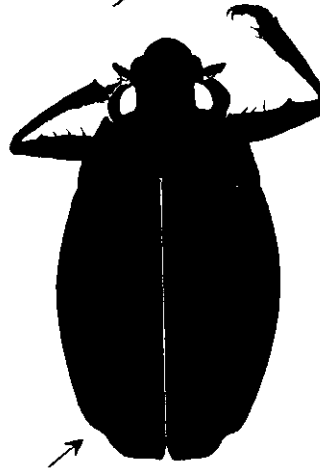
6(4') Venter brownish-yellow ..... 7

6' Venter black/dark brown ..... 8

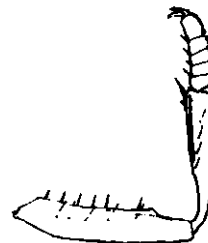
7(6) Form narrowly oval; aedeagus blunt apically, parameres sharply truncate; average size smaller, 9.0-10.5 mm; elytral apices produced into a point, with the lateral margins only slightly sinuate posteriorly ..... *D. angustus*



7' Form elongate oval; aedeagus pointed apically, parameres slightly truncate; average size larger, 10.5-13.0 mm; elytral apices at most slightly produced, with the lateral margins sinuate posteriorly ..... *D. discolor*



8(6') Male fore femur toothed; aedeagus as figured, much shorter than parameres ..... *D. productus*  
(This species probably does not occur in FL; see Notes)

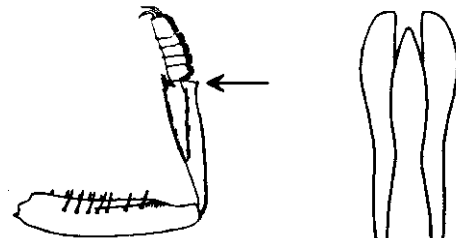


8' Male fore femur without a tooth; aedeagus longer (see figs. below) ..... 9

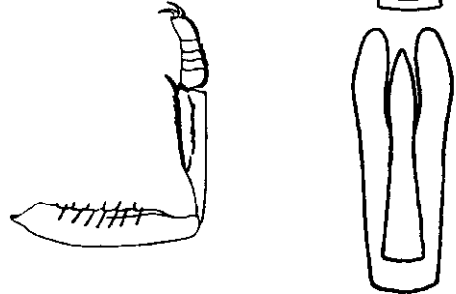
*D. productus*

Gyrinidae 5.6

9(8') Outer apical angle of fore tibia produced to a point; genitalia more robust, with aedeagus gradually narrowed to apex ..... *D. nigrrior*



9' Outer apical angle of fore tibia rectangular; genitalia more slender, with aedeagus abruptly narrowed before apex ..... *D. assimilis*



Notes on species

*D. americanus* - Length 8-9 mm. In Florida, this Caribbean species is known only from a single specimen from Big Pine Key. A long trail of confusion follows the name *americanus* through the literature. Originally described by Linnaeus (1768) in *Gyrinus*, the name was later attributed to Fabricius, then Say. However, Say's (1825) redescription of *americanus* in reality applied to *D. assimilis*, a common species of the U.S, while Linnaeus' *americanus* is a Bahaman species. Wood (1962) considered *D. metallicus* Aubé a junior synonym of *americanus*.

*D. angustus* - Length 9.0-10.5 mm. This species may be difficult to separate from *D. discolor*; examining examples of both species at the same time is the easiest way to separate the two! In addition to the difference in general shape, *D. discolor* averages larger and is generally lighter beneath; *D. angustus* tends to be more reddish beneath. There is usually more evidence of striae on the elytra in *D. discolor*. Both species occur mainly in streams. See also *D. discolor* below.

*D. assimilis* - Length 10-11 mm. Young (1954) noted that Leng & Mutchler (1918) recorded this species from Florida, but doubted their record. There are specimens of this species in the FSCA from the Chattahoochee River in Jackson Co. collected in 1954 by Young and identified as *D. assimilis*; I've seen other specimens from Jackson and Hamilton Counties. It is easily confused with *D. nigrrior*; I've seen this species masquerading as *D. nigrrior* and *D. productus* in collections. The name "*D. americanus* Say" has also been misapplied to this species.

*D. carolinus* - Length 8-11 mm. A common species throughout the state, found more often in lentic situations. The tooth on the male's fore femur is weaker than that of *D. emarginatus*. Specimens from the Keys and extreme south Florida may represent a different subspecies, *D. c. mutchleri* Ochs.

*D. ciliatus* - Length 12.0-15.5 mm. The largest *Dineutus* in Florida, this species is most often found in small, shaded streams; in Florida it appears to be restricted to the northern portion of the state. The large size and the slightly curved, bronzy metallic vitta on each elytron, visible at certain angles, readily identify this species. Ventral coloration varies from yellowish-brown to dark brown.

- D. discolor* - Length 10.5-13.0 mm. This species may be difficult to separate from *D. angustus*. In addition to physical differences, the two species appear to occur in different habitats. Young (1954:151) noted that *D. angustus* seemed to be "restricted to certain highly calcareous streams in the central portion of the peninsular uplands" (although it is now known from as far west as Bay & Santa Rosa Counties), and favored streams with a higher pH (such as the 7.3 + given for the Santa Fe River) than did *discolor*, which preferred streams with a pH ranging from 5.8-6.8. He also noted that hybrid-like forms appeared in streams with a more neutral pH; Wood (1962) noted that such atypical forms appeared within series of typical specimens. Wood (1962:85) also noted that the "dorsal surface of *angustus* is black and polished, while that of *discolor* is of a darker olive-green with some bronzing". See also *D. angustus* above.
- D. emarginatus* - Length 8.5-11.0 mm. There are two subspecies: in Florida, *D. e. emarginatus* apparently occurs only in northern FL, is more elongate-oval and ranges in size from 10-11 mm; *D. e. floridensis* Ochs occurs in northern and central Florida, is more narrowly oval and 8.5-10.0 mm in length.
- D. nigrior* - Length 10-12 mm. Easily confused with *D. assimilis*. I've seen material of *D. nigrior* from Clay and Jackson Counties; it is also listed from Hernando and Volusia Counties in Peck & Thomas (1996).
- D. productus* - Length 9-10 mm. Young (1954) reported this species from Liberty Co., but Wood (1962) doubted that record, stating that *D. productus* appeared to be rare and restricted to Texas and Mexico. I examined three specimens in the FSCA from Sumter Co., GA, identified as *D. productus* by Young; two were *D. assimilis* and the other was *D. emarginatus*. It is doubtful that *D. productus* occurs in FL, but its presence in eastern Texas may mean that it could eventually be found in the western Panhandle.
- D. serrulatus* - Length 9-12 mm. Wood (1968) considered *D. analis* Régimbart to be a subspecies of *D. serrulatus*. Both subspecies occur in FL: *D. s. analis* is the more western subspecies and in Florida is known only from the extreme western counties of the Panhandle. *Dineutus s. serrulatus* is a common species found throughout the rest of Florida; an overlap zone exists around the Chipola and Apalachicola Rivers.

Genus *Gyretes*

**DIAGNOSIS:** Larvae are distinguished by the more elongate head capsule without a distinctly narrowed collar; an anteromedian frontal projection that is apparently without teeth; and the mandible without an inner tooth.

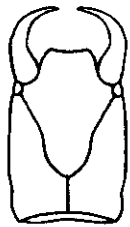
Adults are distinguished by the small size ( $\leq 5$  mm); dorsal and ventral compound eyes widely separated; pronotum and elytra with pubescence on lateral margins; concealed scutellum; smooth elytra; and last 2 abdominal sternites with a median longitudinal row of setae.

**NOTES:** Four species of *Gyretes* are known from North America; one, *G. iricolor* (length 4.5-5.0 mm), occurs in Florida. Since Young's 1947 and 1954 records from Sandy Creek (a tributary of the Choctawhatchee River) in Holmes Co., Folkerts & Donovan (1974) have recorded this species from Alabama and Mississippi. I've also examined specimens from the Blackwater River in Okaloosa Co., the Choctawhatchee River in Walton Co. and Pine Log Creek in Bay Co.

*Gyretes iricolor* adults are found in sand- and gravel-bottomed streams, where they occur beneath overhanging banks.

The larval diagnosis above is based on Sanderson (1982); the caveat "based on early-instar larvae from Missouri" was included. It is possible that mature larvae may differ from this diagnosis.

**ADDITIONAL REFERENCES:** Wall 1974.



*Gyretes* sp., larval head  
(adapted from Sanderson 1982)



*G. iricolor* adult, lateral view  
(adapted from Young 1954)



*G. iricolor*, male genitalia  
(adapted from Young 1954)

Genus *Gyrinus*

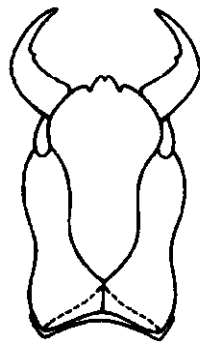
**DIAGNOSIS:** Larvae are distinguished by the more elongate head capsule without a distinctly narrowed collar; an anteromedian frontal projection with 2-4 teeth in a transverse row; and the mandible with a tiny inner tooth.

Adults are distinguished by the small size ( $\leq 7$  mm); dorsal and ventral compound eyes widely separated; pronotum and elytra without pubescence; visible scutellum; striate elytra; and last 2 abdominal sternites without a median longitudinal row of setae.

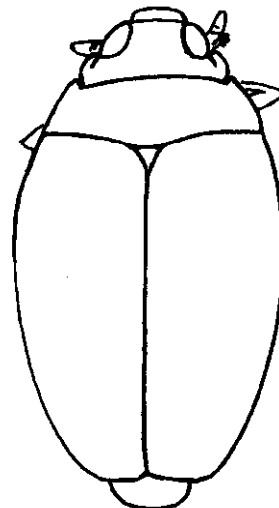
**NOTES:** Forty-one species of *Gyrinus* are known from North America (Atton 1990; Oygur & Wolfe 1991); six, possibly seven, occur in Florida. Oygur & Wolfe (1991) revised the Nearctic species; one name used for a Florida taxon fell into synonymy (see Notes on *G. gibber*). Two other species recorded from Florida (Leng & Mutchler 1918), *G. minutus* Fabricius and *G. permitidus* LeConte, apparently do not occur further south than Delaware (Oygur & Wolfe 1991) and are not considered here.

In contrast to the rather sweet, apple-like smell of *Dineutus*, the defensive secretions of *Gyrinus* are unpleasant. Females are generally longer than males, and often show more microreticulate sculpturing. Although it is possible to identify most females, identifications should be "verified" with the distinctive genitalia of the males. In the following key, all genitalia figures, except those of *G. parvus* and *G. pachysomus*, are adapted from Young (1954).

**ADDITIONAL REFERENCES:** Fall 1922; Hilsenhoff 1990a, 1990b; Oygur & Wolfe 1991.



*Gyrinus* sp., larval head  
(adapted from Sanderson 1982)



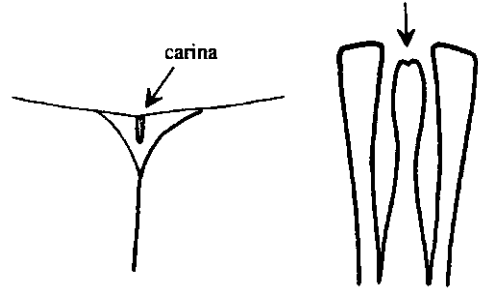
*G. pachysomus*, adult

Key to adult *Gyrinus* of Florida

1 Under surface brownish-yellow to reddish-yellow/reddish-brown ..... 2

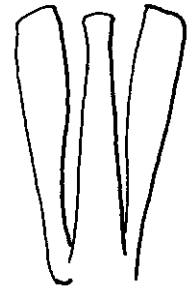
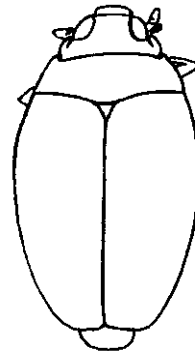
1' Under surface mostly metallic black, but may have reddish margins on abdominal sternites, or last sternite may be reddish-orange ..... 5

2(1) Scutellum with a fine, median longitudinal carina (ridge) near its base; dorsal body surface dull, strongly microreticulate; aedeagus apically notched ..... *G. rockinghamensis*



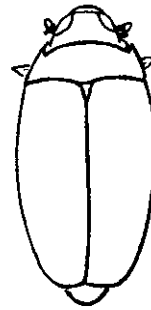
2' Scutellum without a carina; dorsal body surface usually shiny, may be weakly to moderately microreticulate; aedeagus not notched apically ..... 3

3(2') Form broader; size larger, 5.5-6.9 mm (average around 6 mm); aedeagus broader apically ..... *G. pachysomus*

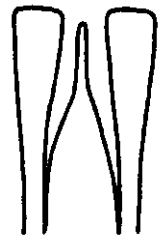
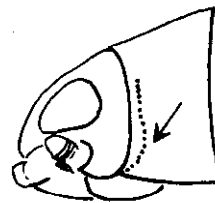


(adapted from Oygur & Wolfe 1991)

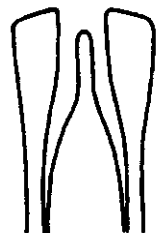
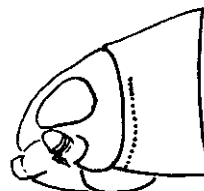
3' Form narrower; size smaller, 4.1-5.2 mm, (average < 5 mm); aedeagus narrower apically (figs. below) ..... 4



4(3') Line of tiny punctures on pronotum arched near base; aedeagus with very narrow apex ..... *G. elevatus*

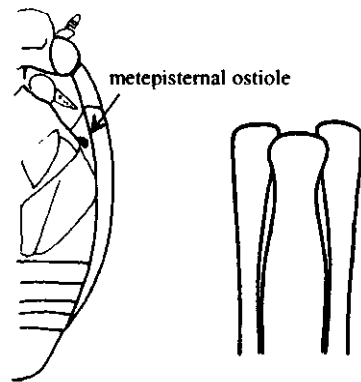


4' Line of tiny punctures on pronotum parallel to anterior margin; aedeagus with broader apex ..... *G. woodruffi*

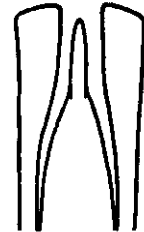


5(1') Metepisternal ostiole not visible; dorsal surface dull, with fine microreticulation; aedeagus with broad apex ..... *G. gibber*

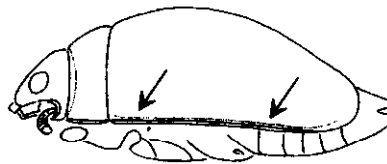
5' Metepisternal ostiole visible; dorsal surface shiny or with a brassy sheen, microreticulation not as evident, often barely detectable; aedeagus with narrow apex (see figs. below) ..... 6



6(5') Anal sternite usually reddish-orange (may be dull red); 11th elytral stria near the elytron's lateral margin only in posterior half at most; aedeagus as figured ..... *G. analis*



6' Anal sternite blackish-red or brown; 11th elytral stria at or very near the elytron's lateral margin throughout its length so that it virtually lies in the lateral fold of the elytron; aedeagus as figured ..... *G. parvus*  
(Doubtfully recorded from Florida; see Notes)



(adapted from Oygur & Wolfe 1991)

(adapted from Fall 1922)

**Notes on species**

*G. analis* - Length 4.3-5.5 mm. This species is relatively common in the northern portion of the state, where it occurs primarily in lotic habitats. Males have a dull brassy sheen and little noticeable microreticulation; females have a distinct, uniform microreticulation.

*G. elevatus* - Length 4.6-5.2 mm. Found throughout most of the state, usually in lentic habitats (but also found in sand-bottomed streams), the distinctive, almost needle-like aedeagus of the male easily identifies this species. *Gyrinus elevatus* is most likely to be confused with *G. woodruffi* or *G. pachysomus*. Note that females of *elevatus* are shiny while those of *woodruffi* are dull due to the presence of microreticulation; also, the elytron of *elevatus* has more of a lateral flange than that of *woodruffi*. Both species are smaller than the much broader *G. pachysomus*.

*G. gibber* - Length 4.7-6.2 mm. Oygur & Wolfe (1991) synonymized *G. frosti* and *G. floridensis* with the older name *gibber*. Young (1954) considered it a species of lakes and ponds of the northern peninsula uplands. Peck & Thomas (1996) also list this species from Hillsborough and Orange Counties.

- G. pachysomus* - Length 5.5-6.9 mm. The largest *Gyrinus* in Florida, this species can be quite common in the northern part of the state. It appears to be more common in lentic habitats, but can also be found in ponds and lakes. Although superficially similar to *G. elevatus*, *G. pachysomus* is much broader and stouter in appearance and is normally much greater in length. In both species the transverse line of punctures on the pronotum is arched near the base; it appears to start in the anterior corner of the pronotum, while that of *G. woodruffi* starts a short distance behind the corner and runs parallel to the front margin of the pronotum.
- G. parvus* - Length 4.3-5.5 mm. A single record, considered doubtful by Young (1954) but apparently accepted by Oygur & Wolfe (1991), exists for this species in Florida (apparently from Marion Co.). In the U.S., it is primarily found in the central states, but this species' range runs from North Dakota to Chile. Although records of this species from Florida must still be regarded with skepticism, the possibility exists that it could be found here. The 11th elytral stria is so close to the lateral margin that it is difficult to see in a lateral view; it basically lies in the lateral fold of the elytron's edge. In some other species of *Gyrinus* the 11th stria may run close to the lateral margin, but usually not for its entire length (it usually bows somewhere before mid-length), and it usually is separated from the margin by at least the width of a puncture. In males, elytral striae 6-11 are noticeably impressed; some of the punctures appear to run together so that they are almost groove-like; in females striae 1-11 are noticeably impressed.
- G. rockinghamensis* - Length 3.4-4.4 mm. The barely noticeable scutellar carina is distinctive among Florida *Gyrinus*; this, its small size, yellowish venter and the coarse, dense microreticulation easily identify this species. This species has been confused with *G. minutus*, but was demonstrated to be a distinct species by Oygur & Wolfe (1991). Although Young (1954) considered *G. rockinghamensis* to be a lentic species, occurring in ditches, marshes, ponds and lakes, Oygur & Wolfe (1991) found that, based on label data from specimens they examined, over half their specimens were from lotic habitats. In Florida, this species is known from central Florida and northward.
- G. woodruffi* - Length 4.1-5.2 mm. This species, along with *G. rockinghamensis*, may be yellowish beneath. Primarily a species of streams, there are no records for this taxon south of Lake Okeechobee. A character often used to identify this species is the distance the 11th elytral stria is removed from the lateral margin in the posterior third of the elytron; in *woodruffi* this line is more removed from the margin than in *elevatus* or *pachysomus*. I have found this a difficult character to interpret; the transverse pronotal line and aedeagus provide characters that are easier to observe. See also *G. elevatus* above.



**Family Haliplidae**

**DIAGNOSIS:** Larvae are distinguished by the apparently 5-segmented legs with single claws; mandibles with an internal groove; short antennae; 9-10 segmented abdomen; and the presence (at least in the last larval instar) of short to very long spines/filaments dorsally on the thoracic and abdominal segments.

Adults are distinguished by the small size (2-5 mm); and the hind coxae that are expanded as broad, flattened plates that cover 2-3 basal abdominal sternites and most of the hind femora .

**NOTES:** Four genera of haliplids occur in the Nearctic; two of these, *Haliplus* and *Peltodytes*, are found in Florida.

Haliplids are small, brightly colored beetles commonly found in dense aquatic vegetation or algal masses along the margins of lakes and ponds, and in the slower portions of streams and rivers. Larvae are herbivorous or feed on periphyton; adults are herbivorous but are known to occasionally ingest animal matter.

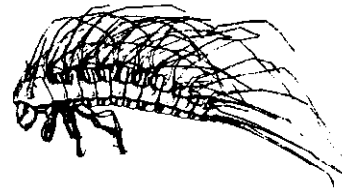
Adult haliplids are poor swimmers, hence the common name "crawling water beetles". The enlarged hind coxae serve to store air for respiratory and hydrostatic purposes.

Habitus figures below of larvae and adults are adapted from Brigham (1982).

**ADDITIONAL REFERENCES:** Brigham 1982; Matta 1976; Wallis 1933; White & Brigham 1996.

**Key to larvae of Florida Haliplidae genera**

1 Larvae with 1-3 dorsal pairs of long filaments on each body segment; last abdominal segment short; forelegs strongly chelate ..... *Peltodytes*

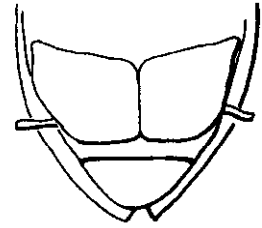
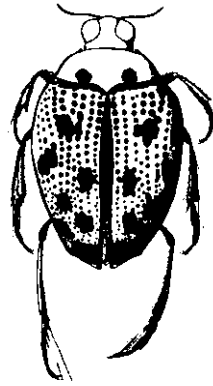


1' Larvae without long dorsal filaments, but short dorsal spines may be present; last abdominal segment long; forelegs weakly chelate .... *Haliplus*

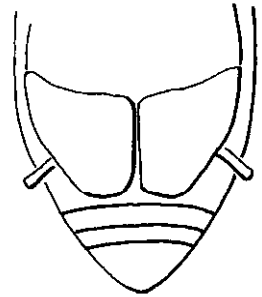


Key to adults of Florida Haliplidae genera

- 1 Posterior margin of pronotum with 2 dark blotches (that may be joined); last segment of maxillary and labial palpi as long as or longer than penultimate segment; hind coxal plates large, leaving only the last abdominal sternite exposed ..... *Peltodytes*



- 1' Posterior margin of pronotum without dark blotches, although an anterior medial blotch may be present; last segment of palpi shorter than penultimate segment; hind coxal plates smaller, leaving last 3 abdominal sternites exposed ..... *Haliphus*



## Haliplidae 6.3

### Genus *Haliplus*

**DIAGNOSIS:** Larvae are distinguished by the weakly to moderately chelate foreleg, with the 4th segment weakly produced ventrally and without a solid row of small teeth but with 2-3 apical spines; the lack of long, spine-tipped dorsal filaments (although short spines may be present); and the long tenth (last) abdominal segment.

Adults are distinguished by the last segment of the palpi being shorter than the penultimate segment; pronotum without two black spots on the basal margin, although one may be present medially on the anterior margin; the smaller, unmarginated hind coxal plates that leave the last three abdominal sternites exposed; and the lack of a fine sutural stria.

**NOTES:** Fifty-one species of *Haliplus* are known from America north of Mexico; at least eight species occur in Florida.

Adults and larvae usually occur in dense mats of vegetation and algae along the margins of ponds and lakes, and in the slower portions of streams and rivers. They are often found in association with *Peltodytes*. Adults and larvae feed mainly on plant matter (or on the organisms living on plants), but are known to occasionally ingest animal matter.

With the exception of the metasternal figures, or unless otherwise noted, figures below and in the following key are adapted from Brigham (1982); genitalia figures are adapted from Matta (1976).

**ADDITIONAL REFERENCES:** Brigham 1982; Hilsenhoff & Brigham 1978; Matta 1976; Roberts 1913; Wallis 1933.



*Haliplus* sp., larva



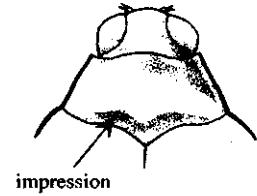
*H. triopsis*, adult

**Key to adult *Haliplus* of Florida**

1 Length typically less than 3 mm ..... 2

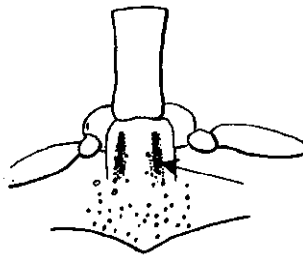
1' Length typically greater than 3 mm ..... 4

2(1) Length < 2.6 mm; pronotum with a basal transverse impression; color usually light ..... *H. annulatus*



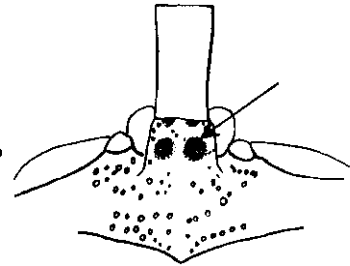
2' Length > 2.6 mm; pronotum without basal transverse impression; color light or dark ..... 3

3(2') Mid-metasternum with longitudinal furrows ..... *H. confluentus*



*confluentus*

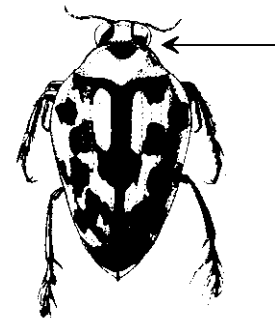
3' Mid-metasternum with large circular pits on each side of middle ..... *H. havaniensis*



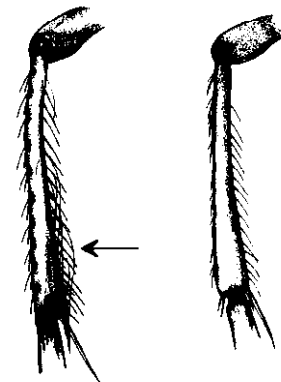
*havaniensis*

4(1') Anterior margin of prothorax without a median dark blotch .. 5

4' Anterior margin of prothorax with a median dark blotch (this blotch may be pale in teneral specimens) ..... 6



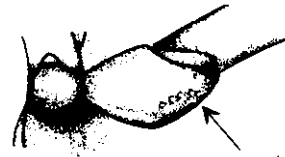
5(4) Size larger, 4.0-4.5 mm; hind tibia with a row of punctures on inner (upper) surface that each bear a long, thin seta; prosternal ridge with apex subequal in width to its base, ridge slightly constricted between the coxae ..... *H. fasciatus*



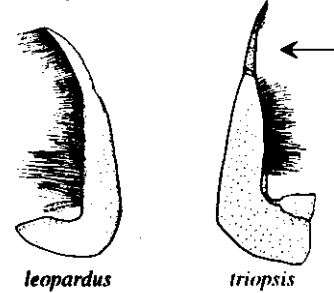
5' Size smaller, 3.3-3.5 mm; hind tibia without a row of seta-bearing punctures on inner surface; prosternal ridge with apex wider than base, evenly divergent from base to apex ..... *H. pseudofasciatus*

Haliplidae 6.5

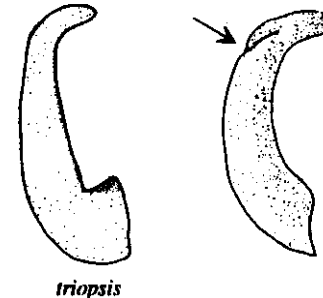
6(4') Middle trochanter with several deep, coarse punctures; male left paramere with dense setal fringe extending to apex ..... *H. leopardus*  
 (Not recorded from Florida, but may occur in northern part of state)



6' Middle trochanter without punctures; male left paramere with setal fringe ending before apex ..... 7

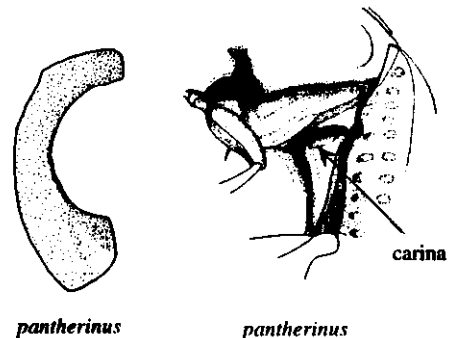


7(6') Color brownish-yellow; aedeagus with outer apical margin not indented ..... 8



7' Color rusty reddish-brown; aedeagus with outer apical margin indented (note that some *H. punctatus* may be brownish-yellow) ..... 9

8(7) Aedeagus sharply bent in apical 1/5 (fig. above); carina on metepisternum at most only slightly darker than rest of venter ..... *H. triopsis*

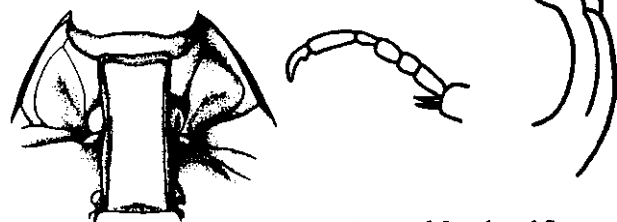


8' Aedeagus more evenly curved; carina on metepisternum blackish, much darker than rest of venter ..... *H. pantherinus*  
 (Not recorded from Florida, but may occur in northern part of state)

9(7') Prosternal ridge broader anteriorly than between the forecoxae; male protarsal claws < 1/2 length of last tarsal segment; aedeagus with indentation closer to apex .....  
 ..... *H. punctatus*



9' Prosternal ridge more uniformly broad; male protarsal claws about 2/3 length of last tarsal segment; aedeagus with indentation farther from apex ..... *H. mutchleri*



(protarsal & aedeagal figs. adapted from Wallis 1933)

## Notes on species

- H. annulatus* - Length 2.0-2.5 mm. This is the smallest *Haliplus* species in Florida, readily recognized by its small size, trifasciate elytral markings and the basal impression of the pronotum. According to literature records it occurs at least as far south as Lake Okeechobee. Young (1954) noted that it occurred in small ponds and swamp streams; I've also seen specimens from the upper Suwannee River.
- H. confluentus* - Length 2.7-3.0 mm. Found throughout the state. The elytral dark markings may be so extensive that the dorsum may appear almost black. In addition to canals, ditches and large springs, Young (1954) reported this species from brackish pools. Note that the mid-metasternal longitudinal furrows contain small punctures, as do the circular pits on *H. havaniensis*. See also *H. havaniensis* below.
- H. fasciatus* - Length 4.0-4.5 mm. I've seen examples of this species collected from creeks and a river from Clay, Jefferson and Levy Counties in the FSCA; it has also been collected from the Santa Fe River in Bradford Co. These specimens are the first records of this species from Florida. The row of long, thin setae arising from a series of punctures on the upper surface of the hind tibiae is sometimes difficult to observe, especially on pinned specimens.
- H. havaniensis* - Length about 3 mm. Leng & Mutchler (1918) synonymized *H. havaniensis* with *H. confluentus*, but Wallis (1933) disagreed and reinstated *H. confluentus*. Among other features, he noted that Zimmermann (1924) had placed *H. confluentus* and *havaniensis* in different groups based on metasternal characters. Apparently none of these authors had examined the type of *H. havaniensis*. Dr. W.U. Brigham (pers. comm.) has compared two female specimens from Collier Co. collected by R. P. Rutter to the type specimen of *H. havaniensis*; the Florida specimens are a bit lighter in color, probably due to their teneral state. In addition to the circular metasternal pits, both specimens are lighter in color and broader than typical *H. confluentus*. See also *H. confluentus*.
- H. leopardus* - Length 4.0-4.3 mm. Not recorded from Florida, but this species may eventually be collected in the northern portion of the state; I've seen material from the Piedmont of Georgia. Matta (1976) noted that the species was collected from ditch margins, woodland pools, willow swamps and farm ponds.
- H. mutchleri* - Length 3.0-3.8 mm. This species is apparently not as common as the similar *H. punctatus*; Matta (1976) stated that *mutchleri* may be a southern subspecies of *punctatus*. The dark elytral markings are usually separate and distinct in *mutchleri* (but can also be confluent). Once one sees both species together, the differences in male protarsal claw length are obvious. Most specimens of *H. mutchleri* are 3.2 mm to 3.8 mm in length, but I have collected one male from St. Marks National Wildlife Refuge in Wakulla Co. that is only 3 mm in length. See also *H. punctatus* below.
- H. pantherinus* - Length 3.5-4.0 mm. Not recorded from Florida, but this species may eventually be collected in the northern portion of the state; it is known from as far south as Richmond Co., GA (W.U. Brigham, pers. comm.). Perhaps the most distinctive feature of this species is the crescentic dark carina of the metepisternum. Note that in some *H. triopsis* this carina may also appear darker than the surrounding sclerites, but the longer protarsal claws (> 0.15 mm in *pantherinus*, < 0.13 mm in *triopsis*) help to separate the species, in addition to the obviously different aedeagi. Also, the prosternal

## Haliplidae 6.7

process of *pantherinus* is about as wide anteriorly as posteriorly and constricted between the procoxae; in *triopsis* the process is gradually widened anteriorly.

*H. pseudofasciatus* - Length 3.3-3.5 mm. There is a single FL specimen from a woods pond in Jackson Co. in the FSCA, the first record for this species from Florida. This species is slightly smaller than the similar *H. fasciatus*.

*H. punctatus* - Length 3.8-4.0 mm. Young (1954) noted that this species varies considerably in color and may be brownish yellow rather than reddish brown. Although known from as far south as Palm Beach Co., it is apparently more common in northern FL. This species is slightly larger than *mutchleri*. Young (1954) and Matta (1976) also noted that in *punctatus* the elytral spots are usually confluent and the dark blotch at the front of the pronotum is dark and well defined; in *mutchleri* the elytral spots are usually separate and the anterior blotch is a reddish brown with suffuse margins. See also *H. mutchleri* above.

*H. triopsis* - Length 3.0-4.5 mm. In Florida this species is probably restricted to the northern portion of the state; there is material of this taxon from the Chattahoochee River in Jackson Co. in the FSCA. The aedeagus is distinctive for this species. See also *H. pantherinus* above.

Genus *Peltodytes*

**DIAGNOSIS:** Larvae are distinguished by the strongly chelate forelegs; 1-3 dorsal pairs of long (at least half as long as body length) filaments on each body segment; and the short last abdominal segment.

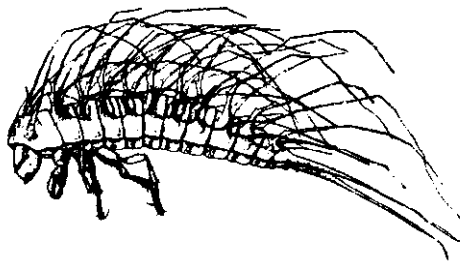
Adults are distinguished by the last segment of the palpi being as long as or longer than the penultimate segment; a pair of dark blotches on the posterior margin of the pronotum (these may be joined medially); large hind coxal plates that leave only the last abdominal sternite exposed; and the fine sutural stria of the elytra present on at least the apical half.

**NOTES:** Of the 18 described species of *Peltodytes* from North America north of Mexico, at least seven occur in Florida. Three species, *P. floridensis*, *P. oppositus* and *P. sexmaculatus*, are especially common.

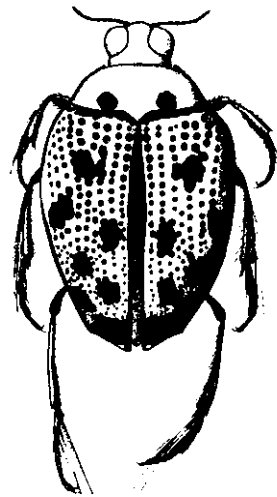
Adults and larvae usually occur in dense mats of vegetation and algae along the margins of ponds and lakes, and in the slower portions of streams and rivers. They are often found in association with *Haliphus*. Adults and larvae feed mainly on plant matter (or on the organisms living on plants), but are known to occasionally ingest animal matter.

Because the subhumeral blotch may be present or absent in Florida *P. sexmaculatus*, this taxon is keyed twice in the following key. In almost all cases, male genitalia must be used for correct identifications. Figures below and in the following key are adapted from Brigham (1982); genitalia figures are adapted from Matta (1976).

**ADDITIONAL REFERENCES:** Brigham 1982; Hilsenhoff & Brigham 1978; Matta 1976; Young 1961.



*Peltodytes* sp., larva

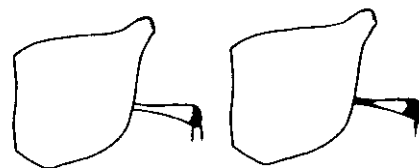


*P. sexmaculatus*, adult



Key to adult *Peltodytes* of Florida

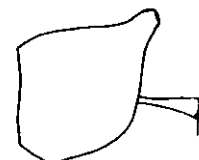
1 Posterior femur pale reddish-brown or yellowish-brown, with darkened extreme apex; or femur black/dark brown with a yellowish subapical ring ..... 2



1' Posterior femur uniformly black or dark brown beyond coxal plate margin ..... 3



2(1) Posterior femur pale reddish-brown/yellowish-brown to base, with extreme apex only darkened; base of elytra and posterior portion of pronotum flattened; basal pronotal blotches often joined across middle ..... *P. dietrichi*



2' Posterior femur mostly black/dark brown, with yellow ring near apex; base of elytra and posterior portion of pronotum convex; basal pronotal blotches not joined ..... *P. lengi*  
(Not known from Florida; see Notes.)



3(1') Elytron without a subhumeral spot or blotch .. 4

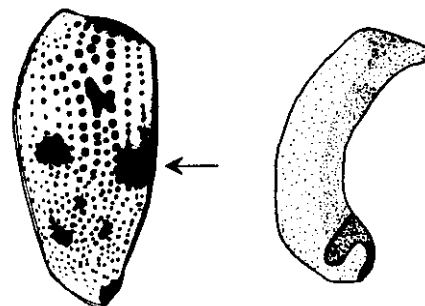


subhumeral blotch

3' Elytron with a subhumeral spot or blotch ..... 5

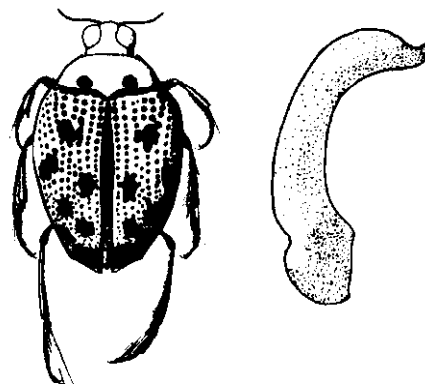
corner of left elytron

4(3) Median sutural blotch joins with the dark sutural stripe; elytral punctures usually scattered posterior to the median blotch; aedeagus as figured ..... *P. muticus*



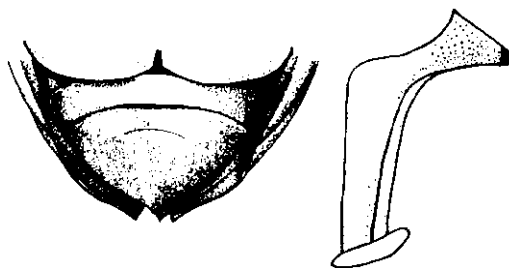
left elytron

4' Median sutural blotch usually separate from the dark sutural stripe; elytral punctures arranged in rows posterior to the median blotch; aedeagus as figured ..... *P. sexmaculatus*



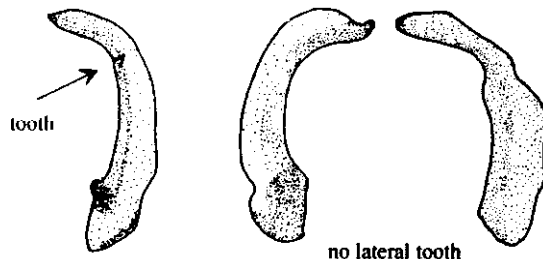
Haliplidae 6.10

5(3') Last abdominal sternite dull, with fine longitudinal lines posteriorly; aedeagus with preapical pointed "crest" ..... *P. oppositus*



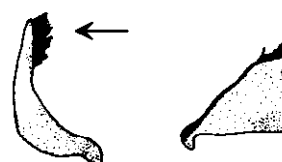
5' Last abdominal sternite shining, without fine lines (there may appear to be coarse internal lines); aedeagus without preapical point ..... 6

6(5') Aedeagus with a lateral tooth ..... 7

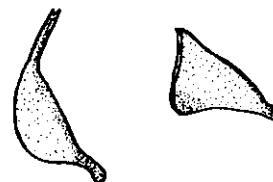


6' Aedeagus without a lateral tooth ... 8

7(6) Male parameres with apical setae ..... *P. floridensis*

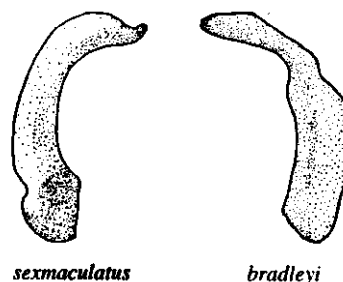


7' Male parameres without apical setae ... *P. dunavani*



8(6') Aedeagus with dorsal margin continuous and with apical hook ..... *P. sexmaculatus*

8' Aedeagus with undulating dorsal margin and apex not hooked ..... *P. bradleyi*



Notes on species

*P. bradleyi* - Length 3.4-3.6 mm. Young (1961) noted that this species was found only in calcareous springs and spring runs, but Matta (1976) reported this species from the Dismal Swamp in VA, where Ca and Mg values were much lower than those expected for calcareous waters. Young (1961) did not designate any paratypes from Florida, but a specimen from Torreya State Park Spring (Liberty Co.) with a paratype label on it is in the FSCA. He also reported the species from Gadsden Co. based on female specimens.

*P. dietrichi* - Length 3.0-4.0 mm. This species, which probably occurs throughout Florida, was mistakenly identified as *P. lengi* in Young (1954). Young (1961) noted this and

described *P. dietrichi* as a new species. The two species can be separated by characters given in the key; their aedeagi are very similar. The dished-out or flat dorsal appearance of *P. dietrichi* is most noticeable when compared with typical *lengi*, as is the difference in leg coloration. A faint ring may be apparent in some *dietrichi* specimens, but the remainder of the femur is light also, not dark as in *lengi*. Be aware that teneral specimens of other *Peltodytes* species may appear to have lightly colored femora.

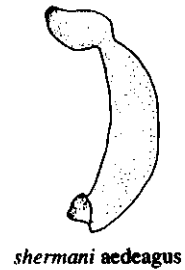
*P. dunavani* - Length 3.1-3.7 mm. Very similar to *P. floridensis* and *P. oppositus* in appearance, male genitalia must be used to identify this species. In Florida it is known from Collier, Jackson, Liberty and Taylor Counties.

*P. floridensis* - Length 3.2-3.6 mm. This species, found at least as far south as Lake Okeechobee, can often be recognized by a series of 3-5 spots/punctures between the first and second striae, anterior to the medial blotch. *P. dunavani* and *P. oppositus* usually have only 0-2 spots in this area (but I have seen some *P. oppositus* from the Suwannee River with as many as 5 punctures). Rely on the male genitalia for positive identification.

*P. lengi* - Length 3.2-3.9 mm. This species apparently does not occur in Florida; records for *P. lengi* in Young (1954) refer to *P. dietrichi*. I have not seen this species from Florida; all FL material I've seen determined as "*P. lengi*" has been *P. dietrichi* (q.v.).

*P. muticus* - Length 3.5-3.8 mm. In Florida, this species appears to be restricted to the northern part of the state. See also *P. sexmaculatus*.

*P. oppositus* - Length 3.3-3.6 mm. A common species found throughout the state, with distinctive male genitalia. The rugosity of the anal sternite may be difficult to observe unless the specimen and light source are at the correct angle. One other eastern species, *P. shermani* Roberts, also has a rugose anal sternite, but can be separated by the male's strongly produced 1st and 2nd mesotarsal segments and the aedeagus. *P. shermani* is not known south of South Carolina/north Georgia, but the remote possibility exists that it could occur in northern Florida.



*shermani* aedeagus

*P. sexmaculatus* - Length 3.4-4.0 mm. A variable species; some specimens possess a subhumeral blotch, others do not. In some specimens examined, the medial blotches join the sutural stripe. This could cause confusion with *P. muticus*, but, when coalesced, the medial spots in *P. sexmaculatus* look like medial spots joining the sutural stripe, while in most *muticus* the two medial spots appear as one large blotch. The distinctive aedeagus of *sexmaculatus* easily identifies that species. I looked at several series of *P. sexmaculatus* to see if the lack of the subhumeral blotch was related to the coalescence of the median blotch and sutural stripe; there was no correlation. The posterior pronotal spots may be separate or joined. This species often occurs with *P. floridensis* and *P. oppositus*. It can usually be "eyeballed" in such samples by its yellower hind tibiae (more reddish in the other two species) and the wider black band at the tibial apex. Confirm identifications by examination of the male genitalia! *P. sexmaculatus* is apparently more common in the northern part of the state, although I've seen specimens from as far south as Port Charlotte.

**Family Hydraenidae**

**DIAGNOSIS:** Larvae are distinguished by the distinct labrum; mandibles with a large, roughened molar lobe; maxilla with a galea; apparently 4-segmented legs with a single tarsal claw; abdominal segment 10 with a pair of recurved ventral hooks; and cerci with 2 segments.

Adults are distinguished by their small size (< 2 mm); 5-segmented antennal club; abdomen with 6-7 visible sternites; and first abdominal sternite not divided by hind coxae.

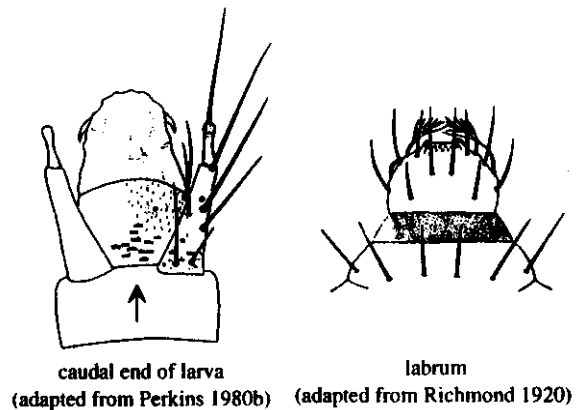
**NOTES:** This family is referred to as Limnebiidae in Young (1954). The family was formerly thought to be closely related to the hydrophilids, but now is considered more closely related to the Staphylinidae. Three genera of Hydraenidae are known from Florida.

Hydraenid larvae and adults live along the margins of streams, rivers, sinkholes, pools and ponds, where they live in moss or accumulations of moist/wet dead leaves and sticks/twigs, but are also found in littoral zone substrata. Larvae and adults apparently feed on the bacterial or fungal elements of periphyton. Larvae are semi-aquatic.

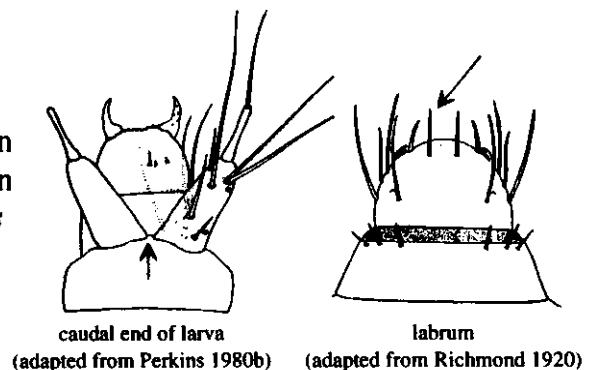
**ADDITIONAL REFERENCES:** Hansen 1991a; Jäch 1994; Perkins 1980b; Richmond 1920.

**Key to larvae of Florida Hydraenidae genera**

1 Cerci widely separated near their bases; median setae of labrum removed from anterior margin ..... *Hydraena*

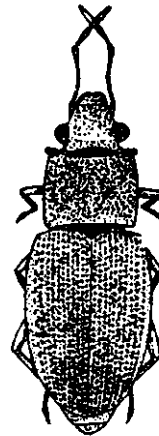


1' Cerci close together near their bases; median setae of labrum near anterior margin ..... *Gymnochthebius/Ochthebius*

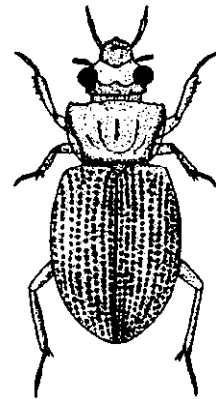


Key to adults of Florida Hydraenidae genera

- 1 Maxillary palps very long, with palpomeres 3 and 4 subequal in length; pronotum without transparent borders ..... *Hydraena*
- 1' Maxillary palps shorter, with palpomere 3 longer and broader than 4; pronotum with transparent borders on anterior, posterior and lateral margins ..... 2



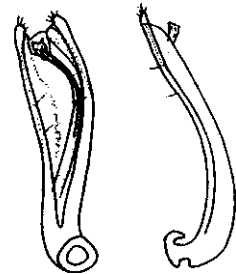
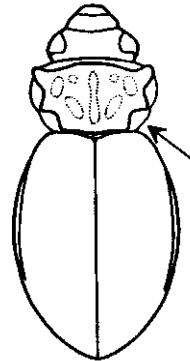
*Hydraena*



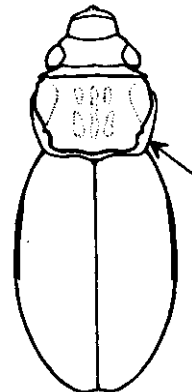
*Ochthebius*

(adapted from Young 1954)

- 2(1') Pronotum with posterior corners deeply incised; parameres longer than aedeagus; apex of aedeagus bifid, without a process that extends beyond apex ..... *Gymnochthebius*



- 2' Posterior corners of pronotum not incised; parameres shorter than aedeagus; apex of aedeagus simple, with a preterminal process that extends beyond apex ..... *Ochthebius*



(adapted from Perkins 1980b)

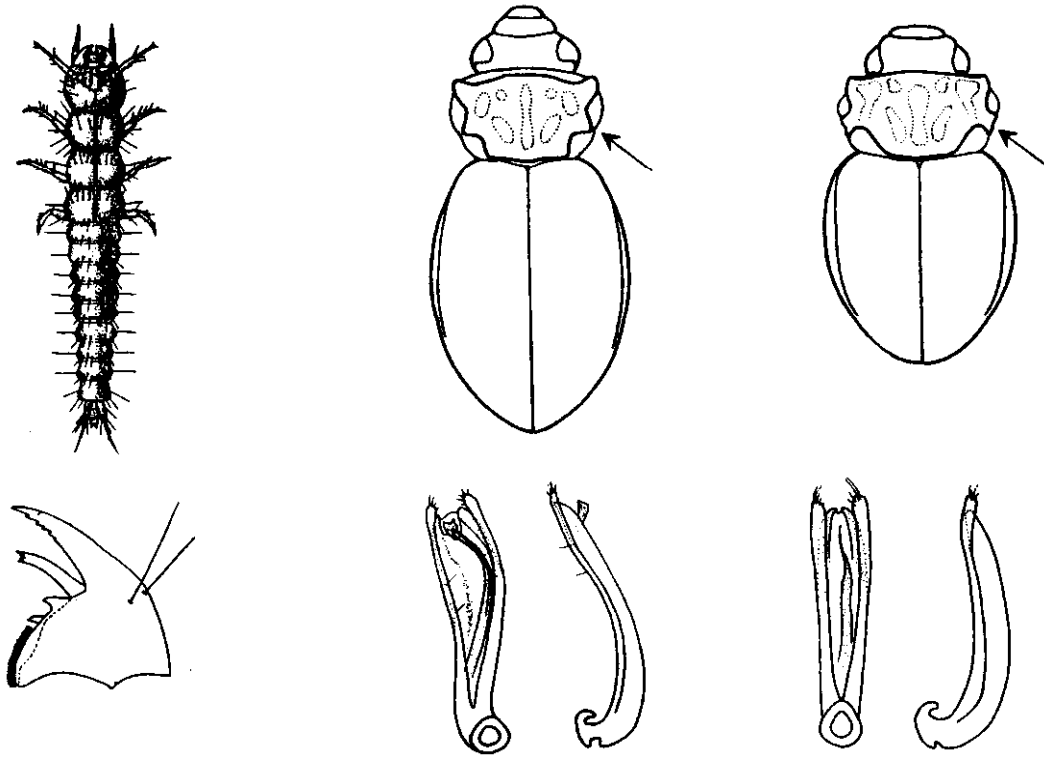
**Genus *Gymnochthebius***

**DIAGNOSIS:** Larvae are presently indistinguishable from *Ochthebius*. Larvae of *Gymnochthebius* and *Ochthebius* are distinguished from other hydraenids by the median setae of the labrum that are located near its anterior margin; narrow lacinia mobilis (a movable blade on the inner face of the mandible); and the cerci that have their bases very close together.

Adults are distinguished by the 3rd maxillary palpomere that is longer and broader than the 4th; pronotum with transparent margins and the posterior corners deeply incised; parameres longer than aedeagus; and the bifid apex of the aedeagus, without a process that extends beyond apex.

**NOTES:** Perkins (1980b) elevated *Gymnochthebius* to genus from its status as a subgenus of *Ochthebius*. Two species are known from Florida: *G. fossatus* (length 1.2-1.8 mm) is widespread, more slender and has the anterior lobes of the pronotum larger than the posterior lobes; *G. seminole* (length 1.2 mm) is known only from a single specimen from the Everglades, is stouter and has the posterior lobes of the pronotum larger than the anterior.

**ADDITIONAL REFERENCES:** Perkins 1980b.



*G. fossatus*. larva and larval mandible  
(adapted from Richmond 1920)

*G. fossatus*. adult and dorsal, lateral  
views of genitalia  
(adapted from Perkins 1980b)

*G. seminole*. adult and dorsal, lateral  
views of genitalia  
(adapted from Perkins 1980b)

## Hydraenidae 7.4

### Genus *Hydraena*

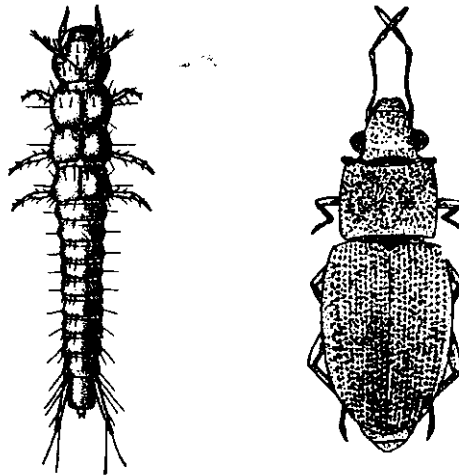
**DIAGNOSIS:** Larvae are distinguished by median setae of the labrum that are located away from its anterior margin; broad lacinia mobilis (a movable blade on the inner face of the mandible); and cerci that have their bases widely separated.

Adults are distinguished by the long maxillary palpi, with the 3rd palpomere about as long as the 4th; and the pronotum without transparent margins.

**NOTES:** Three species are known from Florida. None of the Florida species possess a scintilla, a small, smooth, often shiny area at the midpoint of the anterior margin of the pronotum.

*Hydraena* are found in lentic and lotic situations.

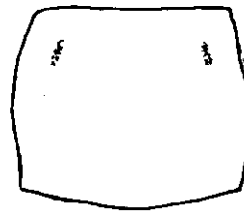
**ADDITIONAL REFERENCES:** Jäch 1994; Perkins 1980b.



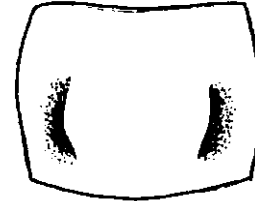
*H. marginicollis*, larva and adult  
(larval fig. adapted from Richmond 1920;  
adult fig. adapted from Young 1954)

Key to adult *Hydraena* of Florida

1 Pronotum without a pair of deep depressions on posterior half; genitalia as figured ..... *H. marginicollis*



1' Pronotum with a pair of deep depressions on posterior half; genitalia not as figured ..... 2



2(1') Punctures on discal area of elytra random; genitalia as figured ..... *H. youngi*



2' Punctures on discal area of elytra in rows; genitalia as figured ..... *H. spangleri*

*H. youngi*

*H. spangleri*

(genitalia figs. adapted from Perkins 1980b)

Notes on species

*H. marginicollis* - Length 1.3-1.5 mm. Primarily a lowland pond species; found throughout Florida and probably the most commonly encountered member of the family in state. Young (1954) noted that it was "usually found in matted debris and roots at the margin rather than in open water". Note that there is a pair of small anterolateral depressions on the pronotum; do not confuse these with the deeper, more posterior depressions found in *H. spangleri* and *H. youngi*.

*H. spangleri* - Length about 1.3 mm. *H. spangleri* appears to be a pond species. It is found throughout Florida, west to OK and as far north as MD.

*H. youngi* - Length about 2.0 mm. In Florida, known only from San Felasco Hammock in Alachua Co. The species also occurs in MD and VA.



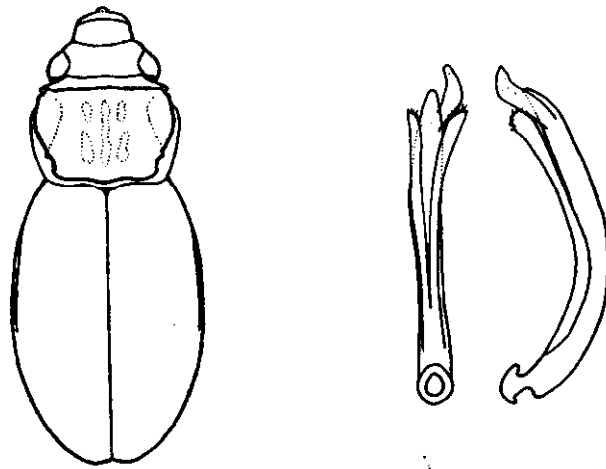
**Genus *Ochthebius***

**DIAGNOSIS:** Larvae are presently indistinguishable from *Gymnochthebius*. Larvae of *Gymnochthebius* and *Ochthebius* are distinguished from other hydraenids by the median setae of the labrum that are located near its anterior margin; narrow lacinia mobilis (a movable blade on the inner face of the mandible); and the cerci that have their bases very close together.

Adults are distinguished by the 3rd maxillary palpomere that is longer and broader than the 4th; pronotum with transparent margins and the posterior corners not incised; parameres shorter than aedeagus; and the simple apex of the aedeagus, with a preterminal process that extends beyond the apex.

**NOTES:** One species, *O. attritus*, (length 1.2-1.5mm), is known from Florida. The species is associated with brackish or salt water habitats, although Young (1954) found it in a freshwater pool in a borrowpit on Big Pine Key. *O. attritus* has a circum-Caribbean-Gulf of Mexico distribution; in Florida, it has been found as far north as Titusville.

**ADDITIONAL REFERENCES:** Perkins 1980b.



*O. attritus*, adult and genitalia  
(adapted from Perkins 1980b)

### Family Hydrophilidae

**DIAGNOSIS:** Larvae are distinguished by the labrum that is fused to the clypeus; maxilla palpiform, without galea or lacinia, with palpifer appearing as a segment of the palp; spiracles, when present (absent in early instars of some genera) with 2 openings; apparently 4-segmented legs usually present (absent in some genera), each usually with single claw (claws absent in some with rudimentary legs) and the abdomen with 8-10 segments (most with 8 complete segments, 9th and 10th reduced); 10th segment with 1-3 segmented cerci, but without terminal hooks.

Adults are distinguished by the antennal club with 3 pubescent segments beyond cupule; long maxillary palps, almost as long as or longer than antennae; and the 5 visible abdominal sternites, the 1st not divided by the hind coxae.

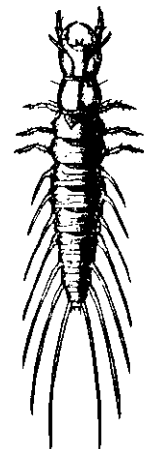
**NOTES:** As recognized in this manual, the family Hydrophilidae includes several groups that have been treated as families (Hansen 1991b; White & Brigham 1996). In our area and in this manual, this concerns only the Helophoridae and Hydrochidae; these are treated here as subfamilies (Helophorinae and Hydrochinae) within the Hydrophilidae, following Lawrence & Newton (1995).

The Hydrophilidae are the second largest of our water beetle families, exceeded only by the Dytiscidae. Standing water is favored by most members, but hydrophilids are also found in running water, usually in backwater areas. Most hydrophilid larvae are predacious; adults are omnivorous and feed on a variety of materials, including living and dead plants, organic matter and even snails and small fish. Some, especially in the subfamily Sphaeridiinae, are not aquatic but are most often found in decaying organic matter, such as dung; two genera in this subfamily have members that are often found in shallow water or along shorelines and are included here. Twenty-one aquatic/semi-aquatic genera including over 75 species are covered in this manual for Florida; there are a few additional terrestrial genera (see Smetana 1978).

**ADDITIONAL REFERENCES:** Brigham 1982; Hansen 1991b; Hilsenhoff 1995b, 1995c; Matta 1974; Richmond 1920; Smetana 1978, 1988; Testa & Lago 1994.

#### Key to larvae of Florida Hydrophilidae genera

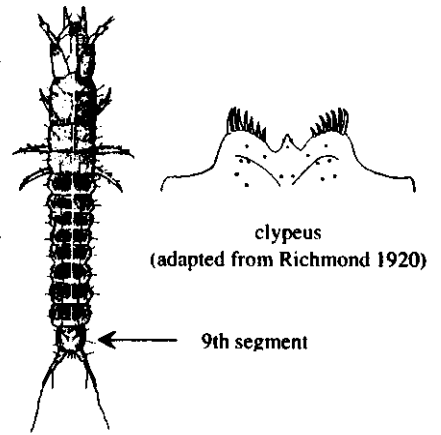
- 1 First 7 abdominal segments with long lateral gills, some at least 2-3 times width of the segment bearing them ..... *Berosus*
- 1' Lateral gills absent or if present then shorter than width of a segment ..... 2



Hydrophilidae 8.2

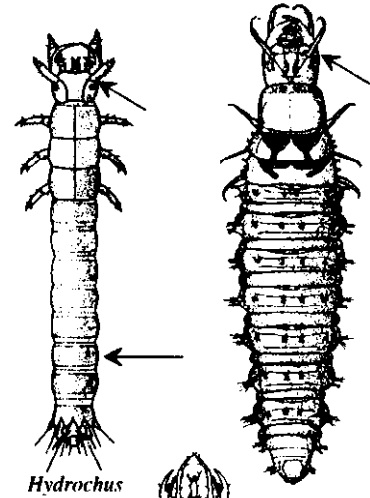
2(1') With 9 complete abdominal segments, the 10th reduced but distinct; clypeus with a large median tooth flanked by wider projections ..... *Helophorus*

2' With 8 complete abdominal segments, the 9th and 10th reduced and usually forming a cavity for the posterior spiracles (figs. below); clypeus variable ..... 3



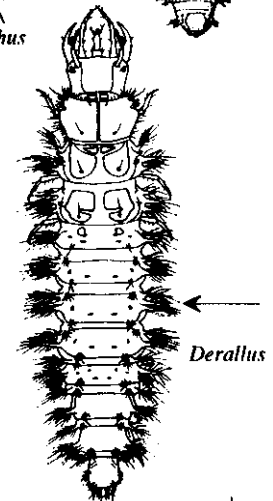
3(2') Antennal insertion points nearer the anterolateral margin of the head than those of mandibles; abdominal segments mostly covered with a dorsal and ventral sclerotized plate ..... *Hydrochus*

3' Antennal insertion points farther from the anterolateral margin of the head than those of mandibles; sclerotized plates do not cover most of abdominal segments ..... 4



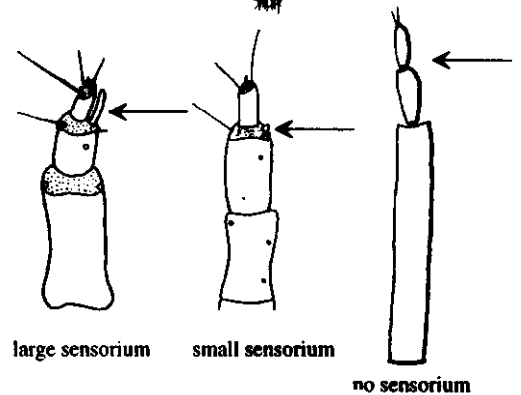
4(3') Meso- and metathoracic segments and abdominal segments 1-6 each with 3-4 moderately long, setiferous lateral gills ... ..... *Derallus*

4' Meso- and metathoracic segments and abdominal segments 1-6 with at most 1 moderately long lateral gill, or none ..... 5



5(4') Basal antennal segment at most slightly longer than combined terminal segments; penultimate antennal segment with an accessory appendage (sensorium) next to terminal segment (may be quite small); femora without fringe of swimming setae ..... 6

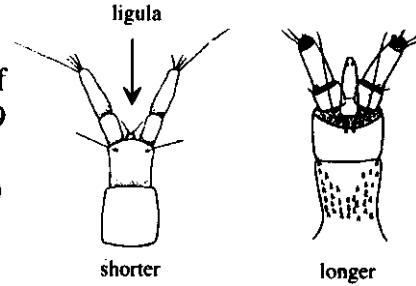
5' Basal antennal segment more than twice as long as combined terminal segments; penultimate antennal segment without a sensorium; femora with fringe of swimming setae ..... 17



- 6(5) Legs absent ..... *Cercyon*
- 6' Legs present, but may be rudimentary ..... 7
- 7(6') Legs rudimentary and without a terminal claw ..... *Chaetarthria*
- 7' Legs complete (may be small), always with a terminal claw ..... 8

- 8(7') Ligula shorter than or subequal to basal segment of labial palp ..... 9

- 8' Ligula longer than basal segment of labial palp ... 10



- 9(8) Clypeus with deep medial emargination ..... *Helobata*

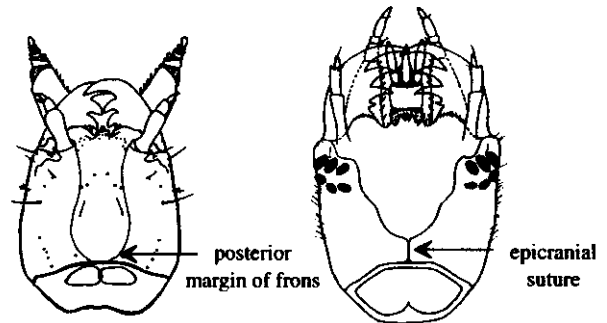


- 9' Clypeus with a pair of large teeth at sides with numerous smaller central teeth ..... *Helocombus*



- 10(8') Epicranial suture absent; legs reduced ... 11

- 10' Epicranial suture present (basal portion of Y-shaped suture); legs long, not reduced ..... 13

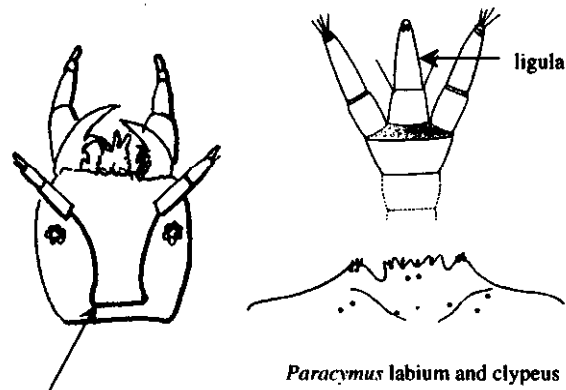


suture absent  
(adapted from Archangelsky & Durand 1992b)

suture present  
(adapted from Spangler 1961)

- 11(10) Posterior margin of frons truncate; ligula 2-segmented, subequal to combined lengths of palps; clypeus with 5 medial teeth ..... *Paracymus*

- 11' Posterior margin of frons rounded (left figure above); ligula 1-segmented, less than combined lengths of palps; clypeus with 3-4 medial teeth (figs. below) .. 12

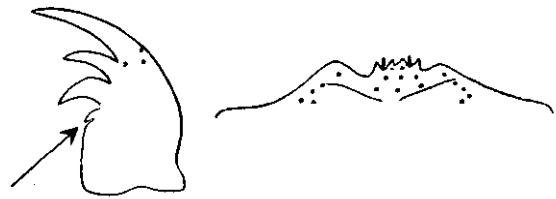


posterior margin of frons

*Paracymus* labium and clypeus  
(adapted from Richmond 1920)

Hydrophilidae 8.4

12(11') Mandible with 3 inner teeth; clypeus with 4 medial teeth ..... *Anacaena*



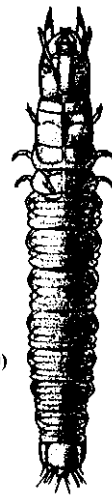
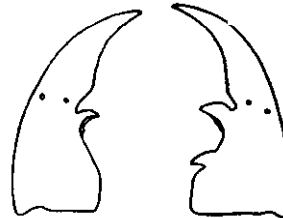
(adapted from Richmond 1920)

12' Mandible with 2 inner teeth; clypeus with 3 medial teeth ..... *Phaenonotum*



(adapted from Archangelsky & Durand 1992b)

13(10') Mandibles asymmetrical, the right with 2 inner teeth, the left with 1; prolegs present on abdominal segments 3-7 ..... *Enochrus*



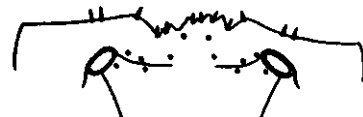
*Enochrus* sp.  
(adapted from Richmond 1920)

13' Mandibles symmetrical, both with 2-3 inner teeth; abdominal prolegs absent ..... 14

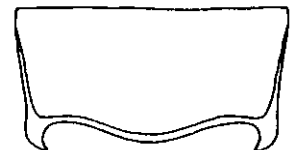
14(13') Clypeus with 5 medial teeth, though central one may be small ..... 15



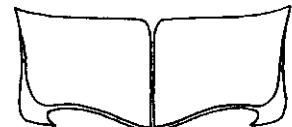
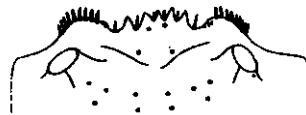
14' Clypeus with 6 or more medial teeth ..... 16



15(14) Middle clypeal tooth smaller than others; prosternum entire ..... *Sperchopsis*



15' Clypeal teeth subequal; prosternum with a mesal fracture ..... *Hydrobius*



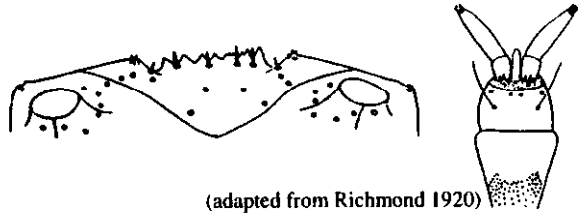
(prosternal figs. adapted from Spangler 1961)

Hydrophilidae 8.5

16(14') Clypeus with 6 distinct teeth placed in 2 groups, with 2 in left group and 4 in right group; ligula much longer than first palpal segment ..... *Helochaeres*

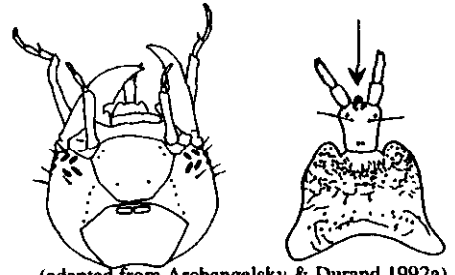


16' Clypeus with more than 6 medial teeth, with several smaller/indistinct teeth to the right; ligula barely longer than first palpal segment ..... *Cymbiodyta*



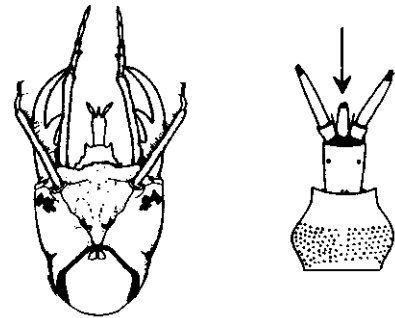
(adapted from Richmond 1920)

17(5') Head subspherical; mandibles asymmetrical; ligula shorter than first palpal segment; pronotum not entirely sclerotized ..... 18

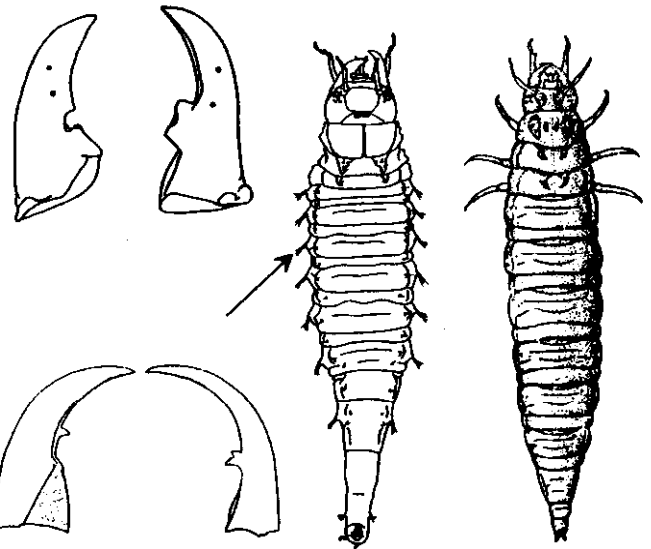


(adapted from Archangelsky & Durand 1992a)

17' Head subrectangular/quadrangular; mandibles mostly symmetrical (proximal inner teeth may differ); ligula longer than first palpal segment; pronotum entirely sclerotized ..... 19



18(17) Right mandible with large blunt tooth, left mandible with deep notch; abdominal segments with a pair of lateral setiferous lobes .... *Dibolocelus*



18' Right mandible thin, with bifid tooth, left mandible much stouter, with 1 tooth; abdominal segments without lateral setiferous lobes ... *Hydrophilus*

*Dibolocelus*

*Hydrophilus*

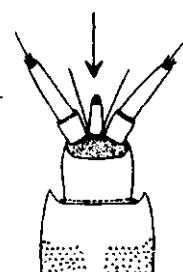
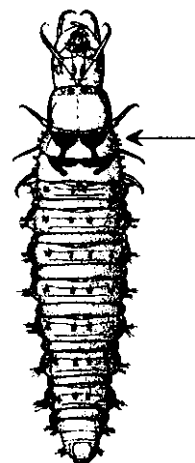
Hydrophilidae 8.6

19(17') Abdomen with well developed, pubescent lateral gills .. *Hydrochara*

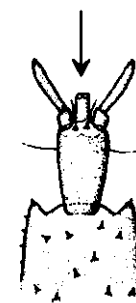
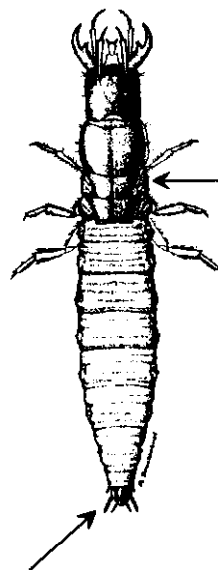
19' Abdomen with at most rudimentary lateral gills (figs. below) ..... 20



20(19') Meso- and metanotal sclerites reduced, triangular; apex of ligula not bifid; lateral gills of abdominal segment 9 short ..... *Tropisternus*



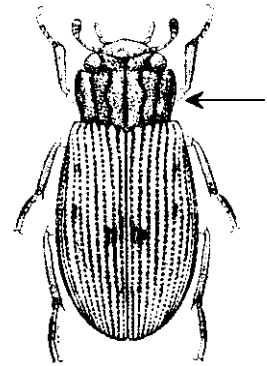
20' Meso- and metanotal sclerites not as reduced, trapeziodal; apex of ligula shallowly bifid; lateral gills of abdominal segment 9 long ..... *Hydrobiomorpha*



**Key to adults of Florida Hydrophilidae genera**

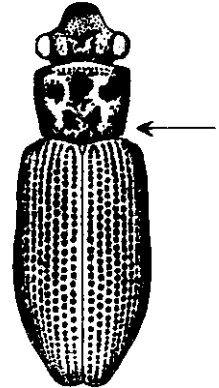
1 Pronotum with 7 longitudinal grooves (including submarginal groove) ..... *Helophorus*

1' Pronotum without longitudinal grooves ..... 2

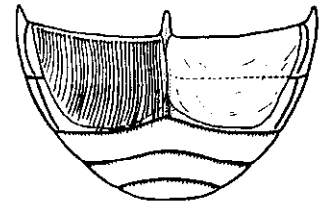


2(1') Pronotum roughly sculptured with pits and much narrower than base of elytra; eyes protruding prominently and head not deflexed ..... *Hydrochus*

2' Pronotum mostly smooth (except for microsculpture) and usually as wide as elytra at base (if narrower then pronotum smooth); eyes usually not as protuberant but if protuberant then head usually deflexed ..... 3



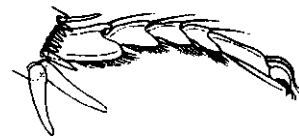
3(2') First 2 abdominal sterna with a common bilobed excavation, usually filled with a gelatinous mass that is covered by a dense fringe of stout cilia arising from the anterior margin of the first sternite; length < 3 mm ..... *Chaetarthria*



3' Abdominal sterna without such an excavation and cilia; length variable ..... 4

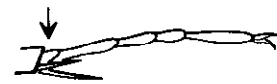
(adapted from Hansen 1991b)

4(3') Mid and hind tarsi 5-segmented with the 1st segment longer than the 2nd; maxillary palpus almost always shorter than antenna .... mostly terrestrial subfamily Sphaeridiinae ..... 5



(adapted from Smetana 1978)

4' Mid and hind tarsi 5-segmented with the 1st segment shorter than the 2nd (sometimes very small!); OR mid and hind tarsi with only 4 segments; maxillary palpus at least as long as antenna ..... 6



5 segments



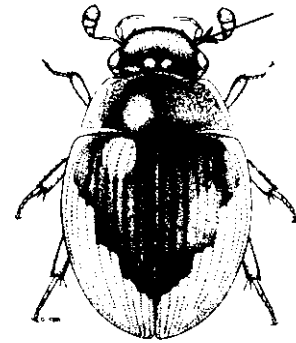
4 segments



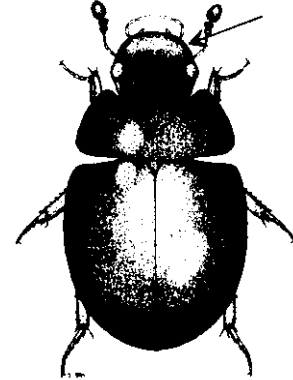
Hydrophilidae 8.8

- 5(4) Head abruptly constricted before eyes, exposing bases of antennae; elytra with striae ..... *Cercyon*

Note: other members of the Sphaeridiinae may key here.! If your specimen does not match the figures or diagnoses, see Smetana (1978)

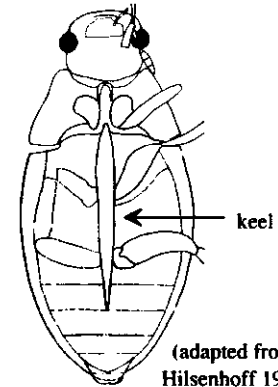


- 5' Head not abruptly constricted before eyes, bases of antennae concealed; elytra punctate, but without striae or rows of punctures ..... *Phaenonotum*



- 6(4') Meso- and metasternum with a well developed median keel that projects as a spine beyond the hind coxae ..... 7

- 6' Meso- and metasternum without a well developed, continuous median keel ..... 11



(adapted from Hilsenhoff 1976)

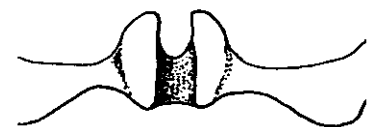
- 7(6) Very large species, length greater than 30 mm ..... 8

- 7' Medium sized species, length less than 20 mm ..... 9

- 8(7) Prosternum hooded anteromedially, with a pocket to receive the anterior edge of the mesosternal keel ..... *Hydrophilus*

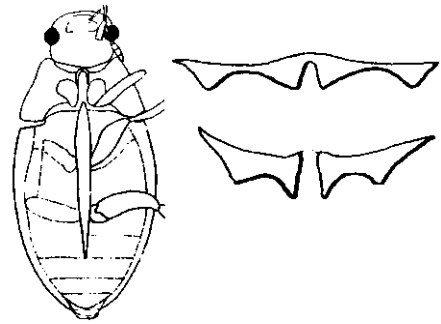


- 8' Prosternum open anteromedially so that the anterior edge of the mesosternal keel can touch head ..... *Dibolocelus*



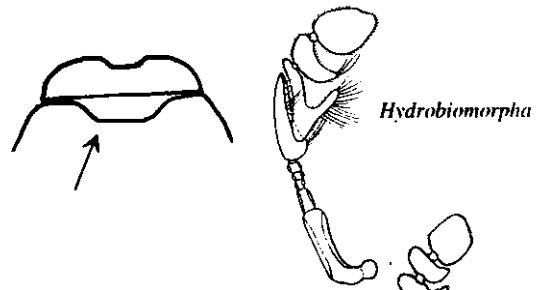
Hydrophilidae 8.9

- 9(7') Metasternal spine extends to hind margin of 1st abdominal sternite; prosternum deeply grooved posteromedially or divided into 2 lobes; length usually less than 13 mm ..... **Tropisternus**

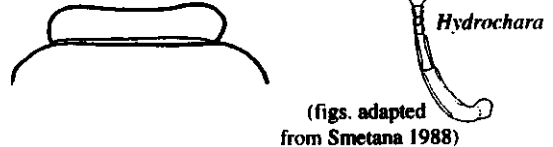


- 9' Metasternal spine shorter, not reaching hind margin of 1st abdominal sternite; prosternum carinate medially; length usually greater than 13 mm ..... 10

- 10(9') Clypeus broadly emarginate anteriorly; prosternum with long, posteriorly directed spine; 6th and 7th antennomeres very asymmetrical, 7th deeply grooved and bilobed ..... **Hydrobiomorpha**



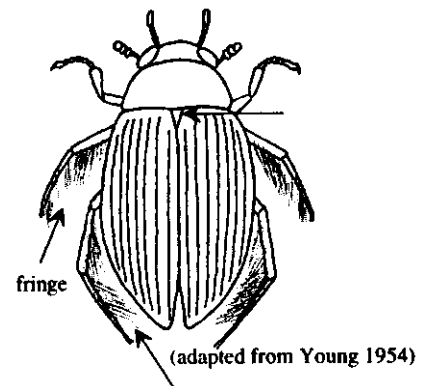
- 10' Clypeus truncate; prosternum without long posterior spine; 6th and 7th antennomeres only slightly asymmetrical ..... **Hydrochara**



(figs. adapted from Smetana 1988)

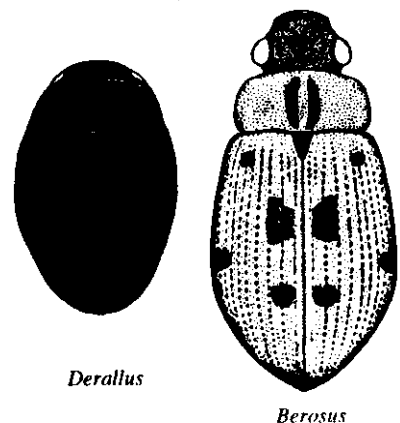
- 11(6') Mid and hind tibiae each fringed with long swimming setae; scutellum much longer than wide ..... 12

- 11' Mid and hind tibiae without fringe of swimming setae; scutellum about as long as wide ..... 13



- 12(11) Elytra black; eyes not protuberant; length less than 3 mm ..... **Derallus**

- 12' Elytra yellowish to reddish-brown and usually with a pattern of dark spots; eyes protuberant; length 2.0-6.5 mm ..... **Berosus**



Derallus

Berosus

Hydrophilidae 8.10

13(11') Maxillary palp short and stout, no more than length of antenna, with last segment as least long as the preceding segment ..... 14



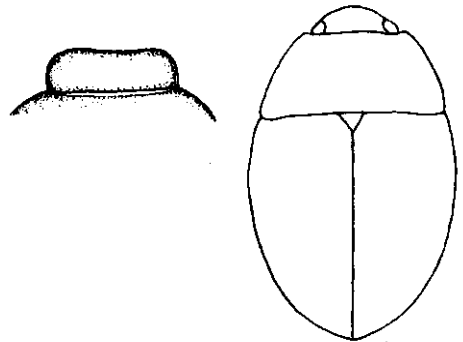
13' Maxillary palp long and slender, longer than antenna, with last segment shorter than the preceding segment ..... 17



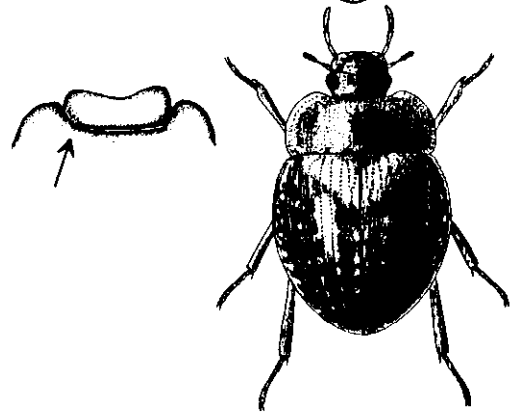
14(13) Length > 4 mm; elytra striate or with punctures arranged in longitudinal rows ..... 15

14' Length < 4 mm; elytra without striae (sutural striae may be present), punctures not arranged in longitudinal rows ..... 16

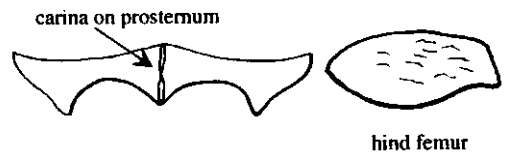
15(14) Clypeus truncate anteriorly; lateral margins of elytra smooth; mid and hind tarsi with a fine fringe of swimming setae, color usually black ..  
..... *Hydrobius*



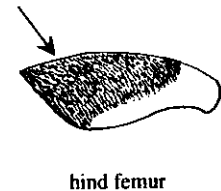
15' Clypeus emarginate anteriorly; lateral margins of elytra weakly serrate; mid and hind tarsi without setal fringe; color reddish-brown .....  
..... *Sperchopsis*



16(14') Prosternum with medial longitudinal carina; mesosternum with longitudinal crest/carina; hind femora without dense pubescence basally .....  
..... *Paracymus*

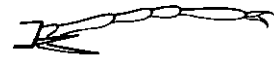


16' Prosternum without medial longitudinal carina; mesosternum never with longitudinal crest/carina; hind femora with dense pubescence basally .....  
..... *Anacaena*



Hydrophilidae 8.11

17(13') All tarsi 5-segmented (basal segment may be very small) .. 18



17' All tarsi 4-segmented ..... 20



18(17) Pseudobasal segment of maxillary palp curves inward when extended forward ..... *Enochrus*



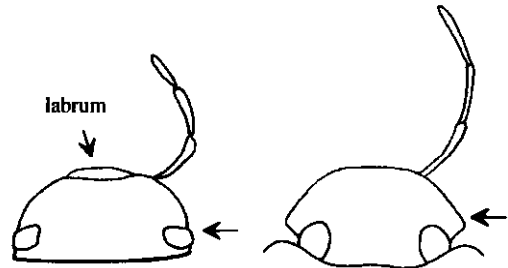
*Enochrus*



*Helocombus*

18' Pseudobasal segment of maxillary palp curves outward when extended forward ..... 19

19(18') Labrum visible; eyes form part of lateral margin of head; body form convex, not flattened ..... *Helochares*



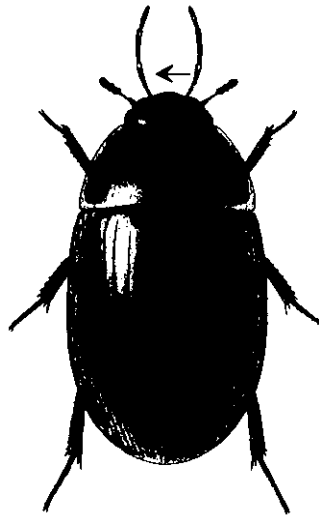
*Helochares*

*Helobata*

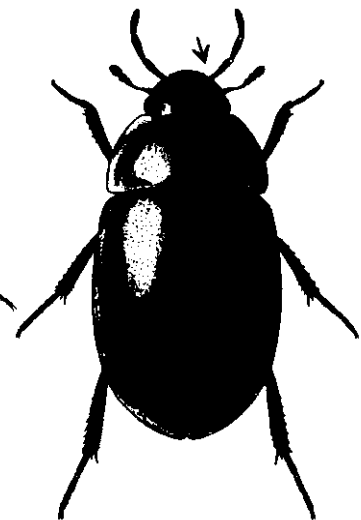
19' Labrum concealed by clypeus that projects in front of eyes so that eyes do not form part of lateral margin of head; pronotal and elytral margins flattened so that body form is limpet-like ..... *Helobata*

20(17') Elytra with distinct striae; maxillary palpi very long with penultimate segment about as long as the width of the labrum at front of clypeus; prosternum with a medial carina; tarsal claws with basal tooth in both sexes, very small in female .....

..... *Helocombus*



*Helocombus*



*Cymbiodyta*

20' Elytra with sutural striae only, although punctures may be arranged in longitudinal rows; maxillary palpi shorter with penultimate segment about 2/3 as long as the width of the labrum at front of clypeus; prosternum without a medial carina; tarsal claws without a basal tooth in both sexes .....

..... *Cymbiodyta*

Genus *Anacaena*

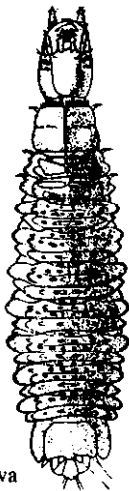
**DIAGNOSIS:** Larvae are distinguished by the small, biramal antennae; 1-segmented ligula that is longer than the basal segment of the labial palp but smaller than combined lengths of palpomeres; labroclypeus with 4 teeth; mandible with 3 inner teeth; posterior margin of frons rounded; and 8 complete abdominal segments.

Adults are distinguished by the very small size; last segment of maxillary palp much longer than preceding segment; non-metallic dorsum; elytron with sutural stria on about posterior half, no other striae present; non-carinate prosternum; mesosternum with a transverse arcuate ridge but without longitudinal ridge; densely pubescent basal portion of hind femur; and all tarsi 5-segmented with first tarsomere of middle and hind legs shorter than the 2nd segment.

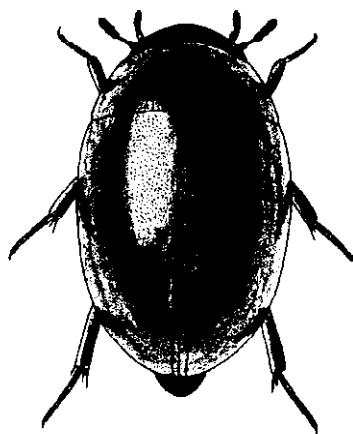
**NOTES:** Smetana (1988) and Hansen (1991b) considered *Crenitulus* a synonym of *Anacaena*; thus our only Florida species is *A. suturalis* (length 1.5-2.1 mm). A second species, *A. limbata* (length 2-3 mm), is recorded from the Carolinas and Mississippi, and may eventually be found in northwest Florida. *A. suturalis* is recognized by the smaller size, more elongate body form that is narrowed posteriorly, hind femora pubescent along anterior margin, combined length of hind tarsomeres greater than the length of the hind tibia and the yellow lateral margins of the pronotum; *A. limbata* is larger, broader, hind femora are pubescent throughout, the combined length of the hind tarsomeres is less than or subequal to the length of the hind tibia and the lateral margins of the pronotum are not pale yellow. The taxonomic status of *A. limbata* in North America is uncertain; Nearctic material may represent another species (or more). *Anacaena* is not well known in North America and requires revision.

Young (1954) found *A. suturalis* to be "abundant in streams in uplands and flatwoods", while Matta (1974) and Testa & Lago (1994) found it mostly in pools and swampy/grassy margins.

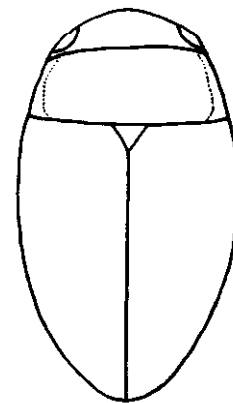
**ADDITIONAL REFERENCES:** Berge Henegouwen 1986; Hansen 1991b; Richmond 1920; Smetana 1988; Testa & Lago 1994.



*A. limbata*, larva  
(adapted from Richmond 1920)



*A. limbata*, adult  
(adapted from Hansen 1991b)



*A. suturalis*, adult

Genus *Berosus*

**DIAGNOSIS:** Larvae are distinguished by the clypeus with a somewhat projecting median area and a large rounded lobe near the left margin; asymmetrical mandibles, the left with a deep groove and 3 irregular teeth near base, the right with large distal tooth and 1-2 inner basal teeth; abdominal segments 1-7 with long, lateral tracheal gills; and 8 complete abdominal segments, the 8th reduced.

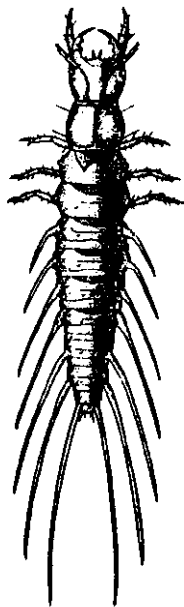
Adults are distinguished by the moderately small size and brown to yellowish brown coloration; pronotum not continuous in outline with elytra; meso- and metasternum without a ventral keel produced into posterior spine; mid and hind tibiae and tarsi fringed with natatory setae; and mid and hind tibiae with basal tarsomere shorter than the second.

**NOTES:** Over two dozen species of *Berosus*, several undescribed, are known from North America north of Mexico; 11 are known to occur in Florida. This genus was revised by Van Tassell (1966), but her revision has not been published.

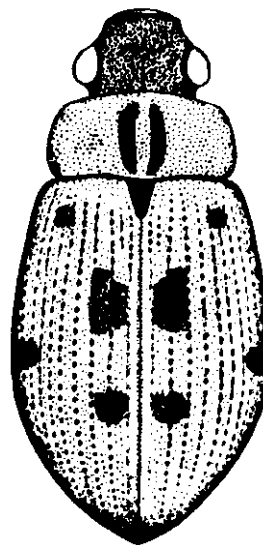
Common and often abundant beetles in many water bodies throughout the state, *Berosus* prefer shallow standing water or slowly moving water with vegetation or plant debris.

Females may be separated from males without genitalic dissection by their thin, 5-segmented fore tarsi; male fore tarsi are expanded basally and 4-segmented.

**ADDITIONAL REFERENCES:** Testa & Lago 1994; Van Tassell 1966, 1990; Wooldridge 1964.



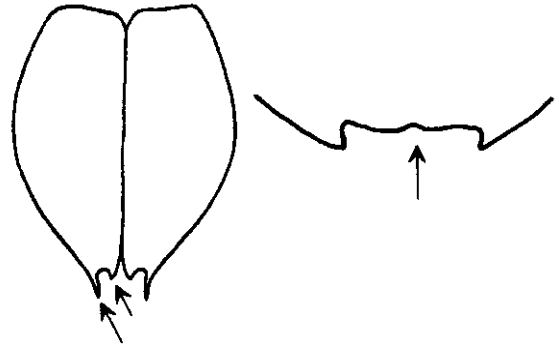
*B. peregrinus*. larva  
(adapted from Richmond 1920)



*Berosus* sp., adult  
(modified from Leech 1948)

Key to adult *Berosus* of Florida

1 Apex of each elytron deeply incised, forming 2 projections; posterior emargination of 5th visible abdominal sternite shallowly emarginate medially ..... *B. pugnax*

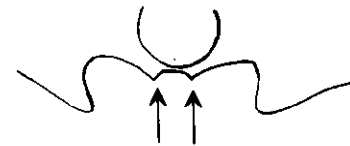


1' Elytral apices entire (but may be extended in some species); emargination of 5th visible abdominal sternite with 1 or 2 central teeth, or simply truncate medially (figs. below) ..... 2

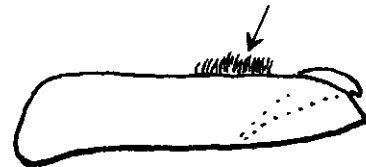
2(1') Emargination of 5th abdominal sternite with 1 central tooth or simply truncate ..... 3



2' Emargination of 5th abdominal sternite with 2 central teeth (note that these teeth are sometimes hidden by a more ventral, posteriorly extended sternal protuberance) ..... 6

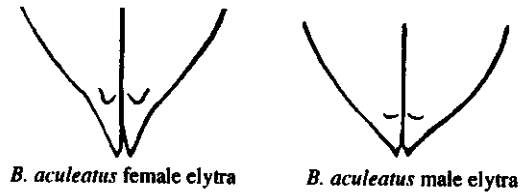


3(2) Size very small, < 3.5 mm (usually < 3.0 mm); head yellowish-brown to brown, elytral apices not prolonged; elytral spots usually faint; male genitalia with dorsal tuft of setae ..... *B. exiguus*

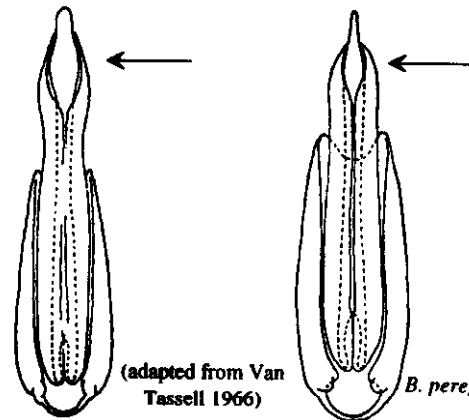


3' Size larger, ≥ 3.5 mm; head usually blackish with metallic reflections, or if yellowish-brown then elytral apices prolonged; elytral spots usually well defined; male genitalia without dorsal tuft of setae ..... 4

4(3') Apices of elytra prolonged, especially in females, and usually with a small preapical tubercle or bump near suture (best developed in females); male genitalia with parameres very slender apically ..... *B. aculeatus*



4' Apices of male elytra not prolonged, if slightly prolonged in females, then without a small preapical tubercle or bump near suture; male genitalia with parameres broader apically ..... 5

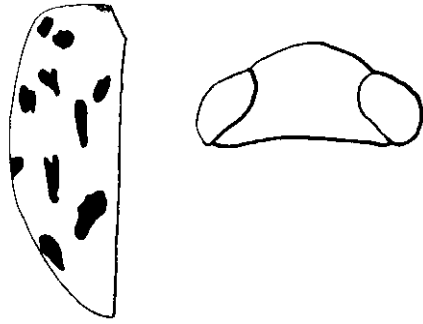


*B. aculeatus* genitalia

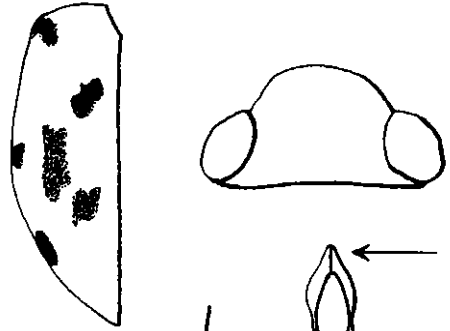
(adapted from Van Tassell 1966)

*B. peregrinus* genitalia

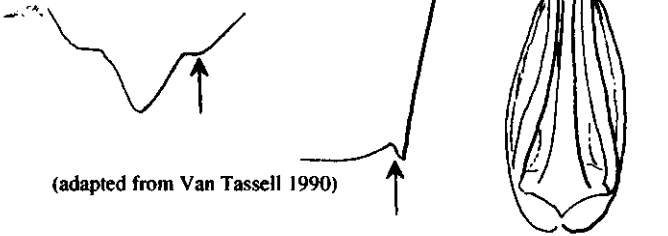
5(4') Each elytron with 10 well defined spots; eyes larger, at least half as wide as interocular distance; scutellum metallic black ..... *B. pantherinus*



5' Each elytron with at most 6-7 spots that may be weakly defined or partially coalesced; eyes smaller, about 1/3 interocular distance; scutellum brown ..... *B. peregrinus*



6(2') Metasternal process with lateral teeth barely projecting; male pronotum and elytra shining, female sides of pronotum and elytra microreticulate; apex of female elytron with a minute tooth at sutural angle; male genitalia as figured ..... *B. arnetti*

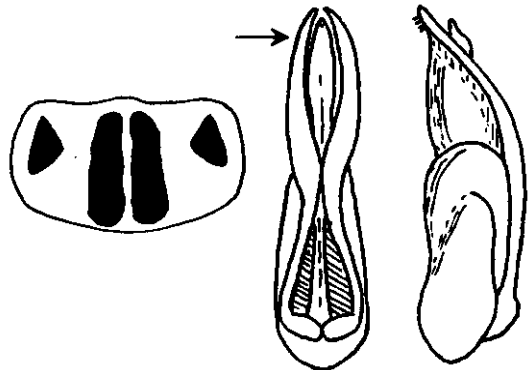


(adapted from Van Tassell 1990)

6' Metasternal process with lateral teeth acute and projecting; male and female pronotum and elytra variable; apex of female elytron with or without minute tooth; genitalia not as figured ..... 7



7(6') Pronotum with a pair of well defined triangular spots laterad to the central pair of vittae; genitalia as figured ..... *B. youngi*



7' Pronotum without a well defined pair of lateral triangular spots; if a darker lateral area is present (some *B. infuscatus*), it is not distinctly delimited or triangular; genitalia not as figured ..... 8

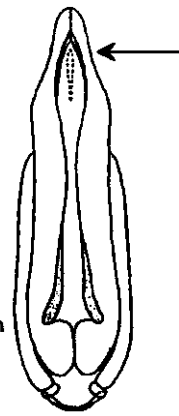
(adapted from Wooldridge 1964)



8(7') Pronotum and elytra of females and pronotum only of males microreticulate; genitalia as figured ..... *B. infuscatus*

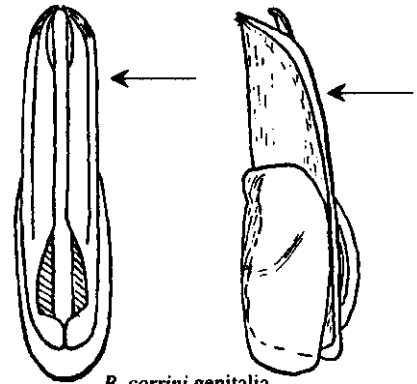
8' Pronotum of females only lightly microreticulate near lateral margins at most, elytra shining; male pronotum and elytra shining; genitalia not as above (see figs. below) ..... 9

(adapted from Van Tassell 1966)



9(8') Discal portion of elytra with some striae (especially the 2nd) weakly impressed so that some punctures within each stria are slightly elongate and separated by flat areas; dorsal margin of male parameres flattened and forming a small flange that lies at approximate right angle to rest of paramere; elytral apices slightly divergent and rounded ..  
..... *B. corrini*

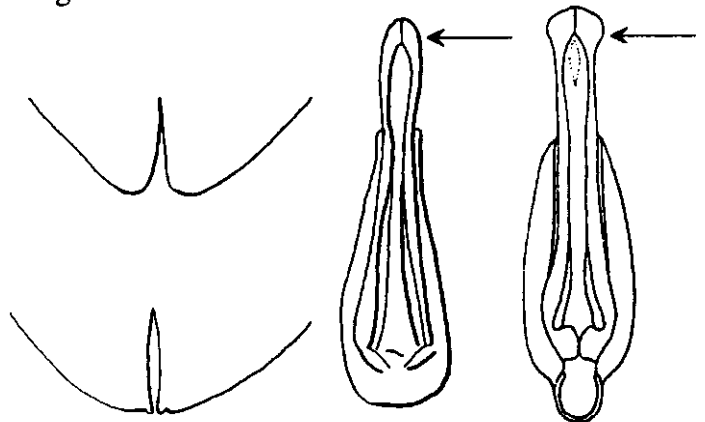
9' Discal portion of elytra with deeply impressed striae, with strial punctures forming mostly continuous groove; dorsal margin of male parameres not flattened as above; elytral apices slightly divergent or not, rounded or in some females with small medial tooth at sutural angle ..... 10



*B. corrini* genitalia  
(adapted from Wooldridge 1964)

10(9') Elytral apices divergent in apical fourth and evenly rounded in both sexes; male parameres with slender apices .....  
..... *B. ordinatus*

10' Elytral apices of females with small tooth; elytral apices of males not or only slightly divergent; male parameres with broader apices ..... *B. striatus*



*B. striatus* female elytral apices

*B. ordinatus*

*B. striatus*  
(adapted from Van Tassell 1966)

**Notes on species**

*B. aculeatus* - Length 3.5-4.5 mm. Found throughout northern Florida and at least as far south as Lake Damon in Highlands Co. Females are usually quite distinctive with their elongated elytral apices bearing preapical tubercles; these tubercles are often more

weakly developed in males, but the elytral apices are still more prolonged than in most other species. Male genitalia are distinctive.

- B. arnetti* - Length 4.0-5.9 mm. This recently described species (Van Tassell 1990) is known from only three localities in Liberty Co., where it was collected from ponds and a stream.
- B. corrini* - Length 4.4-5.6 mm. An uncommon species that probably occurs throughout the state. In Florida it is known from Liberty Co. south to Dade Co.; also known from North Carolina and Mississippi. This species may be difficult to separate from *B. ordinatus* and *B. striatus*; the male genitalia offer the best characters for separation. In addition to characters in the key, note that in *B. corrini* the punctures of the elytral intervals are much smaller than those of the discal striae; in the other two species the punctures of the elytral intervals are subequal to or larger than those of the discal striae.
- B. exiguus* - Length 2.0-3.5 mm. The smallest species of *Berosus* in Florida, usually less than three mm in length; found throughout the state, including the Keys. This small size, along with the yellowish-brown head and distinctly impressed elytral striae, easily identify this species.
- B. infuscatus* - Length 3.5-6.5 mm. A common species found throughout the state, including the Keys. See also *B. youngi*.
- B. ordinatus* - Length 4.5-6.5 mm. I've seen FL material from Alachua, Clay, Glades, Liberty and Polk Counties. Note that in comparison to *B. striatus*, the setigerous punctures of the odd numbered intervals are the same size as adjacent punctures; in *B. striatus* the setigerous punctures are larger than their neighbors. These differences may be difficult to perceive unless one has material of both taxa at hand.
- B. pantherinus* - Length 3.5-5.0 mm. Peck & Thomas (1996) list this species from Gadsden Co. I have seen no FL material, but have examined several specimens from Decatur and Seminole Counties in S GA, directly across the border; *B. pantherinus* is to be expected in the northern tier of FL counties.
- B. peregrinus* - Length 3.5-4.5 mm. Apparently occurs throughout the state in a variety of aquatic habitats. The male genitalia, with the apically thicker and shorter parameres, will definitely separate males of this species from males of *B. aculeatus* with poorly developed preapical elytral tubercles. The relatively faint 6-7 marks on each elytron and the smaller eyes will separate it from *B. pantherinus* with its 10-spotted elytron and larger eyes. Note also that *B. pantherinus* may not occur as far south as *B. peregrinus*, but more collections are needed to ascertain the southern extent of the range of *B. pantherinus*.
- B. pugnax* - Length 5.0-6.5 mm. The double apex of each elytron easily identifies this species, found throughout the peninsula at least as far south as Lake Okeechobee.
- B. striatus* - Length 4.0-6.5 mm. Found throughout the state, but not yet recorded from the Keys. Note that the female of *B. arnetti* also bears a minute apical spine on the elytra; differences in the metasternal process and the lack of an alutaceous elytral integument in *B. striatus* will separate females of the two species.
- B. youngi* - Length 3.6-4.1 mm (Van Tassell (1966) gives a maximum length of 4.6 mm for a paratype, but Wooldridge's range of lengths is 3.6-4.1 mm; I have seen no specimens greater than 4.0 mm). Known only from Florida and south Georgia. In Florida, recorded from Franklin Co. south to Broward Co.; I've collected it at UV light along the Wakulla River in Wakulla Co. Some specimens of *B. infuscatus* have darker lateral areas on the pronotum, but they are indefinite groups of partially coalesced black spots rather than the

## Hydrophilidae 8.18

distinct dark triangular areas found on *B. youngi*; examination of male genitalia will separate doubtful males and females of *B. youngi* have shining elytra compared to the alutaceous elytra of female *B. infuscatus*.

Young (1954) mentions two other species as potentially occurring in south Florida:

- 1) *Berosus interstitialis* Knisch (considered by Van Tassell (1966) to be a senior synonym of *B. sribalus* d'Orchymont) from the West Indies resembles *B. infuscatus* or *B. striatus*, but the punctures of the apical fourth of the elytra bear a short golden seta, the male and female elytra are shining and smooth, and the female lacks an apical spine on the elytra.
- 2) According to Young (1954), *B. metaliceps* Sharp is known from the Bahamas (note that Van Tassell (1966) does not record it from the Bahamas, but from California, Texas and Mexico); the emargination of the fifth sternite lacks teeth, the pronotum is unmarked and the elytra are only vaguely marked. See Van Tassell (1966) for more information.

Genus *Cercyon*

**DIAGNOSIS:** Larvae are distinguished by the presence of a ligula that exceeds the length of the palps; right mandible with 1 inner tooth; lack of legs; and the 8 complete abdominal segments.

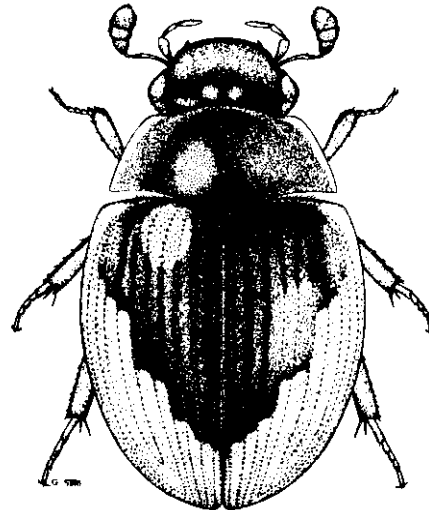
Adults are distinguished by the antennal bases that are visible from above, not hidden by an expanded lateral margin of the head; 9-segmented antennae; lateral margins of head abruptly narrowed before eyes; maxillary palpi shorter than antennae, with 2nd segment much thicker than the 3rd and 4th; mesosternal process narrow posteriorly, narrowly contacting the metasternum at a single point or separated by a narrow gap; striate elytra; and the 5-segmented mid and hind tarsi with the 1st segment longer than the 2nd.

**NOTES:** *Cercyon* is a member of the hydrophilid subfamily Sphaeridiinae; this subfamily differs from the other hydrophilids in that most of its members are terrestrial, living in decaying organic matter such as dung. However, members of two genera, *Cercyon* and *Phaenonotum*, can be considered semi-aquatic and may be collected along water margins. *Cercyon* is a large genus, with 39 Nearctic species; nine occur in Florida. However, only one species, *C. praetextatus* (length 2.4-3.5 mm), is uncommonly encountered in aquatic sampling; the adult is figured below. Note the dorsal pattern and the pair of spots on the back of the head in *C. praetextatus*. Other *Cercyon* species that might be encountered can be keyed in Smetana (1978).

**ADDITIONAL REFERENCES:** Smetana 1978.



*Cercyon* sp., larva  
(adapted from Böving & Henriksen 1939)



*C. praetextatus*, adult  
(adapted from Smetana 1978)

Genus *Chaetarthria*

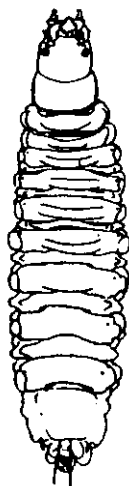
**DIAGNOSIS:** Larvae are distinguished by the short, biramal antennae with 2nd segment never longer than the 1st; clypeus with a median triangular tooth between triangular, symmetrical front angles; mandibles with 2 inner teeth; reduced, clawless legs; and 8 complete abdominal segments.

Adults are distinguished by the very small size; and the first 2 abdominal sterna with a common bilobed excavation, usually filled by a hyaline mass supported by a fringe of long, stout setae originating on the 1st abdominal sternum.

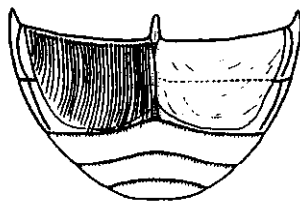
**NOTES:** Fourteen species are known from the U.S., mostly from the West. One species, the yellowish-brown *C. pallida* (length 1.5-2.0 mm), occurs throughout Florida.

*Chaetarthria* should be considered semi-aquatic; they burrow in clean sand (lacking mud or silt) at the margins of streams or rivers and are not known to actively swim.

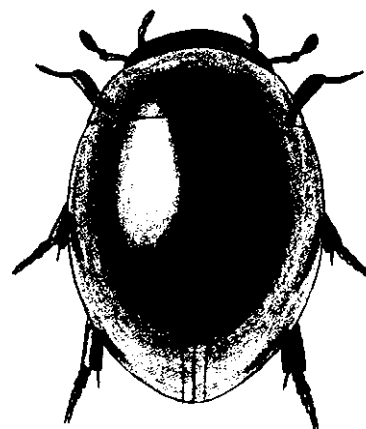
**ADDITIONAL REFERENCES:** Miller 1974.



*Chaetarthria* larva  
(adapted from Hrbáček 1943)



venter of adult abdomen, setae  
removed from right side  
(adapted from Hansen 1991b)



*Chaetarthria* adult  
(adapted from Hansen 1991b)

Genus *Cymbiodyta*

**DIAGNOSIS:** Larvae are distinguished by the biramal antennae; clypeus with more than 6 teeth, with teeth to right of center mostly smaller and not as clearly defined as those of left side; ligula longer than the segment 1 of labial palp; mandibles symmetrical, with 2 inner teeth; legs with claws; and 8 complete abdominal segments.

Adults are distinguished by the long and slender maxillary palpi (distinctly longer than antennae), with last segment shorter than or subequal to the preceding segment and pseudobasal segment concave inwardly when extended; elytron with sutural stria; non-carinate prosternum; transverse mesosternal ridge; the 4-segmented mid and hind tarsi; and tarsal claws without a basal tooth.

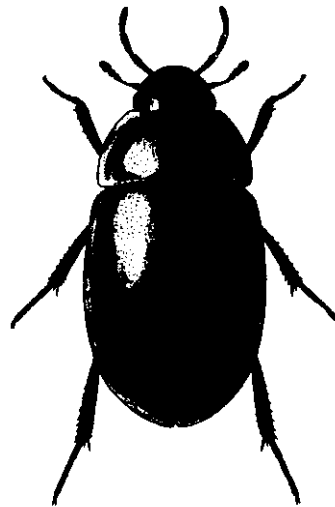
**NOTES:** Of the 28 New World species of *Cymbiodyta*, two are recorded from Florida; a third may also eventually be collected in the northern part of the state. An additional two species have been recorded from Georgia and Mississippi; these two may also occur in western Florida (see Notes on species).

All species are aquatic, but at least one Florida species, *C. vindicata*, may be found in wet moss or in vegetation/leaf litter along marginal areas. Genitalia figures are adapted from Smetana (1974).

**ADDITIONAL REFERENCES:** Smetana 1974; Testa & Lago 1994.



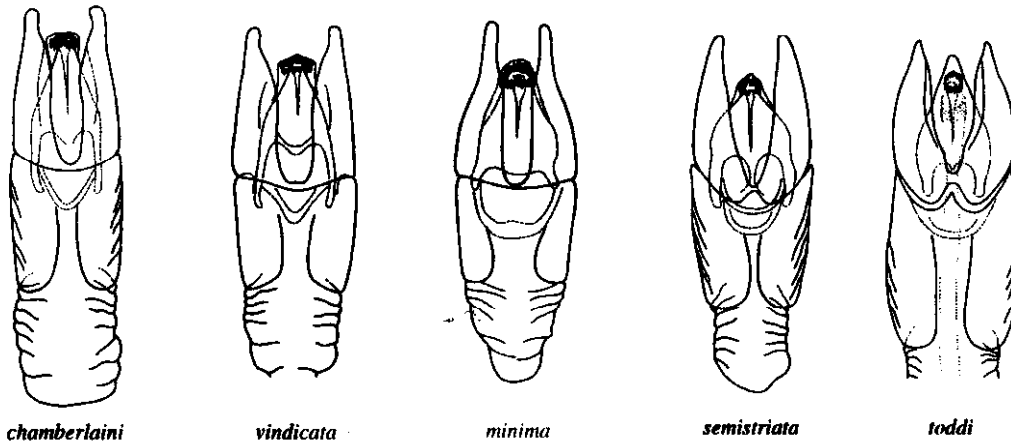
*Cymbiodyta* larva  
(adapted from Richmond 1920)



*Cymbiodyta* adult  
(adapted from Hansen 1991b)

Key to adult *Cymbiodyta* of Florida

- 1 Head with pale spots in front of eyes; genitalia as figured below ..... *C. chamberlaini*
- 1' Head without pale spots ..... 2
- 2(1') Size larger, 3.5-5.3 mm; genitalia as figured below ..... *C. vindicata*
- 2' Size smaller, 2.6-3.5 mm; genitalia as figured below ..... *C. minima*  
(Not recorded from Florida, but to be expected in the northern part of the state)



## Notes on species

- C. chamberlaini* - Length 4.0-5.7 mm. The pale preocular spots are diagnostic. This species was referred to as *C. blanchardi* ? in Young (1954). *C. blanchardi* is not known to occur in FL; its southernmost record is from northern GA (Smetana 1974). Although it also sports pale preocular spots, *C. blanchardi* is smaller (length 3.0-4.1 mm), lighter in color and has a less distinct and shallower medial emargination on the 5th abdominal sternite. *C. chamberlaini* is known from Alachua Co. and northward in Florida.
- C. minima* - Length 2.6-3.5 mm. This species has not yet been collected from Florida, but Smetana (1974) recorded it from Irwin Mill Creek in Alabama (Houston Co.), just across the AL/FL line (this same creek also flows through Florida). *C. minima* is very similar to the usually larger *C. vindicata*; in addition to the size and genitalic differences, note also that the transverse mesosternal projection is much reduced in *C. minima*, forming only a small acute protuberance, while in *C. vindicata* the process forms a distinct tooth.
- C. vindicata* - Length 3.5-5.3 mm. An extremely variable and widespread species, and not always aquatic. It is known from Alachua Co. and northward in Florida.

Two additional species that may possibly be found here are recorded from MS and central GA. *C. semistriata* (Zimmermann) (length 3.9-4.9 mm) and *C. toddi* Spangler (length 4.0-5.5 mm) differ from *C. minima* and *C. vindicata* by having the non-pubescent area of the hind femur larger (apical 1/4 bare in *C. semistriata* and *C. toddi*; apical 5th or 6th bare in *C. minima* and *C. vindicata*) and different genitalia (figures above).

Genus *Derallus*

**DIAGNOSIS:** Larvae are distinguished by the uniramous antennae; lack of natatory setae on the femora; 3-4 pairs of long setiferous lateral gills on the mid and hind thoracic segments and first 6 abdominal segments; and the 8 complete abdominal segments.

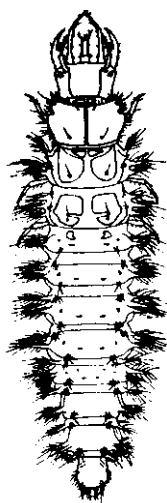
Adults are distinguished by the small size; very convex form; deflexed head; black, punctate-striate elytra; and mid and hind tibiae with a fringe of natatory setae.

**NOTES:** One species, *D. altus* (length 1.5-2.0 mm), of this basically Neotropical genus occurs in Florida and North America. Another species, *D. rudis* Sharp, occurs in the Bahamas and could conceivably be found in the extreme southern portion of the state. *D. rudis* can be separated from *D. altus* by the longer extension of the mesosternal process and by the nearly uniform size of all the punctation at the base of the elytra; in *D. altus* the punctation of the lateral striae is twice as large at the base as the punctation of the intervals.

The black, deeply punctate-striate elytra will easily separate *Derallus* from the other little round hydrophilids (i.e., *Anacaena*, *Paracymus*, *Phaenonotum*) found in the state. *Derallus* are usually found in grass and organic debris at the margins of standing water. Matta (1974) also found *Derallus* in brackish water in North Carolina.

The larva of *D. rudis* was described by Spangler (1966b) from Mexican material. The larva of *D. altus* differs in that the inner teeth of the mandible are not as closely joined at their bases and the clypeus is slightly more convex anteriorly.

**ADDITIONAL REFERENCES:** Spangler 1966b; Van Tassell 1966.



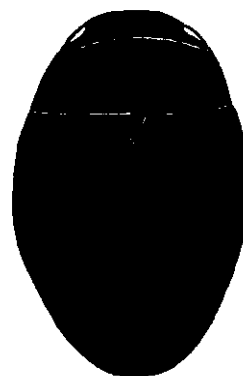
*D. rudis*, larva  
(adapted from Spangler 1966b)



*D. altus*



*D. rudis*



*D. altus*, adult

adult mesosternal process  
(adapted from Van Tassell 1966)



Genus *Dibolocelus*

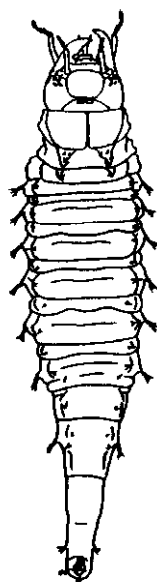
**DIAGNOSIS:** Larvae are distinguished by the semi-globose head shape; uniramal antennae; ligula shorter than first palpal segment; stout, asymmetrical mandibles, the right with a wide blunt tooth, the left with a deep notch; and 8 complete abdominal segments, each segment with a pair of lateral setiferous lobes.

Adults are distinguished by the large size; open, bifurcate prosternal process; and meso- and metasternum with a continuous median longitudinal keel that is prolonged posteriorly into a spine.

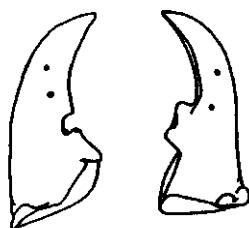
**NOTES:** Hansen (1991b) considered *Dibolocelus* a subgenus of *Hydrophilus*. However, as noted in Jasper & Vogtsberger (1996), most American workers do not accept this classification and retain *Dibolocelus* as a separate genus. One species, *D. ovatus* (length 30-35 mm), is present in Florida and North America, although a second Cuban species may rarely occur in southern Florida. Young (1954) keyed *D. smaragdinus* Brullé based on a doubtful record for Tampa given in Leng & Mutchler (1918) (as *Hydrophilus violaceonitens* Duval). This species, which is known from Cuba, is more frequently an iridescent violet/blue color, not black to greenish black as *D. ovatus*, and has the median line of abdominal sternites 3-5 carinate and with a toothlike process at the median hind margin, especially on sternites 3-4; in *D. ovatus* the sternites are moderately angulate and not strongly produced medially.

Young (1954) noted that most specimens he had taken were from deep canals with considerable vegetation. Larvae are specialized for feeding on snails; the notch on the left mandible holds the snail while the blunt tooth of the right mandible crushes the shell.

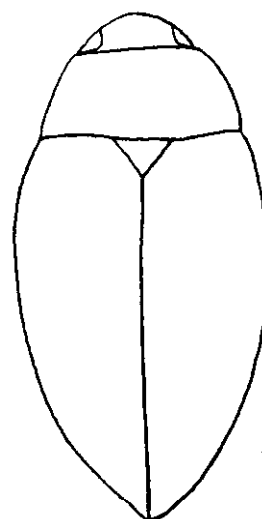
**ADDITIONAL REFERENCES:** Archangelsky & Durand 1992a.



*D. ovatus*, larva,  
(adapted from Archangelsky & Durand 1992a)



*D. ovatus*, left & right mandible of larva  
(adapted from Archangelsky & Durand 1992a)



*D. ovatus*, adult

Genus *Enochrus*

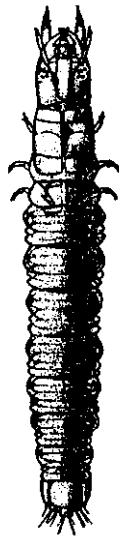
DIAGNOSIS: Larvae are distinguished by the biramal antennae; asymmetrical mandibles, with 1 inner tooth on the left, 2 inner teeth on the right; ligula longer than segment 1 of labial palp; well-developed legs with claws; and the 8 complete abdominal segments with prolegs on segments 3-7.

Adults are distinguished by the long and slender maxillary palpi (distinctly longer than the antennae), with last segment usually shorter than the preceding segment and with pseudobasal segment curved inwardly when extended forward; mesosternum with mesal, projecting longitudinal crest; and the 5-segmented tarsi.

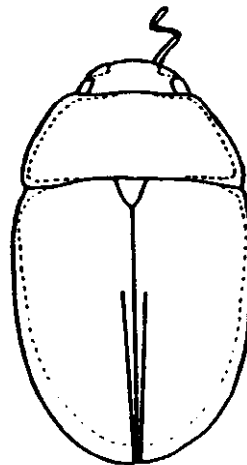
NOTES: *Enochrus* is a speciose genus, with at least 24 Nearctic species; 12 are recorded from Florida. Most members of the genus prefer standing water with lots of plant debris, although some also occur in streams. One species, *E. ochraceus*, is one of the most abundant and ubiquitous water beetles in Florida.

The genus was treated by Gundersen (1978), but some problems still exist with the taxonomy of some species. Note that the key that follows, adapted from Gundersen (1978), relies on colors in some couplets; be aware that teneral (newly emerged) adults may not have darkened sufficiently to allow correct keying. Unless otherwise stated, figures are adapted from Gundersen (1978), with the exception of the epipleural and prosternal figures.

ADDITIONAL REFERENCES: Gundersen 1977, 1978; Hilsenhoff 1995c; Testa & Lago 1994.



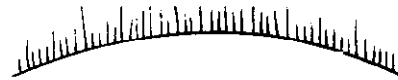
*Enochrus* sp., larva  
(adapted from Richmond 1920)



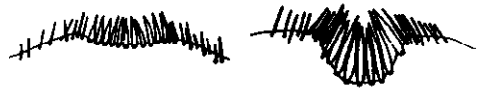
*E. cinctus*

Key to adult *Enochrus* of Florida

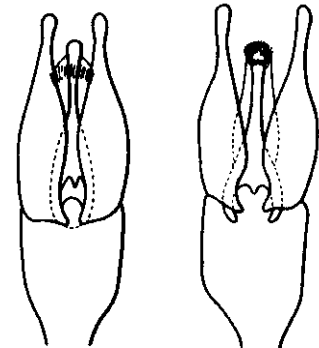
1 Apex of last abdominal sternite smoothly rounded, with a fringe of fine, dark setae present, without a medial notch or fringe of stout golden setae ..... 2



1' Apex of last abdominal sternite fringed with small, stout golden setae and usually with a medial notch ..... 3



2(1) Smaller, length 3-4 mm; body uniformly pale yellow to light brown; posterior edges of elytra reflexed and expanded; genitalia with apices of parameres more knob-like ..... *E. reflexipennis*



*reflexipennis* *hamiltoni*

(adapted from Smetana 1988)

2' Larger, length 4.0-6.6 mm; body dark brown to black or light brown with center of head and thorax darker; elytra not reflexed and expanded; genitalia with apices of parameres more rounded ..... *E. hamiltoni*



3(1') Black or very dark reddish-brown, only sides of thorax and corners of clypeus possibly paler; length usually > 4.5 mm (except for *E. perplexus*, 4.2-6.0 mm, which has a very shallow wide abdominal notch) ..... 4

3' Yellow to brown, although center of thorax may be dark; length < 4.5 mm ..... 8

4(3) Mesosternal crest undercut at posterior end; length 4.9-7.5 mm; genitalia as figured ..... *E. cinctus*



4' Mesosternal crest not undercut; length variable; genitalia not as figured ..... 5

(adapted from Smetana 1988)

5(4') Length 4.2-6.0 mm; last abdominal sternite with a wide, poorly developed notch or just a fringe of stout golden setae; body weakly convex in cross section .... 6



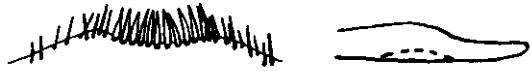
weakly convex

5' Length 6.0-8.2 mm; last abdominal sternite with a well developed, deep notch and a fringe of stout golden setae; body strongly convex in cross section ..... 7

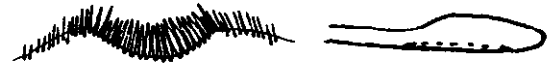


strongly convex

6(5) Abdominal notch wide and very shallow, more than 11 times as wide as deep; mesosternal crest with a few setae and slightly roughened posteriorly; apex of aedeagus narrowed in lateral view ..... *E. perplexus*

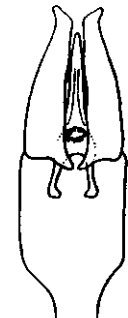


6' Abdominal notch distinct but shallow, about 4 times as wide as deep; mesosternal crest without setae and smooth posteriorly; apex of aedeagus expanded in lateral view ..... *E. interruptus*

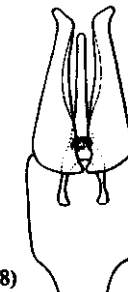
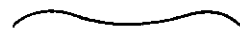


7(5') Uniformly black dorsally; maxillary palpi completely black or almost so; central portion of clypeal emargination straight; aedeagus as figured ..... *E. consors*

clypeal emargination

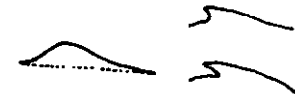


7' Margins of pronotum and elytra brown to yellow; maxillary palpi yellow or brown; central portion of clypeal emargination rounded; aedeagus as figured ..... *E. consortus*



(adapted from Smetana 1988)

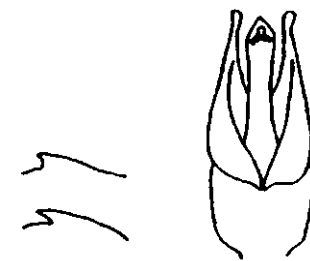
8(3') Mesosternal crest small and rounded with no tooth or only a small posteriorly pointed one ..... 9



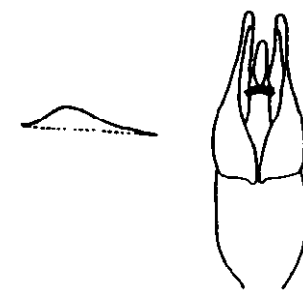
8' Mesosternal crest large, triangular or rectangular with a sharp anterior angle ..... 11



9(8) Mesosternal crest with a posteriorly pointed tooth; male genitalia with apices of parameres pointed outward and aedeagus almost as long as parameres .. *E. pseudochraceus*  
(A Neotropical species not recorded from Florida, but could possibly occur in extreme southern peninsula)

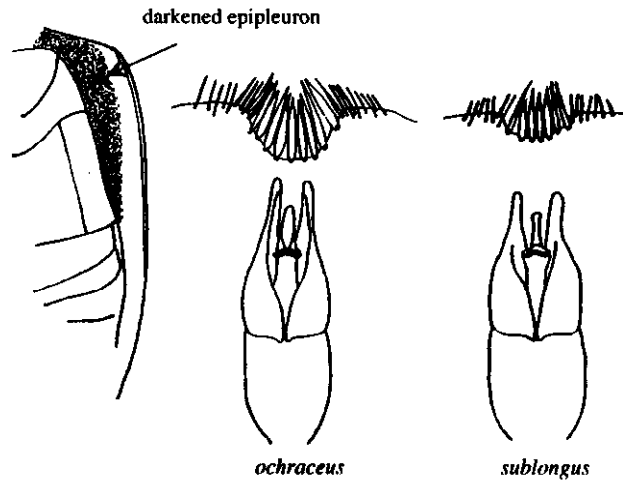


9' Mesosternal crest without a tooth; male genitalia with apices of parameres straight and aedeagus much shorter than parameres ..... 10



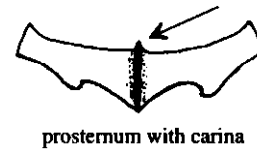
10(9') Length 2.5-3.5 mm (rarely < 2.9 mm); epipleura usually dark; abdominal notch medium to large, easily discerned; clypeal center usually light, but may be clouded; genitalia as figured, generally more elongate ..... *E. ochraceus*

10' Length 2.3-2.7 mm; epipleura normally pale; abdominal notch very small but deep; clypeal center dark; genitalia as figured, generally more squat .....  
..... *E. sublongus*

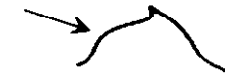


11(8') Prosternum without a median carina ..... *E. blatchleyi*

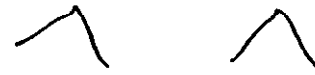
11' Prosternum with a median carina ..... 12



12(11') Prosternum paler than metasternum; mesosternal crest obtusely angled anteriorly, posterior edge with a slight hump ..... *E. sayi*



12' Prosternum and metasternum dark; mesosternal crest triangular, without a posterior hump ..... *E. pygmaeus*  
(See Notes.)



**Notes on species**

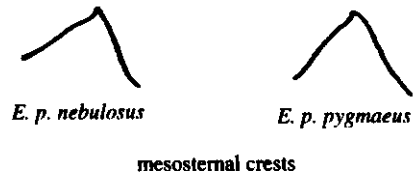
*E. blatchleyi* - Length 3.0-4.4 mm. Apparently found throughout the state. Teneral individuals of normally dark species that are of similar size, such as *E. cinctus* and *E. interruptus*, will key to *E. blatchleyi* in the key above. Note that *E. cinctus* has a posteriorly undercut mesosternal crest and is a bit larger in size, and that *E. interruptus* has a very shallow abdominal notch; the abdominal notch of *E. blatchleyi* is deep, similar to that of *E. ochraceus*.

*E. cinctus* - Length 4.9-7.5 mm. The distinctively undercut mesosternal crest easily identifies this species that occurs throughout the state. Note also the pale lateral margins of the clypeus, pronotum and elytra, the shallow abdominal notch and the simple protarsal claws of the male; in *E. consors* and *E. consortus*, males have a well developed basal tooth on the protarsal claws.

*E. consors* - Length 6.8-8.2 mm. The largest species of the genus, it occurs throughout the state. It is our darkest *Enochrus* species. Note that the aedeagus of *E. consors* is stouter than that of *E. consortus* and has a ventral groove lacking in *E. consortus*.

*E. consortus* - Length 6.0-7.6 mm. To date, this species has only been recorded from the southern half of the state. However, given its wide range (FL to ME and MN) it probably occurs throughout the state.

- E. hamiltoni* - Length 4.3-6.1 mm. Gundersen (1977) synonymized several species with *E. hamiltoni*. He considered the species polymorphic, recognizing 3 forms, two of which, the "light" form and "typical" form, he recorded from Florida. Hilsenhoff (1995c) noted problems with this approach, and removed two species from synonymy, based on size, coloration and the emargination of the clypeus. Based on Hilsenhoff's concepts and material I've examined, only *E. hamiltoni* occurs in Florida. Definite resolution of the taxonomy of these species must await a revision of the subgenus *Lumetus* (which includes, in Florida, *E. hamiltoni* and *E. reflexipennis* (q.v.)).
- E. interruptus* - Length 4.8-6.0 mm. This species is easily confused with *E. perplexus*; note the expanded tip of the aedeagus of *E. interruptus*, visible in lateral view.
- E. ochraceus* - Length 2.5-4.0 mm. One of the most common and ubiquitous water beetles in Florida, this species is highly variable in size and coloration. The low, rounded mesosternal crest separates this taxon from other *Enochrus* except for *E. pseudochraceus* and *E. sublongus*. Small, teneral individuals (without darkened epipleura) can be mistaken for *E. sublongus*; usually the deeper abdominal notch of *E. ochraceus* will distinguish it, but note that the size of the notch is also variable in *E. ochraceus*!
- E. pseudochraceus* - Length 2.7-3.7 mm. Not recorded from Florida, but this Neotropical species occurs in Cuba, the West Indies, Mexico and Central America, and may eventually turn up in the southern part of the state. Note the small posteriorly directed tooth of the mesosternal crest and the distinctive genitalia.
- E. perplexus* - Length 4.2-6.0 mm. Easily confused with *E. interruptus*, but lacks the expanded tip to the aedeagus. Found throughout the state.
- E. pygmaeus* - Length 3.4-4.2 mm. Gundersen (1978) recognized three subspecies of *E. pygmaeus*, two of which occur in the eastern U.S.: *E. p. pygmaeus*, which has the clypeus completely yellow, a mesosternal crest shaped as an elongate triangle and is distributed on the "Gulf Coast, across southern Texas to southern California, down through Mexico and the Bahama Islands"; and *E. p. nebulosus*, which has the center of the clypeus narrowly to broadly darkened, a mesosternal crest with an angle near 90° and is found in "New England States to Colorado and Wyoming down to Texas and back through the Gulf States excluding Florida and Georgia". Thus following Gundersen (1978), only *E. p. pygmaeus* occurs in Florida. However, the majority of material I've seen from Florida appears to be *E. p. nebulosus*, based mainly on the central darkening of the clypeus. Testa & Lago (1994) did not collect *E. p. pygmaeus* in Mississippi although the coastal counties were sampled extensively, but did cite Gundersen's (1978) records for that subspecies. Other specimens I've examined also seem to refute Gundersen's distribution scheme. Examples include: 1) a specimen from the Dominican Republic that has the clypeus darkened centrally and the larger mesosternal crest; utilizing these characters the specimen should be *E. p. nebulosus*, but Gundersen states that only *E. p. pygmaeus* occurs in this area; 2) numerous specimens from FL with the centrally darkened clypeus and large mesosternal crest as in *E. p. nebulosus*; these specimens are similar to *E. p. nebulosus* I've examined from the central part of that subspecies' range; and 3) a specimen I collected in Virginia that has the clypeus darkened as in *E. p. nebulosus*, but has the more elongate triangular



## Hydrophilidae 8.30

mesosternal crest attributed to *E. p. pygmaeus*. Gundersen (1978) does note that "where the three subspecies meet in southern Texas and Mexico they are virtually indistinguishable". This confusion with subspecies identity can be resolved by identifying your material as *E. pygmaeus*, and leave it at that!

*E. reflexipennis* - Length 3.4-5.0 mm. A species of salt marshes and brackish water. The smaller size, lighter color and the slightly reflexed/extended elytral margins will separate it from most specimens of *E. hamiltoni*. This species and *E. hamiltoni* lack the medial notch and the fringe of stout golden setae on the posterior margin of the last abdominal sternite; instead they bear a fringe of finer, dark setae. They could be confused with *E. interruptus* or *E. perplexus*; these two species have very shallow, almost absent abdominal notches, but possess a fringe of stout golden setae. Note also that *E. hamiltoni* and *E. reflexipennis* have setose mesosternal crests, while those of *E. interruptus* and *E. perplexus* are mostly glabrous.

*E. sayi* - Length 3.5-4.1 mm. The carinate prosternum, which is lighter than the mesosternum, and the extended mesosternal crest identify this species, which probably occurs throughout the state. Note that the maxillary palpi are shorter and stouter than most other Florida *Enochrus*.

*E. sublongus* - Length 2.2-2.7 mm. This species may be confused with *E. ochraceus* (q.v.), but is rarely longer than 2.5 mm; *E. ochraceus* is rarely smaller than 2.9 mm. *E. sublongus* appears to be more common in running water.

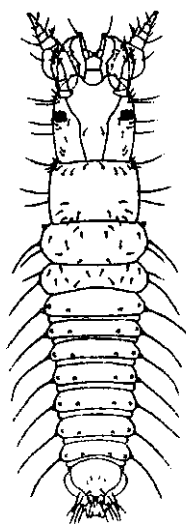
Genus *Helobata*

**DIAGNOSIS:** Larvae are distinguished by the ligula that is shorter than segment 1 of the labial palp; biramal antennae; clypeus with deep medial emargination; symmetrical mandibles with 2 large inner teeth, with serrations between apical and medial teeth, and between medial and basal teeth; legs with claws; and the 8 complete abdominal segments.

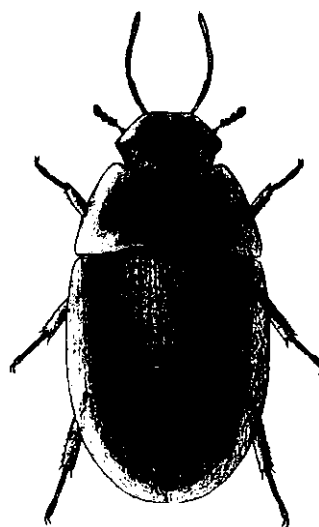
Adults are distinguished by the small size; flattened, limpet-like appearance; long maxillary palpi with pseudobasal segment curved outwardly when extended, and with the last segment subequal to the preceding; expanded clypeus that projects laterally in front of the eyes, concealing the labrum and meeting thorax posterolaterally so that the eyes do not appear to form part of the lateral margin of the head (unless the head is fully extended); mesosternum without a longitudinal ridge or crest; and all tarsi with five segments.

**NOTES:** One species, *H. larvalis* (formerly known as *H. striata*) (length 5-6 mm), of this basically Neotropical genus occurs across southern North America from Florida to Texas. Adults are found on the surfaces of submerged vegetation, wood and other objects, where they appear much like limpets. Young (1954) noted that it is frequently associated with the leaves of *Pontederia*, "on which it sticks like a small suction cup". It is also found in brackish water.

**ADDITIONAL REFERENCES:** Hansen 1991b; Spangler & Cross 1972; Testa & Lago 1994.



*H. larvalis*, 1st instar larva  
(adapted from Spangler & Cross 1972)



*H. larvalis*, adult  
(adapted from Hansen 1991)



Genus *Helochares*

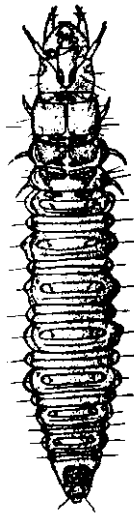
**DIAGNOSIS:** Larvae are distinguished by the biramal antennae; clypeus with 6 distinct teeth placed in 2 groups, 2 on the left and 4 on the right; ligula longer than the segment 1 of labial palp; mandibles symmetrical, with 2 inner teeth; legs with claws; and the 8 complete abdominal segments.

Adults are distinguished by the visible labrum; long and slender maxillary palpi (distinctly longer than antennae), with last segment shorter than the preceding segment and pseudobasal segment concave inwardly when extended forward; eyes forming part of the lateral margin of the head; mesosternum without a definite carina; and the 5-segmented tarsi.

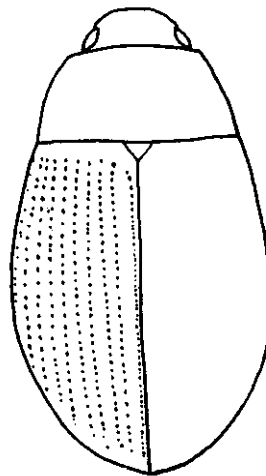
**NOTES:** Two species are recorded from Florida. The most common, *H. maculicollis* (length 4-6 mm), is found throughout the state. A second species, *H. sallaei* (length 5.5-6.5 mm), was believed to have been accidentally introduced from Mexico via the lumber trade (Young 1954). *H. sallaei* was previously known in Florida only from a few specimens from the Dunedin area (as *Enochrus estriatus* in Blatchley 1917); however, Peck & Thomas (1996) also list *H. sallaei* from Dade and Monroe Counties. *H. maculicollis* is marked with ten elytral striae (including the sutural stria); *H. sallaei* lacks elytral striae.

Young (1954) found *H. maculicollis* to be "sometimes very abundant in the muddy borders of small ponds or marshes"; Testa & Lago (1994) found it most often in thin-bladed, grassy vegetation at the margins of ponds or lakes.

**ADDITIONAL REFERENCES:** Richmond 1920.



*H. maculicollis*, larva  
(adapted from Richmond 1920)



*H. maculicollis*, adult

Genus *Helocombus*

**DIAGNOSIS:** Larvae are distinguished by the biramal antennae; ligula that is shorter than or subequal to segment 1 of the labial palp; biramal antennae; clypeus with a pair of large teeth on right and left sides, with numerous, smaller teeth at center; mandibles symmetrical, with 2 inner teeth; legs with claws; and the 8 complete abdominal segments.

Adults are distinguished by the long and slender maxillary palpi (distinctly longer than antennae), with last segment shorter than the preceding segment and pseudobasal segment concave inwardly when extended; distinctly striate elytra; carinate prosternum; a short conical projection medially on the mesosternum; 4-segmented mid and hind tarsi; and the tarsal claws with a basal tooth (weaker in females).

**NOTES:** A monotypic genus with the sole species, *H. bifidus* (length 5.5-7.8 mm), occurring at least as far south as the Tampa area. It is most often found in shallow ponds with abundant rotting plant debris.

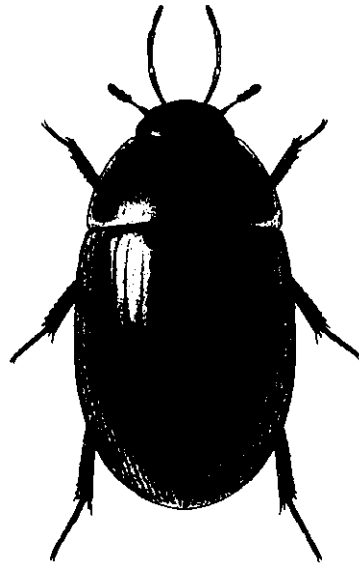
**ADDITIONAL REFERENCES:** Perkins & Spangler 1981.



larval labium



larval clypeus



adult  
(adapted from Hansen 1991b)

Genus *Helophorus*

DIAGNOSIS: Larvae are distinguished by the clypeus with a large median tooth flanked by wider projections; labium without ligula; legs with claws; and the abdomen with 9 complete segments with the integument noticeably chitinized and 10th segment reduced but distinct

Adults are distinguished by the 7 longitudinal grooves on the pronotum (including outermost submarginal area).

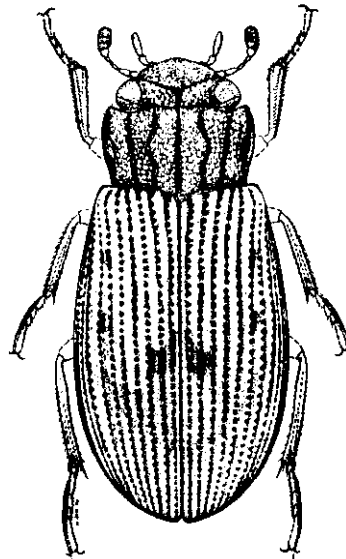
NOTES: *Helophorus* is a large (at least 42 Nearctic species) and very difficult genus; many species are very similar and a great deal of intraspecific variation occurs. Identification of the southeastern U.S. species is made easier because most *Helophorus* species are northern and western in distribution. Only one species has been recorded from Florida; another two are known from Mississippi and may eventually be found in the northern/western parts of Florida.

*Helophorus* larvae are riparian; adults are poor swimmers and are often found clinging to aquatic vegetation in shallow, usually lentic, water bodies. Adult *Helophorus*, like *Hydrochus* and many elmids, accumulate an exterior crust that must be removed before surface features can be clearly seen. Adult figures are adapted from Smetana (1988).

ADDITIONAL REFERENCES: Hilsenhoff 1995b; Smetana 1985, 1988; Testa & Lago 1994.



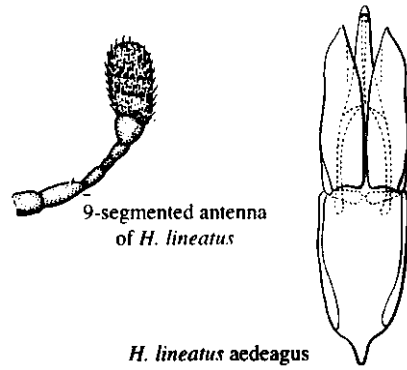
*Helophorus* larva  
(adapted from Richmond 1920)



*H. lineatus*, adult

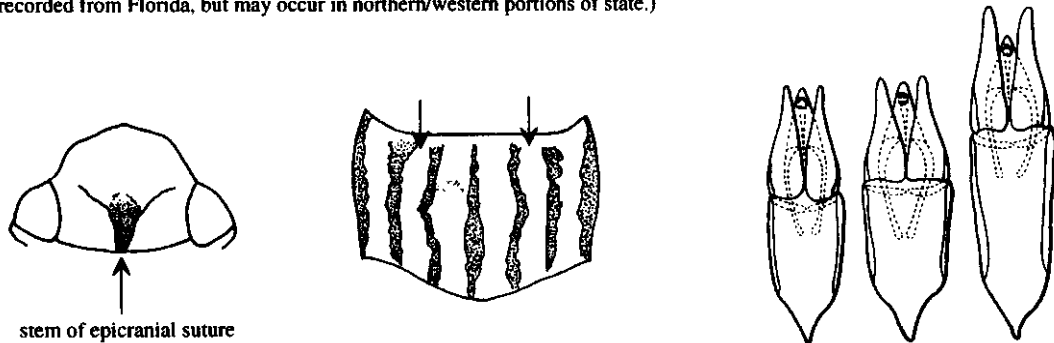
Key to adult *Helophorus* of Florida

1 Antennae 9-segmented; genitalia with aedeagus longer than parameres and parameres pointed apically ..... *H. lineatus*

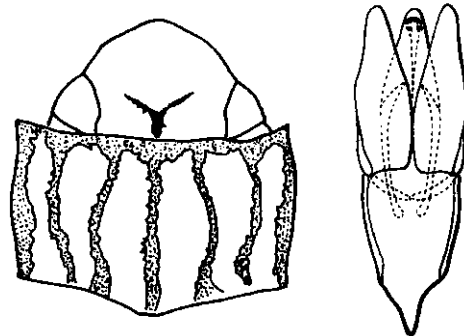


1' Antennae 8-segmented; genitalia with aedeagus subequal to or shorter than parameres and parameres more rounded apically (figs. below) ..... 2

2(1') Stem of epicranial suture widened anteriorly; 2nd and 5th intervals (raised areas) about same width along length; aedeagus as figured, variable ..... *H. linearis*  
(Not recorded from Florida, but may occur in northern/western portions of state.)



2' Stem of epicranial suture narrow; 2nd and 5th intervals on pronotum much wider anteriorly than posteriorly; aedeagus as figured ..... *H. marginicollis*  
(Not recorded from Florida, but may occur in northern/western portions of state.)



Notes on species

*H. linearis* - Length 2.6-3.8 mm. Not recorded from Florida, but may eventually be found in the western or northern portions of the state; Testa & Lago (1994) recorded this species from Mississippi.

*H. lineatus* - Length 3.0-4.5 mm. Smetana (1985) recorded this species from Florida, but label data did not indicate where in the state the specimens were collected.

*H. marginicollis* - Length 1.8-3.8 mm. Not recorded from Florida, but may eventually be found in the western or northern portions of the state; Testa & Lago (1994) recorded this species from Mississippi.

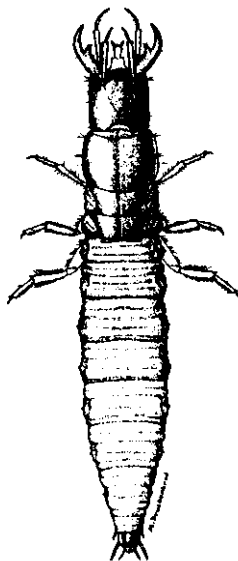
Genus *Hydrobiomorpha*

**DIAGNOSIS:** Larvae are distinguished by the subrectangular head shape; uniramous antennae; ligula longer than 1st palpal segment and with apex shallowly bifid; clypeus with 5 poorly defined central teeth; meso- and metanotal sclerites not much reduced, with trapezoidal hind margins almost as wide as anterior margins; 8 complete abdominal segments; and the long, conspicuous lateral gills on segment 9.

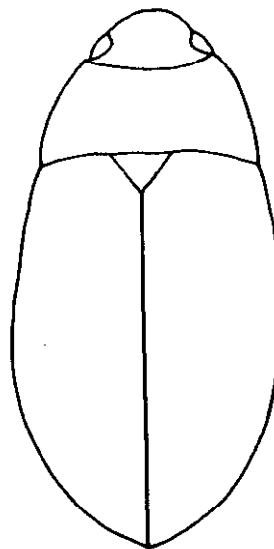
Adults are distinguished by the moderately large size; anteriorly broadly emarginate clypeus that exposes the articulation of the labrum; 6th and 7th antennomeres very asymmetrical, with 7th deeply grooved and bilobed; prosternum carinate, with a long, posteriorly directed spine; mesosternal keel with posteriorly directed spine that does not exceed the 1st abdominal sternite; and 5-segmented mid and hind tarsi, with 1st segment shorter than 2nd.

**NOTES:** One species, *H. casta* (length 13-17 mm), of this mostly tropical genus occurs in the U.S. and Florida; it was previously (Young 1954) placed in *Neohydrophilus*, a generic junior synonym. The species is found throughout the state in standing water such as ponds, ditches and swamps.

**ADDITIONAL REFERENCES:** Spangler 1973b.



*H. casta*, larva  
(adapted from Spangler 1973b)



*H. casta*, adult

Genus *Hydrobius*

**DIAGNOSIS:** Larvae are distinguished by the biramal antennae (antennal appendage very small); symmetrical mandibles, with 3 inner teeth (2 distal teeth much larger than proximal); clypeus with 5 median, subequal teeth, the outer left tooth a bit distant from the rest; prosternum with a mesal fracture; and 8 complete abdominal segments.

Adults are distinguished by the moderate size; short maxillary palpi with the last segment longer than the preceding; smooth lateral margins on pronotum and elytra; and the 5-segmented tarsi, with 1st segment shorter than 2nd, and with a dorsomedial fringe of natatory setae on mid and hind tarsal segments.

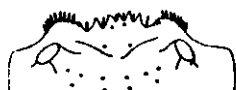
**NOTES:** Of the three North American species, one, *H. tumidus* (length 7-8 mm), occurs in Florida. *H. tumidus* is quite convex and lacks deeply impressed striae, although the elytral punctations are arranged in several rows. See Matta (1974) for a key to all North American species. Young (1954) reported *H. tumidus* from Alachua and Calhoun Counties; Leng & Mutchler (1918) recorded it from Lake Okeechobee; it probably occurs throughout the state. Young (1954) noted that all specimens he had seen were from "stagnant ponds or sloughs among dead leaves or other submerged debris".

Larval figures below are adapted from Richmond (1920).

**ADDITIONAL REFERENCES:** Matta 1974.



*Hydrobius* sp. larva



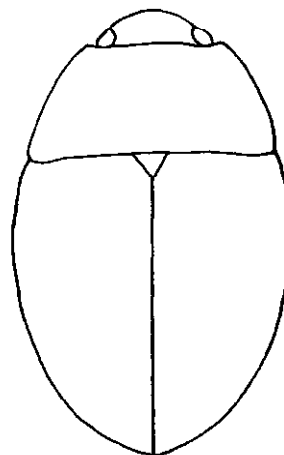
larval clypeus



larval mandible



larval antenna



*H. tumidus*, adult

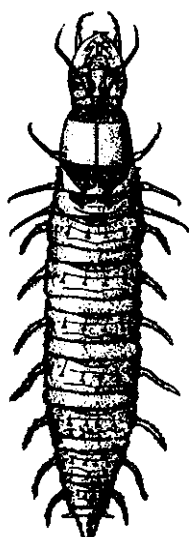
Genus *Hydrochara*

**DIAGNOSIS:** Larvae are distinguished by the subrectangular head shape; uniramous antennae; symmetrical mandibles with 2 inner teeth; submentum roughly pentagonal, wider towards base; and 8 complete abdominal segments, with segments 1-7 each bearing a pair of well-developed, pubescent lateral gills.

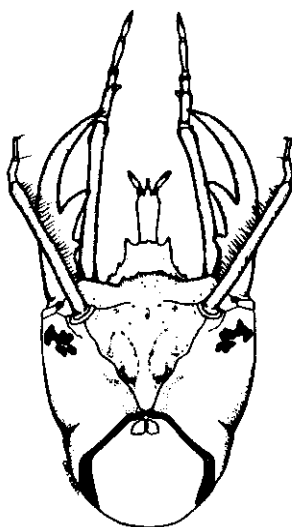
Adults are distinguished by the moderately large size; truncate clypeus, not exposing articulation of labrum; slightly asymmetrical 6th and 7th antennomeres; carinate prosternum with at most a small tooth posteriorly; metasternal spine not reaching hind margin of 1st abdominal sternite; and 5-segmented mid and hind tarsi, with 1st segment shorter than 2nd.

**NOTES:** Of the nine species of *Hydrochara* known from North America north of Mexico, four are known to occur in Florida. *Hydrochara* occur most often in standing water, and may have a preference for eutrophic habitats. Matta (1982) described the larvae of *H. soror* and *H. occulta*, both of which occur in Florida. The following key and genitalia figures are adapted from Smetana (1980).

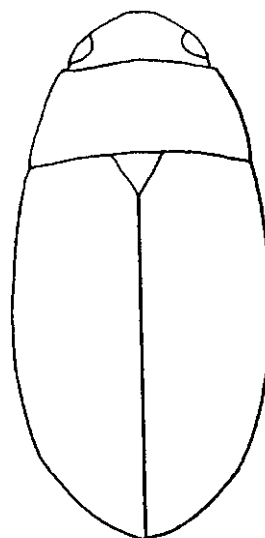
**ADDITIONAL REFERENCES:** Hilsenhoff 1995c; Matta 1982; Smetana 1980; 1988.



*Hydrochara* sp., larva  
(adapted from Richmond 1920)



*Hydrochara soror*, larval head  
(adapted from Matta 1982)

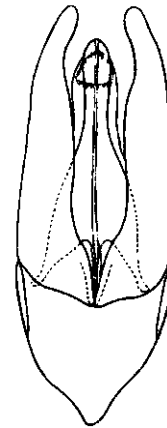


*Hydrochara soror*, adult

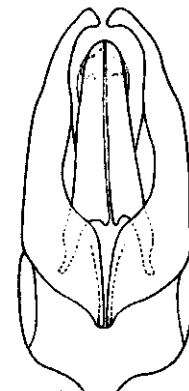
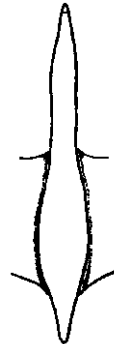
Key to adult *Hydrochara* of Florida

1 Maxillary palp distinctly shorter than the width of the clypeus at the anterior margin of the eyes; length 16-20 mm; genitalia as figured ..... *H. brevipalpus*

1' Maxillary palp at least as long as the width of the clypeus at the anterior margin of the eyes; length usually < 17 mm; genitalia not as above ..... 2



2(1') Sternal keel with metasternal portion distinctly widened, about 2X width of mesosternal portion at its widest point; last segment of maxillary palp not darkened apically; genitalia with apices of parameres sharply recurved ..... *H. occulta*

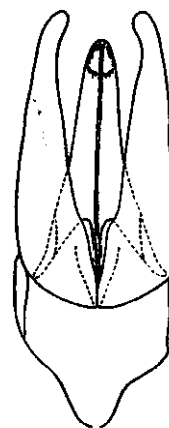


*H. occulta*

2' Sternal keel with metasternal portion not distinctly widened, at most 1.5X width of mesosternal portion at its widest point; last segment of maxillary palp apically darkened or not; genitalia with apices of parameres not sharply recurved (figs. below) ..... 3

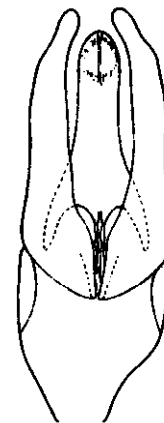


3(2') Maxillary palp with last segment darkened apically, with preceding segment about 1.3X length of last segment; dorsal surface of aedeagus with a median groove, not broadly excavated basally ..... *H. soror*



*H. soror*

3' Maxillary palp with last segment uniformly pale, not darkened apically, with preceding segment about 1.5X length of last segment; dorsal surface of aedeagus without a median groove, but broadly excavated basally ..... *H. spangleri*



*H. spangleri*



**Notes on species**

*H. brevipalpis* - Length 16-20 mm. The largest species occurring in Florida. I've seen a single specimen from the FAMU Biological Station near Holt in Okaloosa Co., a new state record. The large size and short maxillary palps distinguish this species.

*H. occulta* - Length 12-17 mm. Considered a coastal species; recorded from south peninsular Florida, including the Keys, northward to Massachusetts. This is probably the most common species of *Hydrochara* occurring in Florida south of the Orlando area (Smetana (1980) gives one record for *H. soror* from Avon Park, Highlands Co.).

*H. soror* - Length 14-19 mm. Known from Highlands Co. and northward, this is probably the most common species of the genus in northern Florida, but can be confused with the apparently rarer *H. spangleri*. Note that in *H. soror* the last segment of the maxillary palp is darkened apically, and the genitalia are different.

*H. spangleri* - Length 12 -18 mm. In Florida, recorded from Alachua, Liberty and St Johns Counties.

Genus *Hydrochus*

**DIAGNOSIS:** Larvae are distinguished by the biramal antennae that are inserted nearer the anterolateral angles of the head than are the insertion points of the mandibles; robust maxillae; ligula not present; anterior margin of clypeus straight, without teeth; and 8 complete abdominal segments with well developed dorsal and ventral chitinized plates.

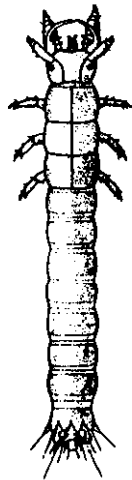
Adults are distinguished by the protruding eyes; posterior margin of pronotum distinctly narrower than elytral bases; small scutellum; and rough, sculptured body.

**NOTES:** Of the approximately 40 species of *Hydrochus* that occur in North America north of Mexico, about half are undescribed. At least 15 taxa are known from Florida; it is possible to apply published names to seven of them. Hellman (1975) produced a detailed revision of the genus for North and Central America, but it has never been published; thus, his names are not available. Recently, Smetana (1988) has described one of Hellman's species; Makhan (1995) has probably described more of Hellman's species, but Makhan's descriptions and illustrations are incomplete and do not allow accurate identification of his species. It is apparent that Hellman does not plan to validate his species' names (Smetana 1988:14); I've included them under Notes solely as a guide to those who may wish further information on those taxa; do not use Hellman's names!

*Hydrochus* species are common inhabitants of standing or slow-moving water where they crawl about on vegetation or floating material.

There is considerable intraspecific variation in some *Hydrochus* species. Extensive experience with the genus may enable some identification of isolated females, but males are usually necessary for accurate separation of most species. Genitalia figures below are adapted from Hellman (1975).

**ADDITIONAL REFERENCES:** Hellman 1975; Makhan 1994, 1995; Smetana 1988.



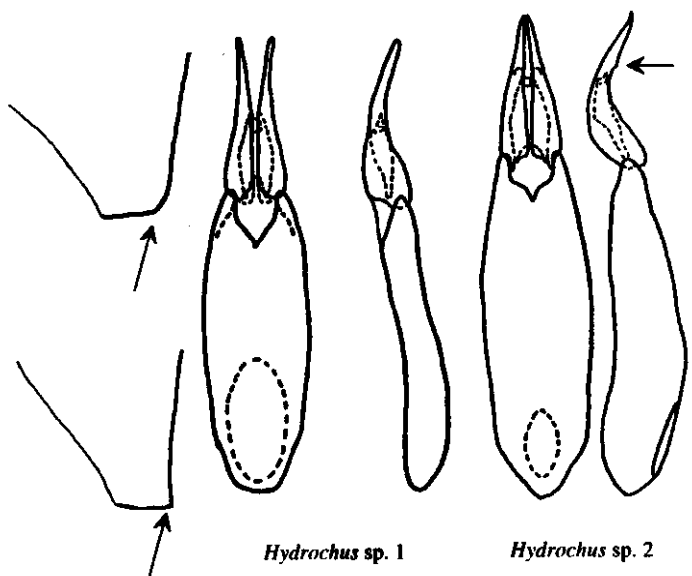
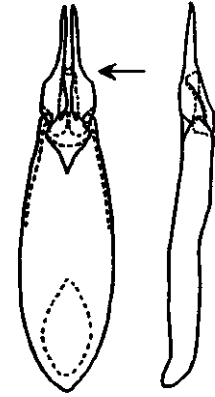
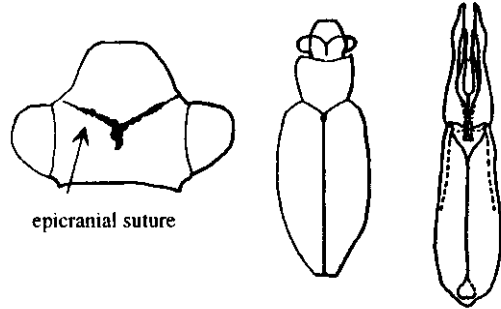
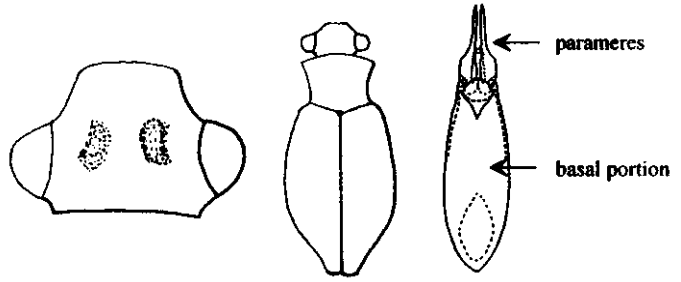
*Hydrochus* sp., larva  
(adapted from Richmond 1920)



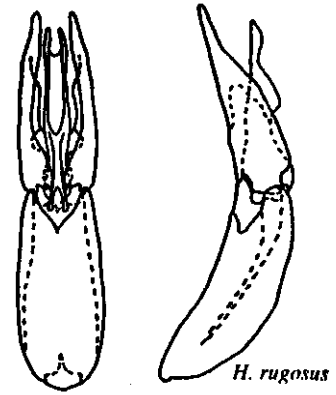
*Hydrochus* sp., adult  
(adapted from Leech 1948)

Key to adult *Hydrochus* of Florida

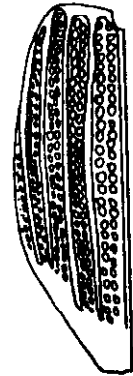
- 1 Epicranial suture lacking or indistinct laterally; body form broader; male genitalia with basal portion much longer than parameres ..... 2
- 1' Epicranial suture distinct; body form narrower; male genitalia with basal portion shorter, subequal to or longer than parameres ..... 4
- 2(1) Male parameres abruptly narrowed beyond base; size generally larger, 3.4-5.6 mm ..... *H. callosus*
- 2' Male parameres gradually narrowed (see figs. below); size generally smaller, 3.6-3.9 mm ..... 3
- 3(2') Inner (sutural) apex of elytron rounded; in lateral view, incurved portion of male parameres without subapical tooth ..... *H. sp. 1*
- 3' Inner (sutural) apex of elytron slightly produced with inner angles almost acute; in lateral view, incurved portion of male parameres with small subapical tooth ..... *H. sp. 2*



- 4(1') Length 4.8-6.1 mm; genitalia as figured ... *H. rugosus*
- 4' Length < 4.6 mm; genitalia not as figured ..... 5

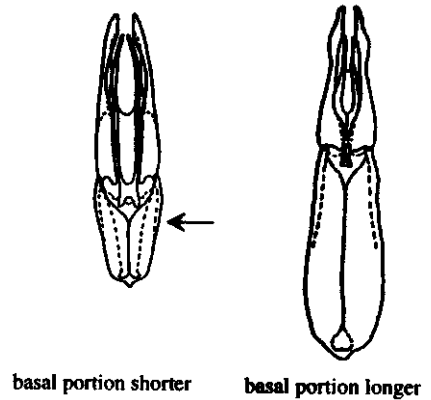


- 5(4') Very small, < 2.3 mm in length; elytra with odd intervals elevated and even intervals reduced so that the punctures seem to lie in double rows between the intervals ..... *H. minimus*
- 5' Usually > 2.4 mm in length; never with double rows of punctures between the intervals ..... 6

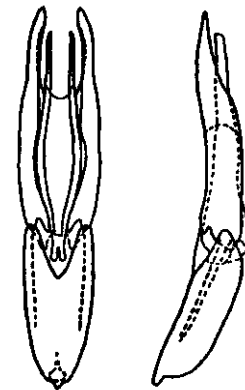


*H. minimus* elytron

- 6(5') Male genitalia with basal portion much shorter than parameres ..... 7
- 6' Male genitalia with basal portion subequal to or longer than parameres ..... 10



- 7(6) Length 3.7-4.5 mm; genitalia as figured ..... *H. sp. 7*
- 7' Length 3.5 mm or less; genitalia not as above ..... 8

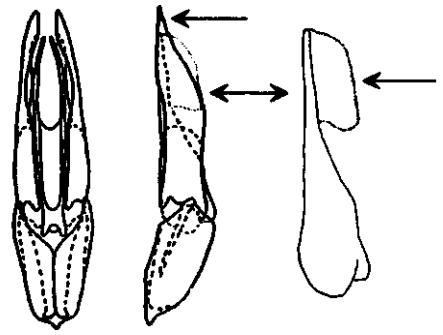


*Hydrochus* sp. 7

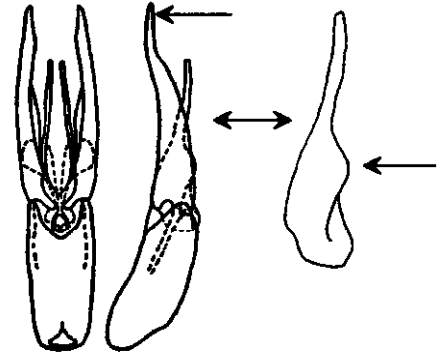
Hydrophilidae 8.44

8(7') In lateral view, parameres thicker apically and aedeagus with membranous apicodorsal lobe ..... *H. simplex*

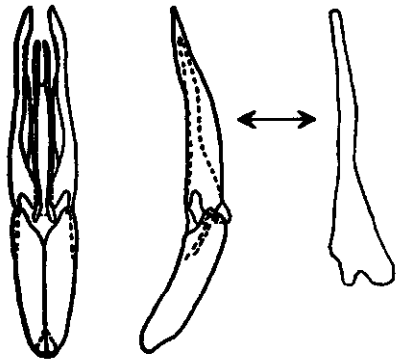
8' In lateral view, parameres thinner apically and aedeagus without membranous apicodorsal lobe (see figs. couplet below) ..... 9



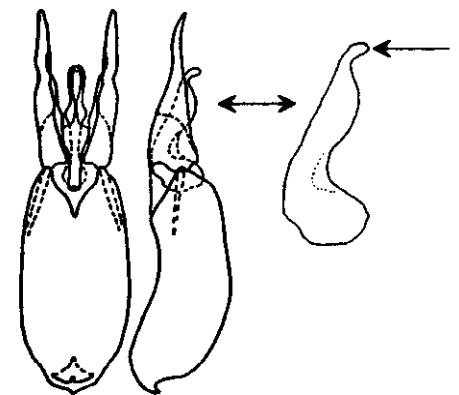
9(8') In lateral view, aedeagus shorter and with submedial hump ..... *H. sp. 5*



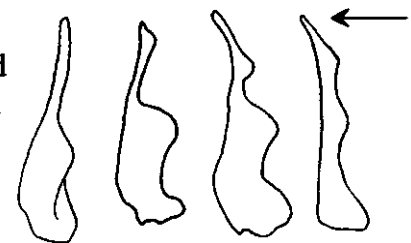
9' In lateral view, aedeagus longer, without submedial hump ..... *H. excavatus*



10(6') In lateral view, tip of aedeagus curved dorsally .. *H. sp. 4*

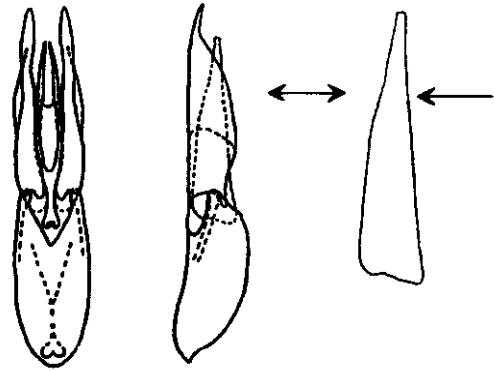


10' In lateral view, tip of aedeagus mostly straight, not curved dorsally ..... 11



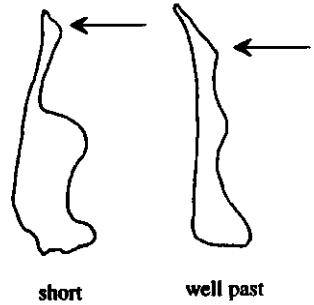
11(10') In lateral view, dorsal margin of aedeagus mostly straight ..... *H. rufipes*

11' In lateral view, dorsal margin of aedeagus strongly undulated (figs. below) ..... 12

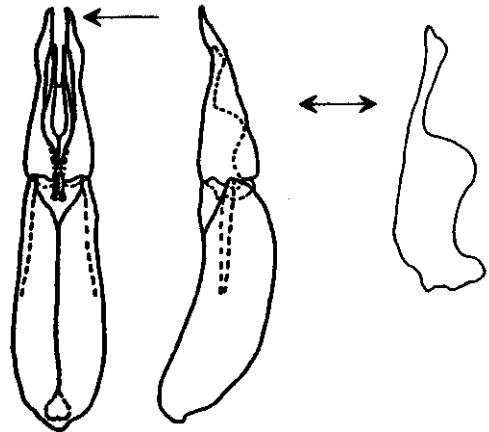


12(11') In lateral view, tip of aedeagus extends at most only short distance past last dorsal hump ..... 13

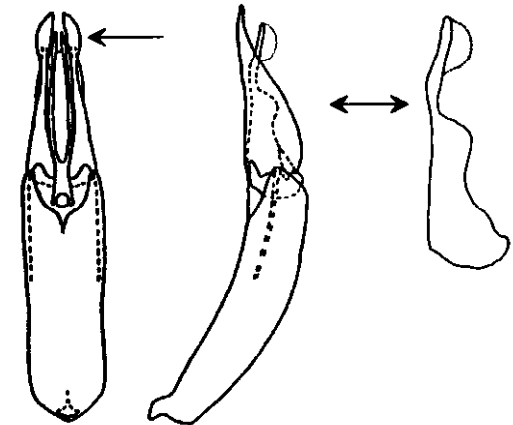
12' In lateral view, tip of aedeagus extends well past last dorsal hump ..... 14



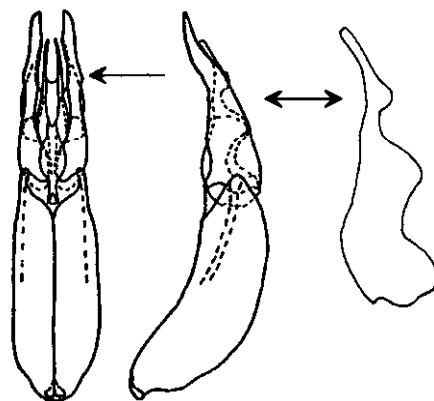
13(12) In dorsal view, parameres attenuated apically ..... *H. sp. 6*



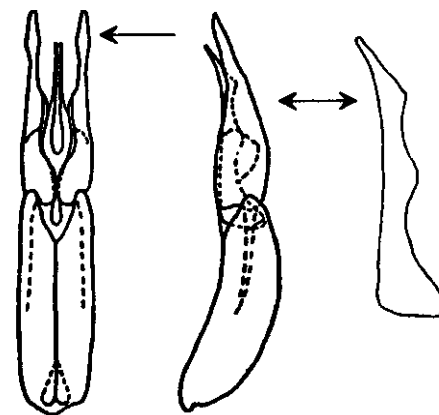
13' In dorsal view, parameres expanded preapically ..... *H. sp. 8*



- 14(12') In dorsal view, parameres slightly widened past midlength and gradually narrowed to apex; aedeagus more deeply undulating dorsally ..... *H. sp. 3*



- 14' In dorsal view, parameres narrowed and then expanded before apex; aedeagus not as deeply incised dorsally ..... *H. inaequalis*



#### Notes on species

- H. callosus* - Length 3.4-5.6 mm. Large specimens may be confused with *H. rugosus*, but *H. callosus* is much broader, lacks a well-defined epicranial suture (two deep pits are present) and has different genitalia. Most specimens have well developed calli on the posterior third of the elytra. Found throughout northern FL and at least as far south as Okeechobee Co., *H. callosus* is often collected in lentic habitats.
- H. excavatus* - Length 2.8-3.3 mm. An uncommon species, known in Florida from Duval, Jefferson, Liberty and Putnam Counties.
- H. inaequalis* - Length 2.6-3.5 mm. Occurs in the state from the Panhandle to at least as far south as Palm Beach Co.
- H. minimus* - Length 1.6-2.0 mm. A tiny species with very distinctive elytra; known from Walton to Pinellas Counties. The odd numbered intervals (sutural, 3rd, 5th, 7th and 9th) are elevated and ridge-like through their entire length; the even numbered intervals are depressed and appear as spots between 2 rows of punctures.
- H. rufipes* - Length 2.7-3.8 mm. Known from northern Florida to at least as far south as the Tampa area.
- H. rugosus* - Length 4.8-6.1 mm. The largest species in Florida and the Nearctic, found throughout the state. I am considering *H. hanoewanti* Makhan, described by Makhan (1994) from a single specimen collected near Jacksonville, to be a junior synonym.
- H. simplex* - Length 2.5-3.0 mm. Hellman (1975) considered *H. equicarinatus* Blatchley as a junior synonym of *H. simplex*, a position also adopted in this manual. This species is

common and widespread throughout the state. Hellman (1975:fig. 206) does not illustrate the membranous apicodorsal lobe present on the median lobe of the genitalia, although it is present on specimens in the FSCA identified by him.

- H. sp. 1* - Length 2.7-3.6 mm. Described by Hellman (1975:78) as "*H. falsus*". In Florida, known from Alachua and Putnam Counties; also known from AL and GA.
- H. sp. 2* - Length 2.6-3.9 mm. Described by Hellman (1975:73) as "*H. prolatus*". It occurs on the coastal plains from Mississippi to Vermont; in Florida it is relatively common and known from the Panhandle south to Highlands Co. In some specimens, the base of the epicranial suture is visible, but the lateral arms are indistinct.
- H. sp. 3* - Length 2.7-3.6 mm. Described by Hellman (1975:143) as "*H. punctulatus*". In Florida, known from the northern part of the state to the Keys.
- H. sp. 4* - Length 2.8-3.4 mm. Described by Hellman (1975:155) as "*H. sandrae*". In Florida, known from the northern peninsula south to Palm Beach Co.
- H. sp. 5* - Length 2.7-3.8 mm. Described by Hellman (1975:216) as "*H. undulatus*". It apparently occurs throughout the state, including the Keys.
- H. sp. 6* - Length 2.2-2.8 mm. Described by Hellman (1975:139) as "*H. woodi*". This may be the same species described from a single GA specimen by Makhan (1995) as *H. schereri* (Makhan, pers. comm.). However, Makhan's (1995) description and illustration are not sufficient to identify the taxon; its close resemblance to *H. sp. 3* necessitates examination of the type of *H. schereri* before the name can be applied to either taxon. *Hydrochus sp. 6* is an abundant species found, in Florida, from the northern part of the state to at least as far south as Highlands Co.
- H. sp. 7* - Length 3.7-4.5 mm. Described by Hellman (1975:65) as "*H. youngi*". In Florida, known from the northern part of the state to at least as far south as Highlands Co.
- H. sp. 8* - Length 3.8-3.9 mm. I have a single specimen of this taxon from Jackson Co.; it appears to be the same as the species described from only two Louisiana specimens as "*H. caumatis*" by Hellman (1975:124), except the median aedeagal lobe bears a membranous apicodorsal lobe not illustrated by Hellman (1975:fig. 190). Note that a similar lobe is also not illustrated for *H. simplex* (Hellman 1975:fig. 206).

Following the distribution of species noted in Hellman (1975), several species of *Hydrochus* keyed in Young (1954) do not occur in Florida. These include *H. foveatus* Haldeman, *H. scabratus* (Mulsant) and *H. subcupreus* Randall; these taxa are more northern or western in distribution.



Genus *Hydrophilus*

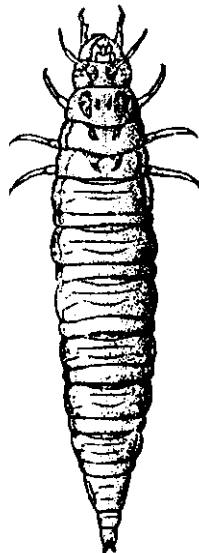
**DIAGNOSIS:** Larvae are distinguished by the semi-globose head shape; uniramal antennae; ligula shorter than first palpal segment; asymmetrical mandibles, the right thinner, with a bifid tooth, the left stouter, with one tooth; partially sclerotized pronotum; and 8 complete abdominal segments, without lateral setiferous lobes.

Adults are distinguished by the very large size; the sulcate, anteriorly closed prosternal process; and meso- and metasternum with a continuous median longitudinal keel that is prolonged posteriorly into a spine.

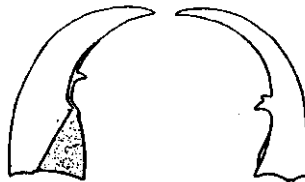
**NOTES:** Two species of this widespread genus are found in the U.S.; both are recorded from Florida. A third species may possibly occur in the extreme southern part of the state. This genus contains the largest water beetles in Florida, rivaled only by *Dibolocelus* and the dytiscid *Cybister*.

These large beetles are apparently more often collected at lights, such as in well-lit parking lots, than in aquatic sampling.

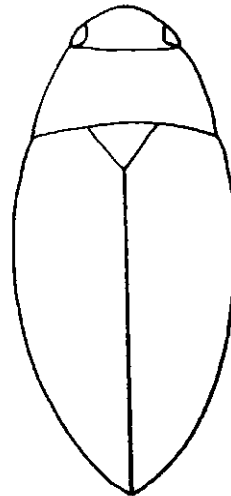
**ADDITIONAL REFERENCES:** Richmond 1920; Testa & Lago 1994.



*H. triangularis*, larva  
(adapted from Richmond 1920)



*H. triangularis*, larval mandibles  
(adapted from Richmond 1920)



*H. triangularis*, adult

Key to adult *Hydrophilus* of Florida

1 Bare area of 2nd visible abdominal sternite smaller, roughly triangular in shape ..... *H. ater*  
(Not recorded from Florida, but may occur in extreme southern part of state.)



1' Bare area of 2nd visible abdominal sternite larger, trapezoidal in shape ..... 2



2(1') Apex of each elytron with a fine tooth; anterior tarsi of male with 5th segment greatly expanded and angulate anteriorly; S FL only ..... *H. insularis*



2' Apex of each elytron without a fine tooth; anterior tarsi of male with 5th segment moderately expanded and simply convex anteriorly; throughout FL .....  
..... *H. triangularis*



Notes on species

*H. ater* - Length about 33 mm. This species has not been recorded from Florida, but may eventually turn up in the extreme southern portion of the state. It is known from the Bahamas and Mexico.

*H. insularis* - Length 33-36 mm. In Florida, known from Dade and Monroe Counties. It has been collected from brackish pools in the Keys, as well as in cattail marshes and a swimming pool.

*H. triangularis* - Length 32-40 mm. The largest water beetle in Florida. It is the more common and widespread species, often found in weedy ponds and similar habitats with deeper water.

Genus *Paracymus*

**DIAGNOSIS:** Larvae are distinguished by the biramal antennae; clypeus with 5 medial teeth; ligula apparently 2-segmented, subequal to labial palpi; posterior margin of frons truncate; symmetrical mandibles, with 2 inner teeth; legs reduced, not visible from above, but with claws; and 8 complete abdominal segments.

Adults are distinguished by the very small size and metallic sheen; carinate prosternum; last segment of maxillary palp distinctly longer than preceding segment; elytron with sutural stria on about posterior half, no other striae present; mesosternum with a transverse pyramidal protuberance with longitudinal ridge behind it, or a continuous longitudinal ridge; hind femur without dense pubescence basally; and all tarsi 5-segmented with first tarsomere of middle and hind legs shorter than the 2nd segment.

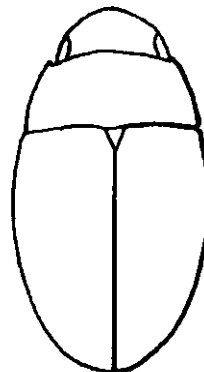
**NOTES:** Fifteen species of *Paracymus* are recorded from North America north of Mexico; at least 7 occur in Florida. Their small size makes them difficult to identify and collect (they will pass through the mesh of many aquatic nets).

*Paracymus* are found in small sand-bottomed streams to swamps, ditches and ponds. They are often associated with thin-bladed aquatic vegetation. Specimens are also occasionally collected under wet debris on shorelines.

**ADDITIONAL REFERENCES:** Richmond 1920; Wooldridge 1966, 1978; Testa & Lago 1994.



*Paracymus* larva  
(adapted from Richmond 1920)



*P. subcupreus*, adult

Key to adult *Paracymus* of Florida

1 Mesosternum with a continuous medial longitudinal ridge that meets the transverse ridge; antennae 7-segmented ..... 2



1' Mesosternum with the longitudinal ridge poorly developed, not reaching transverse ridge; antennae 7- or 8-segmented ..... 5



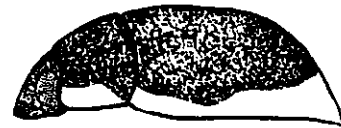
ventral view

lateral view

2(1) Elytra densely microreticulate, appearing dull between the difficult to discern punctures ..... *P. degener*

2' Elytra smooth and shining between well defined punctures ..... 3

3(2') Pronotum and elytra with a wide, sharply defined pale border ..... *P. lodingi*



*P. lodingi*

3' Pronotum and elytra without a sharply defined pale border, although lateral margins may become gradually paler in some specimens ..... 4

4(3') Ventral surfaces and femora reddish-brown to brownish-yellow; mid femora pubescent on basal half; hind femora with longitudinal strigae ..... *P. nanus*



*P. nanus*, mid femur

4' Ventral surfaces and femora black; mid femora pubescent on basal 2/3; hind femora smooth and polished, with minute punctures but without longitudinal strigae ..... *P. seclusus*  
(Not recorded from Florida, but may occur in western part of state.)



*P. nanus*, hind femur

5(1') Elytra densely microreticulate, appearing dull between punctures; antennae 7-segmented ..... *P. reductus*

5' Elytra smooth and shining between punctures; antennae 8-segmented ..... 6

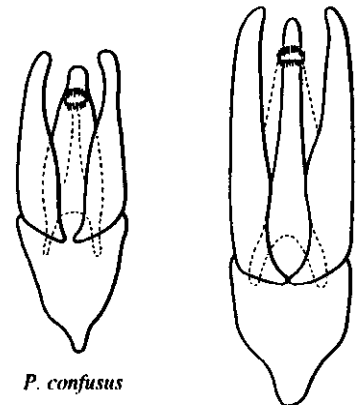
6(5') Genitalia with parameres mostly flat and straight, angled inward only near apex and median lobe subequal to parameres; male protarsal claws equal and thin ..... *P. dispersus*



6' Genitalia with parameres more rounded, curved throughout length or median lobe shorter than parameres (figs. below); male protarsal claws either equal and thick or dissimilar ..... 7

(adapted from Wooldridge 1966)

- 7(6') Genitalia with median lobe shorter than parameres and more robust, median lobe meeting inner margin of parameres at about apical 1/3 of median lobe's length; male protarsal claws dissimilar; length usually < 2.2 mm ..... *P. confusus*
- 7' Genitalia with median lobe subequal to parameres and thinner, median lobe meeting inner margin of parameres at about basal 1/3 of median lobe's length; male protarsal claws equal, thickened; length usually > 2.2 mm ..... *P. subcupreus*

*P. confusus**P. subcupreus*

(adapted from Smetana 1988)

### Notes on species

- P. confusus* - Length 1.9-2.1 mm. An apparently common species found throughout the state. This species has been identified in part as *P. reductus* in the past (several specimens from Young collection in FSCA later determined by Wooldridge), although it is most easily confused with *P. subcupreus*. The aedeagal differences and the thickened anterior protarsal claw (when viewed head-on) of the male will separate males, but females are basically inseparable. In many *P. confusus*, the punctation of the pronotum is confused, i.e., there are areas without punctation and/or where punctures are coalesced; pronotal punctation in *P. subcupreus* is more uniform. However, Testa & Lago (1994) noted that these "pronotal characters are grossly evident on some specimens, but they are not on others. They do seem to hold true more often for females than males, but in general, females of these two species cannot be separated reliably". It would seem from the size ranges given in Testa & Lago (1994) (1.9-2.1 mm for *P. confusus*; 2.3-2.6 mm for *P. subcupreus*) that size alone may differentiate these two taxa. Smetana (1988) also dealt with these two species; he gave much smaller and overlapping size ranges (1.5-2.0 mm for *P. confusus*; 1.8-2.2 mm for *P. subcupreus*). Due to the closer proximity of Mississippi to Florida, for this manual I've used the size ranges from Testa & Lago (1994). You must rely on the male genitalia to separate these two species! See also *P. dispersus* and *P. subcupreus*.
- P. degener* - Length 1.6-1.8 mm. Similar to *P. reductus*, but the mesosternal ridge is complete; in *P. reductus*, the longitudinal ridge is interrupted before the transverse crest. The elytral punctation of *P. degener* is almost invisible through the dense microreticulation. The species is recorded from peninsular Florida, with doubtful records from Okaloosa and Taylor Counties.
- P. dispersus* - Length about 1.9 mm. Originally described from South Carolina and Jackson Co., I've seen additional material from Gadsden and Hardee Counties. An apparently uncommon species that can be confused with *P. confusus* and *P. subcupreus* (q.v.), but can be separated by male genitalia characters. With *P. dispersus*, note the flattened parameres with straight outer and inner margins; parameres of the other two species are

more rounded, have somewhat knob-like apices, and are more curved. See also *P. confusus* and *P. subcupreus*.

*P. lodingi* - Length 2.2-2.6 mm. The distinctive, sharply defined pale lateral borders and large size (for this genus) easily identify this species, which is usually found in brackish water situations. It occurs along the Gulf Coast from the Keys to at least as far west as Mississippi and also occurs in the Bahamas. Note that this species superficially resembles *Cercyon praetextatus*; careful attention to generic characters will separate the two taxa.

*P. nanus* - Length 1.5-1.8 mm. A common and widespread species found throughout the state. This species possesses a very well developed longitudinal mesosternal crest.

*P. reductus* - Length 1.6-2.2 mm. A common species that occurs throughout the state. Wooldridge (1966) noted that many of Young's (1954) records of *P. despectus* (LeConte) probably referred to *P. reductus*; *P. despectus* is unknown from Florida.

*P. seclusus* - Length 1.8-2.2 mm. Not recorded from Florida but may eventually be found in the western or northern parts of the state. This species is known from only 3 specimens from coastal Mississippi.

*P. subcupreus* - Length 2.3-2.6 mm. A widespread species in the U.S. east of the Rockies, probably found throughout Florida. This species is easily confused with *P. confusus* and *P. dispersus*. In addition to the male genitalia, the protarsal claws of the male, when viewed head-on, can provide useful characters. In *P. subcupreus* both claws are thickened; in *P. dispersus* both claws are thin; and in *P. confusus* the anterior claw is thickened while the other is thin. See also *P. confusus* and *P. dispersus*.

Genus *Phaenonotum*

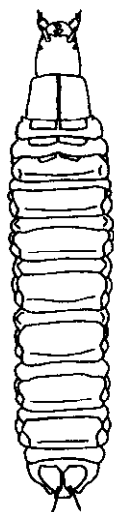
**DIAGNOSIS:** Larvae are distinguished by the biramal antennae; ligula smaller than palpi; mandible with 2 large inner teeth; clypeus with trifid median projection; small legs with claws; and 8 complete abdominal segments.

Adults are distinguished by the antennal bases that are concealed from above by an expanded lateral margin of the head; lateral margins of head not abruptly narrowed before eyes; 9-segmented antennae; maxillary palpi shorter than antennae, with 2nd segment much thicker than the 3rd and 4th; elytra completely without striae; and the 5-segmented mid and hind tarsi with the 1st segment longer than the 2nd.

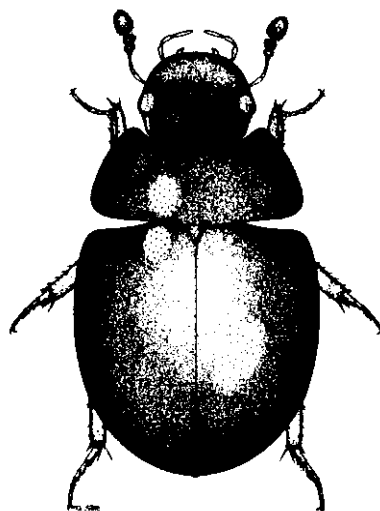
**NOTES:** *Phaenonotum* is a member of the hydrophilid subfamily Sphaeridiinae; this subfamily differs from the other hydrophilids in that most of its members are terrestrial, living in decaying organic matter such as dung. However, members of two genera, *Cercyon* and *Phaenonotum*, can be considered semi-aquatic and may be collected along water margins. Archangelsky & Durand (1992b) reported the larvae of *P. exstriatum* from rotting plant debris and, in Florida, on the floating aquatic fern *Salvinia*.

*Phaenonotum* is a mostly Neotropical genus, with two species found in North America; both occur in Florida. The most commonly encountered species, *P. exstriatum* (length 2.3-4.0 mm), is larger, less broadly oval and has the apical portion of the clypeus finely and densely punctate; *P. minor* (length 1.6-2.4 mm) is smaller, more broadly oval and has the apical portion of the clypeus finely but sparsely punctate.

**ADDITIONAL REFERENCES:** Archangelsky & Durand 1992b; Smetana 1978; Testa & Lago 1994.



*P. exstriatum*, larva  
(adapted from Archangelsky & Durand 1992b)



*P. exstriatum*, adult  
(adapted from Smetana 1978)

Genus *Sperchopsis*

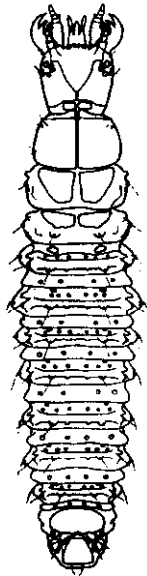
**DIAGNOSIS:** Larvae are distinguished by the biramal antennae; clypeus with 5 median teeth, the central tooth minute; symmetrical mandibles, with 3 inner teeth; entire prosternum, without a mesal fracture; well-developed legs with claws; and 8 complete abdominal segments.

Adults are distinguished by the moderate size, strongly convex body form and reddish-brown coloration; anteriorly emarginate clypeus and labrum; maxillary palp with last segment longer than preceding segment; serrate lateral margins of pronotum and elytra; striate elytra; and all tarsi 5-segmented with first tarsomere of middle and hind legs shorter than the second.

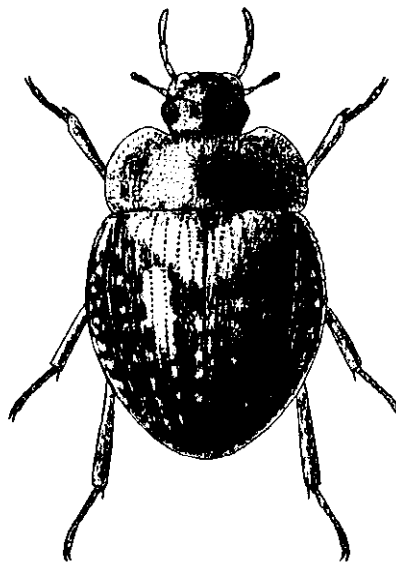
**NOTES:** A monotypic genus; the sole species, *S. tessellata* (length 6.0-7.5 mm), occurs throughout the eastern U.S and southeastern Canada. In Florida it is known to occur from Alachua Co. and northward.

In Florida, *S. tessellata* prefers swiftly running sand-bottomed streams, where it occurs among rootlets below undercut banks, in leaf packs and on submerged logs and branches. With its head partially retracted into the pronotum and its convex form, this beetle is reminiscent to me of a tiny box turtle.

**ADDITIONAL REFERENCES:** Spangler 1961.



*S. tessellata*, larva  
(adapted from Spangler 1961)



*S. tessellata*, adult  
(adapted from Hansen 1991b)



Genus *Tropisternus*

**DIAGNOSIS:** Larvae are distinguished by the subrectangular head; uniramous antennae; clypeus with numerous small teeth; simple apex of ligula; mostly symmetrical mandibles with 1 or 2 inner teeth (proximal inner teeth may not be similar); entirely sclerotized pronotum; much reduced, triangular meso- and metanotal sclerites; and 8 complete abdominal segments, with lateral gills of segment 9 short.

Adults are distinguished by the medium size; last segment of maxillary palp as long or longer than preceding segment; medially sulcate prosternum; meso- and metasternal keel that projects posteriorly past the posterior margin of the first abdominal segment; and all tarsi 5-segmented with first tarsomere of middle and hind legs shorter than second.

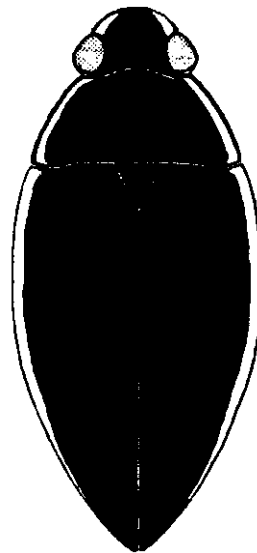
**NOTES:** Fourteen species of this large New World genus occur in North America north of Mexico; five are known from Florida. Spangler (1960) revised the genus and elevated four subgenera to generic status, but his excellent study has not been published.

*Tropisternus* is one of the most ubiquitous water beetle genera in Florida, being found in almost any standing water habitat; occasionally individuals are collected in dense vegetation in running water. Several species may occur together at one site.

**ADDITIONAL REFERENCES:** Spangler 1960.



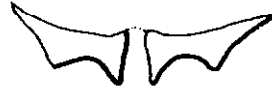
*Tropisternus* sp., larva  
(adapted from Richmond 1920)



*T. lateralis nimbatus*, adult

Key to adult *Tropisternus* of Florida

1 Prosternal sulcus open anteriorly; elytra with numerous, variable longitudinal stripes ..... *T. collaris*

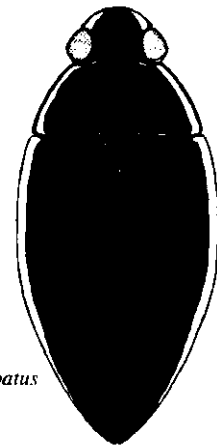


*T. collaris*  
(adapted from Young 1954)

1' Prosternal sulcus closed anteriorly; elytra unpatterned or with marginal stripe only ..... 2



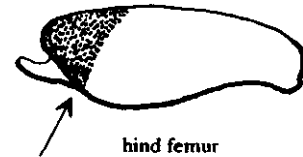
2(1') Head, pronotum and elytra with yellow border ..... *T. lateralis nimbatus*



*T. lateralis nimbatus*

2' Head, pronotum and elytra completely dark ..... 3

3(2') Legs mostly black or very dark reddish-brown; pubescent area at base of hind femur small, beginning near apex of trochanter forward to anterior edge of femur; size larger, usually > 11 mm ..... *T. natator*



hind femur

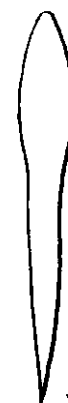
3' Femora bicolored or banded with reddish-brown to brownish-yellow; tibiae either completely brownish-yellow or dark with reddish-brown/brownish-yellow medial band; pubescent area at base of hind femur larger, extending farther along posterior margin of femur adjacent to apex of trochanter; size smaller, < 11 mm ..... 4



- 4(3') Tibiae dark with reddish-brown to brownish-yellow medial band; hind femora with basal pubescent area smaller, somewhat triangular; mesosternal portion of ventral keel wider; ventral spine of last abdominal sternite well developed; widespread, usually freshwater species ..... *T. blatchleyi*



hind femur



ventral keel

- 4' Tibiae completely brownish-yellow; hind femora with basal pubescent area larger, trapezoidal; mesosternal portion of ventral keel narrower; ventral spine of last abdominal sternite moderately developed to rudimentary; coastal, usually brackish water species ..... *T. quadristriatus*



#### Notes on species

*T. blatchleyi* - Length 7.0-10.5 mm. A common species found throughout the state. I have seen numerous specimens misidentified as *T. natator*. I believe this may in part be due to a typo in the widely used key to *Tropisternus* offered by Brigham (1982: 10.94): the first rubric of couplet 4 should lead to couplet 6, not 5; the second rubric should lead to couplet 5, not 6. The smaller size, unmarked dorsum, banded reddish-black legs and presence of a well developed ventral spine on the last abdominal segment usually easily identify this species. There are two subspecies; only *T. b. blatchleyi* occurs in Florida.

*T. collaris* - Length 7-11 mm. A common and abundant species throughout most of the state. This species lacks a ventral spine on the last abdominal segment; all other FL species possess a well developed posteriorly directed spine on the last segment, except *T. quadristriatus*, in which the spine is moderately developed to rudimentary. Dorsal coloration of *T. collaris* varies from almost completely dark, with thin, barely visible greenish-yellow stripes, to individuals that are brightly marked with yellow stripes and a broad yellow marginal band. Note that dark individuals might be mistaken for *T. lateralis nimbatus*; check for the anteriorly open prosternum of *T. collaris* and the lack of a ventral spine on its last abdominal sternite. The taxonomy of this species is unsettled; I follow Testa & Lago (1994) in the application of the name *T. collaris* to this taxon, which has borne several species and subspecies names in various combinations, including *T. striolatus* (LeConte), *T. mexicanus striolatus* (LeConte), *T. m. viridis* Young and Spangler, *T. collaris striolatus* (LeConte) and *T. collaris viridis* Young and Spangler.

- T. lateralis nimbatus* - Length 7.5-10.0 mm. A common and widespread species, found throughout the state. Of the 8 subspecies recognized by Spangler (1960), only *T. lateralis nimbatus* occurs east of the Rockies. The yellow border can be quite narrow. See also *T. collaris* above.
- T. natator* - Length 8.5-12.5 mm. Spangler (1960) described Florida and S GA specimens of *T. natator* as a separate subspecies (unfortunately not usable because his study has not yet been "officially" published); these are larger (11.5-12.5 mm for FL/S GA specimens, 8.7-12.0 mm over the rest of the species' range) and have maxillary palpi that are dark reddish-brown (northern specimens have palpi that are brownish-yellow with darker apices). The femora of *T. natator* are mostly black, with at most the apices a reddish-brown.
- T. quadristriatus* - Length 8.5-10.5 mm. A coastal, brackish water species, known to occur from Massachusetts to Mississippi. There are numerous records for the Keys and several coastal localities from Miami to Dunedin; Spangler (1960) gave a record for Gainesville, and I've collected the species at St Marks National Wildlife Refuge in Wakulla Co. The ventral spine on the last abdominal segment varies from a short spine to a tuft of setae. The dark basal area of the mostly yellow (usually) hind femur coincides with the large basal pubescent patch.

### Family Noteridae

**DIAGNOSIS:** Larvae are distinguished by the head which is partially hidden by the pronotum; basally stout mandible with an enlarged molar area; short, stout, apparently 5-segmented legs; tarsi with 2 claws; abdomen with 8 visible segments that appear capable of telescoping (sliding into each other); and last abdominal segment with a pair of terminal spiracles.

Adults are distinguished by the filiform antennae; maxillary palpi shorter than the antennae; concealed scutellum; distinctly 5-segmented fore and mid tarsi; first abdominal sternite completely divided by the hind coxae; and the hind tarsi with 2 equal claws.

**NOTES:** Six genera of this mostly tropical family occur in North America north of Mexico; all six are found in Florida, including 12 species. Noterids are most often found in standing water, where they are usually associated with algae, plants and plant roots. Adults are predacious; larvae may be omnivores.

Most noterids are easily identified by the well developed ventral "noterid platform", a large, flattened V-shaped platform formed by the prosternal process, metasternal "keel" and inner hind coxal laminae (this platform is reduced in *Notomicrus*), and by the presence of a strong, hooked spur at the apex of the foretibia (absent in *Notomicrus* and weak in *Mesonoterus* and *Pronoterus*). Males are distinguished by the set of small suction cups at the apex of the enlarged first tarsal segment of the fore and mid tibiae.

The larvae of *Notomicrus*, *Mesonoterus* and *Pronoterus* are undescribed. However, larvae that resemble *Hydrocanthus* collected from an herbaceous marsh in Lee County may belong to either *Mesonoterus* or *Pronoterus* (they appear to be too large to be *Notomicrus*); these larvae are included in the larval key as "*Mesonoterus/Pronoterus* ? sp."

**ADDITIONAL REFERENCES:** Beutel & Roughley 1987.

#### Key to larvae of Florida Noteridae genera

(Larvae of *Mesonoterus*, *Notomicrus* and *Pronoterus* are undescribed)

- 1 3rd antennal segment not longer than 4th; mandible with a stout preapical tooth ..  
..... *Suphisellus*
- 1' 3rd antennal segment more than twice as long as 4th; mandible not strongly toothed .... 2

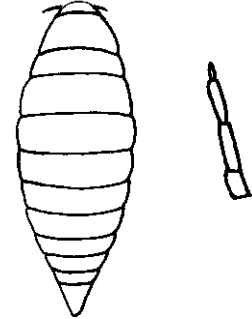
Noteridae 9.2

- 2(1') Body globular; 3rd antennal segment about 12 times length of 4th; mandible serrulate ..... *Suphis*

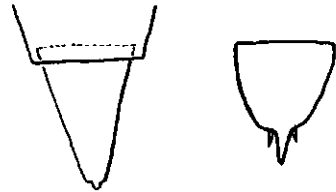


*Suphis*  
(adapted from  
Spangler & Folkerts 1973)

- 2' Body cylindriform, not globular; 3rd antennal segment about 3 times longer than 4th ..... 3



- 3(2') Last abdominal segment long, conical, with a short dorsal projection ..... *Hydrocanthus*

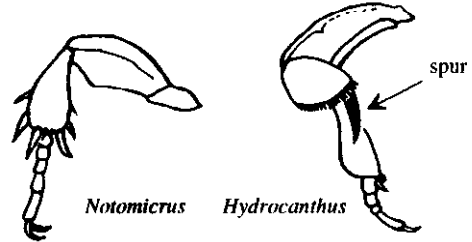


- 3' Last abdominal segment shorter, stouter, with a longer dorsal spine ..... *Mesonoterus/Pronoterus ?*

*Hydrocanthus*      *Mesonoterus/Pronoterus ?*

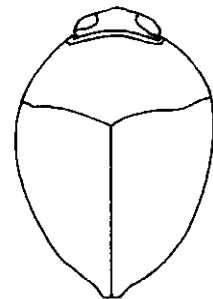
**Key to adults of Florida Noteridae genera**

- 1 Size < 1.5 mm; fore tibia without a curved hook or spur (large setae are present) ..... *Notomicrus*



- 1' Size 1.9 mm or more; fore tibia with a curved hook or spur ..... 2

- 2(1') Body form very broad, almost hemispherical; hind coxae widely separated; color black with irregular reddish markings (sometimes indistinct) ..... *Suphis*

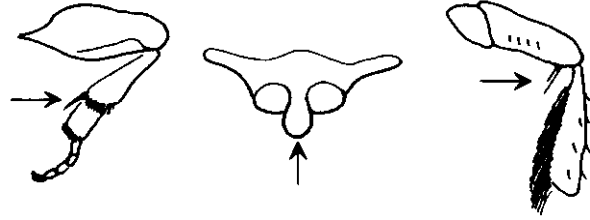


*Suphis*

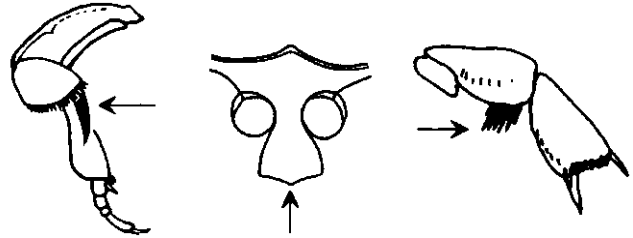
- 2' Body form more elongate; hind coxae contiguous or approximate; unicolored or bicolored, but never black with irregular reddish markings ..... 3

Noteridae 9.3

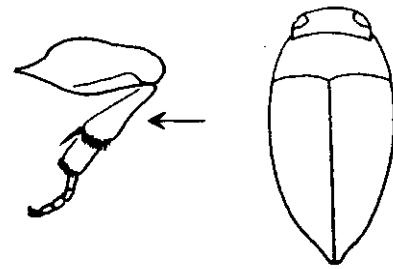
3(2') Fore tibial spurs weak; prosternal process rounded apically; hind femora with weak angular setae ..... 4



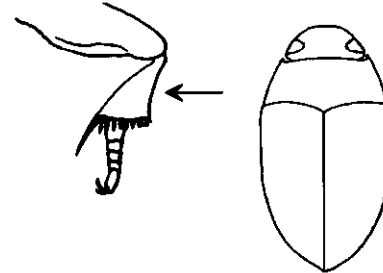
3' Fore tibial spurs strong, curved and conspicuous; prosternal process widened and truncate or slightly triangular apically; hind femora with strong angular cilia ..... 5



4(3) Fore tibia elongate; body form more attenuate posteriorly; length 2.7 mm or more ... *Mesonoterus*



4' Fore tibia broader, triangular; body form more oval; length 2.6 mm or less ..... *Pronoterus*



5(3') Length usually > 4 mm; apical segment of maxillary palp truncate or very shallowly notched ..... *Hydrocanthus*



5' Length 3 mm or less; apical segment of maxillary palp deeply notched ..... *Suphisellus*



*Hydrocanthus*

*Suphisellus*

Genus *Hydrocanthus*

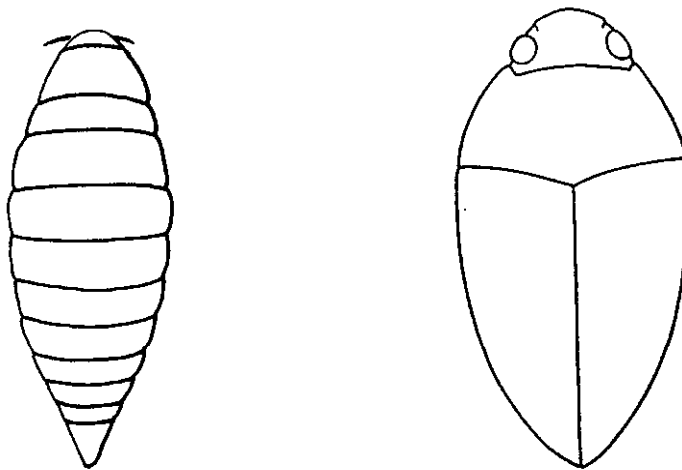
DIAGNOSIS: Larvae are distinguished by the somewhat cylindrical body form; simple mandible; 3rd antennal segment about 3 times longer than 4th; and the long conical last abdominal segment bearing a short dorsal projection.

Adults are distinguished by the larger size (for a noterid) of 4 mm or more; truncate to shallowly notched apical segment of the maxillary palp; very broad apex of the prosternal process; well developed curved hook/spine on the fore tibia; broadly truncate apex of the prosternal process; hind coxae contiguous; and hind femur with well developed angular cilia.

NOTES: Five species of *Hydrocanthus* are known from America north of the Mexico; three species occur in Florida. *Hydrocanthus* are commonly found in most lentic situations, where they are often associated with floating mats of algae and other vegetation. Identification of light colored individuals of normally dark species can be difficult; in males the depth of the prosternal/metasternal depression, presence or absence of metasternal tubercles and the shape of the aedeagus provide useful characters.

Males can be distinguished from females by the set of small suction cups at the apex of the first tarsal segment of the fore and mid legs. Adult figures below are adapted from Young (1954); aedeagal figures are adapted from Young (1985).

ADDITIONAL REFERENCES: Young 1985.

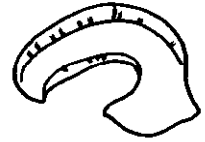


*Hydrocanthus* sp., larva & adult



**Key to adult *Hydrocanthus* of Florida**

1 Typically bicolored, with pronotum yellowish/reddish-brown and elytra darker, brown to blue-black; aedeagus as figured ..... *H. atripennis*

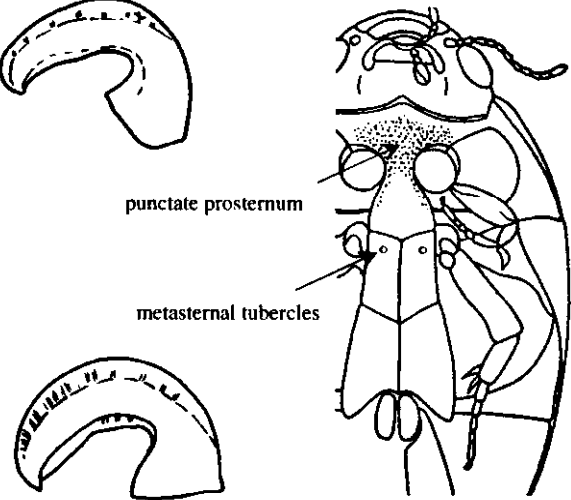


1' Typically unicolored, either light to dark reddish brown or dark brown/blue-black ..... 2

2(1') Color usually light reddish-brown; male with prosternal-metasternal area shallowly depressed, with metasternal tubercles; male and female with prosternum and prosternal process setose/punctate; aedeagus thinner ..... *H. oblongus*



2' Color usually dark brown to bluish-black; male with prosternal-metasternal area deeply depressed, without metasternal tubercles (except in some small specimens); female with prosternum and prosternal process bare or nearly so; aedeagus wider ..... *H. regius*



*H. oblongus*

**Notes on species**

*H. atripennis* - Length 4.2-5.2 mm. Young (1985) noted that "the typical bicolored form [is] rare eastward in Florida ...", but did not state where in the state the species was found. I have collected a single male at St. Marks National Wildlife Refuge in Wakulla Co. and have seen one additional male from a fish pond in Santa Rosa Co. The prosternal/metasternal depression is shallow in *H. atripennis*. Males possess metasternal tubercles in small individuals, but tend to lack them in large individuals. Males and most females have a distinctly punctate prosternum and prosternal process, but some females may have this punctation reduced.

*H. oblongus* - Length 3.7-4.8 mm. Abundant throughout the state and no doubt the most common species of *Hydrocanthus* here. The elytra may sometimes be slightly darker than the head/pronotum.

*H. regius* - Length 4.2-5.8+ mm. The deeply impressed prosternal/metasternal region will help identify light-colored males of this species; females are easily identified by the lack of punctation on the prosternum and prosternal process. Note that males have punctate prosterna.

Genus *Mesonoterus*

DIAGNOSIS: Larvae are undescribed. Unassociated larvae that might represent this genus (or *Pronoterus*) are similar to those of *Hydrocanthus* except the last abdominal segment is not as long/conical and bears a longer dorsal projection (see generic key for figure).

Adults are distinguished by the more apically attenuate elytra; males with four intermediate antennal segments enlarged; rounded apex of the prosternal process; and the more elongate fore tibia with a weak apical spine.

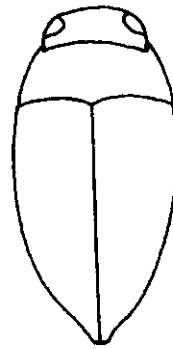
NOTES: One species, *M. addendus* (length 2.7-3.0 mm), of this mostly tropical genus occurs in Florida. It was formerly placed in *Pronoterus*. In gross comparison to *P. semipunctatus*, *M. addendus* is larger and has more darkly colored elytra with denser punctation.

*Mesonoterus addendus* is commonly associated with the roots of water hyacinths in canals; the species is apparently confined to peninsular Florida.

ADDITIONAL REFERENCES: Guignot 1948.



adult fore leg



adult

*M. addendus*

Genus *Notomicrus*

DIAGNOSIS: Larvae are undescribed.

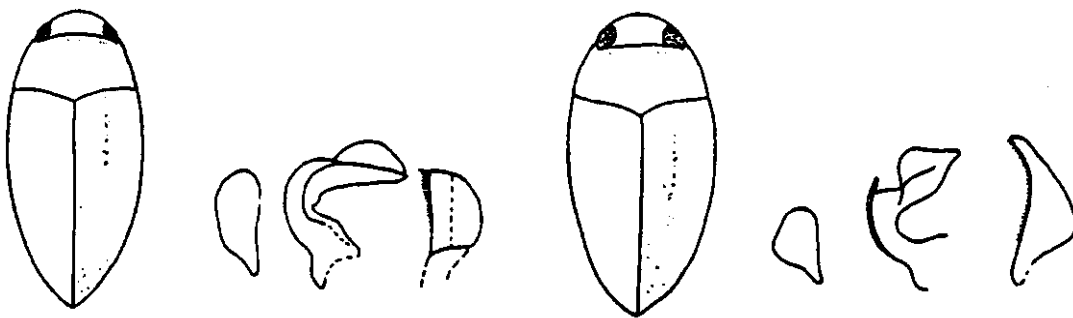
Adults are distinguished by the tiny size (< 1.5 mm) and the absence of a curved hook/spur on the foretibia.

NOTES: Two species of this predominantly tropical genus occur in Florida:

*Notomicrus nanulus* (length 1.2-1.4 mm) is more narrowly ovate and has deeply impressed dorsal microreticulation; in coloration the pronotum is light brownish yellow and the elytra a dark reddish brown. Young (1978b) stated that it occurs abundantly in woods ponds in northern and central Florida; Young (1954) stated that it also is sometimes found along the margins of streams. *Notomicrus nanulus* is also known from LA and GA, and occurs at least as far south as Charlotte and Glades Counties in Florida.

*Notomicrus sharpi* (length 1.2-1.4 mm) is more broadly ovate and has shining, less impressed microreticulation; in coloration the pronotum is yellow and the elytra a light reddish brown. Young (1978b) noted that this species (referred to as *Notomicrus* species ? in Young (1954)) may breed in brackish or temporary water situations. In Florida it is known only from the extreme southern portion of the state (Dade and Monroe Counties).

ADDITIONAL REFERENCES: Beutel & Roughley 1987; Young 1978b.



*N. nanulus*, adult and male genitalia  
(adapted from Young 1978b)

*N. sharpi*, adult and male genitalia  
(adapted from Young 1978b)

Genus *Pronoterus*

DIAGNOSIS: Larvae are undescribed. Unassociated larvae that might represent this genus (or *Mesonoterus*) are similar to those of *Hydrocanthus* except the last abdominal segment is not as long/conical and bears a longer dorsal projection (see generic key for figure).

Adults are distinguished by the more oval body form; males with one intermediate antennal segment slightly dilated; rounded apex of the prosternal process; and the broadened, triangular fore tibia with a weak apical spine.

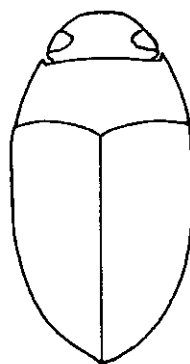
NOTES: One species, *P. semipunctatus* (length 2.3-2.6 mm), occurs in Florida, probably throughout the state (it occurs as far north as Michigan). In gross comparison to *M. addendus*, *P. semipunctatus* is smaller, more oval and has more lightly colored elytra with fewer, coarser punctations that are arranged in several weak striae.

*Pronoterus semipunctatus* is a species of standing water; I've collected numerous individuals from a pond choked with lily pads and submerged vegetation.

ADDITIONAL REFERENCES: Young 1953g.



adult fore leg



adult

*P. semipunctatus*

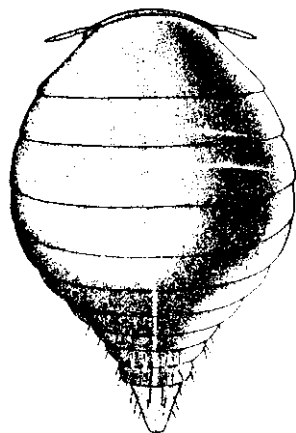
Genus *Suphis*

DIAGNOSIS: Larvae are distinguished by the globular body form; serrulate inner margin of the mandible; and 3rd antennal segment about 12 times as long as the 4th.

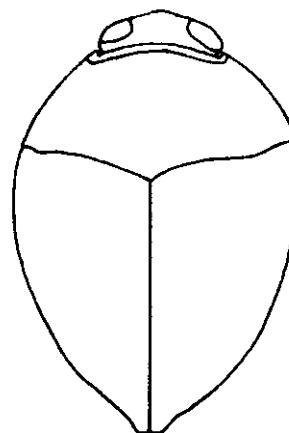
Adults are distinguished by the globose body form; apex of the foretibia with well developed hook/spur; hind coxae separate; and hind femur with well developed angular cilia.

NOTES: One species, *S. inflatus* (length 3.0-3.5 mm) of this predominantly Neotropical genus is found throughout Florida (although much less common west of the Apalachicola River). Previously considered the only member of the genus *Colpius*, Spangler & Folkerts (1973) demonstrated that the species belonged with *Suphis* and considered *Colpius* a junior synonym of *Suphis*. Adults of *S. inflatus* are readily recognized by their globose form and opaque black coloring, with irregular, sometimes indistinct, dark reddish markings. It is most commonly found in ponds, lakes and marshes.

ADDITIONAL REFERENCES: Spangler & Folkerts 1973.



*S. inflatus*, larva  
(adapted from Spangler & Folkerts 1973)



*S. inflatus*, adult

Genus *Suphisellus*

**DIAGNOSIS:** Larvae are distinguished by the antennae, with the 3rd segment not longer than the 4th; and the mandible with a stout preapical tooth.

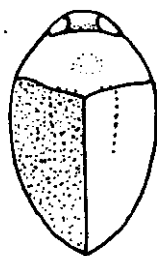
Adults are distinguished by the small size (1.9-3.0 mm); notched apical segment of the maxillary palp; well developed, curved hook/spine on the fore tibia; prosternal process that is not broader than long, with truncate apex; and hind femur with well developed angular cilia.

**NOTES:** Six species of this mostly tropical genus occur in North America north of Mexico; five are known from Florida.

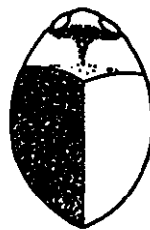
These common beetles most often occur in standing water, where they are usually found in decaying vegetation and among root masses. They are also encountered in slow moving swamp streams and along the vegetated margins of streams and rivers.

The possibility of one of the several Cuban/Caribbean species "accidentally" occurring in south Florida can not be discounted; be sure to check the key and descriptions (especially figures of the aedeagi) in Young (1979) if specimens will not key below. Genitalia and dorsal habitus figures below are adapted from Young (1979).

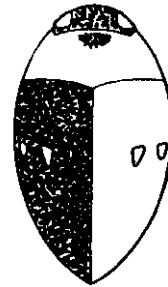
**ADDITIONAL REFERENCES:** Young 1979a.



*S. gibbulus*



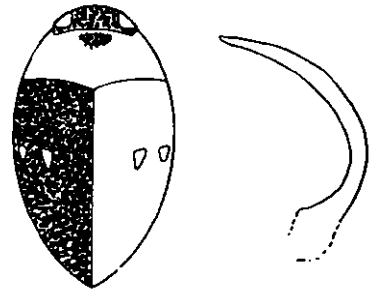
*S. insularis*



*S. puncticollis*

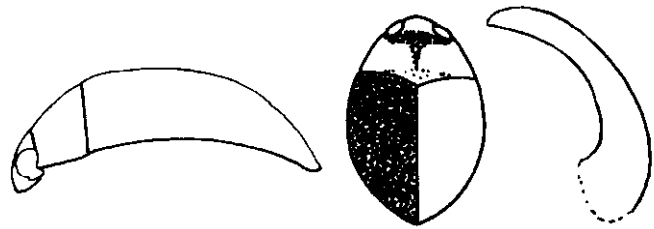
Key to adult *Suphisellus* of Florida

1 Elytra pitchy black to dark brown, with a transverse band of irregular light spots just behind the middle; size larger, 2.7-3.0+ mm; aedeagus as figured ..... *S. puncticollis*



1' Elytra uniformly light brown to dark reddish brown, without light spots on a dark background; size smaller, 2.8 mm or less; aedeagus not as figured above ..... 2

2(1') In lateral view, lateral margin of prothorax and elytra strongly arched; prosternum with medial groove; typical coloration of prothorax yellowish with a medial reddish blotch near the front margin; aedeagus as figured ..... *S. insularis*



2' In lateral view, lateral margin of prothorax and elytra feebly arched or straight; prosternum without medial groove; typical coloration of prothorax reddish or yellowish brown, rarely with a conspicuous median blotch; aedeagus not as figured above ..... 3



3(2') Elytra coarsely and closely punctate, with microreticulation between the punctures; aedeagus as figured ..... *S. parsonsi*



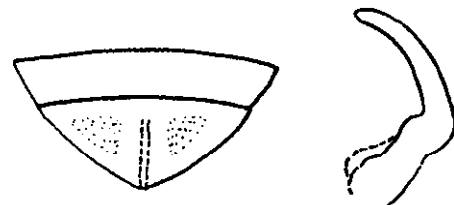
*S. parsonsi*

3' Elytra not as closely punctate, the space between punctures not noticeably microreticulate; aedeagus not as above ..... 4

4(3') Last visible abdominal sternite with an oval impression near middle or shallow transverse impression near front of sternite (most noticeable in females); aedeagus slender and attenuate near apex ..... *S. gibbulus*



4' Last visible abdominal sternite impressed on either side in males and females, more strongly so in female so that sternite may appear medially carinate; aedeagus slightly thicker with rounded apex ..... *S. bicolor*



(See Notes.)

## Notes on species

- S. bicolor* - Length 2.4-2.8+ mm. Young (1979) considered *S. bicolor* to consist of two subspecies: the typical *S. bicolor bicolor*, with yellow pronotum and very dark pitchy-brown to blue-black elytra, and *S. b. punctipennis*, a more unicolorous subspecies that may also have dark brown elytra (but not pitchy brown to blue-black). Specimens referred to as "*S. punctipennis* Sharp (?)" in Young (1954) were reclassified as teneral, lightly colored specimens of *S. gibbulus* in Young (1979); he thus considered that *S. bicolor* did not occur in Florida. He stated that *S. b. bicolor* ranged on the Coastal Plain from eastern Texas to Mobile Bay, AL; I've seen Florida specimens from a fish pond in Santa Rosa Co. He also noted that *S. b. punctipennis* was an inland (from the Coastal Plain) species whose southern limits ranged from Alabama to South Carolina (farthest south specimen from Montgomery Co., AL). Thus, the possibility exists that *S. b. punctipennis* might occur in the northern tier of Florida counties. A series of specimens in the FSCA collected by Young from Dixie, Franklin, Liberty and Taylor Counties from 1987 to 1993 bear Young's determination labels as *S. b. punctipennis*. However, examination of the aedeagi of the male specimens showed them to be *S. gibbulus*; females almost appeared to have the low medial carina on the last abdominal sternite attributed to *S. bicolor*, but the apparent carina was the ventral margin of the female genital valves that was visible through the integument.
- S. gibbulus* - Length 1.9-2.8 mm. The most common and abundant member of the genus in Florida, it occurs throughout the state. Coloration is variable; it may appear unicolorous or bicolorous, and may sport a weak medial blotch on the pronotum. The apically attenuated male aedeagus is distinctive. See also *S. bicolor* above.
- S. insularis* - Length 1.9-2.2 mm. Formerly known as *S. floridanus* (Blatchley). A small, humpbacked species that is often common in the southern part of the state; the northernmost record is from Alachua Co. The species is often abundant in decaying masses of water hyacinths. The pronotal medial blotch may be joined with dark markings at the base and apex in some specimens. Note also that this species has a longitudinal groove on the prosternum.
- S. parsonsi* - Length 2.5-2.7 mm. The microreticulation between the dense punctures on the elytra of this species is distinctive. It is known from Highlands Co. north to Georgia. Young (1979) noted that it may be a sphagnum bog species that is often confused with *S. gibbulus*. In *S. gibbulus* the elytral punctation is not as dense, and the microreticulation between the punctations is not as noticeable.
- S. puncticollis* - Length 2.7-3.0+ mm. In general, the largest and darkest *Suphisellus* in the state; it also bears an anteromedial pronotal blotch. A widespread species found throughout the state northward to Michigan and Ontario.



## Family Psephenidae

**DIAGNOSIS:** Larvae are distinguished by the dorsoventrally flattened, oval body form with the thoracic and abdominal segments greatly expanded laterally; and head completely hidden beneath pronotum.

Adults are distinguished by the soft body, which is broad and depressed; concealed mandibles; labrum not visible from in front; transverse fore coxae; 5-segmented tarsi with unlobed 3rd tarsal segment; and first abdominal sternite not divided by hind coxae.

**NOTES:** Only one genus, *Ectopria*, is known from Florida. *Ectopria* is a member of the subfamily Eubriinae; this subfamily (commonly known as "false water penny beetles") has been accorded family rank by some workers (Brigham 1981; 1982).

Two other psephenid genera, each with one eastern species, occur in northern Alabama and Georgia; a very remote possibility exists that one or both may eventually be found in western Florida. Larvae of *Psephenus herricki* (DeKay) possess external abdominal gills; larvae of *Dicranopselaphus variegatus* Horn (a senior synonym of *Alabameubria starki* Brown) have a gill-containing opercular chamber like *Ectopria* but possess a last abdominal segment that is apically notched. Adults of *P. herricki* can be recognized by the smooth posterior margin of the pronotum; adults of *D. variegatus* lack the bicolored pronotum of *E. thoracica* and have straight tibiae that are about 1.25 times the length of the tarsus.

Adults are not aquatic (although they may enter water to oviposit) and normally are not collected in aquatic sampling programs; they can be found on riparian vegetation or exposed rocks in streams.

Larvae are usually found on submerged wood, rocks and boulders in streams; Hilsenhoff & Schmude (1992) noted that *Ectopria* and *Psephenus* larvae were also collected in wave-swept shallows of lakes.

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Barr & Spangler 1994; Brown 1972; Brown & Murvosh 1974; Brigham 1982 (in part as Eubriidae); Hilsenhoff & Schmude 1992; Murvosh 1970; White & Brigham 1996.

**Genus *Ectopria***

**DIAGNOSIS:** Larvae are distinguished by the flattened, oval/round form; gills enclosed in an operculate chamber on the 9th abdominal segment (no external gills); and the rounded to truncate apex of the 9th abdominal segment.

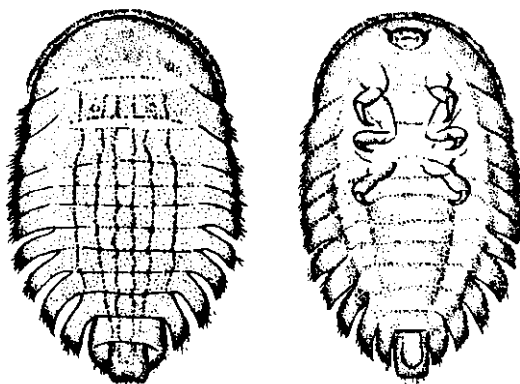
Adults are distinguished by the crenulate or beaded posterior margin of the pronotum; at least anterior male protarsal claw apically bifid; sinuate tibiae that are about as long as the tarsus; and slender tarsi with the 4th segment smaller than the 3rd and not extended beneath the 5th segment.

**NOTES:** Three species are known from North America; one species, *E. thoracica* (length 3-5 mm), occurs in Florida. Adults, which are not aquatic, are easily recognized by the bicolored prothorax and uniformly brownish-black to black elytra.

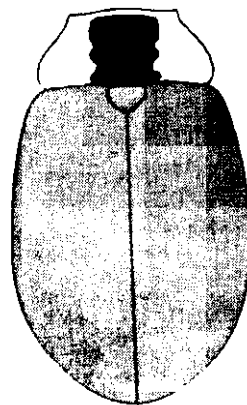
Hilsenhoff & Schmude (1992) keyed the larvae of two *Ectopria* species, neither of which they considered to be *E. thoracica*. They noted that larvae from Louisiana, which were probably *E. thoracica*, lacked asperities (dark, dot-like elevations) that were present on the two species they keyed. Barr & Chapin (1988) considered that only *E. thoracica* occurred in Louisiana.

I've seen adults from Gadsden, Leon and Okaloosa Counties and larvae from Bay, Gadsden and Liberty Counties, and the Suwannee River Basin.

**ADDITIONAL REFERENCES:** Barr & Chapin 1988; Brigham 1981, 1982; Hilsenhoff & Schmude 1992; White & Brigham 1995.



*Ectopria* larva, dorsal and ventral  
(adapted from Brown 1972)



*E. thoracica*, adult pronotum and abdomen  
(adapted from Barr & Chapin 1988)

## Family Ptilodactylidae

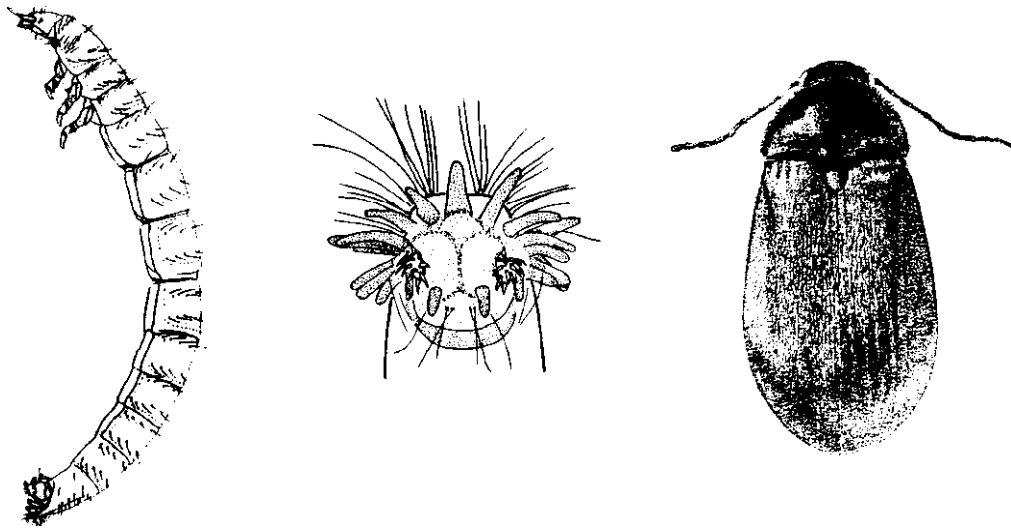
**DIAGNOSIS:** Larvae of the single Florida aquatic genus, *Anchytarsus*, are distinguished by the cylindrical body form; apparently 4-segmented legs with single-clawed tarsi; and the apically rounded, slightly emarginate 9th abdominal segment with lobate anal gills but without an operculum.

Adults are not aquatic; *Anchytarsus* is distinguished by the soft body; head visible in dorsal view, with visible mandibles; apical labial palpomere mostly sclerotized; slightly serrate antennae; simple tarsi and tarsal claws; middle coxae no more widely separated than procoxae; and 1st abdominal sternite not divided by hind coxae.

**NOTES:** Three genera of Ptilodactylidae are known from Florida; only one, *Anchytarsus*, is considered aquatic. The single species, *A. bicolor* (adult length 5-8 mm) is known, in Florida, only from larval specimens collected from February through June in the stream on the Florida A & M University Research Farm near Quincy, Gadsden Co. Mature larvae possess more than 20 lobate anal gills; note also the 3-segmented antennae with long 1st and 2nd and very short 3rd segments.

Larvae are aquatic, feeding on rotting wood in streams, but adults are terrestrial; they can be found on streamside decaying vegetation, but would not normally be collected.

**ADDITIONAL REFERENCES:** LeSage & Harper 1976b; Stribling 1986.



*Anchytarsus bicolor*: larva, ventral view of larval abdominal apex and adult (adapted from Stribling 1986)

## Family Scirtidae

**DIAGNOSIS:** Larvae are distinguished by the distinct labrum; very long, multisegmented antennae; well developed, apparently 4-segmented legs with single-clawed tarsi; and abdomen with 9 segments.

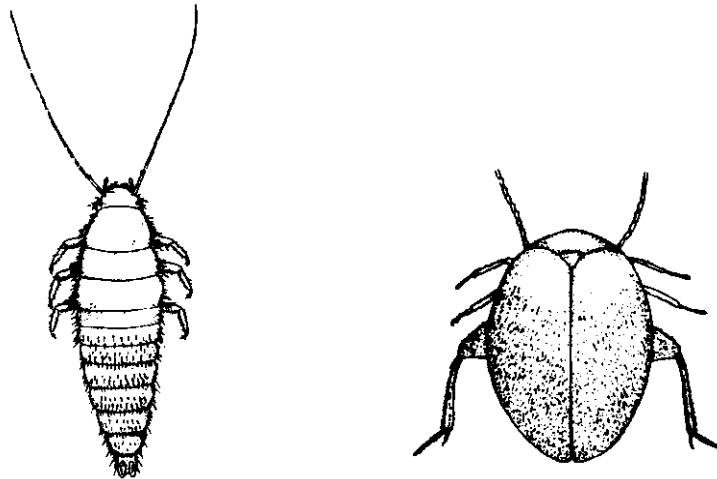
Adults are not aquatic; they can be distinguished by the 11-segmented antennae that may be filiform, serrate or bipectinate; antennae with bases not covered by an anterior extension of the prosternum; pronotum not crenulate or beaded posteriorly; 5-segmented tarsi with the 4th segment deeply bilobed; and the abdomen with 5 visible sternites, the first sternite not divided by the hind coxae.

**NOTES:** Also known as Helodidae, five genera of scirtids including about 17 species are known from Florida. In his unpublished Ph.D. thesis, Tetrault (1967) revised the family for America north of Mexico; he described several new species of *Cyphon*, two of which occur in Florida. Unfortunately, since his study has not been published, his names are not available.

Larvae are most often found in environments with decomposing plant material, including marshes, swamps, ponds, streams and tree holes. Adults are not aquatic but can occasionally be found on emergent vegetation or in rotting plant material.

Because adults are rarely encountered in regular aquatic sampling, this section differs from the others in this manual in presenting only a key to genera for larvae (species-level identification of larvae is not possible). Keys to genera of adults can be found in Brigham (1982) and White & Brigham (1996); species may be identified (adults only) using Tetrault (1967). Note that due to the relatively poor knowledge of the taxonomy of the Scirtidae in North America, several undescribed species may be encountered.

**ADDITIONAL REFERENCES:** Brigham 1982; Tetrault 1967.



*Scirtes tibialis*, larva and adult  
(adapted from Kraatz 1918)

**Key to larvae of Florida Scirtidae genera**

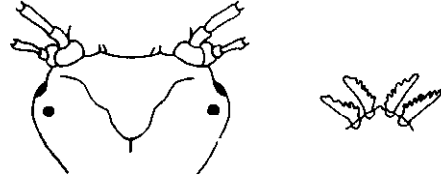
(The larva of *Ora* is undescribed.)

1 Head with 3 ocelli on each side; anterior margin of hypopharynx with a central cone bearing 1 pair of flat, usually serrate spines ..... ***Elodes***



(adapted from Bertrand 1972) (adapted from Hilsenhoff 1975)

1' Head with 1 or 2 ocelli on each side; cone of hypopharynx with 2 pairs of spines ..... 2

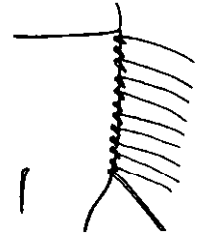


(adapted from Bertrand 1972)

2(1') Lateral margin of abdominal segments 3-6 with scattered, thin setae like those on the dorsum, although usually more numerous ..... ***Cyphon***



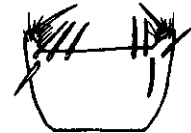
*Cyphon*  
(adapted from Bertrand 1972)



*Scirtes*  
(adapted from Hilsenhoff 1975)

2' Lateral margin of abdominal segments 3-6 with a regular series of short, flattened setae that differ from those on the dorsum ..... 3

3(2') Anterior margin of labrum relatively straight, with the anterior angles bent under to expose inner portion ..... ***Prionocyphon***



3' Anterior margin of labrum with rounded emargination, anterior angles not bent under to expose inner portion ..... ***Scirtes***



(labra adapted from Hilsenhoff 1975)

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## APPENDIX A

## Checklist of the water beetles of Florida

\* = not recorded from FL, but may occur ; = recorded from FL, but occurrence doubtful

Dryopidae	<i>loticus</i> Hilsenhoff
<i>Helichus</i> Erichson	<i>venustus</i> (Say)
* <i>basalis</i> LeConte	<i>Cybister</i> Curtis
<i>fastigiatus</i> (Say)	<i>fimbriolatus fimbriolatus</i> (Say)
<i>lithophilus</i> (Germar)	<i>fimbriolatus crotchii</i> Wilke
<i>Pelonomus</i> Erichson	<i>occidentalis</i> Aubé
<i>obscurus</i> LeConte	<i>Derovatellus</i> Sharp
Dytiscidae	<i>lentus floridanus</i> Fall
<i>Acilius</i> Leach	<i>Desmopachria</i> Babington
<i>fraternus dismalus</i> Matta & Michael	<i>aspera</i> Young
<i>fraternus fraternus</i> (Harris)	<i>cenchraxis</i> Young
<i>mediatus</i> (Say)	<i>grana</i> (LeConte)
<i>Agabetes</i> Crotch	<i>leechi</i> Young
<i>acuctus</i> (Harris)	<i>mutchleri</i> Blatchley
<i>Agabus</i> Leach	<i>seminola</i> Young
<i>aeruginosus</i> Aubé	<i>striola</i> Sharp
<i>johannis</i> Fall	* <i>Dytiscus</i> Linnaeus
<i>punctatus</i> Fall	* <i>carolinus</i> Aubé
<i>stagninus</i> Say	<i>Eretes</i> Castelnau
sp. A Epler	<i>sticticus</i> (Linnaeus)
<i>Agaporomorphus</i> Zimmermann	<i>Graphoderus</i> Stephens
<i>dodgei</i> Young	<i>liberus</i> (Say)
<i>Anodocheilus</i> Babington	* <i>Hoperius</i> Fall
<i>exiguus</i> Aubé	* <i>planatus</i> Fall
<i>Bidessonotus</i> Régimbart	<i>Hydaticus</i> Leach
<i>inconspicuus</i> (LeConte)	<i>bimarginatus</i> (Say)
<i>longovalis</i> (Blatchley)	<i>cinctipennis</i> Aubé
<i>pulicarius</i> (Aubé)	* <i>rimosus</i> Aubé
<i>Brachyvatus</i> Zimmermann	<i>Hydroporus</i> Clairville
<i>apicatus</i> (Clark) [= <i>seminulum</i> LeConte]	<i>brevicornis</i> Fall
<i>Celina</i> Aubé	; <i>dichrous</i> Melsheimer ?
<i>angustata</i> Aubé	<i>falli</i> Blatchley
<i>contiger</i> Guignot	<i>niger</i> Say
<i>grossula</i> (LeConte)	<i>ruficeps</i> Aubé
<i>hubbelli</i> Young	<i>rufilabris</i> Sharp
<i>imitatrix</i> Young	<i>signatus</i> Mannerheim
<i>palustris</i> Young	<i>Hydroporus oblitus</i> group
<i>slossoni</i> Mutchler	<i>deflatus</i> Fall [= <i>ruficeps</i> Aubé in Young 1954]
<i>Copelatus</i> Erichson	<i>filiosus</i> Fall ?
<i>blatchleyi</i> Young	<i>oblitus</i> (Aubé) complex sp. A
<i>caelatipennis princeps</i> Young	<i>oblitus</i> (Aubé) complex sp. B
<i>chevolati chevrolati</i> Aubé	<i>Hydrovatus</i> Motschulsky
<i>chevolati renovatus</i> Guignot	<i>inexpectatus</i> Young
<i>cubaensis</i> Schaeffer	<i>peninsularis</i> Young
<i>glyphicus</i> (Say)	<i>platycornis</i> Young
<i>punctulatus</i> Aubé	<i>pustulatus compressus</i> Sharp
<i>Coptotomus</i> Say	<i>Hygrotus</i> Stephens
<i>interrogatus</i> (Fabricius)	<i>berneri</i> Young & Wolfe
<i>lenticus</i> Hilsenhoff	<i>marginipennis</i> (Blatchley)

- Hygrotus* (continued)  
*nubilis* (LeConte)
- Ilybius*  
*oblitus* Sharp
- Laccodytes* Régimbart  
*pumilio* (LeConte)
- Laccophilus* Leach  
*fasciatus rufus* Melsheimer  
*gentilis gentilis* LeConte  
*proximus* Say  
*vacaensis* Young
- Laccornis* Gozis  
*\*difformis* (LeConte)  
*\*nemorosus* Wolfe & Roughley  
*\*schusteri* Wolfe & Spangler
- Liodesus* Guignot  
*affinis* (Say)  
*cantralli* (Young)  
*flavicollis* (LeConte)  
*fuscatus* (Crotch)  
*hobbsi* Young
- Lioporeus* [= *Falloporeus* Wolfe & Matta]  
*pilatei* (Fall)  
*triangularis* (Fall)
- Matus* Aubé  
*\*bicarinatus* (Say)  
*leechi* Young  
*ovatus blatchleyi* Leech
- Megadytes* Sharp  
*fraternus* Sharp
- Neobidessus* Young  
*pullus floridanus* (Fall)  
*pullus pullus* (LeConte)
- Neoporus* Guignot  
*asidytes* (Young)  
*aulicus* (Aubé)  
*baelus* (Young)  
*blanchardi* (Sherman)  
*carolinus* (Fall)  
*cimicoides* (Sharp)  
*clypealis* (Sharp)  
*dilatatus* (Fall) [= *spurius* (LeConte)? in Young 1954]  
*dixianus* (Fall)  
*effeminatus* (Fall)  
*floridanus* (Young)  
*gaudens* (Fall)  
*hebes* (Fall)  
*helocrinus* (Young)  
*hybridus* (Aubé)  
*\*latocavus* (Wolfe)  
*lobatus* (Sharp)  
*lynceus* (Sharp) complex  
*mellitus* (LeConte)
- \*mixtus* (LeConte)  
*\*psammodytes* (Young)  
*rheocrinus* (Young)  
*shermani* (Fall)  
*striatopunctatus* (Melsheimer)  
*uniformis* (Blatchley)  
*venustus* (LeConte)  
*vittatipennis* (Gemminger & von Harold)
- Pachydrus* Sharp  
*princeps* (Blatchley)
- Rhantus* Dejean  
*calidus* (Fabricius)
- Thermonectus* Dejean  
*basillaris* (Harris)  
*ornaticollis* Aubé
- Uvarus* Guignot  
*falli* (Young)  
*granarius* (Aubé)  
*inflatus* (Young)  
*lacustris* (Say)  
*rogersi* (Young)
- Elmidae
- Ancyronyx* Erichson  
*variegata* (Germar)
- Dubiraphia* Sanderson  
*vittata* (Melsheimer)
- Gonielmis* Sanderson  
*dietrichi* (Musgrave)
- Macronychus* Müller  
*glabratus* Say
- Microcylloepus* Hinton  
*pusillus* (LeConte)
- \*Optioservus* Sanderson  
*\*ovalis* (LeConte)  
*\*trivittatus* (Brown)
- Promoresia* Sanderson  
*\*elegans* (LeConte)  
*tardella* (Fall)
- Stenelmis* Dufour  
*antennalis* Sanderson  
*convexula* Sanderson  
*crenata* (Say)  
*decorata* Sanderson  
*fuscata* Blatchley  
*grossa* Sanderson  
*hungerfordi* Sanderson  
*lignicola* Schmude & Brown  
*musgravei* Sanderson  
*sinuata* LeConte  
*xylonastis* Schmude & Barr  
sp. C Epler  
sp. D Epler



## Gyrinidae

- Dineutus* MacLeay  
*americanus* (Linnaeus)  
*angustus* LeConte  
*assimilis* Kirby  
*carolinus* LeConte  
*ciliatus* (Forsberg)  
*discolor* Aubé  
*emarginatus* (Say)  
*nigrior* Roberts  
*productus* Roberts  
*serrulatus* LeConte [= *analisis* Régimbart]  
*Gyretes* Brullé  
*iricolor* Young  
*Gyrinus* Müller  
*analisis* Say  
*elevatus* LeConte  
*gibber* LeConte [= *frosti* Fall; *floridensis* Ochs]  
*pachysomus* Fall  
*parcus* Say  
*rockinghamensis* LeConte  
*woodruffi* Fall

## Haliplidae

- Haliplus* Latreille  
*annulatus* Roberts  
*confluentus* Roberts  
*fasciatus* Aubé  
*havaniensis* Wehncke  
*\*leopardus* Roberts  
*muschleri* Wallis  
*\*pantherinus* Aubé  
*pseudofasciatus* Wallis  
*punctatus* Aubé  
*triopsis* Say  
*Peltodytes* Régimbart  
*bradleyi* Young  
*diétrichi* Young  
*dunavani* Young  
*floridensis* Matheson  
*muticus* (LeConte)  
*oppositus* Roberts  
*sexmaculatus* Roberts

## Hydraenidae

- Hydraena* Kugelann  
*marginicollis* Kiesenwetter  
*spangleri* Perkins  
*youngi* Perkins  
*Gymnochthebius* d'Orchymont  
*fossatus* (LeConte)  
*seminole* Perkins  
*Ochthebius* Leach  
*attritus* LeConte

## Hydrophilidae

- Anacaena* Thomson [includes *Crenitulus* Winters]  
*\*limbata* (Fabricius)  
*suturalis* (LeConte)  
*Berosus* Leach  
*aculeatus* LeConte  
*arnetti* Van Tassell  
*corrini* Wooldridge  
*exiguus* (Say)  
*infuscatus* LeConte  
*ordinatus* LeConte  
*pantherinus* LeConte  
*peregrinus* (Herbst)  
*pugnax* LeConte  
*striatus* (Say)  
*youngi* Wooldridge  
*Cercyon* Leach  
*praetextatus* (Say)  
*Chaetarthria* Stephens  
*pallida* (LeConte)  
*Cymbiodyta* Bedel  
*chamberlaini* Smetana [= *blanchardi* Horn ? in Young 1954]  
*\*minima* Notman  
*vindicata* Fall  
*Derallus* Sharp  
*altus* (LeConte)  
*Dibolocelus* Bedel  
*ovatus* (Gemminger & Harold)  
*smaragdinus* Brullé  
*Enochrus* Thomson  
*blatchleyi* (Fall)  
*cinctus* (Say)  
*consors* (LeConte)  
*consortus* Green  
*hamiltoni* (Horn)  
*interruptus* Gundersen  
*ochraceus* (Melsheimer)  
*perplexus* (LeConte)  
*\*pseudochraceus* Gundersen  
*pygmaeus nebulosus* (Say)  
*pygmaeus pygmaeus* (Fabricius)  
*reflexipennis* (Zimmermann)  
*sayi* Gundersen  
*sublongus* (Fall)  
*Helobata* Bergroth  
*larvalis* (Horn) [= *striata* Brullé]  
*Helochares* Mulsant  
*maculicollis* Mulsant  
*sallaei* Sharp  
*Helocombus* Horn  
*bifidus* (LeConte)

- Helophorus* Fabricius  
  \**linearis* LeConte  
  *lineatus* Say  
  \**marginicollis* Smetana  
*Hydrobiomorpha* Blackburn  
  *casta* (Say)  
*Hydrobius* Leach  
  *tumidus* LeConte  
*Hydrochara* Berthold  
  *brevipalpis* Smetana  
  *occulta* (d'Orchymont)  
  *soror* Smetana  
  *spangleri* Smetana  
*Hydrochus* Leach  
  *callosus* LeConte  
  *excavatus* LeConte  
  *inaequalis* LeConte  
  *minimus* Blatchley  
  *rufipes* Melsheimer  
  *rugosus* Mulsant [= *hanoewanti* Makhan]  
  *simplex* LeConte [= *equicarinatus* Blatchley]  
  sp. 1 Epler  
  sp. 2 Epler  
  sp. 3 Epler  
  sp. 4 Epler  
  sp. 5 Epler  
  sp. 6 Epler  
  sp. 7 Epler  
  sp. 8 Epler  
*Hydrophilus* Geoffroy  
  \**ater* Olivier  
  *insularis* Castelnau  
  *triangularis* Say  
*Paracymus* Thomson  
  *confusus* Wooldridge  
  *degener* (Horn)  
  *dispersus* Wooldridge  
  *lodingi* (Fall)  
  *nanus* (Fall)  
  *reductus* (Fall)  
  \**seclusus* Wooldridge  
  *subcupreus* (Say)  
*Phaenonotum* Sharp  
  *exstriatum* (Say)  
  *minor* Smetana  
*Sperchopsis* LeConte  
  *tessellata* (Ziegler)  
*Tropisternus* Solier  
  *blatchleyi blatchleyi* d'Orchymont  
  *collaris* (Fabricius)  
  *lateralis nimbatus* (Say)  
  *natator* d'Orchymont  
  *quadristriatus* Horn
- Noteridae  
*Hydrocanthus* Say  
  *atripennis* Say  
  *oblongus* Sharp  
  *regius* Young  
*Mesonoterus* Sharp  
  *addendus* (Blatchley)  
*Notomicrus* Sharp  
  *nanulus* (LeConte)  
  *sharpi* J. Balfour-Browne  
*Pronoterus* Sharp  
  *semipunctatus* (LeConte)  
*Suphis* Aubé  
  *inflatus* (LeConte)  
*Suphisellus* Crotch  
  *bicolor bicolor* (Say)  
  \* *b. punctipennis* (Sharp)  
  *gibbulus* (Aubé)  
  *insularis* (Chevrolat) [= *floridanus* Blatchley]  
  *parsonsi* Young  
  *puncticollis* Crotch
- Psephenidae  
  *Ectopria* LeConte  
  *thoracica* (Ziegler)
- Ptilodactylidae  
  *Anchytarsus* Guérin-Méneville  
  *bicolor* (Melsheimer)
- Scirtidae  
  *Cyphon* Paykull  
  *americanus* Pic  
  *cooperi* Sherman  
  *nebulosus* (LeConte)  
  *perplexus* Blatchley  
  *punctatus* (LeConte)  
  *variabilis* Thunberg  
  sp. 1 Epler  
  sp. 2 Epler  
  *Elodes* Latreille  
  *pulchella* Guérin  
  *Ora* Clark  
  *hyacintha* Blatchley  
  *texana* Champion  
  *troberti* Guérin  
  *Prionocyphon* Redtenbacher  
  *discoideus* (Say)  
  *Scirtes* Illiger  
  *orbiculatus* (Fabricius)  
  *ovalis* Blatchley  
  *piceolus* Blatchley  
  *tibialis* Guérin-Méneville

## APPENDIX B

### Sources of entomological literature, equipment and information

(Mention of a company, product or service does not indicate endorsement by FDEP; these are my personal recommendations.)

**Internet:** If you have Internet access to the World Wide Web, the following site offers information on where to obtain entomological materials:

<http://insects.ummz.lsa.umich.edu/entostuff.html>

Also on the web is the aquatic Coleoptera page at:

[http://www.inhs.uiuc.edu/~brigham/my\\_home.html](http://www.inhs.uiuc.edu/~brigham/my_home.html)

#### CD-ROMs:

CSIRO Publications  
314 East Melbourne Street  
East Melbourne, Victoria 3002  
Australia  
(+613)-418-7217

Source for interactive beetle larvae identification database.

#### Entomology equipment:

BioQuip Products  
17803 LaSalle Avenue  
Gardena, CA 90248-3602  
(310)-324-0620  
e-mail [bioquip@aol.com](mailto:bioquip@aol.com)

The best source for almost all entomological equipment and many books.

Livesay's, Inc.  
456 West Columbus Drive  
Tampa, FL 33602  
(800)-476-2715

Source for extra fine point Dumont number 5 forceps (Swiss made; expensive, but the best).

