

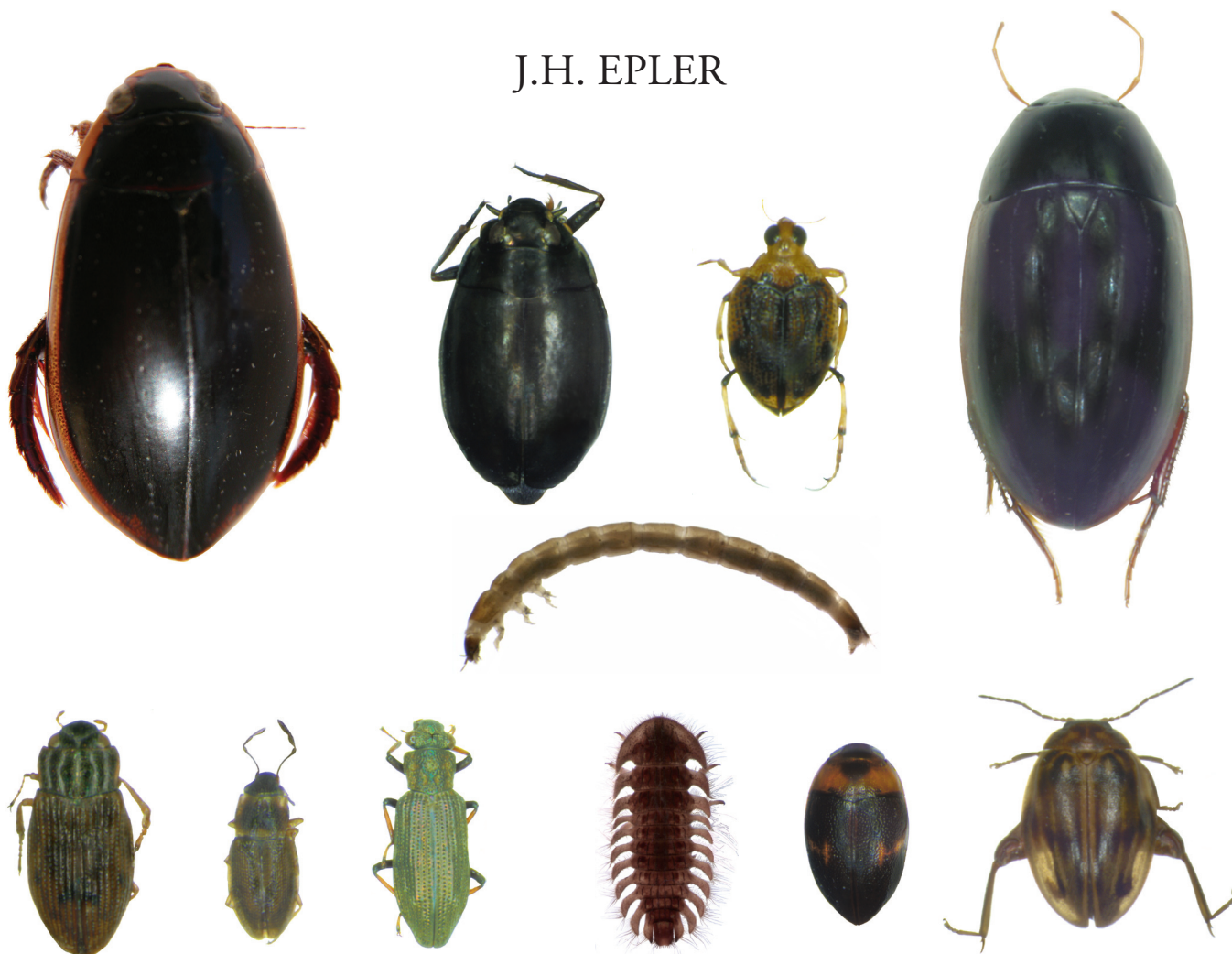


THE WATER BEETLES OF FLORIDA

an identification manual for the families

CHRYSOMELIDAE, CURCULIONIDAE, DRYOPIDAE, DYTISCIDAE,
ELMIDAE, GYRINIDAE, HALIPLIDAE, HELOPHORIDAE,
HYDRAENIDAE, HYDROCHIDAE, HYDROPHILIDAE,
NOTERIDAE, PSEPHENIDAE, PTILODACTYLIDAE
and SCIRTIDAE

J.H. EPLER



on the cover:

Donacia rugosa *Bagous lunatoides* *Helichus lithophilus* *Ancyronyx variegatus*

Cybister fimbriolatus *Dineutus carolinus* *Peltodytes sexmaculatus* *Hydrobiomorpha casta*

Anchytarsus bicolor

Helophorus lineatus *Hydraena marginicollis* *Hydrochus rugosus* *Ectopria thoracica* *Suphisellus puncticollis* *Ora texana*

State of Florida
Department of Environmental Protection
Division of Environmental Assessment and Restoration
Tallahassee

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PTILODACTYLIDAE and SCIRTIDAE

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INTRODUCTION

materials, methods, glossary and key to families

1

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); O'Brien & Wibmer (1978) noted the family included 4,238 genera comprising 44,885 species, but more recently Anderson (2002) reported over 60,000 species in the family. The total number of described genera and species increases every year as new species continue to be described.

Jäch & Balke (2008) summarized the diversity of the world's water beetles. They estimated about 18,000 species in about 30 families that had aquatic representatives. They noted that, in terms of number of water beetle species, the Nearctic was the most poorly represented world region, with the number of described species at around 1,420, and a potential total number of 1,550.

One of the earliest compilations of Florida's water beetles was that of Leng & Mutchler (1918). They reported 114 species in nine 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 greatly expanded our knowledge of Florida's beetle fauna (see Blatchley listings in Bibliography). As Blatchley's work tapered off in the 1930's, the extensive work of Frank N. Young began, leading to Young's (1954) masterpiece that dealt with about 195 species (which did not include the terrestrial Hydrophilidae). Epler (1996) provided the first update to Young's 1954 opus and included over 300 species. Of course, much taxonomic work has taken place since that publication; the present manual will identify adults of over 400 species and subspecies of water beetles and includes, in addition to the families mentioned above, the Chrysomelidae, Curculionidae, Psephenidae, Ptilodactylidae and Scirtidae, and keys

to genera for the known 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, with the exception of the elmids and some adult dryopids, are surface air-breathers – they do not depend on dissolved oxygen in water for respiration. Most larvae, except the elmids which possess an internal gill chamber, respire transcutaneously, although some larvae are often equipped with large external gills (e.g. *Berosus*, *Coptotomus*, Psephenidae); thus the larval stage is the one most apt to be affected by water quality. Although larvae and adults of most of the water beetle families live 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.



Hygrotus nubilus
(Dytiscidae)

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, especially the color habitus figures, 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 1.6 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 Chrysomelidae, Curculionidae (genera only), Dryopidae, Dytiscidae, Elmidae, Gyrinidae, Haliplidae, Helophoridae, Hydraenidae, Hydrophilidae, Hydrochidae, Noteridae, Psephenidae, Ptilodactylidae and Scirtidae. 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 semi-aquatic Heteroceridae (variegated mud-loving beetles), Limnichidae (minute marsh-loving beetles) and Lampyridae (lightning bugs) are 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.

Illustrations and abbreviations: Most of the illustrations in this manual were produced by the author, usually from Florida specimens. 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. Note that all figures on any given page are not to the same scale. The majority of figures are full color pictures taken with a Spot Idea 5 MP digital camera attached to a Leica/Wild MZ8 stereoscope equipped with a Leica phototube. These pictures were processed in a variety of methods utilizing Adobe Photoshop®; in some

figures, important structures may be emphasized by outlining or shading. Note that no new species were created with Photoshop!

Glossary: A glossary of commonly used morphological terms is provided on page 1.9. Throughout this manual, I have used the terms tarsomere and tarsal segment, antennomere and antennal segment, and palpomere and palpal segment interchangeably. The Glossary also lists abbreviations used; no abbreviations for body parts have been used

Taxonomy: This manual follows the family taxonomy utilized in Arnett & Thomas (2001) and Arnett et al. (2001), with the exception of the Hydrophiloidea, which follows Hansen (1999) (the Helophoridae and Hydrochidae are considered separate families rather than subfamilies of Hydrophilidae). For a more detailed arrangement of subfamilies, genera and subgenera, etc., see Peck and Thomas (1996), or the various catalogues or checklists produced for some families (Hansen 1991b, 1999; Nilsson 2001, 2003, 2004, 2005, 2006; O'Brien & Wibmer 1982; Short & Hebauer 2006, Vondel 2005, 2007).

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 (1999). This has led to the unfortunate situation of not being able to apply "real" names to several common species (especially with the genera *Cyphon* (Scirtidae) and *Hydro-*

chus (Hydrochidae). 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 18 chapters. This first chapter provides an introduction to the manual, specimen preparation techniques, illustrations of important morphological, a partial glossary of beetle morphology and a key to families for larvae and adults.

Families are arranged alphabetically, as are genera within families and species within genera. 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; habitus illustrations of most larvae are also included. A **Key to species** and a **Notes on species** section are included when possible.

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 (a slide marked with precise measurement lines) 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 directly from water or alcohol; that mounted in balsam or Euparal must first be placed in 95-100% ethanol or isopropanol and then mounted. For Euparal or balsam mounts, it may be necessary to first clear your material in KOH, rinse it in water, then glacial acetic acid, then in 95% ethanol or isopropanol, and then mount it. 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 colors and fine punctuation, 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 or drawer, pull out a specimen and inspect it, and put it back in the box/drawer. 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 or drawers provided with a suitable fumigant, such as paradichlorobenzene (PDB), naphthalene (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

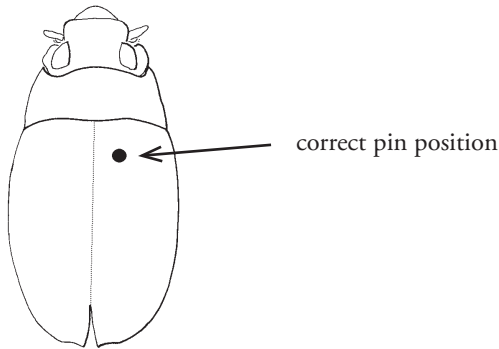
collected when the only information with the specimen is a string of letters or numbers or something like “Elmo’s birdbath”?

Dissection techniques: It is often necessary to remove or extrude the male genitalia for identification purposes. This can be accomplished in a variety of ways depending on the size of the specimen, and is best done on fresh specimens (it can also be done with dried specimens; see Pinning techniques, below). With large beetles, 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 place the detached genitalia back into the abdominal cavity; these can easily be retrieved later if further examination is necessary.

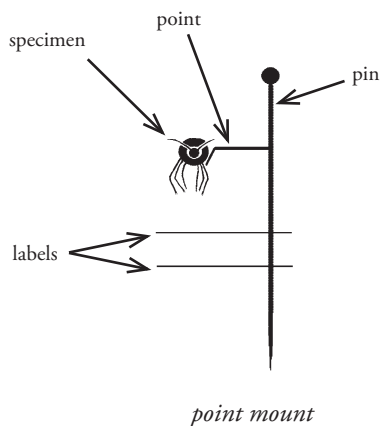
Gyrinus elevatus male genitalia
(Gyrinidae)



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 (generally 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 Elmer's® School Glue Gel, but shellac (an insect product used to glue insects!), Canada balsam, clear nail polish or regular white glue 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 or acetic acid (vinegar), to prevent mold). Once the beetle is softened, genitalia can then be removed by the techniques mentioned above. If point mounted, dissolve the adhesive (ethanol for shellac, 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 specimen 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 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 (e.g. *Stenelmis*) 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. Serious coleopterists will want to obtain the two volume set edited by Arnett & Thomas (2001) and Arnett et al. (2001). These volumes will identify all known (as of 2001) North American beetles to genus; the key to beetle families is in Volume 2. 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 much of the taxonomy outdated and some chapters error-ridden). Although taxonomically outdated, Peterson (1967) is a useful source for additional information and figures of larval beetles. Lawrence et al. (1999) offers state of the art larval beetle identification to the family level via an interactive database with good graphics on CD-ROM (unfortunately runs only under Windows). A good entomological text for both insect morphology and keys to families is Borror, Triplehorn & Johnson (1989) (earlier editions were authored by Borror & Delong).

There are several journals devoted to beetles, the most useful of which I find to be *The Coleopterists Bulletin* and *Koleopterologische Rundschau*. *Lattisimus*, the newsletter of the Balfour-Browne Club, while emphasizing the British fauna, is a great source of information on taxonomic updates and recent literature.

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, which 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 before pinning or preserving in alcohol.

Beetles on the Web

There are several web sites that provide information on water beetles. I have maintained a site for over 12 years with the current URL:

<http://home.comcast.net/~johnnepler3/index.html>

Other notable sites are Water Beetle World:

<http://www.zo.utexas.edu/faculty/sjasper/beetles/index.htm>

Kelly Miller's Lab:

<http://www.kellymillerlab.com/>

Andrew Short's hydrophiloid site:

<http://www.hydrophiloida.org/>

The Coleopterists Society:

<http://www.coleopsoc.org/default.asp>

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.

PREVIOUS ACKNOWLEDGEMENTS. Much of the information in this manual is updated from that provided in Epler (1996). I remain indebted to those persons who helped so much with the production of that manual. Because much of this manual depends on the groundwork laid in the 1996 manual, I repeat many of those acknowledgements here.

The excellent beetle collection at the Florida State Collection of Arthropods (FSCA) in Gainesville was the source of much of the material examined for the 1996 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 (FAMU) 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 Provonsa (Purdue University, West Lafayette, IN) kindly sent Florida material of Peltodytes 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

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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. Robert E. Roughley (University of Manitoba, Winnipeg, MB), Dr. Paul Spangler (Smithsonian Institution, Washington, D.C.), Dr. Frank N. Young and Dr. James Zimmerman (Tuscon, 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. 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.

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phenidae chapters.

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Reviewers included Broughton Caldwell (Braselton, GA), Dr. Juan Delgado (Universidad de Murcia, Spain (Hydraenidae)), Dr. Manfred Jäch (Natural History Museum, Vienna, Austria (Hydraenidae)),

Dr. David Larson (Maple Creek, Saskatchewan (Dytiscidae)), Dr. Kelly Miller (University of New Mexico, Albuquerque, NM (Dytiscidae)), Dr. Sule Oygur (Newark Museum, NJ (Gyrinidae)), Dr. Kurt Schmude, University of Wisconsin, Superior (Elmidae)), Dr. Andrew E.Z. Short (University of Kansas, Lawrence, KS (Hydrochidae, Hydrophilidae)), Dr. James B. (Sam) Stribling (Tetra Tech, Owings Mills, MD (Ptilodactylidae, Scirtidae)) and Ing. Bernhard van Vondel (Netherlands (Halipidae)).

Others supplied much needed and/or hard to find literature or other information: Dr. E.H. Barman (Georgia College and State University, Milledgeville, GA); Dr. Johannes Bergsten (Swedish Museum of Natural History, Stockholm, Sweden); Mark Wetzel (Illinois Natural History Survey); Dr. Hiroyuki Yoshitomi (Sapporo, Japan); Dr. Daniel K. Young (University of Wisconsin) and Dr. Peter Zwick (Schlitz, Germany).

Many thanks to Dr. Miguel Archangelsky (Universidad Nacional de La Patagonia, Chubut, Argentina) for his permission to use his figures of hydrophilid larvae.

FDEP wonder woman Devan Cobb managed this project with masterful skill.

I thank my wife Linda for re-typing sections of the previous manual and proofing portions of the text. I am forever grateful for her love, support, encouragement and understanding for the three years it took to produce this manual and throughout my four decades of work in aquatic entomology.

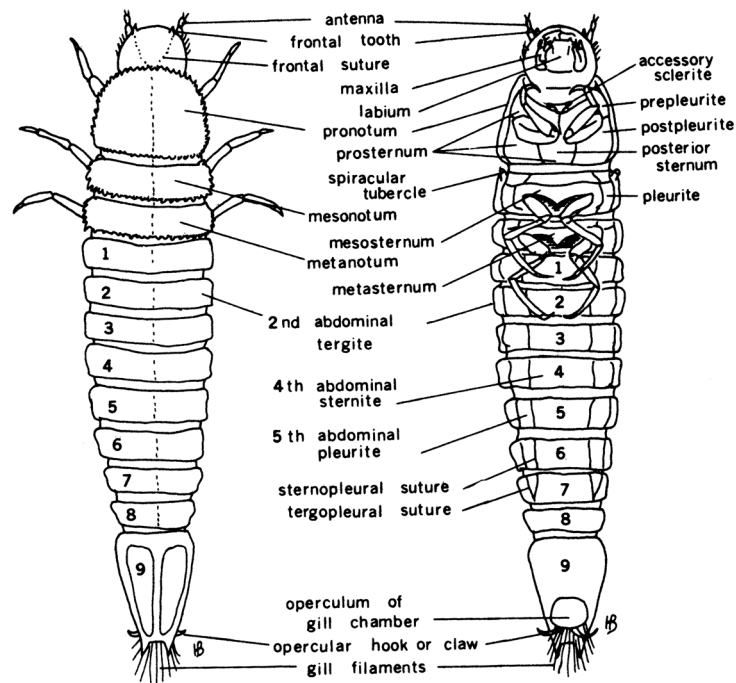


Stenelmis lignicola
(Elmidae)

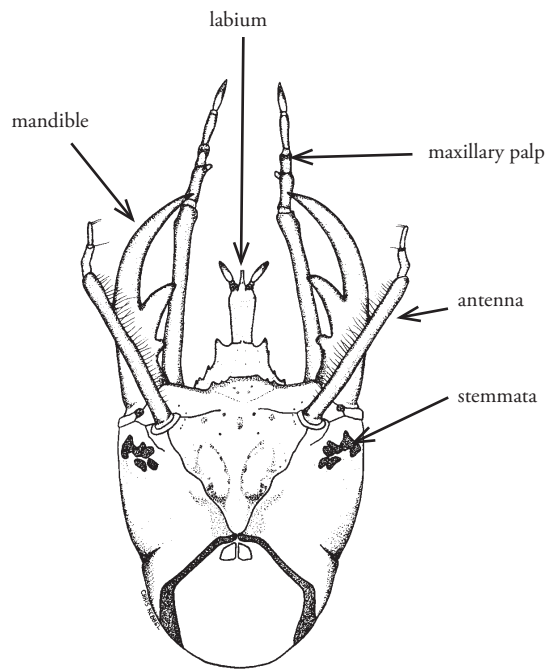
GLOSSARY of ABBREVIATIONS and MORPHOLOGICAL TERMS

Only a brief summary of beetle related terms is given below; for more information on insect morphology, consult an entomology textbook listed under Identification Aids (p. 1.6). Additional terms are also provided in individual family chapters.

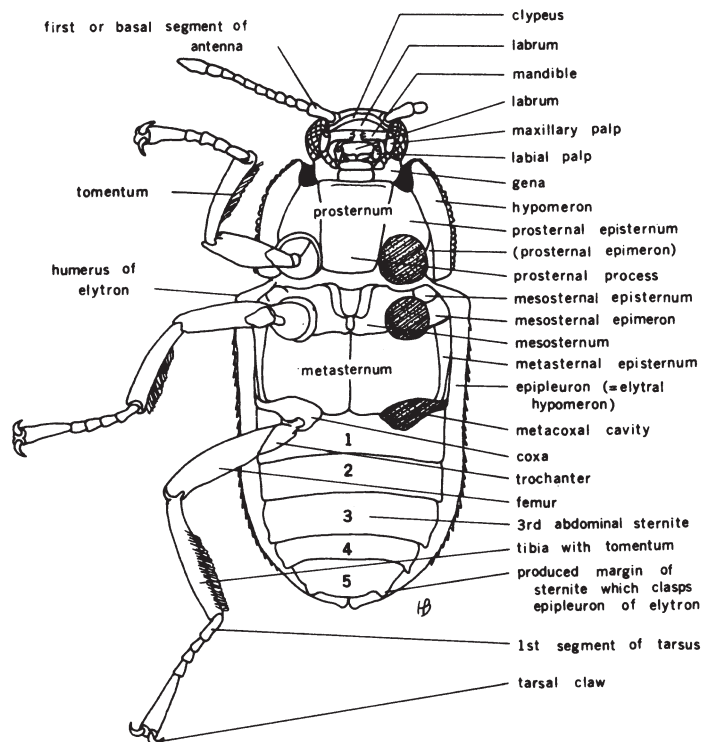
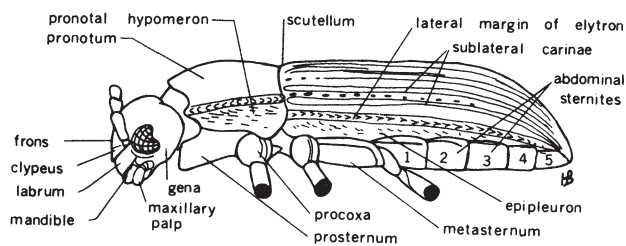
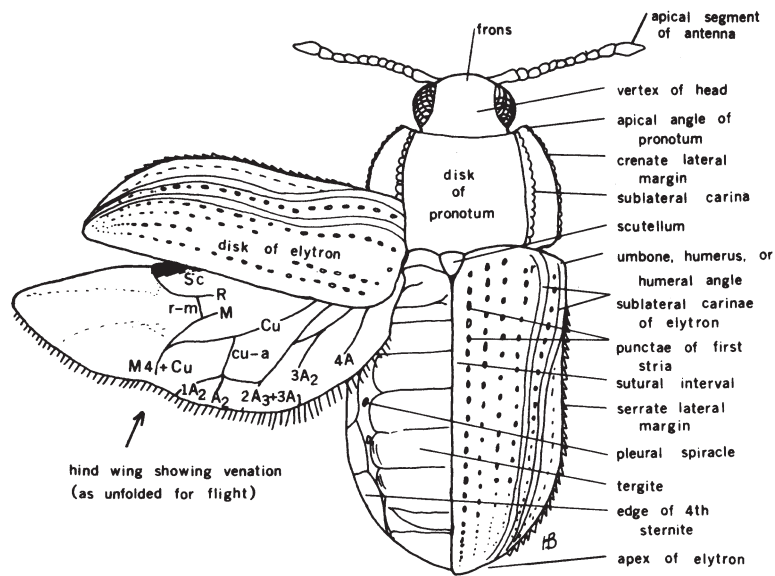
- aedeagus, aedaeagus, aedoeagus (aedeagi)** – central appendage of male genitalia; penis
- alutaceous** – covered with a network of fine cracks, like the skin on the back of your hand; microreticulate
- antennomere** – a division of the antenna; “segment” (in this manual “segment” and “-mere” are used interchangeably)
- carina (carinae)** – an elevated ridge or keel
- carinate** – possessing a carina or carinae
- clavate** – gradually thickening or widening distally, as in a baseball bat
- costa (costae)** – an elevated ridge with a rounded top
- costate** – possessing a costa or costae
- club** – apical expanded segments of antenna
- cupule** – cup shaped segment of antenna (antennomere 7 in hydrophilids)
- decumbent** – bent or curved downward
- digitiform** – finger-like
- disc** – the central portion of the pronotum or the combined elytra
- distal** – the farthest away point or area, as opposed to proximal (the closest)
- dorsal strut** – in hydrophilids, sclerotized structure dorsal of median lobe of male genitalia
- elytra (singular - elytron)** – the hardened first pair of wings on beetles
- emarginate** – notched along margin
- explanate** – flattened
- fascia (fasciae)** – transverse band
- fasciate** – transversely banded
- filiform** – thread-like, with segments equal and slender
- FAMU** – Florida A & M University, Tallahassee
- FDEP** – Florida Department of Environmental Protection
- FSCA** – Florida State Collection of Arthropods, Gainesville
- funicle** – antennal segments between scape and apical club
- galea** – outer lobe of maxilla
- glabrous** – bare
- ICZN** – International Code of Zoological Nomenclature
- immaculate** – without marking(s)
- impunctate** – without punctations
- interval** – area between striae or rows of punctures on elytron
- incrassate** – suddenly swollen, usually distally on a leg segment
- irrorate** – speckled with small spots; freckled; spots referred to as “irrorations”
- lacinia** – inner blade-like lobe of maxilla
- nasale** – anteromedial elongation of frontoclypeus
- occiput** – dorsal posterior portion of head
- palette** – the expanded fore tarsomeres of some male dytiscids, equipped with “suckers” for grasping the female during mating
- palpomere** – division of a palp/palpus; “segment” (in this manual “segment” and “-mere” are used interchangeably)
- plica (plicae)** – a fold, groove or wrinkle
- prehensor** – sclerotized (usually), internal capsule of female genitalia in Scirtidae
- proximal** – the closest, as opposed to distal (the farthest away)
- protheca** – a movable blade on the inner surface of the mandible
- pubescent** – clothed with fine setae
- pygidium** – dorsal portion of the last visible abdominal segment
- RCID** – Reedy Creek Improvement District, Lake Buena Vista, FL
- rugose** – wrinkled
- scape** – basal segment of antenna
- stemmata (singular - stemma)** – simple eyes, as found in larvae
- stria (striae)** – impressed line
- stylus (styli)** – digitiform terminal process of genitalia
- sulcus** – groove (wider than a stria)
- tarsomere** – division of the tarsi; “segment” (in this manual segment and “-mere” used interchangeably)
- tegmen** – the base of the male genitalia
- tomentum** – area of short, dense, woolly “hair”
- umbone** – the anterolateral angle of the elytra; “shoulder”
- urogomphi (singular - urogomphus)** – paired processes at posterior end of last abdominal segment, sometimes referred to as “cerci”
- USNM** – National Museum of Natural History, Smithsonian Institution, Washington, D.C.
- venter** – under surface
- vertex** – dorsal portion of head between the eyes, anterior of the occiput
- vitta (vittae)** – longitudinal stripe(s)
- vittate** – with longitudinal stripes



Larval morphology (Elmidae)
(adapted from Brown 1972)



Larval head, dorsal (Hydrophilidae)
(adapted from Matta 1982)



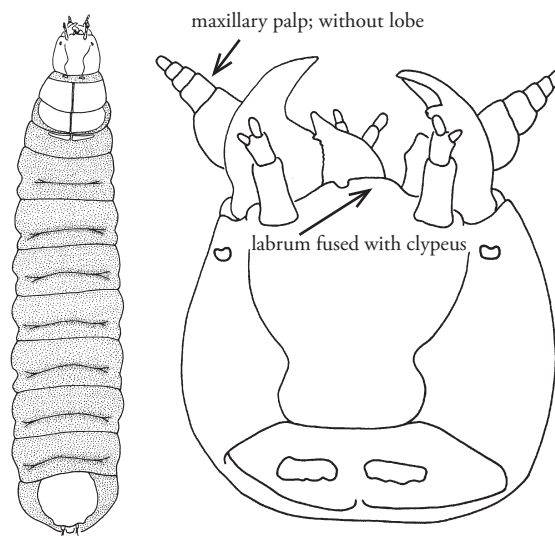
Adult morphology
(adapted from Brown 1972)

Key to Water Beetle Families of Florida - Larvae

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

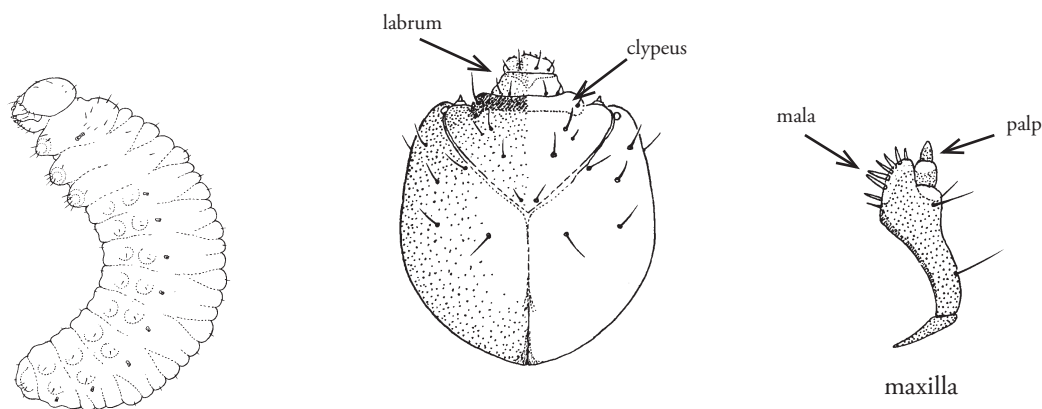
- 1 Thoracic legs absent, or at most represented by swellings with 0-3 rudimentary segments 2
- 1' Thoracic legs present; if reduced, with at least 3 segments 3

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



(adapted from Archangelsky 1997)

- 2' Abdomen with 9 complete segments; distinct, separate labrum present; maxilla with a mala; sclerotized legs completely absent **CURCULIONIDAE**

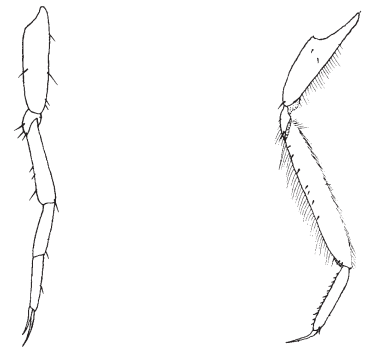


(adapted from Peterson 1967)

- 3(1') Legs with 5 segments plus a single tarsal 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 tarsal claws **OR** apparently 3-4 segmented, with either a single tarsal claw (common) or clawless (uncommon); dorsum of thorax without short to long spines/filaments (lateral filaments/gills may be present); if 10 abdominal segments present, 10th not much longer than 9th 4

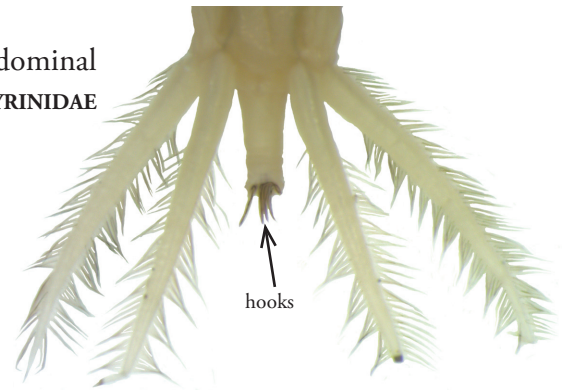


5 segments + 2 tarsal claws

4 segments + 1 tarsal claw

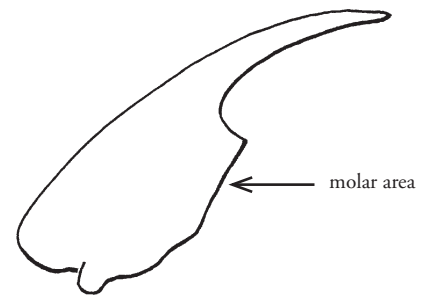
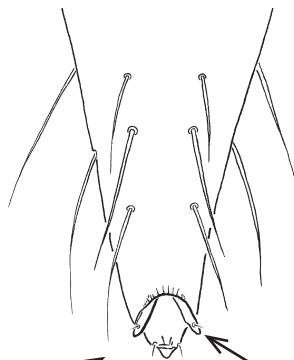
- 4(3') Legs with 5 segments and 2 tarsal claws 5
- 4' Legs with 3-4 apparent segments and either a single claw or clawless 7

- 5(4) Lateral gills present on abdominal segments 1-9; abdominal segment 10 with 2 pairs of stout hooks **GYRINIDAE**



- 5' Lateral gills absent or if present, at most on segments 1-6; at most one pair of small hooks on last abdominal segment 6

- 6(5') Legs short, stout; mandible with enlarged molar area; urogomphi rudimentary **NOTERIDAE**



- 6' Legs longer, slender; mandible sickle-shaped, without enlarged molar area; urogomphi rudimentary to very long **DYTISCIDAE**
 (Carabidae larvae that have fallen in 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 3rd segment **SCIIRTIDAE**

- 7' Antennae shorter, at most scarcely longer than head, with at most 4 segments 8

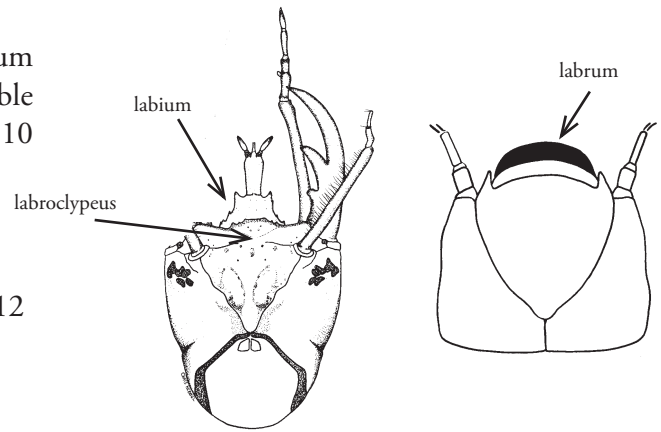


- 8(7') Body greatly flattened, with margins extended so as to resemble a suction cup **PSEPHENIDAE**

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

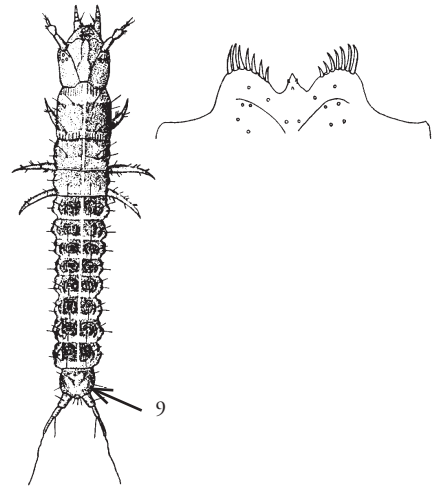


- 9(8') Labrum fused with clypeus, no distinct labrum present (but the more ventral labium may be visible from dorsal aspect) 10



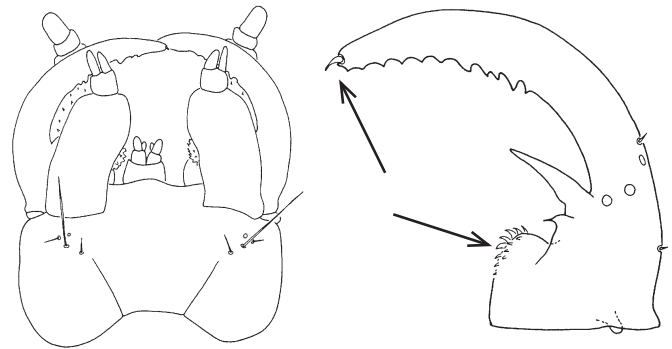
- 9' A distinct, separate labrum present 12

- 10(9) With 9 complete abdominal segments, the 10th reduced and displaced ventrally; clypeus with large median tooth flanked by wider projections **HELOPHORIDAE**



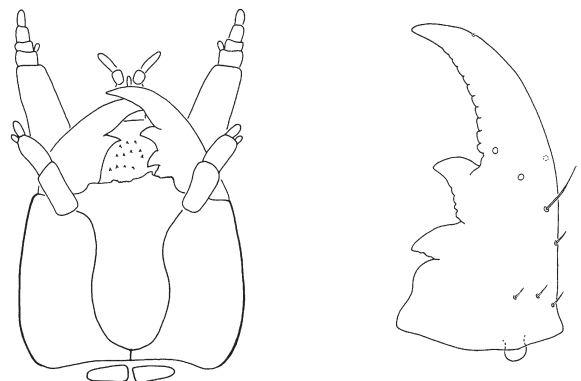
- 10' With 8 complete abdominal segments, the 9th and 10th reduced and usually forming a cavity for the posterior spiracles; clypeus variable 11

- 11(10') Antennal insertion points closer to anterolateral margin of the head; mandible with a small apical seta and a spinose pseudo-molar area near base **HYDROCHIDAE**



(adapted from Archangelsky 1997)

- 11' Antennal insertion points farther from the anterolateral margin of the head; mandible without a small apical seta and a spinose pseudo-molar area near base (a pseudo-molar area may be present, but without spines) **HYDROPHILIDAE** (in part)



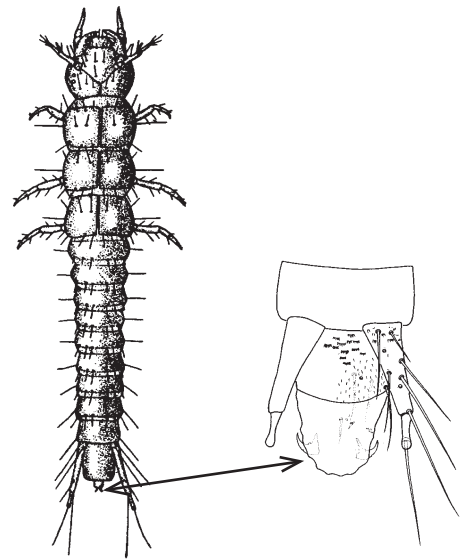
- 12(9') Legs reduced, usually 3-segmented; body obese, without well defined sclerites; posterior sometimes with large sclerotized hooks **CHRYSOMELIDAE**



- 12' Legs not reduced, 4-segmented; body cylindrical with well defined sclerites (body may be slightly flattened); posterior may bear small hooks but not large as above 13

- 13(12') Abdominal segment 10 with a pair of small recurved hooks **HYDRAENIDAE**

- 13' Abdominal segment 10 without a pair of small recurved hooks 14

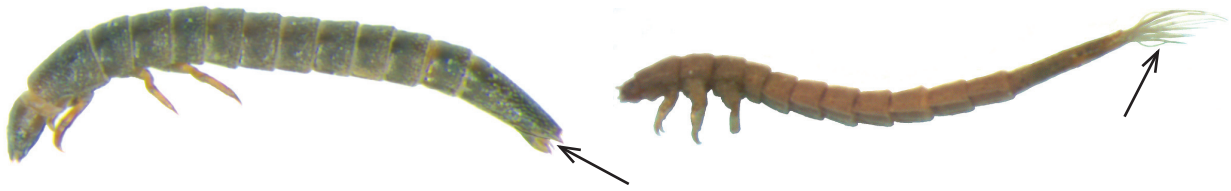


- 14(13') Terminal abdominal segment without an operculum but with clusters of lobe-like gills; antennal segments 1 and 2 very short, 3 long **PTILODACTYLIDAE**



- 14' Terminal segment with a lid-like operculum that covers a chamber; antennae not as above 15

15(14') Opercular chamber with retractable gill tufts and claws **ELMIDAE**



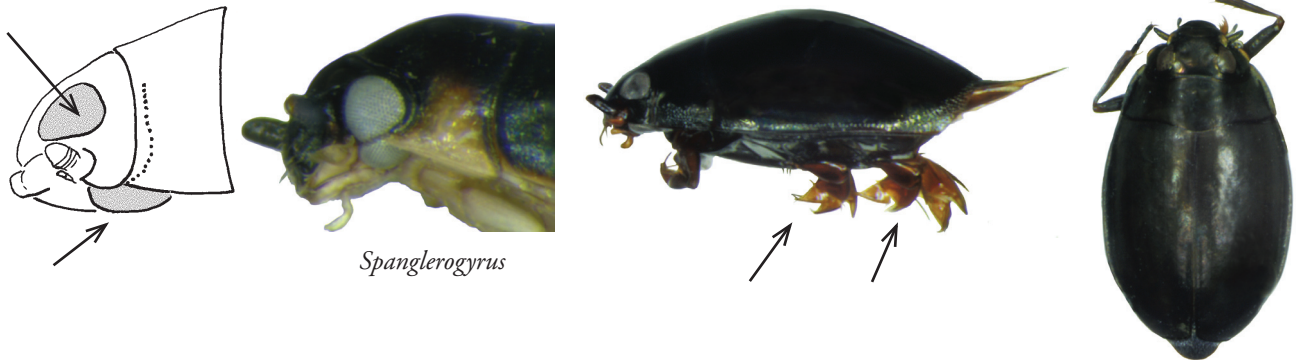
15' Opercular chamber without retractable gill tufts and claws **DRYOPIDAE**



Key to Water Beetle Families of Florida - Adults

(Note 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 appear to have 4 eyes; mid and hind legs thin and flattened, paddle-like **GYRINIDAE**



1' Eyes not divided, beetles with 2 eyes; mid and hind legs not thin and flattened, paddle-like 2

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



2' Hind coxae not expanded into large plates 3

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

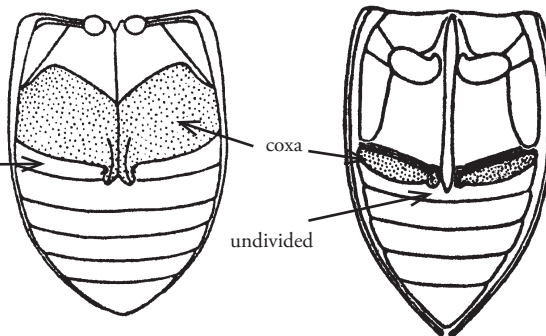
divided

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

divided

coxa

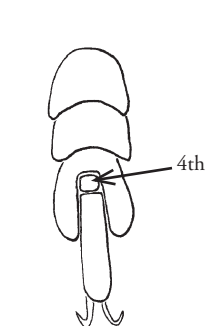
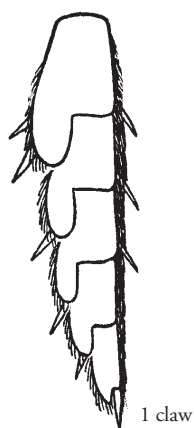
undivided



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



scutellum

pseudotetramerous
fore tarsus

hind tarsus



plicae

- 4' Scutellum not visible; fore and middle tarsi 5-segmented; hind tarsus with 2 equal, slender, curved claws; pronotum without plicae **NOTERIDAE**



no scutellum, no plicae



5 segmented fore tarsus



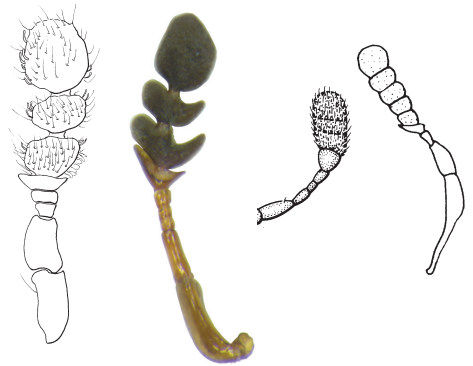
hind tarsus

- 5(3') Head produced anteriorly into a short to long rostrum ("snout"); antennae elbowed (strongly bent after basal segment) **CURCULIONIDAE**

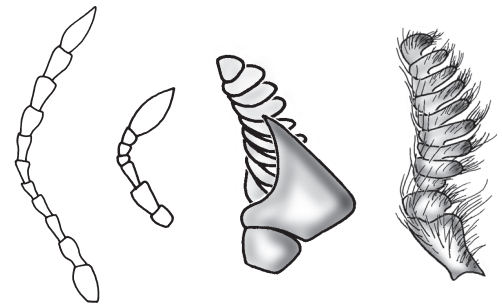


- 5' Head not produced into a rostrum; antennae not elbowed 6

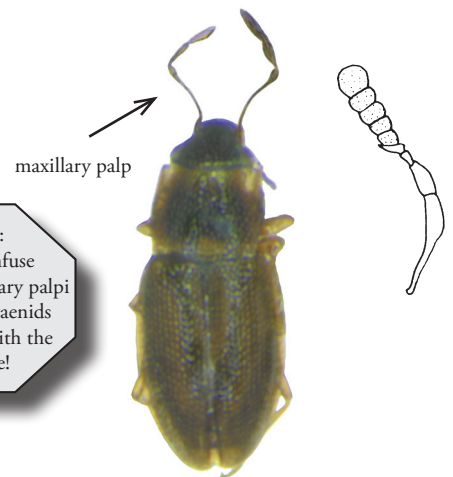
- 6(5') Antennae terminating in an abrupt multi-segmented club; maxillary palpi usually as long as or much longer than antennae (shorter in subfamily Sphaeridiinae of Hydrophilidae) 7



- 6' Antennae filiform, serrate or pectinate, never ending in a multi-segmented club 10



- 7(6) Abdomen with 6-7 visible sternites; antennal club with 5 pubescent segments; length ≤ 2 mm **HYDRAENIDAE**



NOTE:
Do not confuse
the long maxillary palpi
of some hydraenids
(*Hydraena*) with the
antennae!

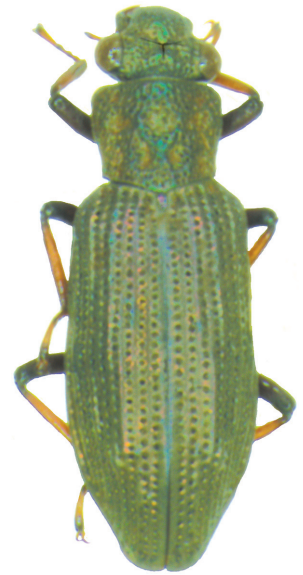
- 7' Abdomen with 5-6 visible sternites; antennal club with 3 pubescent segments; length 1.5-40.0 mm 8

8(7') Pronotum with 7 longitudinal grooves (including submarginal groove) **HELOPHORIDAE**

8' Pronotum without longitudinal grooves 9



9(8') Pronotum roughly sculptured with pits and much narrower than base of elytra; eyes protruding prominently and head not deflexed **HYDROCHIDAE**



9' Pronotum mostly smooth (except for microsculpture) and usually as wide as elytra at base (if narrower than pronotum smooth); eyes usually not protuberant but if protuberant than head usually deflexed ..
..... **HYDROPHILIDAE**



- 10(6') Tarsi apparently with 4 segments, but 3rd segment deeply bilobed, hiding minute 4th segment **CHRYSOMELIDAE**



minute 4th segment



- 10' Tarsi with 5 well defined segments 11

- 11(10') Body form elongate-oval to nearly round; head usually concealed by pronotum; tarsi with 4th segment strongly bilobed ventrally; hind femora often greatly enlarged **SCIRTIDAE**



- 11' Body form never almost round, usually elongate; head usually visible, may be concealed by pronotum; tarsi without ventral lobes in Florida taxa; hind femora not enlarged 12

- 12(11') Antennae short, either with 2nd segment enlarged or with 8 apical segments pectinate **DRYOPIDAE**



12' Antennae longer, mostly filiform, but may be serrate or pectinate, IF short, then filiform 13

13(12') Typically hard-bodied and narrowly elongate; tarsal claws often greatly enlarged **ELMIDAE**

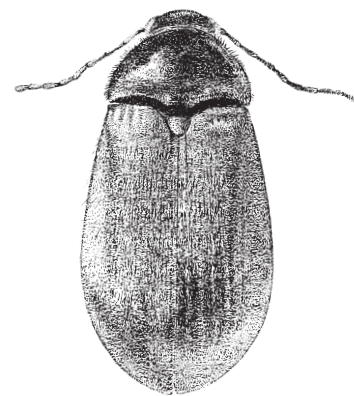


13' Typically soft-bodied, broader and flatter; tarsal claws not greatly enlarged 14

14(13') Pronotum yellow with dark center; mandibles concealed; labrum not visible from in front **PSEPHENIDAE**



14' Pronotum unicolorous; mandibles not concealed; labrum visible from in front **PTILODACTYLIDAE**



FAMILY **CHRYSOMELIDAE**
leaf beetles

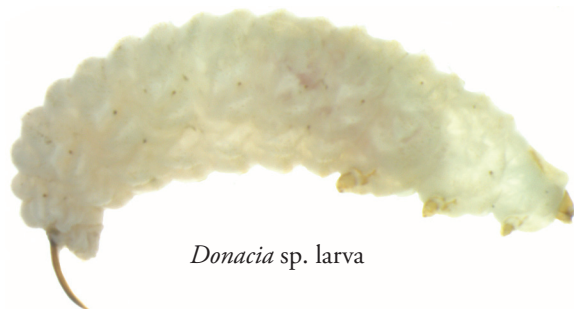
2

DIAGNOSIS: Semiaquatic larvae are distinguished by the labrum not fused to the clypeus; visible but reduced legs, usually with 3 segments; tarsus with a single apical claw; 8-9 dorsally visible abdominal segments; and lack of external gills.

Semiaquatic adults are distinguished by the filiform or clavate antennae; five segmented tarsi, with third segment deeply bilobed, with minute fourth segment hidden in base of lobes; and first abdominal sternite not divided by hind coxae.



Galerucella nymphaeae larva



Donacia sp. larva



Donacia rugosa

NOTES: The leaf beetles comprise a large family with over 1700 species occurring in North America north of Mexico. Of the 195 North American chrysomelid genera, eight which occur in Florida may be considered semiaquatic because they feed on or are associated with aquatic plants. The majority of these species belong with two subfamilies; the Donaciinae, which includes *Donacia* and *Plateumaris* in Florida, and the Galerucinae, especially the tribe Alticini - the flea beetles - which includes *Agasicles*, *Disonycha*, *Lysathia* and *Pseudolampsis*. One Chrysomelinae genus, *Prasocuris*, is also considered semi-aquatic. Brigham (1982) and especially Center et al. (2002) provide much biological information on some of the species.

Only those taxa known to be associated with aquatic plants are included in this chapter. This is a huge family, and no doubt many non-aquatic taxa (e.g., *Chrysomela* and *Paria*) will turn up in some samples. See the excellent publication of Ciegler (2007) to identify non-aquatic species.

Larvae are not keyed or included in the generic diagnoses, but are illustrated for several genera.

ADDITIONAL REFERENCES: Balsbaugh & Hays 1972; Brigham 1982; Center et al. 2002; Ciegler 2007; Riley et al. 2002; Riley et al. 2003.

Florida genera

Agasicles Jacoby
Disonycha Chevrolat in Dejean
Donacia Fabricius
Galerucella Crotch
Lysathia J. Bechyné
Plateumaris Thomson
Prasocuris Latreille
Pseudolampsis Horn

Key to genera of semiaquatic Chrysomelidae adults of Florida

NOTE: there are many chrysomelid genera *not* included here. If your specimen does not match anything in the key below, it is most likely terrestrial. Use the keys in Ciegler 2007 or Riley et al. 2002.

- 1 Prothorax laterally rounded, without a definite lateral margin 2



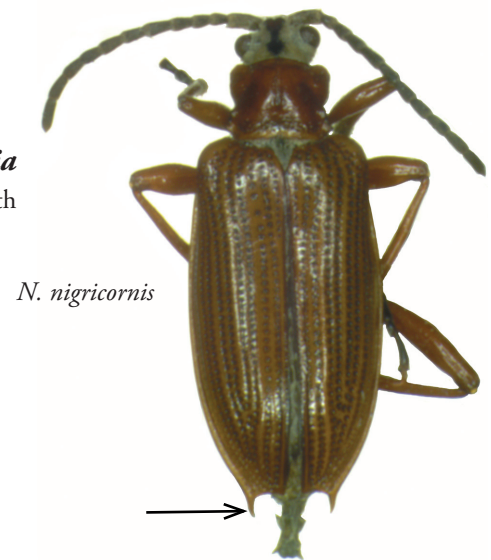
Donacia hypoleuca - no lateral margin



Disonycha pensylvanica

- 1' Prothorax with a lateral margin 4

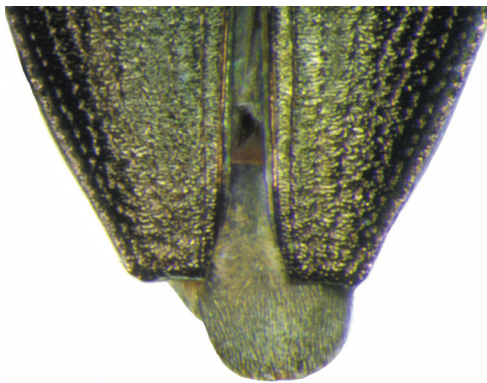
- 2(1') Apex of each elytron with a long spine * *Neohaemonia*
(not recorded from Florida, but one species, *N. nigricornis* (Kirby) (length 5.8-7.4 mm) may eventually be found here)



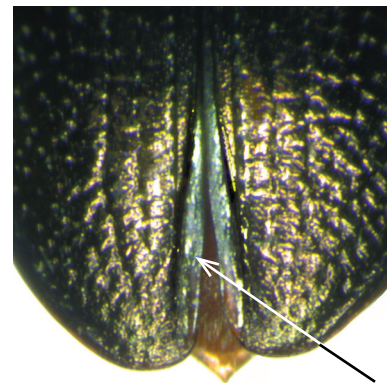
N. nigricornis

- 2' Apex of elytron round, truncate or at most produced to a sharp angle, but without a long spine 3

- 3(2') Inner carina of elytron extending to apex *Donacia*



Donacia



Plateumaris

- 3' Inner carina of elytron curves away laterally before apex, leaving a flattened inner area .. *Plateumaris*

- 4(1') Bases of antennae separated by at least length of first antennomere *Prasocuris*



antennal bases widely separated (*Prasocuris*)



antennal bases close (*Agasicles*)

- 4' Bases of antennae close, separated by less than length of first antennomere 5

- 5(4') Fore coxae very narrowly separated; hind femora not markedly broader than fore and mid femora *Galerucella*



- 5' Fore coxae well separated; hind femora much broader than fore and mid femora (weakly so in *Lysathia*) 6

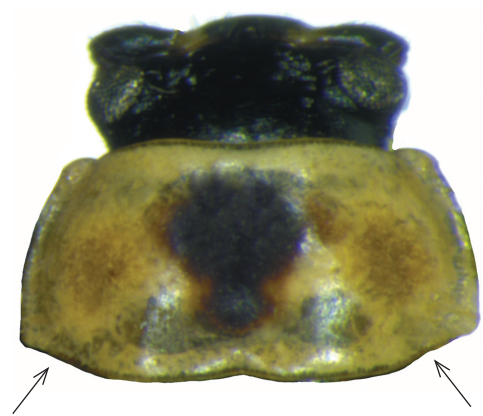


- 6(5') Last tarsomere of hind tarsus globose; total length < 3 mm .. *Pseudolampsis*



- 6' Last tarsomere of hind tarsus normal; total length 4+ mm 7

- 7(6') Eyes vertically elliptical; posterolateral margin of prothorax indented *Disonycha*



- 7' Eyes rounder; posterolateral margin of prothorax smoothly rounded/straight 8



- 8(7') Elytra black with yellow/ivory vittae *Agasicles*



Agasicles hygrophila



Lysathia ludoviciana

- 8' Elytra bluish-purple, without vittae *Lysathia*

GENUS *Agasicles*

DIAGNOSIS: Adults are distinguished by the medium size (around 5 mm); rounded eyes; proximal 1-4 antennomeres lighter than more distal ones; bases of antennae close, separated by less than the length of the first antennomere; black pronotum, with well developed lateral bead and angulate posterolateral margin; fore coxae well separated; black elytra with yellow/ivory vittae; enlarged hind femora; and males with a deep, wide, fossa (pit) on the fifth sternite.

*A. hygrophila* larva

spines

posterior of *A. hygrophila* larva*A. hygrophila*

NOTES: A single species, *A. hygrophila* (length 4.3-5.1 mm) is found in Florida. Introduced into Florida from Argentina in the mid 1960's to control alligatorweed (*Alternanthera philoxeroides* (Mart) Griseb.), this beetle has been a resounding success (Buckingham 1996). Larvae may be separated from those of the somewhat similar *Galerucella nymphaeae* by the presence of spines on last abdominal sternite.

ADDITIONAL REFERENCES: Buckingham 1996; Center et al. 2002; Ciegler 2007.

Florida species

A. hygrophila Selman & Vogt

GENUS *Disonycha*

DIAGNOSIS: Adults are distinguished by the elliptical eyes; bases of antennae close, separated by less than the length of the first antennomere; pronotum with well developed lateral bead and indented posterolateral margin; fore coxae well separated; plain or vittate elytra; fore coxal cavities open behind; and enlarged hind femora.



D. pennsylvanica larva
(posterior shrunk by preservative)



D. pennsylvanica adult

NOTES: *Disonycha* is a large genus with several species that feed on aquatic or emergent plants; the following key deals only with those species known to be “aquatic”, based on host plant records from Balsbaugh & Hays (1972), Brigham (1982), Center et al. (2002) and Ciegler (2007).

ADDITIONAL REFERENCES: Balsbaugh & Hays 1972; Center et al. 2002; Ciegler 2007; Flowers et al. 1994.

Florida species

D. collata (Fabricius)
D. conjugata (Fabricius)
D. fumata (LeConte)
D. glabrata (Fabricius)
D. pennsylvanica (Illiger)
D. xanthomelas (Dalman)

Key to Florida *Disonycha* adults associated with aquatic plants

NOTE: there are many species of *Disonycha* **not** included here. If your specimen does not match anything in the key below, it is most likely terrestrial. Use the keys in Balsbaugh & Hays 1972 or Ciegler 2007.

- 1 Elytra unicolorous, blue/green black
..... 2



unicolorous

D. xanthomelas

vittate

D. pennsylvanica

- 1' Elytra vittate, yellow with dark markings 3

- 2(1) Head entirely dark, except around base of antennae ..
..... *D. xanthomelas*



- 2' Head bicolored *D. collata*



- 3(1') Elytra with lateral margin black *D. glabrata*

*D. glabrata*

black margin



yellow margin

D. pennsylvanica

- 3' Elytra with lateral margin yellow 4

- 4(3') Elytra pale yellow-brown with darker brown or pale reddish-brown vittae *D. conjugata*

- 4' Elytra yellow with black vittae 5

- 5(4') Head black except for yellow ring around base of antennae; femora black *D. pensylvanica*



D. pensylvanica

- 5' Head yellow, labrum black; femora reddish-yellow
..... *D. fumata*



D. fumata

Notes on species

D. collata - Length 4.0-5.5 mm. Associated with *Amaranthus* and *Alternanthera*.

D. conjugata - Length 4.4-5.5 mm. Associated with *Polygonum*. Male elytra are smooth, but those of females are costate (with smooth longitudinal ridges). Ciegler (2007) keys this species twice; with vittae, and also with unicolorous elytra. I have not seen unicolorous *D. conjugata*; following Ciegler (2007) they would be separated from the two other unicolorous species in the key above by the yellowish-brown color.

D. fumata - Length 6.0-7.7 mm. According to Balsbaugh & Hays (1972) a saline marsh species; I've examined specimens labeled as "breeding on *Boltonia diffusa* Ell.", a wetlands species commonly known as Doll's Daisy or False Aster.

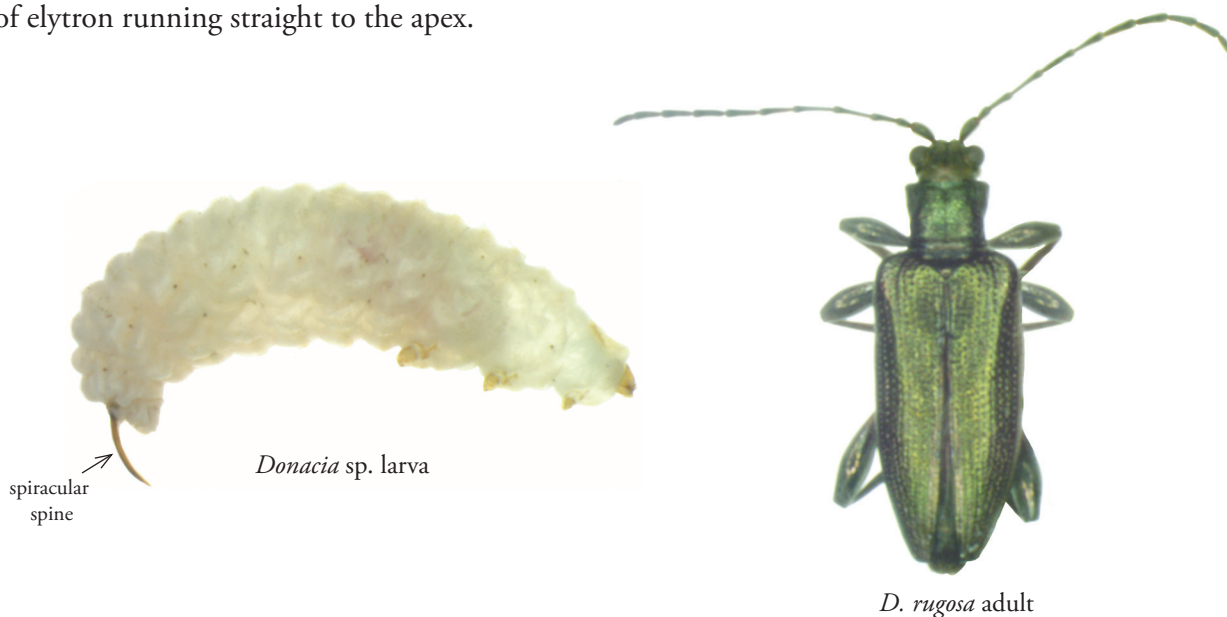
D. glabrata - Length 5.3-6.3 mm. Associated with *Amaranthus* and *Alternanthera*.

D. pensylvanica - Length 5.0-6.0 mm. Found on *Ludwigia*, *Polygonum* and other plants. Male elytra are smooth, but those of females are costate. Note that Illiger did spell it "*pensylvanica*".

D. xanthomelas - Length 4.5- 5.8 mm. Commonly called the "Spinach Flea Beetle", it is found on a wide variety of plants, including *Amaranthus* (water hemp) and *Alternanthera*. In some specimens, there may be light areas in the line of punctures above the eyes, in addition to the light antennal bases.

GENUS *Donacia*

DIAGNOSIS: Adults are distinguished by the rounded lateral margin of the pronotum; and the inner sutural bead of elytron running straight to the apex.



NOTES: With 30 described North American species (plus a few undescribed), *Donacia* is the most speciose genus of the aquatic/semiaquatic Chrysomelidae. Sixteen species are recorded from Florida, with the possibility of at least one other species eventually being found here.

Adults of many species are most often associated with water lilies (*Nymphaea* and *Nuphar*). Larvae are grub-like, with large spiracular spines. In some species these spines are used to pierce plant tissues, where they may function in respiration.

Donacia are difficult to identify - there is considerable sexual dimorphism and intraspecific variability. Although revised by Schaeffer (1925) and reviewed by Marx (1957), the taxonomy of the genus remained confused. The papers of Askevold (1987a, 1987b, 1991a) have reconciled many of the errors in Schaeffer and Marx, but specimens are still difficult to identify - correctly identified comparative material is almost a necessity for correct identifications.

Due to variability and sexual dimorphism, many species are keyed several times in the key below, which is partially adapted from that in Downie & Arnett (1996). The first part of the key deals with the subgenus *Donacia* (*Donacia*) in which males and females are keyed separately; the second portion (couplet 23) deals with *D. (Donaciomima)* where males and females are keyed together.

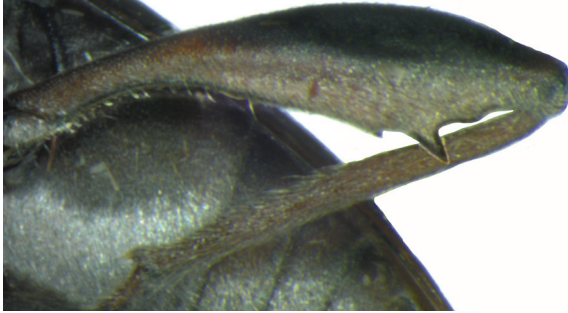
ADDITIONAL REFERENCES: Askevold 1987a, 1987b, 1991a; Balsbaugh & Hays 1972; Center et al. 2002; Ciegler 2007; Marx 1957; Schaeffer 1925.

Florida species

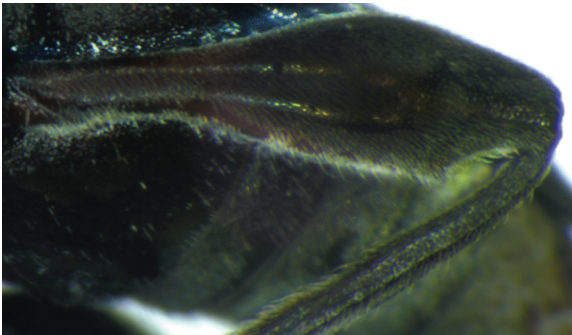
D. assimilis Lacordaire
D. biimpressa Melsheimer
D. caerulea Olivier
D. cincticornis Newman
D. dissimilis Schaeffer
D. edentata Schaeffer
D. hypoleuca Lacordaire
D. militaris Lacordaire
D. palmata Olivier
D. parvidens Schaeffer
D. piscatrix Lacordaire
D. proxima Kirby
D. rufescens Lacordaire
D. rugosa LeConte
D. subtilis Kunze
D. texana Crotch

Key to adult *Donacia* of Florida

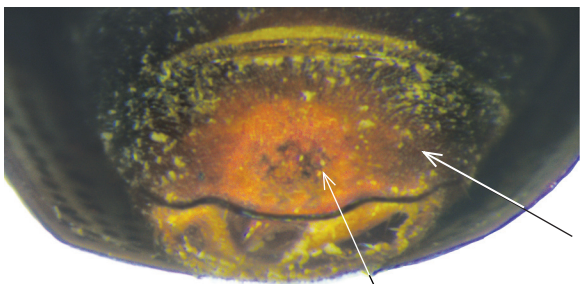
- 1 Hind femora mostly brown to pale red or with the posterodorsal surface darkened, rarely bicolored (distally dark, proximally light; some *D. piscatrix*, *D. texana*); occiput often with two red spots behind eyes or a transverse band of red (*D. proxima* has almost completely black legs but red spots behind the eyes); pronotal disc smooth or finely roughened (like fine sandpaper) 2



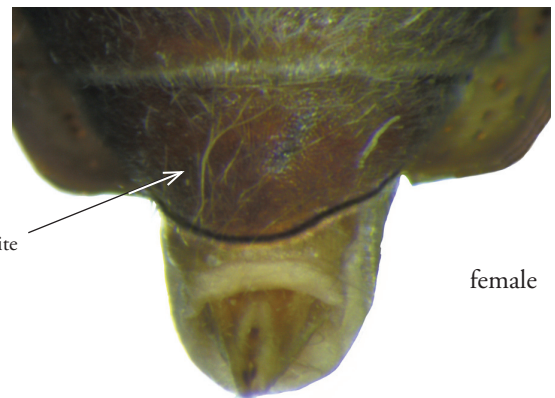
- 1' Hind femora completely dark or dark red, or bicolored, with posterior half or more completely dark, never with just posterodorsal surface darkened; occiput dark, without red spots; pronotal disc usually coarsely punctate or rugose (wrinkled) 23



- 2(1) Males: last sternite with distinct posteromedial depression (posterior margin of sternite appears wavy in posterior view); pygidium (dorsal portion of last abdominal tergite) broadly truncate; first abdominal sternite often with anteromedian broad, shallow depression or somewhat flattened 3



male



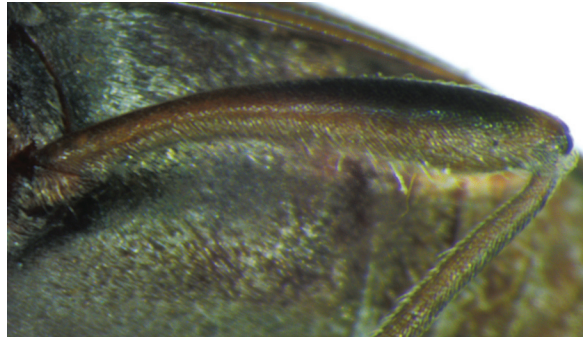
female

depression

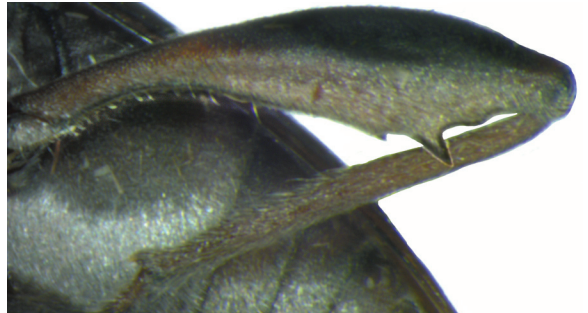
anal sternite

- 2' Females: last sternite without distinct posteromedial depression (posterior margin of sternite usually appears smoothly curved in posterior view); pygidium broadly rounded, or triangularly produced with round apex, or narrowly truncate, or emarginate (notched); first abdominal sternite simply arched 13

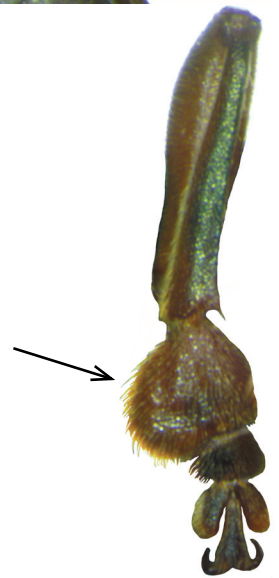
- 3(2) Posterior femur smooth, without preapical teeth on lower margin most *D. edentata*



- 3' Lower margin of posterior femur with one or more preapical teeth 4

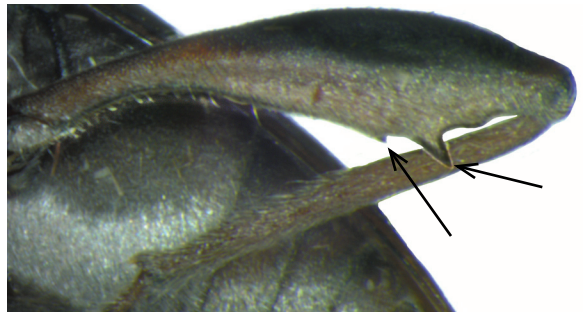


- 4(3') First tarsomere on fore leg asymmetric, greatly expanded *D. palmata*

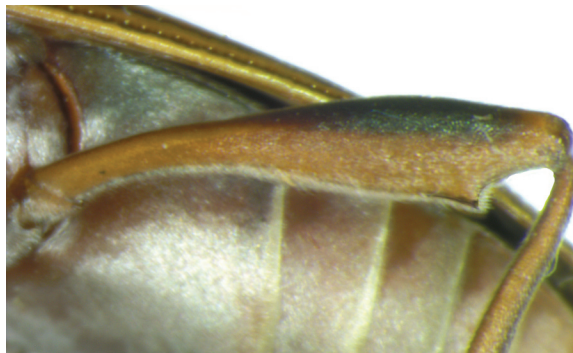


- 4' First tarsomere on fore leg not asymmetric, not greatly expanded 5

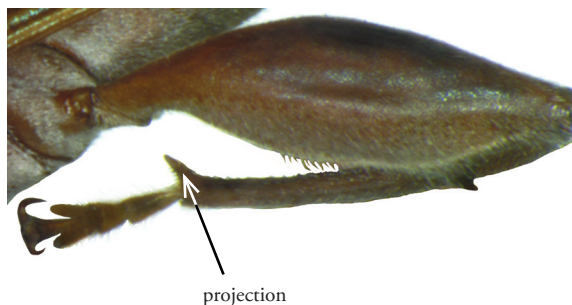
- 5(4') Hind femur with one large preapical tooth and a smaller, offset tooth at approximate middle 6



- 5' Hind femur with one preapical tooth 9



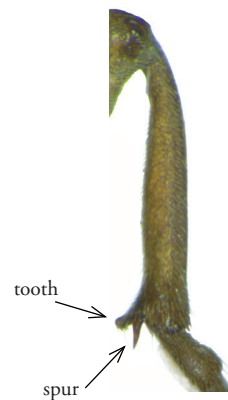
- 6(5) Hind tibia with long apical tooth-like projection and serrate posterior margin; hind femora strongly swollen; size smaller, 5.0-6.5 mm *D. militaris*



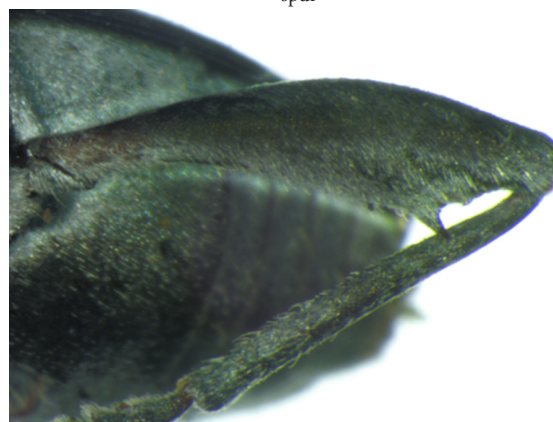
- 6' Hind tibia without long apical tooth-like projection (may be expanded as short rounded scale) and with or without serrate posterior margin; hind femora not as strongly swollen; size larger, 5.0-9.5 mm 7

- 7(6') Mid tibia with inner apical tooth next to apical spur *D. piscatrix*

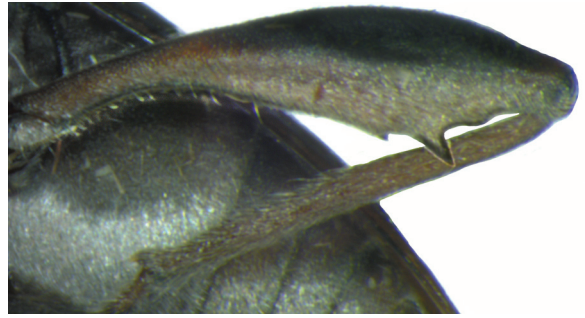
- 7' Mid tibia without inner apical tooth 8



- 8(7') Legs blackish except near base; hind femur shorter than elytra *D. proxima*



- 8' Legs mostly reddish-brown, with dorsum of femora darkened; hind femur extends to or beyond apex of elytra *D. cincticornis*

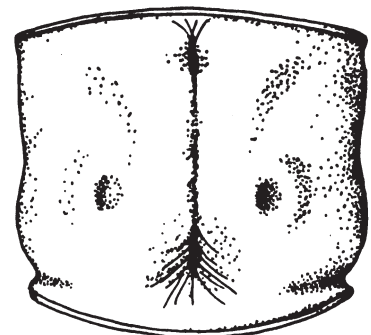


- 9(5') Head behind eyes dark red-brown/purple/black, without red spots; pronotal disc roughened with noticeable punctures; medial line of pronotum complete 10



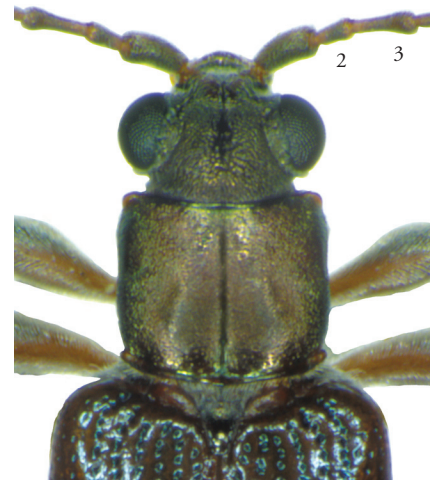
- 9' Head behind eyes dark brown or metallic, usually with red spots; pronotal disc without punctures; medial line of pronotum complete or incomplete 11

- 10(9) Lateral margin of pronotum straighter; anterior portion of pronotal median line with deeper recess; third antennal segment about 1.25X length of second *D. parvidens*

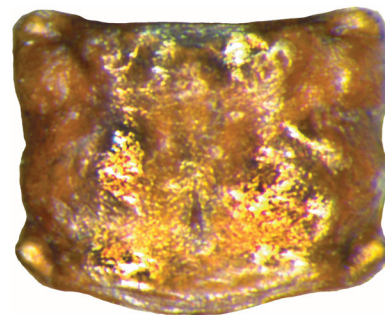


(adapted from Marx 1957)

- 10' Lateral margin of pronotum more sinuate; anterior portion of pronotal median line without deep recess; third antennal segment about 2X length of second some *D. edentata*



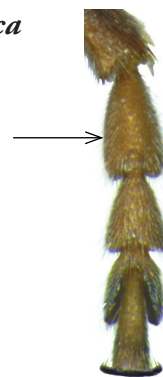
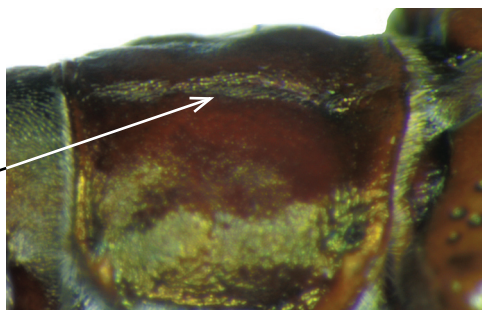
- 11(9') Smaller, length about 4-6 mm; pronotum like shiny leather *D. rufescens*



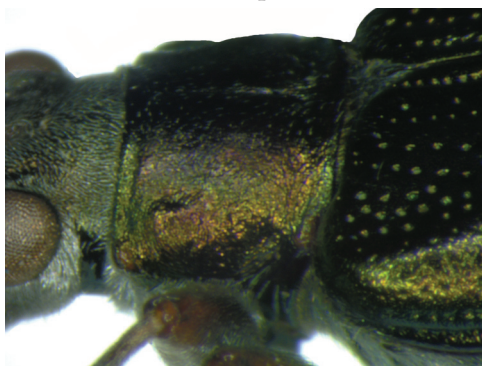
- 11' Larger, length 8.0-10.5 mm; pronotum finely rough but shiny, metallic (see below) 12

- 12(11') First foretarsal segment wider, pear-shaped; at least posterior portion of pronotal median line pubescent *D. hypoleuca*

median line pubescence



- 12' First foretarsal segment narrower, much longer than wide; posterior portion of pronotal median line bare (but scattered setae present on disc) *D. texana*



- 13(2') Posterior femur smooth, without preapical teeth on lower margin 14



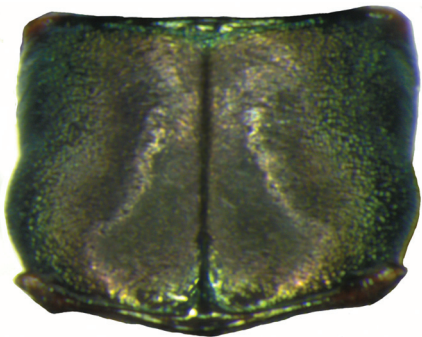
no tooth - *D. edentata*



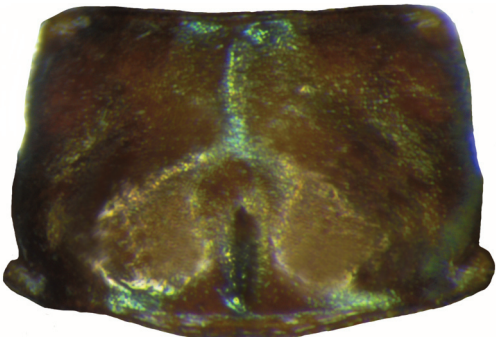
toothed - *D. piscatrix*

- 13' Lower margin of posterior femur with a preapical tooth 15

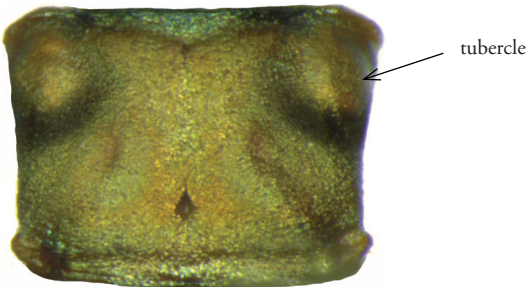
14(13) Pronotal median line complete most *D. edentata*



14' Pronotal median line apparent only on posterior half *D. militaris*

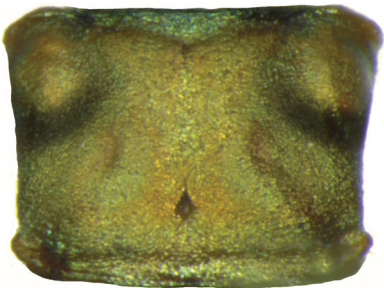


15(13') Middle tibia with a pronounced tooth on apex, next to spur; pronotum with well developed knob-like anterolateral tubercles 16

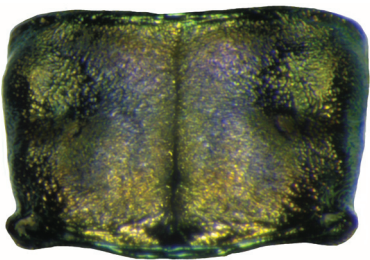


15' Middle tibia at most widened near apex; pronotum without anterolateral tubercles or if tubercles present, not as large 17

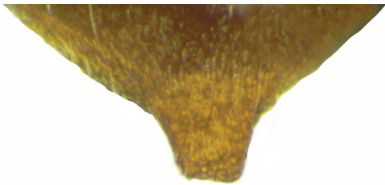
16(15) Pronotum noticeably wider anteriorly than posteriorly; pronotal median line absent or barely noticeable; posterior portion of pronotum slightly more inflated; last abdominal sternite usually with blunt tooth-like posterior projection, but may be simply triangular *D. palmata*



D. piscatrix



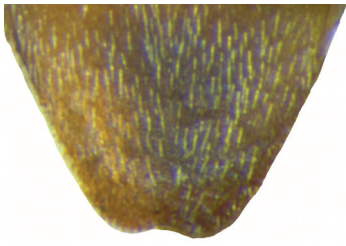
D. palmata



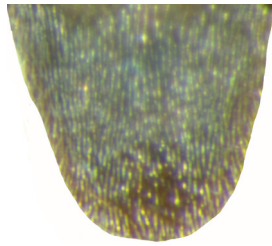
D. piscatrix
last abdominal sternite

16' Pronotum only slightly wider anteriorly than posteriorly; pronotal median line usually present; posterior portion of pronotum not inflated; last abdominal sternite triangular posteriorly *D. palmata*

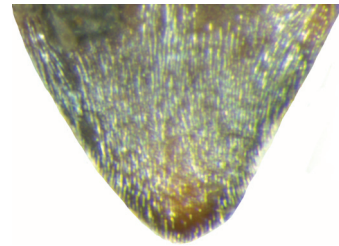
- 17(15') Posterior margin of pygidium truncate or emarginate (notched); head behind eyes dark red-brown/purple/black, without small red spots; pronotal median line distinct 18



truncate-emarginate
D. edentata



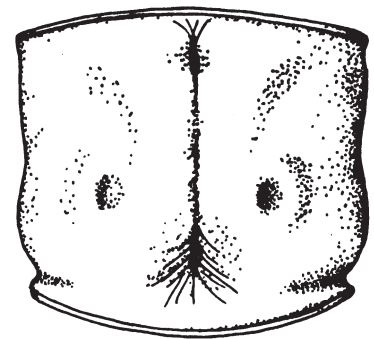
rounded
D. cincticornis



triangular
D. texana

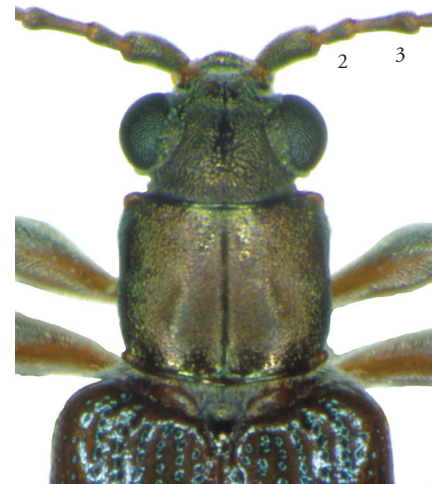
- 17' Posterior margin of pygidium rounded, or broadly triangular; head usually with red spots or reddish band behind eyes; pronotal median line lacking, partial or distinct 19

- 18(17) Lateral margin of pronotum straighter; anterior portion of pronotal median line with deeper recess; third antennal segment about 1.25X length of second *D. parvidens*

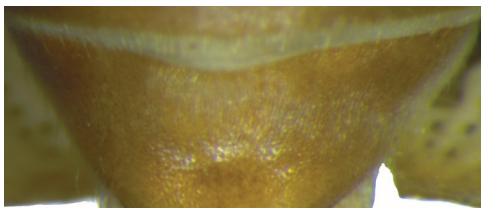


(adapted from Marx 1957)

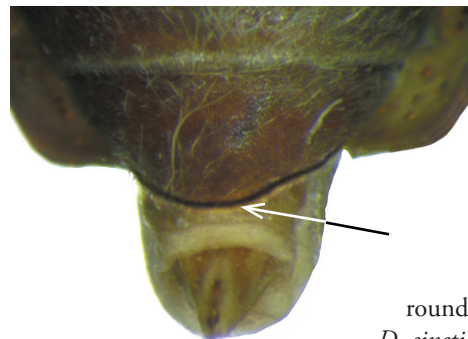
- 18' Lateral margin of pronotum more sinuate; anterior portion of pronotal median line without deep recess; third antennal segment about 2X length of second some *D. edentata*



- 19(17') Last abdominal sternite emarginate or truncate posteriorly 20



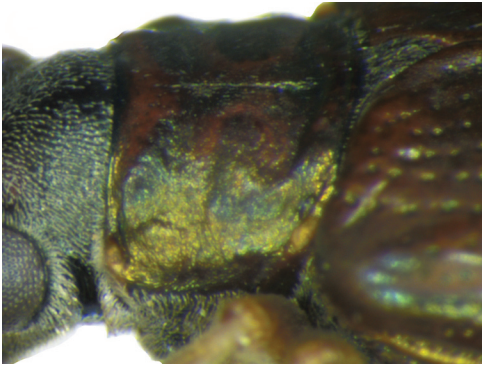
truncate-emarginate
D. hypoleuca



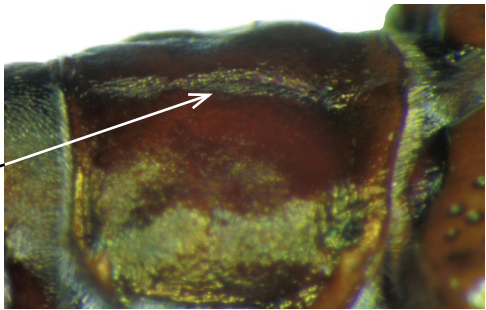
rounded
D. cincticornis

- 19' Last abdominal sternite rounded or broadly triangular posteriorly 21

20(19) Smaller, length 6-8 mm; pronotal median line bare (line lacking in some specimens) *D. rufescens*



D. rufescens



median line pubescence

D. hypoleuca

20' Larger, length 8.0-10.5 mm; pronotal median line pubescent *D. hypoleuca*

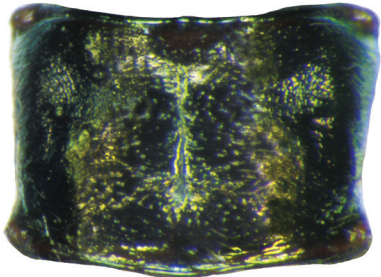
21(19') Legs entirely dark except at extreme base; hind tarsomere 1 more squat, width about $\frac{3}{4}$ length *D. proxima*



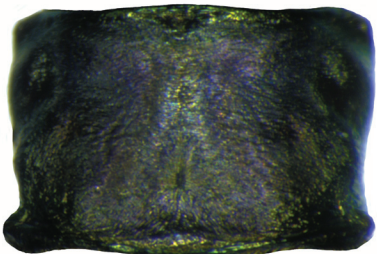
21' Legs at most with distal half darker than proximal half; hind tarsomere 1 longer, about twice as long as wide 22



22(21') Pronotum smooth *D. cincticornis*



D. cincticornis



D. texana

22' Pronotum rough *D. texana*

- 23(1') Posterior femur smooth, without preapical teeth on lower margin 24



smooth



tooth →

- 23' Lower margin of posterior femur with a preapical tooth 27

- 24(23) Hind femur weakly clavate, about as wide at base as apex 25



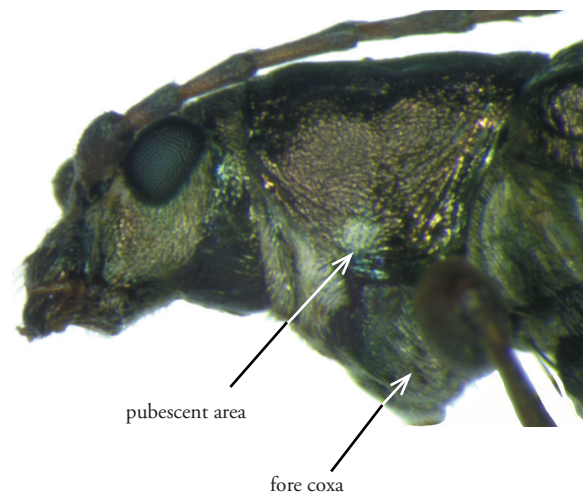
weakly clavate



strongly clavate

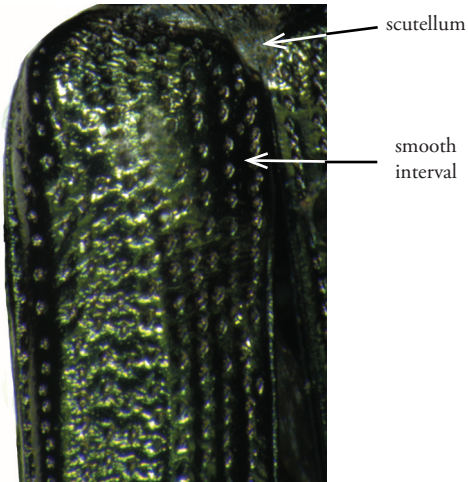
- 24' Hind femur more strongly clavate, about twice as wide at apex as at base 26

- 25(24) 3rd antennal segment as long as or longer than first; pronotum with well developed anterolateral tubercles; prothorax with narrow pubescent area laterally, not extending past fore coxa .. *D. dissimilis*

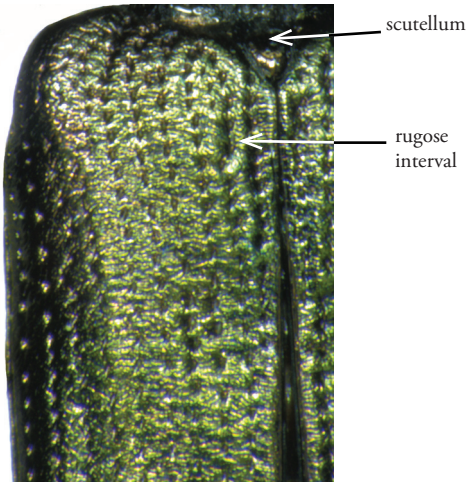
*D. dissimilis*

- 25' 3rd antennal segment shorter than first; pronotum without well developed anterolateral tubercles; prothorax with wide pubescent area laterally, extending beyond fore coxa **D. vicina*
(not recorded for Florida, but may eventually be found in the northern/western part of the state)

26(24') Discal (inner) elytral intervals mostly smooth ... *D. assimilis*

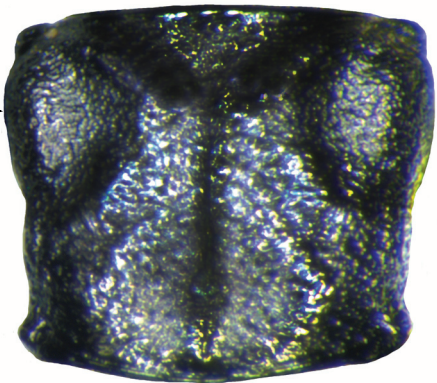


26' All elytral intervals densely rugose (wrinkled) *D. rugosa*



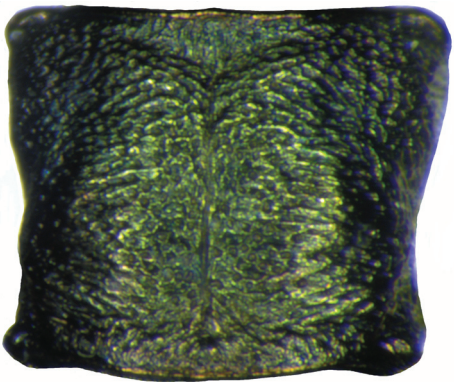
27(23') Pronotum with well developed, knob-like anterolateral tubercles 28

anterolateral tubercle



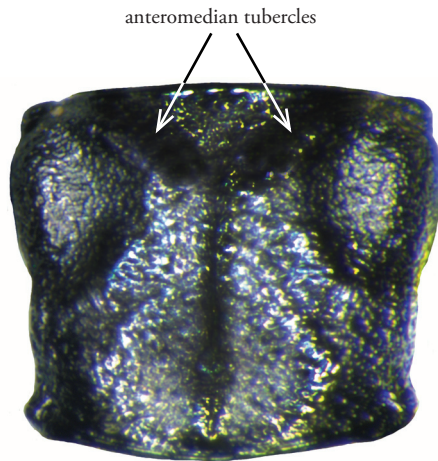
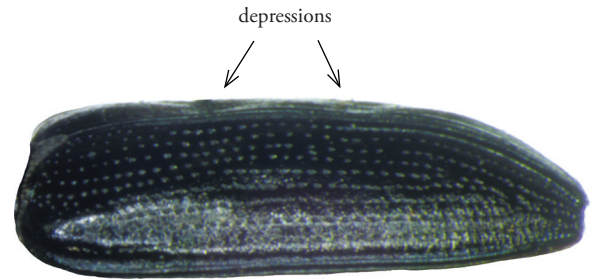
D. caerulea

27' Pronotal anterolateral tubercles, if present, not knob-like and well developed 29



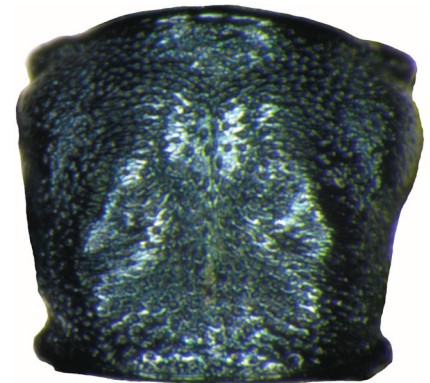
D. rugosa

- 28(27) Pronotum with a pair of oblique anteromedial tubercles, so that pronotal median line appears Y-shaped in most specimens; each elytron with an antero- and posteromedian broad shallow depression (elytra appear “dented”) *D. caerulea*

*D. caerulea*

lateral view of elytra

- 28' Pronotum without oblique anteromedial tubercles; pronotal median line, if present, not Y-shaped; each elytron with at most a single anteromedian depression *D. biimpressa*

*D. biimpressa*

- 29(27') Third antennal segment as long as or longer than first; all elytral intervals densely rugose (see couplet 26') *D. rugosa*

*D. rugosa**D. subtilis*

- 29' Third antennal segment shorter than first; discal (inner) elytral intervals usually mostly smooth (see couplet 26) *D. subtilis*

Note on species

- D. assimilis* - Length 6.0-7.5 mm. The discal intervals of the elytra are basically smooth, while the outer intervals are transversely wrinkled. Associated with bur-reed (*Sparganium americanum*).
- D. biimpressa* - Length 5.5-9.0 mm. Listed for Florida by Riley et al. (2003), but no collection or county data were provided; I have not seen any Florida material of this species. Associated with sedges (*Carex*, *Scirpus*).
- D. caerulea* - Length 6.0-7.5 mm. Referred to as “*D. aequalis*” in Schaeffer (1925), Marx (1957) and Balsaugh & Hays (1972); what Schaeffer (1925) and Marx (1957) called *D. caerulea* was actually *D. proxima* (see Askevold 1991a). This species has elytra that each have two “dents” on them, one before the approximate middle of the elytron, the other after. Some other species, such as *D. subtilis*, may also sport such “dents”, but only one on each elytron. This species may be metallic purple, blue or coppery. Associated with a wide range of plants, including *Juncus*, *Nuphar*, *Nymphaea*, *Pontederia*, *Sagittaria* and *Sparganium*.
- D. cincticornis* - Length 4.5-9.0 mm. A variable species with a wide size range – and associated with a wide range of plants (*Brasenia*, *Myriophyllum*, *Nelumbo*, *Nuphar*, *Nymphaea* and *Potamogeton*). Note that the hind tibiae of the male bear numerous small teeth, similar to those of *D. militaris*.
- D. dissimilis* - Length 5.8-8.0 mm. Associated with *Nuphar*.
- D. edentata* - Length 5.25-7.25 mm. Although most specimens lack a ventral tooth on the posterior femur, a small tooth may be found on some specimens; thus the species is keyed multiple times above. I’ve collected this species from *Nymphaea odorata*.
- D. hypoleuca* - Length 8-10.5 mm. The largest species I’ve seen from Florida, associated with *Nelumbo* and *Brasenia*. Note the pubescence of the pronotal median line in both sexes.
- D. militaris* - Length 5.0-6.5 mm. The male hind femora are strongly incrassate (swollen) and extend far past the apices of the elytra. Associated with *Nymphaea odorata*.
- D. palmata* - Length 7-9 mm. The unique fore tarsi of the male make identification of that sex easy, but females are more difficult to identify. Associated with *Nuphar* and *Nymphaea*.
- D. parvidens* - Length 5.5-8.0 mm. I have not seen Florida material of this species; the Florida record listed in Peck & Thomas (1998) is listed only as “Everglades”. Associated with *Nuphar* and *Nymphaea*.
- D. piscatrix* - Length 6-9 mm. Most Florida specimens I’ve seen range from a shiny yellow-brown to a metallic golden-green. There is variability in the shape of the thorax and the amount of “swelling” of the posterior femur. The last abdominal sternite of the female may be simply rounded, or be produced as a rounded or truncate “tooth”. Associated with *Nuphar*.
- D. proxima* - Length 6.5-9.0 mm. This species was incorrectly called “*D. caerulea*” in Schaeffer (1925) and Marx (1957). I have not seen Florida material of this species; it is noted in Peck & Thomas (1998) that the Liberty County record for this species may be a result of mislabeling. Associated with *Nuphar* and *Nymphaea*.
- D. rufescens* - Length 4.3-8.0 mm. There is strong sexual dimorphism in this species. Males are smaller (~4.3-6.0 mm) and yellowish-brown; females are larger (~6-8 mm) and more often a reddish-purple/brown, although some may be colored like the males. Found most often on *Nymphaea odorata*.
- D. rugosa* - Length 6.0-7.5 mm. A small tooth may be present or absent on the hind femur of this species that was originally described from Florida. Color varies from metallic green or blue to brassy copper. Associated with *Pontederia*.
- D. subtilis* - Length 6-9 mm. The only member of the *D. subtilis* group that is known to occur in Florida. This group is best separated by characters of the male genitalia; see Askevold (1987) for a more complete discussion of the *D. subtilis* group. Although previously believed to not occur in Florida (Ciegler 2007; Riley et al. 2003), Askevold’s compilation of Donaciinae taxa in Peck & Thomas (1998) lists this species for several Florida counties. I have also examined, courtesy of Dr. Wills Flowers at FAMU, a

long series of males and females from Gadsden County in the FAMU/FSCA collection identified by Askevold. The Florida material was associated with *Sagittaria* and *Sparganium*.

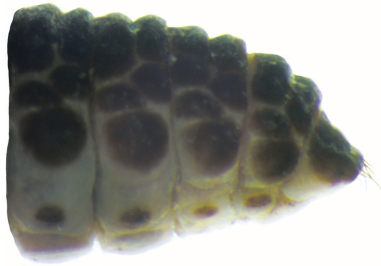
D. texana - Length 8.0-9.5 mm. Females of this species may be difficult to separate from *D. cincticornis*; the pronotum of *D. texana* looks like metallic sandpaper, while that of *D. cincticornis* looks more like shiny leather. Comparative material certainly helps. Associated with *Nuphar* and *Nymphaea*.

Other species

D. vicina Lacordaire - Length 7-8 mm. Although not recorded for Florida, its presence in Mobile, Alabama, as well as southern Georgia (Valdosta) indicates that it will eventually be found in Florida. Associated with *Sparganium*.

GENUS *Galerucella*

DIAGNOSIS: Adults are distinguished by the close bases of the antennae, separated by less than the length of the first antennomere; pronotum with well developed lateral bead and angulate posterolateral margin; fore coxae very narrowly separated; and the hind femora not markedly broader than fore and mid femora.

*G. nymphaeae* larvaposterior of *G. nymphaeae* larva*G. nymphaeae*

NOTES: A single species, *G. nymphaeae* (length 4.5-6.0 mm), is found in the Southeast US. Formerly placed in *Pyrrhalta*. The species feeds primarily on *Nuphar luteum*, but is also associated with *Nymphaea*, *Polygonum*, *Brasenia*, *Sagittaria* and some other taxa. Larvae may be separated from those of the somewhat similar *Agasicles hygrophila* by the absence of spines on last abdominal sternite.

ADDITIONAL REFERENCES: Center et al. 2002; Ciegler 2007.

Florida species

G. nymphaeae (Linnaeus)

GENUS *Lysathia*

DIAGNOSIS: Adults are distinguished by the close bases of the antennae, separated by less than the length of the first antennomere; rounded eyes; pronotum with well developed lateral bead and angulate posterolateral margin; fore coxae well separated; unicolorous elytra; and weakly enlarged hind femora.



L. ludoviciana

NOTES: A single species of this mostly Neotropical genus, *L. ludoviciana* (length 4.0 -4.6 mm), is found in the Southeast US. Found on *Ludwigia* and *Myriophyllum*, this beetle has been suggested as a potential biocontrol agent for nuisance Water Primrose (*Ludwigia grandiflora* (Michaux) Zardini, Gu & Raven) (McGregor et al. 1996).

ADDITIONAL REFERENCES: Ciegler 2007; Habeck & Wilkerson 1980.

Florida species

L. ludoviciana (Fall)

GENUS *Plateumaris*

DIAGNOSIS: Adults are distinguished by the rounded lateral margin of the pronotum; and the inner sutural bead of the elytron curving away laterally before the apex, leaving a flattened inner area.

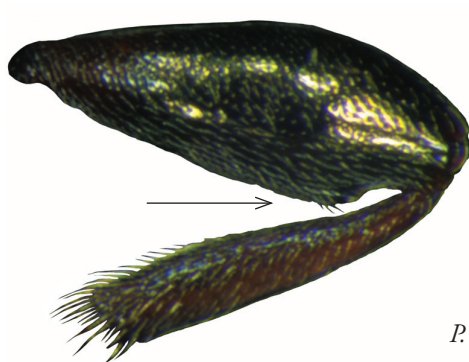
NOTES: *Plateumaris* species are uncommon in Florida; they are associated with sedges (*Carex*), bulrushes (*Scirpus*) and Green Arum (*Peltandra virginica* (L.) Schott & Endl.) Larvae are similar to those of *Donacia*.

Two species are recorded for Florida:

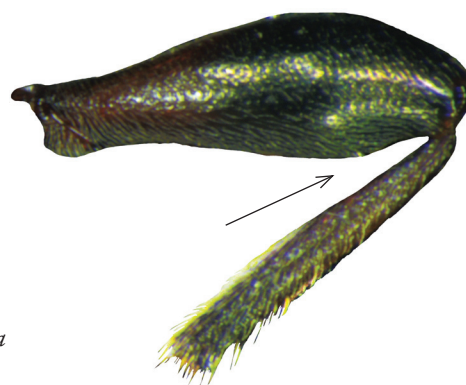
P. metallica (length 6.6-6.8 mm) has hind femora with a small preapical tooth, or the tooth is absent;



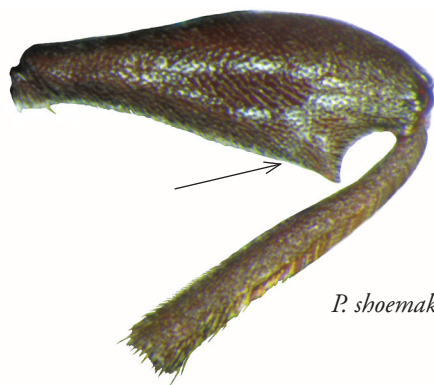
P. metallica



P. metallica



P. shoemakeri (length 5.5-7.5 mm) has hind femora with a large acute preapical tooth. Formerly considered a variety of *D. flavipes* Kirby, but the name *flavipes* was used incorrectly; what was called *D. wallisi* Schaeffer is actually *P. flavipes* (Kirby), which does not occur in Florida.



P. shoemakeri

Florida species

P. metallica (Ahrens)

P. shoemakeri (Schaeffer)

ADDITIONAL REFERENCES: Askevold 1991b; Ciegler 2007.

GENUS *Prasocuris*

DIAGNOSIS: Adults are distinguished by the bases of antennae separated by at least the length of the first antennomere; last maxillary palpomere attenuate; fore coxal cavities open behind; simple tarsal claws; pronotum with well developed lateral bead and angulate posterolateral margin; pronotum and elytra bicolored; and hind femora not enlarged.



P. vittata

NOTES: A single semiaquatic species, *P. vittata* (length 3.0-4.5 mm), occurs in Florida (there are other species in the genus). I have seen only one Florida specimen, from Gadsden County. Formerly considered a *Hydrothassa*, which was reduced to a subgenus of *Prasocuris*. Associated with *Ranunculus*.

ADDITIONAL REFERENCES: Ciegler 2007.

Florida species

P. vittata (Olivier)

GENUS *Pseudolampus*

DIAGNOSIS: Adults are distinguished by the small size (about 2 mm); bases of antennae close, separated by less than the length of the first antennomere; pronotum with well developed lateral bead and angulate posterolateral margin; fore coxae well separated; fore coxal cavities open behind; enlarged hind femora; and the globose hind tarsomere.



venter of *P. guttata* showing greatly enlarged hind femur



P. guttata

NOTES: A single species, *P. guttata* (length about 2 mm), is found in the SE US (north to Maryland and Virginia, west to Texas, Missouri and Oklahoma). This tiny beetle is commonly known as the “Waterfern flea beetle” and is associated with *Azolla*. The hind femora are markedly enlarged in this genus. *Pseudolampus* appear quite different in alcohol (dull reddish-brown) compared to when they are dried (red-brown with golden setae laterally). Note that *Pseudolampus* is not the only alticine chrysomelid with an inflated hind tarsomere; *Capraita*, *Distigmoptera*, *Kuschelina*, *Pachyonychis* and *Pachyonychus* have similar tarsi, but are at least 1.5X larger (or more) - and not aquatic.

Florida species

P. guttata (LeConte)

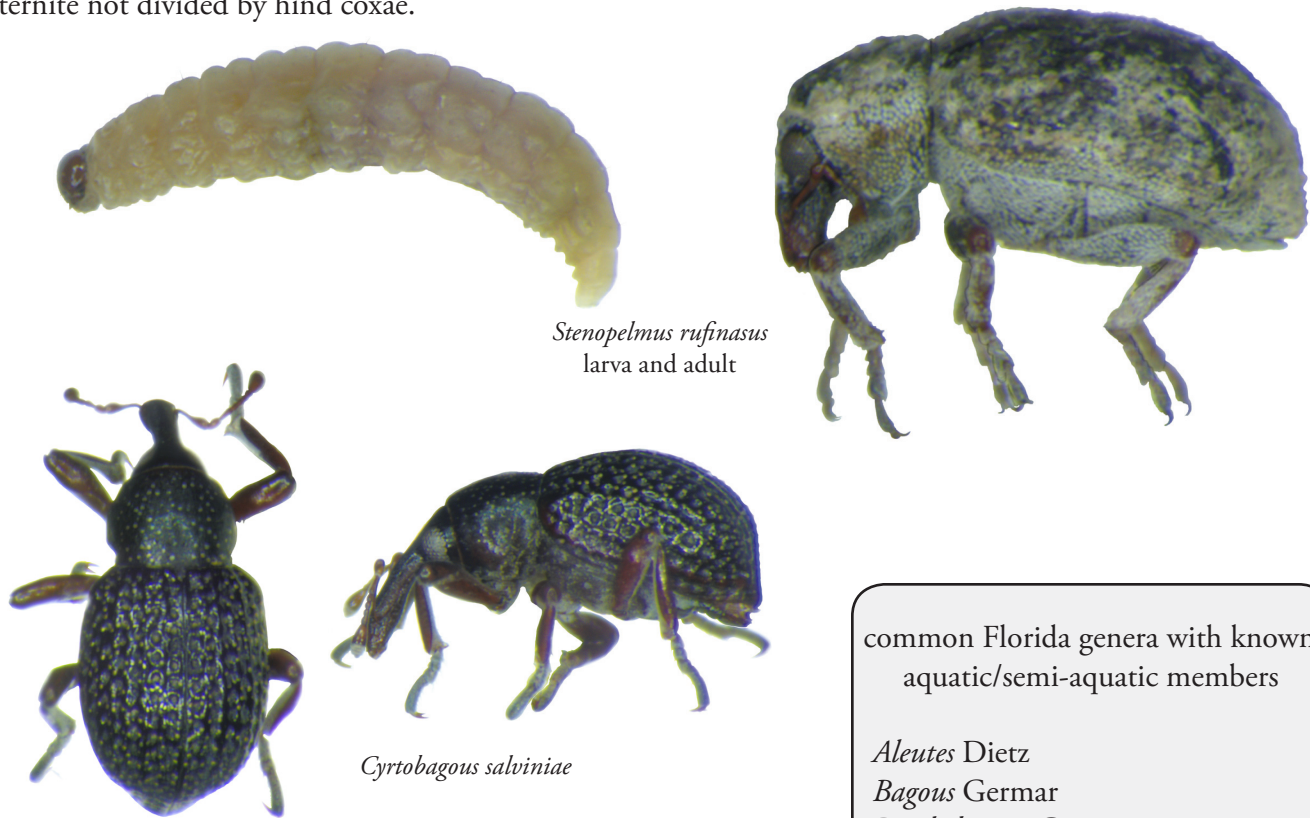
ADDITIONAL REFERENCES: Casari & Duckett 1998; Center et al. 2002; Ciegler 2007.

FAMILY **CURCULIONIDAE**
weevils

3

DIAGNOSIS: Larvae are distinguished by the obese, grub-like body form; distinct, separate labrum; maxilla with a mala; absence of legs; abdomen with 9 complete segments; and lack of posterior spines.

Adults are distinguished by the short to long rostrum; elbowed antennae with apical club and 1st abdominal sternite not divided by hind coxae.



NOTES: The weevils are the largest family of beetles, and probably the largest family of organisms in the world. Oberprieler et al. (2007) provided an overview of the taxonomy, classification and phylogeny of this family; they indicated that about 62,000 species had been described and estimated that the total number of species was probably about 220,000; described weevil species comprise 15.5% of all described beetle species.

Weevils are plant feeders; it is often said that for every species of plant, there are two species of weevils that feed on it! Many species are agricultural pests, but some taxa have been recruited as biocontrol agents. *Cyrtobagous*, *Neochetina* and *Neohydronomus* have been introduced and are established. Two species of *Bagous* have been introduced to control hydrilla, but apparently have not become established (O'Brien & Pajni 1989; Wheeler & Center 2007).

ADDITIONAL REFERENCES: Anderson 2002; Blatchley & Leng 1916; Downie & Arnett 1996; Oberprieler et al. 2007; O'Brien & Wibmer 1978; O'Brien & Wibmer 1984; Wibmer & O'Brien 1989.

common Florida genera with known aquatic/semi-aquatic members

Aleutes Dietz
Bagous Germar
Brachybamus Germar
Cyrtobagous Hustache
Lissorhoptrus LeConte
Listronotus Jekel
Lixus Fabricius
Neobagoidus O'Brien
Neochetina Hustache
Neohydronomus Hustache
Notiodes Schoenherr
Onychylis LeConte
Parenthis Dietz
Perigaster Dietz
Perigasteromimus Colonelli
Rhinoncus Schoenherr
Sibariops Casey
Sphenophorus Schoenherr
Stenopelmus Schoenherr
Tanysphyrus Germar
Tyloderma Say

The following key deals only with commonly encountered genera that are known to be aquatic or semi-aquatic; many genera may include one to several species that are aquatic/semi-aquatic, but may also have species that are terrestrial. A partial species list is given in Chapter 18, but the family is not included in the county distribution table. There are many taxa that live on plants that are marginal wetland inhabitants; these are generally not included, nor are those associated with driftwood; see below.

Due to the complexity of this family and its ever changing taxonomy, species level keys are not offered. For some genera no such keys exist; when easily available keys are extant, they are listed. Species level identification of most weevils requires the assistance of an *bona fide* expert and a correctly identified set of reference specimens; be happy with a genus identification!

Body length measurements are taken from the anterior margin of the eyes to the posterior apex of the elytra; the rostrum (snout) is excluded.

Many aquatic weevils are frequently covered with scales and some have a varnish-like coating; do not remove this coating. All figures in the following key are of dry specimens; weevils in alcohol may show very little color and will usually appear dull gray, dull reddish brown or black. Allow specimens to dry before using the key; the difference in color can be amazing!

Other curculionid genera that may be found on plants near water or associated with driftwood, etc.

(some host data from Anderson (2002), Peck & Thomas (1998) and Ciegler (pers. comm., 8-v-2009))

Acalles Schoenherr - salt marsh, mangroves, under driftwood
Anthonomus Germar - wetland margins, wet sawgrass prairie
Baris Germar - wetland margins, emergent semi-aquatic plants, wet prairie
Barinus Casey - on sawgrass
Dryotribus Horn - under driftwood
Glyptobaris Casey - marshy meadows
Gononotus LeConte - mangroves, salt marsh, beach wrack
Macrancylus LeConte - under driftwood
Mesites Schoenherr - under driftwood
Microcholus LeConte -- wetlands
Nanops Dietz - on *Hypericum* on wetland margins
Nicentrus LeConte - sawgrass, salt marsh
Paralicus O'Brien - under driftwood
Peracalles Kissinger - emergent aquatic vegetation
Plesiobaris Casey - on *Hypericum* on wetland margins
Pseudobaris LeConte - wetland margins, wet prairie
Stenobaris Linell - on black mangrove

and others ...

Key to common genera of aquatic/semi-aquatic Curculionidae adults of Florida

NOTE: there are many genera *not* included here (see p. 3.2). If your specimen does not match anything in the key below, it is most likely terrestrial; see Anderson (2002).

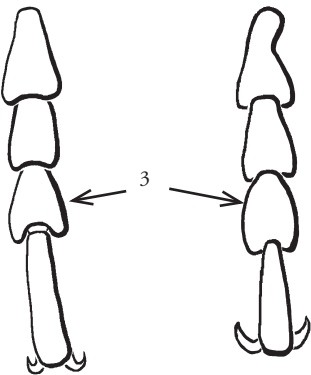
- 1 Antennal club with 2 apparent segments, apical one spongy, basal one glabrous; funicle with 6 segments *Sphenophorus*
(about 23 species in Florida; *S. pontederiae* Chittenden (length 9-11 mm) on *Pontederia*. See Vaurie (1951))



S. pontederiae

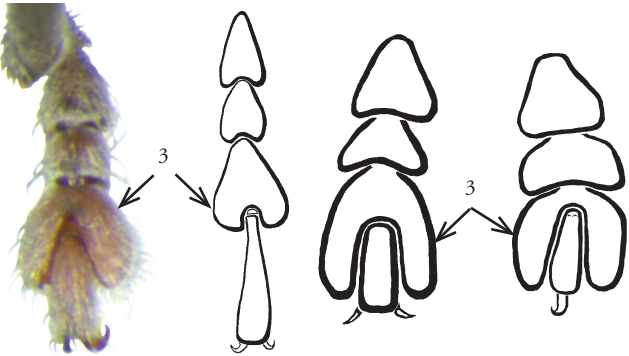
- 1' Antennal club with 3 segments; funicle with 6-7 segments 2

- 2(1') 3rd tarsal segment simple, or at most slightly extended beyond base of 5th segment 3
(*Bagous* keys either way)



NOTE: on weevils the 4th tarsal segment is small and hidden by the 3rd

- 2' 3rd tarsal segment deeply bilobed 7
(*Bagous* keys either way)



- 3(2) Prosternum with wide median channel ***Bagous***
 (about 20 FL species (length 2.2-5.0+ mm); on many aquatic/semi-aquatic plants; see O'Brien references, Wheeler & Center (2007))



prosternal channel



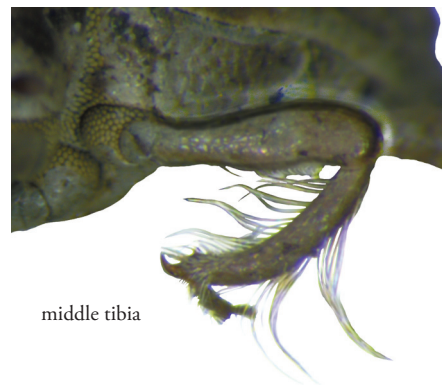
B. lunatoides

- 3' Prosternum without wide median channel 4

- 4(3') Middle tibia thin, curved, scimitar-like, with well developed fringe of swimming setae on outer and inner margins
 ***Lissorhoptus***
 (4 FL species (length about 3-4 mm); on many aquatic/semi-aquatic plants, one species (*L. oryzophilus* Kuschel) a pest of rice; see Kuschel (1952))



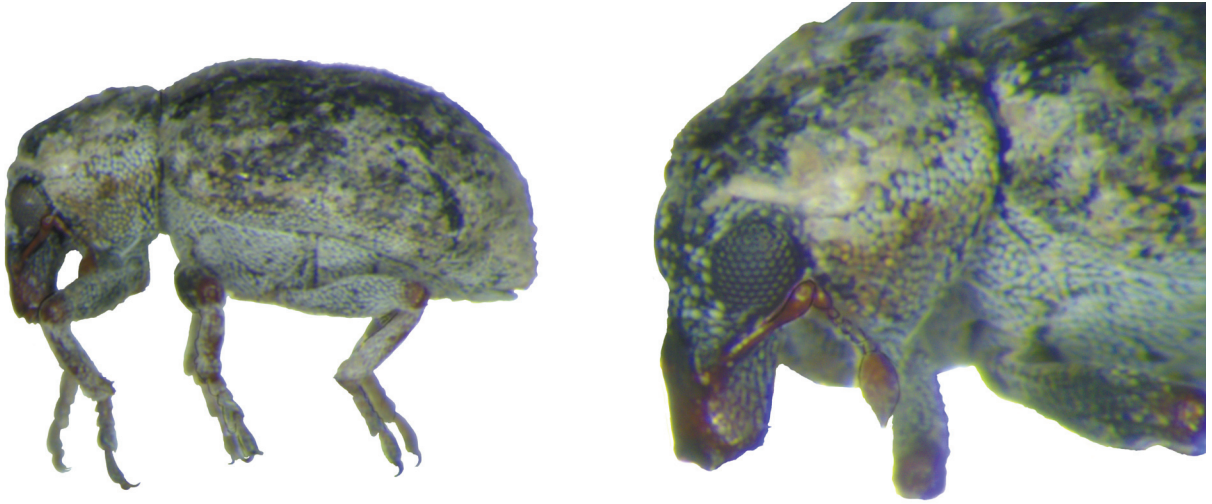
L. simplex



middle tibia

- 4' Middle tibia not scimitar-like, with at most a few swimming setae on inner margin 5

- 5(4') Rostrum short, squat, subequal in length to scape; scape extends to (or almost to) posterior margin of eye ***Stenopelmus***
(1 FL species, *S. rufinatus* Gyllenhal (length about 2 mm); on *Azolla*)



- 5' Rostrum much longer, thinner; scape extends at most to anterior margin of eye 6

- 6(5') Elytra with longitudinal series of large, semi-quadrangle, deep punctures; body without closely applied scales ***Cyrtobagous***
(1 FL species, *C. salviniae* Calder & Sands (length 1.7-1.9 mm); introduced for control of *Salvinia molesta* Mitchell)



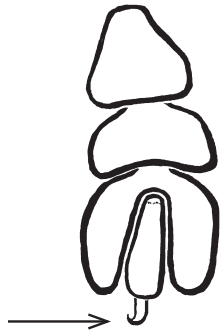
- 6' Elytra with simple longitudinal striae; body covered with closely applied scales ***Neobagoides***
(1 FL species, *N. carlsoni* O'Brien (length about 2.2 mm); on *Lachnanthes caroliniana* (Lamarck) Dandy; see O'Brien (1990))



N. carlsoni paratype

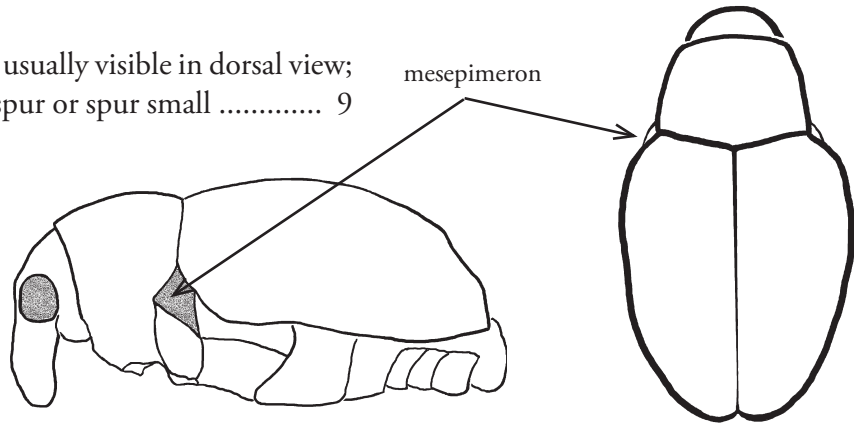


- 7(2') Each tarsus with a single claw *Brachybamus*
 (1 FL species, *B. electus* Germar (length about 2.5 mm); on *Eleocharis*)

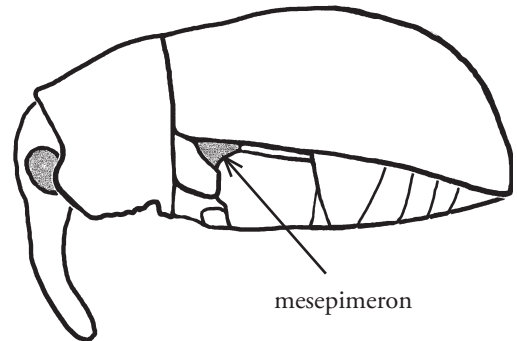


- 7' Each tarsus with 2 claws 8

- 8(7') Mesepimeron extended dorsally, usually visible in dorsal view;
 apex of tibiae usually without a spur or spur small 9



- 8' Mesepimeron not extended as far dorsally, not visible
 in dorsal view; apex of tibiae with a well developed
 spur 15



- 9(8) Elongate, almost cylindrical; usually shining black with (usually) white scales or
 setae *Sibariops*
 (about 10 small (length < 3.5 mm), poorly defined species in FL; genus in great need of revision;
 usually on sedges)



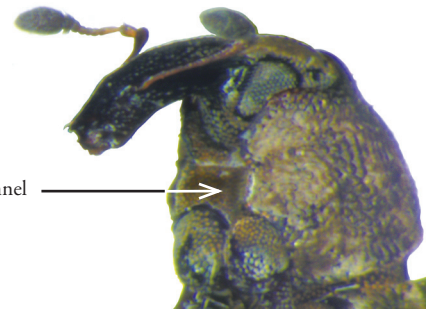
Sibariops sp.



- 9' Squatter, not cylindrical; color various, often covered with multicolored scales
 10

- 10(9') Funicle with 7 segments; ventrolateral margins of pronotum extended flange-like to cover bases of fore coxae and form median channel on prosternum for rostrum 11

prosternal channel

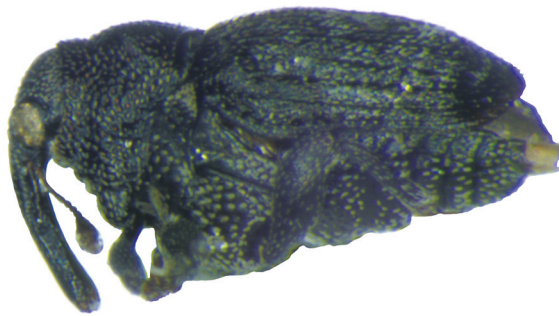


- 10' Funicle with 6 segments; with or without prosternal channel 12

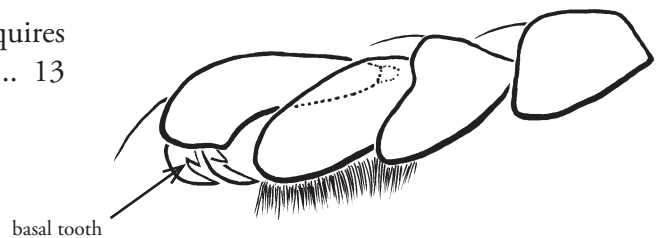
- 11(10) Rostrum short, less than twice as long as wide; anterior margin of pronotum smooth ***Rhinoncus***
(2 FL species; *R. longulus* LeConte (length 2.5-3.0 mm); on *Polygonum*; see Hoebeke & Whitehead (1980))

*R. longulus*

- 11' Rostrum more than 3X as long as wide; anterior margin of pronotum with 2 raised points ***Aleutes***
(4 FL species (length 2-3 mm); on *Ludwigia* and at wetland margins)

*Aleutes* sp.

- 12(10') Tarsal claws with well developed basal tooth (requires high magnification to observe) 13



basal tooth

- 12' Tarsal claws simple, without basal tooth (requires high magnification to observe)..... 14

- 13(12) Rostrum twice or more as long as wide; scape (basal antennal segment) longer than combined lengths of two basal segments of funicle *Perigaster*
 (3 FL species (length 2.5-3.0 mm); on *Ludwigia*; see Buchanan (1931))

*P. cretura*

- 13' Rostrum less than twice as long as wide; scape shorter than combined lengths of two basal segments of funicle *Perigasteromimus*
 (1 FL species, *P. tetracanthus* (Champion) (length about 2 mm); on *Ludwigia*)



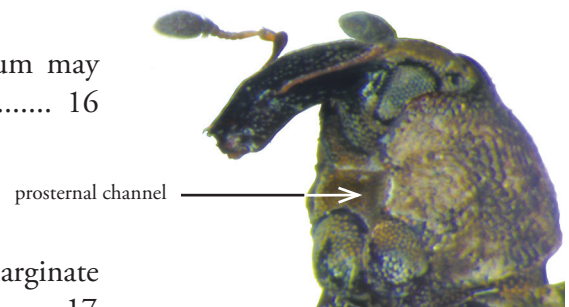
- 14(12') Larger, length 2.6-3.0 mm; pronotum with a pair of small submedian teeth on anterior margin and sharply pointed posterolateral tubercles; 3rd tarsomere slightly wider than 2nd * *Phytobius*
 (1 species, *P. leucogaster* (Marsham) (length 2.6-3.0 mm), introduced to FL but not established; on *Myriophyllum*)



- 14' Smaller, length 2.2-2.7 mm; pronotum with anterior margin smooth and with low, rounded posterolateral tubercles; 3rd tarsomere 1.6-1.7 X wider than 2nd *Parenthis*
 (1 FL species, *P. vestitus* Dietz (length 2.2-2.7 mm); on *Polygonum*)



- 15(8') Prosternum with wide median channel into which rostrum may be placed 16

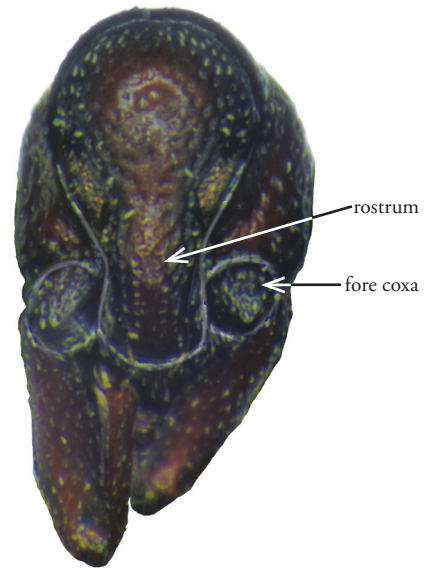


- 15' Prosternum without median channel, at most emarginate anteriorly 17

- 16(15) Prosternum with wide median channel that extends to mesosternum for reception of rostrum; fore coxae separated by rostrum ***Tyloderma***
 (22 FL species (length 2-6 mm); on *Ludwigia*, *Myriophyllum*, *Rhynchospora*, *Salvinia*, *Saururus*; see Wibmer (1981))



T. aquaticum
paratype



- 16' Median channel does not extend to mesosternum; fore coxae contiguous or almost so ***Bagous***
 (about 20 FL species (length 2.2-5.0+ mm); on many aquatic/semi-aquatic plants; see O'Brien references, Wheeler & Center (2007) and couplet 3)



- 17(15') Elongate, slender, semi-cylindrical; without scales ***Lixus***
 (about 10 FL species; genus requires revision; one common species, *L. merula* Suffrain (length 6.5-8.5 mm), on *Polygonum*)



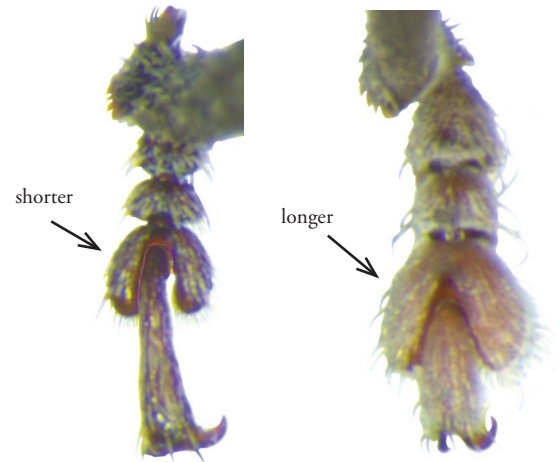
L. merula



- 17' At most elongate oval, not slender or semi-cylindrical; body covered with scales 18

18(17') Third tarsal segment shorter, extends at most to 1/3 length of 5th tarsal segment 19

18' Third tarsal segment longer, extends at least to mid-length of 5th tarsal segment 20



19(18) Larger, 2.7-12.5 mm; anterolateral margin of pronotum with well developed postocular lobe that extends to or over eye ***Listronotus***
(over 40 FL species (length 2.7-12.5 mm); on *Carex*, *Sagittaria*; *Salicornia*; see O'Brien (1981))



L. marshalli



postocular lobe

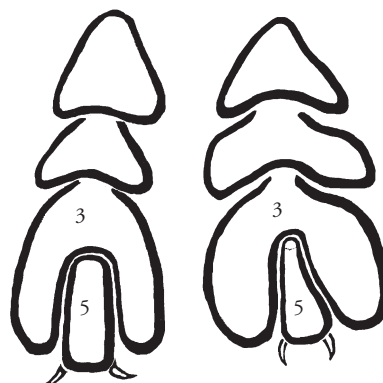


19' Smaller, length < 2.3 mm; postocular lobe weakly, if at all, developed ..
..... ***Neohydronomus***
(1 FL species: *N. affinis* Hustache (length 1.9-2.2 mm); introduced to control *Pistia*)



20(18') Apex of segment 5 not or barely extending
beyond margin of 3rd 21

20' 5th tarsal segment extends beyond anterior
margin of 3rd tarsal segment by about 1/2
length of segment 5 22



5 barely or not extending



5 extending

21(20) Very small, length < 1.5 mm *Tanysphyrus*
(2 FL species: *T. ater* Blatchley (length 1.3 mm), with black legs, on *Ricciocarpus*; *T. lemnae* (Fabricius) (length 1.2 mm),
with reddish legs, on *Lemna*)



T. lemnae



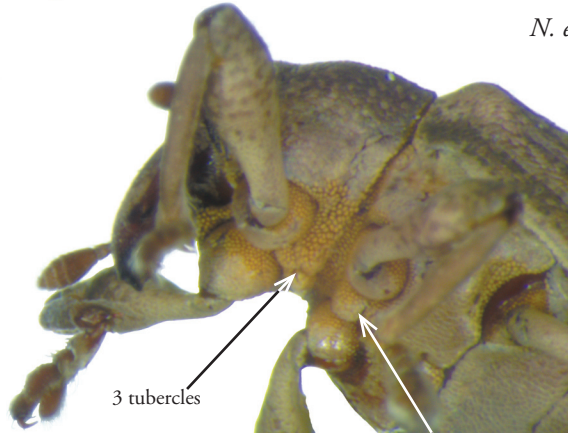
T. ater



21' Length greater than 1.5 mm *Notiodes*
(4 FL species (length 1.8-5.5 mm); on *Eleocharis*, *Rhynchospora*, *Scirpus*, *Typha*; see
Tanner (1943), Burke (1961a))

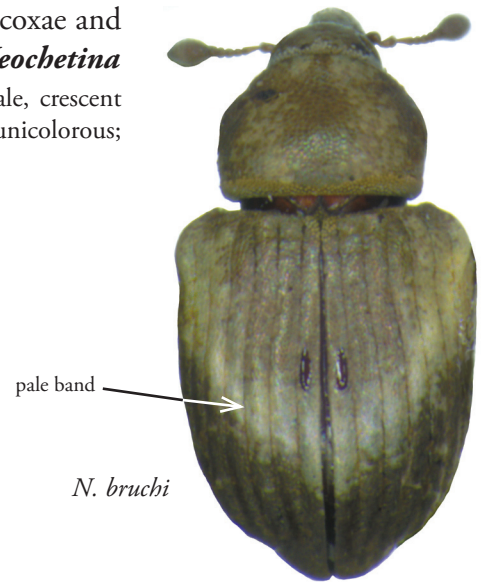


- 22(20') Venter with 3 well developed tubercles behind/between fore coxae and large tubercle between mid coxae ***Neochetina***
 (2 FL species: *N. bruchi* Hustache (length 3.4-4.4 mm), with broad, pale, crescent band across elytra and *N. eichhorniae* Warner (length 3.2-4.1 mm), more unicolorous; introduced to control *Eichhornia*, also on *Pontederia*; see O'Brien (1976))

*N. eichhorniae*

3 tubercles

tubercle

*N. bruchi*

- 22' Prosternum and mesosternum at most only slightly produced ***Onychylis***
 (2 FL species on *Pontederia* and *Sagittaria*: *O. longulus* LeConte (length about 3 mm), with prothorax slightly wider than long and *O. nigrirostris* (Boheman) (length 2.8-3.3 mm), with prothorax distinctly wider than long; see Burke (1961b))

*O. longulus*

FAMILY **DRYOPIDAE**

long-toed water beetles

4

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 with an opercular chamber that lacks hooks or gills.

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



dryopid larva, probably *Pelonomus*

NOTES: The Dryopidae are a cosmopolitan family that are especially diverse in the tropics; two genera are found in Florida. Dryopids are unusual in that the adults are mostly aquatic, while the larvae are mostly terrestrial. Adult dryopids may be fully aquatic (*Helichus*), semi-aquatic (*Pelonomus*) or terrestrial - some species are arboreal; adults of all Florida taxa are aquatic or semi-aquatic. One taxon known only from Texas, *Stygoparnus comalensis* Barr & Spangler, is stygobiontic (lives in subterranean water bodies). Spangler (1987) and Shepard (2002) stated that all known dryopid larvae were terrestrial, although Brigham (1982) and Ciegler (2003) considered the larva of *Pelonomus* to be semi-aquatic.



Pelonomus obscurus



Helichus lithophilus

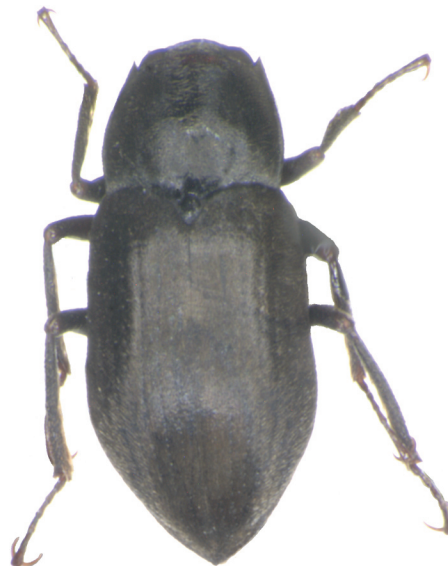
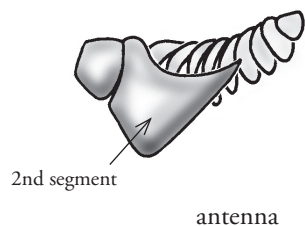
Florida genera

Helichus Erichson
Pelonomus Erichson

ADDITIONAL REFERENCES: Barr & Chapin 1988; Brigham 1982; Brown 1972; Ciegler 2003; Hilsenhoff & Schmude 1992; Shepard 2002b.

Key to genera of adult Dryopidae of Florida

- 1 Second antennal segment enlarged and heavily sclerotized, forming a shield for the remaining bare segments; bases of antennae widely separated; distal antennal segments sparsely setose; eyes bare; elytra with short, velvety pilosity, sometimes interspersed with small clumps of setae *Helichus*



- 1' Second antennal segment not enlarged or heavily sclerotized, not forming a shield for remaining segments; bases of antennae close together; antennae and eyes pubescent; entire body with longer, "fuzzier" pubescence *Pelonomus*



GENUS *Helichus*

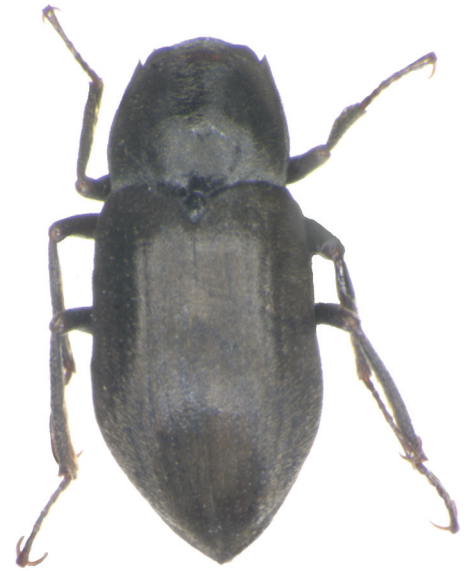
DIAGNOSIS: Larvae may be diagnosed as in the family diagnosis; larvae are insufficiently known to provide a generic level diagnosis that would allow separation of the two genera in Florida.

Adults are distinguished by the enlarged and heavily sclerotized second antennal segment that forms a shield for the remaining antennal segments; bases of antennae widely separated; antennae with mostly short setae confined to apices of lateral extensions of antennomeres; bare eyes; and short, velvety pilosity, sometimes interspersed with small clumps of setae.

NOTES: *Helichus* is the most widespread of the North American dryopids. Seven species are known from North America; two occur in Florida, with the possibility of at least one more species (*H. basalis* LeConte) being found eventually in the northern counties of the state. In Florida, *Helichus* is more common in the northern counties and Panhandle, but *H. lithophilus* has been reported as far south as Manatee County (unverified FDEP record).

Helichus lithophilus is by far the most common species of the genus in the state.

Helichus adults are truly aquatic, living in streams among rocks and gravel, or clinging to submerged wood. Larvae are terrestrial; the immature stages of two Nearctic species were described by Ulrich (1986).



H. lithophilus

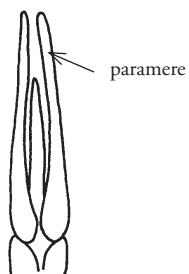
ADDITIONAL REFERENCES: Ciegler 2003; Musgrave 1935; Nelson 1981; Ulrich 1986.

Florida species

H. fastigiatus (Say)
H. lithophilus (Germar)

Key to adult *Helichus* of Florida

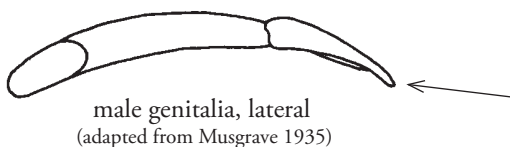
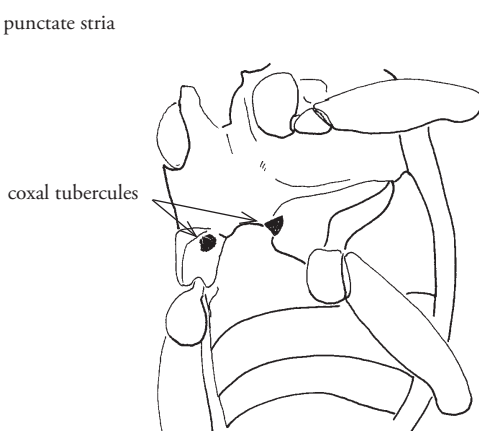
- 1 Pronotum and elytra almost completely covered with a dense pubescence (scutellum and posterior margin of pronotum bare); pubescence less dense on discal portion of elytra; genitalia with aedeagus much shorter than parameres *H. lithophilus*

*H. lithophilus* genitalia, dorsal*H. fastigiatus* genitalia, dorsal

(genitalia figures adapted from Musgrave 1935)



- 1' Elytra with sutural area bare or sparsely pubescent (with small tufts/clumps of setae), with dense pubescence along lateral margins (see couplet below); aedeagus longer 2
- 2(1') First elytral stria distinct, with large, deep punctures often reaching to scutellum; male with thorn-like tubercle on each hind coxa; parameres of male genitalia bluntly pointed *H. fastigiatus*



- 2' First elytral stria weak, at most with small punctures that do not reach the scutellum; male without thorn-like coxal tubercles; parameres of male genitalia acutely pointed * *H. basalis* (not reported from Florida, but may eventually be collected in the northern and/or western part of the state)



dorsal



lateral

male genitalia
(adapted from Musgrave 1935)



H. basalis

Notes on species

- 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. Use of the male genitalia to separate this species from *H. basalis* is difficult unless one has examples of both species. Young (1954) found this species clinging to logs in streams, in the slower portions of the current. I have a male from Hamilton County on which the coxal tubercles are poorly developed.
- H. lithophilus* - Length 4.4-5.8 mm. The most common species of *Helichus* in Florida. This species is densely pubescent over most of its dorsum; it has an almost velvety appearance, with no bare areas on the elytra as in *H. basalis* or *H. fastigiatus*. Note also that the male of *H. lithophilus* lacks the thorn-like coxal tubercles found on male *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: 209) found the species "among rocks and gravel in the riffles of sand-bottomed streams, and more rarely clinging to submerged logs". I have seen numerous specimens collected from Hester-Dendy samplers.

Other species

- H. basalis* LeConte - Length 4.3-5.5 mm. This species has not been reported from Florida, but may eventually be collected in the northern and/or western part of the state. It has been recorded from the Carolinas, Louisiana and Georgia in the Southeast.
- H. striatus* LeConte - Length 4.5-6.3 mm. Reported from the Carolinas by Brigham (1982) and Ciegler (2003). This species would key to *H. fastigiatus* in the key above but differs in having the pronotum gradually depressed posteriorly (abruptly depressed in *H. fastigiatus* and *H. basalis*) and the area anterior to the scutellum is not bare (bare in *H. fastigiatus* and *H. basalis*); the male also lacks the coxal tubercles of *H. fastigiatus*.

GENUS *Pelonomus*

DIAGNOSIS: Larvae may be diagnosed as in the family diagnosis; larvae are insufficiently known to provide a generic level diagnosis that would allow separation of the two genera known from Florida.

Adults are distinguished by the second antennal segment which is not enlarged or heavily sclerotized, not forming a shield for remaining segments; bases of antennae close together; eyes and antennae pubescent; and the soft body with longer, "fuzzier" pubescence.



NOTES: *Pelonomus* is primarily a Neotropical genus, with a single species, *P. obscurus* (length 4.5-6.8 mm), found in eastern North America from Quebec south to Florida, and west to Kansas, Texas and New Mexico. It apparently occurs throughout the state.

Pelonomus adults are recorded as being semi-aquatic; they are common inhabitants of swamps, cypress hammocks and pond margins, where they are found in plant debris. Larvae have been considered terrestrial or semi-aquatic. This is probably the dryopid larva commonly found in samples, but characters to separate the larvae of *Pelonomus* from those of *Helichus* have not been explicitly defined. Bertrand (1955) described the larva of *Pelonomus*; Ulrich (1986) described the immature stages of two species of *Helichus*, but separation of larvae of the two genera is still not possible.

ADDITIONAL REFERENCES: Bertrand 1955.

Florida species

P. obscurus LeConte

FAMILY **DYTISCIDAE**
predacious diving beetles

5

DIAGNOSIS: Larvae are distinguished by the prominent head, visible in dorsal view; long, slender curved mandibles that are grooved or hollow for injecting/sucking fluids; apparently 5 segmented legs with 2 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, not clubbed) antennae; maxillary palpi shorter than antennae; fully visible scutellum, or, if scutellum hidden by elytral bases, then fore and mid tarsi pseudotetramerous (4th segment reduced and hidden between lobes of 3rd), or hind tarsus with a single, thick, straight claw; 1st abdominal sternite completely divided by the hind coxae; and flattened, streamlined hind tarsi (and usually tibiae) lined with long, stiff swimming setae.



Neoporus vittatipennis



Thermonectus basillaris



Laccophilus proximus



Liodessus noviaffinis



Laccophilus sp.



Neoporus sp.



Cybister sp.

NOTES: Adult dytiscids are, along with the hydrophilids, among the most commonly encountered aquatic beetles. They can be found in almost any aquatic habitat, from rain puddles and birdbaths, springs, seeps, swamps, ditches, ponds and lakes to streams and rivers. They are notably absent from deep water. Larvae are predacious; adults are predators and/or scavengers. Thirty-seven genera are recorded from Florida, including over 115 species. Several other genera and species may occur in the state, especially in the northern and western portions.

While the taxonomy of many genera is relatively settled, several genera, such as *Neoporus* and *Uvarus*, remain in great need of revision. I have attempted to follow the latest concepts for many genera, but note that some workers are not in total agreement with the classification of some genera.

Dytiscid larvae pass through three instars; the larval keys below are designed mostly for 3rd (last) instar larvae. First and second instar larvae may differ from 3rd instar larvae in the presence or absence of various setae (such as swimming setae) and other characters. Instar 1 larvae are usually identified by their very small size and the presence of short, spine-like egg bursters on the dorsal surface of the head; 2nd instar larvae may differ from 3rd instars in lacking spiracles on the mesopleural area of the abdominal segments (note that 3rd instar *Neoporus* and *Heterosternuta* larvae lack spiracles). See Larson et al. (2000) for a more thorough treatment of dytiscid larvae.

There are some significant differences between the larval key below and those presented in earlier keys, such as Brigham (1982), Epler (1996) and White & Brigham (1996); many of these differences are due to incomplete or incorrect descriptions in earlier literature. Portions of this key are modified from that in Larson et al. (2000). Separation of some hydroporine genera remains difficult. Much remains to be learned about larval dytiscids (several genera remain undescribed as larvae) and no doubt the following key will have to be modified again as more knowledge is accumulated.

Larson et al. (2000) is an outstanding reference for North American Dytiscidae adults and larvae; it is be considered an “Additional Reference” for most genera included in this chapter.

ADDITIONAL REFERENCES: Brigham 1982; Ciegler 2003; Larson et al. 2000; Michael & Matta 1977; Nilsson 2001, 2003, 2004, 2005; Nilsson & Fery 2006; Roughley & Larson 2001; White & Roughley 2008.

Florida genera

<i>Acilius</i> Leach	<i>Eretes</i> Laporte	<i>Lioporeus</i> Guignot
<i>Agabetes</i> Crotch	<i>Graphoderus</i> Dejean	<i>Matus</i> Aubé
<i>Agabus</i> Leach	<i>Hydaticus</i> Leach	<i>Megadytes</i> Sharp
<i>Anodocheilus</i> Babington	<i>Hydrocolus</i> Roughley & Larson	<i>Neobidessus</i> Young
<i>Bidessonotus</i> Régimbart	<i>Hydrodytes</i> Miller	<i>Neoporus</i> Guignot
<i>Brachyvatus</i> Zimmermann	<i>Hydroporus</i> Clairville	<i>Pachydus</i> Sharp
<i>Celina</i> Aubé	<i>Hydrovatus</i> Motschulsky	<i>Platambus</i> Thompson
<i>Copelatus</i> Erichson	<i>Hygrotus</i> Stephens	<i>Prodaticus</i> Sharp
<i>Coptotomus</i> Say	<i>Ilybius</i> Erichson	<i>Rhantus</i> Dejean
<i>Cybister</i> Curtis	<i>Laccodytes</i> Régimbart	<i>Thermonectus</i> Dejean
<i>Derovatellus</i> Sharp	<i>Laccophilus</i> Leach	<i>Uvarus</i> Guignot
<i>Desmopachria</i> Babington	<i>Laccornis</i> Gozis	
<i>Dytiscus</i> Linnaeus	<i>Liodessus</i> Guignot	

Key to genera of Dytiscidae larvae of Florida(Larvae of *Bidessonotus*, *Brachyvatus*, *Hydrodytes*, *Laccodytes*, *Lioporeus* and *Neobidessus* are unknown or undescribed)

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

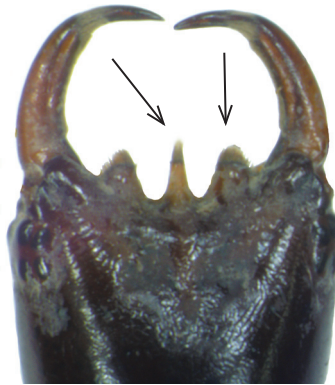


- 1' Abdominal segments without lateral gills 2

- 2(1') Anterodorsal margin of head with a frontal projection or large medial "teeth" 3



frontal projection



medial "teeth"



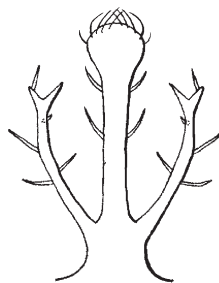
convex

- 2' Anterodorsal margin of head straight or simply convex 19

- 3(2) Anterior margin of head with long medial "teeth"; urogomphi rudimentary 4

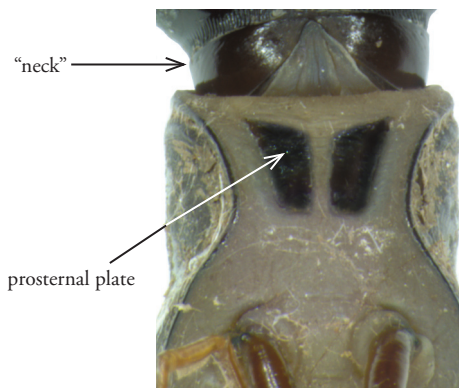


- 3' Anterior margin of head with simple, notched or branched frontal process; urogomphi present and usually well developed subfamily Hydroporinae 5

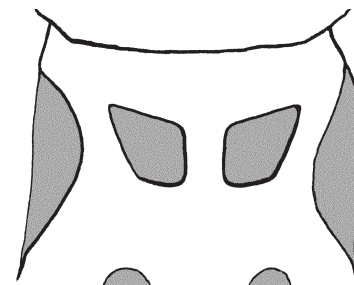


(adapted from Spangler (1966a))

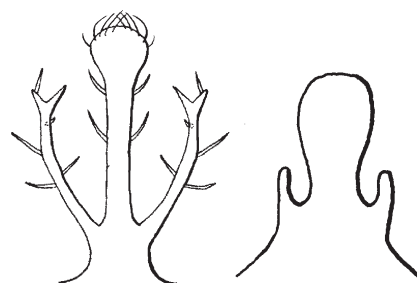
- 4(3) Inner length of prosternal plates about 1.5 X maximum width of plate; distance between prosternal plates less than proximal width of fore femur; mature larva with head length > 6 mm *Cybister*



- 4' Inner length of prosternal plates subequal to maximum width of plate; distance between prosternal plates greater than proximal width of fore femur; mature larva with head length < 6 mm *Megadytes*
(based on South American species; see Notes for *Megadytes*)



- 5(3') Frontal projection trifid 6

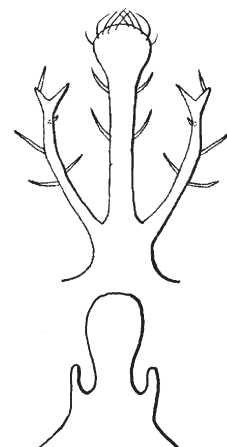


- 5' Frontal projection simple or at most notched near midpoint, or, if small projections present near base, then central portion not spatulate as in *Pachydrus* (below) and urogomphi extend far past apex of abdomen 7



Neoporus

- 6(5) Frontal projection with longer, narrower central spatulate portion and each long lateral branch with 2 apical spines *Derovatellus*



- 6' Frontal projection with shorter, wider central spatulate portion and two short, simple lateral branches *Pachydrus*

7(5') At least abdominal sternite 6 sclerotized (usually sternites 2-8 sclerotized)

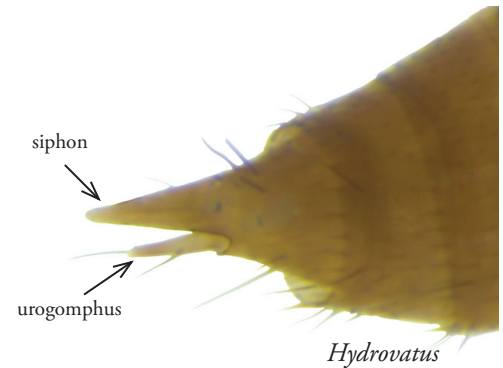
..... 8



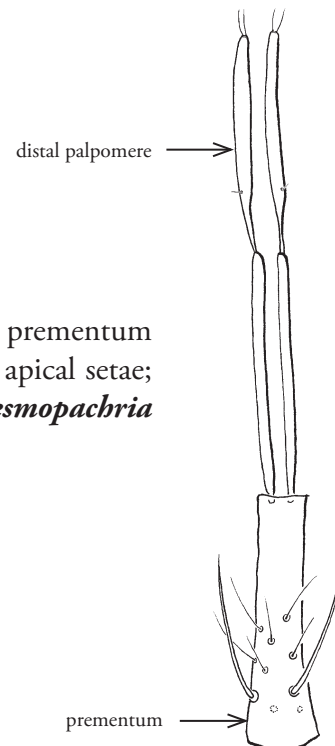
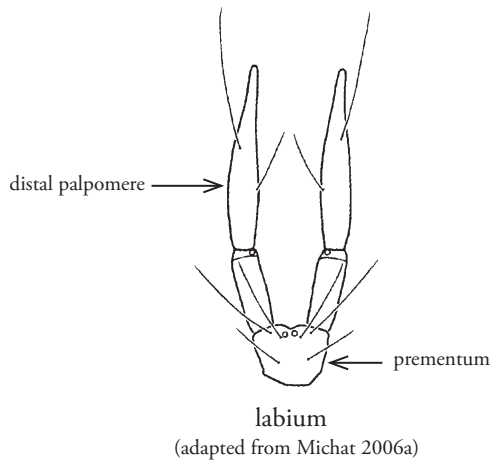
Hydrovatus

7' Abdominal sternite 6 membranous (usually sternites 2-6 membranous, but 7 and 8 sclerotized) 9

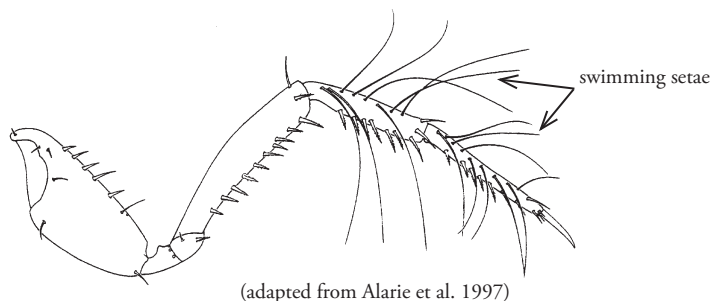
8(7) Legs without swimming setae; prementum subquadrate, proximal labial palpomere not elongate; distal palpomere with preapical setae; urogomphus does not extend to apex of siphon (although may extend past in 2nd instar?) ***Hydrovatus***



Hydrovatus

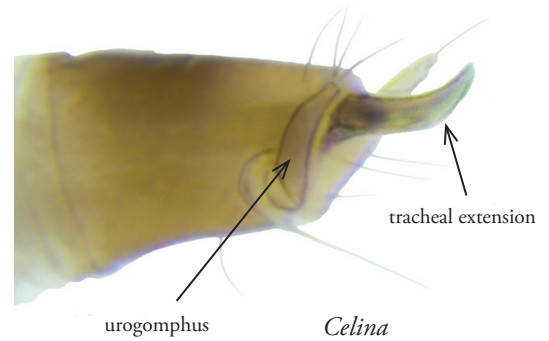


8' Legs with swimming setae (may require compound scope to observe); prementum and both labial palpomeres elongate; distal palpomere with pair of apical setae; urogomphus extends to or beyond apex of siphon ***Desmopachria***



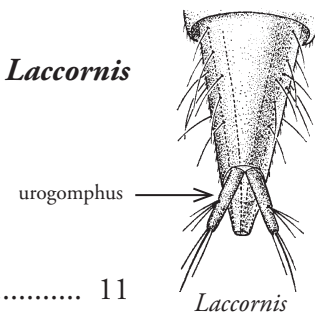
9(7') Apex of last abdominal segment with an apically curved tracheal extension ***Celina***

9' Apex of last abdominal segment without an apically curved tracheal extension 10



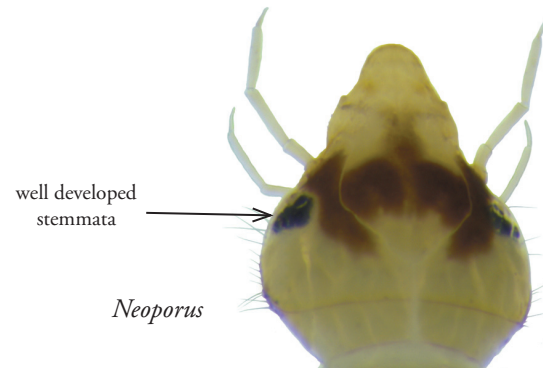
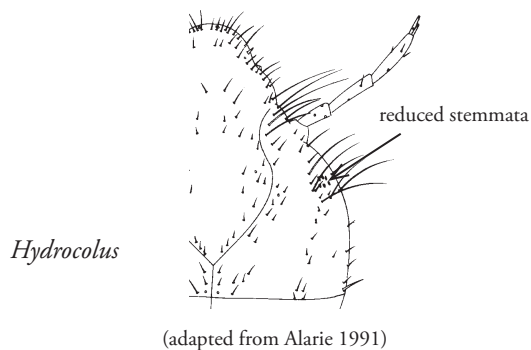
10(9') Urogomphi at most about 1/2 as long as last abdominal segment ***Laccornis***

10' Urogomphi subequal to or longer than last abdominal segment 11



(adapted from Spangler & Gordon 1973)

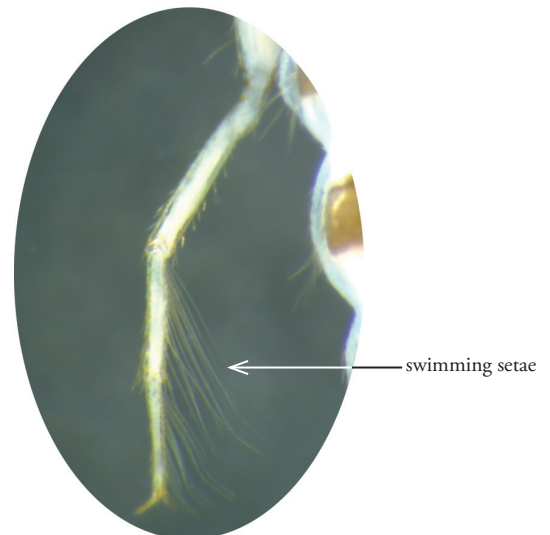
11(10') Stemmata (simple eyes) absent or group at most subequal to width of 1st antennal segment ***Hydrocolus***



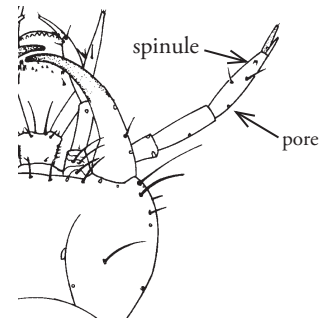
11' Stemmata well developed, group width at least 2X width of 1st antennal segment 12

12(11') Legs with swimming setae 13

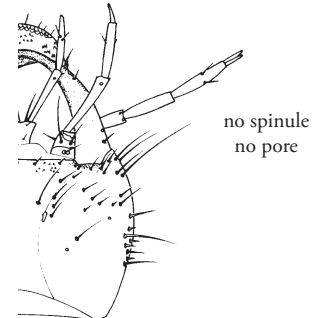
12' Legs without swimming setae 14



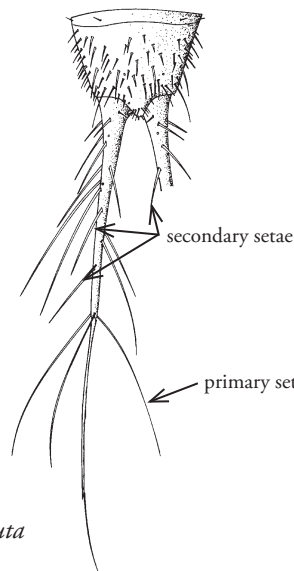
- 13(12) Antennal segment 3 with a laterobasal pore and a ventroapical spinule;
3rd instar larvae without spiracles on abdominal segments 1-7; very
common ***Neoporus***



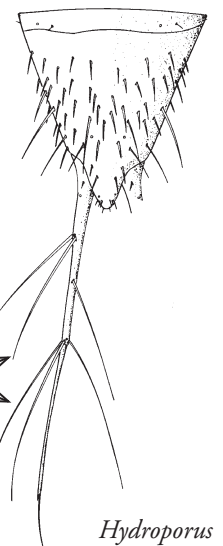
- 13' Antennal segment 3 without a laterobasal pore and without a
ventroapical spinule (use compound scope to observe); 3rd instar
larvae with abdominal spiracles; uncommon ***Hygrotus*** (in part)



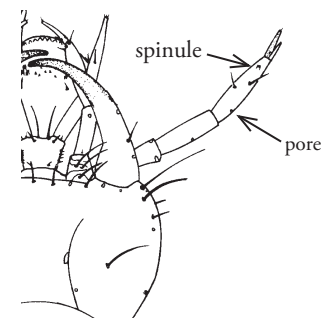
- 14(12') Basal portion of urogomphus with smaller secondary
setae in addition to 6 large setae 15



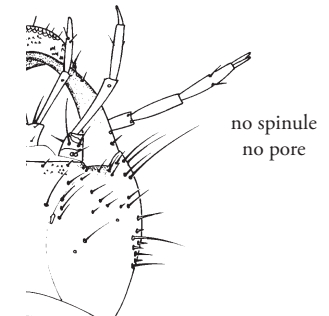
- 14' Basal portion of urogomphus with 6 large setae only
..... 16



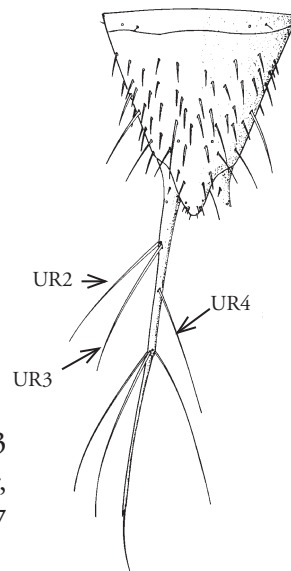
- 15(14) Antennal segment 3 with a laterobasal pore and a ventroapical spinule;
3rd instar larvae without spiracles on abdominal segments I-VII
..... * ***Heterosternuta***
(not known from Florida but may occur in northern portion of state; see Alarie &
Longing 2010)



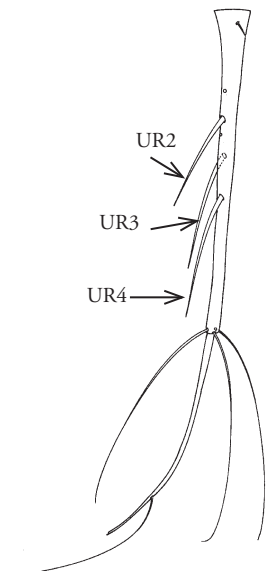
- 15' Antennal segment 3 without a laterobasal pore and without a
ventroapical spinule (use compound scope to observe); 3rd instar larvae
with abdominal spiracles ***Hygrotus*** (in part)



- 16(14') Urogomphus with bases of setae UR2 and UR3 contiguous, UR4 more distal; mature larva larger, approximately > 5 mm .. ***Hydroporus***



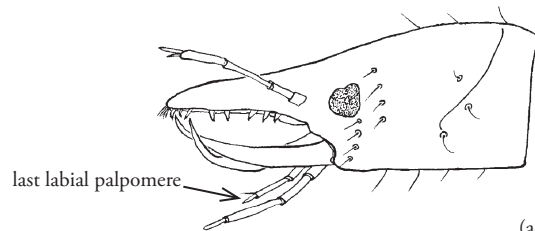
Hydroporus
(adapted from Alarie 1991)



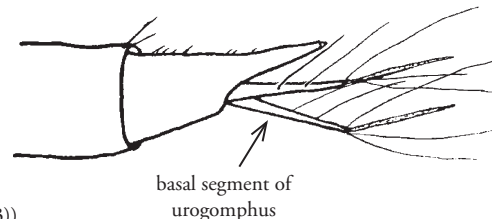
Liodesus
(adapted from Alarie et al. 2007)

- 16' Urogomphus with bases of setae UR2, UR3 and UR4 equidistant; mature larva smaller, approximately < 5 mm 17

- 17(16') Last labial palpomere shorter than preceding palpomere; basal segment of urogomphus shorter than last abdominal segment ***Uvarus***



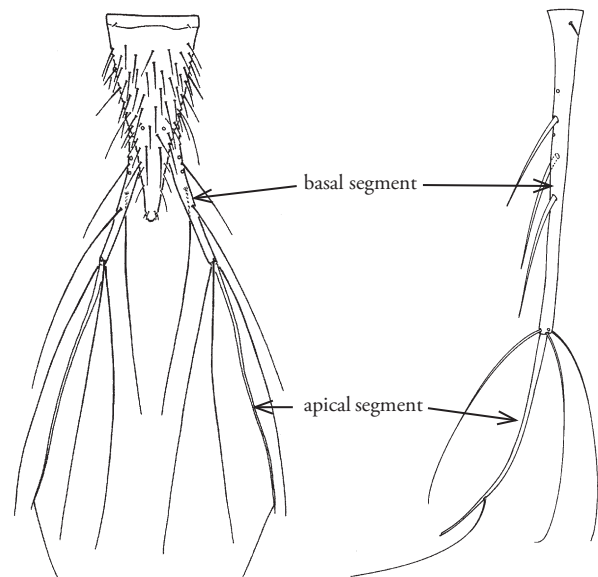
Uvarus
(adapted from Matta (1983))



basal segment of
urogomphus

- 17' Last labial palpomere longer than preceding palpomere; basal segment of urogomphus subequal to or longer than last abdominal segment 18

- 18(17') Basal segment of urogomphus shorter than apical segment ***Anodocheilus***

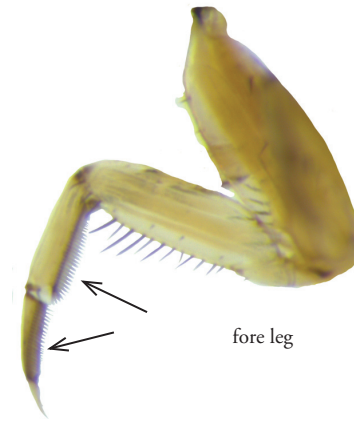


Anodocheilus
(adapted from Michat & Torres 2006a)

Liodesus
(adapted from Alarie et al. 2007)

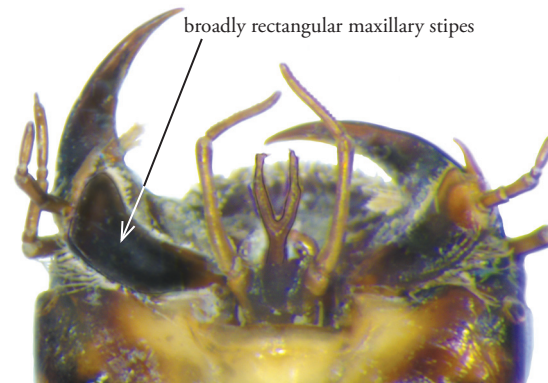
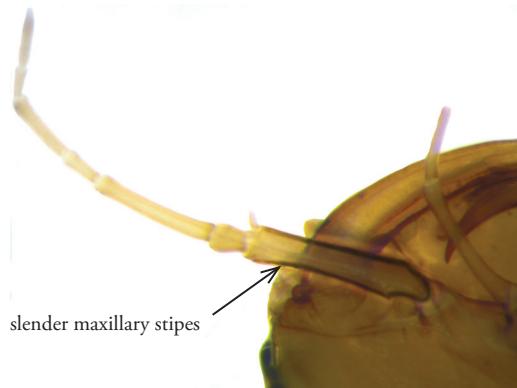
- 18' Basal segment of urogomphus longer than apical segment ***Liodesus***

- 19(2') Fore and mid legs chelate (pincer-like) OR with ventral fringe of flattened spine-like setae on tibiae and tarsi **Matus**



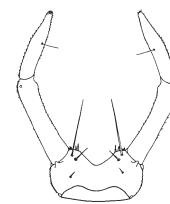
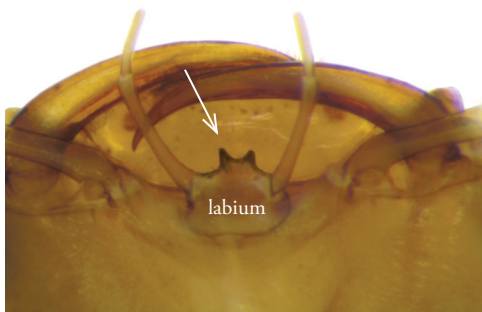
- 19' Fore and mid legs simple, without ventral fringe of flattened spine-like setae on tibiae and tarsi 20

- 20(19') Maxillary stipes long and slender 21

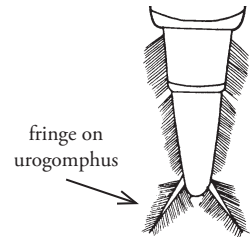


- 20' Maxillary stipes suboval or broadly rectangular 24

- 21(20) Labium with 2 projecting lobes near center; urogomphi without lateral setal fringe 22



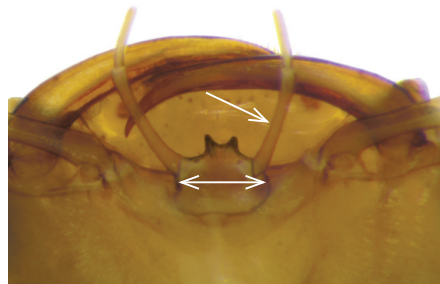
labium without
projecting lobes



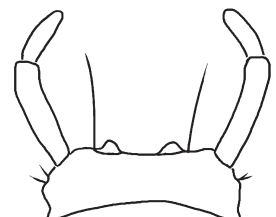
(adapted from James 1970)

- 21' Labium without projecting lobes near center; urogomphi with lateral setal fringe 23

- 22(21) Basal labial palpomere much longer than width of labium **Prodaticus**



- 22' Basal labial palpomere length less than width of labium **Hydaticus**

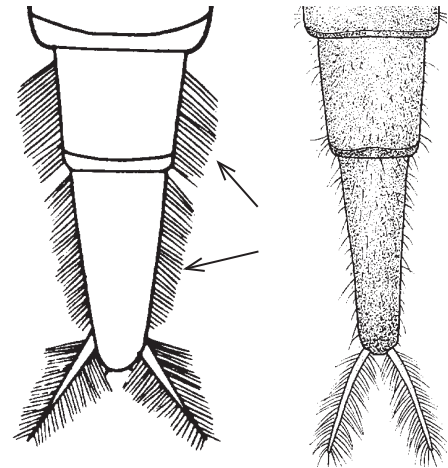


Prodaticus

Hydaticus

23(21') Last 2 abdominal segments with well developed lateral fringe of setae *Dytiscus*

23' Last 2 abdominal segments with only scattered lateral setae, without dense lateral fringe **Hoperius*
(Monotypic genus with one SE US species, *H. planatus* Fall; not known from Florida but may occur in northern portion of state; see Spangler (1973a) and Alarie & Hughes (2006))

*Dytiscus**Hoperius*

(adapted from Spangler 1973a)

24(20') Abdominal segments 7 and/or 8 with lateral fringe of long swimming setae 25

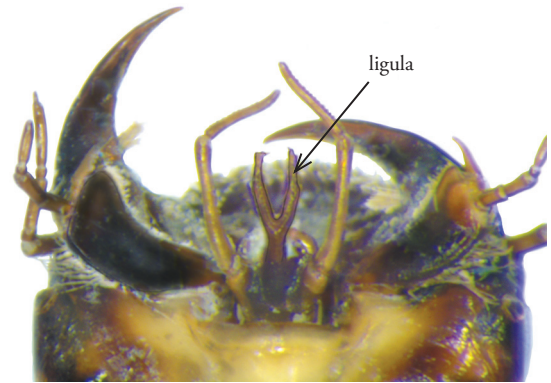
24' Abdominal segments 7 and/or 8 without lateral fringe of swimming setae (lateral setae may be present but not as a dense fringe) 28

25(24) Ligula very short, armed with 4 spines; stemmata equally sized *Eretes*

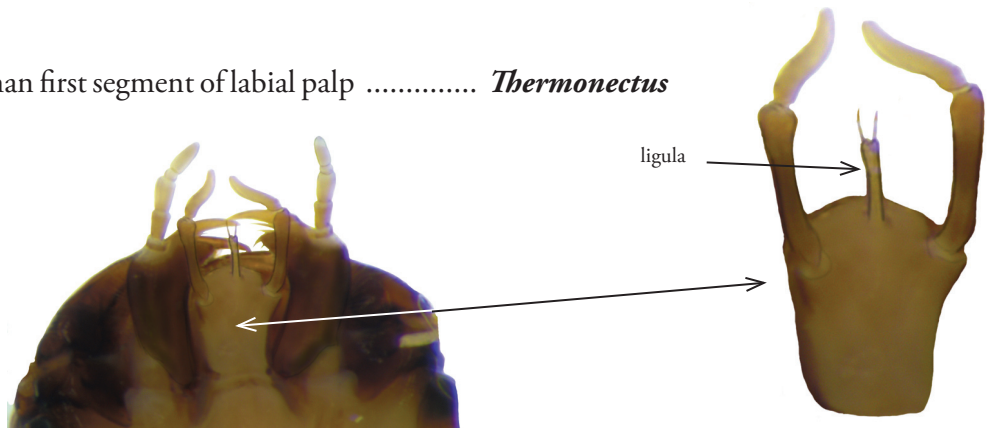
25' Ligula long, may be simple or bifid (see figs. below), but without 4 spines; some stemmata much larger than others 26

26(25') Ligula bifid apically *Acilius*

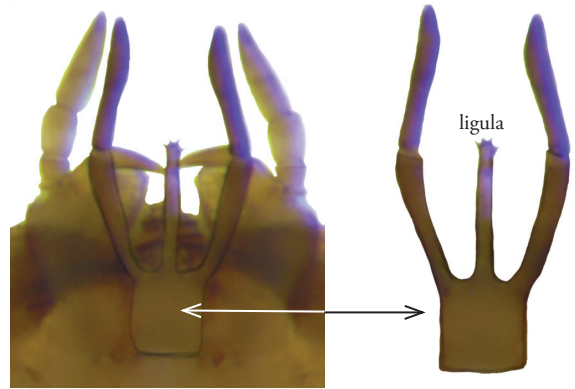
26' Ligula simple (but may bear two apical setae) 27

*Acilius*

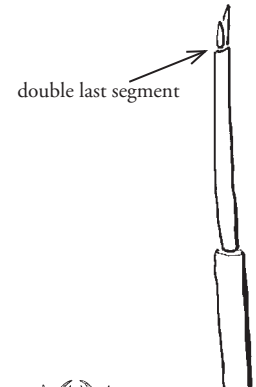
27(26') Ligula shorter than first segment of labial palp *Thermonectus*



- 27' Ligula subequal to or longer than first segment of labial palp ***Graphoderus***

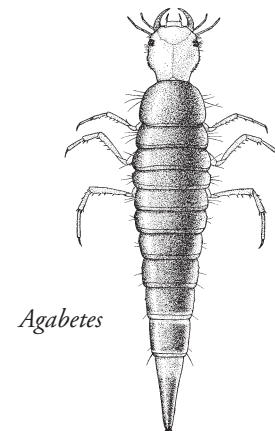


- 28(24') Last antennal segment "double", although lesser lobe may be only a stout seta arising from apex of 3rd antennal segment 29



- 28' Last antennal segment simple 31

- 29(28) Urogomphi rudimentary, scarcely visible ***Agabetes***



Agabetes

- 29' Urogomphi obvious, shorter or longer than last abdominal segment 30

- 30(29') Inner margin of mandible with strong serrations; legs without swimming setae; urogomphi shorter than to subequal to length of last abdominal segment ***Copelatus***



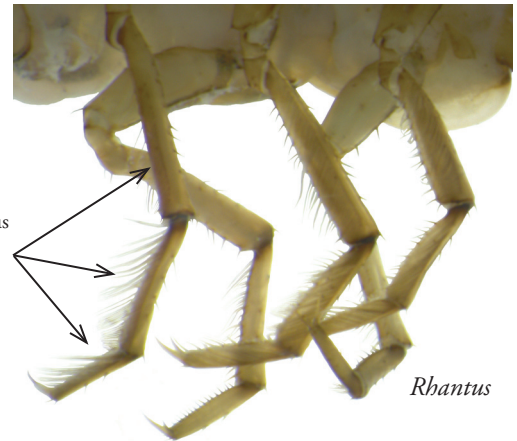
Copelatus

- 30' Inner margin of mandible without strong serrations; legs with swimming setae (2nd and 3rd instar); urogomphus much longer than last abdominal segment ***Laccophilus***



- 31(28') Femora, tibiae and tarsi with a single, well developed row of swimming setae ***Rhantus***

hind femur, tibia and tarsus
with swimming setae

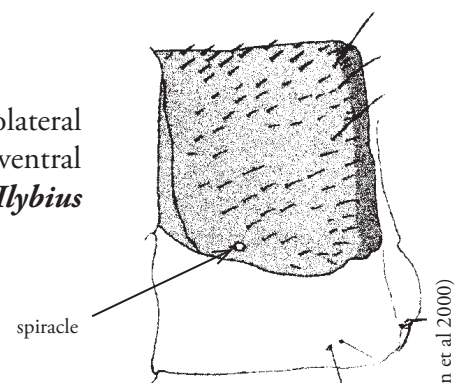


- 31' Swimming setae, if present, only on tibiae and tarsi 32

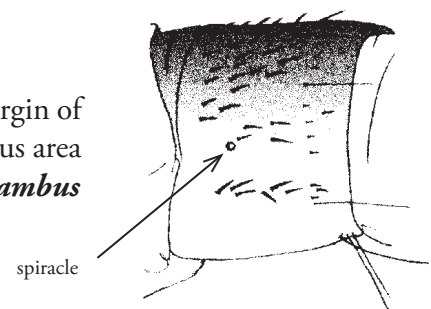
- 32(31') Tibiae and tarsi with swimming setae ***Agabus***
(pertains only to Florida species)

- 32' Tibiae and tarsi without swimming setae 33

- 33(32') Spiracle of 6th abdominal segment near well defined ventrolateral margin of dorsal sclerotized plate; segment with extensive ventral membranous area ***Ilybius***



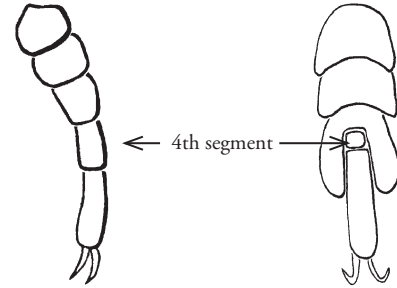
- 33' Spiracle of 6th abdominal segment distant from ventrolateral margin of dorsal sclerotized plate; segment with narrow ventral membranous area ***Platambus***



Key to genera of Dytiscidae adults of Florida

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

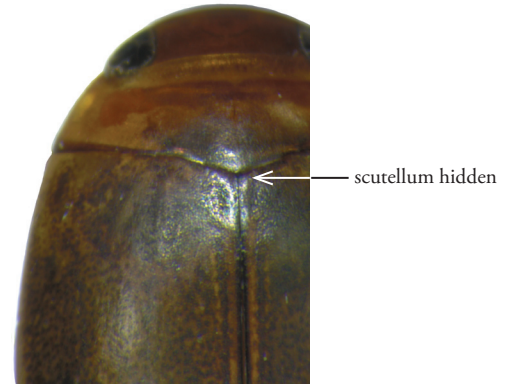
1' Fore and mid tarsi distinctly 4 segmented, *OR* pseudotetramerous (with 4th segment small and hidden between enlarged lobes of 3rd segment, so that 5th segment appears to be 4th) 23



5 segments

pseudotetramerous

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

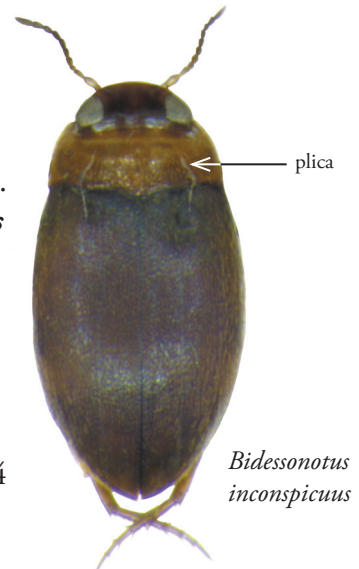


2' Scutellum entirely visible 5

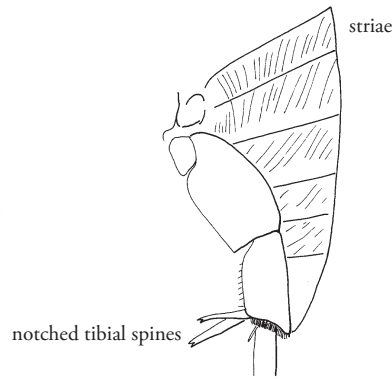


3(2) Hind tarsus with 2 equal claws; pronotum and elytra with plicae *Bidessonotus*

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

*Bidessonotus inconspicuus*

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

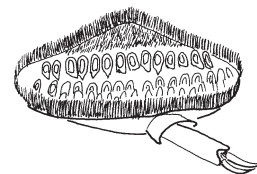
*Laccophilus proximus**Laccophilus* venter*Laccodytes pumilio*

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

- 5(2') Anterior margin of eye emarginate ("notched") above antennal base; basal 3 segments of male fore tarsus widened, but not forming an oval to round palette 6

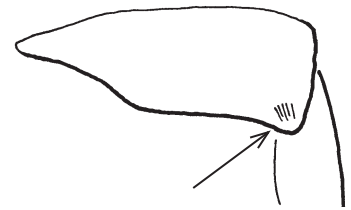
*Copelatus chevrolati*

- 5' Anterior margin of eye not emarginate above antennal base; basal 3 segments of male fore tarsus widened into an oval to round palette 15

*Thermonectus basillaris*

6(5) Hind femur with a linear group of short, stout setae on posterior apical angle 7

6' Hind femur without such a group of setae 9



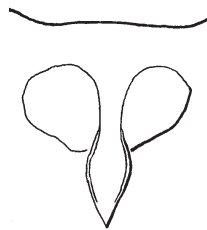
7(6) Hind tarsal claws unequal **OR** if subequal, then about 1/2 length of last tarsomere; posterior margin of female last abdominal sternite notched *Ilybius*



Ilybius biguttulus
female sternite

7' Hind tarsal claws equal **OR** if subequal then < 1/4 length of last tarsomere; posterior margin of female last abdominal sternite entire 8

8(7') Prosternal process with narrow lateral bead; elytra without preapical submarginal stripe; inner hind tibial spur longer than basal tarsal segment; total length usually < 8.0 mm *Agabus*

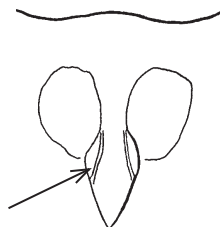


prosternal process

Agabus xyztrus



8' Prosternal process with lateral bead inflated behind fore coxae; elytra with preapical submarginal stripe; inner hind tibial spur subequal to basal tarsal segment; total length 7.5 mm or longer *Platambus*



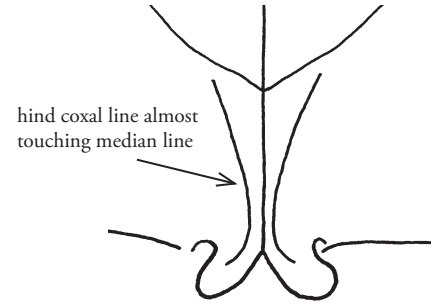
prosternal process

preapical submarginal stripe

Platambus johannis



- 9(6') Hind tarsal claws approximately equal in length 10
- 9' Hind tarsal claws obviously unequal 13
- 10(9) Hind coxal lines approach each other posteriorly, almost touching median line 11
- 10' Hind coxal lines never almost touch median line 12
- 11(10) Each elytron with 6-11 striae; basal abdominal sternites with striae; length > 3.5 mm ***Copelatus***

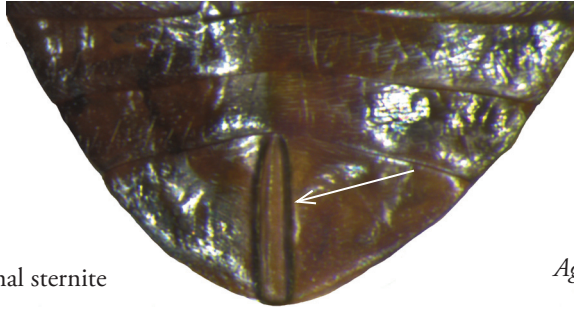
*Copelatus caelatipennis princeps**Hydrodytes dodgei*

- 11' Elytra without striae; basal abdominal sternites without striae; length < 3.0 mm ***Hydrodytes***

- 12(11') Labial and maxillary palpi notched apically; last abdominal sternite without a pair of medial parallel grooves; elytra without dense sculpture of irregular grooves ***Coptotomus***

*Coptotomus venustus*

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



male last abdominal sternite

Agabetes acuductus

- 13(9') Prosternum with longitudinal medial furrow *Matus*

prosternum with furrow

*Matus leechi**Matus ovatus blatchleyi*

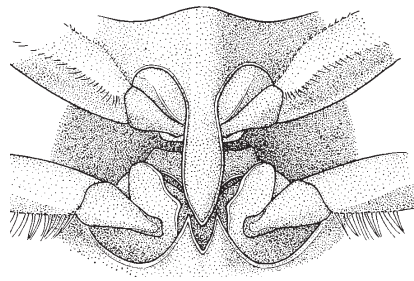
- 13' Prosternum flat, convex or keeled, without longitudinal medial furrow 14

- 14(13') Prosternal process convex or keeled; pronotum narrowly margined laterally *Rhantus*

keeled prosternum

*Rhantus calidus*

- 14' Prosternal process flat; pronotum widely margined **Hoperius*
 (Monotypic genus with one SE US species, *H. planatus* Fall (length 12-14 mm); not known from Florida but may occur in northern portion of state; see Spangler (1973a))



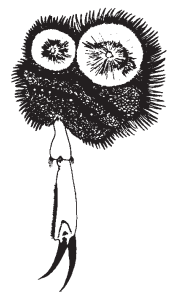
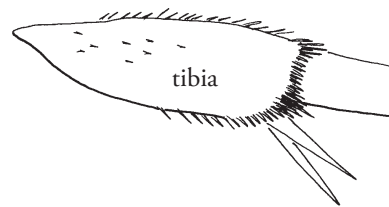
prosternum
 (adapted from Spangler 1973a)



Hoperius planatus

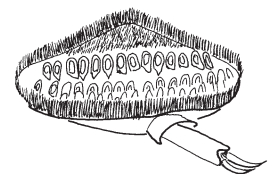
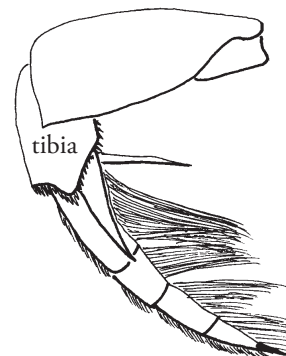
- 15(5') Larger, length > 20 mm; hind margin of first 4 hind tarsal segments without a coarse fringe of golden yellow setae (although some may be present on outer apical angle) 16
- 15' Smaller, length < 20 mm; hind margin of first 4 hind tarsal segments with a coarse fringe of golden yellow setae 18

- 16(15) Hind tibia moderately slender; shorter spur at hind tibial apex about as broad as longer spur; first 3 segments of male fore tarsi forming a round palette *Dytiscus*



palette

- 16' Hind tibia short and broad; shorter spur at hind tibial apex much broader than longer spur; first 3 segments of male fore tarsi forming an oval palette 17



palette

- 17(16') Larger, length > 25 mm; elytra with yellow lateral borders; male hind tarsus with 1 apical claw; female hind tarsus usually with 1 apical claw or a long outer and rudimentary inner apical claw ***Cybister***



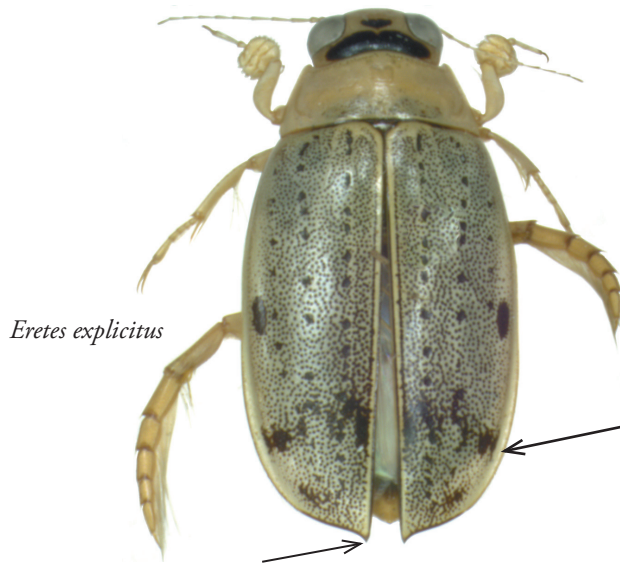
Cybister fimbriolatus



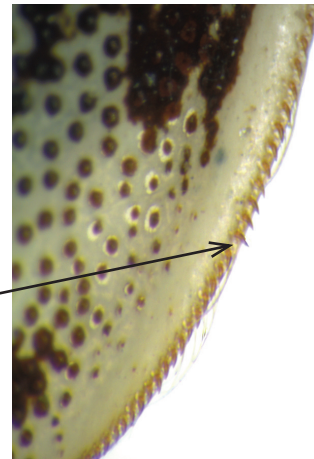
Megadytes fraternus

- 17' Smaller, length < 25 mm; elytra without yellow lateral borders (but margin may be lighter reddish-brown); male hind tarsus with 2 apical claws; female hind tarsus with a long outer and rudimentary inner apical claw ***Megadytes***

- 18(15') Posterolateral margin of elytra with a row of small spines; elytra pointed apically; prosternal process sharply pointed apically ***Eretes***



Eretes explicitus



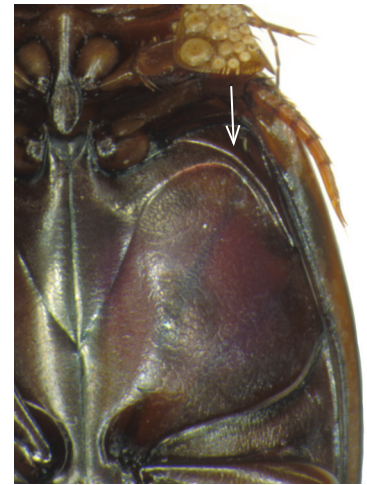
- 18' Posterolateral margin of elytra without a row of small spines; elytra not pointed apically; prosternal process rounded apically 19

19(18') Smaller spur at hind tibial apex sharply pointed; outer margin of metasternal "wing" straight 20

19' Smaller spur at hind tibial apex notched or blunt; outer margin of metasternal "wing" strongly arched 21

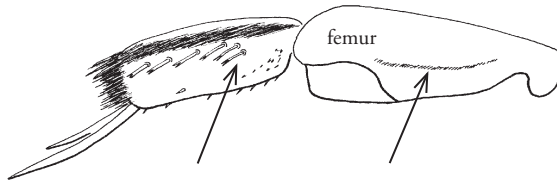


straight wing

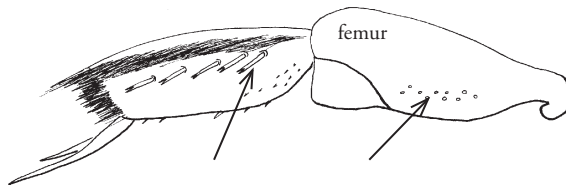


arched wing

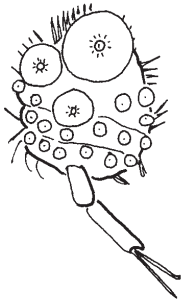
20(19) Upper (anterior) surface of hind femur with mostly straight line of numerous small punctures; upper surface of hind tibia with row of bifid spines curving inward basally, not parallel to outer tibial margin; male with small, linear series of setae in setal brush near base of middle tarsomere 1; general color black ***Prodaticus***

*Prodaticus bimarginatus*

20' Upper (anterior) surface of hind femur with irregular line of a few moderately large punctures; hind tibia with row of bifid spines on upper surface straight, parallel to outer tibial margin; male with large, broad setal brush near base of middle tarsomere 1; general color reddish-brown ***Hydaticus***

*Hydaticus cinctipennis*

- 21(19') Venter, elytra and pronotum coarsely punctate; palette (suction disc) of male fore tarsus with 1 large basal, 2 smaller and many tiny suction cups *Acilius*



Thermonectus basillaris
male foretarsus



Acilius fraternus
male foretarsus



Acilius fraternus

- 21' Venter almost smooth, with scarcely observable microreticulation, pronotum and elytra of some females with many small, short grooves, but not punctate; palette of male fore tarsus with a few large and many small suction cups 22

- 22(21') 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 row of small suction discs; female elytra without sculpture *Graphoderus*



Graphoderus liberus



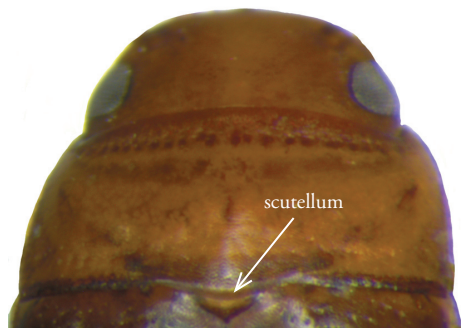
- 22' Elytra black with yellow spots or fasciae, or yellow with black spots; hind margin of mid femur with a row of stiff setae that are as long as or longer than width of femur; mid tarsi of male without suction discs; female elytra with sculpture of many short longitudinal grooves *Thermonectus*



Thermonectus basillaris

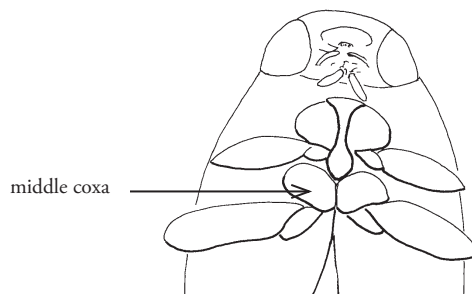


- 23(1') Scutellum exposed; body form somewhat cylindrical, with apices of elytra and last abdominal sternite produced into a point ***Celina***

*Celina contiger**Celina angustata*

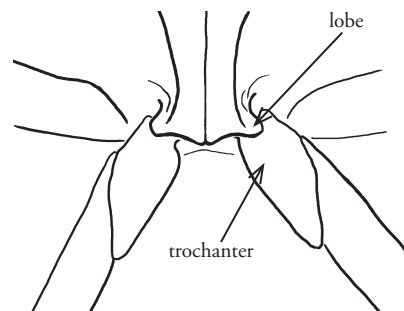
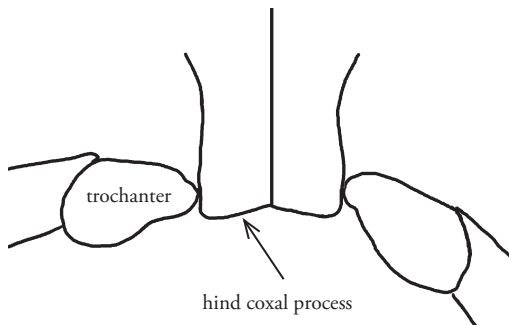
- 23' Scutellum hidden (if apex slightly visible, elytra not apically pointed); body form variable, with apex of abdomen not produced into a sharp point, OR if elytra produced into a point, then body form semi-spherical (see *Hydrovatus*, couplet 33) 24

- 24(23') Middle coxae contiguous; prosternal process short, ending before middle coxae; mesepimeron extends between metepisternum and mesocoxal cavity ***Derovatellus***

*Derovatellus floridanus*

- 24' Middle coxae not contiguous, separated by prosternal process or mesosternite by at least 1/2 the width of a middle coxa; metepisternum reaches mesocoxal cavity 25

- 25(24') Hind coxal process without lateral lobes, bases of hind trochanters entirely free 26



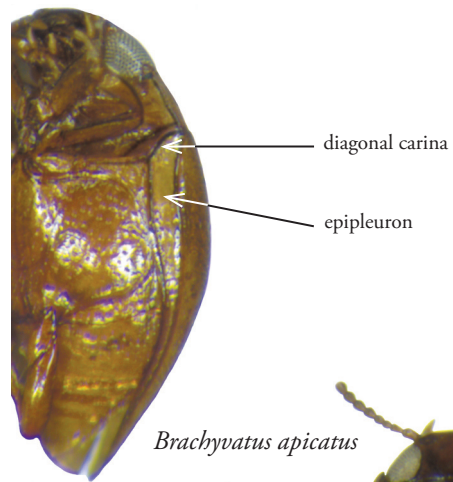
- 25' Hind coxal process produced laterally into lobes that cover the bases of the hind trochanters 32

26(25) Epipleuron with a diagonal carina 27

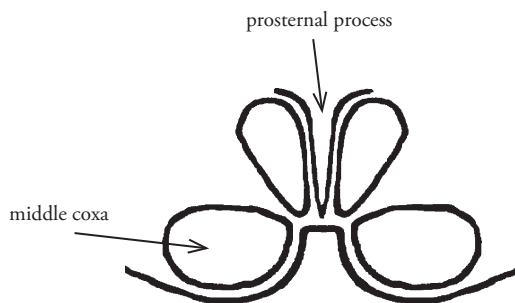
26' Epipleuron without a diagonal carina 29

27(26) Hind tarsal claws equal; hind tibiae slightly arcuate, narrow basally and widening gradually to apex; clypeus with 2 small tubercles; body pointed posteriorly ***Brachyvatus***

27' Hind tarsal claws unequal; hind tibiae straight, about as wide at base as at apex; clypeus without 2 small tubercles; body globose 28



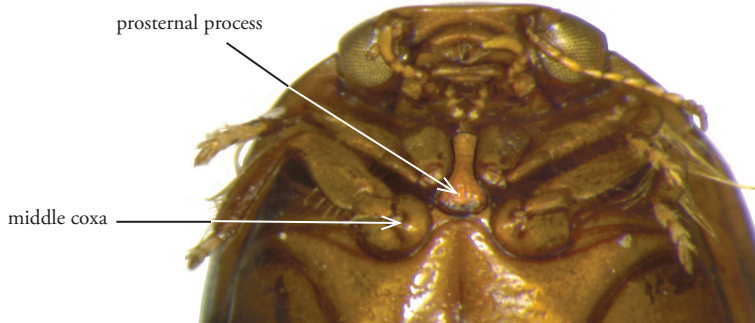
28(27') Length < 2.5 mm; middle coxae separated by about 1/2 the width of a middle coxa; prosternal process pointed apically ***Desmopachria***



Desmopachria granum



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



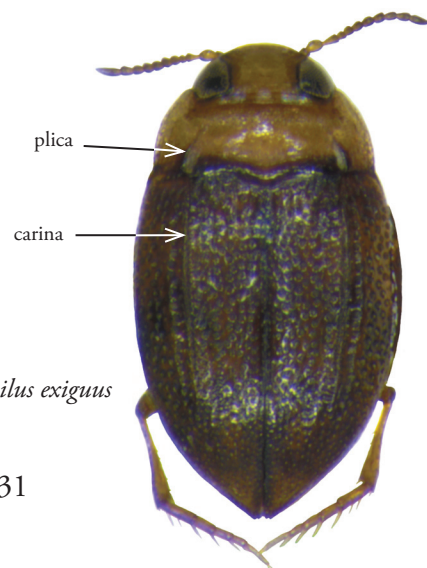
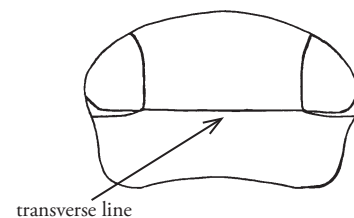
Pachydrus princeps



29(26') Head **without** a transverse line behind the eyes *Uvarus*

29' Head **with** a transverse line behind the eyes 30

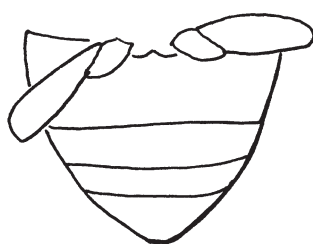
30(29') Each elytron with a strong carina beginning behind the pronotal plica and extending most of the length of the elytron *Anodocheilus*



Anodocheilus exiguus

30' Elytra without strong carinae 31

31(30') Last abdominal sternite broad, slightly pointed near center; metacoxal plate and epipleuron mostly smooth, punctation scarcely noticeable; elytra with pattern of longitudinal dark vittae, often diffuse; male with truncate spur at apex of hind tibia; aedeagus in lateral aspect resembles a bird's head *Neobidessus*



Neobidessus



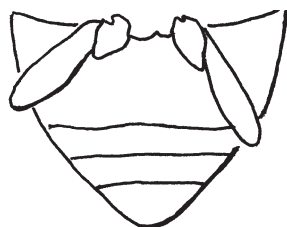
Neobidessus pullus
male hind tibia



Neobidessus pullus aedeagus
(adapted from Young 1977)



Neobidessus pullus



Liodessus



Liodessus crotchii aedeagus
(adapted from Larson & Roughley 1990)

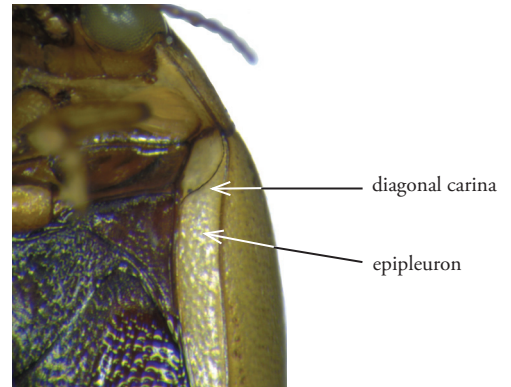
31' Last abdominal sternite narrower, almost triangular; metacoxal plate and epipleuron usually coarsely punctate; elytra immaculate, broadly fasciate OR if with irregular longitudinal vittae, then usually with dark medial pronotal spot; male without truncate spur at apex of hind tibia; aedeagus simple, arcuate *Liodessus*



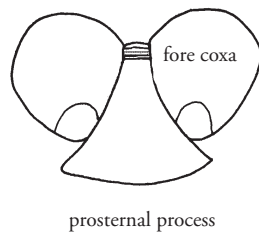
Liodessus noviaffinis

32(25') Epipleuron with a diagonal carina 33

32' Epipleuron without a diagonal carina 34

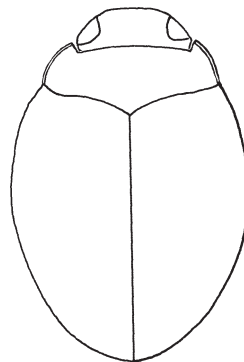
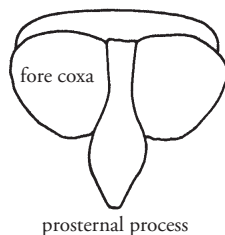


33(32) Prosternal process broadly rounded at apex, as wide as fore coxae; body form semi-spherical with elytral apices pointed; fore and mid tarsi pseudotetramerous ***Hydrovatus***



Hydrovatus pustulatus

33' Prosternal process pointed at apex, about 1/2 as wide as fore coxae; if body form semi-spherical, elytral apices not pointed; fore and mid tarsi apparently 4 segmented ***Hygrotus***



Hygrotus marginipennis



Hygrotus nubilus

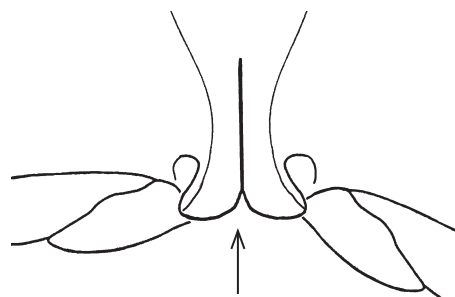
- 34(32') Base of hind femur contacting hind coxal lobe **Laccornis**



Laccornis difformis

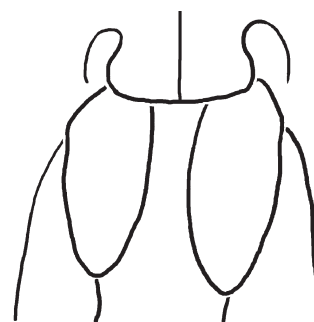
- 34' Base of hind femur separated from hind coxal lobe by trochanter 35

- 35(34') Posterior margin of hind coxal lobes medially incised ***Stictotarsus**
(One widespread species, *S. griseostriatus* (De Geer) (length 3.9-5.2 mm), known from SE US; not known from Florida but may occur in northern portion of state. See Larson et al. (2000))

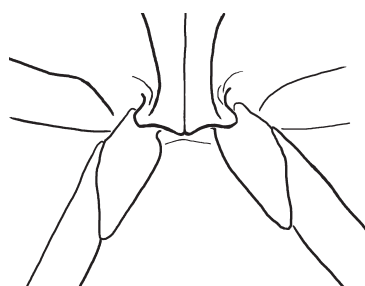
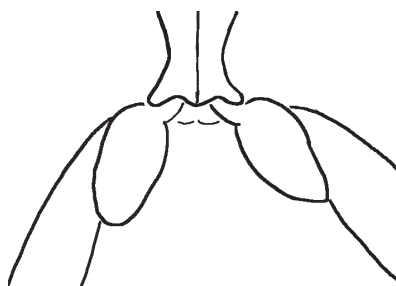


- 35' Posterior margin of hind coxal lobes straight, sinuate or produced posteriorly (see below) 36

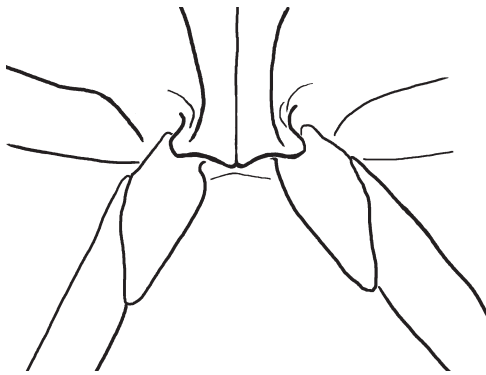
- 36(35') Posterior margin of hind coxal process essentially straight, the middle portion not extending more posteriorly than the lateral lobes; anterior margin of clypeus rounded **Hydroporus**



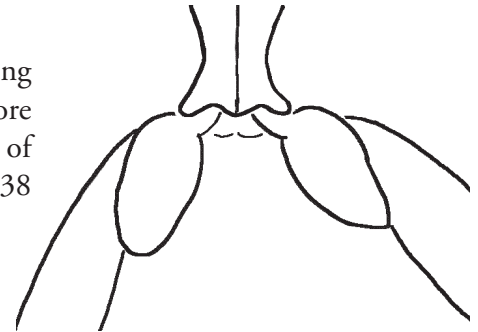
- 36' Posterior margin of hind coxal process with central portion extended, with hind margin either angulate or sinuate; **OR** if posterior margin appears almost straight, anterior margin of clypeus truncate 37



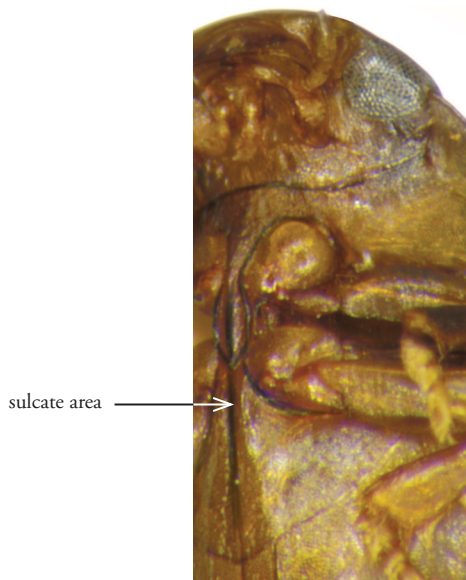
- 37(36') Posterior margin of hind coxal lobes angulate, with line running from center to outermost portion of lateral lobe straight to arcuate, not curving in more anteriorly than posterior margin of lateral lobe, **OR** anterior margin of clypeus truncate (2 spp.; most species with rounded clypeus) *Neoporus*

*Neoporus vittatipennis**Neoporus clypealis**Neoporus hybridus*
(species with truncate clypeus)

- 37' Posterior margin of hind coxal lobes sinuate, with line running from center to outermost portion of lateral lobe curving in more anteriorly than posterior margin of lateral lobe; anterior margin of clypeus rounded 38



- 38(37') Metasternum weakly sulcate (concave) posterior to apex of prosternal process; male with 4th and/or 5th antennal segment enlarged; male fore tibia straight; basal segment of male fore tarsus with small suction cup; body more elongate and tapered posteriorly *Lioporeus*



sulcate area →



male antennae

*Lioporeus pilatei*

- 38' Metasternum not sulcate posterior to apex of prosternal process; male with 4th and/or 5th antennal segment normal; male fore tibia straight or incised; basal segment of male fore tarsus without small suction cup; body not elongate, not as tapered posteriorly 39

- 39(38') Elytra without broad fasciae; body flattened; aedeagus simple;
apex of scutellum often visible; fore tibia of male incised near
base *Hydrocolus*



Hydrocolus oblitus

- 39' Elytra with broad fascia; body not as flat; aedeagus apically
bifid in dorsal/ventral view; apex of scutellum not visible; male
fore tibia simple **Heterosternuta*
(not known from Florida but may occur in northern portion of state; see
Larson et al. (2000))



Heterosternuta wickhami

GENUS *Acilius*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection, apically bifid ligula; broadly rectangular maxillary stipes; and abdominal segments 7 and 8 with lateral fringe of swimming setae.

Adults are distinguished by the moderately large size (10-16 mm); eyes without anterior emargination; 5 segmented fore and mid tarsi; 3 basal segments on male fore tarsi forming a more or less round palette, with a large and 2 smaller suction cups; apically rounded prosternal process; densely punctate pronotum, elytra and venter; posterior margins of first 4 hind tarsomeres with dense fringe of golden setae; and blunt outer apical spur on hind tibia.

NOTES: The genus was recently revised by Bergsten & Miller (2006); three species are known from Florida (Epler 2009). *Acilius* 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 larvae of *A. fraternus* to be most commonly associated with debris/leaf litter, usually the dead blades of submerged grass tufts in temporary pools.



Acilius sp. larva

Acilius larvae (and other members of the tribe Acilini, including *Graphoderus* and *Thermonectus*) have at least two pairs 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: Bergsten & Miller 2006; Epler 2009; Hilsenhoff 1975a, 1993a; Matta & Michael 1976; Matta & Peterson 1987; Wolfe 1980.



A. fraternus



Acilius sp. larval head

Florida species

A. confusus Bergsten
A. fraternus (Harris)
A. mediatius (Say)

Key to adult *Acilius* of Florida

- 1 Length 12.6 mm or less; head yellow with distinct black M or V shaped mark on dorsum; elytra with irregular, sharply contrasting posterior yellow band *A. mediatius*

*A. mediatius*

- 1' Length > 12.6 mm; head reddish with indistinct M shaped mark; elytra with posterior band not as distinct 2

- 2(1') Male fore tarsus palette with largest sucker less than twice as large as second largest sucker; female with smooth elytra *A. fraternus*

*A. fraternus*
male fore tarsus*A. confusus*
male fore tarsus*A. fraternus*

- 2' Male fore tarsus palette with largest sucker more than twice as large as second largest sucker; female with distinct elytral sulci *A. confusus*

*A. confusus* female

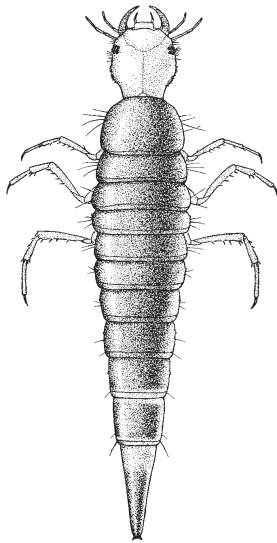
Notes on species

- A. confusus* - Length 12.9-15.9 mm. Recently described in Bergsten & Miller (2006), this species had previously been confused with *A. fraternus* and *A. semisulcatus* Aubé. This stems partially from Harris (1828) describing *A. fraternus* from a mixture of male *A. fraternus* and female *A. semisulcatus* specimens (the female of *A. semisulcatus* is sulcate). The female of *A. confusus* has distinct elytral sulci, lacking in female *A. fraternus*. Numerous previous workers had considered that *A. fraternus* females could be smooth or sulcate, but females of *A. fraternus* always have smooth elytra (Bergsten & Miller 2006). *Acilius semisulcatus* is not known from Florida; it is a more northern species. Ciegler's (2003) records for *A. semisulcatus* probably refer to *A. confusus* (Bergsten & Miller 2006). In addition to the fore tarsal characters given in the key, male *A. confusus* possess small brushes of setae at the posterior margins of mid tarsomeres 1-3, lacking in *A. fraternus*, and the large punctures on the elytra are crescentic in *A. confusus*, while being round in *A. fraternus*.
- A. fraternus* - Length 13.0-16.0 mm. The largest and apparently most common *Acilius* in Florida. Because the differences between *A. confusus* and *A. fraternus* in both sexes have been unrecognized until Bergsten & Miller (2006), previous records of *A. fraternus* must be reconsidered (literature records given in this manual are courtesy of Dr. Johannes Bergsten). Subspecies formerly assigned to *A. fraternus* were relegated to synonymy by Bergsten & Miller (2006). Descriptions of the larvae of these two "subspecies" (Wolfe 1980; Matta & Peterson 1987) must be considered unreliable because without reexamination of adult material it is uncertain to which taxon these larvae can be assigned.
- A. mediatius* - Length 10.1-12.6 mm. Although common through most of its range, this species is rare in Florida; the sole Florida record, for Santa Rosa County, is given by Young (1954).

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; antennae with last segment $< 2/3$ length of 3rd segment, with stout seta arising from apex of 3rd segment subequal to 4th segment; abdominal segments 7 and 8 without a lateral fringe of swimming setae; and rudimentary urogomphi. Live larvae are easily recognized by the reddish-yellow head contrasting with the very dark gray body segments.

Adults are distinguished by their small size (< 8 mm); emarginate eyes; labial and maxillary palpi simple; unmargined pronotum, visible scutellum; 5 segmented fore and mid tarsi; hind femur without a linear group of short, stout setae on posterior apical angle; elytra with dense sculpture of irregular grooves; and last abdominal sternite of male with a pair of medial parallel grooves; and equal hind tarsal claws.



larva

(adapted from Spangler & Gordon 1973)



apical abdominal sternites of male



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

Young (1954) made reference to the apparent flightlessness of this species. Spangler & Gordon (1973) noted that it flew to UV light traps. I have seen scores of specimens from UV light traps from numerous sites in northern Florida.

ADDITIONAL REFERENCES: Alarie et al. 2002; Burmeister 1990; Spangler & Gordon 1973.

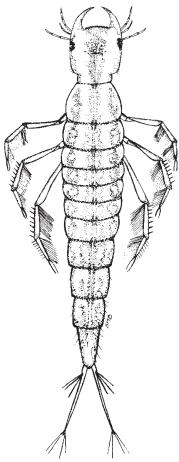
Florida species

A. acuductus (Harris)

GENUS *Agabus*

DIAGNOSIS: Larvae of Florida *Agabus* are distinguished by the lack of a frontal projection; simple last antennal segment; broad maxillary stipes; abdominal sternites 1-6 membranous, 7-8 sclerotized; abdominal segments 7-8 without a lateral setal fringe; tibiae and tarsi with swimming setae; and urogomphus with 2 whorls of primary setae, no secondary setae.

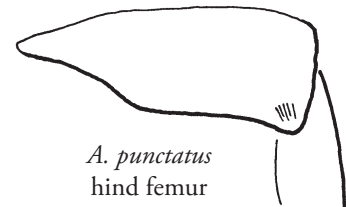
Adults are distinguished by the small size (< 8.5 mm); emarginate eyes; prosternal process with narrow lateral bead; visible scutellum; elytra without preapical submarginal stripe; 5 segmented fore and mid tarsi; inner hind tibial spur longer than basal tarsal segment; males with stridulatory organ of ridges on dorsal margin of hind femur; hind femur with a linear group of short, stout setae on posterior apical angle; equal hind tarsal claws; and posterior margin of female last abdominal sternite entire.



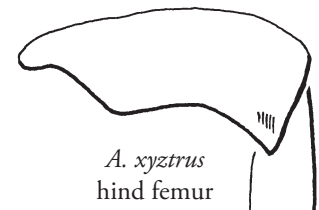
A. punctatus larva
(adapted from Matta 1986)



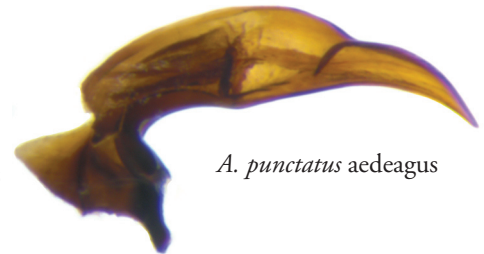
A. xyztrus male



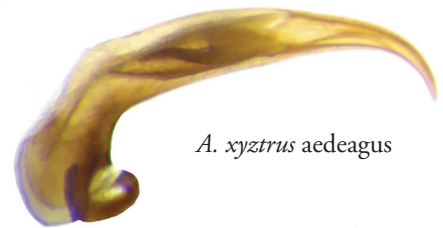
A. punctatus
hind femur



A. xyztrus
hind femur



A. punctatus aedeagus



A. xyztrus aedeagus

NOTES: Over 90 species of *Agabus* are found in the Nearctic. Nilsson (2000) elevated several species groups of *Agabus* to genus status as *Platambus* species. In North America this includes the *americanus*-, *confusus*-, *semivittatus*- and *spinipes*-groups; the genus *Agabinus* Crotch (which does not occur in Florida) is also now included in *Platambus*. This reorganization leaves us with only two *Agabus* species in Florida:

A. punctatus (length 7.0-8.2 mm) has the posterior margin of the hind femur only slightly concave; the long spur of the hind tibia is flattened; male mid and hind femora lack ventral setal brushes and the aedeagus is distinctive.

A. xyztrus (replaces *A. aeruginosus* Aubé in the SE US; see Larson et al. 2000: 597) (length 6.5-7.8 mm) has the posterior margin of the hind femur deeply concave; the long spur of the hind tibia is cylindrical; male mid and hind femora have yellowish ventral setal brushes and the aedeagus is distinctive. I have examined one male specimen from Liberty County, Florida (figured on this page); other records listed are transferred from Young's (1954) records of *A. aeruginosus*.

ADDITIONAL REFERENCES: Larson et al. 2000; Matta 1986.

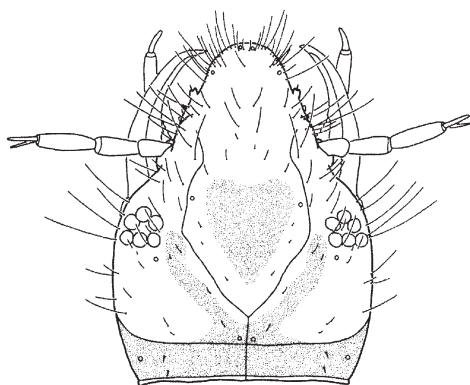
Florida species

- A. punctatus* Melsheimer
- A. xyztrus* Larson

GENUS *Anodocheilus*

DIAGNOSIS: Larvae are distinguished by the broadly conical frontal projection; last labial palpomere longer than preceding palpomere; legs without swimming setae; membranous abdominal sternite 6; and urogomphus with basal segment shorter than apical segment, without secondary setae and with bases of setae UR2, UR3 and UR4 equidistant.

Adults are distinguished by their very small size (< 2 mm); thickened clypeal margin; transverse stria across the occiput posterior to the eyes; pseudotetramerous fore and mid tarsi; lack of a diagonal epipleural carina; pronotum with plicae; each elytron with strong carina beginning behind the pronotal plica and running most of the length of the elytron; and weakly arcuate hind tibiae.



A. maculatus larval head
(adapted from Michat & Torres 2006a)



A. exiguus

NOTES: This mostly Neotropical genus has one representative, *A. exiguus* (length 1.4-1.7 mm), in Florida; another species, *A. francescae* Young, occurs in southern Texas. It is most often found in sandy or silty margins of streams, ponds and lakes; Young (1974) reported it as abundant in shallow sand-bottomed streams open to sunlight. I have collected large numbers from a pond with mossy margins and from marginal vegetation in a shallow sand-bottomed pond.

Michat & Torres (2006a) recently described the larva of *A. maculatus* Babington, a widespread and abundant species in South America. This description is used for the larval diagnosis above and placement in the larval key; the larva of *A. exiguus* remains undescribed.

ADDITIONAL REFERENCES: Michat & Torres 2006a; Young 1974.

Florida species

A. exiguus (Aubé)

GENUS *Bidessonotus*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the very small size (<2.5 mm); transverse stria across the occiput posterior to the eyes; presence of pronotal and elytral plicae; hidden scutellum; lack of diagonal epipleural carina; 5 segmented fore and mid tarsi, with 4th segment small but not concealed within lobes of 3rd; hind tibiae slightly arcuate; and the equal hind tarsal claws.



B. inconspicuus female

NOTES: Three species of this mostly Neotropical genus occur in Florida. There is noticeable sexual dimorphism in this genus, with females 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. However, note that more than one species may be collected at the same site. Females of all three species usually bear a small preapical “tooth” on the posterior outer margin of each elytron. Development of these teeth is variable and their size can not be considered a good character for species separation. The relative lengths of pronotal and elytral plicae do not provide reliable characters for species separation because of variation in lengths that occurs at least in *B. inconspicuus*; one must rely on male genitalia for species identification.

These small beetles are most often “found in small pools or the edges of slow streams with considerable vegetation and debris in the water” (Young 1990a: 356).

Florida species

B. inconspicuus (LeConte)

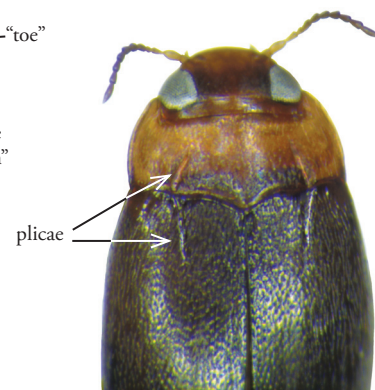
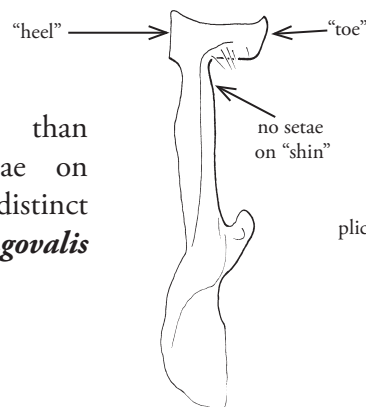
B. longovalis (Blatchley)

B. pulicarius (Aubé)

ADDITIONAL REFERENCES: Ciegler 2003; Young 1990a.

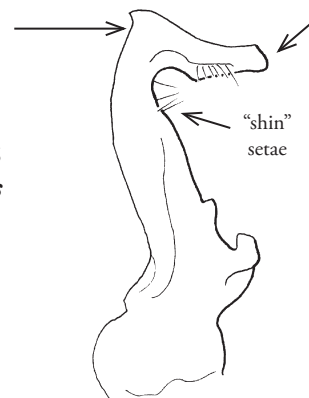
Key to adult male *Bidessonotus* of Florida

- 1 Elytral plicae distinctly longer than pronotal plicae; aedeagus without setae on “shin”, with smooth “toe” portion and distinct “heel”; larger, length 1.7-2.4 mm ***B. longovalis***

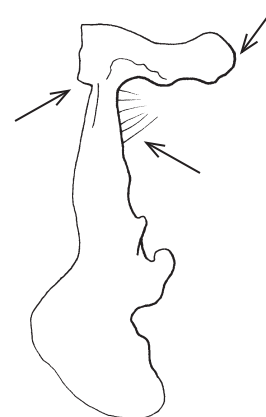


- 1' Elytral plicae longer, subequal to or shorter than pronotal plicae; aedeagus with setae on “shin” (see figures below); length usually < 2.2 mm 2

- 2(1') Aedeagus with smooth “toe” portion and “heel” not distinctly produced; larger, length 1.7-2.2+ mm ***B. inconspicuus***



- 2' Aedeagus with rounded projection on “toe”, “heel” distinctly produced; smaller, length usually < 2.0 mm; ***B. pulicarius***



Notes on species

B. inconspicuus - Length 1.7-2.2+ mm. Females are usually slightly smaller than males. The preapical elytral “tooth” may be more weakly developed in this species than in others, but one can not use this character to separate species; male genitalia must be used.

B. longovalis - Length 1.75-2.40 mm. Generally larger than the other two Florida species, but lengths overlap. As noted in the key, the pronotal/elytral plicae of this species are often longer than in others, but rely on male genitalia for positive identification. As in the other two species, females are usually slightly smaller than males. The female's preapical elytral “tooth” is usually small but distinctly developed in this species, but should not be used to differentiate species.

B. pulicarius - Length 1.7-2.0 mm. Generally the smallest of the three Florida species, but sizes overlap. Females usually have a well developed preapical elytral “tooth”, but male genitalia must be used to separate species.

GENUS *Brachyvatus*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the very small size (< 2 mm); thickened, bituberculate clypeal margin; transverse stria across the occiput posterior to the eyes; presence of pronotal plicae; hidden scutellum; a diagonal epipleural carina; pseudotetramerous fore and mid tarsi; hind coxal process without lateral lobes; and equal hind tarsal claws.



NOTES: Of the four species of this Neotropical genus, one, *B. apicatus* (length 1.6-1.7 mm), makes it as far north as peninsular Florida. This tiny beetle was formerly known as *B. seminulum* (LeConte), but was listed as a junior synonym of *B. apicatus* by Young (1969).

This beetle apparently prefers lentic habitats; all specimens in my collection are from ponds and lakes. Young (1954) noted it “frequently in various permanent situations in the peninsular uplands”. He also noted that it was apparently absent from the southern Everglades and the Keys; my southernmost records are from northwest Lake Okeechobee and near Big Cypress National Preserve.

ADDITIONAL REFERENCES: Young 1967b, 1969.

Florida species

B. apicatus (Clark)

GENUS *Celina*

DIAGNOSIS: Larvae are distinguished by the large, unnotched conical frontal projection; membranous abdominal sternites 2-6; short urogomphi; and apex of last abdominal segment with an apically curved tracheal extension.

Adults are distinguished by the small size (< 6 mm); pseudotetramerous fore and mid tarsi; exposed scutellum; and the apically pointed elytra and last abdominal sternite.



C. angustata



Celina sp.

NOTES: *Celina* is a mostly Neotropical genus, with six species known with certainty from Florida; a seventh species, *C. palustris*, may also be found here (see Notes on species). These beetles are most often associated with mucky bottoms of ponds and other standing water; they are commonly associated with stands of *Typha*.

The larva has a unique pair of dorsoapically curved tracheal extensions that arise at the ventral apex of the last abdominal segment, posterior to the origin of the urogomphi. With great consistency, the urogomphi have been mislabeled as these tracheal extensions in the Coleoptera chapter of “Merritt & Cummins” since at least the 2nd edition, most recently Fig. 20.104 (White & Roughley 2008 in Merritt, Cummins & Berg 2008, the 4th edition).

Spangler (1973c) described a *Celina* larvae from Maryland presumed to be *C. angustata* based on its occurrence with adults of that species. More recently, Michat et al. (2007) described the larva of *C. imitatrix*.

The key below is adapted from that in Young (1979b) as modified in Larson et al. (2000).

ADDITIONAL REFERENCES: Folkerts & Donavan 1973; Michat et al. 2007; Spangler 1973c; Young 1979b.

Florida species

C. angustata Aubé
C. contiger Guignot
C. grossula (LeConte)
C. hubbelli Young
C. imitatrix Young
C. palustris Young
C. slossonae Mutchler

Key to adult *Celina* of Florida

- 1 Large, length > 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*

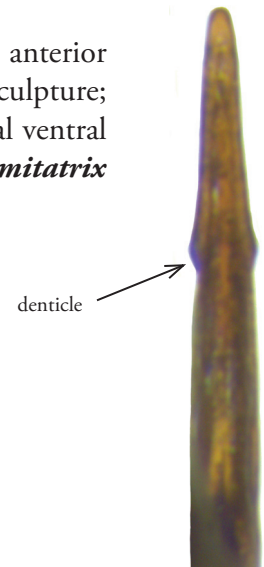
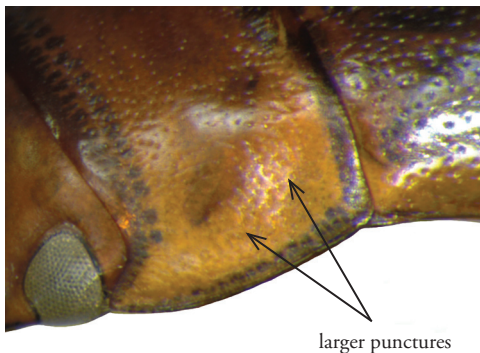
- 1' Smaller, length ≤ 5.7 mm; pronotum with finer punctation or almost impunctate, with distinct basal and apical transverse rows of coarser punctures (rows may not be continuous across pronotum); male with mid tibia incised 2

- 2(1') Length ≥ 4.4 mm 3

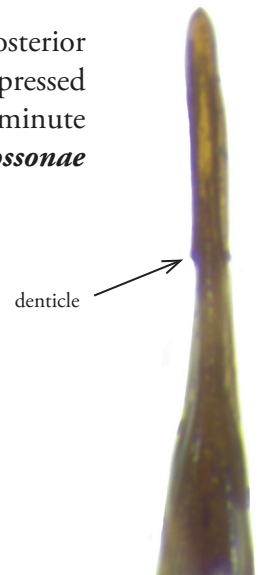
- 2' Length ≤ 4.3 mm 4



- 3(2) Larger, 5.0-5.7 mm; pronotum laterally with larger punctures running from anterior to posterior portion; pronotum with larger, well impressed reticulate microsculpture; elytral punctation distinctly coarse and irregular; aedeagus with small preapical ventral denticles *C. imitatrix*



- 3' Smaller, 4.4-5.3 mm; pronotum laterally with larger punctures at anterior and posterior portions, with smaller punctures in between; pronotum with finer, less impressed reticulate microsculpture; elytral punctation not as coarse; aedeagus with minute preapical ventral denticles *C. slossonae*



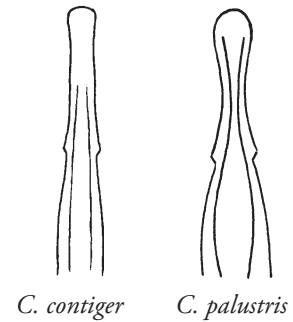
- 4(2') Microsculpture on central portion of pronotum almost or quite concealing punctation; aedeagus with minute preapical denticles and rounded, semi-spatulate apex (figs. below) 5

C. contiger

- 4' Microsculpture on central portion of pronotum finer, with some punctures distinct; aedeagus without minute preapical denticles, apex attenuate, sharply to bluntly pointed (figs below) 6

C. angustata

- 5(4) Aedeagus long and slender *C. contiger*
- 5' Aedeagus shorter *C. palustris*



(adapted from Young 1979b)

- 6(4') Average size smaller, 3.2-3.9 mm; color usually nearly uniform brown or with elytra darker than head and pronotum, sometimes narrowly lighter across base and sides; aedeagus proportionately more elongate, apex thicker in lateral view *C. angustata*



lateral and ventral view of aedeagus tip
(adapted from Young 1979b)

*C. angustata*

- 6' Average size larger, 3.6 to rarely 4.3 mm; elytra brown with a distinct, broad light yellow-brown basal band; aedeagus proportionately less elongate, apex thinner in lateral view *C. hubbelli*



lateral and ventral view of aedeagus tip
(adapted from Young 1979b)



C. hubbelli
paratype from Texas

Notes on species

- C. angustata* – Length 3.2-3.9 mm. A widespread species, ranging from South America north to Massachusetts. According to Young (1979b), 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. The two may be synonyms, but such a decision will probably require DNA comparison. See *C. hubbelli* below.
- 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 and the only Florida species in which the middle tibia of the male is not incised on its inner side.
- C. hubbelli* – Length 3.6-4.3 mm. Very similar to *C. angustata*, but specimens average larger and are differently colored **when mature** (i.e., not teneral). I have not seen Florida material of this species. In his description of this species, Young (1979b) noted specimens from the “western panhandle of Florida” but did not designate any of them as type material, and gave no specific Florida records.
- C. imitatrix* – Length 5.0-5.7 mm. A large (for the genus), 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 can easily be confused with *C. slossonae*. In addition to the differences in pronotal and elytral punctuation, note the very small ventral denticles on the aedeagus of *C. imitatrix*, located about 1/3 of the distance back from the apex; these denticles are larger than the minute ones found on the aedeagus of *C. slossonae*. See *C. slossonae* below.
- 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). I have examined one female in the Tallahassee FDEP reference collection from Water Conservation Area 2A (Broward County) that may be this species. Confirmation of this species in Florida requires examination of male specimens.
- C. slossonae* – 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”. Most published keys (Young 1979b, Larson et al. 2000; Ciegler 2003) use the supposed absence of preapical denticles on the aedeagus of *C. slossonae* as a character to separate it from *C. imitatrix*. However, minute denticles **are** present on the aedeagus of *C. slossonae* (based on 10 specimens determined as *C. slossoni* by Young). I’ve found the best character to separate the two taxa is the lateral punctuation of the pronotum. Note that because this species was named for Mrs. Annie Trumbull Slosson, the species epithet must end with an “ae” and is thus *C. slossonae*, not *C. slossoni* as originally spelled.

GENUS *Copelatus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; last segment of antennae “double”; broad, suboval maxillary stipes; inner margin of mandible with strong serrations; legs without swimming setae; and urogomphi shorter than to subequal to length of last abdominal segment.

Adults are distinguished by the small size (< 7 mm); anterior margin of eye notched above antennal base; pronotum with distinct lateral margin; basal 3 segments of male fore tarsus widened, but not forming an oval to round palette; 5 segmented fore and mid tarsi; well developed elytral striae; hind coxal lines divergent anteriorly and almost touching median line anterior to coxal processes; hind coxal plate and basal abdominal sternites with fine striae; inner side of hind femur without preapical group of setae; and equal hind tarsal claws.



C. caelatipennis princeps



Copelatus sp.

NOTES: A large (over 460 species) pantropical genus with 6 species known from Florida. These beetles are pioneer species, often found in temporary pools/puddles and in water bodies with accumulated organic debris.

The key below is adapted from that of Young (1963a). Spangler (1962b) described the larva of *C. glyphicus*; larvae can not be identified to species.

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

Florida species

C. blatchleyi Young
C. caelatipennis princeps Young
C. c. chevrolati Aubé
C. c. renovatus Guignot
C. cubaensis Schaeffer
C. glyphicus (Say)
C. punctulatus Aubé

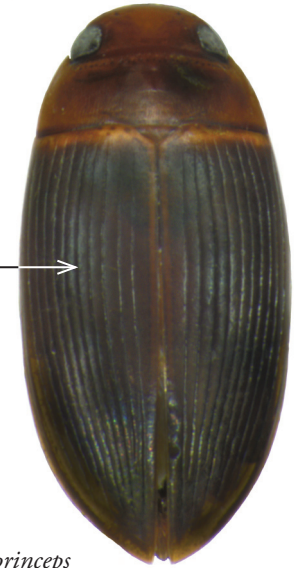
Key to adult *Copelatus* of Florida
(genitalia figures adapted from Young 1963a)

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

10 discal striae →

- 1' Each elytron with less than 10 distinct striae 4

C. caelatipennis princeps



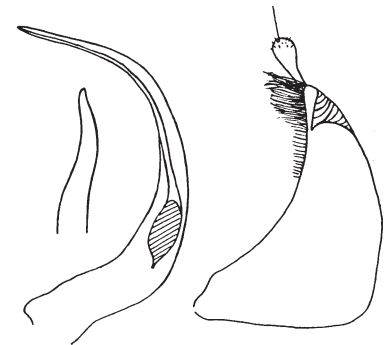
- 2(1) Base of elytra usually with lighter transverse band (above); aedeagus with clubbed apex, resembling a bird's head; body form narrow ***C. caelatipennis princeps***



- 2' Elytral bases usually uniformly colored; aedeagus with apex simply curved (figs. below); body form broader 3

C. caelatipennis princeps
aedeagus

- 3(2') Aedeagus stouter, apex curved but not strongly bent at extreme apex; parameres broad at base; elytra with distinct, but small, punctures on intervals between striae ***C. punctulatus***



aedeagus tip and lateral view

paramere

- 3' Aedeagus narrower, apex strongly bent at extreme apex; parameres narrower at base; elytral intervals at most inconspicuously punctate between striae ***C. glyphicus***



aedeagus tip and lateral view

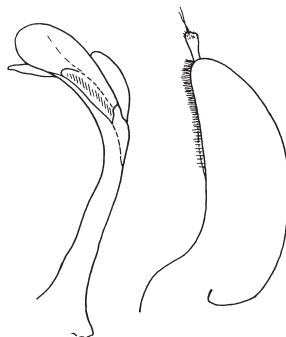
paramere

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



- 4' Each elytron with a submarginal and 5-6 discal striae; base of elytra with a lighter transverse band; southern Florida 5

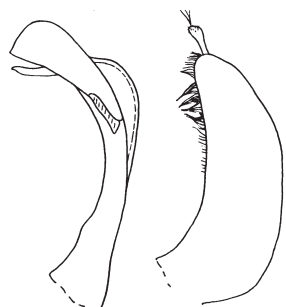
- 5(4') Each elytron with a submarginal and 5 discal striae; elytra usually darker than pronotum; basal transverse band narrow; aedeagus as figured; length < 4.8 mm *C. blatchleyi*



aedeagus paramere



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



aedeagus paramere



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, *C. glyphicus* and *C. punctulatus* are the most common members of the genus in Florida. Young (1963a) divided *C. caelatipennis* into three subspecies, of which only *C. caelatipennis princeps* is known to definitely occur in Florida. The subspecies *C. caelatipennis 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 small striae on the pronotal disc in *C. caelatipennis 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 (this is true for many dytiscids and other beetles).
- C. chevrolati* – Length about 6.0-6.4 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: the more common *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 County.
- C. cubaensis* – Length 5.0-5.3 mm. This species has apparently recently (since the 1960's) become established in south Florida (Miami-Dade County).
- 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. According to Young (1963a), *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). Nilsson (2001) again relegated *C. punctulatus* to synonymy under *C. glyphicus*, but male genitalia indicate that the two are distinct species, and are treated as such in this manual. I have collected this species and *C. glyphicus* from bird baths in northern Florida. 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; and abdominal segments 7-8 and urogomphi with a lateral fringe of setae.

Adults are distinguished by the small size (< 9 mm); emarginate eyes; apically notched palpi; visible scutellum; smooth, non-striate elytra; 5 segmented fore and mid tarsi; and the equal hind tarsal claws.



C. longulus lenticus



C. venustus



Coptotomus sp. larva

NOTES: Hilsenhoff (1980) reviewed the genus and described two new species (one of which has been relegated to synonymy). All four of the eastern North American species occur in Florida. Bacon et al. (2000) described the larva of *C. longulus lenticus* (as *C. lenticus*).

Coptotomus are very common inhabitants of streams (where adults occur near the margins of deeper streams/ rivers) and ponds; they come readily to UV light. 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.

Because of their color pattern variability, these beetles can be very difficult to identify to species, especially *C. interrogatus* and *C. venustus* - which may be variants of the same species. It may be necessary to pry open an elytron to observe the color pattern, especially the submarginal stripe and the area below it; this is especially true for alcohol preserved specimens, which tend to darken with long term storage in alcohol. The key below is adapted from those in Hilsenhoff (1980, 1993b).

ADDITIONAL REFERENCES: Bacon et al. 2000; Barman 2004; Hilsenhoff 1980, 1993b.

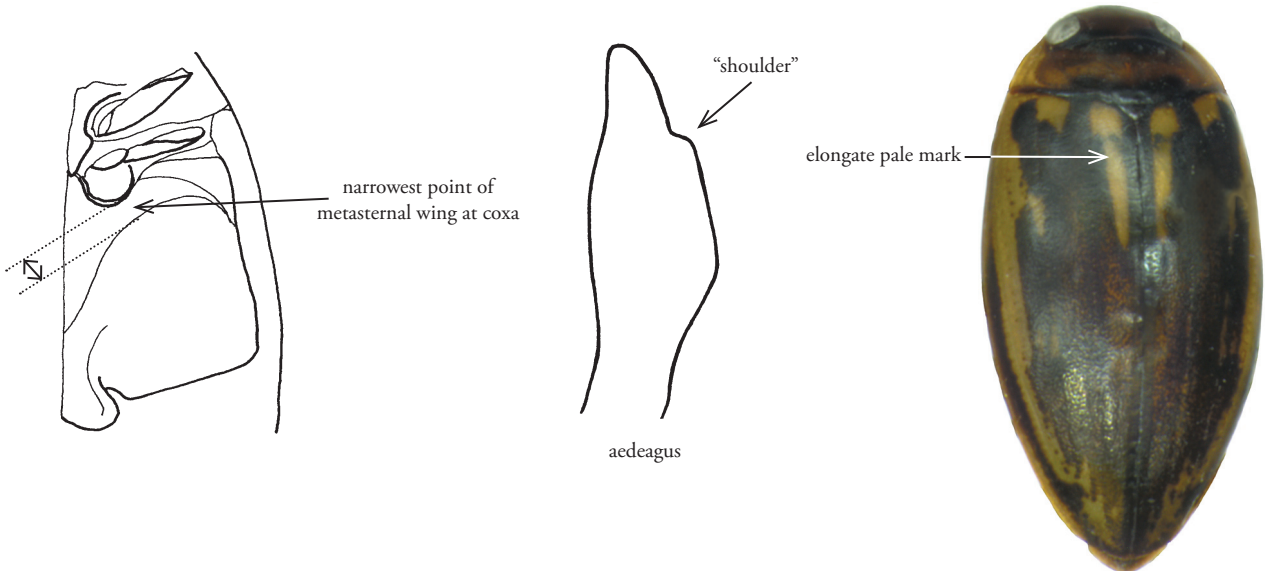
Florida species

- C. interrogatus* (Fabricius)
- C. longulus lenticus* Hilsenhoff
- C. loticus* Hilsenhoff
- C. venustus* (Say)

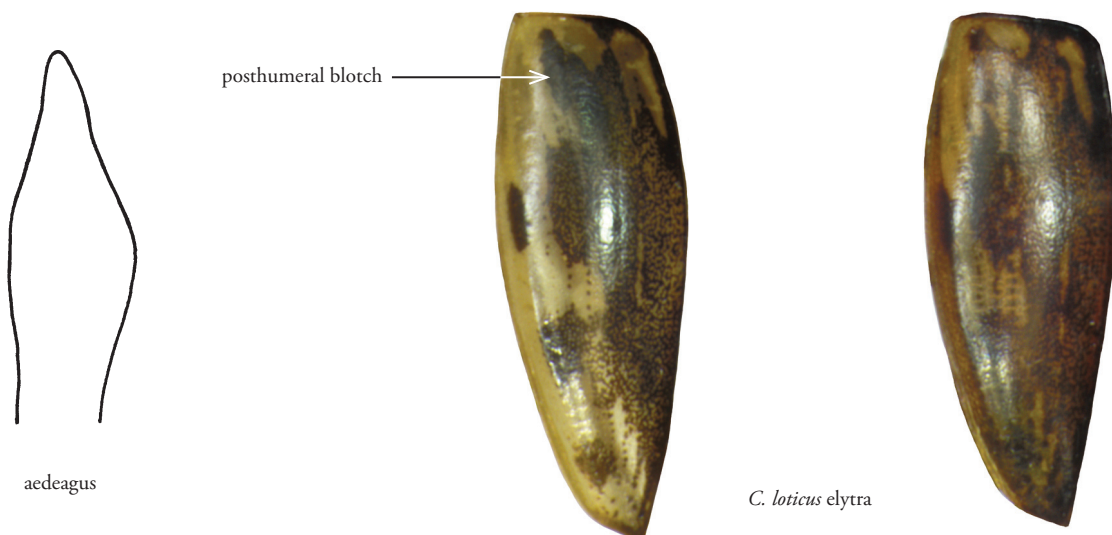
Key to adult *Coptotomus* of Florida

(aedeagus figures adapted from Hilsenhoff (1980))

- 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 with well defined "shoulder" *C. longulus lenticus*

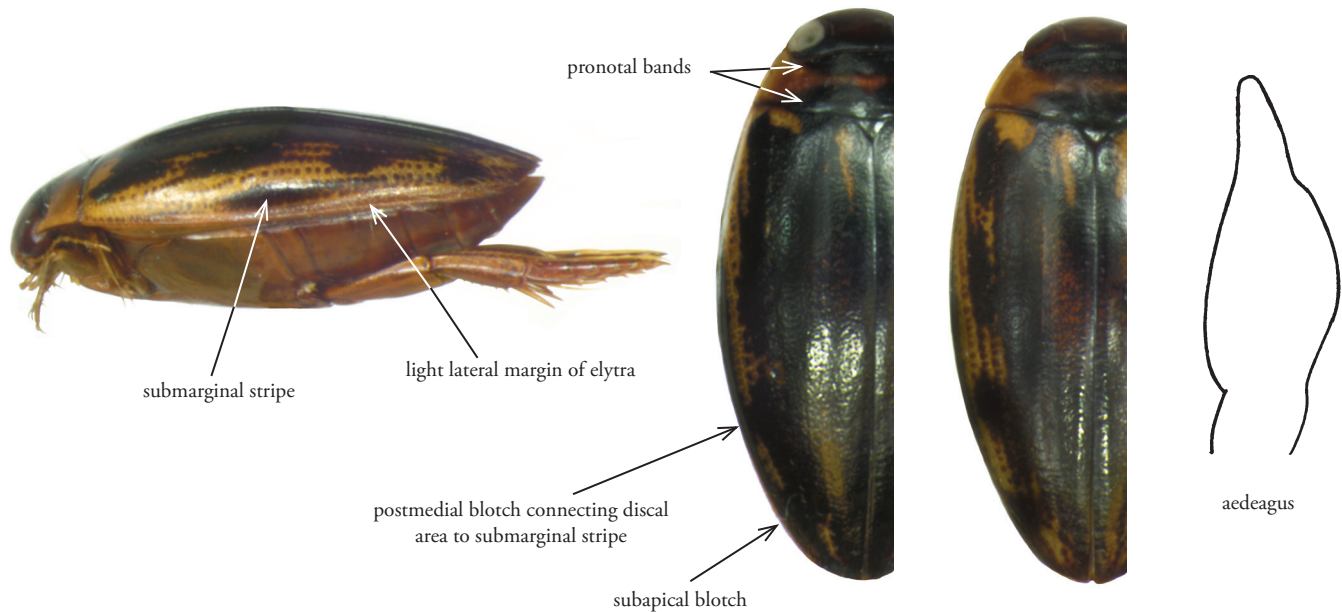


- 1' Metasternal wing ≤ 0.30 mm wide at narrowest point adjacent to middle coxa; elongate pale marks at base of elytra broad in relation to their length; aedeagus with or without well defined "shoulder" ... 2
- 2(1') Margins of elytra pale yellow or only slightly darkened, with 2-3 lateral blotches that are not connected or connected only by a series of dots; posthumeral blotch spotted with yellow; metasternal wing narrow, about 0.25 mm or less; dark area on posterior margin of head usually sharply defined anteriorly; aedeagus broad, gradually narrowing to apex *C. loticus*



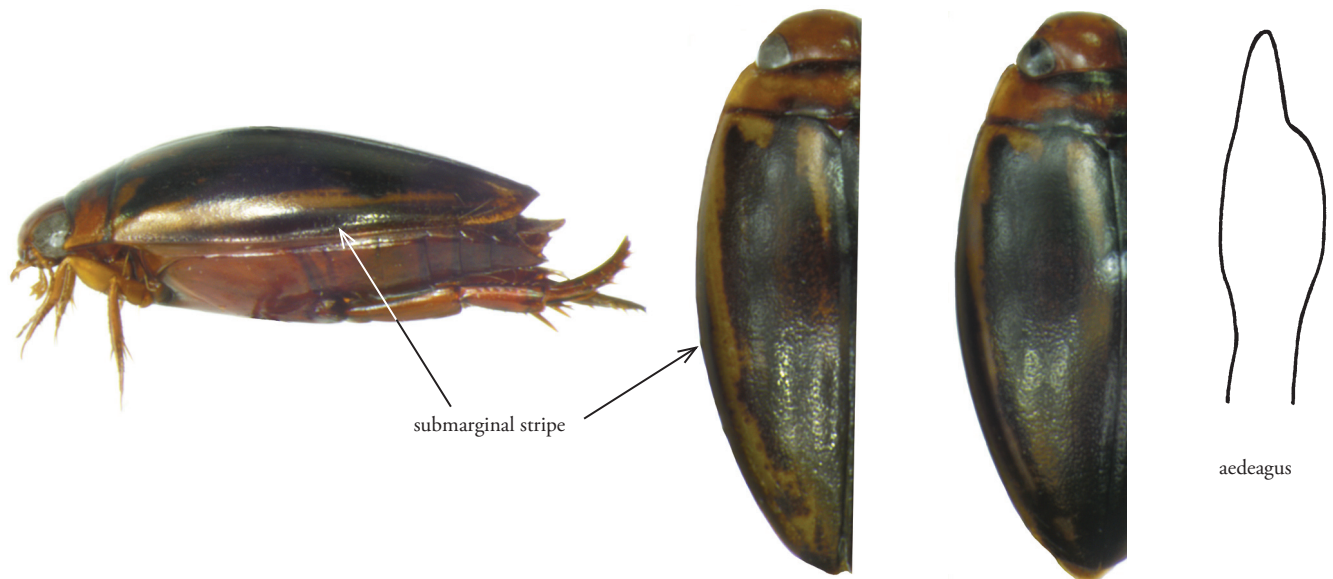
- 2' Margins of elytra darkened, with a continuous sublateral dark stripe that extends forward from apex of elytron; posthumeral blotch mostly solidly colored; metasternal wing broader, 0.25-0.30 mm; dark area on posterior margin of head more gradually blending anteriorly; aedeagus with "shoulder" 3

- 3(2') Lateral margin of elytron with a lighter area between the margin and the submarginal stripe; submarginal stripe weaker, not extending as far anteriorly; yellow stripe separating central darker area from submarginal stripe usually interrupted by a postmedial blotch; dark transverse anterior and posterior pronotal bands closer together; aedeagus with weaker "shoulder" *C. venustus*



With many alcohol preserved specimens, it may be necessary to pry open an elytron to observe the color pattern, especially the submarginal stripe and the area below it.

- 3' Lateral margin of elytron dark, at most only slightly lighter than submarginal stripe; submarginal stripe stronger, extending anteriorly to basal 1/5 of elytron; yellow stripe separating central darker area from submarginal stripe rarely interrupted by a postmedial blotch; dark transverse anterior and posterior pronotal bands farther apart; aedeagus with stronger "shoulder" *C. interrogatus*



Notes on species

- C. interrogatus* – Length 5.7-7.6 mm. The smallest and darkest *Coptotomus* in Florida. Hilsenhoff (1980) synonymized *C. obscurus* with *C. interrogatus*. The taxon *C. interrogatus obscurus* as used in Young (1954) probably included *C. interrogatus* and *C. venustus*. *Coptotomus interrogatus* 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. longulus lenticus* and *C. loticus* previously identified as different subspecies of *C. interrogatus* in the FSCA. The similarity between *C. interrogatus* and *C. venustus* makes separating them very difficult, with many seemingly intergraded specimens; the two may be variants of the same species. In general, the lighter area below the elytral submarginal stripe in *C. venustus* seems to be the best character to separate the two taxa. Also, in most *C. venustus* there is a postmedial blotch that connects the central discal dark area to the submarginal stripe; in *C. interrogatus* the light line above the dark submarginal line extends almost to the apex of the elytron; this light line is usually interrupted by a dark blotch connecting the discal darker area to the submarginal line near the apex in *C. interrogatus* and *C. venustus*.
- C. longulus 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. Hilsenhoff (1980) described *C. lenticus* as a new species, but because of obvious intergradation with *C. longulus* LeConte in Canada, Larson et al. (2000) considered it as a subspecies of *C. longulus*. As the name implies, it is more likely to be found in lentic situations. Bacon et al. (2000) found that larvae of this species (as *C. lenticus*) were benthic. In Florida, this species and *C. loticus* appear to be confined to the northern part of the state.
- C. loticus* – Length 6.7-8.1 mm. This species is easily recognized by its more lightly colored elytra and the narrower metasternal wing. Usually associated with lotic habitats, but known to occur in permanent ponds and lakes; found throughout the northern tier of counties in Florida.
- C. venustus* – Length 6.4-7.5 mm. This species is easily confused with *C. interrogatus*; the two may occur together in samples taken with dipnet; see *C. interrogatus* above. I've seen several UV light trap samples in which three *Coptotomus* species were collected - *C. interrogatus*, *C. loticus* and *C. venustus*.

GENUS *Cybister*

DIAGNOSIS: Larvae are distinguished by large size (mature larva with head length > 6 mm); 3 large “teeth” on the anterior margin of the head; long and slender maxillary stipes; rudimentary ligula; inner length of prosternal plates about 1.5 X maximum width of plate; distance between prosternal plates less than proximal width of fore femur; abdominal segments 7 and 8 with lateral fringe of setae; and very reduced urogomphi.

Adults are distinguished by the very large size (> 28 mm); yellow lateral margin of pronotum and abdomen; non-emarginate eyes; 5 segmented fore and mid tarsi; males with first 3 fore tarsomeres forming an oval palette; hind tibia with one large spur twice as broad as the other; and hind tarsus of male with single claw, females with single claw or with a long outer and rudimentary inner claw.



C. fimbriolatus male



Cybister sp.

NOTES: Two species occur in Florida. These are the largest dytiscids in Florida; among the other water beetles in Florida, only *Dytiscus*, *Megadytes* and the hydrophilid *Hydrophilus* approach *Cybister* in size. Epler (1966) noted that Young (1954) stated that *Cybister* prefers the deeper water of ponds, ditches and similar situations. However, other authors (Michael & Matta (1977) and Larson et al. (2000)) have found the beetles in shallower water. I have collected adults in marshy, grass-choked pine-woods ponds in less than 0.5 m of water.

Shepley-James et al. (2009) recently provided characters for the separation of larval *Cybister* and *Megadytes*; these characters have been used in the generic key to differentiate the larvae of the two genera.

Cybister adults are consumed as food in the Orient.

ADDITIONAL REFERENCES: Shepley-James et al. 2009; Young 1953b.

Florida species

C. fimbriolatus (Say)
C. occidentalis Aubé

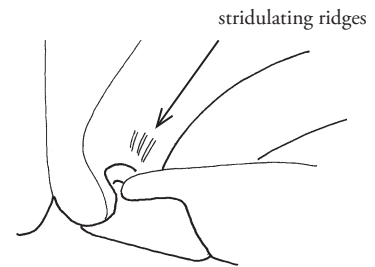
C. fimbriolatus - Length 26-33 mm. This species is smaller and has a narrower yellow lateral margin on the pronotum and elytra. This yellow band usually ends before the apex of the elytron in an irregular yellow spot. Females have one large and one rudimentary claw on the hind tarsus.

Two subspecies have been proposed for *C. fimbriolatus*. Young (1953b:7-11) offered an extensive discussion on separation of *C. f. fimbriolatus* and *C. f. crotchii* Wilke. Males of *C. f. fimbriolatus* usually have 4 distinct stridulating ridges anterior to the hind coxa; female elytra are densely covered with short striae; and the marginal yellow stripe is broader and not markedly separated from the margin posteriorly. Males of *C. f. crotchii* usually have 3 distinct stridulating ridges anterior to the hind coxa; female elytra are less densely covered with short striae or lack them entirely; and the marginal yellow stripe is narrower and is separated from the margin posteriorly.

Differentiation of these two subspecies is problematic. I have not found the characters supposedly separating the two subspecies to be consistent, a matter also noted by Michael & Matta (1977) and Ciegler (2003). Thus I have listed only *C. fimbriolatus* in the county distribution table at the end of this manual.



C. fimbriolatus



C. occidentalis - Length 30-34 mm. Larger than *C. fimbriolatus*, with a broader yellow-orange lateral margin on the pronotum and elytra; this band remains broad to the apex of the elytra. Females have one claw on the hind tarsus.

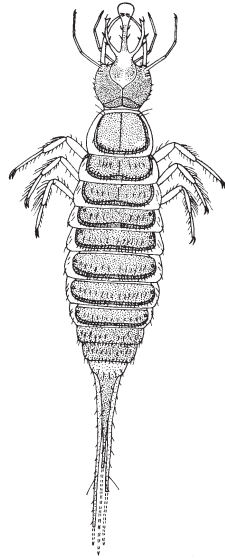
In Florida, this species is known only from two males (one specimen illustrated to the left) collected in a borrowpit on Big Pine Key; the species is known from the Bahamas and Cuba. The male has four stridulating ridges anterior to the hind coxa.

C. occidentalis

GENUS *Derovatellus*

DIAGNOSIS: Larvae are distinguished by the frontal projection with a longer, narrower central spatulate portion and each long lateral branch with 2 apical spines; membranous abdominal sternite 6; and abdominal segments 7 and 8 completely sclerotized.

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



D. floridanus larva
(adapted from Spangler 1966a)



D. floridanus adult

NOTES: In the US, this mostly tropical genus is known only from Florida; one species, *D. floridanus* (length 3.4-4.1 mm) occurs here. This species was formerly considered a subspecies of *D. lentus* (Wehncke) by Young (1954), but Miller (2005) restored it to species status and considered *D. ibarraei* Spangler a junior synonym. Thus the larva described by Spangler (1966a) is assignable to *D. floridanus*.

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

ADDITIONAL REFERENCES: Miller 2005; Spangler 1966a, 1967.

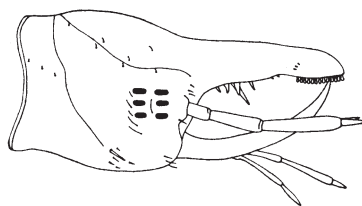
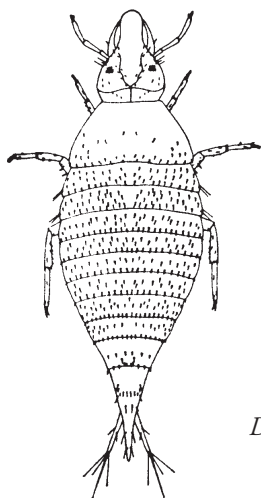
Florida species

D. floridanus Sharp

GENUS *Desmopachria*

DIAGNOSIS: Larvae are distinguished by the elongate, broadly spatulate frontal projection; prementum and both labial palpomeres elongate, distal palpomere with pair of apical setae; legs with swimming setae; sclerotized abdominal sternites 2-8; and urogomphus extends to or beyond apex of siphon.

Adults are distinguished by the very small size (< 2.4 mm) and globose shape; prosternal process with acute apex; epipleuron with diagonal carina near base; pseudotetramerous fore and mid tarsi; middle coxae separated by about 1/2 width of a mid coxa; hind coxal process without lateral lobes; straight hind tibiae; and unequal hind tarsal claws.



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



D. mutchleri

NOTES: Seven species of this largely Neotropical genus are recorded from Florida. 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; identification of many species requires examination of the male genitalia. The possibility of extralimital Caribbean species occurring in southern Florida can not be discounted.

Numerous subgenera have been proposed for *Desmopachria*, but Miller (2001b) considered many of these to be paraphyletic and opted to use species groups instead. Florida species fall into several groups: the *convexa* group (*aspera*, *cenchræmis*, *granum*); the *dispersa* group (*mutchleri*, *seminola*); the *glabricola* group (*leechi*); and the *striola* group (*striola*).

Larvae can not be identified beyond genus. I have seen many unassociated larvae that are apparently *Desmopachria* which have a sclerotized sternite 6 and swimming setae on the legs, but the urogomphi are shorter than the siphon; these specimens may be 2nd instar *Desmopachria* larvae or may represent another genus with an undescribed larva. I've also examined a single probable *Desmopachria* larva that bears short lateral processes near the base of the frontal projection, but the central portion is not spatulate (narrowed basally) as in *Pachydrus*, and the larva bears long urogomphi that extend far past the apex of the abdomen.

ADDITIONAL REFERENCES: Alarie et al. 1997; Barman 1973; Michat & Archangelsky 2007; Miller 2001b; Young 1980, 1981a, 1981b, 1989a, 1990b, 1995.

Florida species

D. aspera Young
D. cenchræmis Young
D. granum (LeConte)
D. leechi Young
D. mutchleri Blatchley
D. seminola Young
D. striola Sharp

Key to adult *Desmopachria* of Florida

- 1 Pronotal base with plicae; elytra with color pattern 2



D. mutchleri
patterned elytra



D. granum
immaculate elytra

- 1' Pronotal base without plicae, elytra immaculate 3

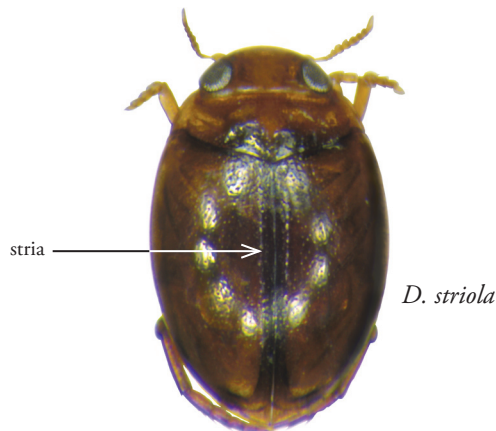
- 2(1) Vertex of head with dark markings; discal and sutural markings of elytra united, forming a large "W" (see figure above); metacoxal plates coarsely and densely punctate *D. mutchleri*

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

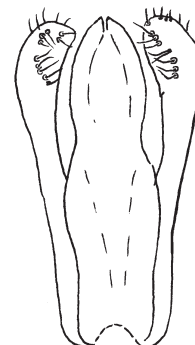


(adapted from Young 1981)

- 3(1') Elytra with a weak stria on either side of suture, most noticeable at mid-length; male genitalia with broad spatulate aedeagus *D. striola*



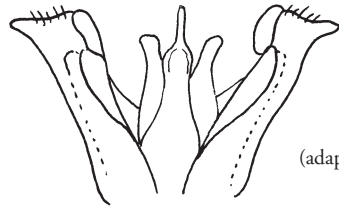
D. striola



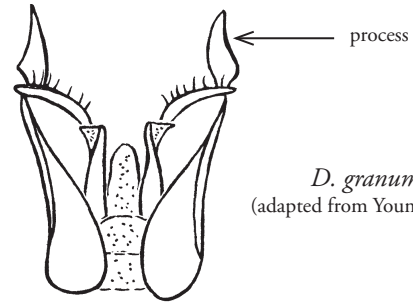
(adapted from Young 1981)

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

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



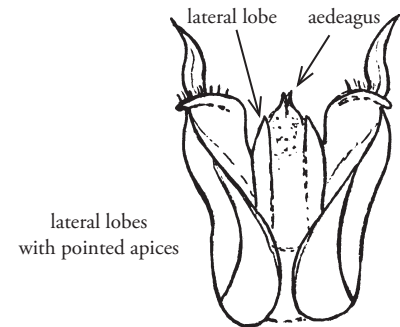
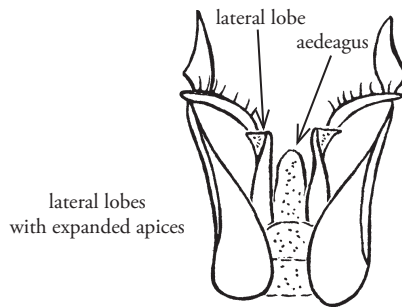
D. leechi
(adapted from Young 1981)



D. granum
(adapted from Young 1981)

- 4' Parameres of male genitalia with movable apical process 5

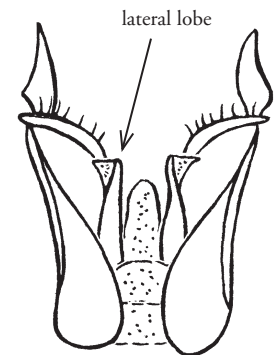
- 5(4') Aedeagus shorter than or subequal to aedeagal lateral lobes, lateral lobes with expanded or foot-shaped apices 6



- 5' Aedeagus obviously longer than aedeagal lateral lobes, apices of lateral lobes pointed or somewhat rounded and membranous 7

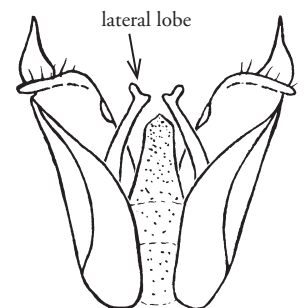
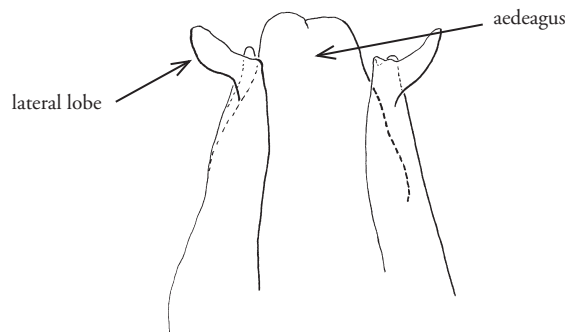
- 6(5) Smaller, 1.3-1.5 mm; apex of aedeagal lateral lobe not as sclerotized, with membranous apicolateral flange *D. granum*

The aedeagus (median lobe) may collapse
or not be readily discernible



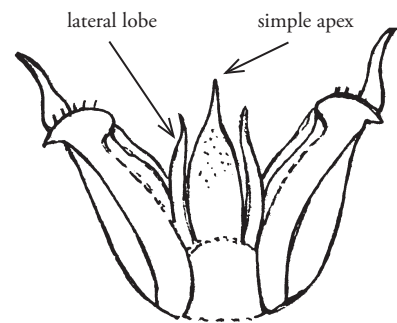
(adapted from Young 1981)

- 6' Larger, 1.5-1.9 mm; apex of aedeagal lateral lobe more sclerotized, foot-shaped, without membranous flange **D. convexa*
(not known from Florida; see Notes on species)



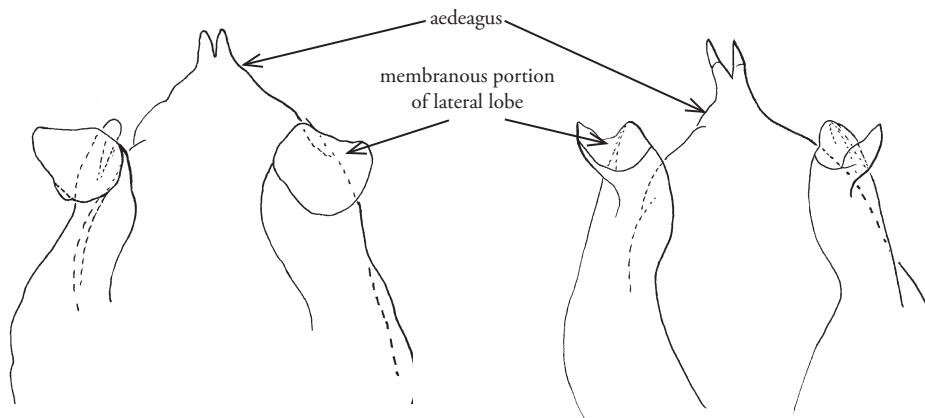
(adapted from Young 1981)

- 7(5') Apex of aedeagus simple; aedeagal lateral lobes separate from aedeagus (median lobe) and apically pointed *D. aspera*



D. aspera
(adapted from Young 1981)

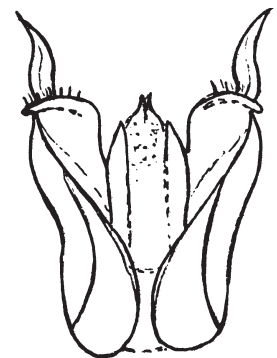
- 7' Apex of aedeagus bifid; aedeagal lateral lobes appressed to aedeagus (median lobe) and with membranous apical flange *D. cenchramis*



Alabama specimen

Wakulla Co. specimen

variations of aedeagus and lateral lobes



D. cenchramis
(adapted from Young 1981)

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*. *Desmopachria cenchramis* was formerly listed in the Federal Register (50 CFR Part 17) as a Category 2* organism. This category lists taxa that 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 indicated that the species may possibly be extinct. Note that this species is no longer listed (as of November 2009). Epler (1996) noted that he had 8 specimens of *D. cenchramis* in his collection from the northern Everglades (Broward County), where it was an uncommon organism on Hester-Dendy samplers. This species is more widespread and may be more common than previously thought. It is easily confused with *D. granum*; examination of male genitalia under a compound microscope is necessary for accurate identification. I now have in my collection additional material from St. Marks National Wildlife Refuge in Wakulla County and from Jackson County, Alabama; there is also material from Broward County in the FDEP/Tallahassee reference collection.

- D. granum* – Length 1.3-1.5 mm. Previously spelled as *D. grana*, but Nilsson (2007) explained that the correct spelling is *D. granum*. The most common species of the genus in Florida. It is superficially quite similar to the more northern *D. convexa*, from which it is separated by its smaller size and different genitalia (see *D. convexa* below), *D. aspera*, *D. cenchramis* (see above) and *D. leechi* (see below). On many of the specimens I've examined under a microscope, the aedeagus has collapsed and is not readily observable; this is also often the case with dried, point-mounted genitalia. Young (1954) handled *D. granum* as a complex, but later (Young 1981) called them the *convexa-grana* group and described several new species from that complex. Of those new species *D. aspera* and *D. cenchramis* occur in Florida. It is necessary to observe the genitalia under a compound microscope to discriminate the species.
- D. leechi* – Length 1.3-1.5 mm. Very similar to *D. granum*, but separable by the male genitalia that lack movable processes on the parameres and by the coarse setate punctation of the last visible abdominal sternite.
- D. mutchleri* – Length 2.0-2.3 mm. A very distinctive colorful species found in temporary or fluctuating water bodies, it does not appear to be common.
- D. seminola* – Length about 2.1 mm. This apparently rare species was 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 County (specimen examined).

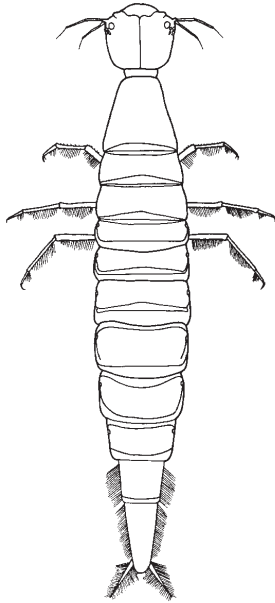
Other species

- D. convexa* (Aubé) - Length 1.5-1.9 mm. Externally very similar to *D. granum*, but larger and with different genitalia. The hind coxal plates of *D. convexa* are slightly more punctate than those of *D. granum*, with some *D. granum* hind coxal plates being almost smooth, while others are noticeably punctate, but more weakly than in *D. convexa*. The most widespread North American *Desmopachria* species, but it is not known from Florida. Ciegler (2003) recorded it from the Coastal Plain in South Carolina. A specimen from Choctaw County, Alabama, (approximately 100 km from the NW tip of Florida) is the closest I've seen. It is likely that this species will eventually be found in northern Florida.

GENUS *Dytiscus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal process; labium without projecting lobes near center; long and slender maxillary stipes; and the last 2 abdominal segments and urogomphi with well developed lateral fringe of setae.

Adults are distinguished by the very large size (> 22 mm); non-emarginate eyes; 5 segmented fore and mid tarsi; males with first 3 fore tarsomeres forming a round palette; subequal hind tibial spurs; hind tibia moderately slender; shorter spur at hind tibial apex about as broad as longer spur; and posterior margins of first 4 hind tarsomeres without a fringe of fine golden setae.



Dytiscus sp. larva
(adapted from James 1970)



D. carolinus
male mid tarsus adhesive setae



D. carolinus female

NOTES: Of the 12 Nearctic species of this genus, only one, *D. carolinus* (length 22-26 mm) has been found in Florida (to date, only in the Panhandle). Another species, *D. hybridus* Aubé (length 24-28 mm), has been recorded from South Carolina. Males of *D. carolinus* have an undivided patch of adhesive setae on the basal 3 tarsomeres of the middle tarsus; this patch is divided by a bare median area on *D. hybridus* males. Female *D. carolinus* are easily recognized by their sulcate elytra; the elytra of female *D. hybridus* are smooth.

To date, all Florida material has been collected at black light; adults are normally found in permanent ponds and lakes.

Florida species

D. carolinus Aubé

ADDITIONAL REFERENCES: Ciegler 2003; Epler 2009; Roughley 1990.

GENUS *Eretes*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal process; very short ligula, armed with 4 spines; broad maxillary stipes; equally sized stemmata; and the last 2 abdominal segments with well developed lateral fringe of setae.

Adults are distinguished by the medium size (~ 16 mm); non-emarginate eyes; pronotum with a lateral bead; 5 segmented fore and mid tarsi; males with first 3 fore tarsomeres forming a rounded palette; apically pointed prosternal process; subequal, pointed hind tibial spurs; posterior margins of mid and hind tarsomeres with a fringe of fine golden setae; posterolateral margin of elytra with a row of short spines; and elytra apically pointed.



E. explicitus male
Texas specimen



E. explicitus aedeagus, lateral view
Note the bent apex; the aedeagus
of *E. sticticus* is straight

NOTES: Two species of this genus occur in North America; one, *E. explicitus* (length 14.7-18.1 mm), is known from Florida. Young (1954) collected specimens he recorded as *E. sticticus* (Linnaeus), a mostly Tropical species, from Jackson County, 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.

Miller (2002) recently revised the genus for the world. He clarified the status of the name *Eretes sticticus* (*E. occidentalis* (Erichson), used by Larson et al. (2000) for North American specimens, is considered a junior synonym of *E. sticticus*) and described an additional North American species, *E. explicitus*, from central and southwestern North America. The two species are superficially similar, differing mainly in genitalia - the tip of the aedeagus is bent dorsally in *E. explicitus*, while that of *E. sticticus* is straight.

I have re-examined Young's material and dissected the genitalia from one of the males; the specimens are *E. explicitus*. Thus, *E. sticticus* does not occur in Florida. Miller (2002) noted *E. sticticus* from California, Arizona and Texas in the US, and Puerto Rico and the Virgin Islands southward to northern South America in the Western Hemisphere; it also occurs in the Eastern Hemisphere. To my knowledge, no *Eretes* have been collected in Florida since Young's specimens.

ADDITIONAL REFERENCES: Miller 2002b.

Florida species

E. explicitus Miller

GENUS *Graphoderus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal process; simple ligula that is subequal to or greater than the length of the first labial palpomere; broad maxillary stipes; and abdominal segments 7 and 8 with lateral fringe of long swimming setae.

Adults are distinguished by the moderate size (10-12 mm); non-emarginate eyes; pronotum without lateral bead; apically rounded prosternal process; 5 segmented fore and mid tarsi; males with first 3 fore tarsomeres forming a round palette; mid tarsi of male with row of small suction discs; 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 on hind tibia notched; and posterior margins of hind tarsal segments with fringe of golden setae.



G. liberus
larva and adult



NOTES: Of the 5 North American species of this mostly northern genus, only one, *G. liberus* (length 10-12 mm), is found in the Southeast US and Florida. These beetles are found in ponds and lakes, usually associated with forests and bogs. Note that in life, and on pinned material, this beetle is decidedly lighter in color than specimens preserved in alcohol.

Compared with the other Nearctic members of the genus, *G. liberus* is a bit of an oddball; among other characters, the adults lack dark markings on the pronotum and the larvae lack temporal spines. It has been suggested that *G. liberus* may deserve placement in its own subgenus, but more work on a world-wide level is needed.

Hilsenhoff (1993a) provided a key for the larvae of the Nearctic species.

ADDITIONAL REFERENCES: Hilsenhoff 1993a; Schulte-Hostedde & Alarie 2006; Tracy & Hilsenhoff 1982; Wallis 1939a.



G. liberus elytron
showing vermiculations

Florida species

G. liberus (Say)

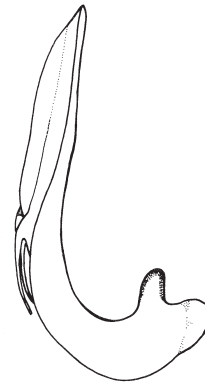
GENUS *Hydaticus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; long and slender maxillary stipes; labium with 2 projecting lobes near center; length of basal labial palpomere less than width of prementum of labium; and urogomphi without lateral setal fringe.

Adults are distinguished by the moderately large size (13-15 mm); general reddish-brown color; non-emarginate eyes; outer margin of metasternal “wing” straight; 5 segmented fore and mid tarsi; males with first 3 fore tarsomeres forming a round palette; male with large, broad setal brush near base of middle tarsomere 1; upper (anterior) surface of hind femur with irregular line of a few moderately large punctures; hind tibia with row of bifid spines on upper surface straight, parallel to outer tibial margin; and smaller spur at hind tibial apex sharply pointed.



H. cinctipennis
Walton Co., FL specimen



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

NOTES: With Miller et al.'s (2009) reclassification of the tribe Hydaticini, the number of *Hydaticus* species in Florida falls to one, *H. cinctipennis* (length 13-15 mm), with the other former *Hydaticus* species placed in *Prodaticus*.

More common farther north, *H. cinctipennis* is rare in Florida, with only two records, one each from Baker and Walton Counties. *Hydaticus* are found in ponds and lakes, where they inhabit vegetation in shallow margins.

ADDITIONAL REFERENCES: Barman et al. 2008; Miller et al. 2009; Roughley & Pengelly 1981.

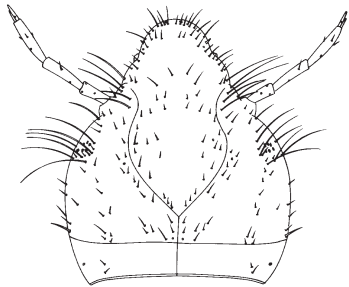
Florida species

H. cinctipennis Aubé

GENUS *Hydrocolus*

DIAGNOSIS: Larvae are distinguished by the frontal projection; stemmata (simple eyes) absent or group at most subequal to width of 1st antennal segment; antennomere 2 with one dorsomedian seta; legs without swimming setae; abdominal sternites 2-6 membranous; and urogomphi longer than last abdominal segment (diagnosis based solely on larva of *H. paugus* (Fall), which probably does not occur in Florida).

Adults are distinguished by the small size (< 5 mm); somewhat flattened body; male fore tibiae with basal notch; pseudotetramerous fore and mid tarsi; lack of an epipleural carina; hind coxal process produced laterally into lobes that cover the bases of the hind trochanters; base of hind femur separated from hind coxal lobe by trochanter; and the posterior margin of hind coxal lobes sinuate, with marginal line running from center to outermost portion of lateral lobe curving in more anteriorly than posterior margin of lateral lobe.



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



H. oblitus

NOTES: *Hydrocolus* was established by Larson et al. (2000) for members of Fall's (1923) *Hydroporus oblitus* group, to which this taxon was referred to in Epler (1996). Species identification of this genus is very difficult because of general similarity of the species, and characters show a high degree of variation. Males, which have a basal emargination on the fore tibiae, should be used for identification. As noted by Larson et al. (2000), in some species, notably *H. oblitus*, females may be dimorphic in microreticulation and punctation; some may resemble the male in having sparse elytral punctation, while others may have dense punctation.

Although usually associated with mosses, seeps and the margins of small pools, ponds and springs, I have collected several different taxa in such odd places as a bird bath, a hot tub and in water held by a wheelbarrow.

Larvae of this genus, described by Alarie (1991), are known only for *H. paugus*, in which the first and second instars lack an ocularium (group of simple eyes); the ocularium of the third instar larva is reduced.

ADDITIONAL REFERENCES: Alarie 1991; Ciegler 2003; Fall 1923; Larson et al. 2000.

Florida species

H. deflatus (Fall)
H. filioli (Fall)
H. oblitus (Aubé)
H. sp. A

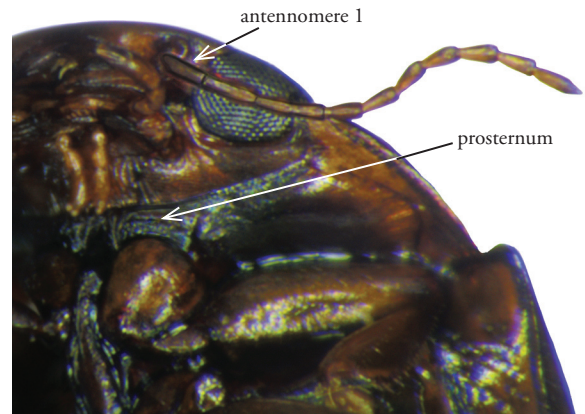
Key to adult *Hydrocolus* of Florida

1 Larger, 3.8-4.7 mm; elytra with sparse punctation, punctae separated by about 3-5 times their diameter; aedeagus asymmetrical with complex flanged apex *H. deflatus*

1' Smaller, length 4.0 mm or less; elytral punctation sparse or dense; aedeagus with simple pointed apex 2



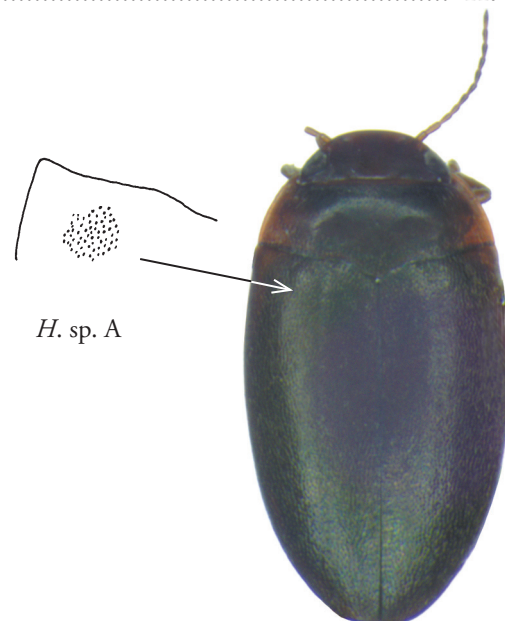
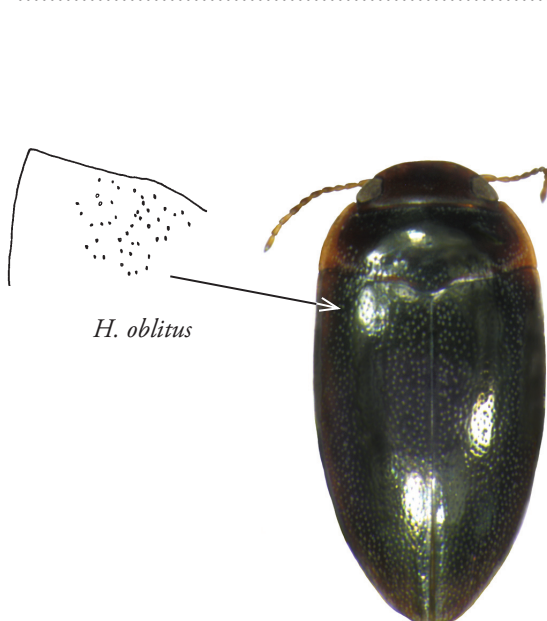
2(1') Prosternum shorter, length anterior to fore coxa subequal to greatest width of antennomere 1
..... *H. filiulus*



2' Prosternum longer, length anterior to fore coxa about twice greatest width of antennomere 1 ... 3

H. oblitus

3(2') Length 2.8-3.4 mm; elytra with sparse punctation, punctae separated by about 3-5 times their diameter *H. oblitus*



3' Length about 4.0 mm; elytra with denser punctation, punctae separated by about 2-3 times their diameter *H. sp. A*

Notes on species

- H. deflatus* - Length 4.2-4.7 mm. The largest *Hydrocolus* in Florida. This species was included in Young (1954) as "*H. (s. str.) ruficeps* (Aubé)?" based on a single female specimen from Jacksonville recorded by Fall (1923). However, Young (personal communication, viii-1993) related to me that this record referred to *H. deflatus*; note that the "real" *H. ruficeps*, now known as *H. pseudoniger* Nilsson & Fery, also occurs in Florida (see *Hydroporus*). I collected a single male *H. deflatus* in Wakulla County when it flew into a hot tub that I occupied, apparently only the second specimen known from Florida.
- H. filiulus* - Length 2.9-3.1 mm. In Florida, known from one specimen from Glen Julia Spring in Gadsden County. Larson et al. (2000) examined this specimen and tentatively assigned it to *H. filiulus*, noting that it was far south of its normal range. The specimen from Gadsden County reported by Epler (1996) as a putative *H. filiulus* is an *H. oblitus*.
- H. oblitus* - Length 2.8-3.4 mm. Epler (1996) referred two taxa to an *H. oblitus* complex, but one of these, called *H. sp. A* in this manual, does not appear to be an *H. oblitus*; see *H. sp. A* below. *Hydrocolus oblitus* is the most common member of the genus in Florida. Although Larson et al. (2000) stated that females of *H. oblitus* may be dimorphic in elytral punctation, all females I've examined from Florida have had sparse, widely separated elytral punctae, similar to that of the male. I have collected *H. oblitus* from a sand-bottomed forest stream (Sugar Creek in Hamilton County, near the Suwannee River) and from rainwater held in a wheel barrow in a mesic hardwood riparian woodland in Wakulla County.
- H. sp. A* - Length 4.0 mm. This taxon was referred to as *Hydroporus oblitus* complex sp. A in Epler (1996). As noted by Larson et al. (2000), in some species, notably *H. oblitus*, females may be dimorphic in microreticulation and punctation; some may resemble the male in having sparse elytral punctation, while others may have dense punctation. This taxon is known only from a single female I collected in a bird bath in Wakulla County; it is apparently too large for *H. oblitus* and may represent the female of another described eastern US *Hydrocolus* species, such as *H. oblitoides* Larson & Roughley or *H. paugus* (Fall); it does not appear to be a female *H. deflatus*.

GENUS *Hydrodytes*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the emarginate eyes; weakly margined pronotum; visible scutellum; elytra without well defined striae; 5 segmented fore and mid tarsi; hind coxal plates and abdominal sternites without fine striae; hind coxal lines divergent anteriorly and almost touching median line anterior to hind coxal processes; inner side of hind femur apex without setae; and equal hind tarsal claws.



H. dodgei

NOTES: One species, *H. dodgei* (length 2.3-2.8 mm), is known from Florida. Originally described in the genus *Agaporomorphus*, the species was moved to a new genus, *Hydrodytes*, established by Miller (2001c). Miller (2001a) also revised *Agaporomorphus* (a South American taxon which does not occur in Florida or the Nearctic); Miller (2002a) provided more information on *Hydrodytes*.

Only females are known for *H. dodgei*, which indicates the species may be parthenogenetic; this was discussed by Young (1989b) and Miller (2001a, 2002a). Although Miller (2002a) stated that *H. dodgei* was “known only from southern Florida”, he gave a record for Columbia County, Young (1989b) gave records for Baker and Madison Counties, and I have a specimen from the Withlacoochee River in Hamilton County; these records indicate that the species will no doubt eventually be found in southern Georgia and perhaps even the Carolinas. All the specimens examined by Young (1989b) and Miller (2002a) were collected at blacklight, but I have examined material collected by dipnet from the Withlacoochee River and Lake Okeechobee.

Hydrodytes resembles a diminutive *Copelatus*, but is distinguished by its smaller size and lack of elytral and sternal striae.

ADDITIONAL REFERENCES: Miller 2001a, 2001c, 2002a; Young 1989b.

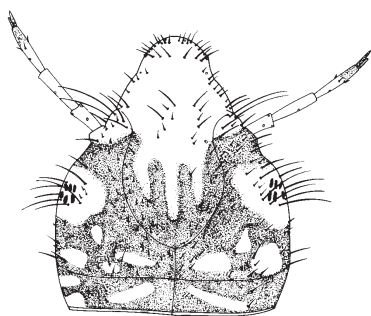
Florida species

H. dodgei (Young)

GENUS *Hydroporus*

DIAGNOSIS: Mature larvae are distinguished by the frontal projection; well developed stemmata; legs without swimming setae; abdominal sternites 2-6 membranous; spiracles present (last instar only); urogomphi longer than last abdominal segment; and basal portion of urogomphus without secondary setae, with bases of setae UR2 and UR3 contiguous, UR4 more distal.

Adults are distinguished by the small size (< 6 mm); rounded anterior margin of clypeus; usually brown to black dorsum, usually without fasciate/vittate markings (pale markings may be present in one species); usually black venter; pseudotetramerous fore and mid tarsi; lack of an epipleural carina; hind coxal process produced laterally into lobes that cover the bases of the hind trochanters; base of hind femur separated from hind coxal lobe by trochanter; and posterior margin of hind coxal process essentially straight, the middle portion not extending more posteriorly than the lateral lobes.



H. niger larval head
(adapted from Alarie 1991)



H. falli



H. pseudoniger

NOTES: *Hydroporus* is a large genus, with about 160 species world-wide and about 55 in North America, of which 5 or 6 are known from Florida. The genus was formerly much larger, but the elevation of many of Fall's (1923) subgenera and species groups to generic status has reduced its size. In North America, what used to be *Hydroporus* is now *Heterosternuta* ("pulcher group"); *Hydrocolus* ("oblitus group"); *Hydroporus* ("niger-tenebrosus group"), *Lioporeus* ("pilatei-triangularis group"), *Nebrioporus*, *Neoporus* ("undulatus group"), *Oreodytes*, *Sanfilippodytes* ("vilus group") and *Stictotarsus*. With the exception of *Lioporeus*, *Neoporus* and a few *Hydrocolus*, most of these genera and species are more northern and western. Species identification of many of these taxa is extremely difficult, usually requiring males and correctly identified comparative material.

Hydroporus are found in streams, woodland pools, ditches and ponds, often associated with moss; the genus is not commonly encountered in Florida.

Hydroporus floridanus Young, placed by Nilsson (2001) in *Neoporus*, group *undulatus*, probably belongs here, but a lack of material precludes accurate placement. It might key to couplet 2, but fits neither species; see Notes on species.

ADDITIONAL REFERENCES: Alarie 1991; Ciegler 2003; Fall 1923; Gordon 1969, 1981; Hilsenhoff 1992, 1995a.

Florida species

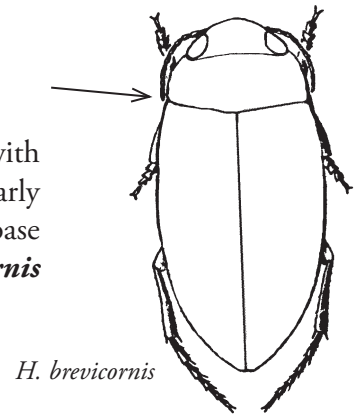
H. brevicornis Fall
H. falli Blatchley
H. floridanus Young
H. pseudoniger Nilsson & Fery
H. rufilabris Sharp
H. signatus youngi Gordon

Key to adult *Hydroporus* of Florida

- 1 General color reddish to brown, head and pronotum rufous, usually lighter than elytra 2
- 1' General color black, head reddish or black, pronotum as dark or darker than head 3

- 2(1) Antennae short, barely reaching hind angles of pronotum, with antennomeres 4-10 about as long as wide; male protarsal claws nearly equal; male fore tibiae sinuate on inner margin and constricted at base *H. brevicornis*

H. floridanus may key here, but has normal antennae and equal male fore tarsal claws; see Notes on species



H. brevicornis

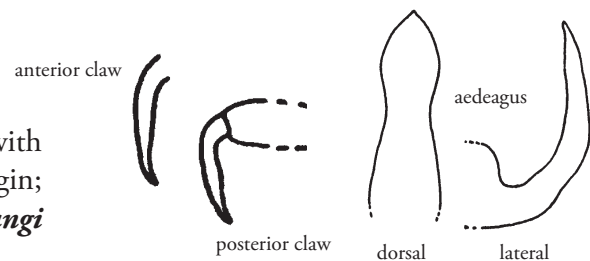
(adapted from Gordon 1969)

- 2' Antennae normal, with antennomeres 4-10 longer than wide; male protarsal claws distinctly unequal; male fore tibiae not sinuate **H. dichrous*
(not known from Florida, see Notes on species)

- 3(1') Male protarsal claws nearly equal in length 4

- 3' Male protarsal claws distinctly unequal 6

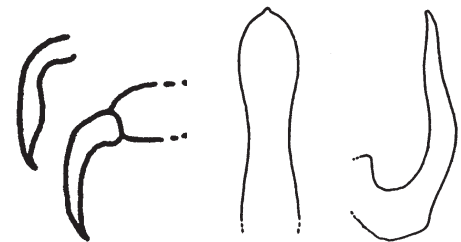
- 4(3) Male protarsal claws thin, slightly sinuate; elytra with weak spots subapically and near posterior margin; aedeagus as figured *H. signatus youngi*



(adapted from Gordon (1969))

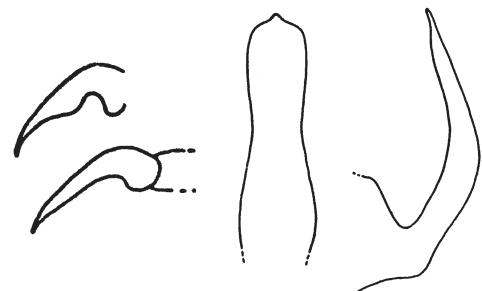
- 4' Male protarsal claws noticeably expanded (figs. below); elytra immaculate 5

- 5(4') Smaller, 4.0-4.7 mm; male protarsal claws wider medially; aedeagus as figured; females shining
..... *H. rufilabris*



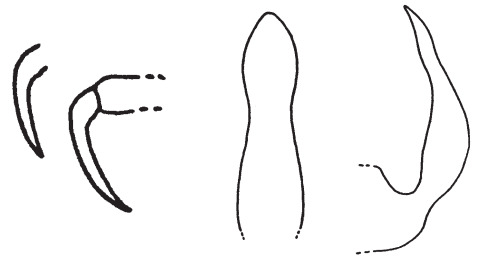
(adapted from Gordon (1969))

- 5' Larger, 4.80-5.5 mm; male protarsal claw wider near base; aedeagus as figured; females dull
..... *H. pseudoniger*

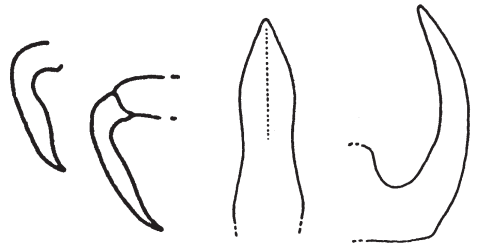


(adapted from Gordon (1969))

- 6(3') Elytra with large, coarse punctures; male protarsal claws straight; aedeagus inflated near middle
 *H. falli*



- 6' Elytra with fine, dense punctures; male protarsal claws sinuate; aedeagus not inflated medially
 **H. niger*
 (not known from Florida; see Notes on species)



(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 fore tibiae are unique among the members of this genus.
- H. falli* – Length 4.2-4.6 mm. This species is easily confused with *H. niger* which apparently may not occur in 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. floridanus* (Young) – Length about 3.8 mm. Known only from Kingsley Lake in Clay County. Nilsson (2001) placed this species in *Neoporus*, under the *undulatus* group. However, Young's (1954) key indicates that the specimen belongs with *Hydroporus* due to its metacoxal process. A Tennessee specimen in the FSCA labeled and determined by Young as *H. floridanus* is not a *Neoporus*, but is a species of *Hydroporus*; it appears to be a member of the *H. obscurus* group, perhaps *H. americanus* Aubé. Thus, if this specimen is truly conspecific with *H. floridanus*, it would key to couplet 2 in my *Hydroporus* key above but will fit neither species there (it has longer antennae and equal male fore tarsal claws). Young's (1954:78-79) diagnostic couplet in his *Hydroporus* key stated: "Elytra almost uniformly dark brown, but covered with a dense pubescence which gives the dorsum a silvery appearance and 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; metasternum distinctly sulcate at summit; abdominal segments and elytra acuminate; male protarsal claws slender and nearly equal; length about 3.8 mm". Young (1954: 83) also stated "the peculiar pubescence suggest that it may possibly be a deepwater species which has been missed by our collecting methods in other lakes." I have seen no Florida material of this species; examination of type material is necessary. I am removing this taxon from *Neoporus* and returning it to *Hydroporus*. This species was not included in either *Hydroporus* or *Neoporus* in Larson et al. (2000).
- H. pseudoniger* – Length 4.8-5.5 mm. Formerly called *H. ruficeps* Aubé but Nilsson & Fery (2006: 162) noted that *H. ruficeps* was preoccupied and introduced *H. pseudoniger* as a replacement name. This species was recorded by Young (1954) based on a record from Jacksonville in Fall (1923). Dr. Young (pers. comm., viii-1993) informed me that this record is applicable to *H. deflatus*, now known as *Hydrocolus deflatus*. However, Gordon (1969) recorded *H. pseudoniger* (as *H. ruficeps*) from Atlantic Beach and

two localities in Gadsden County, and I've collected it from a roadside pool in Wakulla County. 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 County. Females of this species are shining, unlike the dull females of *H. falli*, *H. niger*, *H. pseudoniger* and *H. signatus*.

H. signatus youngi – Length 3.8-4.2 mm. Gordon (1981) described the form of *H. signatus* Mannerheim that occurs in the Southeast US and Florida (one record from Liberty County) as a new subspecies. The Florida subspecies has either a plain rufous head or more typically has two dark triangular spots between the eyes.

Other species

H. dichrous Melsheimer – Length 3.4-4.3 mm. Young (1954) gave a single doubtful record for Columbia County 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. niger Say – Length 4.4-5.0 mm. This species is easily confused with *H. falli*; *H. niger* apparently does not occur in Florida. Young (1954) recorded it from Bay County; Peck and Thomas (1996) also list it from Gadsden County, but Gordon (1969) did not record this species from Florida. Larson et al. (2000) noted Young's record, but stated that "it likely belongs to another species of the group". I have not seen any Florida material of this species; the closest record to Florida for this species appears to be from the Piedmont in South Carolina (Ciegler 2003).

GENUS *Hydrovatus*

DIAGNOSIS: Larvae are distinguished by the frontal projection; subquadrate prementum; proximal labial palpomere not elongate; distal palpomere with preapical setae; legs without swimming setae; abdominal sternites 2-8 sclerotized; and urogomphus does not extend to apex of siphon (although may extend past in 2nd instar?).

Adults are distinguished by the small size (<4 mm); subglobose shape; pseudotetramerous fore and mid tarsi; epipleuron with diagonal carina near base; prosternal process with broadly rounded apex; hidden scutellum; hind coxal process deeply incised apically, produced laterally into lobes that cover the bases of the hind trochanters; and apically pointed elytra.



Hydrovatus sp. larva



H. pustulatus

NOTES: A speciose genus with over 200 species world wide, *Hydrovatus* is represented in Florida by four species; the most common species in the state is *H. pustulatus*. These beetles are commonly found in vegetation and detritus at lake and pond margins. In most cases, males are necessary for accurate identification.

The larval diagnosis in Larson et al. (2000: 879) stated that the urogomphus is “slightly but distinctly longer than abdomen segment 8”. However, this is apparently a lapsus, as the opposite is true – in third instar larvae the urogomphus is distinctly shorter than segment 8; their key and figure 225B correctly indicate this. I’ve examined unassociated larvae that appear to be second instar *Hydrovatus* in which the urogomphi do extend past the apex of the siphon. The diagnosis in Larson et al. (2000) also stated that abdominal segments 2-6 were membranous; in actuality they are sclerotized.

ADDITIONAL REFERENCES: Biström 1997; Michat 2006a; Spangler 1962b; Spangler & Vega 1982; Young 1953d, 1956, 1963b.

Florida species

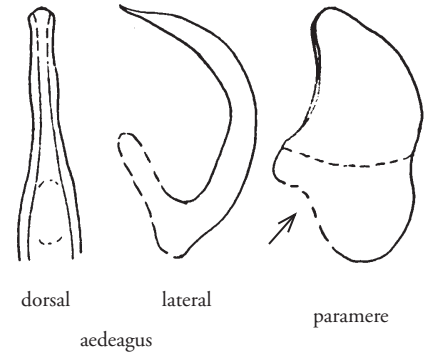
H. in expectatus Young
H. peninsularis Young
H. platycornis Young
H. pustulatus Melsheimer

Key to adult *Hydrovatus* of Florida

(genitalia figures adapted from Young 1963b)

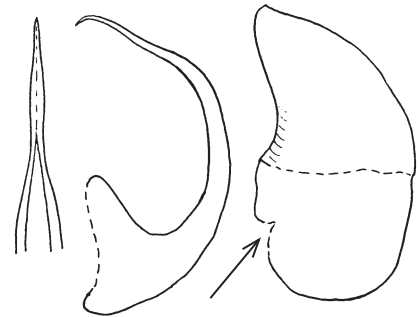
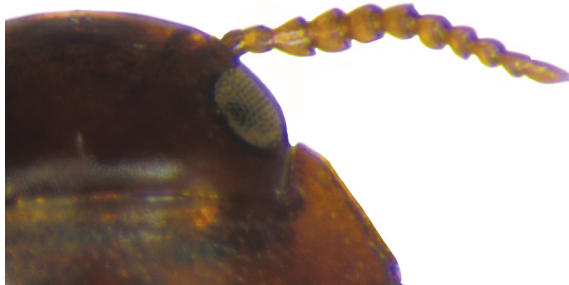
- 1 Size larger, total length 2.9-3.0+ mm *H. peninsularis*
- 1' Size smaller, total length 2.8 mm or less 2

- 2(1') Smaller, total length 1.9-2.2 mm; aedeagus stouter, with blunter apex, in dorsal aspect swollen preapically; right paramere with shallow basolateral excavation *H. inexpectatus*

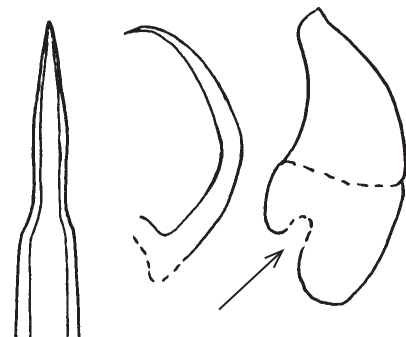


- 2' Larger, total length 2.2-3.0 mm; aedeagus slimmer, with fine apex, not preapically swollen in dorsal aspect; right paramere with small notch or U-shaped basal excavation (figs. below) 3

- 3(2') Male antennae with antennomeres 3-10 apically expanded; right paramere with small basolateral notch *H. platycornis*



- 3' Male antennae not modified, antennomeres only slightly expanded apically; right paramere with deep U-shaped notch *H. pustulatus*



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, the male's bluntly tipped aedeagus and shallowly notched right paramere are diagnostic for this species, which is recorded from Miami-Dade to Alachua Counties. The elytra usually bear weak sub-basal and postmedial 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. See *H. hornii* below.
- H. platycornis* – Length 2.4-2.5 mm. The distinctive male antennae characterize this immaculate species recorded from Gainesville north to southern Georgia.
- H. pustulatus* – Length 2.2-2.5 mm for Florida specimens; the most common species in the genus throughout Florida. The range of size for Florida specimens is lower than that realized when the entire range of the species is taken into account. More northern specimens (some previously referred to as *H. indianensis* Blatchley) may reach a length of 3.0 mm. Previously, two subspecies were recognized from the eastern U.S.; *H. pustulatus compressus* supposedly replaced 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. p. pustulatus*. It may be difficult to observe any markings on specimens that have been preserved in alcohol for an extended period. Biström (1997) noted that intermediates between the two taxa were common and did not recognize the subspecies, a position adopted in this manual.

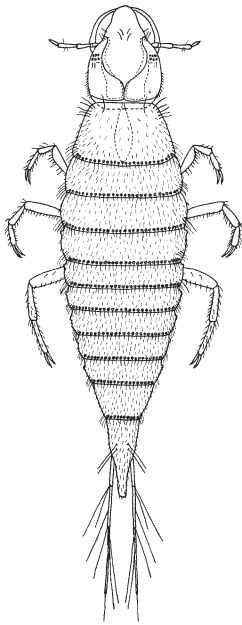
Other species

- H. hornii* Crotch - Length 3.0-3.8 mm. This large (for North American *Hydrovatus*) species is known from Texas, Mexico/Central America and Cuba; there is a slight possibility that it could be found in extreme southern Florida. It resembles a giant *H. pustulatus*, but has a longitudinal groove above the lateral margin of each elytron. See Spangler & Vega (1982).

GENUS *Hygrotus*

DIAGNOSIS: Larvae are distinguished by the frontal projection; antennomere 3 lacking a laterobasal pore and ventral spinule; well developed stemmata; legs with or without swimming setae (probably with in Florida taxa); mature larva with abdominal spiracles; abdominal sterna 2-6 membranous; and urogomphi with or without secondary setae (probably without in Florida taxa) and subequal to or longer than last abdominal segment.

Adults are distinguished by the small size (< 5 mm); pseudotetramerous fore and mid tarsi; hidden scutellum; apically pointed prosternal process; epipleuron with a diagonal carina near base; and hind coxal process that covers the bases of the hind trochanters.



H. sayi larva



epipleural carina

H. nubilus



H. nubilus

NOTES: A large genus with about 70 species world wide, about 38 in North America, but only three known from Florida; these three species appear to be uncommon in the state.

Hygrotus adults and larvae are recorded from algal mats, and adults are known to occur in canals, ditches, peat bogs, temporary freshwater ponds and shallow brackish ponds.

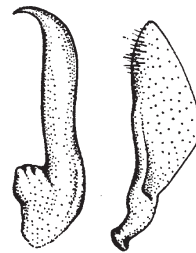
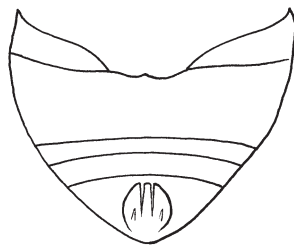
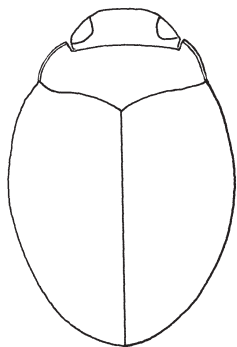
ADDITIONAL REFERENCES: Alarie, Harper & Roughley 1990; Anderson 1971, 1976, 1983; Spangler & Gillespie 1973; Young & Wolfe 1984.

Florida species

*H. berner*i Young & Wolfe
H. marginipennis (Blatchley)
H. nubilus (LeConte)

Key to adult *Hygrotus* of Florida

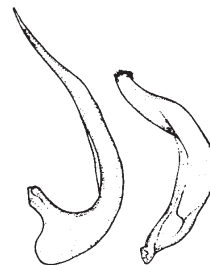
- 1 Body form ovate; male with large oval excavation that bears two posteriorly directed spines on penultimate abdominal sternite; aedeagus stouter *H. marginipennis*



(adapted from Anderson 1971)

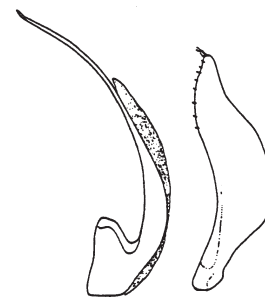
- 1' Body form more elongate-oval (see below); male without excavation on penultimate abdominal sternite; aedeagus thinner 2

- 2(1') Dorsum yellowish with reddish-brown vittate pattern; venter black (except for prosternum and mid coxae); aedeagus stouter *H. nubilus*



(adapted from Anderson 1983)

- 2' Dorsum reddish-brown, immaculate; venter brownish-yellow, rarely blackish; aedeagus thinner *H. berneri*



(adapted from Young & Wolfe 1984)

Notes on species

H. berneri - Length 2.1-2.3 mm; general coloration reddish-brown. Known only from a few Florida counties (Dixie, Leon and Liberty), but will probably be found in southern Georgia.

H. marginipennis - Length 2.5-2.7 mm. Found throughout the peninsula at least as far north as Duval County, it will probably eventually be found in Georgia. This species is very similar to the more northern *H. acaroides* (LeConte) and *H. farctus* (LeConte), but is larger and has a stouter aedeagus; see Anderson (1971).

H. nubilus - Length 3.8-4.7 mm. A widespread species, but in Florida known from only a few specimens from the northern part of the state (Jackson and Okaloosa Counties).

GENUS *Ilybius*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; simple last antennal segment; broad maxillary stipes; tibiae and tarsi without swimming setae; abdominal sternites 1-6 membranous, 7-8 sclerotized; spiracle of 6th abdominal segment near well defined ventrolateral margin of dorsal sclerotized plate, segment with extensive ventral membranous area; abdominal segments 7-8 without a dense lateral setal fringe; and urogomphus with 2 whorls of primary setae, no secondary setae.

Adults are distinguished by the moderate size (< 12 mm); emarginate eyes; visible scutellum; elytra without preapical submarginal stripe; 5 segmented fore and mid tarsi; inner hind tibial spur longer than basal tarsal segment; hind femur with a linear group of short, stout setae on posterior apical angle; hind tarsal claws unequal or if subequal, then about 1/2 length of last tarsomere; and posterior margin of female last abdominal sternite notched.

NOTES: Of the 14 North American species, one (*I. incarinatus*), or possibly two (*I. oblitus*), occur in Florida, with the strong possibility of a third (*I. biguttulus*) also occurring here (see Notes on species).

Ilybius is very similar to *Agabus*; the difference between the equal hind tarsal claws of *Agabus* and the unequal hind tarsal claws of *Ilybius* is not always apparent, for some *Ilybius* possess hind tarsal claws that are almost equal - but usually about 1/2 the length of the last tarsomere; in *Agabus* the hind tarsal claws may appear not equal, but in such cases they are not more than 1/4 the length of the last hind tarsomere.

Ilybius are primarily lentic, found in bog pools, marshes, ponds and lakes. Michael & Matta (1977) noted that *I. oblitus* seemed to prefer ponds or pools without detritus of leaf litter, but Barman et al. (2001) collected *I. oblitus* larvae from detritus laden water in a *Typha* marsh.

Barman et al. (2001) provided additional characters for separating the larvae of *Ilybius* from those of *Agabus* and *Platambus* in the Southeast US.

ADDITIONAL REFERENCES: Barman et al. 2001; Ciegler 2003; Hilsenhoff 1993c; Larson 1987; Michael & Matta 1977; Wallis 1939b.



I. incarinatus

Florida species

I. incarinatus Zimmermann
I. oblitus Sharp

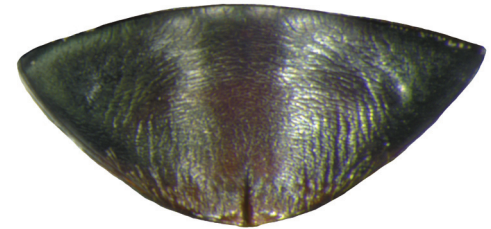
Key to adult *Ilybius* of Florida

- 1 Posterior margin of abdominal sternum 6 rounded (as in couplet 2 below); fore and mid tarsomeres 1-3 with long yellow adhesive setae males 2

- 1' Posterior margin of abdominal sternum 6 medially notched; fore and mid tarsomeres 1-3 without long yellow adhesive setae females 4

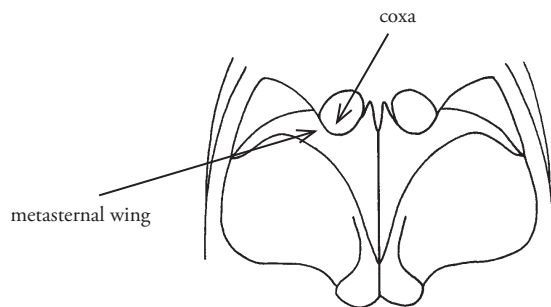


- 2(1) Abdominal sternum 6 with posteromedial longitudinal keel **I. biguttulus*
(not known from Florida; see Notes on species)

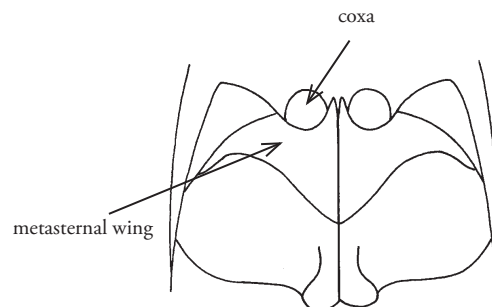


- 2' Abdominal sternum 6 without median longitudinal keel 3

- 3(2') Metasternal wing adjacent to mid coxa narrow, narrower to about as wide as base of coxa *I. oblitus*



narrow metasternal wing



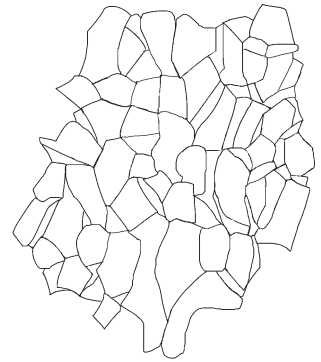
wide metasternal wing

- 3' Metasternal wing adjacent to mid coxa wide, about twice as wide as base of coxa *I. incarinatus*

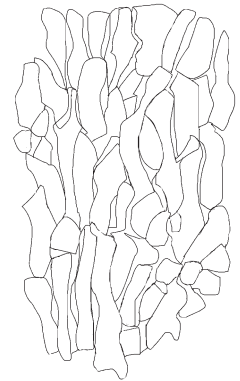
- 4(1') Metasternal wing adjacent to mid coxa narrow, about as wide as base of coxa (see couplet 3 above)
..... *I. oblitus*

- 4' Metasternal wing adjacent to mid coxa wide, about twice as wide as base of coxa (see couplet 3 above)
..... 5

- 5(4') Reticulate mesh sculpture near sutural (inner) base of elytron with few or no polygons more than 3 times as long as wide * *I. biguttulus*
(not known from Florida; see Notes on species)



- 5' Reticulate mesh sculpture near sutural base of elytron with many polygons more than 3 times as long as wide *I. incarinatus*



Notes on species

- I. incarinatus* - Length 8.7-9.9 mm. I found a single male specimen from Wakulla County in the FAMU collection; this represents a new state record, and the southernmost, for this species.
- I. oblitus* - Length 8.9-10.7 mm. Young (1954) gave a record for a single female specimen of this species, determined by Leech, from Alachua County, but doubted it was from Florida. Peck & Thomas (1998) repeated this record and added one from Gadsden County. I have not seen any material of this species from Florida; it is recorded from the Piedmont and Coastal Plain of South Carolina by Ciegler (2003).

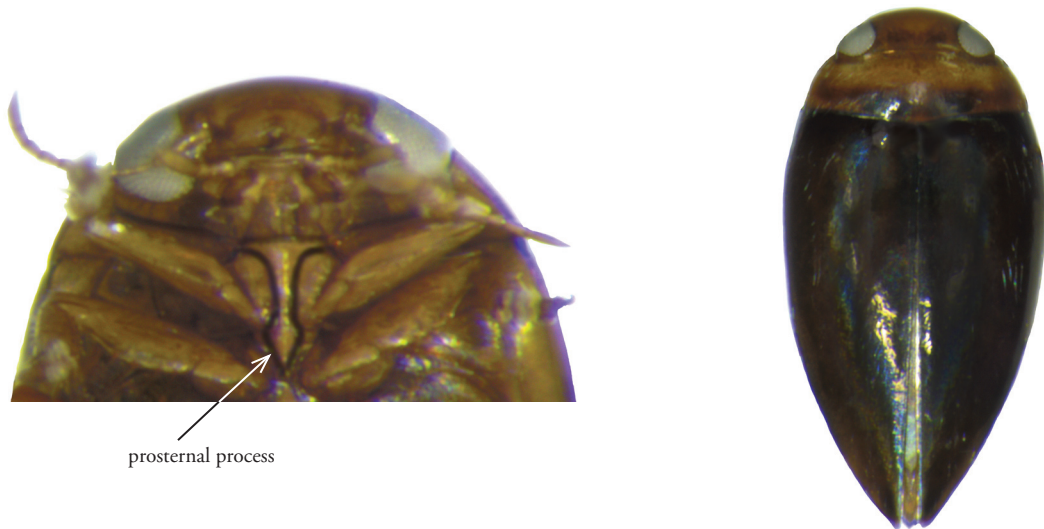
Other species

- I. biguttulus* (Germar) - Length 8.8-10.5 mm. Not known from Florida, but occurs in Georgia at least as far south as the Macon area (Barman et al. 2001). A common species throughout the eastern US. that may eventually be found in the northern tier of Florida counties.

GENUS *Laccodytes*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the very small size (< 2.2 mm); hidden scutellum; prosternal process with apical third dilated behind fore coxae and somewhat diamond shaped; 5 segmented fore and mid tarsi; simple, acute spines on hind tibiae; hind tarsus with a single straight claw; and mostly smooth abdominal sternites.



NOTES: Young (1954) placed *Laccophilus pumilio* LeConte in the genus *Laccodytes*. However, Toledo et al. (2010) noted that *Laccodytes* is exclusively tropical South American and that *pumilio* does not belong in *Laccodytes*, but represents an undescribed genus. This new genus will be described in a future publication; until this is done I am continuing to use the name *Laccodytes pumilio* for this taxon.

A single species, *L. pumilio* (length 1.9-2.1 mm), is known from Florida. It has been recorded from as far north as the Gainesville area (San Felasco Hammock); it is also known from Cuba.

Young (1954) found this species in the heavily shaded edges of a large permanent woods pond; it has also been collected from a canal.

ADDITIONAL REFERENCES: Toledo et al. 2010.

Florida species

L. pumilio (LeConte)

GENUS *Laccophilus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; broad maxillary stipes; inner margin of mandible without strong serrations; last antennal segment double; legs with swimming setae (2nd and 3rd instar); abdominal segments 7 and 8 without lateral fringe of swimming setae; and urogomphus much longer than last abdominal segment.

Adults are distinguished by the small size (2.5-6.0 mm); hidden scutellum; lanceolate prosternal process; 5 segmented fore and mid tarsi; apically bifid or notched spines on hind tibiae; hind tarsus with single straight claw; and basal abdominal sternite with longitudinal striae.



L. proximus



L. gentilis



Laccophilus sp.

NOTES: Of the 14 species recorded from North America north of Mexico, four are known from Florida, with at least one other species (*L. maculosus*) a possibility. Although Hilsenhoff (1992) produced a key for *Laccophilus* larvae, his key covers only Wisconsin species; only one Florida species was included in that key. Alarie et al. (2000) offered a key to known *Laccophilus* larvae of the world, but also included only one Florida species. Thus, without associating the larva with an adult, it is not possible to identify Florida *Laccophilus* larvae to species.

Laccophilus are common beetles, often found in temporary or newly formed water bodies; they also occur in small streams. All but one of our species have yellowish to light reddish-orange elytra that are spotted or freckled with very small dark spots; Zimmerman (1970: 25) called this "irroration" or "color applied as grains of sand".

ADDITIONAL REFERENCES: Alarie et al. 2000; Ciegler 2003; Hilsenhoff 1992; Michat 2008; Sizer et al. 1998; Young 1953a; Zimmerman 1959, 1960, 1970.

Florida species

L. fasciatus rufus Melsheimer
L. gentilis LeConte
L. proximus Say
L. vacaensis Young

Key to adult *Laccophilus* of Florida

- 1 Elytra without irrorations (tiny black spots on a yellow or reddish background) *L. gentilis*

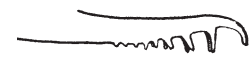
*L. gentilis*

- 1' Elytra with irrorations 2

irrorations →

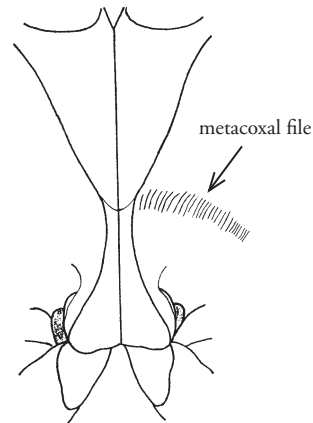


- 2(1') Males without a metacoxal file (series of striations before hind legs); females with a rake-like ovipositor *L. vacaensis*

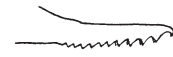


rake-like ovipositor

- 2' Males with a metacoxal file; females with a saw-like ovipositor 3



metacoxal file



saw-like ovipositor

(adapted from Zimmerman 1970)

- 3(2') Elytra with an irregular but definite black band across posterior half *L. fasciatus rufus*

- 3' Elytra without a definite black posterior band 4



- 4(3') Elytra with poorly defined lateral blotches, or none; size smaller, 3.8-4.4 mm *L. proximus*

*L. proximus**L. maculosus*

- 4' 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 in northern portion of state)

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 Florida, it is apparently restricted to the northern part of the state; the southernmost record is from Alachua County. See *L. proximus* below.

L. 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. There are two subspecies; ours is *L. g. gentilis*.

L. proximus – Length 3.8-4.4 mm. This is the most common species of the genus in Florida. 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*. The aedaeagus of *L. proximus* has a pointed apex (as does *L. fasciatus*), but that of *L. maculosus* is more blunt. Specimens held long term in alcohol will become dark and the posterior elytral macula is difficult to discern; pulling an elytron loose and examining it separately may be necessary.

L. vacaensis – Length 4.0-5.3 mm (specimens recorded from FL are 4.2-4.6 mm). In Florida, this species has only been recorded from the type locality on Vaca Key, Monroe County. However, the species is also recorded from Louisiana, Texas and Arizona, as well as Mexico and several localities in the Caribbean and Central America. Thus, the possibility exists that this species is found throughout Florida, 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 ½ to 3 times the length of the fourth; in other species of *Laccophilus* the fifth does not exceed twice the length of the fourth. There are three subspecies; ours is *L. v. vacaensis*.

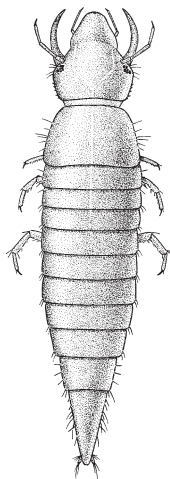
Other species

L. maculosus Say – Length 5.0-5.8 mm. This species has not been recorded from Florida, but records from Alabama, Georgia, and South Carolina indicate that it may eventually be found in the northern part of the state. The aedaeagus has a blunt apex. There are three subspecies; the southeastern US representative is *L. m. maculosus*.

GENUS *Laccornis*

DIAGNOSIS: Larvae are distinguished by the broad and bluntly rounded frontal projection; well developed stemmata; antennomere 2 without setae; legs without swimming setae; abdominal sternites 2-6 membranous; last instar with abdominal spiracles; and urogomphi at most about 1/2 as long as last abdominal segment, with basal segment without secondary setae.

Adults are distinguished by the small size (< 8 mm); pseudotetramerous fore and mid tarsi; epipleuron without a diagonal carina; hidden scutellum; hind coxal process produced laterally, covering base of trochanter; and base of hind femur contacting hind coxal lobe.



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



L. difformis male

NOTES: A small genus with 10 species worldwide; most of these occur to the north of Florida, but at least one species occurs in the state.

Folkerts & Donovan (1974) reported *L. deltoides* from Calhoun Co., FL, based on a USNM specimen. In their revision of *Laccornis*, Wolfe & Roughley (1990) did not examine this Florida specimen (it was not located in 2009, *fide* W. Steiner), but considered other material from Alabama (Bullock County, southeast of Montgomery) identified as *L. deltoides* by Folkerts & Donovan (1974) to be a new species, *L. nemorosus*. I have examined single female *Laccornis* specimens from Eglin Air Force Base (Walton County) and Lost Creek (Wakulla County) that are probably *L. difformis*, mainly due to their smaller size (*L. nemorosus* is larger). It is not possible to identify southeastern *Laccornis* females; the key in Wolfe & Roughley (1990) resorted to using distribution areas to “identify” female *Laccornis*.

Spangler & Gordon (1973) described the larva of “*L. difformis*”; Wolfe & Spangler (1985) assigned that material to *L. etnieri*.

Laccornis are inhabitants of woodland pools and ponds.

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

Florida species

L. probably difformis (LeConte)

Key to adult male *Laccornis* of the Southeast United States

(figures adapted from Wolfe & Roughley 1990)

- 1 Length 6.8 mm or greater; protarsal claw and genitalia as figured * *L. nemorosus*
(not known from Florida)

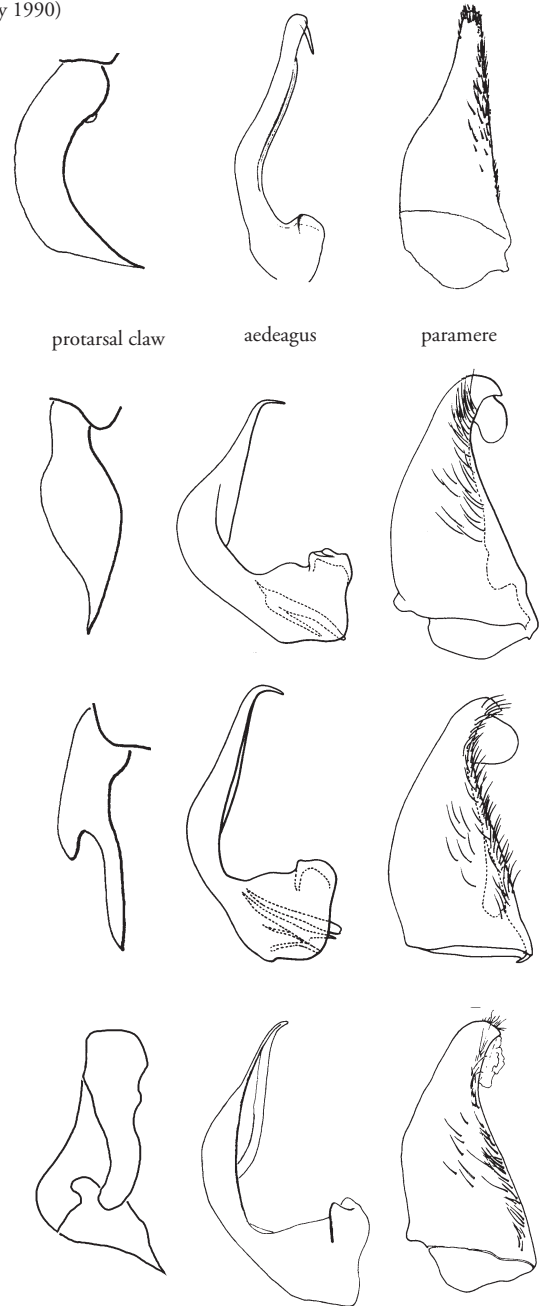
- 1' Length < 6.6 mm; protarsal claw and genitalia not as above 2

- 2(1') Protarsal claw with simple pointed apex; genitalia as figured *L. difformis*

- 2' Protarsal claw with bifid or notched apex; genitalia not as above 3

- 3(2') Protarsal claw deeply bifid, without notch; genitalia as figured * *L. schusteri*
(not known from Florida)

- 3' Protarsal claw more complex, with notch; genitalia as figured * *L. etnieri*
(not known from Florida)



Notes on species

L. difformis - Length 5.6-6.2 mm. I have seen single females from Eglin Air Force Base (Walton County) and Lost Creek (Wakulla County) that, based upon their smaller size, are most likely this species. This species has been recorded as far south as the Coastal Plain in South Carolina (Ciegler 2003).

Other species

L. etnieri Wolfe & Spangler - Length 5.2-6.0 mm. Not recorded from Florida; known from as far south as Tennessee.

L. nemorosus Wolfe & Roughley - Length 7.0-7.2 mm. Not recorded from Florida; known from at least as far south as Alabama.

L. schusteri Wolfe & Spangler - Length 5.4-6.1 mm. Not recorded from Florida; known from as far south as central Mississippi. Wolfe & Roughley (1990) predicted that this species should eventually be found as far south as the Gulf Coast. It may be possible that the Florida specimens I've seen go here.

GENUS *Liodessus*

DIAGNOSIS: Larvae are distinguished by the broadly conical frontal projection; last labial palpomere longer than preceding palpomere; legs without swimming setae; membranous abdominal sternite 6; and basal segment of urogomphus longer than basal segment, without secondary setae and with bases of setae UR2, UR3 and UR4 equidistant.

Adults are distinguished by the very small size (< 2.5 mm); head with transverse line behind the eyes; pseudo-tetramerous fore and mid tarsi; pronotum with plicae; elytra with or without basal plicae; lack of an epipleural carina; metacoxal plate and epipleuron usually coarsely punctate; last abdominal sternite narrower, almost triangular; elytra immaculate, broadly fasciate OR if with irregular longitudinal vittae, then usually with dark medial pronotal spot; male without truncate spur at apex of hind tibia; the jointed parameres of the male genitalia and the simple, arcuate aedeagus.



L. flavicollis



L. noviaffinis

NOTES: Following the work of Miller (1998), 9 species of these very small beetles are known from North America; four occur in Florida. Species that are now considered *Liodessus* were treated by Young (1954), along with species from what are now considered other genera, as *Bidessus*.

Liodessus are usually associated with dense vegetation, moss or filamentous algae in lentic habitats; they can also be collected from the margins of streams.

ADDITIONAL REFERENCES: Alarie et al. 2007; Larson & Roughley 1990; Miller 1998; Young 1950.

Florida species

L. crotchii Nilsson
L. flavicollis (LeConte)
L. hobbsi Young
L. noviaffinis Miller

Key to adult *Liodes* of Florida

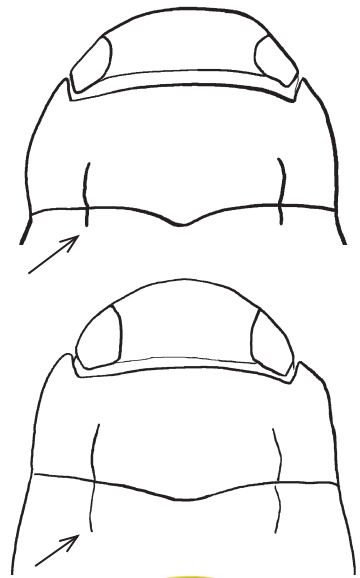
1 Elytra without basal plicae, or elytral plicae $\leq 1/2$ as long as pronotal plicae 2

1' Elytral plicae better developed, at least $1/2$ as long as pronotal plicae 4

2(1) Elytron reddish-brown with subbasal, median and sometimes apical pale transverse bands, rarely elytra plain reddish-brown; elytra very coarsely, densely punctate and setose .. *L. flavicollis*

2' Elytron without transverse bands, uniformly yellowish-brown to reddish-brown, or with variegated pale markings; dorsum not as coarsely or densely punctate, not as setose 3

3(2') Dorsum shining, elytra usually with pale maculae but may be immaculate; aedeagus thinner, without hooked apex *L. crotchii* (in part)



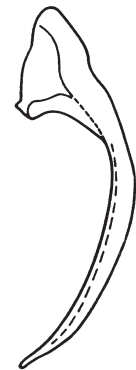
L. flavicollis



maculate form



immaculate form



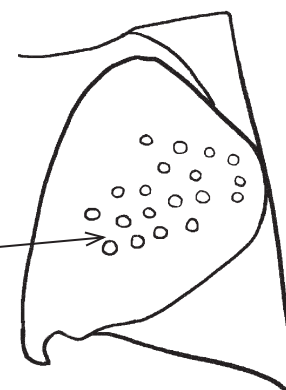
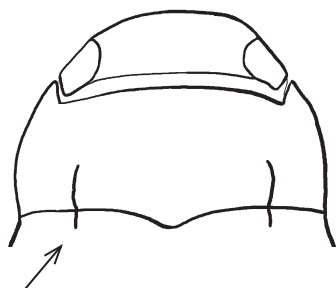
(adapted from Larson & Roughley 1990)

- 3' Dorsum dull, immaculate; aedeagus stouter, with hooked apex *L. hobbsi*

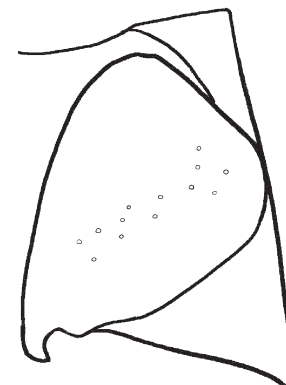
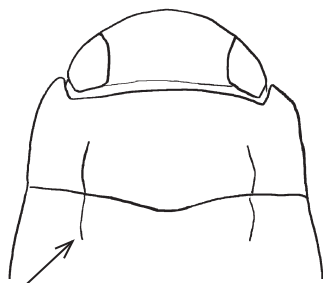


(adapted from Larson & Roughley 1990)

- 4(1') Elytral plicae at most about 1/2 as long as pronotal plicae; pronotum usually without dark median spot (may be infusate band posteriorly); metacoxa with many, coarse punctae *L. crotchii* (in part)



- 4' Elytral plicae longer than 1/2 length of pronotal plicae; pronotum usually with median dark spot; metacoxal plate with few, fine punctae, or punctae obscured by rugose sculpture *L. noviaffinis*



Notes on species

- L. crotchii* – Length 1.6-2.0 mm. Formerly known as *L. fuscatus* (Crotch); this name was preoccupied so the name *L. crotchii* was proposed by Nilsson (2001: 129). Usually found in sphagnum moss at the margins of small pools/ponds. The elytral plicae are often very short; thus this species is keyed twice in the preceding key. In lateral view, the aedeagus is thinner and straighter medially than that of *L. hobbsi*, and is not hooked at the tip. The elytra may be unmarked or, more commonly in the Florida material I've examined, are marked with pale maculae. The maculate forms are likely to be confused with *L. noviaffinis*, but that species usually has longer elytral plicae, a dark central spot on the pronotum (usually mostly unicolorous in *L. crotchii*), more finely and sparsely punctate metacoxal plates (with more, and coarser, punctae in *L. crotchii*) and - usually - the paler hind tibiae with only the apical third darkened in *noviaffinis*. The hind tibiae of *L. crotchii* usually have at least the apical 2/3 infuscate, although I've seen some *L. crotchii* with almost completely yellow hind tibiae.
- 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 (Larson & Roughley 1990). This species prefers deeper water (Young 1954; Larson & Roughley 1990; Miller 1998).
- L. hobbsi* – Length 1.5-1.7 mm. This species was described from a few specimens collected from a shallow, filamentous algae-filled pool near Wilma, Liberty County. The specimen illustrated in the key, a female collected by Young in Liberty County ("flatwoods near "New River") in 1954, is one of two specimens in the FSCA determined by Young as *L. hobbsi*. The two were collected by Young in Liberty County in 1954 and 1992 (from "pools 5 mi. S Wilma"); they are not part of the type series.
- L. noviaffinis* – Length 1.7-2.0 mm. Epler (1996), following Young (1954) and Larson & Roughley (1990), stated that "*L. affinis* may represent a complex of closely related species. Young (1954) noted two varieties in Florida." Miller (1998) revised the *L. affinis* group and described the form in the southeast US as *L. noviaffinis*. It is found in a variety of habitats, including brackish water. At St. Marks National Wildlife Refuge (Wakulla County), I've collected it from the large, brightly lit, brackish water pond at the lighthouse and from a small, completely shaded woodland pool that was choked with filamentous algae. See also *L. crotchii* above. Note that *L. affinis* is a more northern species found from Virginia north to southern Canada and west to Minnesota and Iowa; it differs in having a stouter aedeagus and a slimmer apical appendage on the paramere; see Miller (1998).

Other species

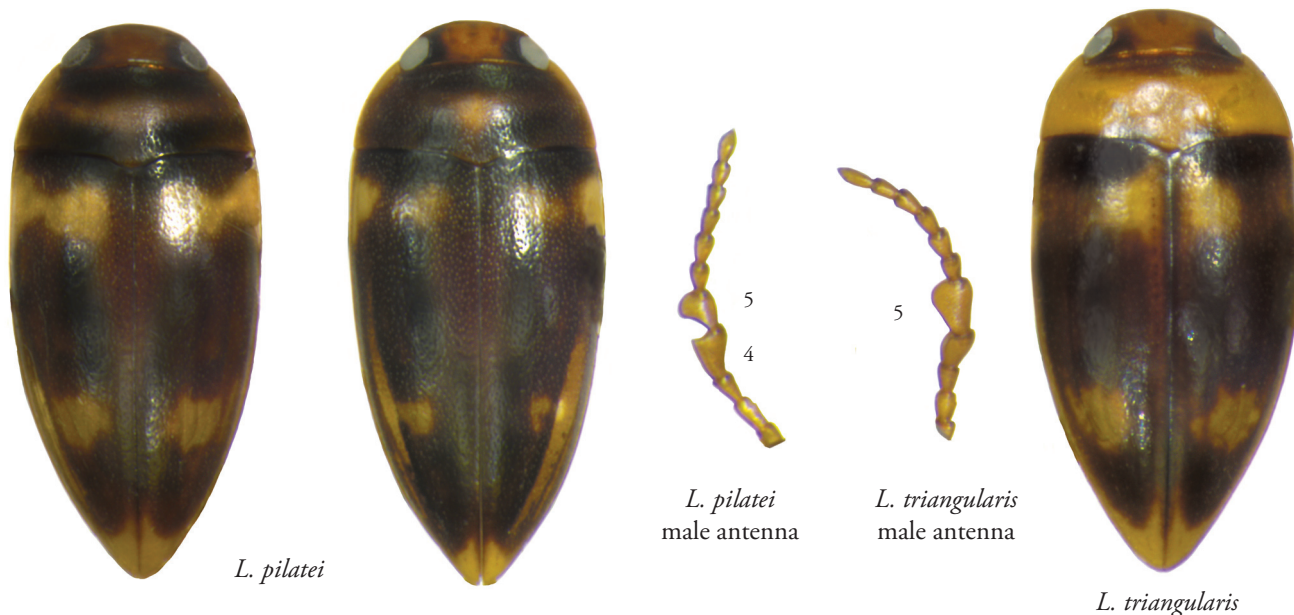
- L. cantralli* Young – Length about 1.7 mm. This species was recorded for Florida in Downie & Arnett (1996); because of this, it was included in the key in Epler (1996). I have not seen any material of this species from Florida - or anywhere near the state - and believe the record is erroneous. The Florida record is also considered doubtful by other workers; Miller (1998) and Larson & Roughley (1990) noted that it was known only from Alberta to Manitoba in Canada, and Michigan and Wisconsin in the U.S. The species occurs in small pools and depressions in moss mats. The species is distinctive for the sutural groove on the elytra, formed by a longitudinal series of punctures.



GENUS *Lioporeus*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the small size (< 5 mm); male with 4th and/or 5th antennal segment enlarged; pseudotetramerous fore and mid tarsi; prosternum without basal protuberance and with a median carina; lack of an epipleural carina; metasternum weakly sulcate (concave) posterior to apex of prosternal process; male fore tibia straight; basal segment of male fore tarsus with small suction cup; and the sinuate posterior margin of hind coxal lobes.



NOTES: A small genus with only two species, known only from the eastern half of the US; both occur in Florida. Both species were originally described as *Hydroporus*; Wolfe & Matta (1981) established the genus *Falloporus* for them. Later (Wolfe 1983), it was noted that the name *Lioporeus* Guignot, 1950, predated *Falloporus*.

The more common *L. pilatei* (length 3.7-4.4 mm) has a broadly infuscated pronotum; the male has antennomeres 4 and 5 broadened. This species is found in the northern part of the state to at least as far south as Lake County.

Less common (found across the northern part of the state) is *L. triangularis* (length 3.4-4.3 mm); its pronotum has the infuscation (if any) restricted to the anterior and/or posterior margins; only antennomere 5 is broadened in the male.

Lioporeus species are found in creeks, streams and rivers.

ADDITIONAL REFERENCES: Wolfe & Matta 1981.

Florida species

L. pilatei (Fall)
L. triangularis (Fall)

GENUS *Matus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; maxillary stipes longer than wide; fore and mid legs chelate (pincer-like) or with ventral fringe of flattened spine-like setae on tibiae and tarsi (*M. leechi*); legs with swimming setae; abdominal segments 7 & 8 without a lateral fringe of setae; and urogomphi much shorter than or subequal to (*M. leechi*) last abdominal segment.

Adults are distinguished by their medium size (~5-10 mm); emarginate eyes; 5 segmented fore and mid tarsi; median longitudinal sulcus on the prosternum; lobate posterior corners of basal 4 hind tarsomeres; and the unequal hind tarsal claws.



M. ovatus blatchleyi
larva and adult



M. bicarinatus

NOTES: The genus *Matus* is Nearctic, with 4 species; 3 occur in Florida. *Matus* are found in marshes, ditches, pools, ponds, streams and rivers.

The larva of *M. leechi* was recently discovered (Alarie & Butera 2003); it differs from other *Matus* larvae in lacking the pseudochelate fore and mid tibiae/tarsi, and in having much longer urogomphi (almost as long as the last abdominal segment). Hilsenhoff (1993b) separated the larvae of *M. bicarinatus* from those of *M. ovatus* by the 11 or fewer posteroventral spines (not the ventral row of very fine setae) on the hind tarsus (15 or more in *M. ovatus*) and the 20 or fewer spines on the inner ventral surface of the fore coxa (at least 23 on *M. ovatus*).

ADDITIONAL REFERENCES: Alarie & Butera 2003; Alarie et al. 2001; Epler 2009; Hilsenhoff 1993b; Leech 1941; Spangler & Gordon 1973; Wolfe & Roughley 1985; Young 1953c.

Florida species

M. bicarinatus (Say)
M. leechi Young
M. ovatus blatchleyi Leech

Key to adult *Matus* of Florida

(genitalia figures adapted from Young 1953c)

- 1 Length < 6.5 mm; body form short and broad, not strongly narrowed posteriorly; aedeagus with shorter apex *M. leechi*

- 1' Length 7 mm or more; body form more elongate, narrowed posteriorly; aedeagus with longer, thinner apex (see below) 2

*M. leechi*

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



- 2' Body form more elongate and tapered posteriorly; metacoxal plates without microreticulation; aedeagus not sinuate
..... *M. bicarinatus*

*M. ovatus blatchleyi**M. bicarinatus***Notes on species**

M. bicarinatus - Length 7.7-9.3 mm. This mostly northern species was recently recorded for Florida (Epler 2009). It may be difficult to discern the differences in the metacoxal plate sculpture between this species and *M. ovatus*, but body shape (comparative material helps) and genitalia will separate them.

M. leechi - Length 5.5-6.1 mm. Although considered by some as a Florida endemic (e.g., Peck & Thomas 1998), Folkerts & Donovan (1974) reported *M. leechi* from Baldwin and Geneva Counties in Alabama. The larva differs from other *Matus* larvae in lacking the pseudochelate fore and mid tibiae/tarsi, and in having much longer urogomphi, which are almost as long as the last abdominal segment.

M. ovatus blatchleyi - Length 7.0-9.1 mm. Two subspecies of *M. ovatus* occur in eastern North America. Only *M. o. blatchleyi* is known from Florida; it is smaller and darker than the nominate subspecies (see Leech 1941; Young 1953c). This species is found throughout the state at least as far south as Lake Okeechobee.

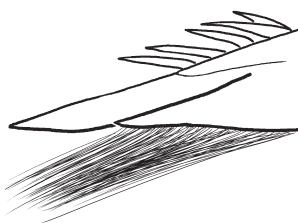
GENUS *Megadytes*

DIAGNOSIS: Larvae are distinguished by the very large size (mature larva with head length < 6 mm); 3 large “teeth” on the anterior margin of the head; long and slender maxillary stipes; rudimentary ligula; inner length of prosternal plates subequal to maximum width of plate; distance between prosternal plates greater than proximal width of fore femur; abdominal segments 7 and 8 with lateral fringe of setae; and very reduced urogomphi.

Adults are distinguished by the very large size (> 20 mm); elytra without yellow lateral borders (but margin may be lighter reddish-brown); non-emarginate eyes; 5 segmented fore and mid tarsi; males with first 3 fore tarsomeres forming an oval palette; hind tibia with one large spur twice as broad as the other; and hind tarsus of male with 2 apical claws; female hind tarsus with a long outer and rudimentary inner apical claw.



male hind tarsus



female hind tarsus

*M. fraternus* female

NOTES: Of the 21 species of this Neotropical genus of very large beetles, only one, *M. fraternus* (length 20-22 mm) makes it into the extreme southern part of Florida. There is a slim chance that another species, *M. giganteus* (Laporte), known from Cuba, might also occur as a vagrant in extreme southern Florida. The two may be separated by the much larger size of *M. giganteus* (> 35 mm) and the posterior hind tibial spur: it is simple in *M. fraternus*, bifurcate in *M. giganteus*.

Larvae of many *Megadytes* species have been described (Cekalovic 1974; Ferreira-Jr, 1993, 1995; Ferreira-Jr et al. 2006; Michat 2006b) but the larva of *M. fraternus* remains undescribed. Shepley-James et al. (2009) compared the larvae of *M. giganteus* and *M. marginithorax* (Perty) with those of *Cybister fimbriolatus* and found differences that could be used to separate larvae of the two genera, utilized in this manual.

ADDITIONAL REFERENCES: Cekalovic 1974; Ferreira-Jr, 1993, 1995; Ferreira-Jr et al. 2006; Michat 2006b; Miller et al. 2006; Mouchamps 1957; Shepley-James et al. 2009; Tremouilles & Bachmann 1980.

Florida species

M. fraternus Sharp

GENUS *Neobidessus*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by their very small size (< 2.5 mm); head with transverse line behind the eyes; pseudo-tetramerous fore and mid tarsi; pronotum with posterior plicae; elytra with basal plicae, a weak discal stria and with irregular longitudinal weak or well-marked vittae; lack of an epipleural carina; metacoxal plate and epipleuron mostly smooth; male with truncate spur at apex of hind tibia; last abdominal sternite broader, almost semi-circular; the simple parameres of the male genitalia; and the aedeagus with apex produced at a right angle.



N. pullus floridanus

N. p. pullus

NOTES: *Neobidessus* is a mostly Neotropical genus with 28 described species. Two are found in the US; one of these, *N. pullus*, occurs in Florida.

Following Young (1954: 67-70; 1977: 6-11), two subspecies occur in Florida: *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 vitta that contrast sharply with the lighter background; *N. p. floridanus* (Fall) (1.76-2.24, average length 1.88 mm) occurs throughout Florida (and in southern Georgia) and has elytra that are usually uniformly brown to reddish-brown, or with the elytra vaguely striped, the vittae not contrasting strongly with their background. There are intermediates and workers are probably best served by identifying these confusing small beetles simply as *N. pullus*.

Florida species

N. pullus (LeConte)

ADDITIONAL REFERENCES: Young 1977, 1981c.

GENUS *Neoporus*

DIAGNOSIS: Larvae are distinguished by the frontal projection; antennomere 2 without a dorsomedian secondary seta; antennomere 3 with a laterobasal pore and a ventroapical spinule; legs with swimming setae; abdominal sterna 2-6 membranous; absence of abdominal spiracles (in 3rd instar); and urogomphi longer than abdominal segment 8, with or without secondary setae.

Adults are distinguished by the small size (≤ 6 mm); pseudotetramerous fore and mid tarsi; lack of an epipleural carina; hind coxal process produced laterally into lobes that cover the bases of the hind trochanters; base of hind femur separated from hind coxal lobe by trochanter; and posterior margin of hind coxal lobes with line running from center to outermost portion of lateral lobe straight to arcuate, not curving in more anteriorly than posterior margin of lateral lobe.



Neoporus sp. larva



N. asidytus



N. hebes



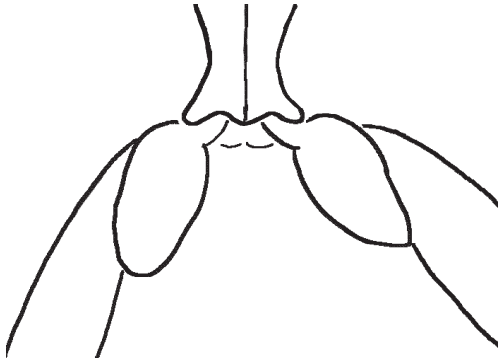
N. vittatipennis

NOTES: With at least 23 species present in Florida, *Neoporus* is the most speciose water beetle genus in the state. It was previously considered the *undulatus* section of Fall's (1923) *pulcher-undulatus* group of *Hydroporus*, then a subgenus within *Hydroporus*, but is now considered a full genus. See Notes under *Hydroporus* for the current arrangement of genera once considered to be *Hydroporus*.

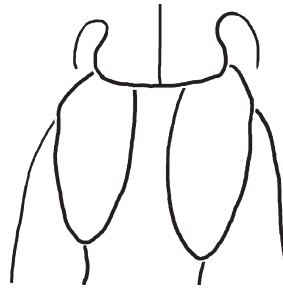
Identification of many *Neoporus* species is extremely difficult, even with comparative material. While some specimens are easily put to species, many appear to be intermediate. Do these represent different species, hybrids, or just ecophenotypes, with their color patterns, or lack thereof, and body forms dictated by their environments? This is especially true with what might be called the "*N. undulatus* complex"; see Notes on species.

Several species are known only from a restricted range or specific habitats, such as in root masses in undercut banks, or apparently only in springs/seeps; see Notes on species for each taxon.

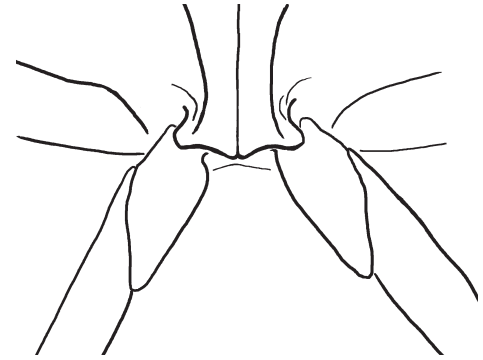
Separating adults of *Hydrocolus*, *Hydroporus*, *Neoporus* and related genera may be quite difficult. The structure of the hind coxal lobes is the key character used for their separation. The best way to view this structure is with a dry specimen; you will have to orient the specimen so that your light source will illuminate the posterior margin of the metacoxal process. With your specimen on its back, shine the light so that it illuminates the area directly below the process (actually dorsal to the process - remember, your specimen is on its back) so that it stands out against a brighter background. In most *Neoporus* this process is smoothly curved posteriorly but in *N. venustus* the process is almost straight, thus making it more similar to that of a *Hydroporus*; note, however, the truncate clypeus of *N. venustus*.



Hydrocolus oblitus



Hydroporus pseudoniger



Neoporus dilatatus

metacoxal processes

ADDITIONAL REFERENCES: Alarie 1991; Ciegler 2003; Fall 1923; Matta & Peterson 1985; Wolfe 1984; Young 1940b; 1967a; 1978a; 1984.

Florida species

<i>N. asidytus</i> (Young)	<i>N. dixianus</i> (Fall)	<i>N. mellitus</i> (LeConte)
<i>N. aulicus</i> (Aubé)	<i>N. effeminatus</i> (Fall)	<i>N. rheocrinus</i> (Young)
<i>N. baelus</i> (Young)	<i>N. gaudens</i> (Fall)	<i>N. shermani</i> (Fall)
<i>N. blanchardi</i> (Sherman)	<i>N. hebes</i> (Fall)	<i>N. striatopunctatus</i> (Melsheimer)
<i>N. carolinus</i> (Fall)	<i>N. helocrinus</i> (Young)	<i>N. uniformis</i> (Blatchley)
<i>N. cimicoides</i> (Sharp)	<i>N. hybridus</i> (Aubé)	<i>N. venustus</i> (LeConte)
<i>N. clypealis</i> (Sharp)	<i>N. lobatus</i> (Sharp)	<i>N. vittatipennis</i> (Gemminger & von Harold)
<i>N. dilatatus</i> (Fall)	<i>N. lynceus</i> (Sharp)	

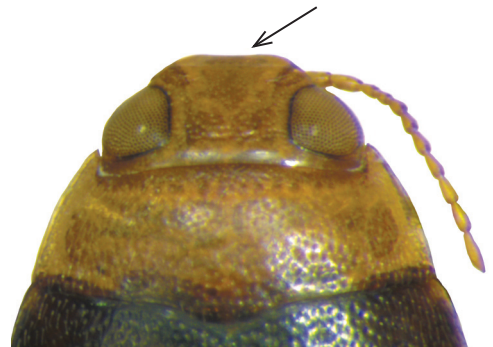
Key to adult *Neoporus* of Florida

1 Length > 5.5 mm *N. aulicus*

1' Length < 5.0 mm 2

N. aulicus

2(1') In dorsal view, clypeus distinctly truncate anteriorly;
lateral margin of elytra distinctly ascending at base .. 3



2' In dorsal view, clypeus rounded anteriorly; lateral margin of elytra straight, or if slightly ascending, clypeus not truncate 4

3(2) Smaller, length ≤ 4.0 mm; body form evenly oval, widest at middle; dorsal surface more shiny; posterior margin of metacoxal process distinctly produced medially *N. hybridus*

*N. hybridus*

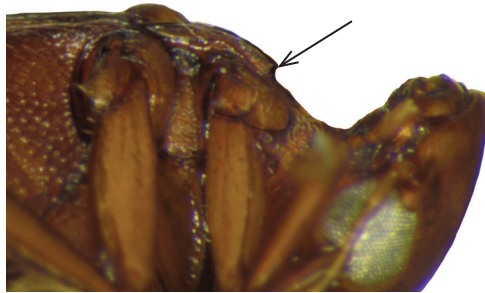
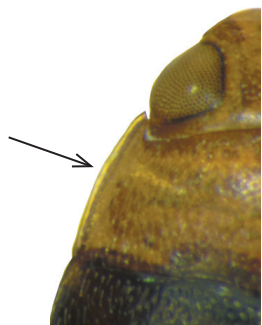
3' Larger, length ≥ 4.1 mm; body form obovate, widest behind middle; dorsal surface duller; posterior margin of metacoxal process almost straight *N. venustus*

*N. venustus*

- 4(2') Pronotum with at most a very narrow lateral marginal bead; in lateral view, prosternum smoothly curved; elytra moderately to weakly vittate; length ≤ 3.3 mm 5



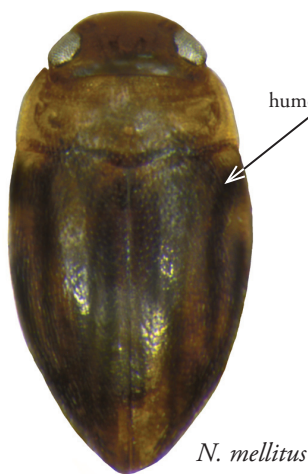
- 4' Pronotum with well developed lateral marginal area, noticeably smoother or flatter than rest of pronotum; in lateral view, prosternum usually with an anterior protuberance (if prosternum smoothly rounded then length > 3.8 mm, antennae completely yellow and elytra fasciate); elytra fasciate, vittate, spotted or immaculate; length > 3.0 mm 8



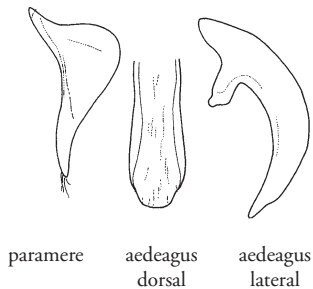
- 5(4) Smaller, length 2.3-2.7 mm 6

- 5' Larger, length 2.6-3.3 mm 7

- 6(5) Humeral spot always present (may be obscure); prosternal process narrow; elytral vittae broader and rather suffused, longer; aedeagus with inner margin more arcuate, in dorsal aspect apex more blunt ..
..... *N. mellitus*



N. mellitus

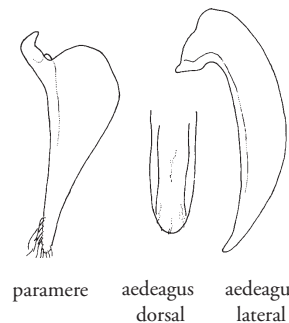


paramere aedeagus dorsal aedeagus lateral

(adapted from Wolfe 1984)



N. latocavus

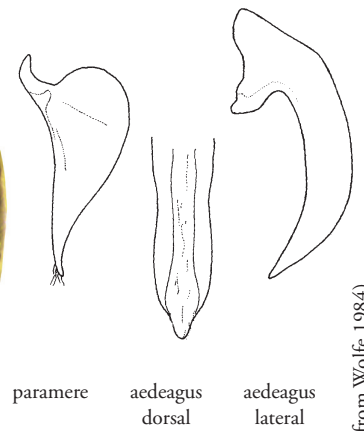


paramere aedeagus dorsal aedeagus lateral

(adapted from Wolfe 1984)

- 6' Elytra without humeral spot; prosternal process broader and more oval; elytral vittae narrower, shorter; aedeagus with inner margin straighter, in dorsal aspect tip more evenly rounded **N. latocavus*
(not recorded from Florida, but may occur in northern portion of state)

- 7(5') Body shape broader and more oval ($L/W = 1.8$); elytral vittae rather suffused and broadly coalesced; aedeagus with inner margin straighter; parameres sinuate at base *N. dixianus*

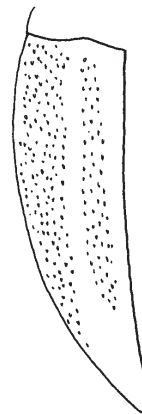


(adapted from Wolfe 1984)

- 7' Body shape more elongate ($L/W > 1.95$); elytra vittae usually distinct, not as suffused; aedeagus with inner margin more arcuate; parameres not incised at base *N. vittatipennis*



- 8(4') Coarse punctation of each elytron interrupted by 3 longitudinal bands of smoother, more finely punctate areas; elytra with 3 broad transverse fasciae .. *N. striatopunctatus*



- 8' Elytra without smoother longitudinal bands; elytra fasciate, vittate, spotted or immaculate 9
- 9(8') Form elongate/narrow, twice as long as wide (see couplet 10); male protarsal claws dissimilar 10
- 9' Body usually not twice as long as wide; male protarsal claws dissimilar or equal - BUT if body twice as long as wide (some *N. blanchardi*), then length 3.5 mm or less, dark with weak bands of poorly defined spots (see couplet 16) and male protarsal claws thin and equal 11

- 10(9) Length 3.4-3.8 mm; elytra yellow-brown with 3 irregular and interconnected brown fasciae; anterior (inner) male protarsal claw blunt and $\leq 1/2$ length of posterior claw *N. shermani*

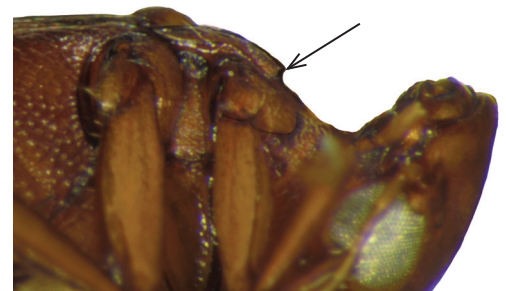
- 10' Length 3.7-4.2 mm; elytra reddish-brown/brown with small pale elongated spots; anterior male protarsal claw slightly thicker and shorter than posterior claw *N. gaudens*

*N. shermani**N. gaudens*

- 11(9') Antennae entirely yellow, with no apical infuscation; prosternum mostly rounded in lateral view, with little to no protuberance
..... *N. dilatatus*

*N. dilatatus*

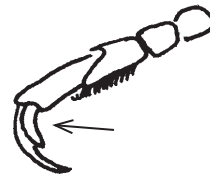
- 11' Antennae with at least last antennomere infuscate, or antennae entirely reddish-brown; prosternum usually with well developed subapical protuberance, but may be reduced 12



- 12(11') Male anterior (inner) protarsal claw very short, $\leq 1/2$ length of posterior claw; female with anterolateral margin of pronotum sinuate (in dorsal view) *N. clypealis*
(see *N. lecontei* under Notes on species)



female



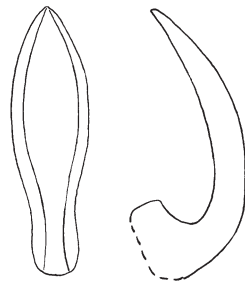
male foretarsus



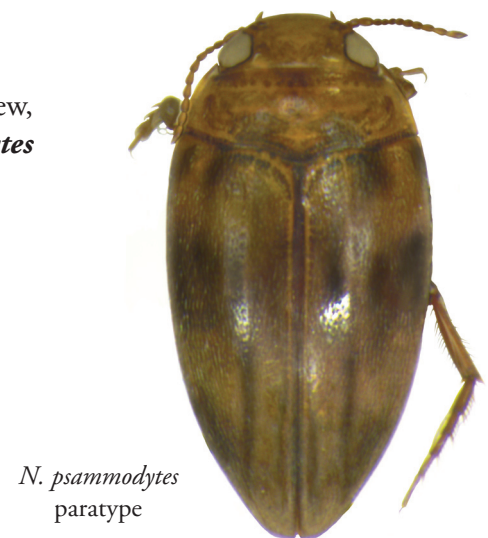
male

- 12' Male tarsal claws more or less equal; female without sinuate pronotal margin 13
- 13(12') Smaller, length 2.9- 3.5 mm; mostly dark brown/reddish-brown/brownish-yellow beetles with small, weakly marked pale spots 14
- 13' Larger, length 3.1-4.6 mm; if < 3.5 mm, elytra yellowish/reddish brown with obvious fasciate markings 17

- 14(13) Elytra light brownish yellow with darker maculae; in ventral view, aedeagus widened medially * *N. psammodytes*
(not recorded from Florida, but may occur in northern portion of state)



ventral lateral
(adapted from Young 1978a)



N. psammodytes
paratype

- 14' Elytra dark brown/reddish-brown with small pale elongate spots; aedeagus not widened medially
..... *N. blanchardi complex* 15

The following three species are basically inseparable without comparative material, and even then identification is questionable. It is perhaps best to leave specimens keying here as "*N. blanchardi complex*".

- 15(14') Outer margin of aedeagus with subbasal indentation; elytra more coarsely, densely and deeply punctate *N. rheocrinus*



(adapted from Young (1967a))

- 15' Aedeagus without subbasal indentation; elytra more finely punctate 16

- 16(15') Smaller, length 2.9-3.0 mm; punctation more coarse *N. helocrinus*



(adapted from Young 1967a)

N. helocrinus
paratype



- 16' Larger, length 3.0-3.5 mm; punctation finer *N. blanchardi*



(adapted from Young 1967a)



- 17(13') Elytra basically immaculate or with markings very obscure 18

With many alcohol preserved specimens, it may be necessary to pry open an elytron to observe the color pattern

- 17' Elytra with obvious markings, usually 2-3 transverse series of elongated spots, some of which may be contiguous 21



fasciate elytron

- 18(17) Size smaller, length 3.2-3.8 mm; northern and western Florida
 *N. baelus*

- 18' Larger, length ≥ 3.6 mm 19



N. baelus
paratype

- 19(18') Anterior outline blunt *N. hebes*

- 19' Anterior more rounded 20



N. hebes

- 20(19') Elytral punctation finer; elytra setae dense, almost obscuring punctation; form more ovate *N. lobatus*

- 20' Elytral punctation coarser; elytra setae finer, not obscuring punctation; form slimmer
 *N. uniformis*



N. lobatus



N. uniformis

21(17') Form very broad, obtuse anteriorly, posteriorly sharply attenuated past midlength; pronotal margins very broad ***N. cimicoides***

21' Form more ovate; pronotal margins not as broad 22



N. cimicoides

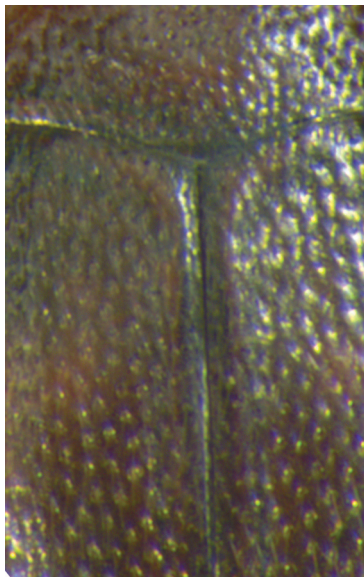
22(21') Dorsal and ventral integument polished and shining, with microsculpture between punctures greatly reduced; pronotal margins somewhat more horizontal than usual, appearing wider in lateral view than in dorsal view ***N. effeminatus***

22' Dorsal and ventral integument not polished and shining, with evident microsculpture between punctures; pronotal margins not appearing wider in lateral view than in dorsal view 23



N. effeminatus

23(22') Dorsal punctation sparser and coarser (punctae deeper and farther apart); epipleuron with punctures fine, inconspicuous, almost appearing smooth except near ventral margin; antennomere 11 and sometimes 10 infuscate ***N. carolinus***

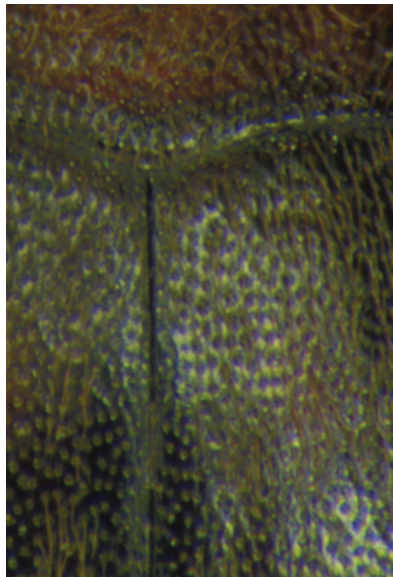


- 23' Dorsal punctation denser and finer; epipleuron with numerous shallow punctures (appears to have been dented with a minuscule ball-peen hammer); antennomeres infusate from 5-7 distally to 11 24

- 24(23') Smaller, length 3.1-3.8 mm; punctation coarser, punctures near center of elytra separated by about twice their diameter *N. asidytus*



- 24' Larger, length ≥ 3.8 mm; punctation usually finer, closer; punctures near center of elytra separated by about their diameter BUT may be as coarse as in *N. asidytus* *N. lynceus*
(see Notes for *N. lynceus* and *N. undulatus*)



Notes on species

- N. asidytus* – Length 3.1-3.8 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. *Neoporus asidytus* is very similar to *N. carolinus* in elytral color pattern, but the elytra are more finely punctate (coarser in *carolinus*), the epipleuron is shallowly punctate (punctuation fine to obsolete in *carolinus*) and it averages smaller in size. Some specimens are only separable from *N. lynceus* by the smaller size; it appears that *N. asidytus* always has coarser punctuation, but *N. lynceus* varies between fine and coarse. Also known from South Carolina, Mississippi and southern Georgia; see Young (1984). Also see *N. lynceus* and *N. undulatus* below.
- N. aulicus* – Length 5.6-6.0 mm. The largest *Neoporus*, it is coarsely punctate dorsally and lacks a well developed protuberance on the prosternum. 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 and slimmer 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* complex in Florida; *N. psammodytes* is another member of this group that may occur in Florida, but its elytral color pattern and aedeagus easily distinguish it from the other members. *Neoporus 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* complex” for these species.
- N. carolinus* – Length 3.6-4.0 mm. Young (1982) 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 or considerable experience.
- N. cimicoides* – Length 4.2-4.6 mm. Usually easily recognized by its distinctive, somewhat boxy, shape. *Neoporus cimicoides* has transverse elytral fasciae that may be weakly expressed in some specimens. It might be confused with unmarked *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 (the process may be slightly angulate in the area where the protuberance usually is), completely yellow antennae 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, but Ciegler (2003) recorded it from South Carolina and also noted it occurred in Alabama and Maryland. Recorded from Brevard, Flagler, Levy, Osceola and Taylor Counties in Florida; I've seen a single specimen from Seminole County.
- 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 fasciae) 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. See *N. blanchardi* above.
- N. hybridus* – Length 3.5 mm. This species and *N. venustus* possess a distinctive truncate clypeus and the basal margins of the elytra are sharply upturned in lateral aspect. However, *N. venustus* is larger and the middle projection of the metacoxal process is almost straight, while that of *N. hybridus* is obviously produced medially.
- 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, apparently replaced by *N. uniformis* in extreme southern Florida. *Neoporus lobatus* is very similar to *N. uniformis*, but in most of the material available to me, specimens that I’ve assigned to *N. lobatus* have dense yellowish elytral setae that almost obscure the finer punctation; these elytral setae in *N. uniformis* are thinner, almost colorless and do not obscure the coarser punctation. However, I have collected a pair from Wakulla County in which the setae are similar to those of *N. uniformis*, but the body form is more ovate, as in “typical” *lobatus*. It is likely that the two “species” represent northern (*lobatus*) and southern (*uniformis*) forms of the same taxon - and all may belong within *N. undulatus* (q.v.).
- 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”. The distinction between *N. lynceus* and *N. undulatus* is difficult to quantify; see *N. undulatus* below. In addition, separating these taxa from *N. lobatus* can be problematical when one discounts at least maculation, which is variable and may be influenced by environment. An additional caveat applies to using *N. asydytus*, which may be just a smaller version of *N. lynceus* (and thus, *N. undulatus*). For the time being, I continue to use *N. lynceus* for Florida specimens mainly for the reason that if this should prove to be a separate species, it would be easier to maintain records of it then trying to pull records of *lynceus* from those of *undulatus*. See also *N. undulatus* below.
- 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 County, in addition to material ranging from Louisiana to Vermont; I’ve examined material from Bay, Walton and Washington Counties.
- 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 3.4-3.8 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 County, where it was collected at a spring, and from the Little River in Gadsden County. The coarse punctation of each elytron is interrupted by 3 longitudinal bands of smoother, more finely punctate areas: one along the suture, one medial and one sublateral.
- N. uniformis* – Length 3.9-4.1 mm. Lighter in color, more coarsely punctate, more shining and smaller than typical *N. lobatus*. A small series of what I’ve assigned to *N. uniformis* collected from the Everglades is darker, more reddish-brown, but slightly lighter than typical *lobatus*; these specimens are also slimmer than typical *lobatus*. Young (1954) noted that *N. uniformis* was “known only from the rock rim of the Everglades and Everglades Keys from Broward County to southern Dade County”. This species may be a southern form of *N. lobatus* (q.v.).
- N. venustus* – Length 4.2-4.4 mm. I have specimens from the New and Santa Fe Rivers (Suwannee River

basin) and have seen material from Baker and Taylor Counties; also recorded from Gadsden County in Peck & Thomas (1996). *Neoporus venustus* differs from other Florida *Neoporus* in having an almost straight posterior margin to its metacoxal process; the process is produced just a bit more than that of *Hydroporus*.

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 and small rivers.

Other species

N. latocavus (Wolfe) – Length 2.6-2.7 mm. This species is not recorded from Florida, but has been collected near Midway in Bullock County, Alabama.

N. lecontei Nilsson – Length 4.1-4.4 mm. Formerly known as *N. mixtus* (LeConte); the name was preoccupied and the species renamed by Nilsson (2001). Not recorded from Florida, but Young (1954) noted that it (as *Hydroporus mixtus*) “probably occurs in streams in the western uplands of Florida”. This species is very similar to *N. chypealis*; it supposedly differs by having the male anterior male protarsal claw 2/3 as long as the posterior, a more ovate form (i.e., narrower than *chypealis*), and the lateral margin of the female pronotum is not sinuate anteriorly. Other than the non-sinuate female pronotum, most of the characters supposedly separating the two species are variable and may occur in either taxon. Larson et al. (2000) considered that they may be conspecific, but Ciegler (2003) treated them as separate taxa. Obviously, more work is needed - as it is with many *Neoporus* “species”.

N. psammodytes Young – Length 2.9-3.4 mm. This species is not recorded for Florida, but has been collected from a stream near Blakely, Early County, Georgia. 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. undulatus (Say) - Length 3.7-4.7 mm. The distinction between this species and *N. lynceus* is difficult to quantify. Ciegler (2003) followed Fall (1923) and separated the two using punctuation, pronotal markings and length/width ratios. However, specimens of *N. lynceus* and *N. undulatus* that I’ve examined, many determined by Young, can go either way in her key. Fall (1923), Young (1954), Larson et al. (2000) and the present author have expressed exasperation at separating these and other similar taxa. Larson et al. (2000: 263) considered *N. undulatus* a polymorphic species and included (for the Florida fauna) *N. asidytus*, *N. baelus*, *N. effeminatus*, *N. hebes*, *N. lynceus* and *N. uniformis* within this taxon. Thus, in the key above, all species from couplet 17 on, with the exception of *N. carolinus* and *N. cimicoides*, would be included in their *N. undulatus*. Some specimens of these taxa will definitively key out in the above key, but often specimens are encountered that appear to be intermediate. If a specimen does key exactly to a couplet and matches the figure(s) provided, use that name. But if a specimen appears to be intermediate, it would perhaps be best to use “*N. undulatus* complex” for such beetles. Be sure to retain voucher specimens! Hopefully, ongoing revisionary work will better delimit these taxa. See also *N. lynceus* above.

GENUS *Pachydrus*

DIAGNOSIS: Larvae are distinguished by the frontal projection with an elongate, wider central spatulate portion and two short, simple lateral branches; legs with swimming setae; abdominal sternites 2-5 membranous, 6-8 sclerotized; and urogomphi not extending past apex of siphon.

Adults are distinguished by the small size (~ 5 mm); globose form; pseudotetramerous fore and mid tarsi; short prosternal process that is broader than long and has a rounded apex; epipleuron with a diagonal carina; mid coxae separated by about the width of a mid coxa; hind coxal process with a lateral lobe; straight hind tibiae; and unequal hind tarsal claws.



Pachydrus princeps
larva and adult

NOTES: Most of the nine described species of *Pachydrus* are Neotropical; one species, *P. princeps* (length 4.2-5.0 mm), is found in Florida. This species may be a junior synonym of *P. obniger* (Chevrolat), known from Cuba. Young (1954: 53) noted “*Pachydrus princeps* from Florida is rather close to *obniger* from Cuba, but there seem to be small but consistent differences between the two forms in color pattern and punctuation.” Interestingly, much of Young’s Florida *Pachydrus* material in the FSCA is determined as *P. obniger* by Young. Much of this material was collected after 1954, but a specimen from 1938 was originally determined as *P. princeps* and then changed to *obniger* by Young; perhaps he had planned to publish this synonymy. However, Alarie & Megna (2006) suggested that *P. obniger* may be a junior synonym of *P. globosus* (Aubé). Thus, it may turn out that the species that is found in Florida should be named *P. globosus*. The genus is currently being revised by Vincenzo Volpe (Rome, Italy); hopefully he can settle this matter. For now, I am retaining the name *P. princeps* for SE US material.

Pachydrus princeps is often associated with the roots of water hyacinths (Young 1954) and has been collected throughout the peninsula and in southern Georgia; Ciegler (2003) did not record it from South Carolina.

ADDITIONAL REFERENCES: Alarie & Megna 2006; Alarie et al. 1997; Michat & Torres 2008; Spangler & Folkerts 1973.

Florida species

P. princeps (Blatchley)

GENUS *Platambus*

DIAGNOSIS: Larvae of Florida *Platambus* are distinguished by the lack of a frontal projection; simple last antennal segment; broad maxillary stipes; tibiae and tarsi without swimming setae; abdominal sternites 1-6 membranous, 7-8 sclerotized; spiracle of 6th abdominal segment distant from ventrolateral margin of dorsal sclerotized plate, segment with narrow ventral membranous area; abdominal segments 7-8 without a lateral setal fringe; and urogomphus with 2 whorls of primary setae, no secondary setae.

Adults are distinguished by the small to moderate size (7.5-9.6 mm); emarginate eyes; prosternal process with lateral bead inflated behind fore coxae; visible scutellum; elytra with preapical submarginal stripe; 5 segmented fore and mid tarsi; inner hind tibial spur subequal to basal tarsal segment; males without stridulatory organ of ridges on dorsal margin of hind femur; hind femur with a linear group of short, stout setae on posterior apical angle; equal hind tarsal claws; and posterior margin of female last abdominal sternite entire.



Platambus sp.



P. johannis



P. astrictovittatus

NOTES: Nilsson (2000) elevated several species groups of *Agabus* to genus status as *Platambus* species. In North America this included the *americanus*-, *confusus*-, *semivittatus*- and *spinipes*-groups; the genus *Agabinus* Crotch (which does not occur in Florida) is also now included in *Platambus*. Our three *Platambus* species are all members of the former *A. semivittatus* group.

Platambus are found in lentic and lotic habitats.

Florida species

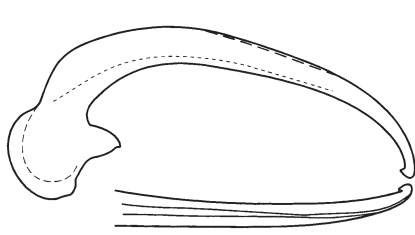
P. astrictovittatus (Larson & Wolfe)
P. johannis (Fall)
P. stagninus (Say)

ADDITIONAL REFERENCES: Ciegler 2003; Larson & Wolfe 1998; Matta 1986.

Key to adult *Platambus* of Florida

(aedeagal and claw figures adapted from Larson & Wolfe 1998)

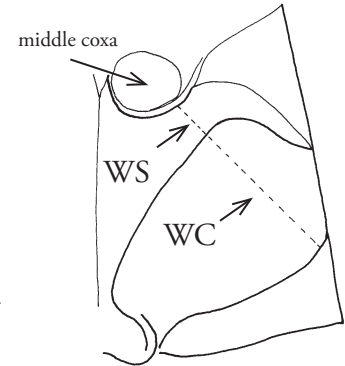
- 1 Aedeagus apex with small, pointed ventral hook; male protarsal claws elongate, with small tooth near base; metasternal wing broader, WC/WS 2.80-3.42 (WC = width of metacoxa along continuation of line WS; WS = width of metasternal wing at closest point to middle coxa (not including width of the ridge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



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



P. stagninus anterior and posterior
male protarsal claws

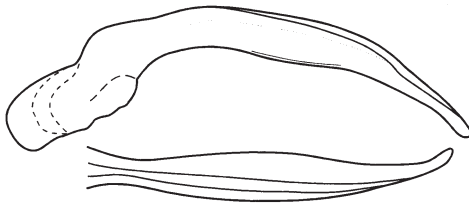


- 1' Aedeagus apex rounded, without ventral hook; male protarsal claws shorter and broader, anterior (inner) claw with large tooth near base; metasternal wing narrower, WC/WS 3.32-4.22; body more convex, body length/body depth 2.76-3.21 2

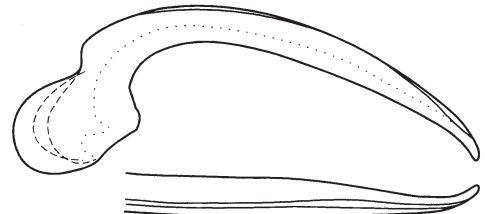


P. johannis anterior and posterior
male protarsal claws

- 2(1') Aedeagus in lateral aspect widened medially and obliquely flattened on its ventral surface; female with apex of elytra with fine, somewhat equal-meshed reticulation, containing small regular punctures ***P. johannis***



P. johannis



P. astrictovittatus

- 2' 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 punctures very faint ***P. astrictovittatus***

Notes on species

P. astrictovittatus - Length 7.5-8.8 mm. This is the taxon known as *Agabus* sp. A in Epler (1996). Closely related to and previously confused with *P. johannis*.

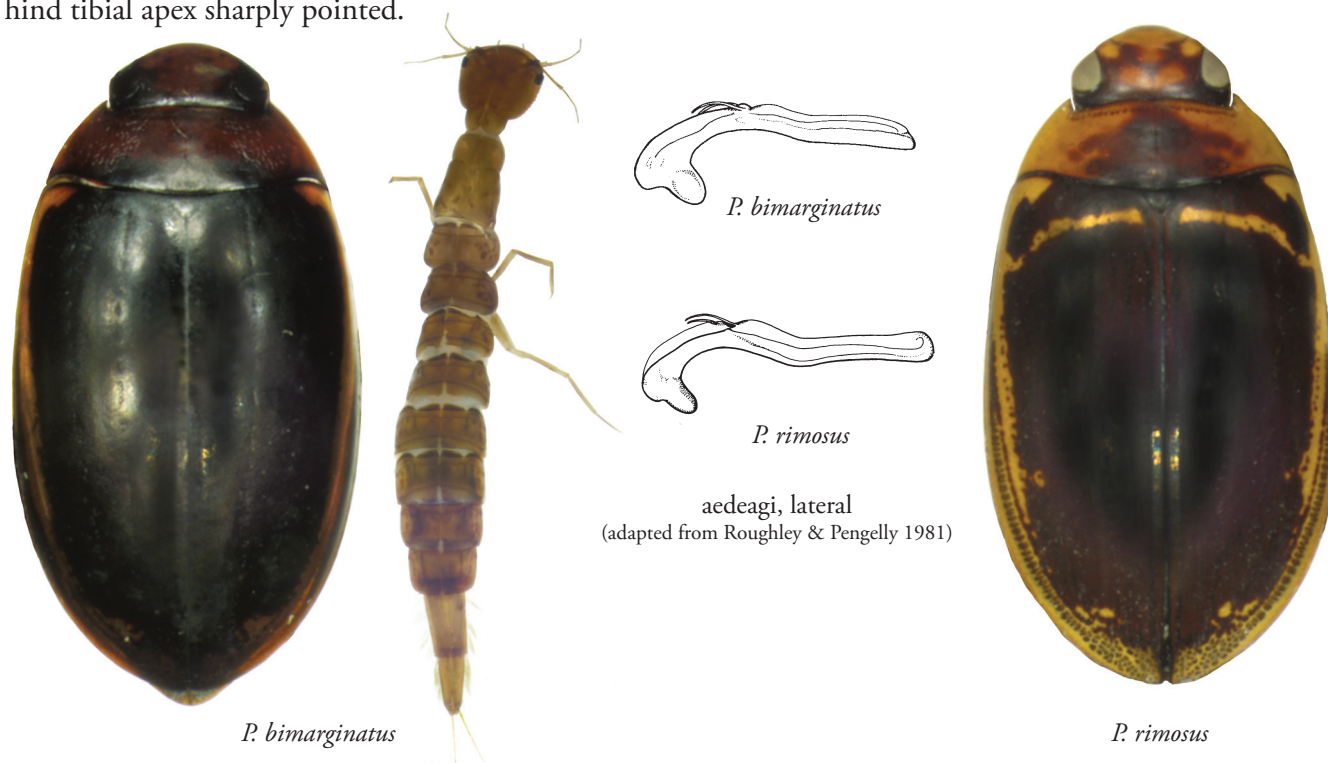
P. johannis - Length 8.3-9.5 mm. Previously confused with *P. astrictovittatus*; some of the previous Florida records of Young (1954) (at least those from Liberty County) are assignable to *P. astrictovittatus*. Although considered endemic to Florida by Larson et al. (2000), Ciegler (2003) recorded this species from South Carolina.

P. stagninus - Length 8.5-9.6 mm. A Coastal Plain species found from Mississippi through northern Florida north to New Jersey and New York; apparently a denizen of open marsh ponds.

GENUS *Prodaticus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; long and slender maxillary stipes; labium with 2 projecting lobes near center; length of basal labial palpomere much longer than width of prementum of labium; and urogomphi without lateral setal fringe.

Adults are distinguished by the moderately large size (10-13 mm); general blackish color; non-emarginate eyes; outer margin of metasternal “wing” straight; 5 segmented fore and mid tarsi; males with first 3 fore tarsomeres forming a round palette; male with small, linear setal brush near base of middle tarsomere 1; upper (anterior) surface of hind femur with mostly straight line of numerous small punctures; upper surface of hind tibia with row of bifid spines curving inward basally, not parallel to outer tibial margin; and smaller spur at hind tibial apex sharply pointed.



NOTES: Miller et al.'s (2009) reclassification of genera in the tribe Hydatichini resulted in the placement of all *Hydaticus* (*Guignotites*) species in *Prodaticus*. Thus *P. bimarginatus* (length 10-13 mm) is the sole representative of *Prodaticus* known from Florida. This beetle is very common throughout the state, where it occurs in a variety of aquatic habitats from saline to fresh, from puddles to swamps to ponds.

A species that occurs in the Bahamas and Cuba, *P. rimosus* (Aubé) (length 11-13 mm), has been reported from Florida (Young 1954), but Roughley & Pengelly (1981) placed those specimens in *H. bimarginatus*. The two species can be separated by the apically acute aedeagus in *P. bimarginatus* (blunt in *P. rimosus*); more than 10 large spines on the lower (posterior) surface of the hind tibia in *P. bimarginatus* (< 10 in *P. rimosus*); basal black band of pronotum usually restricted to basal 1/3 in *P. bimarginatus* (band may extend to anterior margin in *P. rimosus*); and the sublateral yellow elytral stripes of *P. marginatus* lack yellow inward extensions, while those of *P. rimosus* may have such extensions.

ADDITIONAL REFERENCES: Barman et al. 2008; Michat & Torres 2006b; Miller et al. 2009; Roughley & Pengelly 1981.

Florida species

P. bimarginatus (Say)

GENUS *Rhantus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; simple last antennal segment; broad maxillary stipes; femora, tibiae and tarsi with a single, well developed row of swimming setae; and abdominal segments 7 and 8 without a lateral fringe of setae.

Adults are distinguished by the moderate size (about 11-14 mm); emarginate eyes; narrowly margined pronotum; convex or keeled prosternal process that fits into triangular depression on the metasternum; 5 segmented fore and mid tarsi; hind femora without a linear group of short, stout setae on posterior apical angle; and unequal hind tarsal claws.



R. calidus adult
slightly oblique



R. calidus larva

NOTES: Ten species are recorded for North America; only one, *R. calidus* (length 11.5-13.5), is known to occur in Florida. A second species, *R. binotatus* (Harris), was recorded for South Carolina by Brigham (1982), but Ciegler (2003) doubted the validity of the record. This species is smaller (10-12 mm) and has two spots on the pronotum. The male of *R. binotatus* has unequal claws on the mid tarsi; those of *R. calidus* are equal.

Alarie et al. (2009) offered a key for known *Rhantus* larvae. The larva of *R. calidus* differs from other North American *Rhantus* larvae in the subdivided antennomeres 2-4 and in lacking secondary setae on the urogomphi; it also has a much longer 8th abdominal segment. This species, along with several other Neotropical *Rhantus* species, may represent a different genus; more study is needed.

ADDITIONAL REFERENCES: Alarie et al. 2009; Ciegler 2003; Zimmerman & Smith 1975.

Florida species

R. calidus (Fabricius)

GENUS *Thermonectus*

DIAGNOSIS: Larvae are distinguished by the lack of a frontal projection; broad maxillary stipes; simple ligula that is shorter than first segment of labial palp; and abdominal segments 7 and 8 with lateral fringe of setae.

Adults are distinguished by the small to moderate size (9-13 mm); non-emarginate eyes; 5 segmented fore and mid tarsi; hind margin of mid femur with series of stiff setae that are as long or longer than the width of the femur; females with numerous small scratches on basal portion of elytra; apex of outer spur of hind tibia notched; and posterior margins of first 4 hind tarsal segments with fringe of golden setae.



Thermonectus sp. larva



T. basillaris female

NOTES: Most of the 19 species of *Thermonectus* are Neotropical. Six species are known from the Nearctic, with two of these found in Florida; an additional three species occur in Cuba that could possibly be found in extreme southern Florida. Our two *Thermonectus* species are lentic, occurring in ponds, lakes, swamps, ditches and temporary puddles.

Females of both Florida species are adorned dorsally with a distinctive series of deep, longitudinal striae on the lateral areas of the pronotum and the basal half of the elytra.

Wilson (1923) gave characters to separate the larvae of *T. basillaris* and *T. ornaticollis*, repeated by Brigham (1982), Epler (1996), Hilsenhoff (1993a) and Michat & Torres (2005a); Hilsenhoff's key was referred to by Larson et al. (2000). However, Barman & Epler (2005) demonstrated that these characters would not work for separation of the larvae of these two taxa, and issued a caveat for using any of the larval descriptions offered by Wilson (1923).

ADDITIONAL REFERENCES: Alarie et al. 2009; Barman & Epler 2005; Carroll & Barman 2004; McWilliams 1968; Michat & Torres 2005a.

Florida species

- T. basillaris* (Harris)
- T. nigrofasciatus ornaticollis* (Aubé)

T. basillaris (length 9.0-11.5 mm) is the most common species of the genus in Florida; it is one of the most commonly encountered dytiscids in the state. It is distinguished by its smaller size, dark rufous to black venter, and dark dorsum, which is basically black with irregular marginal and sublateral yellow markings that are divided by black lines and specks; an indefinite pale transverse band is usually present on the base of the elytra (but darker individuals may lack this band). Young (1954) noted that specimens from the Keys were lighter than those from the rest of the state.

This species may be found in just about any kind of standing water, permanent or temporary, including brackish habitats. This species' name is misspelled several times as "*basilaris*" in Larson et al. (2000).



T. basillaris female



T. nigrofasciatus ornaticollis

T. nigrofasciatus ornaticollis is larger (length 11.5-13.0 mm), has a yellow to orange venter, yellow elytra covered with black speckles and lacks the transverse pale band at the base of the elytra. This species was referred to as *T. ornaticollis* in Epler (1996) and other earlier works, but relegated to subspecies status by Nilsson (2000), in agreement with the unpublished work of McWilliams (1968). Young (1954: 117) noted that this species was found in temporary habitats less often than *T. basillaris*; "upland ponds or pools with grassy margins seem to be a fairly characteristic habitat".

Other species

T. circumscriptus (Latreille) - Length 10.9-13.4 mm. Similar to *T. nigrofasciatus ornaticollis* but the male genitalia have a longer median lobe that extends to just below the apices of the parameres. Known from Cuba southward; see Alarie et al. (2009).

T. margineguttatus (Aubé) - Length 9.4-10.0 mm. Similar to *T. basillaris* but has broader yellow lateral margins and a yellow transverse preapical elytral fascia. Known from Cuba southward; see Alarie et al. (2009).

T. succinctus (Aubé) - Length 11.0-12.4 mm. Similar to *T. nigrofasciatus ornaticollis* and *T. circumscriptus*, but the markings on the pronotum are more reduced, with 2 basal lens-shaped spots that are usually confluent medially (these spots may be open and appear similar to a mask). Male genitalia have a shorter median lobe than *T. circumscriptus*; the female lacks the longitudinal striae on the basal half of the elytra. Known from Cuba southward; see Alarie et al. (2009).

GENUS *Uvarus*

DIAGNOSIS: Larvae are distinguished by the broadly conical frontal projection; last labial palpomere shorter than preceding palpomere; legs without swimming setae; membranous abdominal sternite 6; and basal segment of urogomphus shorter than basal segment, without secondary setae and with bases of setae UR2, UR3 and UR4 equidistant.

Adults are distinguished by the very small size (≤ 2 mm); simple clypeal margin; lack of a transverse ridge behind the eyes; pseudotetramerous fore and mid tarsi; pronotal and elytral plicae; epipleuron without a diagonal carina; weakly arcuate hind tibiae; equal hind tarsal claws; and male genitalia with jointed parameres and simple aedeagus.



U. lacustris



U. rogersi

NOTES: A moderately large genus (about 60 species worldwide) of very small, very confusing beetles; at least nine species are known from North America, with at least six taxa in Florida.

The taxonomy of this genus in North America is very unsatisfactory and revision is sorely needed. The identity of the type species of the genus is uncertain, and the genus may be polyphyletic (comprised of more than one genus). Larson et al. (2000) placed the North American species into two groups: the *U. lacustris* group, with one Florida member (*U. lacustris*) and the *U. granarius* group, to which the remaining Florida taxa belong. The key which follows should be considered tentative until the species are adequately revised. Unless one has a series of specimens, plus a series of correctly identified reference specimens and considerable experience, an identification to species group might be the most prudent action.

Most *Uvarus* species are found in streams and small rivers, ditches, ponds and swamps.

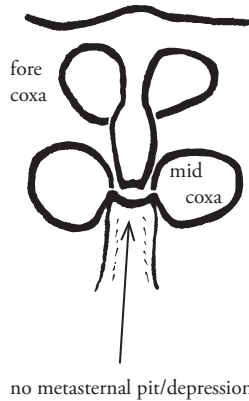
ADDITIONAL REFERENCES: Matta 1983; Young 1940a, 1941, 1950.

Florida species

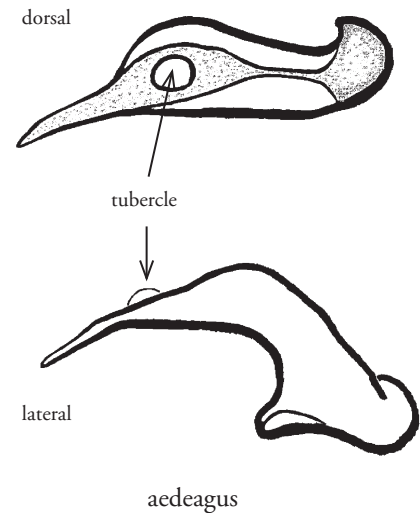
U. falli (Young)
U. cf. granarius (Aubé)
U. inflatus (Young)
U. lacustris (Say)
U. rogersi (Young)
U. sp. 1 Epler

Key to adult *Uvarus* of Florida

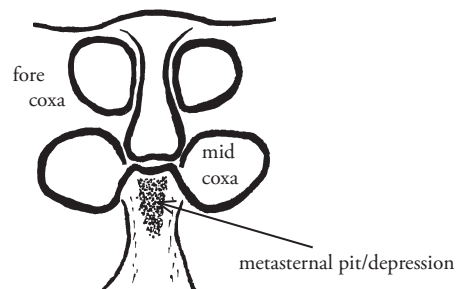
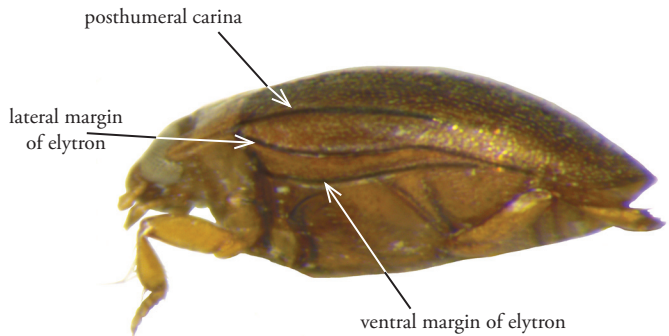
- 1 Body form more elongate-ovate, length/width 1.8-2.0; dorsum more finely punctate; anteromedial projection of metasternum without a small pit at its base; elytral plicae longer than pronotal plicae; elytra without posthumeral lateral carina; elytra yellow-brown; aedeagus sharply pointed; in dorsal aspect, apex off center; a small dorsal preapical tubercle present *U. lacustris*

*U. lacustris*

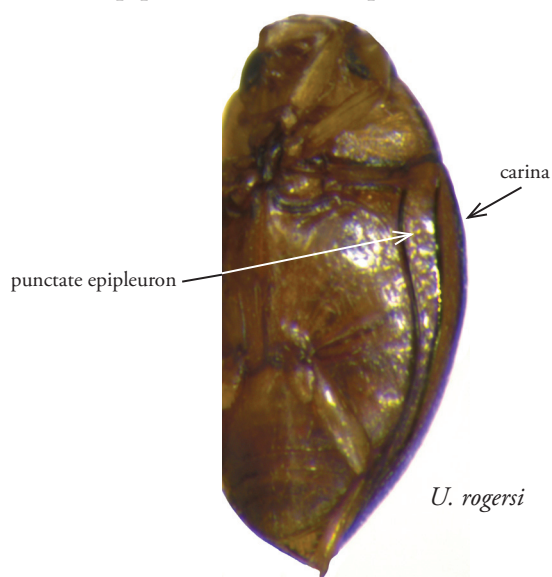
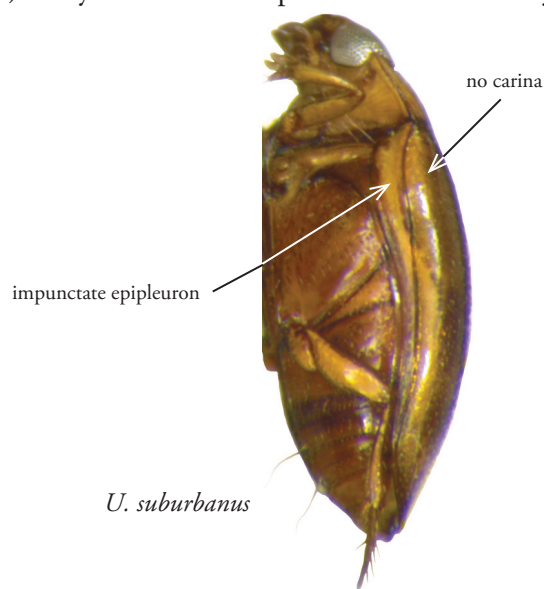
no metasternal pit/depression



- 1' Body form elongate-ovate or more broadly ovate, length/width 1.50-1.95; dorsum more coarsely punctate; anteromedial projection of metasternum with a small pit/depression at its base; elytral plicae longer than or subequal to pronotal plicae; elytra usually with posthumeral lateral carina, **but** may be weak or absent; elytra reddish brown or fuscous with obscure reddish-brown markings (tenereal beetles may be lighter); aedeagus not as above, without dorsal preapical tubercle ... *U. granarius* group ... 2

*U. sp. 1**U. rogersi*

- 2(1') Elytron without a posthumeral lateral elytral carina; epipleuron mostly impunctate 3



- 2' Elytron with a weak to well developed posthumeral lateral carina; epipleuron with punctae 4

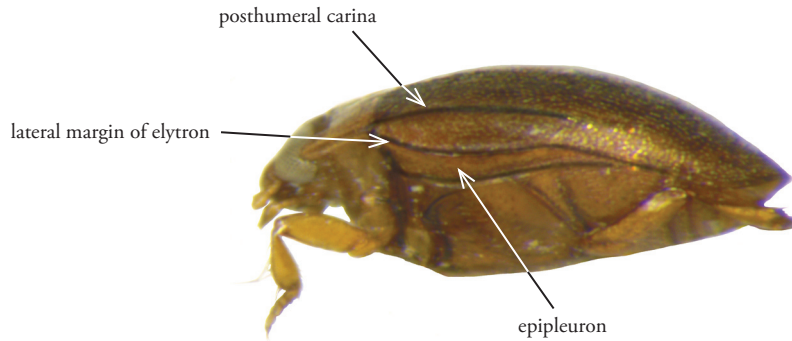
- 3(2) Aedeagus stouter *U. sp. 1*



- 3' Aedeagus thinner, more elongate **U. suburbanus*
(not known from Florida; see Notes on species)



- 4(2') Posthumeral margins of elytra strongly carinate; in dorsal aspect body very wide just past middle; length around 1.5 mm *U. inflatus*



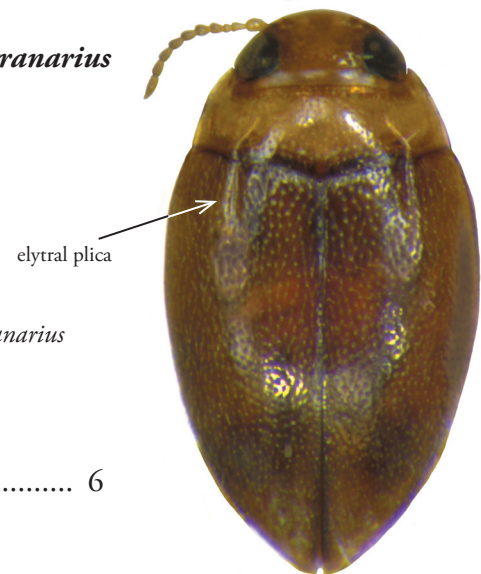
- 4' Posthumeral margins of elytra moderately to weakly carinate; body not as wide; length 1.3-2.0 mm 5

- 5(4') Elytral plicae much longer than pronotal plicae *U. cf. granarius*

U. granarius sensu Larson et al. (2000) has pronotal plicae subequal to elytral plicae, straight or somewhat concave posthumeral lateral elytral margins in dorsal aspect and dark labial palpi; see Notes on species.



U. cf. granarius



- 5' Elytral plicae subequal to pronotal plicae 6

- 6(5') Length 1.3-1.6 mm; pronotum duller yellow, with more basal infuscation; aedeagus wider medially in lateral aspect *U. rogersi*



U. rogersi



U. falli

U. granarius sensu Larson et al. (2000) may key here; it has straight or somewhat concave posthumeral lateral elytral margins in dorsal aspect and dark labial palpi; see Notes on species.

- 6' Length 1.6-2.0 mm; pronotum brighter yellow, with less basal infuscation; aedeagus thinner in lateral aspect *U. falli*



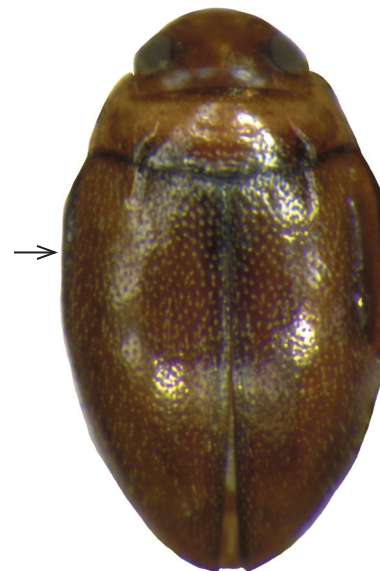
Notes on species

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. The elytra of this species may appear weakly carinate laterally. Young (1940a) described the species from Madison County and later (Young 1954) added material from Alachua and Levy Counties; there are additional specimens determined by Young from Calhoun, Jefferson and Taylor Counties in the FSCA. Larson et al. (2002) considered the species widespread in the eastern US and southern Canada.

U. cf. granarius – Length 1.5-1.7 mm. Following the definition of *U. granarius* in Larson et al. (2000), what has been called *U. granarius* in Florida may not be that species. The habitus and genitalia figures in Larson et al. (2000: figs. 21A, 21C) of *U. granarius* are dissimilar to those provided by Young (1941: figs. 2, 2c) for the same species. FSCA *U. granarius* specimens from Michigan determined by Young fit the description in Larson et al. (2000) (i.e., straight posthumeral lateral elytral margins in dorsal aspect, dark labial palpi). FSCA specimens from Alabama and Florida determined by Young do not fit this description, but fit the descriptions/comparisons in Young (1941, 1954) (more continuously arcuate posthumeral lateral elytral margins in dorsal aspect; labial palpi not darkened; I have examined material Young utilized for his paper). There is also disagreement with the relative lengths of the pronotal/elytral plicae: Larson et al. (2000) stated that these plicae are subequal; Young (1954) stated that the elytral plicae are distinctly longer than the pronotal plicae. I have not seen Florida material that fits the Larson et al. (2000) description for *U. granarius*. I have seen specimens with almost straight posthumeral lateral margins, but these specimens have the elytral plicae longer than the pronotal plicae and the labial palpi are not darkened. Young (1954: 64) noted “Specimens from Michigan and Indiana do not agree perfectly with Florida examples and probably indicate that the species as now defined is composite”; Larson et al. (2000:131) reiterated that statement.

U. inflatus – Length 1.4-1.5 mm. This species has a distinctive, widened outline in dorsal aspect and possesses distinctive elytra that are strongly carinate along the anterolateral/posthumeral margin. Young (1950) originally recorded this species only from the type locality in Bay County; Young (1954) noted that this species was known from as far north as New Jersey. Ciegler (2003) did not record it from South Carolina. Specimens from moss-lined roadside ditch/pools in the Apalachicola National Forest southwest of Tallahassee referred to this species by Epler (1996) were *U. rogersi*.

U. lacustris – Length 1.6-2.0 mm (53 Florida specimens). This widespread species may be confused with *U. sp. 1*; both taxa have a slimmer, more elongate shape, lack a posthumeral lateral carina, an impunctate (or almost so) epipleuron and finer, sparser punctation on the metacoxal plate. Note that *U. lacustris* is yellowish-brown rather than reddish-brown, more finely punctate dorsally, usually darker beneath, lacks the depression/pit on the anteromedian extension of the metasternum and has very distinctive genitalia. The venter of *U. lacustris* is usually much darker (dark chestnut brown to black) and glossier than other Florida *Uvarus* species, with metacoxal plate punctation scarcely visible in some specimens. Young (1954: 66) noted that Say’s type of *lacustris* is lost and “various writers have treated the species in such different ways that its identity is uncertain” and “the form treated here as *lacustris* may prove not to be that species” (ibid: 67). A neotype needs to be designated for this species to stabilize the taxonomy and nomenclature. For this manual, specimens that match the description of Larson et al.



U. granarius (Aubé)
sensu Larson et al. (2000)
(Michigan specimen)

(2000) are called *U. lacustris*. Until one is familiar with this species, positive identification requires examination of the male genitalia.

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. *Uvarus rogersi* is abundant in moss-lined roadside ditches/pools in the Apalachicola National Forest southwest of Tallahassee. A specimen I've examined from Moores Creek in Santa Rosa County, listed by Young (1954: 66) as a possible *U. falli*, has the stouter aedaeagus of a typical *U. rogersi*.

U. sp. 1 - Length 1.8 mm. This longer and slimmer species may be confused with *U. lacustris* but has coarser dorsal punctation, a suggestion of a depression on the anteromedian extension of the metasternum (depression is much weaker than that of most other *U. granarius* group species) and has different genitalia. I have two males from Union County in my collection, and I've examined a female from Hardee County in the FDEP collection that is probably this species. This species is apparently close to *U. suburbanus*, but has a stouter aedeagus and longer pronotal plicae (assuming my reference material for *U. suburbanus* does represent that species); examination of the male genitalia is necessary for identification.

Other species

U. suburbanus (Fall) - Length 1.7-1.9 mm. Originally described from New York; redescribed from New York, Maryland and Louisiana material by Larson et al. (2000). The presence of this species in Louisiana indicates that it may occur in Florida. There is a series in the FSCA determined by Young as *U. suburbanus*, but only one of the Young specimens, from College Park, Maryland, fits this species (epipleuron mostly impunctate, metacoxal plate finely and sparsely punctate, no or very weak posthumeral lateral elytral carina; aedeagus slender and sharply pointed); this is the specimen figured in the preceding key. The other specimens in the series, including two from Gadsden County, Florida, appear to be closer to *U. falli*; they have a posthumeral carina, punctate epipleuron and more coarsely punctate metacoxae.

In the FSCA there is a tray with many specimens, one of which bears a Young label identifying them as "*Uvarus exasperatus* Young", apparently a new species Young was planning on describing. Most are from one site in Alachua County; the specimen bearing the Young determination label is from Laurens County, Georgia. These appear to me to be quite similar to, and inseparable from, *U. falli*. The name "*exasperatus*", which is unavailable and should not be used, seems quite suitable, since working with *Uvarus* is an exasperating experience. The identity of this taxon, and much other material, awaits a revision of the genus for the Nearctic.

FAMILY **ELMIDAE**
riffle beetles

6

DIAGNOSIS: Larvae are distinguished by the cylindrical or subcylindrical body form; apparently 4-segmented legs with single-clawed tarsi; abdominal sternites without external gills; an apicoventral operculum on the 9th abdominal segment that encloses a chamber containing gill tufts and a pair of hooks; and a terminal abdominal segment that is apically bifid, medially notched or rounded, but lacks urogomphi.

Adults are distinguished by the hard body; filiform, unclubbed antennae (apical segment 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: As the common name “riffle beetles” implies, these insects are most often found in streams and rivers, but several taxa occur in lakes and ponds. Epler (1996) recorded seven genera from the state, but today nine genera are now known from Florida (Epler et al. 2005). Larvae and adults feed on decayed plant material 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 replenish their air supply at the water’s surface. The elmids offer some of 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”.

Adult elmids are often covered with dirt or mineral encrustations; in most instances these must be removed before elytral color patterns or punctuation can be observed. Encrustations may be removed by scraping or by placing beetles in 95% alcohol and using an ultrasonic cleaner. Thick deposits may require the use of HCl.

ADDITIONAL REFERENCES: Barr & Chapin 1988; Brown 1972; Ciegler 2003; Shepard 2002a; Sinclair 1964; White 1982.

Florida genera

Ancyronyx Erichson
Dubiraphia Sanderson
Gonielmis Sanderson
Macronychus Müller
Microcylloepus Hinton
Optioservus Sanderson
Oulimnius des Gozis
Promoresia Sanderson
Stenelmis Dufour

Key to genera of Elmidae larvae of Florida

- 1 Last abdominal segment extremely long, at least 4 times as long as wide *Dubiraphia*



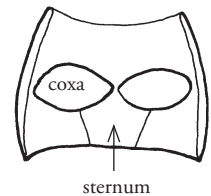
- 1' Last abdominal segment not extremely long, < 4 times as long as wide 2

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

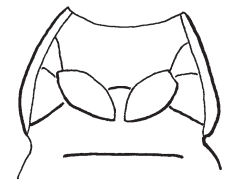


- 2' Posterolateral margins of abdominal segments 1-8 not produced into spine-like processes; body more elongate-cylindrical 3

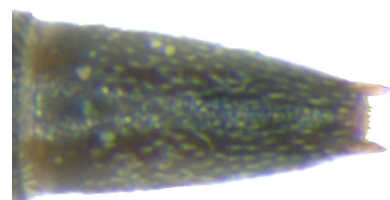
- 3(2') Prothorax with a posterior sternum, procoxal cavities closed posteriorly 4



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

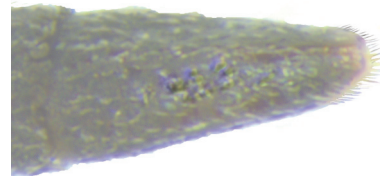


- 4(3) Last abdominal segment with a pair of posterolateral spines; dorsal tubercles not arranged in longitudinal rows *Stenelmis*



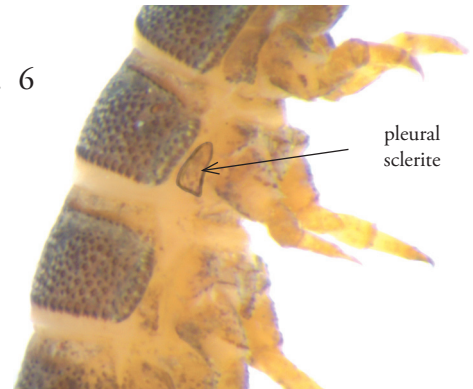
dorsal view of last abdominal segment

- 4' Last abdominal segment may be slightly notched but without a pair of posterolateral spines; dorsal tubercles arranged in longitudinal rows *Microcylloepus*



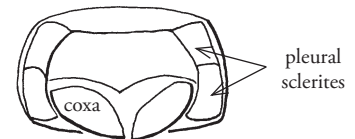
dorsal view of last abdominal segment

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

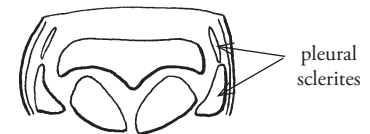


pleural sclerite

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



pleural sclerites



pleural sclerites

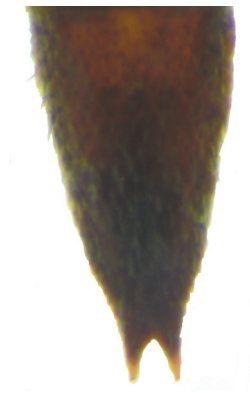
- 6(5) Dorsum of each abdominal segment with dorsal and lateral humps *Promoresia*



- 6' Dorsum of each abdominal segment without dorsal and lateral humps *Optioservus*



- 7(5') Abdominal segments 1-5 or 6 with pleural sutures; last abdominal segment with 2 well developed, narrowly separated, dorsal spines ***Macronychus***

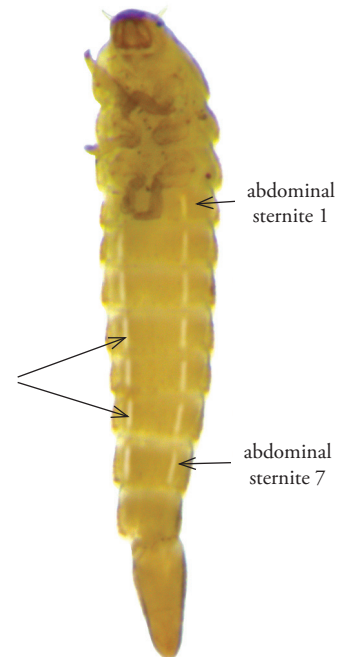


dorsal view of *Macronychus* larva



- 7' Abdominal segments 1-7 with pleural sutures; last abdominal segment without 2 well developed, narrowly separated, dorsal spines 8

ventral view of *Oulimnius* larva
showing pleural sutures



- 8(7') Abdominal segments with dorsal humps that bear scale-like setae; thoracic segments each usually with 2 longitudinal dark markings (marks may fade) ...
..... ***Gonielmis***

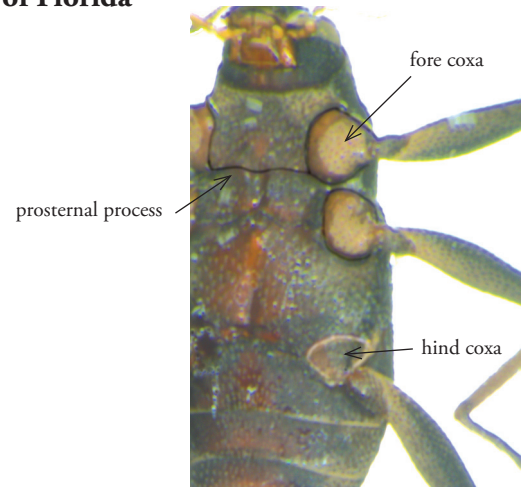


- 8' Abdominal segments without dorsal humps; no scale-like setae present; thorax without dark markings ***Oulimnius***

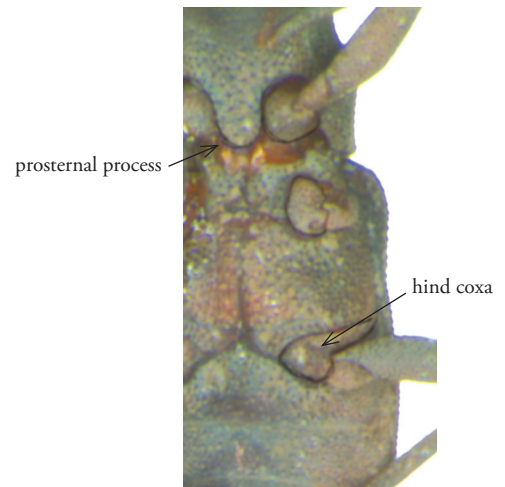


Key to genera of Elmidae adults of Florida

- 1 Hind coxae globular to squatly triangular and subequal to other coxae; posterior margin of prosternal process about as wide as head 2



- 1' Hind coxae transverse and larger than other coxae; posterior margin of prosternal process much narrower than head 3



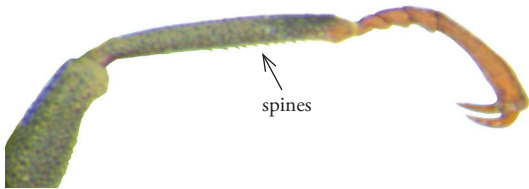
- 2(1) Black with conspicuous C-shaped yellow/orange elytral vittae and elongate apical spots *Ancyronyx*



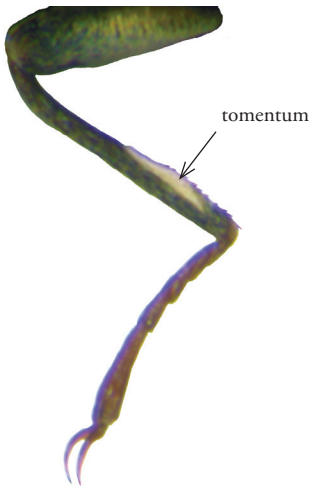
- 2' Black with gold/silver pubescence laterally, without brightly colored vittae *Macronychus*



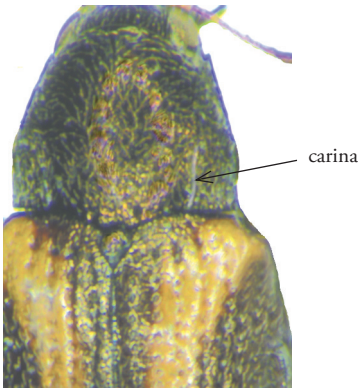
3(1') Anterior tibia without a fringe of tomentum (a patch of fine dense setae), although a row of short spines may be present; pronotal/elytral length 2.1 mm or more *Stenelmis*



3' Anterior tibia with a fringe of tomentum; pronotal/elytral length variable 4

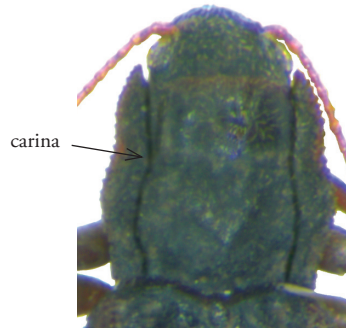


4(3') Pronotum with carinae, either full length or confined to basal third 5

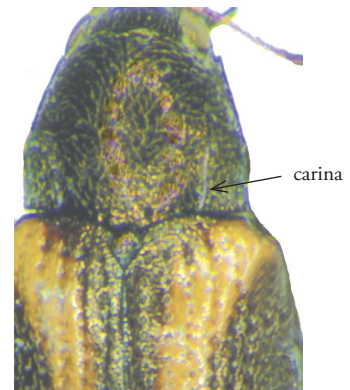


4' Pronotum without carinae, basically smooth 8

- 5(4) Pronotum with sublateral carinae for entire length 6



- 5' Pronotum with sublateral carinae limited to basal third ... 7



- 6(5) Pronotum with a transverse impression at anterior 2/5 and a medial longitudinal impression; 5th abdominal sternite with a lateral tooth *Microcylloepus*



- 6' Pronotum with medial area mostly smooth; 4th abdominal sternite with a posterolateral tooth *Oulimnius*

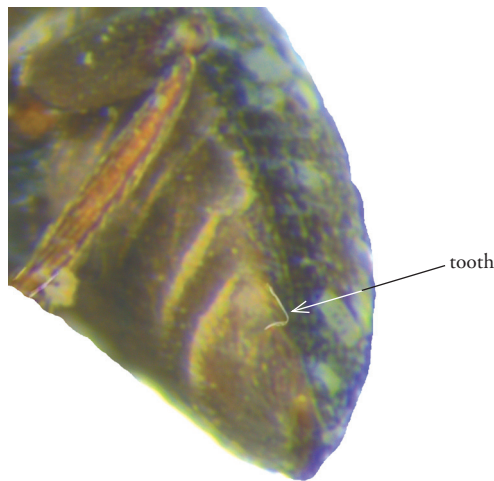


- 7(5') Body more elongate; lateral and posterior margins of pronotum mostly smooth *Promoresia*



- 7' Body rounder; lateral and posterior margins of pronotum serrulate or denticulatae *Optioservus*

- 8(4') Each elytron black, usually with 2 oblique yellowish spots (rarely may be contiguous); posterolateral margin of 4th abdominal sternite with prominent tooth that is bent upward to clasp epipleuron; in Florida found only in northern counties *Gonielmis*



- 8' Each elytron black/dark brown, usually with entire yellowish vitta (may be obscure or, rarely, vitta interrupted near middle and may appear as two yellowish spots); posterolateral margin of 4th abdominal sternite without prominent tooth that is bent upward to clasp epipleuron; common throughout Florida *Dubiraphia*



GENUS *Ancyronyx*

DIAGNOSIS: Larvae are distinguished by the robust, somewhat flattened body form; prothorax with a sternum, so that procoxal cavities are closed behind; pleural sutures on abdominal segments 1-8; and the posterolateral margins of abdominal segments 1-8 produced into spine-like processes.

Adults are distinguished by the long-legged, spidery appearance, with black body marked by a pair of C-shaped yellow/orange vittae; 11-segmented, filiform antennae; fore tibiae without fringe of tomentum; globular hind coxae that are subequal to the fore and mid coxae; and tarsal claw with basal tooth.



A. variegatus, larva and adult

NOTES: A single species, *A. variegatus* (total length 3.0-3.5 mm), occurs in North America (note the spelling of the name; the specific epithet has often been misspelled as *variegata*). The species occurs at least as far south as Marion and Putnam Counties in Florida.

This distinctive species is often found on submerged wood or roots, and can be common on Hester-Dendy samplers in streams and rivers. Sinclair (1964) noted that *A. variegatus* was “sensitive to sewage and industrial wastes”.

ADDITIONAL REFERENCES: Barr & Chapin 1988; Brown 1972; Jäch 2003; Phillips 1997.

Florida species

A. variegatus (Germar)

GENUS *Dubiraphia*

DIAGNOSIS: Larvae are distinguished by the long, slender last abdominal segment (at least 4 times as long as wide), with the operculum confined to the posterior third.

Adults are distinguished by the filiform antennae; tomentum on the anterior tibiae; smooth pronotum without sublateral carinae; posterior portion of prosternal process much narrower than the head; vittate/maculate elytra; posterolateral margin of abdominal sternite 4 not produced as a prominent upturned tooth; and transverse hind coxae.



Dubiraphia sp., larva



D. vittata, adult

NOTES: Of the 11 species of *Dubiraphia* known from North America, to date only one species, *D. vittata* (total length 2.0-2.3 mm), has been recorded from Florida. This species was referred to as *Simpsonia quadri-notata* by Young (1954).

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 four described species and three probable new species from Louisiana.

Dubiraphia larvae and adults are commonly found on Hester-Dendy samplers. 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 the wave-swept shallows of lakes. Brown (1972) noted that *D. vittata* was sensitive to chlorides.

All material I’ve examined from Florida, from the southern peninsula to the Panhandle, appears to be *D. vittata*. Specimens were sent to Dr. W.L. Hilsenhoff when the previous edition of this manual (Epler 1996) was being prepared. The yellow elytral vittae were more narrow on some specimens from the Steinhatchee and Withlacoochee Rivers in northern Florida, but Hilsenhoff noted that the genitalia indicated that they were a dark morph of *D. vittata*.

I re-examined some of this earlier material plus new material. Elytral vittae are variable, ranging from narrow to wide; in some specimens

Florida species

D. vittata (Melsheimer)

the vittae are interrupted and the elytra appear four-spotted (no doubt leading to some misidentifications as *D. quadrinotata*). Note that elytral vittae may be difficult to discern, especially in material that has been preserved in alcohol for some time. Gently lifting the elytra from the abdomen so that they are illuminated from beneath will usually reveal the vittae.

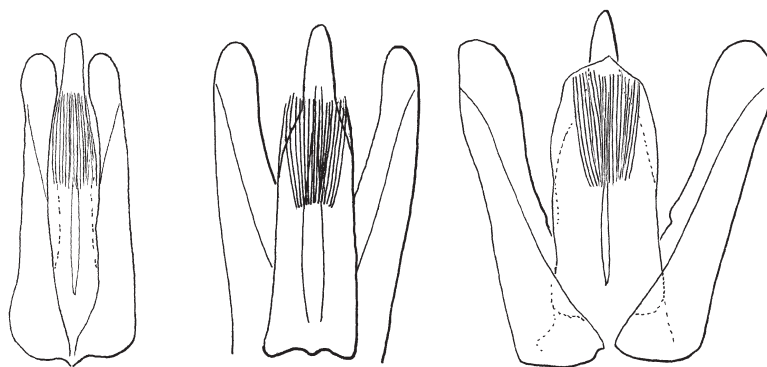
In specimens with wide vittae, each vitta extends across 4 or more intervals at the base of the elytron; thus the inner (medial) 2 intervals on each elytron are dark. In specimens with a narrow vitta on each elytron, the vitta is only about 3 intervals wide at the base and the inner 3 intervals are dark. Carefully mounted genitalia from a specimen with narrow vittae from Thirty Mile Creek in Polk Co. were indistinguishable from those of a specimen with broad vittae from the Suwannee River in Gilchrist Co.



wide vittae

narrow vittae

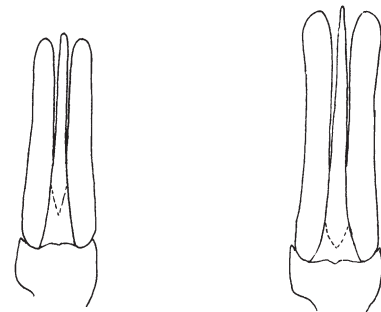
Identification of species may depend upon examination of the male genitalia. However, examination of the male genitalia presents problems, for the genitalia may appear different depending on the amount of pressure exerted on the genitalia when slide mounting. Genitalia of several species figured by Hilsenhoff (1973) were of “squashed” slide mounted material and thus were widened and lengthened. Hilsenhoff and Schmude (1992) noted this and provided figures of unmounted genitalia (see below).



unpressed

slightly pressed

fully pressed

Florida *D. vittata* genitalia
ventral view*D. minima* genitalia*D. quadrinotata* genitalia

dorsal view

(adapted from Hilsenhoff & Schmude (1992))

Florida material I've examined that was identified as *D. minima* Hilsenhoff or *D. quadrinotata* (Say) was all assignable to *D. vittata*. Genitalia of these two taxa are figured above; the aedeagus is much thinner in these two taxa than in *D. vittata*. Ciegler (2003) recorded *D. quadrinotata* from South Carolina. It is possible that some Florida *D. vittata* may be the same taxa that Barr & Chapin (1988) referred to as “*Dubiraphia* sp. A?” or “*Dubiraphia* sp. B?”.

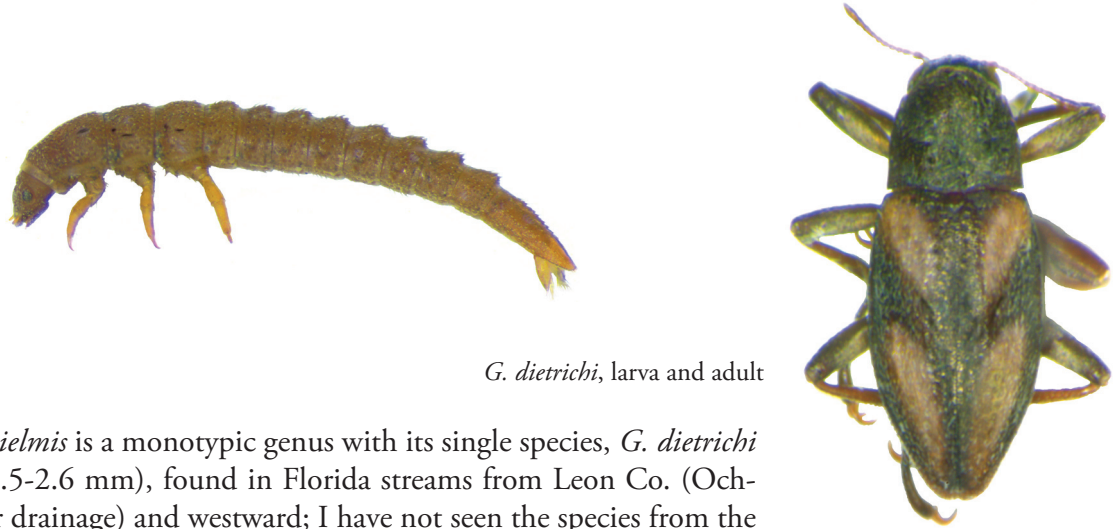
Given the taxonomic uncertainty associated with *Dubiraphia*, workers would be well advised to retain specimens from different water bodies/sites as well those with variably marked elytra; future revisionary work may reveal that more than one species is present.

ADDITIONAL REFERENCES: Barr & Chapin 1988; Brown 1972; Ciegler 2003; Hilsenhoff 1973; Hilsenhoff & Schmude 1992.

GENUS *Gonielmis*

DIAGNOSIS: Larvae are distinguished by the prothorax that lacks a posterior sternum; mesopleura with two sclerites, anterior sclerite much smaller and thinner than posterior sclerite; dorsum of each thoracic segment with two usually dark spots on each side; abdominal segments 1-7 with pleura and 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 somewhat elongate, spindle-shaped body; filiform antennae; tomentum on the anterior tibiae; pronotum without sublateral carinae; each elytron with two oblique yellow spots (sometimes contiguous); 4th abdominal sternite with a prominent tooth on its posterolateral margins; and transverse hind coxae.



G. dietrichi, larva and adult

NOTES: *Gonielmis* is a monotypic genus with its single species, *G. dietrichi* (total 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 portion of the divided mesopleural sclerites in *Gonielmis* is thin and scarcely discernible. I have seen specimens from Turkey Creek (Eglin AFB) in which the elytral spots were contiguous.

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

ADDITIONAL REFERENCES: Barr & Chapin 1988; Brown 1972; Brown & White 1978; Ciegler 2003.

Florida species

G. dietrichi (Musgrave)

GENUS *Macronychus*

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



M. glabratus, larva and adult

NOTES: One species, *M. glabratus* (total length 3-4 mm), occurs in the eastern US; in Florida there are unconfirmed FDEP records from as far south as Hardee and Hillsborough Counties.

Macronychus glabratus occurs in streams and rivers and, less often, ponds and lakes. Adults and larvae are often associated with wood, and are often found with *Ancyronyx variegatus*; they often occur on Hester-Dendy samplers. 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; Brown 1972; Čiampor & Kodada 1998; Ciegler 2003; LeSage & Harper 1976.

Florida species

M. glabratus Say

GENUS *Microcylloepus*

DIAGNOSIS: Larvae are distinguished by the prothorax with a posterior sternum (thus coxal cavities closed); dorsal tubercles partially arranged in longitudinal rows; and last abdominal segment without well developed posterolateral spine-like projections.

Adults are distinguished by the small size (< 2.4 mm); filiform antennae; mandible with a lateral lobe; anterior tibiae with tomentum; pronotum with a transverse impression at anterior 2/5, a medial longitudinal impression, distinct sublateral carinae that run the length of the pronotum and a serrulate lateral margin; 5th abdominal sternite with posterolateral tooth; and transverse hind coxae.



M. pusillus larva and adult

NOTES: Primarily a Neotropical genus, *Microcylloepus* is represented by 6 species in the U.S.; one species (*M. pusillus*, total length 1.7-2.2 mm), is found throughout Florida, and is one of the commonest elmids in the state. Although numerous authors have treated this species as having three subspecies, most workers today (Barr & Chapin 1988, Hilsenhoff & Schmude 1992, Shepard 1990) consider these “subspecies” to be color morphs that vary only in the number and form of spots or vittae on the elytra, a position also adopted in this manual. See Ciegler (2003) for a key to these forms.

Microcylloepus pusillus is common in streams and rivers (it can be abundant on Hester-Dendy samplers) and has been collected from the roots of water hyacinths in Florida lakes (Young 1954). Larvae commonly occur with those of *Stenelmis*, but are easily separated by the lack of posterodorsal spines on the last abdominal segment and the longitudinal arrays of tubercles/setae on its dorsum. 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”.



M. pusillus pronotum, with carinae emphasized

Florida species

M. pusillus (LeConte)

ADDITIONAL REFERENCES: Barr & Chapin 1988; Brown 1972; Ciegler 2003; Hilsenhoff & Schmude 1992; Shepard 1990.

GENUS *Optioservus*

DIAGNOSIS: Larvae are distinguished by the prothorax without a posterior sternum; laterally expanded, hood-like pronotum; single mesopleural sclerite; dorsum without humps; and last abdominal segment twice as long as high.

Adults are distinguished by more ovate body form; filiform antennae; anterior tibiae with tomentum; pronotum with lateral and posterior margins serrulate/denticulate and with carinae on basal half; 4th abdominal sternite with posterolateral tooth; and transverse hind coxae.



Optioservus sp. larva

NOTES: Thirteen species of *Optioservus* occur in North America. One species, *O. ovalis* (pronotal/elytral length 2.2-2.6 mm) has been recorded from the Panhandle (Epler et al. 2005); this species may possess elytra with a rounded humeral and an elongate apical spot, or the spots may be joined as one elongate vitta. Another species, *O. trivittatus* (Brown) (pronotal/elytral length 1.7-2.2 mm), with a median elytral vitta and a lateral vitta on each elytron, is likely to be found here; *O. immunis* (Fall) (pronotal/elytral length 1.7-2.4 mm), which lacks elytral vittae, may also eventually be found in northern/western Florida.

Adults may be confused with *Gonielmis* or *Promoresia*; be sure to observe prothoracic characters.



O. ovalis



O. trivittatus

Florida species

O. ovalis (LeConte)

ADDITIONAL REFERENCES: Brown 1972; Ciegler 2003; Epler et al. 2005; White 1982.

GENUS *Oulimnius*

DIAGNOSIS: Larvae are distinguished by the prothorax without a posterior sternum; mesopleuron with two subequal sclerites; abdominal segments 1-7 with pleural sutures; dorsum without humps.

Adults are distinguished by the very small size (< 2 mm); filiform antennae; anterior tibiae with tomentum; center of pronotum mostly smooth, with complete sublateral pronotal carinae; 4th abdominal sternite with posterolateral tooth; and transverse hind coxae.



Oulimnius sp. larva



O. latiusculus, adult



O. nitidulus, oblique posterolateral view of elytra

NOTES: *Oulimnius* was not included in Epler (1996). However, since then both of the two species known from North America have been collected in the Panhandle of Florida: *O. latiusculus* (total length about 1.5 mm) and *O. nitidulus* (total length about 1.3 mm). The two species are separated by the larger, variably sized and more widely separated punctures on the elytra of *O. nitidulus*; the elytral punctures are smaller, consistently sized and closer together on *O. latiusculus*. Brown's classic 1972 (reprinted in 1976) work on dryopoid beetles neglected *O. nitidulus*; thus many records of *O. latiusculus* may refer to *O. nitidulus*.

Oulimnius are found on gravel, coarse sand, under rocks or on objects covered with algae in streams (Brown 1972; Ciegler 2003).

ADDITIONAL REFERENCES: Brown 1972; Ciegler 2003; Epler et al. 2005.

Florida species

O. latiusculus (LeConte)

O. nitidulus (LeConte)

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 twice as long as high.

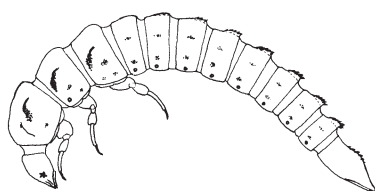
Adults are distinguished by the somewhat elongate body form; filiform antennae; anterior tibiae with tomentum; long, prominent tarsal claws; pronotum with lateral and posterior margins smooth and with carinae on basal half; 4th abdominal sternite with posterolateral tooth; and transverse hind coxae.



P. tardella larva



P. tardella adult



P. elegans larva
(adapted from Brown & White 1978)



P. elegans



P. tardella

male genitalia
(adapted from Brown & White 1978)



P. elegans adult

NOTES: Two species of *Promoresia* are known from the eastern Ne-arctic; larvae and adults of one (*P. tardella*, length 1.7-2.7 mm) have been collected in the Florida Panhandle and the other (*P. elegans*, length 2.1-2.8 mm) will probably also eventually be collected here. 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*). Note that in Brown (1972) and White (1982) the opposite is incorrectly stated and in White (1982) larval figures for *P. elegans* and *P. tardella* are switched.

Promoresia are found in gravel and under rocks in streams.

ADDITIONAL REFERENCES: Brown 1972; Brown & White 1978; Ciegler 2003.

Florida species

P. tardella (Fall)

GENUS *Stenelmis*

DIAGNOSIS: Larvae are distinguished the tooth at each corner of the anterior margin of the head; prothorax with a posterior prosternum; dorsal tubercles not arranged in parallel longitudinal rows; and last abdominal segment with a pair of posterolateral spines.

Adults are distinguished by the filiform antennae; fore tibiae without fringe of tomentum; and transverse hind coxae. Males of some species possess a spinose ridge on the inner margin of the mid tibia.



Stenelmis sp. larva



S. lignicola adult

NOTES: *Stenelmis* is a speciose genus with 33 described species known from North America. The genus was revised by Schmude (1992) in an unpublished Ph.D. dissertation. Several of the new species described in his dissertation have been published (Schmude & Brown 1991; Schmude, Barr & Brown 1992) but many remain to be validated by official publication. Two of these species are found in Florida and are designated *S. sp. C* and *S. sp. D* in this manual. To date, 15 species are known from Florida. Dr. Schmude has graciously made specimens and figures available (all genitalia figures below are adapted from his illustrations) and has verified/identified many of the specimens.

In contrast to their more northern maculate/vittate conspecifics, many Florida *Stenelmis* specimens are immaculate. Based on material I've examined, one is more likely to encounter a maculate/vittate *Stenelmis* in the Panhandle than in peninsular Florida. Male genitalia provide the most reliable characters to identify many species, although females may often be identified by prothoracic and elytral sculpturing, especially when associated with males. Note that in specimens preserved in formaldehyde or highly concentrated alcohol the lateral flange of the aedaeagus (if present) may be invaginated or folded under the aedaeagus.

Although commonly referred to as "riffle beetles", *Stenelmis* occur in lakes and ponds in addition to flowing water.

ADDITIONAL REFERENCES: Barr & Chapin 1988; Brown 1972; Ciegler 2003; Hilsenhoff & Schmude 1992; Schmude 1992; Schmude, Barr & Brown 1992; Schmude & Hilsenhoff 1991.

Florida species

- S. antennalis* Sanderson
- S. convexula* Sanderson
- S. crenata* (Say)
- S. decorata* Sanderson
- S. fuscata* Blatchley
- S. grossa* Sanderson
- S. hungerfordi* Sanderson
- S. lignicola* Schmude & Brown
- S. mera* Sanderson
- S. morsei* White
- S. musgravei* Sanderson
- S. sinuata* LeConte
- S. xylonastis* Schmude & Barr
- S. sp. C* Epler
- S. sp. D* Epler

Key to adult male *Stenelmis* of Florida

- 1 At least basal portion of palpi brown to black; male genitalia as figured *S. musgravei*



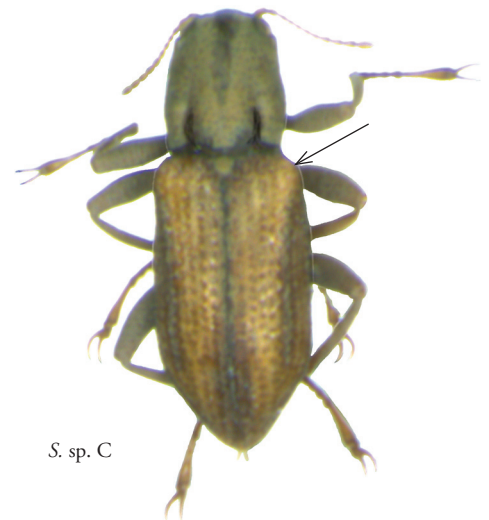
- 1' Palpi completely yellow-brown; genitalia various 2

- 2(1') Antennae bicolored, with distal 5-8 segments black, proximal segments yellow-brown; each elytron with a pair of spots or complete vitta; genitalia as figured *S. antennalis*

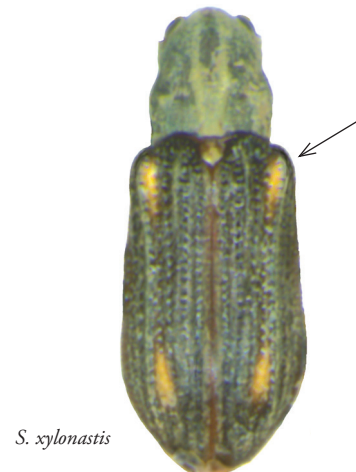


- 2' Antennae completely yellow-brown; elytra with or without spots or vittae; genitalia various 3

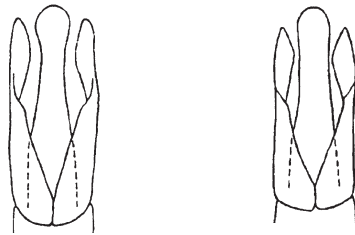
- 3(2') Elytral vittae or spots completely overlap the umbone (anterolateral corner) 4



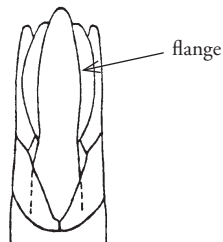
- 3' Elytral vittae or spots, if present, do not overlap umbone 7



- 4(3) Tarsi gradually expanded to apex; aedeagus without lateral flange 5



- 4' Tarsi dilated at about 3/4 length to apex; aedeagus with lateral flange 6



- 5(4) Pronotum with shallow median sulcus; elytra with broad vittae, sides of elytra yellow below sublateral carina; legs pale; aedeagus with apex only slightly wider than medial portion *S. morsei*



- 5' Pronotum with deep median sulcus; elytra with narrower vittae, elytra dark below sublateral carina; legs dark; aedeagus with apex much wider than medial portion *S. mera*



- 6(4') Vitta covers most of elytral disc, extending outside of sublateral carina; pronotum with dark basomesal triangles; middle tibia of male with mesotibial ridge; genitalia as figured **S. sp. C**



mesotibial ridge



- 6' Vitta extends from stria 3 to lateral margin; pronotum without dark basomesal triangles; middle tibia of male without mesotibial ridge; genitalia as figured **S. sp. D**



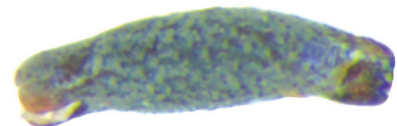
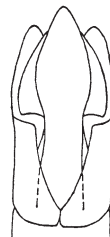
- 7(3') Tarsomere 5 shorter than or subequal to tarsomeres 1-4; genitalia as figured **S. crenata**



- 7' Tarsomere 5 distinctly longer than tarsomeres 1-4 8



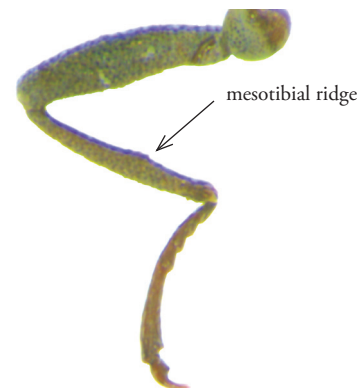
- 8(7') Surface of femur punctate, not noticeably granulate; aedeagus distinctly arrowhead-shaped **S. grossa**



- 8' Surface of femur granulate; aedeagus not distinctly arrowhead-shaped 9

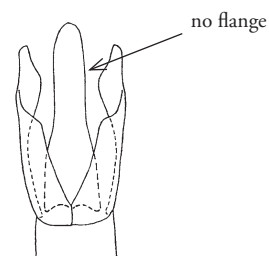


9(8') Middle leg of male with mesotibial ridge (ridge may be weak) 10

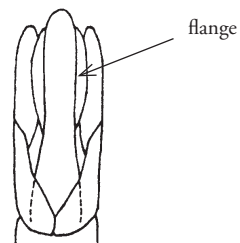


9' Middle leg of male without mesotibial ridge 13

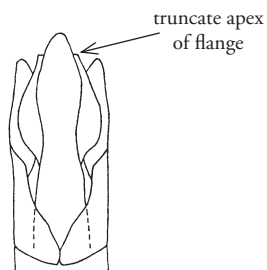
10(9) Aedeagus without lateral flange; basal portion of parameres much longer than apical portion ***S. decorata***



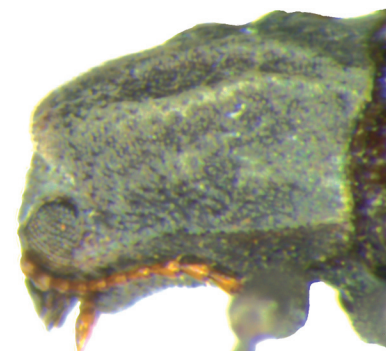
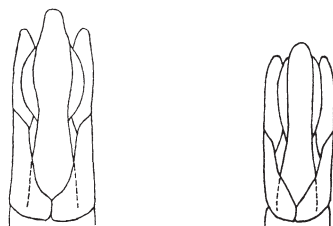
10' Aedeagus with lateral flange (but may be folded under aedeagus); basal portion of parameres subequal to apical portion 11



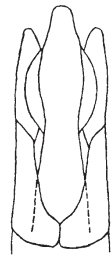
11(10') Pronotum weakly sculptured; aedeagus with wide lateral flange that is apically truncate ***S. convexula***



11' Pronotum coarsely sculptured; aedeagus with lateral flange smaller to almost absent, and apically rounded 12



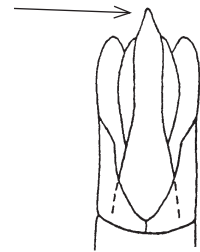
- 12(11') Larger, pronotal/elytral length 2.9-3.9+ mm; aedeagus wider medially, with shorter, wider lateral flange *S. fuscata*



- 12' Smaller, pronotal/elytral length 2.5-3.1 mm; aedeagus narrow medially, with a longer but narrower lateral flange *S. hungerfordi*



- 13(9') Apex of aedeagus pointed *S. xylonastis*



- 13' Apex of aedeagus rounded (see below) 14

- 14(13') Anterolateral angles of pronotum strongly divergent and truncate apically; pronotum coarsely sculptured and without dark basolateral triangles; larger, pronotal/elytral length 3.0-3.7 mm; genitalia as figured *S. sinuata*



- 14' Anterolateral angles of pronotum not strongly divergent, attenuate apically; pronotum weakly sculptured and with dark basolateral triangles; smaller, pronotal/elytral length 2.6-3.3 mm; genitalia as figured *S. lignicola*



basolateral triangle



Notes on species

- S. antennalis* - Pronotal/elytral length 2.4-3.3 mm. Known from Nassau County westward through the Panhandle; not known to occur in peninsular Florida. Note that the aedaeagus has a lateral flange, contrary to that illustrated by Young (1954). Rarely, *S. hungerfordi* may have darkened apical antennomeres. I have examined three such specimens from the Santa Fe River in Gilchrist County (determined and generously loaned by Dr. K.L. Schmude). The darkened antennomeres were not as dark as typical *S. antennalis* (which are normally shining black); these specimens lacked the usual bimaculate elytra present on *S. antennalis* and were otherwise typical *S. hungerfordi* (note that weakly bimaculate elytra also occur in some *S. hungerfordi*).
- S. convexula* - Pronotal/elytral length 2.7-3.5 mm. Common and known from northern and western Florida south to Alachua Co.; it is very common in the Panhandle. Elytral color varies from vittate to immaculate, with the immaculate form the most common in Florida. In most specimens the pronotum and anteromedial portion of the elytra are relatively smooth, with indistinct discal costae (longitudinal ridges that begin at about half way across the base of the elytron). The relatively smooth pronotum alerts one to this species, but I always pull the genitalia from a male to confirm this species' identity.
- 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 uncommon (in Florida) 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 known from Jefferson County west through the Panhandle; I have not seen it from the Suwannee drainage. This species is one of three (along with *S. mera* and *S. morsei*) known from the state in which the male lacks a lateral flange on the aedaeagus. Note that preservation in formalin or other strong preservatives may cause the lateral flange to shrivel or fold under the aedaeagus (in taxa that normally have this structure), but the longer basal portion of the parameres in *S. decorata*, *S. mera* and *S. morsei* will separate those taxa. Schmude (1992) termed this type of genitalia as "Type I"; all other Florida species of *Stenelmis* have "Type II" genitalia (aedaeagus with lateral flange and shorter basal portion of parameres).
- S. fuscata* - Pronotal/elytral length 2.9-3.9+ mm. A common species that occurs throughout the state south to the Everglades. Throughout most of this species' range (from FL and MS north to NC and WI) the elytra are bimaculate but most Florida specimens are immaculate. Specimens from the southern part of the state are smaller and narrower than those from the northern portion of the state.
- S. grossa* - Pronotal/elytral length 2.7-4.1 mm. An uncommon species known in Florida only from Escambia, Jefferson and Santa Rosa Counties. The femora appear almost bare when compared to the granulose femora of other Florida *Stenelmis* species; this is most easily seen on dry specimens. The arrowhead-shaped aedaeagus is distinctive for Florida *Stenelmis*.
- S. hungerfordi* - Pronotal/elytral length 2.5-3.1 mm. A common species throughout much of peninsular Florida, but uncommon in the Panhandle. In some male specimens, the mesotibial ridge is reduced or absent (I have such a specimen from the Suwannee River in Levy Co., verified by Schmude); such specimens could be confused with *S. lignicola*. The pronotum of *S. hungerfordi* is more coarsely sculptured, with deeper oblique lateral depressions and the discal costae are better developed (discal costae are barely noticeable in *S. lignicola*). *Stenelmis hungerfordi* appears to be most common in calcareous streams and rivers. Some specimens are faintly bimaculate (best seen by lifting the elytra). See also *S. antennalis* above.
- S. lignicola* - Pronotal/elytral length 2.6-3.3 mm. This species is found throughout the state at least as far south as Hardee and Polk Counties. This relatively recently described species (Schmude, Barr & Brown 1992) 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, and is

common on Hester-Dendy samplers. It is one of four *Stenelmis* species found in Florida in which the male lacks a mesotibial ridge.

- S. mera* - Pronotal/elytral length 2.3-3.2 mm. This species, new for Florida, has recently been collected in extreme western Florida (known from at least three streams in Escambia Co.). It is one of three species known from Florida in which the vitta extends forward over the umbone ("shoulder") and one of four with Type I genitalia.
- S. morsei* - Pronotal/elytral length 2.2-2.7 mm. Another species new to Florida, recently collected in Escambia Co. Like *S. mera*, it has vittae that extend forward over the umbone and Type I genitalia.
- S. musgravei* - Pronotal/elytral length 2.3-3.0 mm. The only Florida *Stenelmis* with dark palpi, it is uncommon from Alachua Co. west through the Panhandle. It is variable in coloration; some specimens may have several antennomeres darkened; specimens may be vittate or immaculate. 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 County west through the Panhandle. Usually easily recognized by its larger size and laterally sinuate pronotum, also note that the projecting anterolateral angles of the pronotum are truncate (in most other *Stenelmis* these projections are more attenuated). 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 found mostly in the northern tier of counties in the state. It is one of four Florida species in which the male lacks a mesotibial ridge.
- S. sp. C* - Pronotal/elytral length 2.1-2.5 mm. An undescribed species that will be described by Dr. K.L. Schmude (paper in preparation). I have specimens from Big Juniper Creek and Big Coldwater Creek in Santa Rosa Co.; it is also known from Escambia Co. in Florida (the species occurs from Louisiana to North Carolina). It is similar to *S. morsei* in general appearance but has larger tarsi and tarsal claws; it also has a lateral flange on the aedaeagus.
- 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 Florida; there is also a single record from Marion Co. It is one of four Florida species in which the male lacks a mesotibial ridge.

Other species

- S. gammoni* White & Brown - Ciegler (2003) included Florida in the range of this apparently rare species known only from the Blue Ridge Mountains from Virginia to South Carolina (Schmude 1992). I have seen no material of this taxon from Florida. In the key above it would key with *S. musgravei* because of its dark palpi, but its anterior elytral markings overlap the umbone (they do not overlap the umbone in *S. musgravei*).
- S. lateralis* Sanderson - Not recorded from Florida, but known from southern Mississippi and Louisiana. This species, which has broad elytral vittae, would key to *S. morsei* in my key above but is generally larger (pronotal/elytral length 2.4-3.1 mm), is more elongate and has a more convex pronotum and smaller pronotal granules (Schmude 1992). It is also similar to *S. sp. C* but has an aedaeagus that lacks lateral flanges.

FAMILY **GYRINIDAE***whirligig beetles*

7

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 the presence of four apical hooks on the tenth abdominal segment.

Adults are distinguished by the divided compound eyes, resulting in an apparent pair of dorsal and ventral compound eyes (compound eyes are separated only by a thin ridge in *Spanglerogyrus*); short clubbed antennae, with third segment enlarged and ear-like; fore legs adapted for grasping; greatly flattened, paddle-like mid and hind legs (legs not as broadly flattened in *Spanglerogyrus*); and first abdominal sternite completely divided by the hind coxae.

*Gyrinus elevatus*foreleg of male *Dineutus nigrior*posterior of *Dineutus* sp. larva*Dineutus* sp. larva

NOTES: Four genera of Gyrinidae are known from North America; all four genera are found in Florida. 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; these rafts may contain a single species or as many as 13 (Hilsenhoff 1990a), and may include more than one genus (*Dineutus* and *Gyrinus* are often found together). Adults feed on anything they can find or subdue on the water's surface; larvae are predacious. Adults produce defensive secretions that may be pleasant smelling or foul.

Male gyrinids are easily distinguished from females by the expanded setose segments of the fore tarsi.

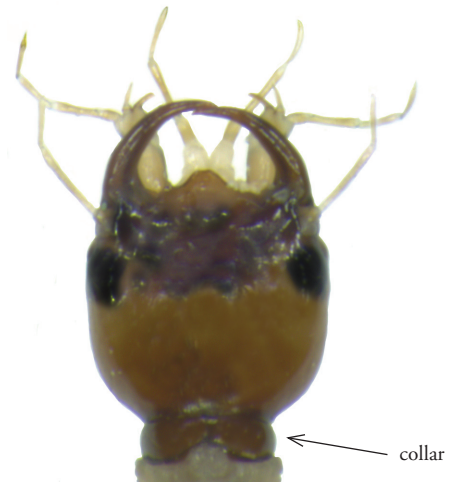
ADDITIONAL REFERENCES: Ciegler 2003; Folkerts 1979; Hilsenhoff 1990a, 1990b; Oygur & Wolfe 1991; Roughley 2001a; Sanderson 1982; Wall 1974; Wood 1962.

Florida genera

Dineutus MacLeay*Gyretes* Brullé*Gyrinus* Müller*Spanglerogyrus* Folkerts

Key to genera of Gyrinidae larvae of Florida(the larva of *Spanglerogyrus* is unknown)

- 1 Head more square, with a distinctly narrowed posterior collar *Dineutus*



- 1' Head more rectangular, without a narrowed posterior collar 2

- 2(1') Frontal projection with 2-4 teeth in a transverse row *Gyrinus*



- 2' Frontal projection broadly truncate, without teeth ...
..... *Gyretes*



Key to genera of Gyrinidae adults of Florida

- 1 Length < 3 mm; dorsal and ventral compound eyes separated by thin ridge; lateral portion of pronotum and venter white *Spanglerogyrus*



- 1' Length > 3 mm; dorsal and ventral compound eyes well separated; venter black, reddish-brown to yellow 2

- 2(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*



- 2' 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 3

- 3(2') Size larger, > 8 mm; scutellum concealed; elytra smooth or with barely impressed weak striae .. *Dineutus*

*Dineutus carolinus**Gyrinus elevatus*

- 3' Size smaller, ≤ 7 mm; scutellum exposed; elytra with distinct striae *Gyrinus*

GENUS *Dineutus*

DIAGNOSIS: Larvae are distinguished by the more squat head capsule with a distinctly narrowed posterior collar; an anteromedial frontal projection that may or may not be notched, with a smaller lateral tooth on each side; and the mandible without an inner tooth.

Adults are distinguished by the larger size (> 8 mm); dorsal and ventral compound eyes widely separated; non-pubescent pronotum and elytra; concealed scutellum; elytra smooth or with weak, indistinct striae; and last two abdominal sternites without a median longitudinal row of setae.



Dineutus sp. larval head



D. carolinus female

NOTES: At least nine *Dineutus* species occur in Florida. The genus was revised by Wood (1962) as a Masters thesis, but his study was never published in its entirety; he (Wood 1968) did publish a portion that dealt with the taxonomy of two species. Adults are readily distinguished from the other three gyrinid genera in Florida by their large size and concealed scutellum. *Dineutus* are usually seen circling about on the water's surface, often in huge rafts (which sometimes include *Gyrinus* species), and will quickly dive if collection is attempted. 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* will feed on anything, dead or alive, that lands on the water's surface that they can hold or subdue. I have observed numerous adults of *D. hornii* Roberts (not found in Florida) simultaneously attack the same prey item; the effect was similar to that seen in numerous films depicting feeding piranha! Larvae are predacious and frequently occur on Hester-Dendy samplers.

There is some sexual dimorphism evident, especially in the shape of the posterior portion of the elytra. The key below should easily identify both sexes, but rely on male genitalia for more positive identifications.

ADDITIONAL REFERENCES: Ciegler 2003; Cook et al. 2006; Roberts 1895; Wood 1962, 1968.

Florida species

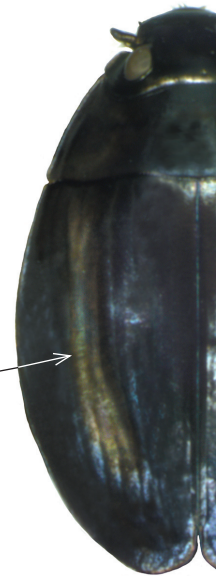
- D. americanus* (Linnaeus)
- D. angustus* LeConte
- D. assimilis* Kirby
- D. carolinus* LeConte
- D. ciliatus* (Forsberg)
- D. discolor* Aubé
- D. emarginatus* (Say)
- D. nigrior* Roberts
- D. serrulatus* LeConte

Key to adult *Dineutus* of Florida

- 1 Size larger, ≥ 12 mm; each elytron with an arcuate bronzy metallic vitta; fore femur of male without a tooth; male genitalia with a short, broad aedeagus .. *D. ciliatus*



bronzy vitta

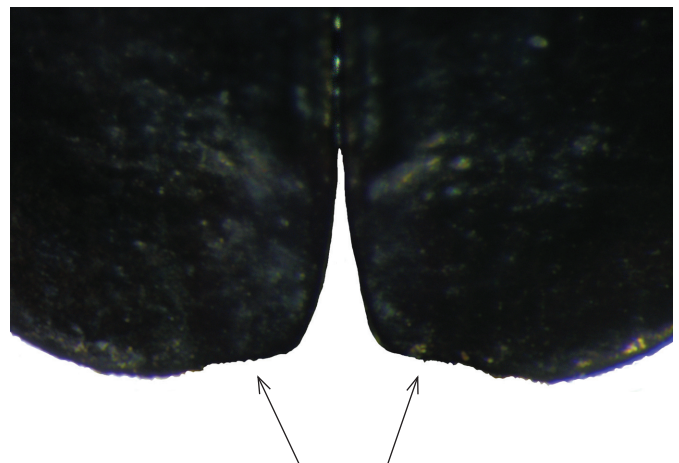


- 1' Smaller, 8-13 mm; elytra without bronzy vittae; fore femur of male with or without a tooth; aedeagus not as broad, may be longer (figures below) 2

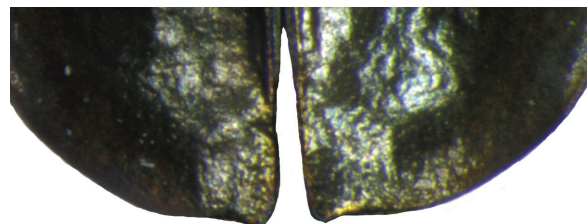
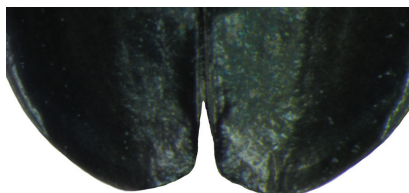


tooth

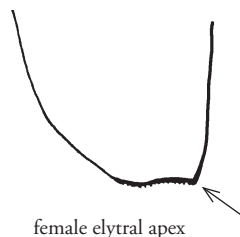
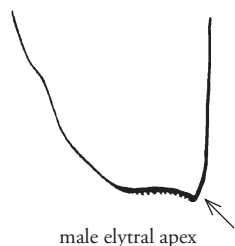
- 2 Elytral apices serrulate (with many small teeth; you may have to use 20-30X and a light background to observe); fore femur of male with a tooth 3



- 2' Elytral apices smooth; fore femur of male with or without a tooth 5

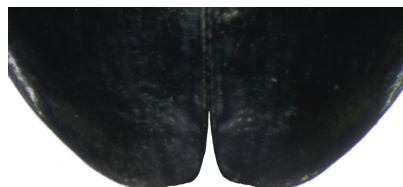


- 3(2) Small, 8-9 mm; inner apical angle of elytral apices noticeably produced; venter black; aedeagus blunter and much shorter than parameres; rare, extreme south Florida only *D. americanus*



(figs. adapted from Wood 1962)

- 3' Larger, 8-12 mm; inner apical angle of elytral apices more or less rounded; venter black or reddish-brown; common throughout Florida 4



- 4(3') Venter chestnut brown and shining or dark brown with last sternite reddish-brown; parameres narrower apically, aedeagus more rapidly attenuated *D. serrulatus*

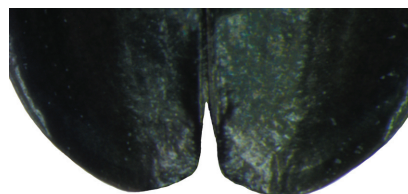


- 4' Venter black; parameres broader apically, aedeagus more gradually narrowed to apex *D. carolinus*

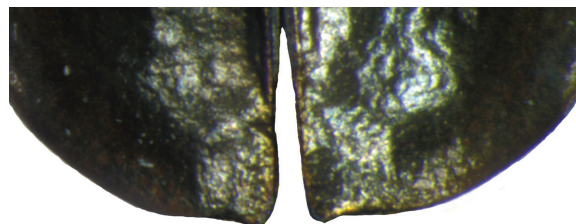
D. serrulatus

D. carolinus

- 5(2') Inner apical angle of elytral apices rounded; aedeagus shorter than parameres and abruptly narrowed at apex *D. emarginatus*

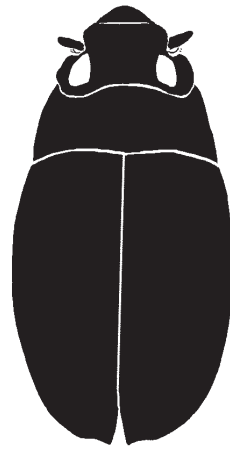


- 5' Inner apical angle of elytral apices angulate or produced into a point; aedeagus variable 6



- 6(4') Venter brownish-yellow 7
- 6' Venter black/dark brown 8

- 7(6) Form narrowly oval; aedeagus and parameres narrower; 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 and parameres broader; average size larger, 10.5-13.0 mm; elytral apices at most slightly produced, with the lateral margins markedly sinuate posteriorly
..... *D. discolor*



- 8(6') Smaller, 9-10 mm; male fore femur toothed; aedeagus as figured, much shorter than the parameres; female gonocoxae elongate oval with truncate apices **D. productus*
(probably does not occur in Florida; see Notes)



female gonocoxae

(figs. adapted from Wood 1962)

- 8' Larger, 10-12 mm; male fore femur without tooth; aedeagus longer (see figs below); female gonocoxae broader or with rounded apices 9

*D. assimilis**D. nigrior*

female gonocoxae

- 9(8') Fore tibia curved inward preapically, with outer apical angle produced to a point; elytral apices only slightly separated; aedeagus more gradually narrowed to apex

D. nigrrior



- 9' Fore tibia straight preapically, with outer angle merely rectangular; elytral apices separated; aedeagus more abruptly narrowed to 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 (I could not locate this specimen in the FSCA); Turnbow & Thomas (2008) reported it from Great Inagua in the Bahamas. A long trail of confusion follows the name *americanus* through the literature (see Wood 1962:3-5). Originally described by Linnaeus (1768) in *Gyrinus*, the name was later attributed to Fabricius, then Say. However, Say's (1825) redescription of *americanus* actually applied to *D. assimilis*, a common species of the U.S., while Linnaeus' *americanus* is a Bahamian species. Ciegler (2003) also used *D. americanus* incorrectly. The fore femur of the male is toothed.
- D. angustus* - Length 9.0-10.5 mm. The fore femur of the male is toothed. This species may be difficult to separate from *D. discolor*; examining examples of both species at the same time is the easiest way to learn to separate the two. In addition to the difference in general shape, *D. discolor* averages larger and is generally lighter yellow beneath; *D. angustus* tends to be more reddish beneath. There is usually more evidence of elytral striae 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 (Jackson County) 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* or *D. productus*; I've seen this species masquerading as *D. nigrrior* and *D. productus* in collections. I've examined some specimens of *D. assimilis* on which the posterior margins of the elytra were not smooth, but almost appeared serrulate, which may lead to a determination of *D. serrulatus*. However, note that the male of *D. serrulatus* bears a tooth on the fore femur, lacking in *D. assimilis*. The names "*Gyrinus americanus* Say" and "*D. americanus* (Linnaeus)" have been misapplied to this species (see above).

- 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*. *Dineutus carolinus* can be confused with examples of *D. serrulatus* in which the elytra are more rounded apically. Note that *D. carolinus* is almost always black beneath, while *D. serrulatus* is reddish-brown (but may be dark reddish-brown). Also, the aedeagus of *D. carolinus* is more gradually tapered; that of *D. serrulatus* is more sharply attenuated. 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 part 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. The fore femur of the male lacks a tooth.
- D. discolor* - Length 10.5-13.0 mm. This species may be difficult to separate from the relatively smaller *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 and Santa Rosa Counties), and favored streams with a higher pH (such as the 7.3 given for the Santa Fe River) than did *D. 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. The fore femur of the male is toothed.
- D. emarginatus* - Length 8.5-11.0 mm. This species was previously considered to consist of two subspecies (*D. e. emarginatus* (Say) and *D. e. floridensis* Ochs) based on size and distribution. Cook et al. (2006) demonstrated through principle components analyses of several morphological characters that this separation was unjustified; thus we have but one species, *D. emarginatus*, in Florida. The fore femur of the male is toothed.
- D. nigrior* - Length 10-12 mm. Easily confused with *D. assimilis*. An uncommon species, it does not appear to occur farther south in Florida than Hernando and Volusia Counties (fide Peck & Thomas 1998). The fore femur of the male lacks a tooth.
- D. serrulatus* Length 9-12 mm. A common species through most of the state, it occurs at least as far south as Hardee County. Wood (1968) considered *D. analis* Régimbart to be a subspecies of *D. serrulatus*; however, Ciegler (2003) treated them as separate species. Both subspecies occur in Florida; *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 the common subspecies throughout the remainder of the state. The two subspecies may be separated by the black, shiny elytra, with rounded apices, of *D. s. serrulatus*; those of *D. s. analis* are bronzed and not as shiny, with their apices sinuate and dehiscent (separated). According to Wood (1968), an overlap zone between the two subspecies exists around the Chipola and Apalachicola Rivers. The fore femur of the male is toothed.

Other species

- D. productus* Roberts - Length 9-10 mm. Young (1954) reported this species from Liberty County, 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 County, Georgia, identified as *D. productus* by Young; two were *D. assimilis* and the other was *D. emarginatus*. It is doubtful that *D. productus* occurs in Florida, but its occurrence in eastern Texas may mean that it could eventually be found in the western Panhandle; thus it is included in the key above. The fore femur of the male is toothed.

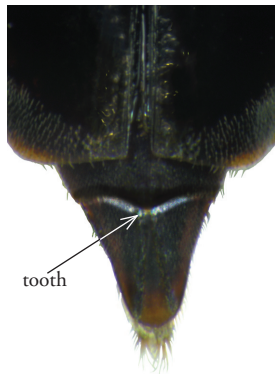
GENUS *Gyretes*

DIAGNOSIS: Larvae are distinguished by the more elongate rectangular head shape, without a distinct posterior collar; a truncate median frontal projection without teeth; and the mandible without an inner tooth.

Adults are distinguished by the smaller size (≤ 6 mm); dorsal and ventral compound eyes well separated; pronotum and elytra with pubescence on lateral margins; concealed scutellum; smooth, shining elytra; and last 2 abdominal sternites with a median longitudinal row of setae.



Gyretes sp. larval head



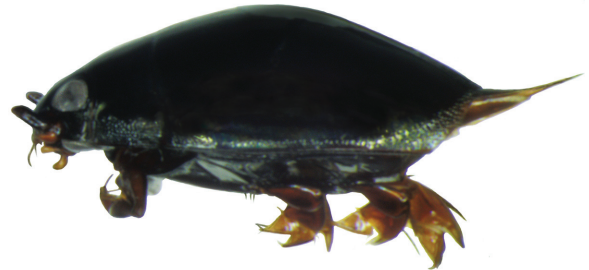
G. sinuatus female posterior
(enhanced to show tooth)



G. iricolor female posterior



G. iricolor male, dorsal



G. iricolor female, lateral

NOTES: Three species of this Western Hemisphere gyrid genus occur in North America (Babin & Alarie 2004); one species, *G. iricolor* (length 4.5-5.1 mm), is known from the Panhandle counties of Florida as well as Alabama and Mississippi (Folkerts & Donovan 1974). There is a strong possibility that another species, *G. sinuatus* LeConte (length 4.7-6.0 mm), may eventually be collected here, because it occurs in Alabama (Monroe County) not far from the state line with Florida. The two species may be separated in both sexes by the presence of a posteromedian tooth on the penultimate abdominal tergite in *G. sinuatus* that is lacking in *G. iricolor*.

Gyretes are found in sand and gravel bottomed streams, where they occur beneath overhanging banks.

ADDITIONAL REFERENCES: Babin & Alarie 2004; Wall 1974.

Florida species

G. iricolor Young

GENUS *Gyrinus*

DIAGNOSIS: Larvae are distinguished by the more elongate rectangular head shape, without a distinct posterior collar; a median frontal projection with 2-4 apical teeth; and the mandible with a small inner tooth.

Adults are distinguished by the small size (≤ 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.



Gyrinus sp. larval head



G. elevatus

NOTES: Following Atton (1990) and Oygur & Wolfe (1991), 41 species of *Gyrinus* are known from North America. At least eight occur in Florida. Two additional species (*G. minutus* Fabricius and *G. pernitidus* LeConte) recorded from Florida by Leng & Mutchler (1918) 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 malodorous. 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.

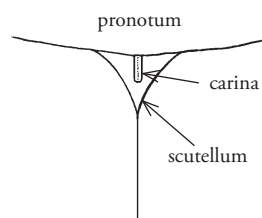
ADDITIONAL REFERENCES: Ciegler 2003; Epler et al. 2005; Fall 1922; Hilsenhoff 1990a, 1990b; Oygur & Wolfe 1991.

Florida species

G. analis Say
G. elevatus LeConte
G. gibber LeConte
G. marginellus Fall
G. pachysomus Fall
G. parvus Say
G. rockinghamensis LeConte
G. woodruffi Fall

Key to adult *Gyrinus* of Florida

- 1 Scutellum with a fine, anteromedian longitudinal carina (ridge); dorsal body surface dull, strongly microreticulate; aedeagus apically notched ***G. rockinghamensis***



- 1' Scutellum without carina; dorsal body surface shining in most males, may be weakly to moderately microreticulate in some females; aedeagus not apically notched 2
- 2(1') Venter brownish-yellow to reddish-yellow/reddish-brown/dark reddish brown 3

*G. elevatus*

reddish-brown sternites

*G. analis*

metallic black sternites

IV
VII

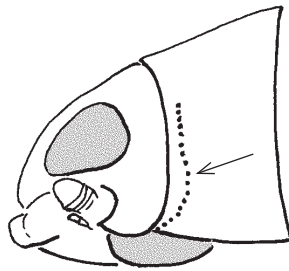
- 2' Venter mostly metallic black, especially abdominal sternites IV-VII, but may have reddish-brown/reddish-black thoracic sternites or margins on abdominal sternites, or last sternite may be reddish-orange 6

- 3(2) Form broader; size larger, 5.5-6.9 mm (average around 6 mm); aedeagus broad apically ***G. pachysomus***



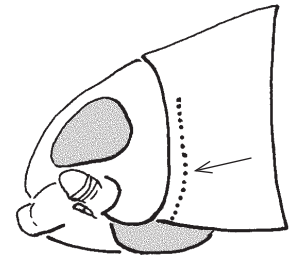
- 3' Form narrower; size smaller, 3.9-5.2 mm; aedeagus narrow or broad apically (see below) 4

- 4(3') Transverse line of tiny punctures on pronotum arched near base; aedeagus with very narrow apex .. *G. elevatus*



G. elevatus

- 4' Transverse line of tiny punctures on pronotum parallel to anterior margin; aedeagus with broader apex 5



- 5(4') Males: aedeagus with expanded apex, broader than preapical portion of aedeagus. Females: shiny; length 4.2-4.4 mm *G. marginellus*



- 5' Males: aedeagus without expanded apex, narrower than preapical portion of aedeagus. Females: dull; length 4.8-5.2 mm *G. woodruffi*



- 6(2') Metepisternal ostiole not visible; dorsal surface dull, with fine microreticulation; aedeagus with broad apex *G. gibber*



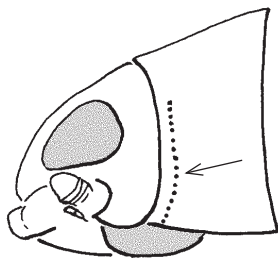
no
ostiole

- 6' Metepisternal ostiole visible; dorsal surface shiny or with a brassy sheen, microreticulation not as evident, often barely detectable; aedeagus with narrow apex (see below) 7



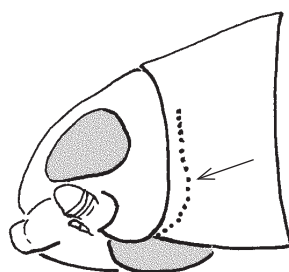
ostiole

- 7(6') Anal sternite usually reddish-orange (may be dull red); transverse line of tiny punctures on pronotum parallel to anterior margin; aedeagus more sharply attenuated; 11th elytral stria near the elytron's lateral margin only in posterior half at most *G. analis*



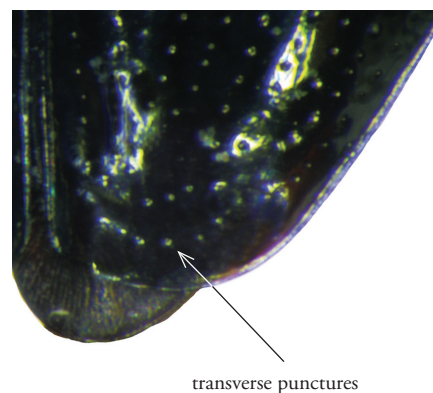
anal sternite

- 7' Anal sternite blackish-red or brown; transverse line of tiny punctures on pronotum arched near base; aedeagus with apex broader, not as attenuated; 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 *G. parvus*



Notes on species

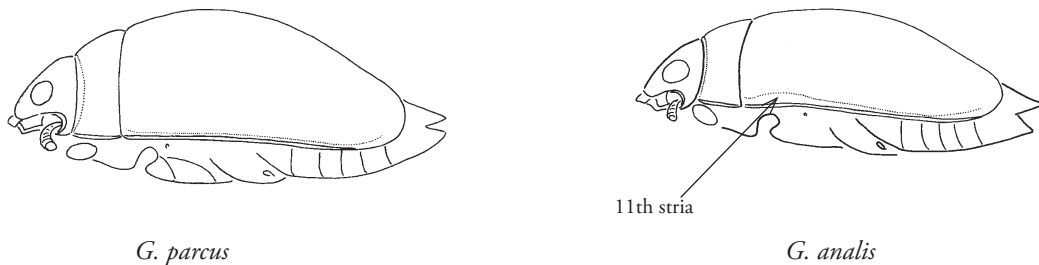
- G. analis* - Length 4.43-5.5 mm. This species is relatively common in the northern portion of the state, where it occurs primarily in lotic habitats. Males have a dull brassy sheen and little noticeable microreticulation; females have a distinct, uniform microreticulation.
- G. elevatus* - Length 4.6-5.2 mm. Found throughout most of the state, usually in lentic habitats (but also in sand-bottomed streams), the distinctive, almost needle-like aedeagus easily identifies males of this species. Female *G. elevatus* is most likely to be confused with *G. woodruffi*, *G. marginellus* or *G. pachysomus*. The arched pronotal transverse impressed line of tiny punctures is found on *G. elevatus* and *G. pachysomus*, but you may need to see material of the other species to get a "feel" for the difference. Note that females of *G. pachysomus* are considerably larger than the other three species; *G. elevatus* females are shinier than the slightly duller *G. woodruffi*; and *G. marginellus* females are smaller than the others.
- G. gibber* - Length 4.7-6.2 mm. Oygur & Wolfe (1991) synonymized *G. floridensis* and *G. frosti* with the older name *G. gibber*. Young (1954) considered this taxon (as *G. floridensis*) a species of lakes and ponds of the northern peninsula uplands.
- G. marginellus* - Length 3.9-4.5 mm. This species was first reported from Florida (Okaloosa County) by Epler et al. (2005). A recent visit to the FSCA revealed 25 specimens from Bay County collected by Frank Young in 1981, and specimens from Alaquá Creek (Walton County) are in the FDEP (Tallahassee) collection. Females may be difficult to separate from those of *G. woodruffi*. Female *G. marginellus* are shinier than those of *G. woodruffi*, but one should have examples of both on hand to note the difference. In material I examined, the last transverse stria near the apex of the elytron had 4-6 punctures in *G. marginellus*; there were 7-9 in *G. woodruffi*. Note that my sample size was small, and this may not hold when more specimens are examined. Although apparently restricted to the



Panhandle in Florida, *G. marginellus* probably occurs throughout the northern tier of Florida counties; *G. woodruffi* is known from the same area and south down the Peninsula. Rely on identifications based on male genitalia.

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 lotic habitats, but can also be found in ponds and lakes. Easily recognized because of its broader, stouter appearance ("*pachysomus*" means "thick body") and greater length, this species shares with *G. elevatus* and *G. parvus* a slightly arched transverse line of tiny punctures on the pronotum near the anterior margin.

G. parvus - Length 4.3-5.5 mm. This species was recorded for Florida by Oygur & Wolfe (1991) and mentioned by Young (1954). The Young (1954) reference is apparently due to a putative record of this species in Leng & Mutchler (1918: 98), in which they speculated on the identity of "An unnamed species noted from Biscayne Bay in Schwarz Mss. notes". I have not been able to locate any material of this species from Florida, and the location and locality data for the Florida record is unknown (Oygur, pers. comm. 2009). Ciegler (2003) did not record this species from South Carolina. The closest other record for this species in Oygur and Wolfe (1991) is from eastern Texas. The 11th elytral stria is at or very near the elytron's lateral margin throughout its length so that it virtually lies in the lateral fold of the elytron; this character may be difficult to observe; the male genitalia and the transverse arcuate line of punctures on the pronotum provide better, more reliable characters.



(figures adapted from Oygur & Wolfe 1991)

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 uncommon (in Florida) species. This species has been confused with the more northern *G. minutus* Fabricius, 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 the 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 species south of Lake Okeechobee. A character sometimes 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 *G. woodruffi* this line is further from the margin than in *G. elevatus* or *G. pachysomus*. I have found this character difficult to interpret; the transverse pronotal line and aedeagus provide characters that are easier to observe. See also *G. marginellus* above.

GENUS *Spanglerogyrus*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by their very small size (< 3 mm); dorsal and ventral portions of eye separated by thin ridge; white markings laterally on the pronotum; partially setose elytra without striae; tibiae of mid and hind legs extended considerably past the base of the tarsi; and white venter.



lateral view



lateral view of head and pronotum

NOTES: An enigmatic monotypic genus originally described from south-central Alabama, first recorded for Florida (Gadsden County) by Epler et al. (2005); it has since also been collected in Holmes County. Ciegler (2003) also noted it from South Carolina, and it has been collected in Bainbridge, Georgia (Wolfe, pers. comm. 2009).

A remarkable character of the gyrinids is their divided compound eyes, with the dorsal eye (above the water's surface) usually separated from the ventral eye (below the water's surface) by a section of cuticle at least half as wide as the dorsal eye. *Spanglerogyrus* is unusual among the Gyrinidae in that the dorsal and ventral eyes are separated only by a thin ridge of cuticle. Also unusual are the tibiae of the mid and hind legs, which extend considerably past the base of the tarsi; the mid and hind legs are also much narrower than the greatly broadened mid and hind legs of the other Nearctic gyrinid genera. Adults also have a long curved seta that arises from the posterolateral angle of the elytron.

Spanglerogyrus adults are found beneath undercut stream banks with hanging roots of terrestrial vegetation.

ADDITIONAL REFERENCES: Ciegler 2003; Epler et al. 2005; Folkerts 1979; Steiner & Anderson 1981.

Florida species

S. albiventris Folkerts

FAMILY **HALIPLIDAE***crawling water beetles***8**

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 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 unique hind coxae that are expanded as broad, flattened plates that cover 2-5 basal abdominal sternites (leaving 1-3 sternites exposed) and about half of the hind femora.

*Peltodytes* sp. larva*Peltodytes sexmaculatus*

NOTES: Four genera of haliplids occur in the Nearctic; two of these, *Haliplus* and *Peltodytes*, are found in Florida. The Nearctic Haliplidae are currently under revision by Ing. B.J. van Vondel (Rotterdam, The Netherlands).

Adult haliplids are small, brightly colored, yellow-orange beetles commonly found in dense aquatic vegetation or algal masses along the margins of ponds and lakes, and in the slower portions of streams and rivers. Larvae are herbivorous or feed on periphyton; adults are primarily herbivorous but are also known to occasionally ingest animal matter.

Adult haliplids have dense natatory setae on their legs and may swim quite well. The common name “crawling water beetles” may come from their manner of swimming (alternating right side legs with left side legs, rather than both mid and hind legs of both sides propelling simultaneously, as in dytiscids) or it may be from their habit of crawling in or on algae and matted plant material. The enlarged, flattened hind coxae serve to store air for respiratory and hydrostatic purposes. Larvae of *Peltodytes* have well developed chelate forelegs, the fifth tarsomere being opposed to a projection or spines on the fourth tarsomere; larvae of *Haliplus* have weakly chelate forelegs, or the forelegs may not be chelate.

Florida genera

Haliplus Latreille*Peltodytes* Régimbart

ADDITIONAL REFERENCES: Brigham 1982; Ciegler 2003; Hilsenhoff & Brigham 1978; Matta 1976; Nilsson & Vondel 2005; Roberts 1913; Roughley 2001b; Vondel & Spangler 2008.

Key to genera of Haliplidae larvae of Florida

- 1 Larvae with 1-3 dorsal pairs of long filaments on each body segment; last abdominal segment short; forelegs moderately to strongly chelate *Peltodytes*

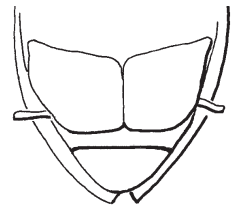


- 1' Larvae without long dorsal filaments, but short dorsal spines may be present; last abdominal segment long; forelegs weakly chelate or non-chelate *Haliplus*

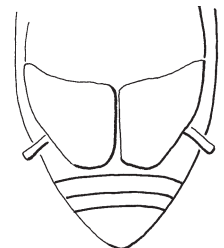


Key to genera of Haliplidae adults of Florida

- 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 last abdominal sternite exposed *Peltodytes*



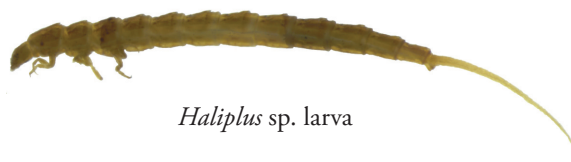
- 1' Posterior margin of pronotum without dark blotches, although a single anterior spot may be present; last segment of palpi shorter than penultimate segment; hind coxal plates smaller, leaving 1-3 abdominal sternites exposed *Haliplus*



GENUS *Haliphus*

DIAGNOSIS: Larvae are distinguished by the very weakly to moderately chelate foreleg (one species with essentially non-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 maxillary and labial palpi shorter than penultimate segment; pronotum without two black spots on posterior margin, although one may be present on anterior margin; the smaller, unmarginated hind coxal plates that leave the last three abdominal sternites exposed; and the lack of a fine sutural stria.

*H. mutchleri**Haliphus* sp. larva

NOTES: Forty-three species of *Haliphus* are recorded from North America (Nilsson & Vondel 2005); 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*, but in Florida *Haliphus* does not appear to be as common as *Peltodytes*.

Larvae of *Haliphus* have been described as having forelegs that are weakly chelate with the 4th segment more or less produced (White & Roughley 2008). However, most Florida larvae I've examined lack any form of a chelate foreleg. Vondel (pers. comm., 2009) noted that larvae of the subgenus *H. (Liaphlus)* and probably all larvae of *H. (Paraliaphlus)*, to which the majority of Florida species belong, have non-chelate forelegs (for subgenera, see Notes on species below). Larvae of the subgenus *H. (Haliphus)* have chelate forelegs, but none of these are known from Florida.



Non-chelate larval foreleg

Florida species

H. annulatus Roberts
H. confluentus Roberts
H. fasciatus Aubé
H. havaniensis Wehncke
H. mutchleri Wallis
H. pseudofasciatus Wallis
H. punctatus Aubé
H. triopsis Say

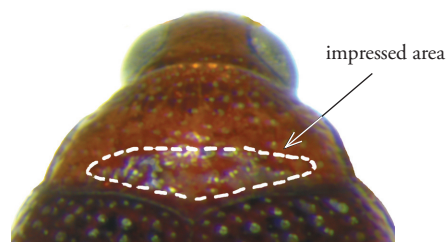
ADDITIONAL REFERENCES: Brigham 1982; Ciegler 2003; Hilsenhoff & Brigham 1978; Matta 1976; Nilsson & Vondel 2005; Roberts 1913; Vondel & Spangler 2008; Wallis 1933.

Key to adult *Haliplus* of Florida
(aedeagus figures adapted from Matta 1976)

1 Length typically less than 3 mm 2

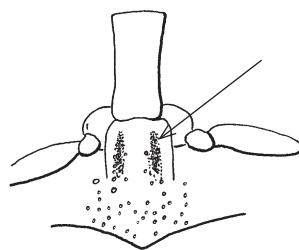
1' Length typically greater than 3 mm 4

2(1) Length < 2.6 mm; pronotum with a posterior transverse impression *H. annulatus*



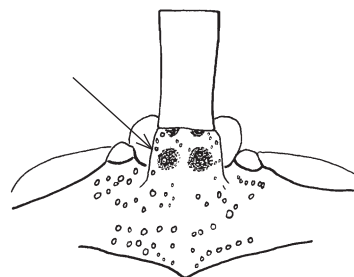
2' Length > 2.6 mm; pronotum without posterior transverse impression 3

3(2') Mid-metasternum with longitudinal furrows *H. confluentus*



H. confluentus

3' Mid-metasternum with a pair of large circular pits *H. havaniensis*



H. havaniensis

4(1') Anterior margin of pronotum without a median dark blotch .. 5



H. fasciatus

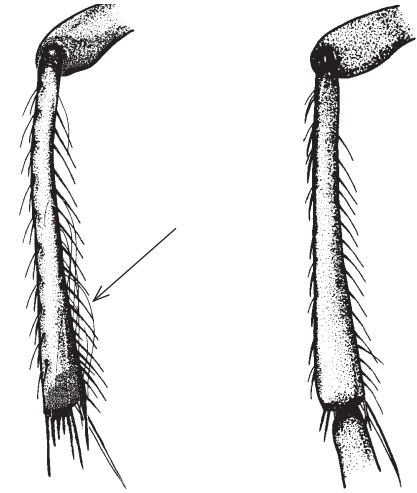
4' Anterior margin of pronotum with median dark blotch (blotch may be pale in teneral specimens) 6



H. mutchleri

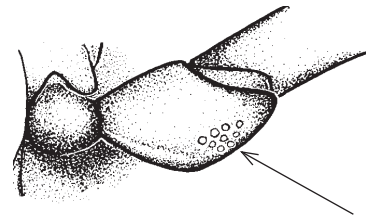
- 5(4) Size larger, 4.0-4.5 mm; hind tibia with a row of punctures on inner (upper) surface that each bear a long, thin seta; prosternal ridge with apex subequal in width to its base, ridge slightly constricted between middle coxae *H. fasciatus*

- 5' Size smaller, 3.3-3.5 mm; hind tibia without a row of punctures on inner surface of hind tibia; prosternal ridge with apex wider than base, evenly divergent from base to apex *H. pseudofasciatus*

*H. fasciatus**H. pseudofasciatus*

(adapted from Brigham 1982)

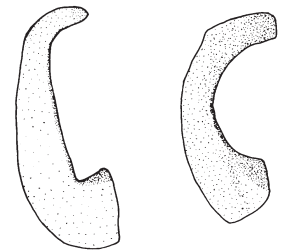
- 6(4') Middle trochanter with several deep, coarse punctures; male left paramere with dense setal fringe that extends to apex **H. leopardus*
(not recorded from Florida, but may occur in northern part of state)



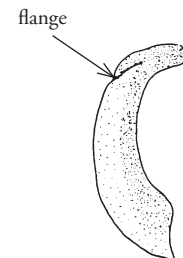
(adapted from Brigham 1982)

- 6' Middle trochanter without deep punctures; male left paramere with setal fringe ending before apex 7

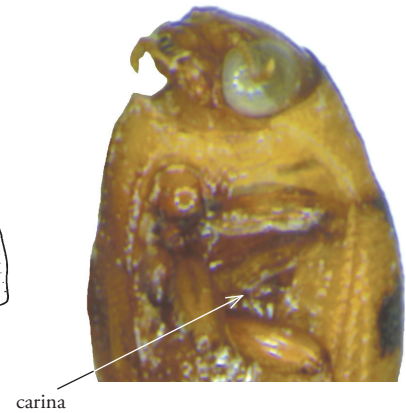
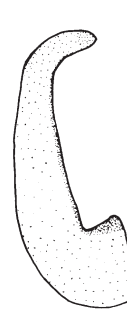
- 7(6') Color usually brownish-yellow; aedeagus with simple outer apical margin 8

*H. triopsis*

- 7' Color usually rusty reddish-brown; aedeagus with an outer flange (note that some *H. punctatus* may be brownish-yellow) 9

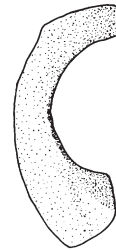
*H. mutchleri*

- 8(7) Aedeagus sharply bent before apex; carina on metepisternum at most slightly darker than rest of surrounding area *H. triopsis*



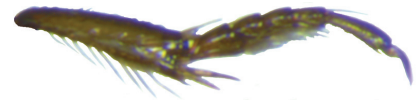
carina

- 8' Aedeagus more evenly curved; carina on metepisternum blackish, much darker than surrounding sclerites
..... **H. pantherinus*
(not recorded from Florida, but may occur in northern part of state)

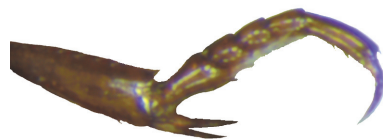


carina

- 9(7') Prosternal ridge broader anteriorly than between the fore coxae; pronotal spot usually dark, circular and well defined; male protarsal claws < 1/2 length of last tarsal segment *H. punctatus*



- 9' Prosternal ridge more uniformly broad; pronotal spot lighter, broader and with more diffuse edges; male protarsal claws > 1/2 length of last tarsal segment *H. mutchleri*



Notes on species

- H. (Paraliaphlus) annulatus* - Length 2.0-2.5 mm. The smallest *Haliphilus* species in Florida, easily recognized by its small size, trifasciate elytral markings and the transverse impression on the posterior portion of the pronotum. This species is recorded throughout the state at least as far south as Lake Okeechobee. Young (1954) noted that it was found in small ponds and swamp streams; I've also seen specimens from the upper Suwannee River and from a roadside ditch in Wakulla County.
- H. (Liaphlus) confluentus* - Length 2.7-3.0 mm. Found throughout the state. The dark elytral markings may be so extensive that the dorsum may appear black. However, take caution with such a character, because some beetles preserved for many years in alcohol will become much darker over time, and will appear to be black. In such cases it is frequently necessary to gently pry an elytron from the abdomen to see what pattern, if any, is present. In addition to canals, ditches and large springs, Young (1954) reported *H. confluentus* from brackish pools; Ciegler (2003) reported it "on beaches" in South Carolina. Note that the mid-metasternal longitudinal furrows contain small punctures, as do the circular pits on the somewhat similar *H. havaniensis* (q.v.)
- H. (P.) fasciatus* - Length 4.0-4.5 mm. Epler (1996) presented the first Florida records for this species. In the state it is known from several northern counties, with the southernmost record from the Suwannee River basin in Levy County. The row of long, thin setae arising from a series of punctures on the upper surface of the hind tibiae may be difficult to observe, especially on pinned specimens where it may become matted.
- H. (L.) havaniensis* - Length about 3 mm. Epler (1996) reported the first US record for this species based on two female specimens from Collier County collected by Bob Rutter. Vondel & Spangler (2008) reported additional specimens from Homestead, Vaca Key and Lower Matecumbe Key. They also gave a record from "Old Town", which is in Dixie County and far north of other Florida records; the specimen may be mislabeled. Some taxonomic confusion has been associated with this species. Leng & Mutchler (1918) had incorrectly synonymized *H. confluentus* with *H. havaniensis*. Wallis (1933) noted that Zimmermann (1924) had placed *H. confluentus* and *H. havaniensis* in different groups based on metasternal characters, among other features; Wallis reinstated *H. confluentus* as a separate species. I sent the Florida specimens of *H. havaniensis* to the late Dr. W.U. Brigham, who compared them to the type specimen of *H. havaniensis* and found them to be conspecific, although a bit lighter in color. Note that the Florida specimens were teneral and probably thus lighter in color. Two similar species, with circular pits on the metasternum, occur in Cuba and the Bahamas and could conceivably be collected in south Florida. Both are squatter species (length < 1.6 X width) than *H. havaniensis* (length > 1.7 X width). *Haliphilus cubensis* Chapin differs by being smaller (length 2.6 mm) and having weakly serrated "shoulders" on the elytra; *H. youngi* Vondel & Spangler is larger (length 2.8-3.3 mm) and has strongly serrated shoulders on the elytra. See Vondel & Spangler (2008).
- H. (P.) mutchleri* - Length 2.9-3.8 mm. Very similar to *H. punctatus*; Matta (1976) suggested that *H. mutchleri* may be a southern subspecies of *H. punctatus*. Males of the two species are usually easily separated by the lengths of the protarsal claws. Those of *H. mutchleri* are noticeably longer, about 2/3 the length of the fore tarsus. This is much easier to observe when one has comparative material of the two species; those of *H. punctatus* are about 1/2 the length of the foretarsus, or less. One should measure the relative lengths with an ocular reticle to be certain. Wallis (1933) and Young (1954) used the apical origin of the outer flange of the aedeagus to separate males of *H. mutchleri* and *H. punctatus* (the flange originates closer to the apex in *H. punctatus*); I also included this character in my 1996 key. However, I have found this character difficult to discern and have not included it in the key above. Separating females is more difficult. In many *H. mutchleri* specimens, the spot near the anterior margin of the pronotum is wider, lighter in color and more diffuse at its edges; this spot tends to be more circular, darker and its edges more sharply defined in *H. punctatus*. The elytral spots tend to be more separate in

H. mutchleri; they tend to coalesce in many *H. punctatus*. The prosternal ridge is broader at its anterior margin than at the forecoxae in *H. punctatus*; in *H. mutchleri* the prosternum is about the same width anteriorly as at the forecoxae. However, I have females in which the anterior pronotal spot is wider and diffuse at its edges (thus supposedly *H. mutchleri*), while the prosternum is wider anteriorly than at the forecoxae (thus supposedly *H. punctatus*). In such cases I would tend to go with a structural character rather than a color character and would tentatively call such specimens *H. punctatus* in the absence of any cohabiting males. Most specimens of *H. mutchleri* are about 3.2-3.8 mm in length, but I have collected one male from St. Marks National Wildlife Refuge in Wakulla County that is only 2.9 mm in length. Although Young (1954) and Matta (1976) stated that *H. mutchleri* was (apparently) confined to peninsular Florida, I have collected it in Franklin and Wakulla Counties, and have material from Bradford County. Ciegler (2003) did not record *H. mutchleri* from South Carolina, but noted that it may occur in that state.

- H. (P.) pseudofasciatus* - Length 3.3-3.5 mm. Epler (1996) presented the first Florida record for this species from Jackson County; I have since seen material from Taylor County (Steinhatchee River). This species is slightly smaller than the similar *H. fasciatus*.
- H. (P.) punctatus* - Length 3.8-4.0 mm. Very similar to *H. mutchleri*. Young (1954) noted that this species varied considerably in color and may be brownish yellow rather than reddish brown. Although recorded from as far south as Broward Co., it is apparently more common in northern Florida. See the discussion under *H. mutchleri* above for more information regarding separating the two species.
- H. (P.) triopsis* - Length 3.0-4.5 mm. I've seen males from two localities in Florida – one from Jackson County, the other from Orange County (Reedy Creek Improvement District); I also have females that are probably this species from Santa Rosa and Wakulla Counties. This species is very similar to *H. pantherinus*. The foretarsal claws are longer in *H. pantherinus* (> 0.15 mm; *H. triopsis* < 0.13 mm) and *H. pantherinus* has a darkened metepisternal carina (however, the metepisternal carina in *H. triopsis* may also be darker than the surrounding sclerites). Hilsenhoff & Brigham (1978) stated that the prosternal ridge is more constricted between the forecoxae in *H. pantherinus*, while it is gradually widened anteriorly in *H. triopsis*. However, I have in my collection a male *H. triopsis* that I collected in Pennsylvania (Susquehanna River near Three Mile Island) on which the prosternal ridge is constricted between the forecoxae. The two species are best separated by the shape of the aedeagus (inner margin straight, with apex sharply bent in *H. triopsis*; more curved interiorly and with gradually bent apex in *H. pantherinus*). See also *H. pantherinus* below.

Other species

- H. (P.) leopardus* Roberts - 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 (in the FSCA) from the Piedmont in Georgia and it occurs on the Coastal Plain of South Carolina (Ciegler 2003). Matta (1976) noted that the species was collected from ditch margins, woodland pools, willow swamps and farm ponds.
- H. (P.) pantherinus* Aubé - Length 3.5-4.0 mm. Not recorded from Florida, but this species may eventually be collected in the northern portion of the state. Ciegler (2003: fig. 3.7) incorrectly illustrated the metepisternal carina that is darkened in this species; she showed a longitudinal carina, while the darkened carina in *H. pantherinus* is transverse (see fig. 13 in Hilsenhoff & Brigham 1978 or fig. 10.103 in Brigham 1982). See also *H. triopsis* above.

GENUS *Peltodytes*

DIAGNOSIS: Larvae are distinguished by the moderately to 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 maxillary and labial palpi being as long as or longer than the penultimate segment; a pair of dark blotches near 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 present on at least the apical half of the elytra.



Peltodytes sp. larva



P. sexmaculatus

NOTES: Of the 18 species of *Peltodytes* known from North America, eight are known from Florida; the record of *P. pedunculatus* in Nilsson & Vondel (2005) may be recorded in error; Florida records of *P. duodecimpunctatus* and *P. lengi* are also probably incorrect. 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*; in Florida, *Peltodytes* are more commonly encountered than *Haliphus*.

Because the subhumeral blotch may be present or absent in *P. sexmaculatus*, this taxon is keyed twice in the following key. In almost all cases, male genitalia must be used for correct species-level identifications of *Peltodytes*.

ADDITIONAL REFERENCES: Brigham 1982; Hilsenhoff & Brigham 1978; Matta 1976; Nilsson & Vondel 2005; Roberts 1913; Vondel & Spangler 2008; Young 1961.

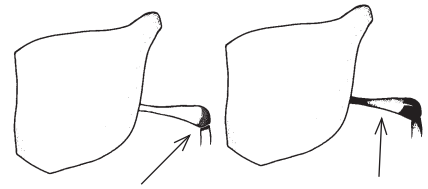
Florida species

P. bradleyi Young
P. dietrichi Young
P. dunavani Young
P. floridensis Matheson
P. muticus (LeConte)
P. oppositus Roberts
P. pedunculatus (Blatchley)
P. sexmaculatus Roberts

Key to adult *Peltodytes* of Florida

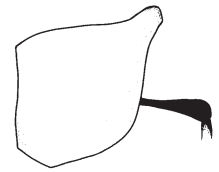
(aedeagus figures adapted from Matta 1976)

- 1 Posterior femur bicolored, either pale reddish-brown/yellowish-brown with darkened extreme apex, or femur black/dark brown with a yellowish subapical ring 2

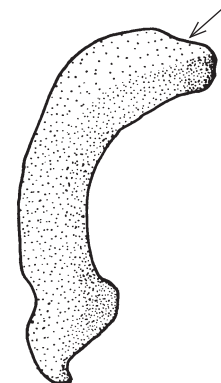
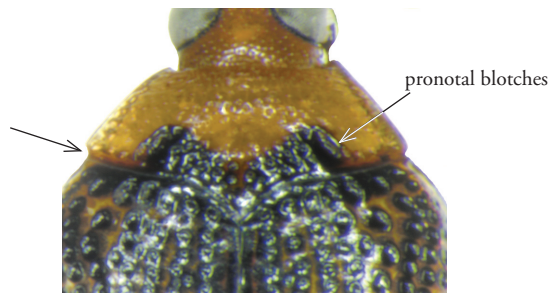
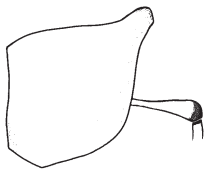


NOTE:
entire femur may
be pale in color on
teneral specimens

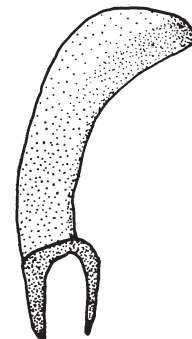
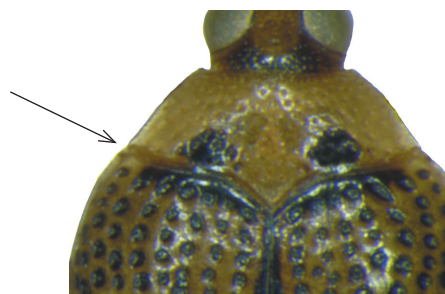
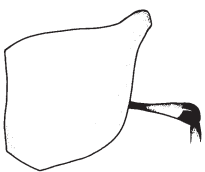
- 1' Posterior femur uniformly black or dark brown beyond coxal plate margin ... 3



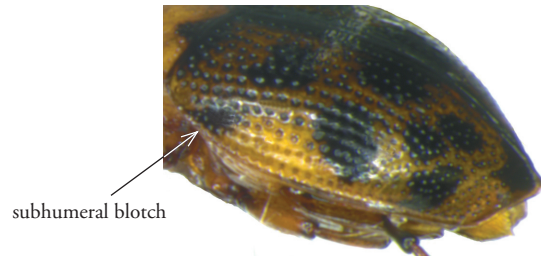
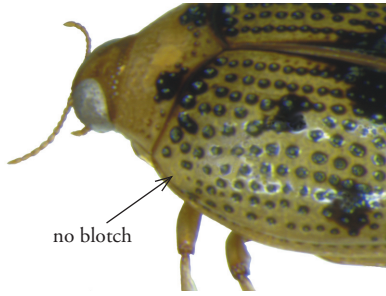
- 2(1) Posterior femur pale reddish-brown/yellowish brown to base, with only extreme apex darkened; posterolateral angle of pronotum exposed; in lateral view, base of elytra and posterior portion of pronotum flattened; basal pronotal blotches often joined across middle; aedeagus indented subapically *P. dietrichi*



- 2' Posterior femur mostly black/dark brown, with yellow ring near dark apex; posterolateral angle of pronotum contiguous with elytron; base of elytra and posterior portion of pronotum convex in lateral view; basal pronotal blotches not joined; aedeagus not indented subapically **P. lengi*
(not known from Florida; see Notes on species)

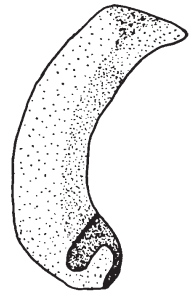


- 3(1') Elytron without a subhumeral blotch or spot 4

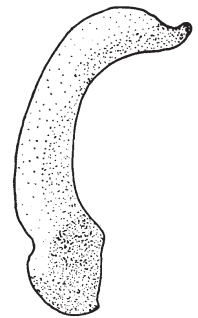


- 3' Elytron with a subhumeral blotch or spot 5

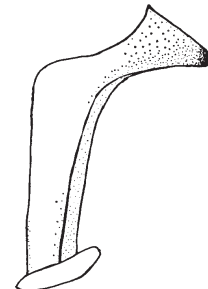
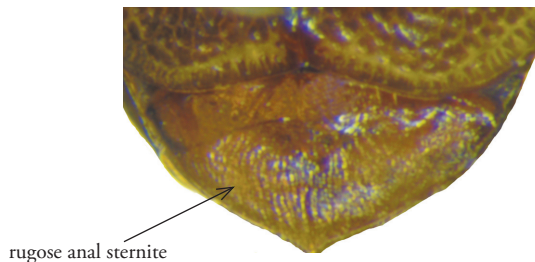
- 4(3) Median sutural blotch joins with dark sutural stripe; sutural stripe weak or vestigial anterior to median blotch; elytral punctures scattered posterior of blotch; aedeagus with broadly pointed apex
..... *P. muticus*



- 4' Median sutural blotch usually separate from dark sutural stripe; sutural stripe well developed for entire length of elytra; elytral punctures arranged in lines posterior to median blotches; aedeagus with upturned apical hook
..... *P. sexmaculatus*

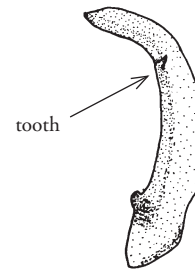


- 5(3') Last abdominal sternite relatively dull, with fine longitudinal lines posteriorly ("rugose"); aedeagus with preapical pointed "crest" *P. oppositus*

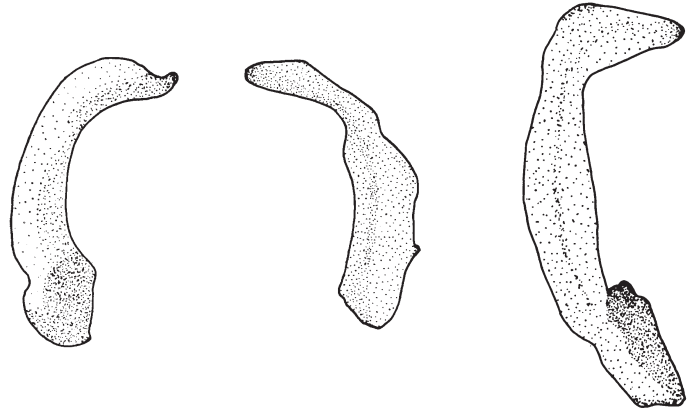


- 5' Last abdominal sternite smooth and shining, without fine lines (there may appear to be wide, coarse internal lines); aedeagus without preapical crest 6

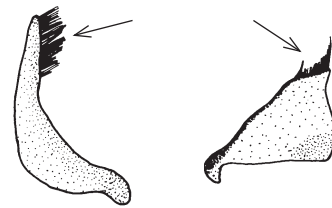
6(5') Aedeagus with lateral tooth 7



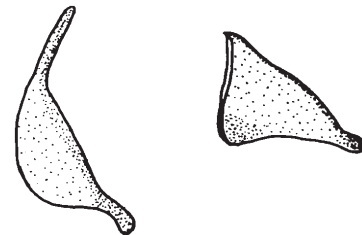
6' Aedeagus without lateral tooth 8



7(6) Male parameres with apical setae *P. floridensis*



7' Male parameres without apical setae *P. dunavani*



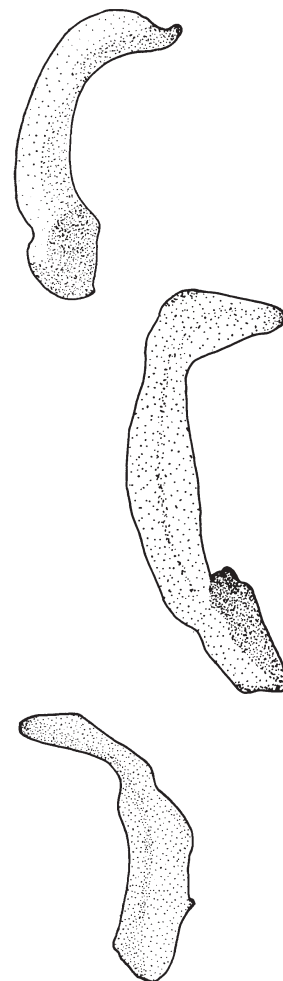
P. dunavani

8(6') Aedeagus with upturned apical hook *P. sexmaculatus*

8' Apex of aedeagus without upturned hook 9

9(8') Aedeagus with expanded, hammerhead-like apex; dorsal margin smooth *P. pedunculatus*

9' Apex of aedeagus not hammerhead-like; dorsal margin undulating *P. bradleyi*



Notes on species

P. bradleyi - Length 3.4-3.6 mm. An apparently rare species in Florida. Young (1961) noted that this species was found only in calcareous swamps and spring runs, but Matta (1976) reported *P. bradleyi* from the Dismal Swamp in Virginia, where Ca and Mg values were much lower than those expected for calcareous waters. Young did not designate any paratypes from Florida, but a specimen from Torreya State Park (Liberty County) with a paratype label on it is in the FSCA. He also reported the species from Gadsden County based on female specimens. This species is very similar to *P. pedunculatus* and is best separated by the male genitalia.

P. dietrichi - Length 3.0-4.0 mm. A relatively common species throughout Florida, it was mistakenly identified as *P. lengi* in Young (1954) and by numerous workers since then. Young (1961) noted this and described *P. dietrichi* as a new species. The two species can be separated by characters given in the preceding key. The flattened dorsal appearance of *P. dietrichi* is most apparent when compared directly to specimens of *P. lengi*, as is the difference in hind femur coloration. Note that in *P. dietrichi* the proximal portion of the femur is light also, not dark as in *P. lengi*, which usually appears to have light ring between two dark areas. Be aware that teneral specimens of other *Peltodytes* specimens may appear to have lightly colored or pale posterior femora. Note also that *P. dietrichi* lacks a subhumeral blotch. *Peltodytes darlingtoni*, described by Young (1961) from Cuba, is probably synonymous with *P. dietrichi*.

P. dunavani - Length 3.1-3.7 mm. Very similar to *P. floridensis* and *P. oppositus* in general appearance. Male genitalia must be used to separate *P. dunavani* from *P. floridensis*.

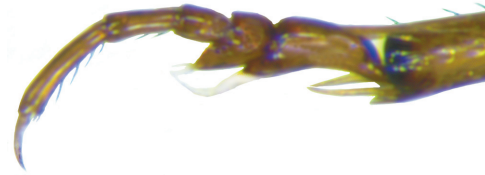
- P. floridensis* - Length 3.2-3.6 mm. A common species, especially in the central to northern parts of the state. Young (1954) noted that it was “rare or lacking in the western and southern counties”. Similar to *P. dietrichi* and *P. oppositus* in general appearance; male genitalia should be used to confirm identifications. *Peltodytes floridensis* can often be recognized by the series of 3-5 spots/punctures between the first and second series of elytral punctures anterior to the medial blotch; *P. dunavani* and *P. oppositus* usually have only 0-2 spots/punctures in this area, but I have specimens of *P. oppositus* from the Suwannee River with as many as 5 punctures in this area. Of course, *P. oppositus* also has a rugose anal sternite, but this can sometimes be difficult to discern, especially in specimens that are still in fluid preservative; see below under *P. oppositus*.
- P. muticus* - Length 3.5-3.8 mm. In Florida this species appears to be restricted to the northern part of the state. Generally, more plain in appearance than *P. sexmaculatus*, with fewer spots and weaker sutural dark stripe. See the discussion under *P. sexmaculatus*. Young (1954: 138) noted that *P. muticus* was “nearly always associated with beds of *Spirogyra* or other filamentous algae”.
- P. oppositus* - Length 3.3-3.6 mm. A very common species found throughout the state, with distinctive male genitalia. The rugosity (wrinkle-like lines running longitudinally) of the anal sternite may be difficult to observe unless the specimens and light source are at the correct angle; it is more easily seen on dried (=pinned/pointed) specimens. Note that the anal sternite in *P. floridensis* may appear to have longitudinal lines, but these are “under” (= dorsal) the anal sternite; angling the sternite correctly will show it to be glossy and smooth ventrally. Another eastern species, *P. shermani*, also has a rugose anal sternite but has not been found in Florida. See below under “Other species”.
- P. pedunculatus* - Length about 3.0 mm. Nilsson & Vondel (2005) included a new record for Florida for this species, based on a single specimen from in the Canadian National Collection. This record, from Suwannee River State Park, is far out of the known range for this species; the specimen needs to be re-examined (Vondel, pers. comm., 2008). I have not seen material of this species from Florida. Ciegler (2003) recorded *P. pedunculatus* from the Coastal Plain in South Carolina.
- P. sexmaculatus* - Length 3.4-4.0 mm. A very common species, but variable in that some specimens possess a subhumeral blotch, while others do not. The medial blotches join the sutural stripe in some specimens, which may cause confusion with *P. muticus*. However, in most *P. muticus* the sutural stripe is weak or absent anterior to the medial blotch, and the medial blotch looks like one medial blotch, while in *P. sexmaculatus* it may appear like two blotches joining near the sutural stripe. The distinctive aedeagus of *P. sexmaculatus* easily identifies males of that species. I have examined several series of *P. sexmaculatus* to determine if the lack of a subhumeral blotch was related to coalescence of the medial blotch and sutural stripe, but found 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 quickly picked out of such samples by its yellower hind tibiae (more reddish in the other two species) and the wider black band at the apex of the hind tibia. Confirm identifications with examination of the male genitalia! *Peltodytes sexmaculatus* is apparently more common in the northern portion of the state, although I have seen specimens from as far south as Port Charlotte (Charlotte County).

Other species

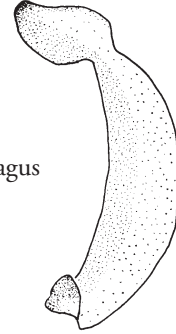
- P. duodecimpunctatus* (Say) - Length 3.5-4.0 mm. Ciegler (2003) and Nilsson & Vondel (2005) included Florida in the range for *P. duodecimpunctatus*, but this species is not known to me from this state. It will key to *P. lengi* in the key above. *Peltodytes duodecimpunctatus* has a yellow band near the apex of its hind femur, but also sports a subhumeral blotch, thus differentiating it from *P. lengi* or *P. dietrichi*.
- P. lengi* Roberts - Length 3.2-3.9 mm. Although often recorded from Florida, this species apparently does not occur here. Florida records for this species probably all refer to *P. dietrichi* (see above); all Florida specimens identified as “*P. lengi*” that I’ve examined have been *P. dietrichi*. Note also that *P. lengi*, like

P. dietrichi, lacks a subhumeral blotch.

P. shermani Roberts - Length 3.2-3.6. Not known from Florida, but may eventually be collected here; it is recorded from the Tidewater region of South Carolina (Ciegler 2003). This species may be confused with *P. oppositus* because both possess a rugose anal sternite. However, the male genitalia are radically different, and *P. shermani* males also have strongly produced 1st and 2nd mesotarsal segments.



P. shermani mesotarsus



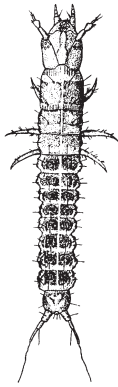
P. shermani aedeagus

FAMILY **HELOPHORIDAE**
helophorid beetles

9

DIAGNOSIS (for family and genus): Larvae are distinguished by the clypeus with a large median tooth flanked by wider projections; labium without a ligula; well developed legs with simple claws; and the abdomen with 9 complete segments, with the integument well sclerotized and 10th segment reduced but distinct.

Adults are characterized by the antennal club with 3 pubescent segments; 7 longitudinal grooves on the prothorax (including each sublateral groove); and the 5 visible abdominal sternites, the first not divided by the hind coxae.



H. lacustris larva
 (adapted from Richmond 1920)



H. lacustris larval labroclypeus
 (adapted from Richmond 1920)



H. lineatus

NOTES: Formerly considered a subfamily of the Hydrophilidae, but now given full familial rank by most authorities (Hansen 1991b; 1999). The family consists of but one genus, *Helophorus*, with over 40 species known from North America. In North America, *Helophorus* is distributed mostly in the northern and western portions; three species are known from the SE US; one species, *H. lineatus*, is recorded from Florida. Note that Ciegler (2003) and others list Illiger, 1801, as the author of the genus name, but that was an emendation of an incorrect original spelling by Fabricius; the original date and author of the genus are retained (ICZN Art. 19.2; 32.2.2; 33.2.2).

The adult prothorax is considered to have 7 grooves if one considers the flattened, smooth area near the lateral margins as a “groove”. Species identification is difficult because many species are similar and a great deal of interspecific variation occurs.

Helophorus larvae are riparian; adults are poor swimmers and are often found clinging to aquatic vegetation in shallow, usually lentic, water bodies. I’ve collected adults from standing water in a horse trough. Adult *Helophorus*, like *Hydrochus* and many elmids, often accumulate an exterior crust that must be removed before surface features can be observed.

ADDITIONAL REFERENCES: Ciegler 2003; Smetana 1985, 1988; Testa & Lago 1994.

Florida genera

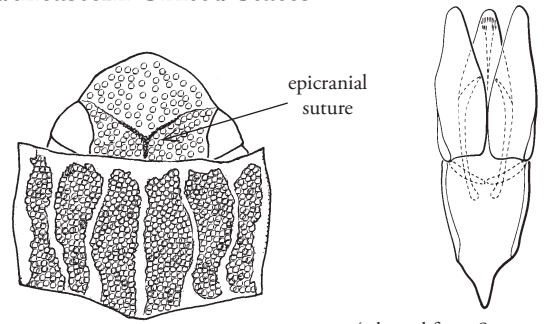
Helophorus Fabricius

Florida species

H. lineatus Say

Key to adult *Helophorus* of the Southeastern United States

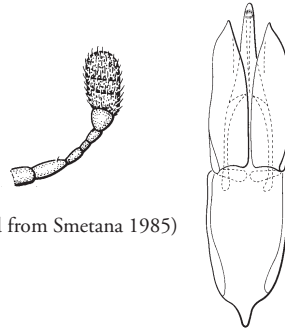
- 1 Stem of epicranial suture narrow; aedeagus as figured * *H. marginicollis*
(not recorded from Florida, but may occur in northern or western portion of state)



(adapted from Smetana 1985)

- 1' Stem of epicranial suture wide (see next couplet); genitalia not as figured 2

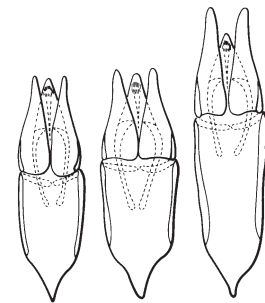
- 2(1') Antenna with 9 segments; last maxillary palpomere shorter than longitudinal length of eye in dorsal aspect; genitalia with aedeagus longer than parameres *H. lineatus*



(adapted from Smetana 1985)



- 2' Antennae with 8 segments; last maxillary palpomere as long as longitudinal length of eye in dorsal aspect; genitalia with aedeagus as long as or shorter than parameres * *H. linearis*
(not recorded from Florida, but may occur in northern or western portion of state)



(adapted from Smetana 1985)

Notes on species

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.

Other species

H. linearis LeConte - Length 2.6-3.8 mm. Not recorded from Florida, but may eventually be found in the northern or western parts of the state. Testa & Lago (1994) recorded this species from Mississippi; Cieger (2003) recorded it from South Carolina.

H. marginicollis Smetana - Length 1.8-3.8 mm. Not recorded from Florida. Testa & Lago (1994) recorded this species from Mississippi. Cieger (2003) recorded it from the Piedmont and Coastal Plains in South Carolina, so there is a good chance it will be found eventually in the northern or western parts of the state. The antennae are 8-segmented.

FAMILY **HYDRAENIDAE**
minute moss beetles

10

DIAGNOSIS: Larvae are distinguished by the distinct labrum; mandible 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 apical, recurved ventral hooks; and 2-segmented urogomphi.

Adults are distinguished by their small size (≤ 2.2 mm); antennal club with 5 pubescent antennomeres; abdomen with 6-7 visible sternites; and first abdominal sternite not divided by hind coxae.



Ochthebius gonggashanensis larva [Chinese species]
 (adapted from Delgado 2003)



Hydraena marginicollis adult

NOTES: A large family of tiny beetles with at least 22 described genera and over 1000 species worldwide, with many new species being described on a yearly basis. This family is referred to as Limnebiidae in Young (1954). Three genera of Hydraenidae are known from Florida.

Perkins (1980b) provided an excellent review of the Hydraenidae of the western hemisphere, with keys to all species known at that time. Hansen (1991a) provided a synopsis and key to hydraenid genera of the world. Many larvae have been described by Delgado and co-workers (see under individual genera).

Hydraenid larvae and adults are found 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 graze on wet stones, sand grains and plant matter, where they feed on algae, bacteria, protozoans and detritus. Larvae are usually found in moist areas near the same habitats as the adults.

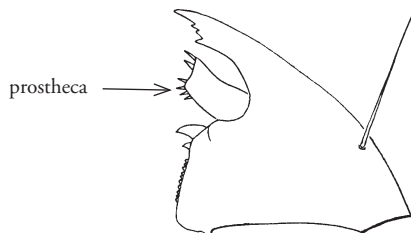
ADDITIONAL REFERENCES: Delgado 2003; Delgado & Archangelsky 2005; Hansen 1991a; Perkins 1980b, 2001; Richmond 1920.

Florida genera

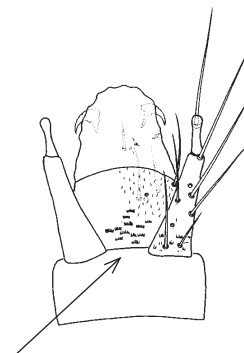
Gymnochthebius d'Orchymont
Hydraena Kugelann
Ochthebius Leach

Key to genera of Hydraenidae larvae of Florida

- 1 Urogomphi widely separated at their bases; mandible with broad prostheca *Hydraena*

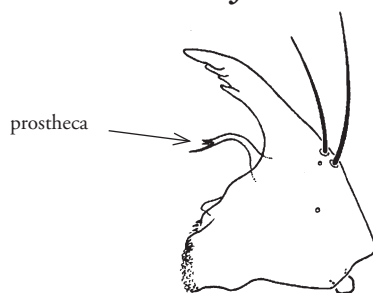


(adapted from Richmond 1920)

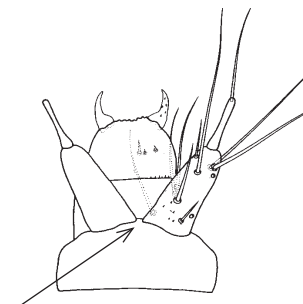


(adapted from Perkins 1980)

- 1' Urogomphi close together at their bases; mandible with narrow prostheca *Gymnochthebius/Ochthebius*

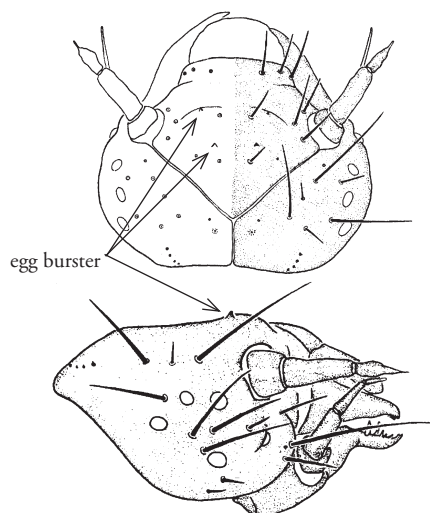


(adapted from
Delgado & Archangelsky 2005)



(adapted from Perkins 1980)

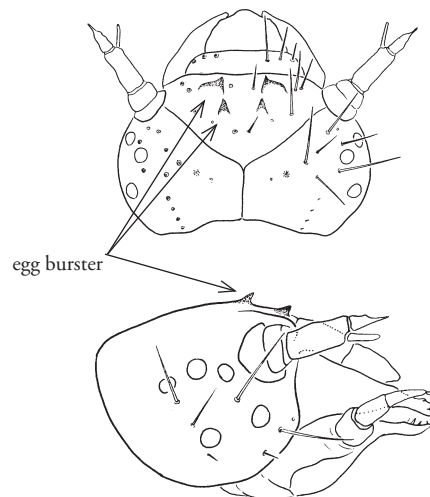
NOTE: The larvae of *Gymnochthebius* and *Ochthebius* may be separable in the first larval instar. Richmond (1920) described the larva of *G. fossatus* (as *Ochthebius tuberculatus* LeConte). He did not mention the presence of egg-bursters (small pointed structures on the dorsum of the head that are used to pierce the “shell” of the egg) in first instar larvae; Delgado & Archangelsky (2005) found tiny egg-bursters on the head of *G. jensenhaarupi*, an Argentinean species. These egg-bursters were extremely small, in contrast to larger egg-bursters found in first instar *Ochthebius*. It is possible that Richmond missed observing the egg-bursters on *G. fossatus* because of their small size - or they may be absent. Thus, first instar *Gymnochthebius* larvae may be separable from those of *Ochthebius* by their smaller egg-bursters. Note that the first instar larvae of *Hydraena* lack egg-bursters.



G. jensenhaarupi, 1st instar larva
(adapted from Delgado & Archangelsky 2005)

dorsal view

lateral view



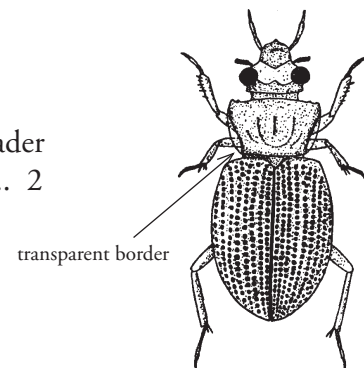
O. subinteger, 1st instar larva
(adapted from Delgado & Soler 1995)

Key to genera of Hydraenidae adults of Florida

- 1 Maxillary palps very long, with palpomeres 3 and 4 subequal in length; pronotum without transparent borders *Hydraena*

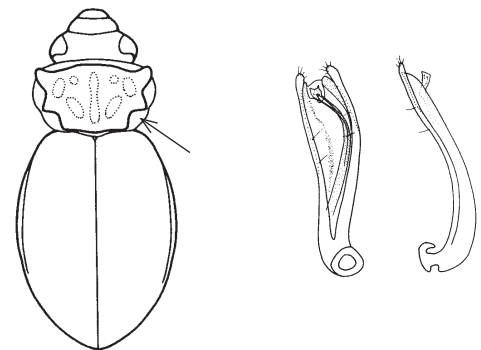


- 1' Maxillary palps much shorter, with palpomere 3 longer and broader than 4; pronotum with transparent borders 2



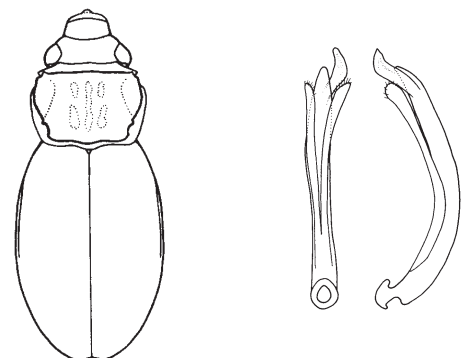
(adapted from Young 1954)

- 2(1') Non-transparent portion of pronotum with posterior corners deeply incised; parameres longer than aedeagus; apex of aedeagus bifid, without a process that extends beyond apex *Gymnochthebius*



(adapted from Perkins 1980)

- 2' Posterior corners of pronotum not incised; parameres shorter than aedeagus; apex of aedeagus simple, with a subapical process that extends beyond apex *Ochthebius*

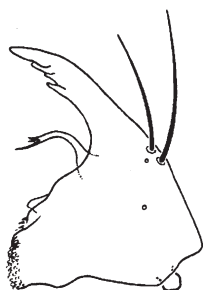


(adapted from Perkins 1980)

GENUS *Gymnochthebius*

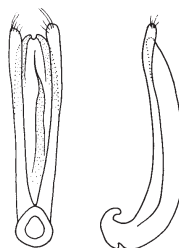
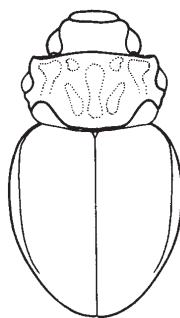
DIAGNOSIS: Larvae are indistinguishable from those of *Ochthebius* except, perhaps, in the first instar. First instar *Gymnochthebius* larvae lack, or have vestigial, egg-bursters on the dorsum of the head capsule. Larvae of *Gymnochthebius* and *Ochthebius* are distinguished from other hydraenid larvae in our area by the narrow mandibular prostheca; and the bases of the urogomphi being 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 of the non-transparent portions of the pronotum deeply incised; parameres longer than the aedeagus; and the bifid apex of the aedeagus, without a subapical process that extends past the apex.

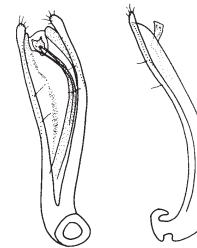
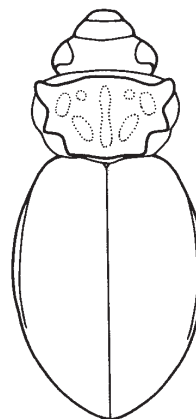


G. jensenhaarupi larval mandible

[Argentinian species]
(adapted from Delgado & Archangelsky 2005)



G. seminole adult and genitalia
(adapted from Perkins 1980)



G. fossatus adult and genitalia
(adapted from Perkins 1980)

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. *Gymnochthebius seminole* (length 1.2 mm) is known only from a single specimen from Snake Bight Trail in the Everglades; it is stouter and has the posterior lobes of the pronotum larger than the anterior.

ADDITIONAL REFERENCES: Delgado & Archangelsky 2005; Perkins 1980b.

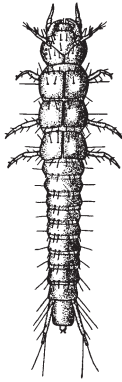
Florida species

G. fossatus LeConte
G. seminole Perkins

GENUS *Hydraena*

DIAGNOSIS: Larvae are distinguished by the broad mandibular prostheca; and bases of urogomphi 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.



H. pennsylvanica larva
(adapted from Richmond 1920)



H. pennsylvanica larval mandible
(adapted from Richmond 1920)



H. marginicollis adult

NOTES: Three species are known from Florida; 29 are known from the United States. None of the Florida species possesses a scintilla, a small, smooth, often shiny area at the midpoint of the anterior margin of the pronotum. *Hydraena marginicollis* is the most commonly encountered hydraenid in Florida.

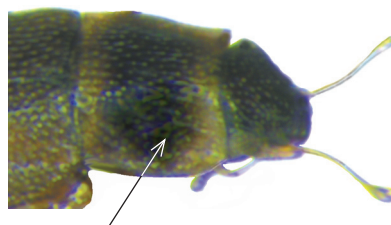
ADDITIONAL REFERENCES: Ciegler 2003; Delgado et al. 1997; Delgado & Soler 1996; 1997a; Jäch 1994; Jäch & Diaz 1998; Perkins 1980b.

Florida species

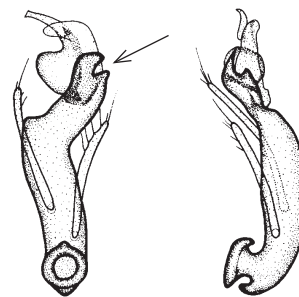
H. marginicollis Kiessenwetter
H. spangleri Perkins
H. youngi Perkins

Key to adult male *Hydraena* of Florida

- 1 Discal area of pronotum weakly delimited by weak parallel ridges, pronotum with shallow, wide depressions present anterolaterally; genitalia as figured, with bifid apex on main piece of aedeagus; common *H. marginicollis*

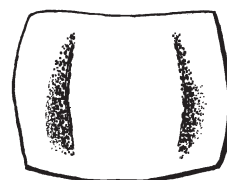


anterolateral depression

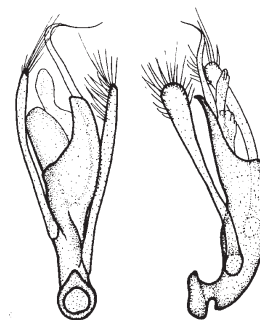


(adapted from Perkins 1980)

- 1' Discal area of pronotum sharply delimited by rounded parallel ridges; genitalia without apically bifid main piece; uncommon 2

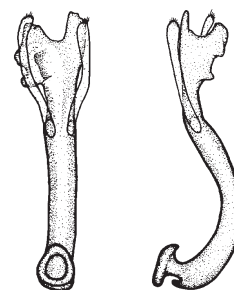


- 2(1') Punctures on discal area of elytra in rows; genitalia as figured *H. spangleri*



(adapted from Perkins 1980)

- 2' Punctures on discal area of elytra random; genitalia as figured *H. youngi*



(adapted from Perkins 1980)

Notes on species

H. marginicollis - Length 1.3-1.5 mm. Found throughout Florida and the most common *Hydraena* species in the state. Young (1954) noted that it was "usually found in matted debris and roots at the margin rather than in open water". This species occurs in lentic and lotic situations; I have seen adults from Hester-Dendy samplers.

H. spangleri - Length about 1.3 mm. This appears to be a pond species. 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 County. The species also occurs in MD and VA.

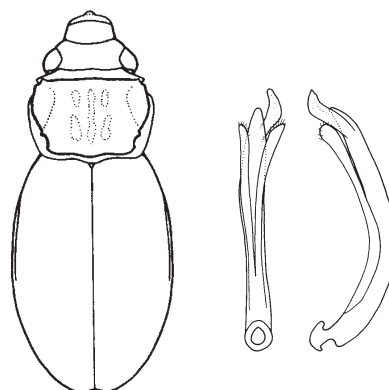
GENUS *Ochthebius*

DIAGNOSIS: Larvae are indistinguishable from those of *Gymnochthebius* except, perhaps, in the first instar. First instar *Ochthebius* larvae have well-developed egg-bursters on the dorsum of the head capsule. Larvae of *Gymnochthebius* and *Ochthebius* are distinguished from other hydraenid larvae in our area by the narrow mandibular prostheca; and the bases of the urogomphi being very close together.

Adults are distinguished by the 3rd maxillary palpomere that is longer and broader than the 4th; pronotum with transparent lateral and posterior margins, with posterior corner not incised; parameres shorter than the aedeagus; and the simple apex of the aedeagus, with a subapical process that extends beyond the apex.



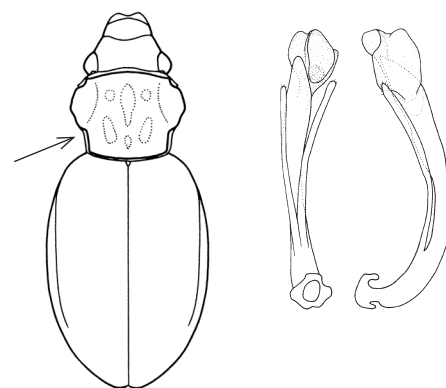
O. gonggashanensis larva: dorsal, lateral view;
mandible [Chinese species]
(adapted from Delgado 2003)



O. attritus adult and male genitalia
(adapted from Perkins 1980)

NOTES: A speciose genus with 43 US species; one species, *O. attritus* (length 1.2-1.5 mm), is known from Florida. This 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. *Ochthebius attritus* has a circum-Caribbean distribution; in Florida it has been found on the peninsula as far north as Titusville.

Ciegler (2003) listed Florida in the range of *O. benefossus* LeConte, but it is not known from any farther south than Virginia (Perkins 1980b). Perkins (1980b) examined a specimen supposedly from Dunedin, but believed the label data to be incorrect, since it was far south of its usual distribution (Appalachian Mountains). *Ochthebius benefossus* can be separated from *O. attritus* by the smaller transparent area of the prothorax.



O. benefossus adult and male genitalia
(adapted from Perkins 1980)

Florida species

O. attritus LeConte

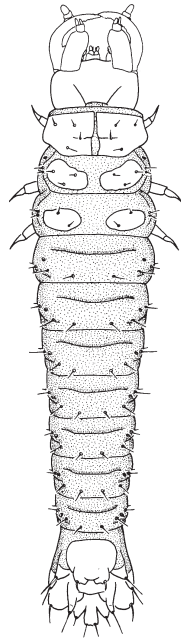
ADDITIONAL REFERENCES: Ciegler 2003; Delgado 2003; Delgado & Matsui 2000; Delgado & Soler 1995, 1997b; Perkins 1980b.

FAMILY **HYDROCHIDAE**
hydrochid beetles

11

DIAGNOSIS (for family and genus): Larvae are distinguished by the biramal antennae that are inserted closer to 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; mandible with a small apical seta and a spinose pseudo-molar area near base; well developed legs with simple claws; and 8 complete abdominal segments.

Adults are distinguished by the rough, sculptured body; protruding eyes; posterior margin of pronotum distinctly narrower than bases of elytra; small scutellum; and first abdominal sternite not divided by hind coxae.



H. rufipes larva
 (adapted from Archangelsky 1997)



Hydrochus callosus

NOTES: Formerly included in the Hydrophilidae as the subfamily Hydrochinae, but now given full family status by most authorities (Hansen 1991b; 1999). The family consists of only one genus, *Hydrochus*, although several other genera have been proposed by Makhan (1994a, 1998, 2001a, 2001b); these genera have all been considered synonyms (Hansen 1999) or are being ignored. Note that the taxonomy of the Hydrochidae, and several other groups of invertebrates, has been severely confused by Mr. Makhan and his names (see Foster 2006; Jäch 2006; etc.). Most of Makhan's descriptions provide no diagnostic characters, and many of his proposed names do not meet the criteria for availability under the ICZN.

ADDITIONAL REFERENCES: Ciegler 2003; Hansen 1991b, 1999; Hellman 1975; Makhan 1994b; 1995; Smetana 1988.

Florida genera

Hydrochus Leach

GENUS *Hydrochus*

DIAGNOSIS: See family diagnosis.

NOTES: *Hydrochus* is the sole recognized genus in the family Hydrochidae. Approximately 40 species occur in North America north of Mexico; about half are undescribed. At least 15 taxa are known from Florida; it is possible to apply available names to seven of them. Although Hellman (1975) produced a detailed revision of the genus for North and Central America in a Ph.D. dissertation, it has never been published; thus, his names are unavailable (ICZN, Articles 8 and 9). Smetana (1988) described one of Hellman's species and thus validated the name *H. neosquamifer* Smetana. Steiner et al. (2003) described one of Hellman's species and thus validated Hellman's name *H. spangleri* Hellman. Neither species is known from Florida. Makhan (1995, 2001b) has probably "described" at least two more of Hellman's species (see Notes on species), but Makhan's descriptions are incomplete and do not allow accurate identification of his species. Hellman apparently will not be validating his species' names (although it was done for one in Steiner et al. 2003). In the following Notes on species section, I've included Hellman's manuscript names solely as a guide for those who may wish further information on those taxa; do not use Hellman's unpublished names!

Hydrochus are common inhabitants of standing or slow-moving water where they crawl about on vegetation or floating detritus.

There is considerable intraspecific variation in some *Hydrochus* species. Extensive experience with the genus may enable identification of isolated females, but males are usually necessary for accurate separation of most species. Genitalia figures below are adapted from Hellman (1975). Note that in several species there may be a membranous apical lobe or lamella present on the middle lobe of the genitalia; this structure was not illustrated by Hellman, although it is present on some material determined by him that I've examined. I've modified some of his illustrations to show this membranous lobe/lamella; the figures show a dorsal view to the left, a lateral view to the right.

ADDITIONAL REFERENCES: Ciegler 2003; Hellman 1975; Makhan 1994b, 1995, 2001b; Smetana 1988; Steiner et al. 2003.

Florida species

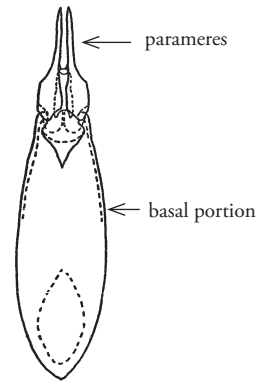
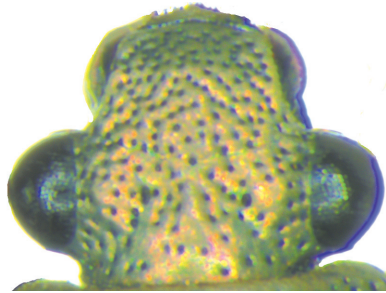
H. callosus LeConte
H. excavatus LeConte
H. inaequalis LeConte
H. minimus Blatchley
H. rufipes Melsheimer
H. rugosus Mulsant
H. simplex LeConte
H. sp. 1 Epler
H. sp. 2 Epler
H. sp. 3 Epler
H. sp. 4 Epler
H. sp. 5 Epler
H. sp. 6 Epler
H. sp. 7 Epler
H. sp. 8 Epler

Key to adult *Hydrochus* of Florida

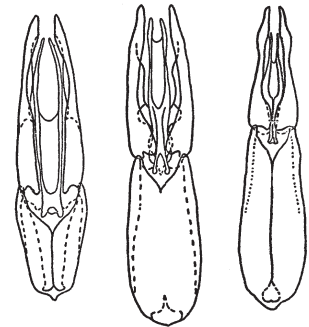
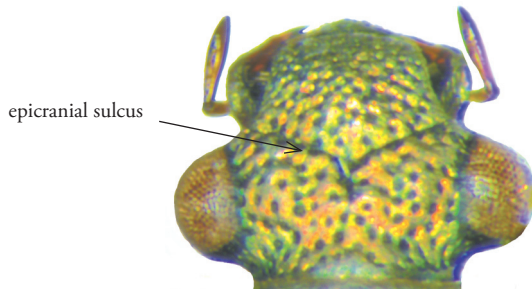
- 1 Minute, 2.0 mm or less in length; elytra distinctive, with odd intervals elevated and even intervals reduced so that the punctures appear to lie in double rows between the intervals *H. minimus*

- 1' Longer than 2.3 mm; elytra not as above 2

- 2(1') Epicranial sulcus lacking or poorly developed laterally (a thin crack-like suture may be present, but not a deep, wide sulcus); body form broader; male genitalia with basal portion much longer than parameres 3



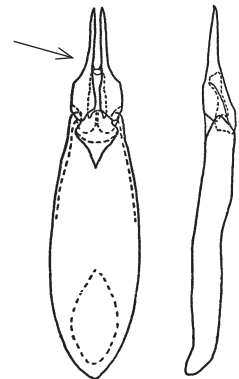
- 2' Epicranial sulcus distinct; body form narrower; male genitalia with basal portion shorter, subequal to or longer than parameres 5



- 3(2) A large callus present near apical third of each elytron; male parameres abruptly narrowed beyond base; size generally larger, 3.4-5.6 mm *H. callosus*

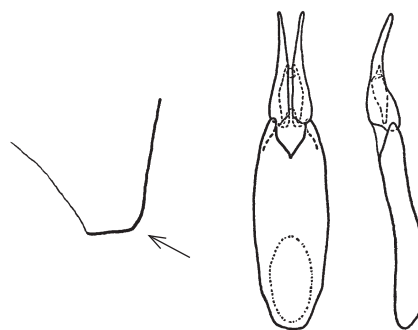


oblique lateral view of elytra

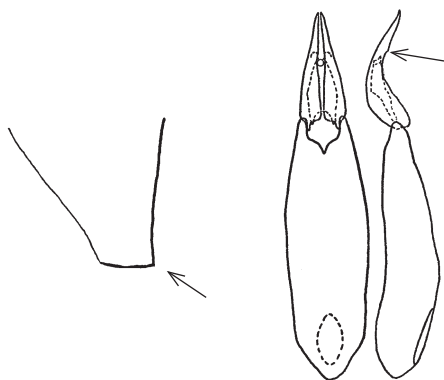


- 3' Large calli not present on apical third of elytra; male parameres gradually narrowed (see figs. below); size generally smaller, 3.6-3.9 mm 4

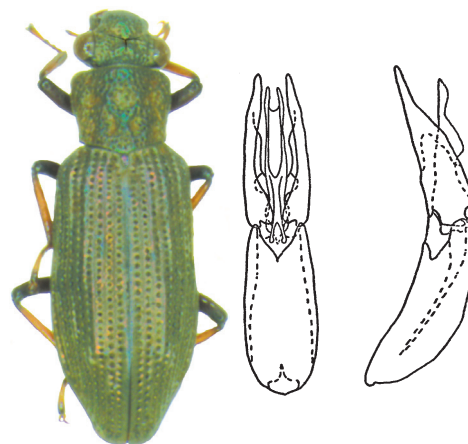
- 4(3') Inner (sutural) apex of elytron square to slightly rounded; in lateral view, incurved portion of male parameres without subapical tooth ***H. sp. 1***



- 4' Sutural apex of elytron noticeably pointed; in lateral view, incurved portion of male parameres with small subapical tooth ***H. sp. 2***

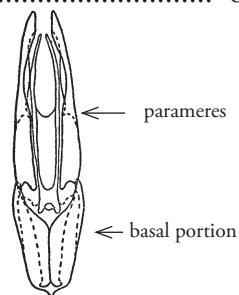


- 5(2') Large, length 4.8-6.1 mm; genitalia as figured ***H. rugosus***

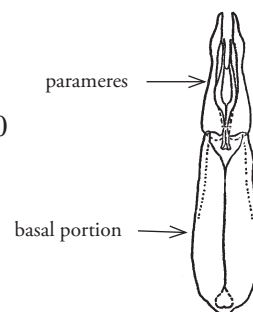


- 5' Smaller, length <4.6 mm; genitalia not as figured 6

- 6(5') Male genitalia with basal portion noticeably shorter than parameres 7

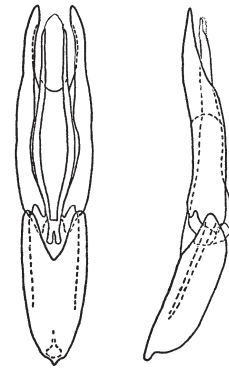


- 6' Male genitalia with basal portion subequal to or longer than parameres .. 10

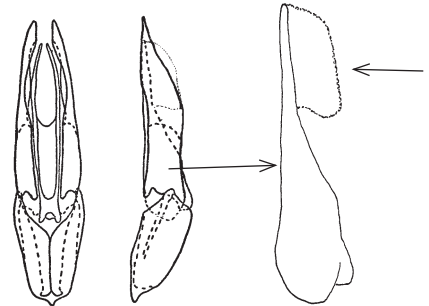


7(6) Length 3.5-4.5 mm; genitalia as figured *H. sp. 7*

7' Length 3.5 mm or less; genitalia not as above 8



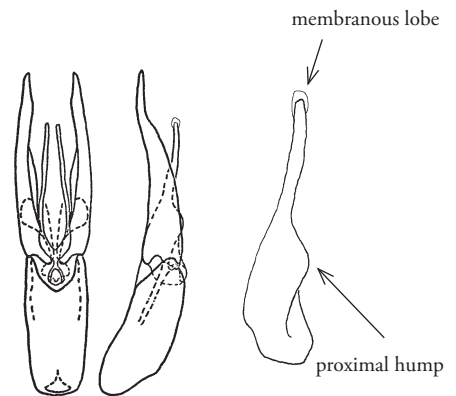
8(7') In lateral view, parameres wider; aedeagus with large, membranous, crest-like apicodorsal lobe *H. simplex*



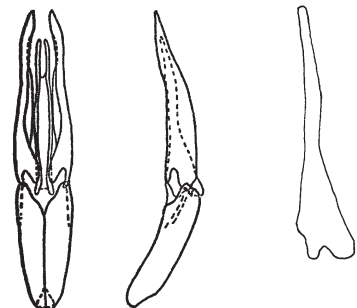
aedeagus, lateral

8' In lateral view, parameres thinner, more gradually attenuated; aedeagus without membranous apicodorsal crest (although small membranous lobe may be present) 9

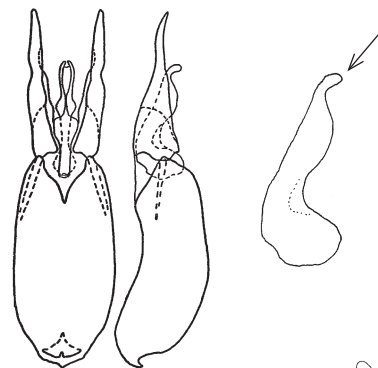
9(8') In lateral view, aedeagus shorter, with proximal hump, apex may bear membranous lobe *H. sp. 5*



9' In lateral view, aedeagus longer, without proximal hump or membranous lobe at apex *H. excavatus*



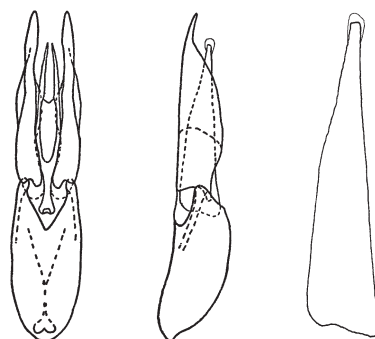
- 10(6') In lateral view, sclerotized tip of aedeagus recurved dorsally *H. sp. 4*



- 10' In lateral view, tip of aedeagus mostly straight, not recurved dorsally 11

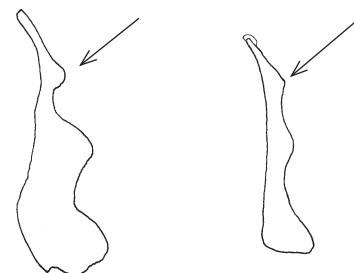


- 11(10') In lateral view, dorsal margin of aedeagus mostly straight *H. rufipes*

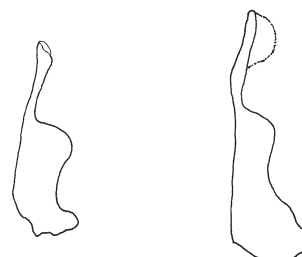


- 11' In lateral view, dorsal margin of aedeagus strongly undulated (see figs. below) 12

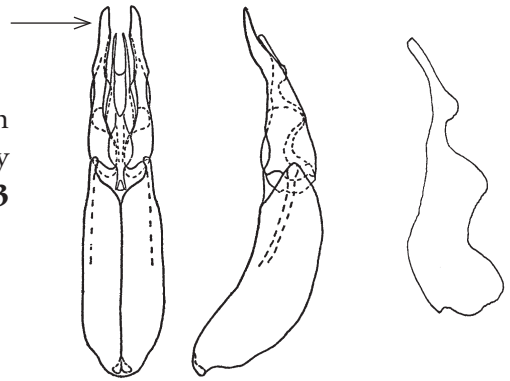
- 12(11') In lateral view, aedeagus with preapical dorsal hump 13



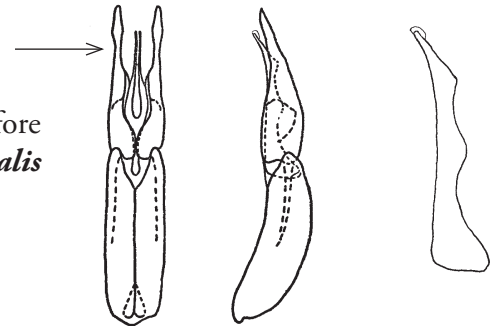
- 12' In lateral view, aedeagus without preapical dorsal hump 14



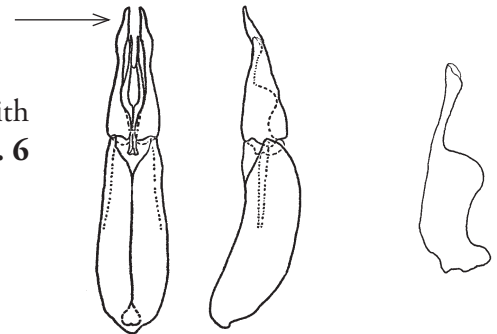
- 13(12) In dorsal view, parameres slightly widened past midlength and gradually narrowed to apex; aedeagus more deeply undulating dorsally ***H. sp. 3***



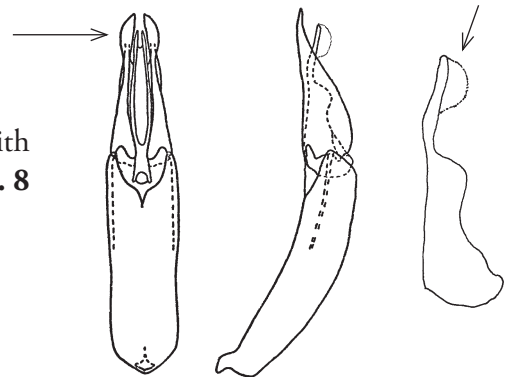
- 13' In dorsal view, parameres narrowed and then expanded before apex; aedeagus not as deeply incised dorsally ***H. inaequalis***



- 14(12') In dorsal view, parameres attenuated apically; aedeagus with small membranous lobe apical lobe ***H. sp. 6***



- 14' In dorsal view, parameres expanded preapically; aedeagus with larger membranous crest-like lobe apically ***H. sp. 8***



Notes on species

- H. callosus* - Length 3.4-5.6 mm. Large specimens may be confused with *H. rugosus*, but *H. callosus* has different genitalia, is much broader and lacks a well-defined Y-shaped epicranial sulcus. Instead, two deep foveae (pits) are present; there is a very thin lateral suture present, most easily seen on pinned (= dried) specimens. Most specimens have a well developed callus (rounded lump) on the posterior third of each elytron; the size of these calli may vary. The two other Florida species that lack an epicranial sulcus, *H. sp. 1* and *H. sp. 2*, lack these calli and are considerably smaller in length. Found throughout northern Florida and at least as far south as Okeechobee County, *H. callosus* is often collected in lentic habitats.
- H. excavatus* - Length 2.8-3.3 mm. An uncommon species recorded from Duval, Jefferson, Liberty and Putnam Counties in Florida. Externally, very similar to *H. inaequalis*, but genitalia easily separate males of the two species.
- H. inaequalis* - Length 2.6-3.5 mm. Many other *Hydrochus* species have been identified as this species, mostly due to the use of outdated identification keys. This species occurs in Florida from the Panhandle to at least as far south as Palm Beach Co.
- H. minimus* - Length 1.6-2.0. A tiny species with distinctive elytral punctations, known from Walton to Pinellas Counties. Considered by Peck & Thomas (1998) to be a Florida endemic, but its presence in Duval and Walton Counties indicates it will probably also be found in Alabama and Georgia. The odd numbered intervals (sutural, 3rd, 5th, 7th and 9th) are elevated and ridge-like throughout their entire length while the even numbered intervals are depressed and appear as spots between two rows of punctures.
- H. rufipes* - Length 2.7-3.8 mm. In the state, known from northern Florida to at least as far south as the Tampa area. Hellman (1975: 230) noted that this species is "one of the most abundant species in the eastern half of the United States". Hellman (1975: fig. 246) did not illustrate the small, membranous apical lamella present on the median lobe (aedeagus) of the genitalia, but I have observed it on some Florida specimens.
- H. rugosus* - Length 4.8-6.1 mm. The largest *Hydrochus* species in Florida and the Nearctic, found throughout the state. Epler (1996) considered *H. hanoewanti* Makhan, described by Makhan (1994) from a single specimen collected near Jacksonville, to be a junior synonym of *H. rugosus*. This synonymy was not noted by Hansen (1999).
- H. simplex* - Length 2.5-3.0 mm. Hellman (1975) considered *H. equicarinatus* Blatchley as a junior synonym, a position accepted by Epler (1996), but apparently missed in Hansen (1999) and Peck & Thomas (1998). This species is common and widespread throughout the state. Hellman (1975: fig. 206) did not illustrate the membranous apicodorsal lobe present on the median lobe (aedeagus) of the genitalia, although it is present on specimens in the FSCA identified by him. Note that this species is externally similar to *H. sp. 6*; only the male genitalia can separate the two taxa.
- H. sp. 1* - Length 2.7-3.6 mm. Described by Hellman (1975: 78) as "*H. falsus*". In Florida it is known from Alachua, Putnam and Union Counties; it is also known from AL and GA. Very similar to *H. sp. 2*.
- 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 county. In some specimens the base of the epicranial sulcus 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 County. Makhan (2001b) described *H. roomlyae* from a single specimen from Alachua County that may be this species. His description and figure do not allow identification of his species; the type must be examined by a competent taxonomist before the

name could be applied to this taxon.

- 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. An apical membranous lamella, not illustrated by Hellman (1975: fig. 240), is present on the median lobe of the genitalia.
- H. sp. 6* - Length 2.2-2.8 mm. Described by Hellman (1975: 139) as “*H. woodi*”. This species and *H. simplex* are externally similar; only the male genitalia can separate the two taxa. This may be the same taxon described from a single specimen from Georgia 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* would necessitate an examination of the type of *H. schereri* by a competent taxonomist before the name could 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 County.
- H. sp. 7* - Length 3.5-4.5 mm. Described by Hellman (1975: 65) as “*H. youngi*”. Hellman (1975) considered this species to be the 4th largest *Hydrochus* north of Mexico; in Florida only *H. callosus* and *H. rugosus* are larger. In Florida it is known from the northern part of the state to at least as far south as Highlands County. Hellman gave this taxon’s length as 3.7-4.5 mm, but I have two specimens assignable to this species from Highlands County that are 3.5 and 3.6 mm in length.
- H. sp. 8* - Length 3.8-4.0 mm. Described by Hellman (1975: 124) as “*H. caumatis*”. I have a single male specimen of this relatively large species from Jackson County. Hellman described “*H. caumatis*” based on two specimens from Louisiana. My specimen differs from Hellman’s description in possessing a membranous apicodorsal lobe on the median lobe of the genitalia; no such lobe was figured by Hellman (1975: fig. 190). Note that several species of *Hydrochus* possess such lobes or lamellae on their aedeagi that were not shown in Hellman’s figures.

Other species

Following the species distributions given in Hellman (1975), several species of *Hydrochus* keyed in Young (1954) or listed in Peck & Thomas (1998) do not occur in Florida. These include *H. foveatus* Haldeman, *H. scabratus* (Mulsant) and *H. subcupreus* Randall (also listed by Ciegler (2003) for Florida); these taxa are more northern or western in distribution.

FAMILY **HYDROPHILIDAE***water scavenger beetles***12**

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; mandible without a small apical seta and a spinose pseudo-molar area near base; spiracles, when present (absent in early instars of some genera) with 2 openings; 5 segmented legs usually present (may appear 4 segmented, 3 segmented, extremely reduced to absent) with single tarsal claw; abdomen with 8-10 segments (most with 8 segments with 9, 10 reduced); and the last segment with 1-3 segmented urogomphi, without terminal hooks.

Adults are distinguished by the antennal club with 3 pubescent segments beyond the cupule; long maxillary palps, almost as long or longer than antennae; and the 5 (6 in *Laccobius*) visible abdominal sternites, the 1st not divided by the hind coxae.

*Berosus sayi**Enochrus sayi**Hydrobiomorpha casta*

NOTES: One of our largest and most common families of water beetles, the name “water scavenger” is a bit of a misnomer, since many taxa (especially larvae) are predacious. Two groups formerly considered subfamilies, Helophoridae and Hydrochidae, are now treated as families. One subfamily, the Sphaeridiinae, is mostly terrestrial but two genera, *Cercyon* and *Phaenonotum*, have semi-aquatic members that are included in this manual; for more information on Sphaeridiinae, see Smetana (1978) or Ciegler (2003).

Although most members prefer standing water, hydrophilids are found in all types of water bodies. Most hydrophilid larvae are predacious; adults are omnivores and feed on a variety of materials, including living and dead plants, organic matter and even snails and small fish; many members of the Sphaeridiinae live in dung.

ADDITIONAL REFERENCES: Archangelsky 1997; Brigham 1982; Ciegler 2003; Hansen 1991b, 1999; Hilsenhoff 1995b, 1995c; Matta 1974; Richmond 1920; Short & Hebauer 2006; Smetana 1978, 1988; Testa & Lago 1994; Van Tassell 2001.

Florida genera

Anacaena Thomson
Berosus Leach
Cercyon Leach
Chaetarthria Stephens
Cymbiodyta Bedel
Derallus Sharp
Enochrus Thomson
Helobata Bergroth
Helochares Mulsant
Helocombus Horn
Hydrobiomorpha Blackburn
Hydrobius Leach
Hydrochara Berthold
Hydrophilus Geoffroy
Laccobius Erichson
Paracymus Thomson
Phaenonotum Sharp
Sperchopsis LeConte
Tropisternus Solier

Key to genera of Hydrophilidae larvae of Florida

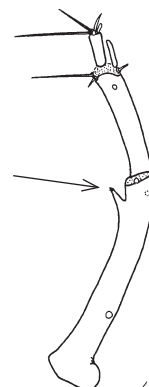
(unless otherwise noted, line drawings adapted from Archangelsky 1997)

- 1 First 7 abdominal segments with long, simple lateral gills, some at least 2-3 times width of segment bearing them ***Berosus***



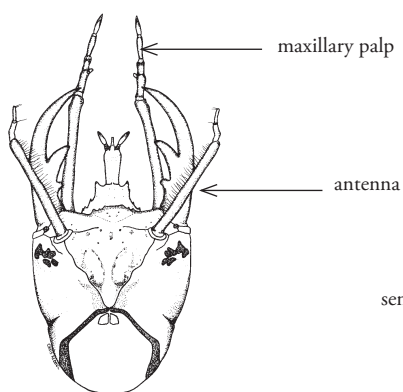
- 1' Simple lateral gills absent or if present, then shorter than width of a segment, OR setiferous gills present 2

- 2(1') Meso- and metathoracic segments each with 3-4 moderately long setiferous lateral gills; basal antennal segment with preapical spur on inner side ***Derallus***



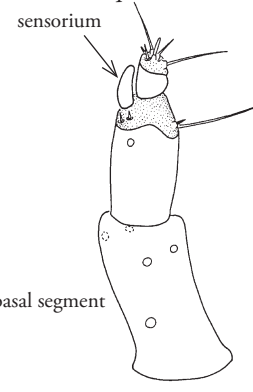
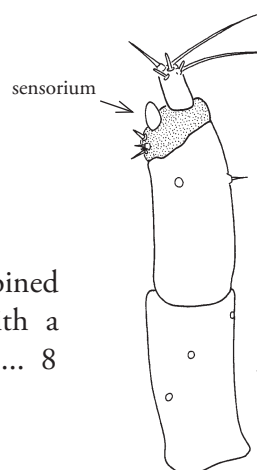
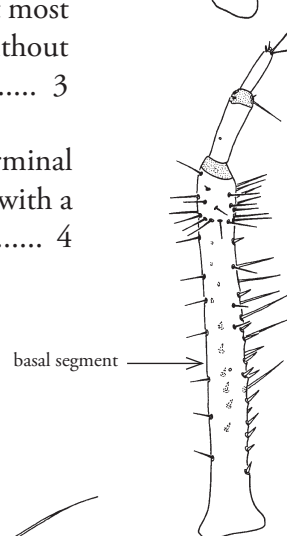
- 2' Meso- and metathoracic segments and abdominal segments 1-6 with at most 1 moderately long lateral gill, OR none; basal antennal segment without preapical spur on inner side 3

- 3(2') Basal antennal segment more than twice as long as combined terminal segments; penultimate antennal segment without a sensorium; femora with a fringe of swimming setae 4



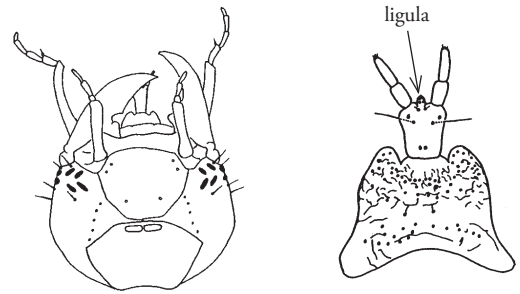
Do not confuse the long maxillary palpi with the antennae! The antennae originate on the top of the head above the base of the mandibles; the maxillary palpi are ventral.

(adapted from Matta 1982)



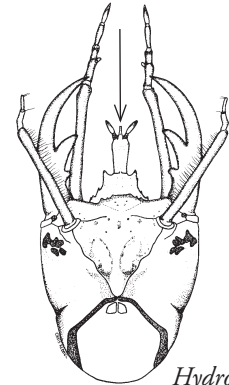
- 3' Basal antennal segment at most slightly longer than combined terminal segments; penultimate antennal segment with a sensorium; femora without a fringe of swimming setae 8

- 4(3) Head subspherical; mandibles asymmetrical; ligula shorter than first palpal segment; pronotum not entirely sclerotized *Hydrophilus* 5



(adapted from Archangelsky & Durand 1992a)

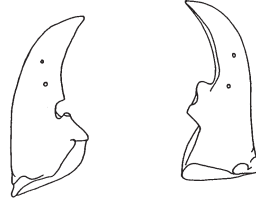
- 4' Head more rectangular/quadrangular; mandibles mostly symmetrical (proximal inner teeth may differ); ligula longer than first palpal segment; pronotum entirely sclerotized 6



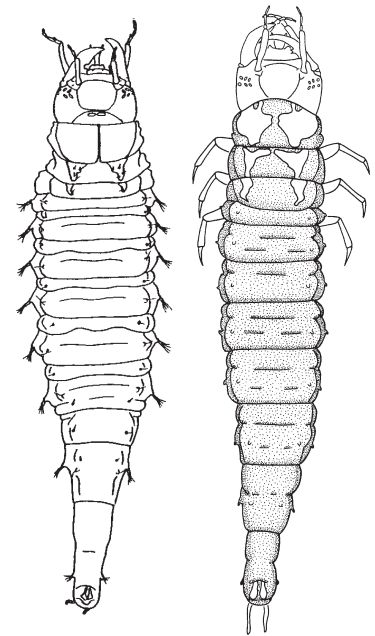
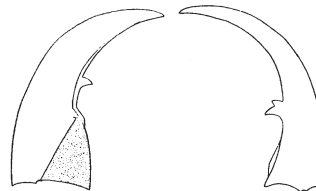
Hydrochara

(adapted from Matta 1982)

- 5(4) Right mandible stout, with large blunt tooth, left mandible stout, with deep notch; abdominal segments with a pair of lateral setiferous lobes *H. (Dibolocelus)*



- 5' Right mandible thin, with bifid tooth, left mandible much stouter, with 1 tooth; abdominal segments without lateral setiferous lobes *H. (Hydrophilus)*



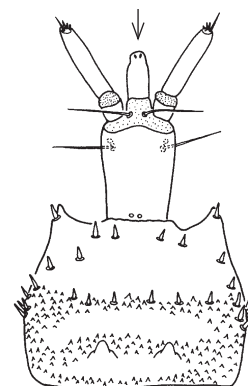
H. (Dibolocelus) *H. (Hydrophilus)*

- 6(4') Abdominal segments 1-8 with well developed, pubescent lateral gills *Hydrochara*

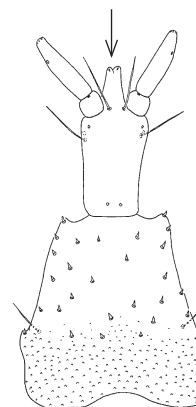


- 6' Abdominal segments 1-8 with at most rudimentary lateral gills (see figures below) 7

- 7(6') Meso- and metanotal sclerites reduced, triangular; apex of ligula not bifid; lateral gills of abdominal segment 9 short ***Tropisternus***



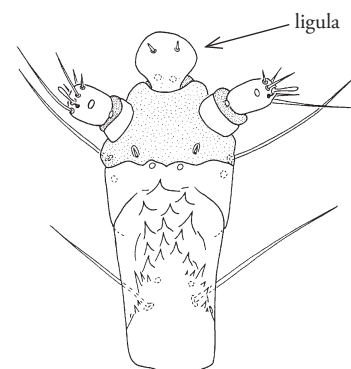
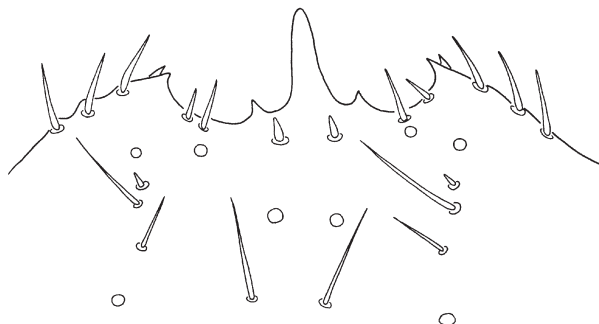
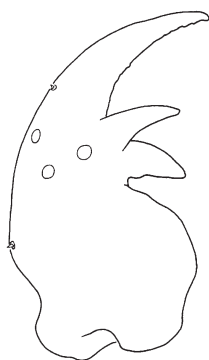
- 7' Meso- and metanotal sclerites not as reduced, trapezoidal; apex of ligula shallowly bifid; lateral gills of abdominal segment 9 long .. ***Hydrobiomorpha***



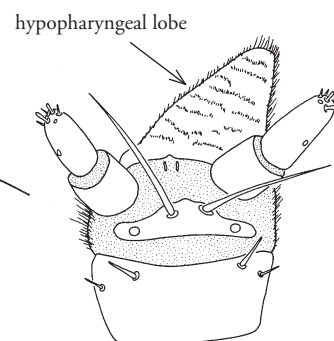
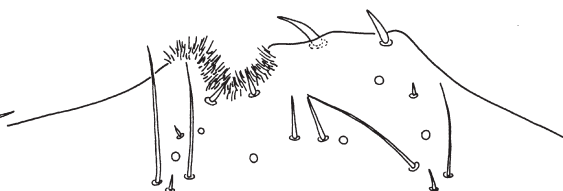
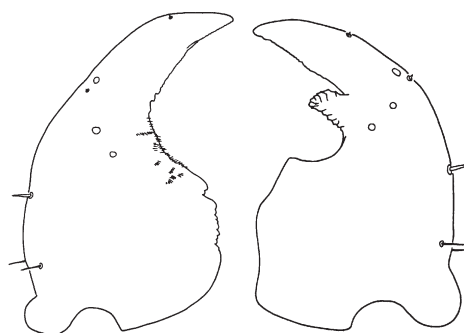
- 8(3') Legs absent or reduced, with at most 3 segments, no terminal claw present 9

- 8' Legs with at least 4 apparent segments and a terminal claw present 10

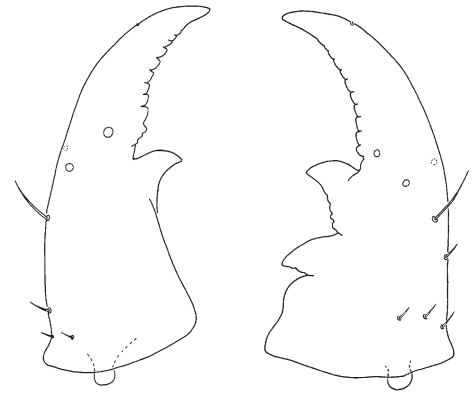
- 9(8) Each mandible with 2 inner teeth; labroclypeus with one large median tooth; ligula short and rounded ***Chaetarthria***



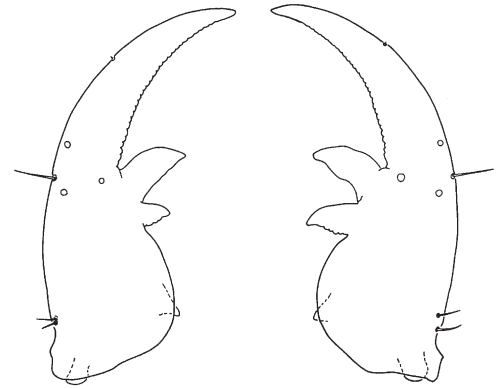
- 9' Right mandible with 1 inner tooth, left mandible with no inner teeth; labroclypeus without teeth, with notch on left margin; ligula absent, but a tongue-like hypopharyngeal lobe present ***Cercyon***



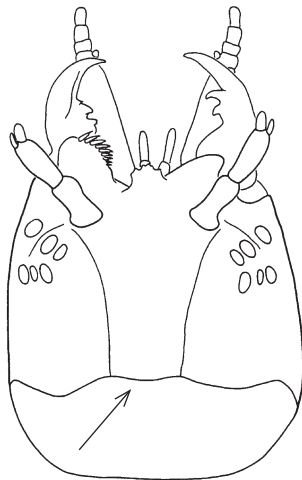
- 10(8') Mandibles asymmetrical, with different number of teeth on each mandible 11



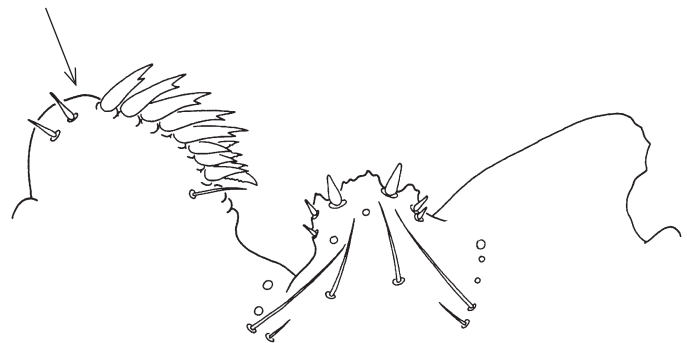
- 10' Mandibles symmetrical or nearly so, each mandible with same number of teeth (each mandible may have 2 OR 3 teeth) 12



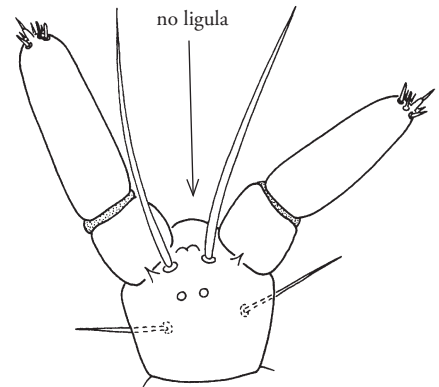
- 11(10) Posterior margin of frons truncate; labroclypeus with large epistomal lobe on left side; right mandible with 2 large inner teeth, left with 2 large and 1 small inner teeth; ligula absent ***Laccobius***



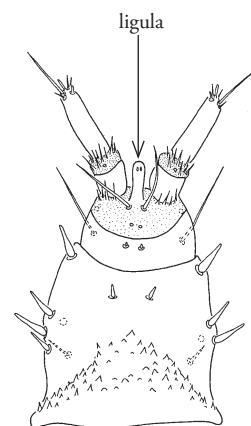
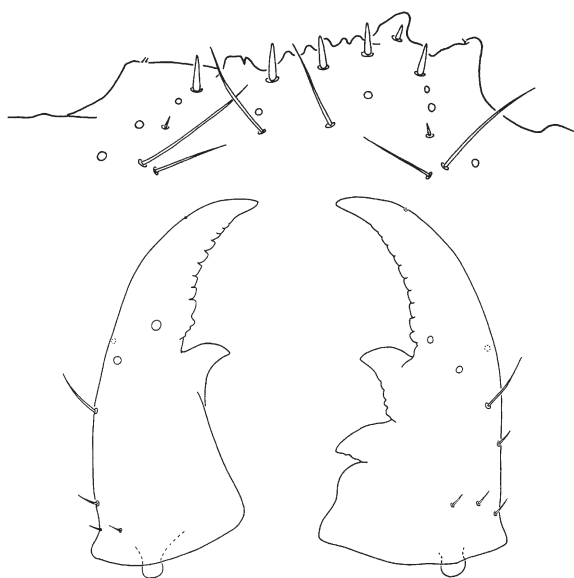
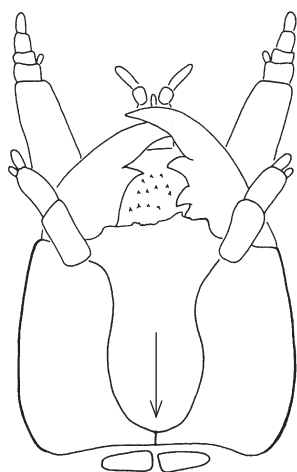
epistomal lobe



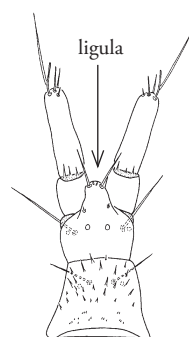
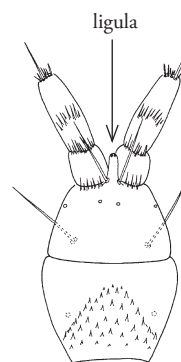
no ligula



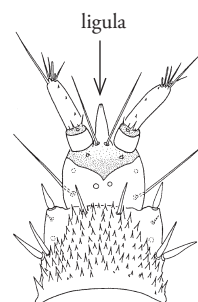
- 11' Posterior margin of frons U-shaped; labroclypeus without large lobe on left side, with asymmetrical group of teeth on right side; right mandible with one inner tooth, left with 2 inner teeth; ligula present *Enochrus*



- 12(10') Ligula shorter than or subequal to basal segment of labial palp 13

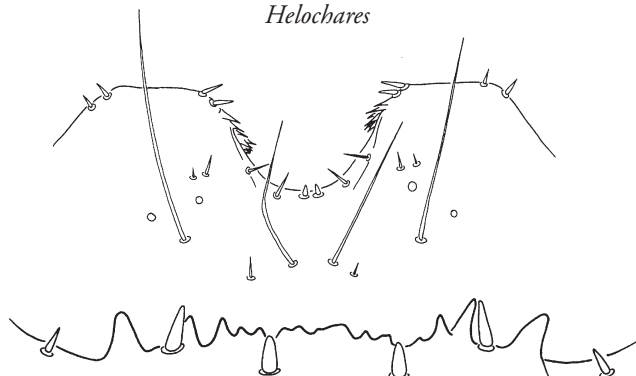
*Helocombus**Helobata*

- 12' Ligula longer than basal segment of labial palp 14

*Helochaeres*

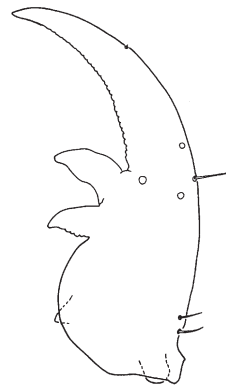
- 13(12) Labroclypeus with deep medial emargination *Helobata*

- 13' Labroclypeus with 2 larger teeth on each side with numerous smaller central teeth *Helocombus*



14(12') Mandibles with 2 distinct inner teeth 15

14' Mandibles with 3 distinct inner teeth 17



2 teeth
Helochaeres



3 teeth
Hydrobius

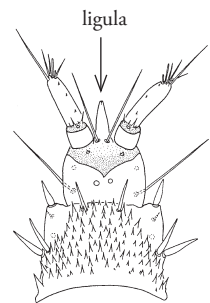
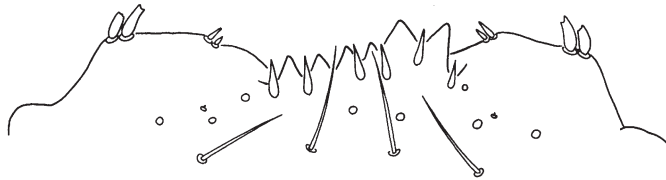
15(14) Labroclypeus with 1 median tooth (may appear trifid) ***Phaenonotum***

15' Labroclypeus with 6 or more median teeth (see below) 16

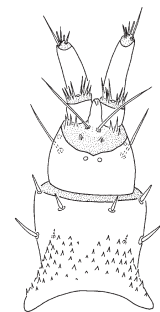
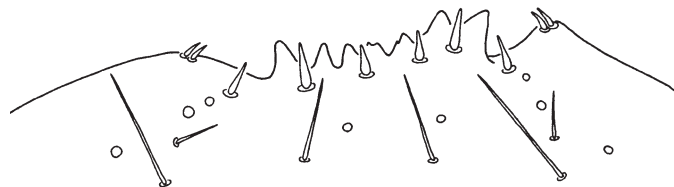


Phaenonotum

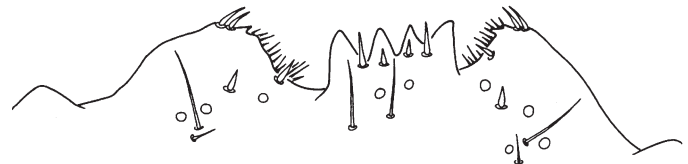
16(15') Labroclypeus with 6 distinct teeth placed in two groups, with 2 in left group, 4 in right group; ligula much longer than first palpal segment ***Helochaeres***



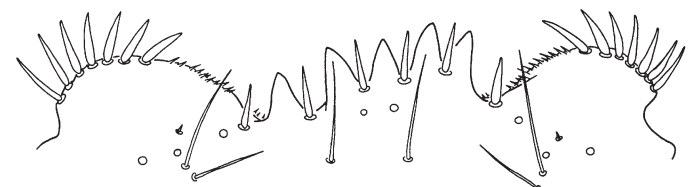
16' Labroclypeus with more than 6 medial teeth, with several smaller indistinct teeth to the right; ligula barely longer than first palpal segment .. ***Cymbiodyta***



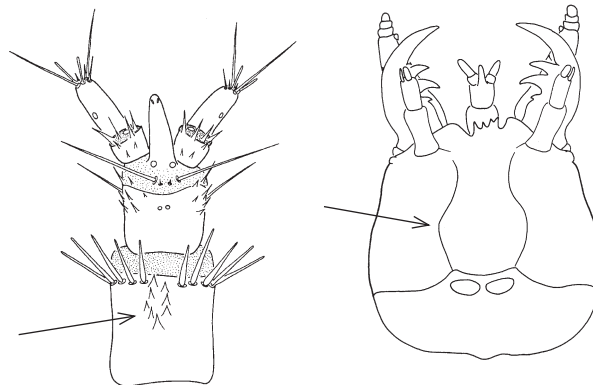
17(14') Labroclypeus with 4 medial teeth 18



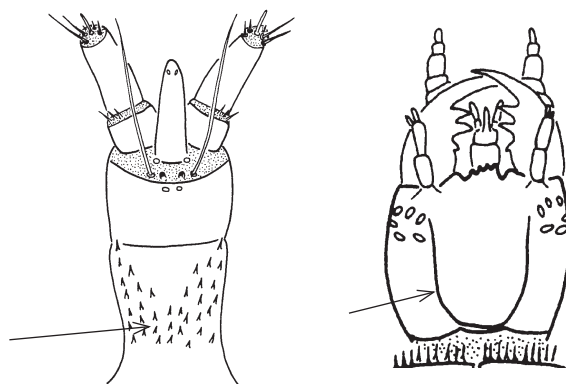
17' Labroclypeus with 5 medial teeth 19



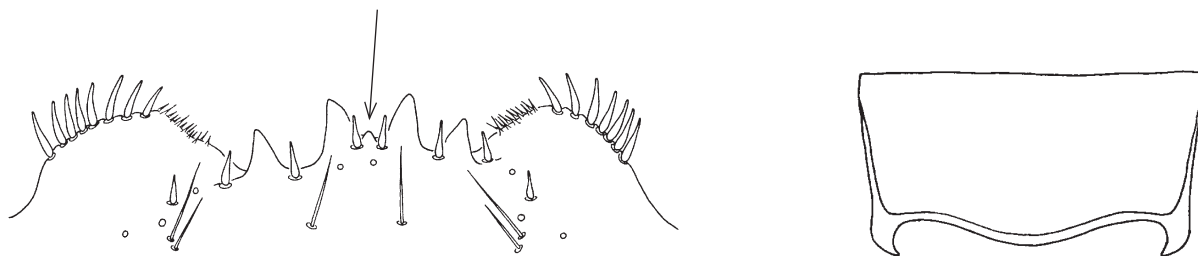
- 18(17) Mentum with an anterior group of large setae (requires compound microscope to view); frontal sulcus lyriform *Paracymus*



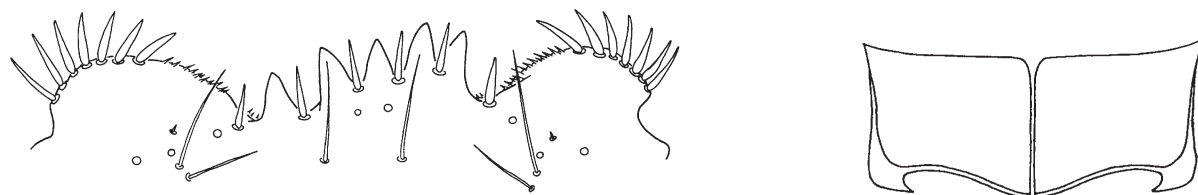
- 18' Mentum with numerous scattered setae (requires compound microscope to view); frontal sulcus U-shaped *Anacaena*



- 19(17') Middle labroclypeal tooth much smaller than others; prosternum entire *Sperchopsis*

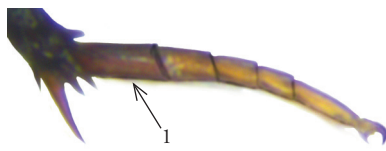


- 19' Labroclypeal teeth subequal; prosternum with a mesal longitudinal suture *Hydrobius*



Key to genera of Hydrophilidae adults of Florida

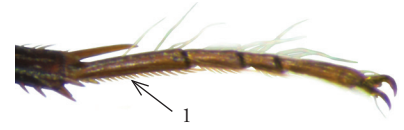
- 1 Mid and hind tarsi 5 segmented, with 1st segment longer than 2nd; maxillary palpus almost always shorter than antennae .. mostly terrestrial subfamily Sphaeridiinae 2



5 segments, 1st longer
Phaenonotum exstriatum



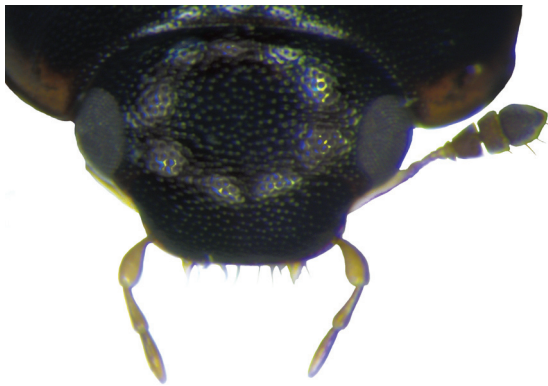
5 segments, 1st shorter
Hydrochara soror



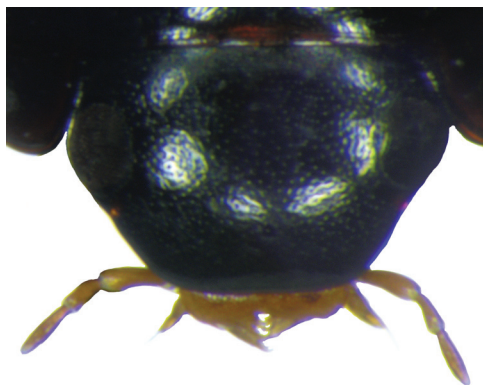
4 segments
Helocombus bifidus

- 1' Mid and hind tarsi 5 segmented with 1st segment shorter than 2nd (sometimes very small) or almost subequal to 2nd (*Paracymus*); **OR** mid and hind tarsi with only 4 segments; maxillary palpus at least as long as antennae, usually much longer 3

- 2(1) Head abruptly constricted in front of eyes, exposing bases of antennae; elytra with noticeable striae ...
..... ***Cercyon***



- 2' Head not abruptly constricted in front of eyes, bases of antennae concealed; elytra punctate, but without striae or rows of punctures ***Phaenonotum***



- 3(1') First 2 abdominal sternites with a common bilobed excavation, usually filled with a gelatinous mass that is covered by a dense fringe of long, stout, golden setae arising from anterior margin of first sternite; length < 3 mm *Chaetarthria*



- 3' Abdominal sternites without such an excavation; length variable 4

- 4(3') Meso- and metasternum with a well developed median keel that projects as a spine to at least the base of the hind coxae 5



short spine - *Hydrobiomorpha casta*

- 4' Meso- and metasternum without a well developed, continuous median keel that extends to the hind coxae 8

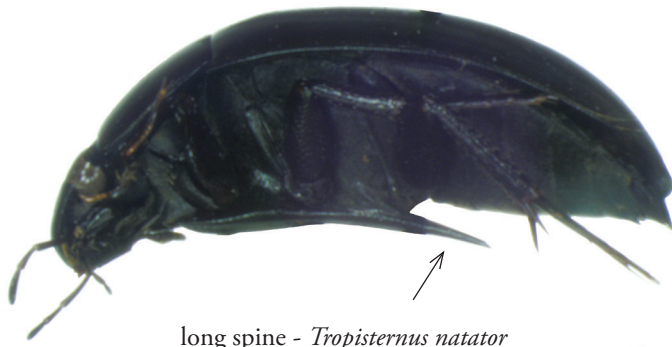
- 5(4) Very large species, length > 30 mm *Hydrophilus*

- 5' Medium sized species, length < 20 mm 6



Hydrophilus triangularis

- 6(5') Metasternal spine extends at least to hind margin of 1st abdominal sternite; prosternum deeply grooved posteromedially or divided into two lobes; length usually < 13 mm ***Tropisternus***

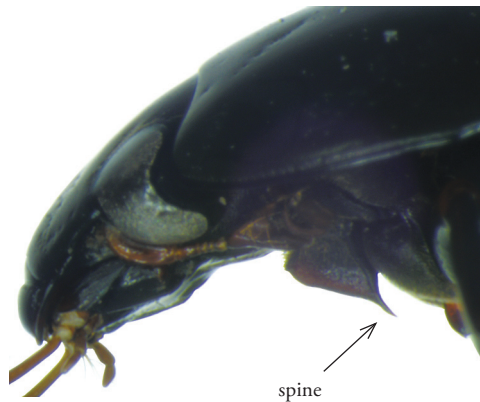


long spine - *Tropisternus natator*



short spine - *Hydrobiomorpha casta*

- 6' Metasternal spine shorter, not reaching hind margin of 1st abdominal sternite; prosternum carinate medially; length usually > 13 mm 7
- 7(6') Clypeus broadly emarginate anteriorly; prosternum with long, posteriorly directed spine; 6th and 7th antennomeres very asymmetrical, 7th deeply grooved and bilobed and bearing long yellow setae ***Hydrobiomorpha***



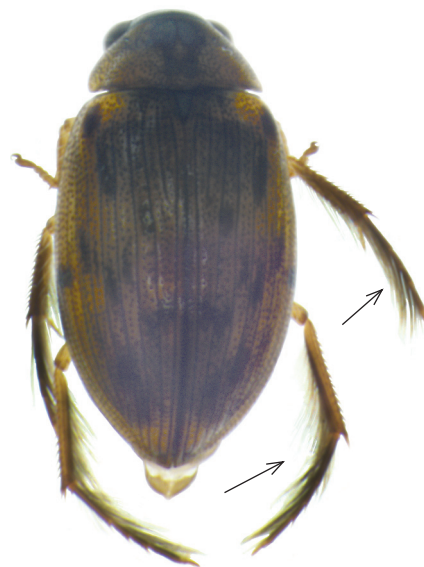
spine



- 7' Clypeus not emarginate anteriorly; posterior of prosternum with sharp point; 6th and 7th antennomeres only slightly asymmetrical, without long yellow setae ... ***Hydrochara***



- 8(4') Middle and hind tibiae and tarsi with well developed fringe of long natatory (swimming) setae; scutellum much longer than wide 9



- 8' Middle and hind tibiae without well developed fringe of natatory setae, BUT weak fringe of natatory setae may be present on mid and hind tarsi and sometimes scattered setae on mid and hind tibiae; scutellum at most slightly longer than wide 10

- 9(8) Elytra black; length < 3.0 mm *Derallus*



- 9' Elytra yellowish to reddish brown and usually with pattern of dark spots (spots may be weak); length 2.0-6.5 mm *Berosus*



- 10(8') Elytra without striae, but serial rows of punctures present; hind tibiae arcuate; 6 visible abdominal sternites; small, < 4 mm ***Laccobius***

Laccobius reflexipennis



- 10' Elytra with at least a sutural stria; hind tibiae straight; 5 visible abdominal sternites; length variable 11

- 11(10') Maxillary palp short and stout, no more than length of antenna, with last segment at least as long as the preceding segment .. 12



- 11' Maxillary palp long and slender, longer than antenna, with last segment shorter than preceding segment 15



- 12(11) Length > 4 mm; elytra striate or with punctures arranged in longitudinal rows 13

- 12' Length < 4 mm; at most a sutural stria present; punctures not arranged in longitudinal rows 14

- 13(12) Lateral margins of elytra smooth; mid and hind tarsi with fine fringe of natatory setae; clypeus truncate anteriorly; color black ***Hydrobius***



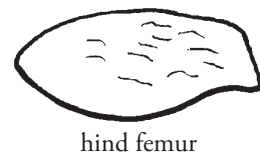
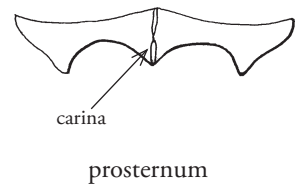
Hydrobius tumidus



Sperchopsis tessellata

- 13' Lateral margins of elytra weakly serrate; mid and hind tarsi without setal fringe; clypeus emarginate anteriorly; color reddish-brown ***Sperchopsis***

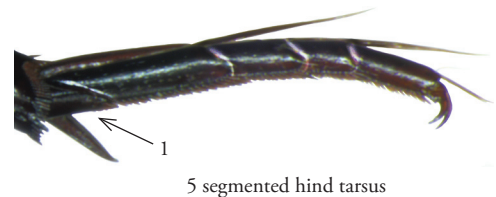
- 14(12') Prosternum with medial longitudinal carina; mesosternum with longitudinal crest/carina; hind femora without dense pubescence basally *Paracymus*



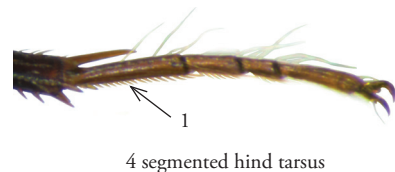
- 14' Prosternum without medial longitudinal carina; mesosternum never with longitudinal crest/carina; hind femora with dense pubescence basally *Anacaena*



- 15(11') All tarsi 5 segmented (basal segment may be very small) 16



- 15' Middle and hind tarsi 4 segmented 18



- 16(15) In dorsal aspect, pseudobasal segment of maxillary palp curves inward when extended *Enochrus*



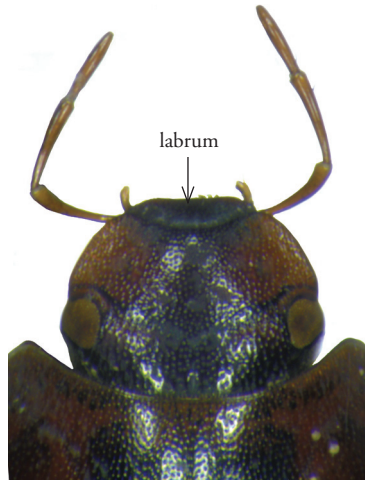
Enochrus consors



Cymbiodyta chamberlaini

- 16' In dorsal aspect, pseudobasal segment of maxillary palp curves outward when extended 17

17(16') Labrum visible; eyes form part of lateral margin of head; body form convex, not flattened *Helochares*

Helochares*Helobata*

17' 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*

18(15') Elytra with distinct striae; maxillary palpi very long with penultimate segment about as long as width of labrum at front of clypeus; tarsal claws with basal tooth in both sexes, very small in female .. *Helocombus*



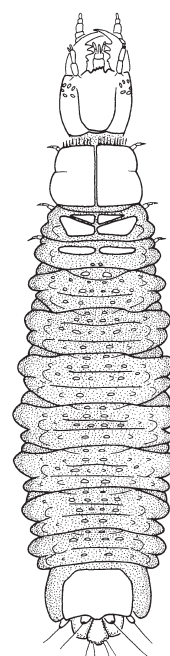
18' Elytra with sutural striae only, although punctures may be arranged in longitudinal rows; maxillary palpi shorter, with penultimate segment about 2/3 as long as width of labrum at front of clypeus; tarsal claws without a basal tooth in both sexes ..
..... *Cymbiodyta*



GENUS *Anacaena*

DIAGNOSIS: Larvae are distinguished by the short antennae, with basal segment subequal to combined length of remaining segments; well developed sensorium on apex of 2nd antennal segment; U-shaped frontal sulcus; mentum without anterior row of large setae; one segmented ligula that is longer than the basal labial palpomere but shorter than the combined lengths of the 2 palpomeres; labroclypeus with 4 small median teeth; symmetrical mandibles with 3 inner teeth, proximal one much smaller; and well developed but short legs that are barely visible in dorsal view.

Adults are distinguished by the small size (≤ 3 mm); 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 second segment.

*A. suturalis**A. limbata* larva

(adapted from Archangelsky 1997)

NOTES: Only one species, *A. suturalis*, is known from Florida. This species was formerly classified in the genus *Crenitulus*, but that genus is considered a junior synonym of *Anacaena*. Another species, *A. limbata*, may eventually be found in northern or western Florida. The genus requires revision in North America.

Anacaena often occur in the grassy margins of ditches, ponds and lakes as well as along streams.

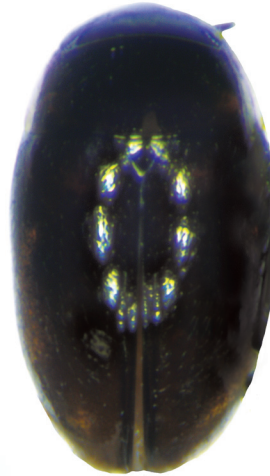
ADDITIONAL REFERENCES: Berge Henegouen 1986; Ciegler 2003; Hansen 1991b; Komarek 2005; Smetana 1988; Testa & Lago 1994.

Florida species

A. suturalis (LeConte)

Key to adult *Anacaena* of the Southeast United States

- 1 Body more elongate, narrowed posteriorly; pronotum dark brown-black, with a narrow yellowish lateral margin; hind femora pubescent only along the anterior margin; combined length of hind tarsomeres greater than length of hind tibia *A. suturalis*



- 1' Body broader, not as narrowed posteriorly; pronotum with lateral margins darker (may be light but usually not as yellow as *A. suturalis*); hind femora are almost entirely pubescent (bare near apex); combined length of hind tarsomeres less than or subequal to length of hind tibia **A. limbata*
(not known from Florida, but may occur in northern or western part of state)



Notes on species

A. suturalis - Length 1.5-2.1 mm. Young (1954: 167) noted that this species, as *Crenitulus suturalis*, was "often abundant in streams in uplands and flatwoods; more rarely found in lenitic [sic] situations."

Other species

A. limbata (Fabricius) - Length 2-3 mm. Recorded from Mississippi and the Carolinas and may eventually be found in northern/western Florida. Testa & Lago (1994) recorded this species from Mississippi based on a record in Richmond (1962). Since this record is from Horn Island, a barrier island in the Gulf of Mexico, it is most probably a misidentification of *A. suturalis*.

Komarek (2005), in a revision of the Neotropical *Anacaena*, included several similar species in an "*A. suturalis* group". At least one of these, the widespread (in the Neotropics) *A. solstitialis* (Kirsch) (length 1.4-1.9 mm), could possibly occur in southern Florida; it has a mostly yellow pronotum, or yellowish brown with a darker central area, in contrast to the mostly dark brown-black pronotum, with a narrow yellowish lateral margin, of *A. suturalis*.

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, the right with a large distal tooth and 1-2 inner basal teeth; and abdominal segments with long lateral tracheal gills.

Adults are distinguished by the moderately small size (2-7 mm) and brown to yellowish-brown coloration; pronotum not continuous in outline with elytra; scutellum longer than wide; meso- and metasternum without a ventral keel produced into a posterior spine; and middle and hind tibiae and tarsi with well developed fringe of long natatory setae, basal tarsomere shorter than second.



Berosus sp. larva



B. sayi adult

NOTES: *Berosus* are common and often abundant beetles throughout the state; they prefer shallow standing water or slowly moving water with vegetation or plant debris. Over two dozen species of *Berosus* are known from North America; 11 are recorded from Florida. The genus was revised by Van Tassell (1966), but her dissertation was never published.

Positive identification is often best made by examination of the male genitalia. Males and females can be separated without dissection by their fore tarsi: those of the male are 4-segmented and expanded basally; female fore tarsi are 5-segmented and thin.

ADDITIONAL REFERENCES: Archangelsky 1994; Ciegler 2003; Testa & Lago 1994; Van Tassell 1966, 1990; Wooldridge 1964 .

Florida species

B. aculeatus LeConte
B. arnetti Van Tassell
B. corrini Wooldridge
B. exiguus (Say)
B. infuscatus LeConte
B. ordinatus LeConte
B. pantherinus LeConte
B. peregrinus (Herbst)
B. pugnax LeConte
B. sayi Hansen
B. youngi Wooldridge

Key to adult *Berosus* of Florida

- 1 Elytral apex with 2 projections, the preapical one much longer and spine-like; posterior emargination of 5th visible abdominal sternite with a shallow median notch *B. pugnax*



5th abdominal sternite emargination

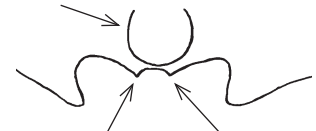
- 1' Elytral apex without two projections (but may be simply extended in some species); emargination of 5th visible abdominal sternite with 1 or 2 central teeth, or simply truncate medially (see below) 2

- 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

sternal protuberance



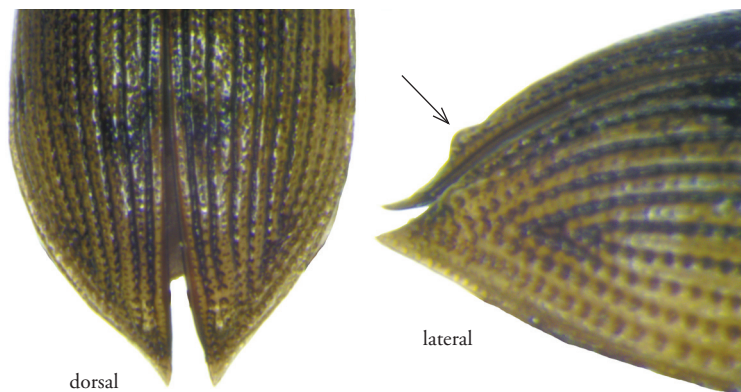
- 3(2) Size very small, <3.5 mm (usually < 3.0 mm); head yellowish-brown to brown; elytral apices not prolonged, elytral spots usually faint; male genitalia with a dorsal tuft of fine setae (these setae may be difficult to observe in teneral specimens) *B. exiguus*



- 3' Size larger, ≥ 3.5 mm; head usually blackish with metallic reflections, or if yellowish-brown, then elytra with prolonged apices; 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 near suture (best developed in females); male genitalia with parameres very slender apically *B. aculeatus*

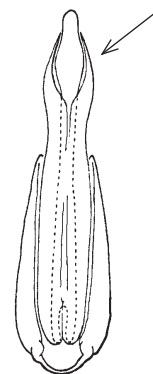


dorsal

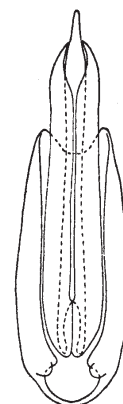
lateral

female *B. aculeatus*

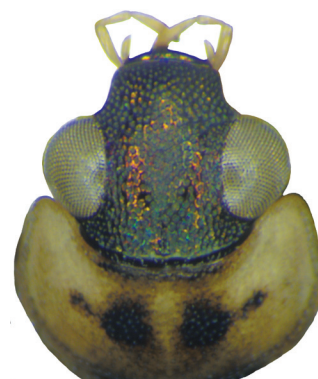
male dorsal

male genitalia
(adapted from Van Tassell 1966)

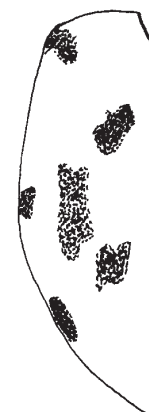
- 4' Apices of male elytra not prolonged, if slightly prolonged in females, then without small preapical tubercle near suture; male genitalia with parameres broader apically 5

*B. peregrinus* male genitalia
(adapted from Van Tassell 1966)

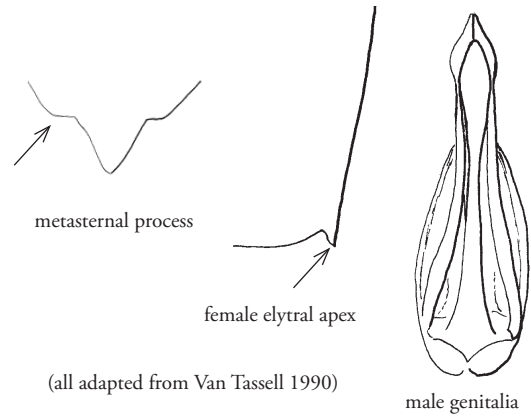
- 5(4') Each elytron with 10 distinct spots; eyes larger, at least half as wide as interocular distance; scutellum metallic black *B. pantherinus*



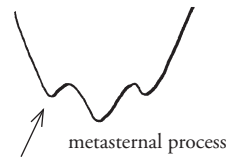
- 5' Each elytron with at most 6-7 spots that may be weakly defined or partially coalesced; eyes smaller, width about 1/3 interocular distance; scutellum brown *B. peregrinus*



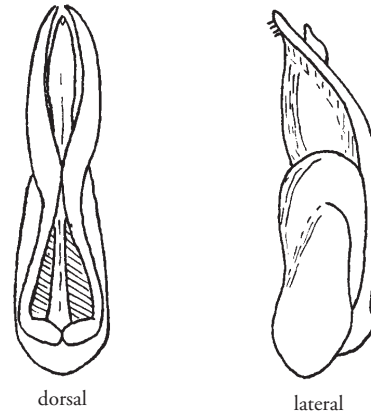
- 6(2') Metasternal process with lateral teeth barely projecting; male pronotum and elytra shining; female with sides of pronotum and elytra microreticulate; apex of female elytron with minute tooth at sutural angle; male genitalia as figured ***B. arnetti***



- 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; male genitalia not as above 7



- 7(6') Pronotum with a pair of well defined triangular spots laterad to the central pair of vittae; male genitalia as figured ***B. youngi***



(adapted from Wooldridge 1964)

- 7' Pronotum without a pair of well defined lateral triangular spots laterad to the central pair of vittae; if a darker lateral area is present (some *B. infuscatus*), it is not distinctly delimited or triangular; male genitalia not as above 8

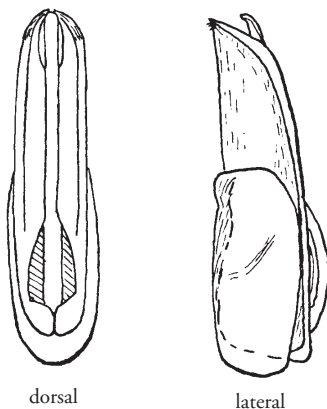
- 8(7') Pronotum and elytra of females and pronotum only of males microreticulate; male genitalia as figured ***B. infuscatus***



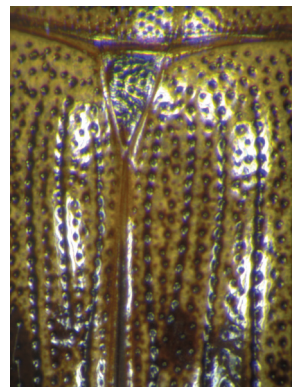
- 8' Pronotum of female only lightly microreticulate near lateral margins at most; elytra shining; male pronotum and elytra shining; male genitalia not as above 9

B. infuscatus male genitalia
(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***



(adapted from Wooldridge 1964)



- 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 divergent or not or in some females with small tooth at sutural angle 10

- 10(9') Elytral apices divergent in apical fourth and evenly rounded in both sexes; male parameres with slender apices ***B. ordinatus***



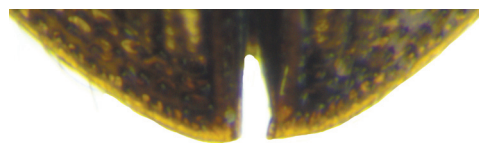
male elytral apices



- 10' Elytral apices of female with small tooth; elytral apices of males not or only slightly divergent; male parameres with broader apices ***B. sayi***



male elytral apices



female elytral apices



(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, with the extremely narrow apices on the parameres.
- B. arnetti* – Length 4.0-5.9 mm. This species, described by Van Tassell (1990), is known from only three localities in Liberty Co., where it was collected from ponds and a stream. Although listed by Peck & Thomas (1998) as a Florida endemic, it most likely will also eventually be found in southern Georgia and Alabama. I have not seen any material of this species.
- B. corrini* – Length 4.4-5.6 mm. An uncommon species that probably occurs throughout the state. In Florida it is known from Liberty County south to Dade County; also known from North Carolina and Mississippi. This species may be difficult to separate from *B. ordinatus* and *B. sayi*; 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. This species is quite variable in size and in hue; some individuals are quite dark. See also *B. youngi*.
- B. ordinatus* – Length 4.5-6.5 mm. Apparently a relatively uncommon species. Note that in comparison to *B. sayi*, the setigerous punctures of the odd numbered intervals are the same size as adjacent punctures; in *B. sayi* the setigerous punctures are larger than their neighbors. These differences may be difficult to perceive unless one has material of both taxa at hand; rely on male genitalia for more positive identification.
- B. pantherinus* – Length 3.0-5.0 mm. Epler (1996) had seen no Florida material of this species, but since then I have seen Florida material from Hernando, Leon and Liberty Counties. Peck & Thomas (1998: 27) incorrectly list this species as “endemic” from Gadsden County; it is found throughout the eastern US, north to Massachusetts and west to at least Mississippi.
- B. peregrinus* – Length 3.5-4.9 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. I have not seen any Florida material of this apparently very uncommon species; Van Tassell (1966) noted its occurrence in Cuba.
- B. pugnax* – Length 5.0-6.5 mm. The two points on the apex of each elytron, one much longer and spine-like, easily identify this species, found throughout the peninsula at least as far south as Lake Okeechobee. Note that there are other species with elytral spines in the western US as well as Mexico and the West Indies, but most of these species have two teeth in the emargination of the 5th abdominal sternite, or the 5th sternite is entire; see Van Tassell (1966). The aedeagus is also unique in the Florida fauna in having a truncate apex with a ventral “tooth” that is apically emarginate and reflexed towards the base.
- B. sayi* – Length 4.0-6.5 mm. Formerly called *B. striatus*, this species is 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. sayi* 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 County south to Broward and Collier Counties; I've collected it at UV light along the Wakulla River in Wakulla County. 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 distinct dark triangular areas found on *B. youngi*; examination of male genitalia will separate doubtful males. Females of *B. youngi* have shining elytra compared to the alutaceous elytra of female *B. infuscatus*.

Other species

- B. interstitialis* Knisch - Length about 6.0 mm. Considered by Van Tassel (1966) to be a senior synonym of *B. stribalus* d'Orchymont from the West Indies, but the two taxa are listed as separate species in Hansen (1999). It resembles *B. infuscatus* or *B. sayi*, 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.
- B. metalliceus* Sharp - Length about 4.0 mm (Young 1954) to 6.2 mm (Van Tassell 1966). Young (1953b) recorded this brackish water species from South Bimini in the Bahamas and keyed it in his 1954 work; it is listed from Grand Inagua by Turnbow & Thomas (2008). 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.

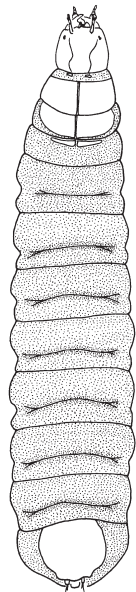
Several other species are recorded or described from the Bahamas or Cuba that could possibly occur in Florida. These include *B. chevrolati* Zaitzev, *B. trilobus* Chevrolat, *B. truncatipennis* Castelnau (= *quadridens* Chevrolat?) and *B. undatus* (Fabricius). See Van Tassell (1966).

GENUS *Cercyon*

DIAGNOSIS: Larvae are distinguished by the short antennae, with sensorium at apex of segment 2; right mandible with 1 inner tooth, left mandible with no inner teeth; labro-clypeus without teeth, with notch on left margin; ligula absent, but a tongue-like hypopharyngeal lobe present; and extremely reduced, 3-segmented legs without tarsal claws.

Adults are distinguished by the small size (< 3 mm); 9 segmented antennae with bases that are visible from above, not hidden by an expanded lateral; margin of the head; lateral margins of head abruptly narrowed before eyes; maxillary palpi shorter than antennae, with 2nd palpomere much thicker than 3rd and 4th; mesosternal process narrow posteriorly; striate elytra; and the 5-segmented mid and hind tarsi with the 1st segment longer than the 2nd.

NOTES: A large genus (39 species in North America) of small beetles, the majority of which are terrestrial, living in dung or rotting vegetation. Of the nine species recorded from Florida, two, *C. floridanus* and *C. praetextatus*, are considered semi-aquatic; for identification of other *Cercyon* species, see Ciegler (2003) or Smetana (1978).

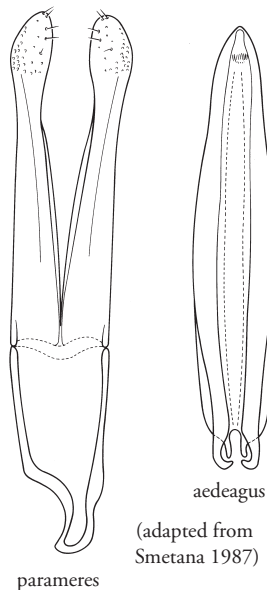


C. praetextatus larva
(adapted from Archangelsky 1997)

Cercyon floridanus is smaller (length 1.6-2.4 mm); lacks the reddish spots on the occiput; has fine microsculpture on the elytra; has a smaller yellowish marginal area on the elytra; and the male parameres are subequal to the base.



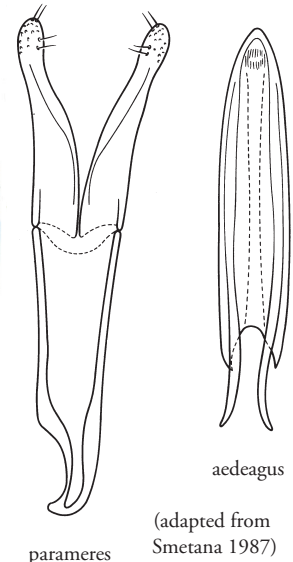
C. praetextatus



(adapted from
Smetana 1987)



C. floridanus



(adapted from
Smetana 1987)

Cercyon praetextatus is larger (length 2.4-3.5 mm); usually has two small reddish spots on the occiput; lacks microsculpture on the elytra; has a larger yellowish area on the elytra; and the male parameres are much longer than the base.

ADDITIONAL REFERENCES: Ciegler 2003; Smetana 1978.

Florida species

C. crocatus Smetana
C. floridanus Horn
C. herceus Smetana
C. mendax Smetana
C. nigriceps (Marsham)
C. praetextatus (Say)
C. quisquilius (Linnaeus)
C. variegatus Sharp
C. versicolor Smetana

GENUS *Chaetarthria*

DIAGNOSIS: Larvae are distinguished by the short antennae, with sensorium at apex of segment 2; mandibles with 2 inner teeth; labroclypeus with one large median tooth; ligula short and rounded; and extremely reduced legs without tarsal claws.

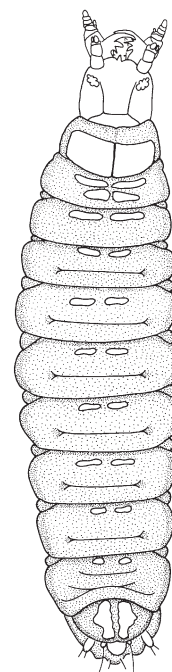
Adults are distinguished by the very small size (< 2 mm); first 2 abdominal sternites with a common bilobed excavation, usually filled with a hyaline mass supported by a fringe of long, stout golden setae originating on the 1st abdominal sternite; and all tarsi 5 segmented, with 1st and 2nd segments subequal.



C. pallida adult, ventral



C. pallida adult, dorsal



Chaetarthria sp. larva
(adapted from Archangelsky 1997)

NOTES: Most of the 14 North American species of this genus are western; only one species, the yellowish-brown *C. pallida* (length 1.3-1.7 mm) occurs in the southeastern US.

Chaetarthria are considered semiaquatic. They burrow in clean sand (lacking mud or silt) at the margins of streams or rivers; adults are not known to actively swim. Unless one is running light traps, these beetles are rarely seen - but when found, they may be abundant. The function of the gelatinous mass under the abdomen is unknown. Since it is carried by both sexes, it most likely is not involved with eggs or egg masses.

ADDITIONAL REFERENCES: Miller 1974.

Florida species

C. pallida (LeConte)

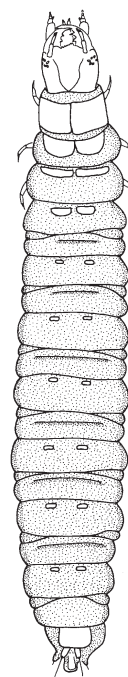
GENUS *Cymbiodyta*

DIAGNOSIS: Larvae are distinguished by the moderately long antennae, with basal segment subequal to total of remaining segments, with sensorium at apex of segment 2; labroclypeus with more than 6 medial teeth, with several smaller indistinct teeth to the right; ligula barely longer than first palpal segment; mandibles each with 2 inner teeth; well developed legs; and femora without a fringe of natatory setae.

Adults are distinguished by the small size (2.6-6.0 mm); long and slender maxillary palpi (longer than antennae), with pseudobasal segment concave on inner side when extended and last segment shorter than or subequal to the preceding segment, about 2/3 as long as width of labrum at front of clypeus; elytron with sutural stria; non-carinate prosternum; transverse mesosternal ridge; elytra with sutural striae only, although punctures may be arranged in longitudinal rows; 4 segmented mid and hind tarsi with weak fringe of natatory setae; and tarsal claws without a basal tooth.



C. chamberlaini



C. vindicata larva
(adapted from Archangelsky 1997)

NOTES: Only two of the 23 species known from the Nearctic are recorded from Florida; a third species is also likely to be eventually collected here. The genus was revised by Smetana (1974).

All species are aquatic, occurring in seeps, bogs, ponds, lake margins and streams. Note that at least one species found in Florida, *C. vindicata*, has been found in wet moss or in vegetation/leaf litter.

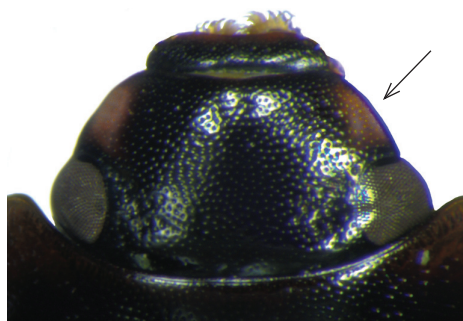
ADDITIONAL REFERENCES: Ciegler 2003; Smetana 1974; Testa & Lago 1994.

Florida species

C. chamberlaini Smetana
C. vindicata Fall

Key to adult *Cymbiodyta* of Florida
(genitalia figures adapted from Smetana 1974)

- 1 Head with pale spots in front of eyes; male genitalia with parameres narrowed towards base and aedeagus with lower lateral margins straight *C. chamberlaini*



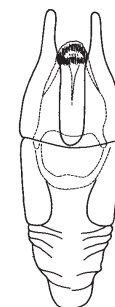
- 1' Head without pale spots; parameres of male genitalia not narrowed towards base 2

- 2(1') Size larger, 3.5-5.3 mm; parameres of male genitalia with almost straight outer margin *C. vindicata*

- 2' Size smaller, 2.6-3.5 mm; parameres of male genitalia narrowed towards apex **C. minima*
(not recorded for Florida, but should eventually be found in northern/western part of state)



C. vindicata



C. minima

Notes on species

C. chamberlaini - Length 4.0-5.7 mm. The pale preocular spots are diagnostic for species found in Florida. This species appears to be the most common *Cymbiodyta* in Florida. It was referred to as "*C. blanchardi*?" in Young (1954), but that species is not known from Florida (see below).

C. vindicata - Length 3.5-5.3 mm. An extremely variable, widespread species, not confined to fully aquatic habitats. It is likely that many earlier records of this species from Florida refer to *C. chamberlaini*.

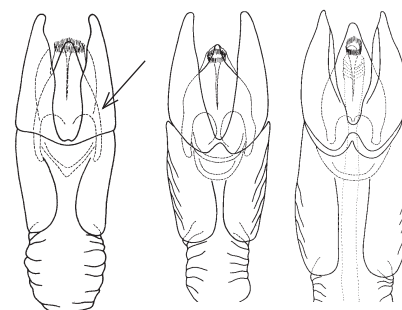
Other species

C. blanchardi Horn - Length 3.0-4.1 mm. Not known from Florida, but is recorded from the Coastal Plain and Sand Hills of South Carolina (Ciegler 2003). Similar to *C. chamberlaini* in that it has pale spots in front of the eyes, but it is smaller and much lighter brown; it resembles *Enochrus ochraceus* in coloration. Its genitalia are very similar to those of *C. chamberlaini* but differ in having the lower lateral margins of the aedeagus arcuate instead of straight as in *C. chamberlaini*.

C. minima Notman - Length 2.6-3.5 mm. This species has not yet been collected from Florida but is to be expected in the Panhandle. Smetana (1974) recorded it from Irwin Mill Creek in Alabama (Houston Co.), just across the AL/FL state line; this creek flows into Florida.

C. semistriata (Zimmermann) - Length 3.9-4.9 mm. Not known from Florida but recorded from Mississippi and South Carolina. Similar to *C. vindicata* but apical 1/4 of hind femur bare (apical 5th-6th bare in *C. vindicata*) and genitalia different.

C. toddi Spangler - Length 4.0-5.5 mm. Not known from Florida but recorded from central Georgia and South Carolina. Similar to *C. semistriata* but genitalia different.



C. blanchardi *C. semistriata* *C. toddi*

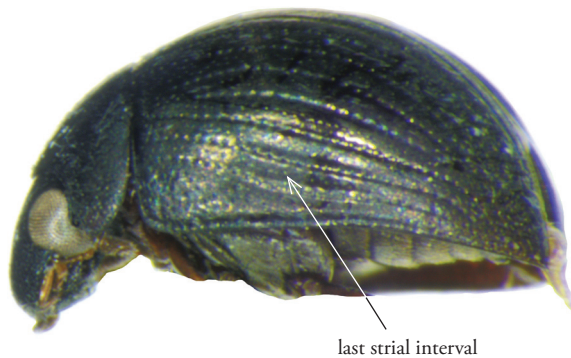
GENUS *Derallus*

DIAGNOSIS: Larvae are distinguished by the antenna with basal segment longer than remaining segments, with preapical spur on inner side and with sensorium at apex of 2nd segment; well developed, 5 segmented legs, usually visible in dorsal view; and meso- and metathoracic segments each with 3-4 moderately long setiferous lateral gills.

Adults are distinguished by the small size (< 2.5 mm); dark metallic black coloration; laterally compressed, hemispherical body shape; scutellum longer than wide; striate elytra; and mid and hind tibiae and tarsi with well developed natatory setae.



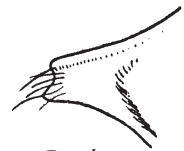
D. altus adult, dorsal



D. altus adult, lateral



D. altus larva



D. altus



D. rudis

NOTES: Only one species, *D. altus* (length 1.8-2.4 mm) of this mostly Neotropical genus occurs in Florida. A second species, *D. rudis* Sharp (length 2.3-3.4 mm), is known from Cuba and the Bahamas and could possibly occur in southern Florida. The two species can be separated by the mesosternal process with two apical points subequal in *D. altus*, the posterior one longer in *D. rudis*; and the single row of punctae in the last stria interval in *D. altus*, multiple rows in last stria interval in *D. rudis*.

Derallus are usually found in grass and organic debris at the margins of standing water. Matta (1974) found *Derallus* in brackish water in North Carolina. The genus was recently reviewed by Short & Torres (2006).

Spangler (1966b) described the larva of *D. rudis* 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 anterior margin of the clypeus is slightly more convex. Note that the lateral processes on the abdomen are not as setose on early instar *Derallus* larvae; they can be identified by the unique basal segment of the antennae, with its preapical inner process.

ADDITIONAL REFERENCES: Short & Torres 2006; Spangler 1966b; Van Tassell 1966.

mesosternal process
(adapted from Van Tassell 1966)

Florida species

D. altus (LeConte)

GENUS *Enochrus*

DIAGNOSIS: Larvae are distinguished by the basal antennal segment shorter than to subequal to combined terminal segments; short sensorium at apex of segment 2; labroclypeus without large lobe on left side, with asymmetrical group of teeth on right side; right mandible with one inner tooth, left with 2 inner teeth; ligula present; posterior margin of frons U-shaped; and well developed legs, femora without a fringe of natatory setae.

Adults are distinguished by the small size (2.2-8.7 mm); long, slender maxillary palpi, with last segment usually shorter than penultimate and with pseudobasal segment curved inwardly when extended forward; mesosternum with mesal, projecting longitudinal crest; weak fringe of natatory setae on mid and hind tibiae and tarsi; and 5 segmented tarsi, with 1st segment shorter than 2nd.



E. reflexipennis



E. sayi



Enochrus sp larva

NOTES: A very common and speciose genus, with at least 25 species recorded from the Nearctic; 13 are known from Florida. Most *Enochrus* prefer standing water with lots of plant debris, although some also occur in streams. One species, *E. ochraceus*, is one of the most common and abundant water beetles in Florida.

The genus was treated by Gundersen (1978), but as noted by Epler (1996), Hilsenhoff (1995c) and Short (2004a), several problems exist with the taxonomy of several species.

If identifying teneral (newly emerged) specimens use extra caution in the following key because they may not be as dark as older individuals; teneral material can often be identified as such by the very soft body parts (and lighter color).

The median lobe, or penis, of the genitalia bears a supplemental sclerotized structure dorsally termed the “dorsal strut”.

ADDITIONAL REFERENCES: Byttebier & Torres 2009; Ciegler 2003; Gundersen 1977, 1978; Hilsenhoff 1995c; Short 2003a, 2003b, 2004a, 2005; Testa & Lago 1994.

Florida species

E. blatchleyi (Fall)
E. cinctus (Say)
E. consors (LeConte)
E. consortus Green
E. fimbriatus (Melsheimer)
E. grossi Short
E. hamiltoni (Horn)
E. interruptus Gundersen
E. ochraceus (Melsheimer)
E. pygmaeus (Fabricius)
E. reflexipennis (Zimmermann)
E. sayi Gundersen
E. sublongus (Fall)

Key to adult *Enochrus* of Florida

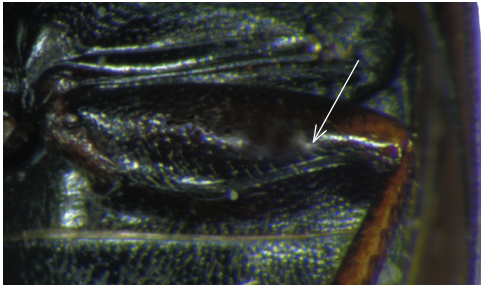
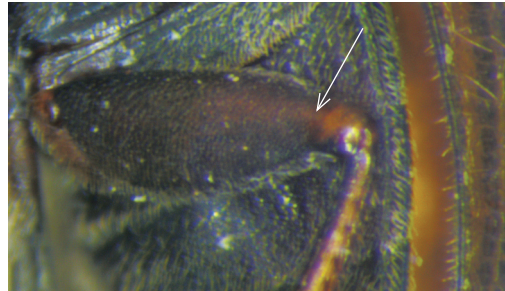
- 1 Apex of 5th visible abdominal sternite smoothly rounded, with a fringe of fine dark setae, without a medial emargination (notch) or fringe of stout golden setae 2



- 1' Apex of 5th visible abdominal sternite with a medial group of stout golden setae and usually with a medial emargination 4

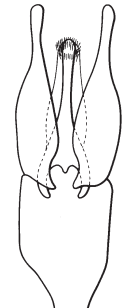
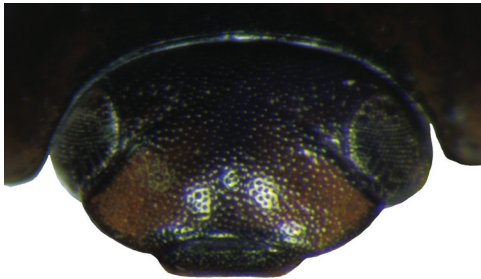


- 2(1) Hind femur with sparse pubescence that extends about 3/5 length of femur; male genitalia with parameres bent outward ***E. grossi***

*E. grossi**E. hamiltoni**E. grossi*

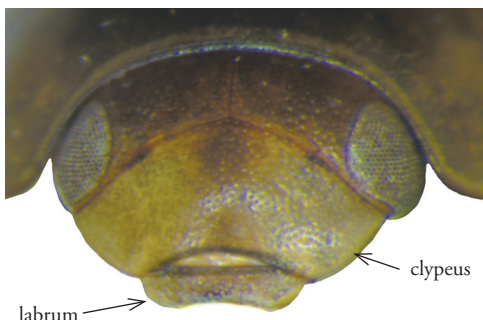
- 2' Hind femur with dense pubescence that extends about 5/6 length of femur; parameres of male genitalia with rounded knob-like apices (see below) 3

- 3(2') Larger, length 4.0-6.6 mm; body dark brown to black or light brown with center of head and thorax darker; anterior margin of clypeus straight or at most slightly concave, gap between it and the posterior margin of the labrum not trapezoidal; posterior margin of elytra not reflexed or flattened .. ***E. hamiltoni***



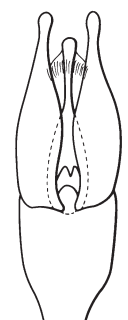
(adapted from Smetana 1988)

- 3' Smaller, length 3.4-5.0 mm; body uniformly pale yellow to light brown; anterior margin of clypeus emarginated, with a trapezoidal gap between it and the posterior margin of the labrum; posterior margin of elytra slightly flattened and reflexed ***E. reflexipennis***



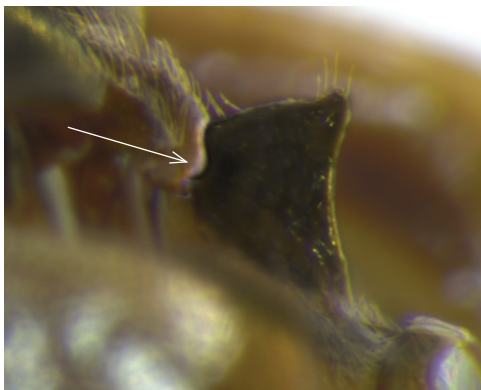
labrum

clypeus



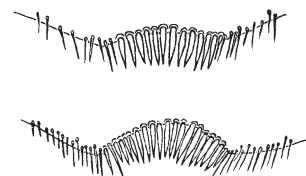
(adapted from Smetana 1988)

- 4(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. fimbriatus*, 4.2-6.0 mm, which has a shallow, wide, posterior abdominal emargination) 5
- 4' Yellow to brown, although center of prothorax may be dark; length < 4.5 mm 9
- 5(4) Mesosternal crest undercut at posterior end; length 4.9-8.7 mm; genitalia with parameres more apically rounded *E. cinctus*



- 5' Mesosternal crest not undercut, extends to middle coxae; length variable; genitalia not as figured, with parameres more apically pointed 6

- 6(5') Length 4.2-6.0 mm; 5th visible abdominal sternite with a wide, shallow emargination or just a medial fringe of stout golden setae; body weakly convex in cross section 7

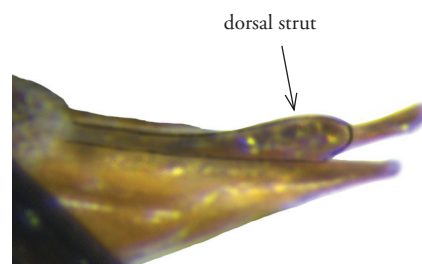
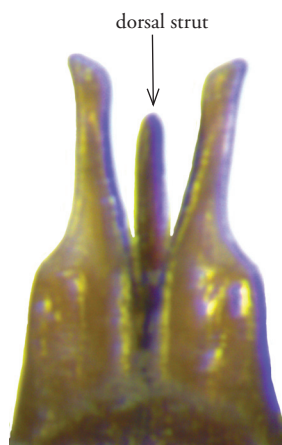
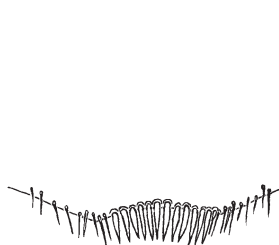


abdominal emarginations

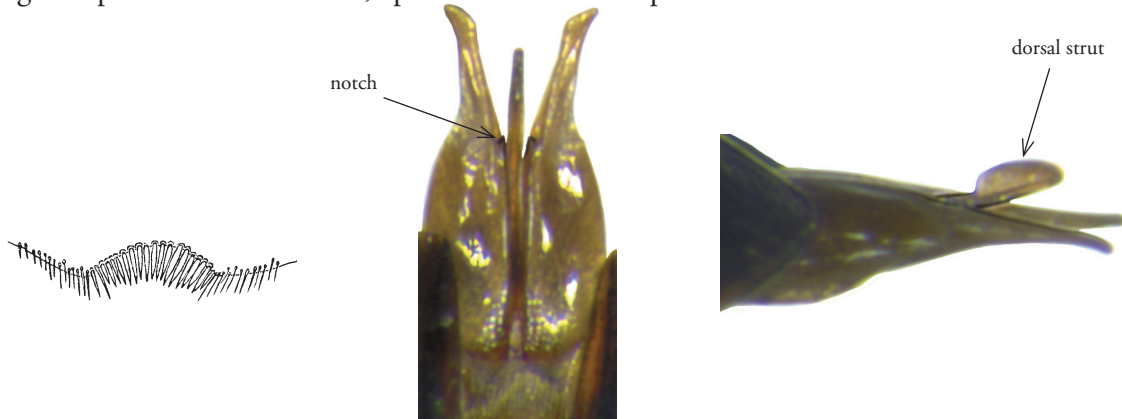
- 6' Length 6.0-8.2 mm; 5th visible abdominal sternite with a well developed, deep emargination and a medial fringe of stout golden setae; body more strongly convex in cross section 8



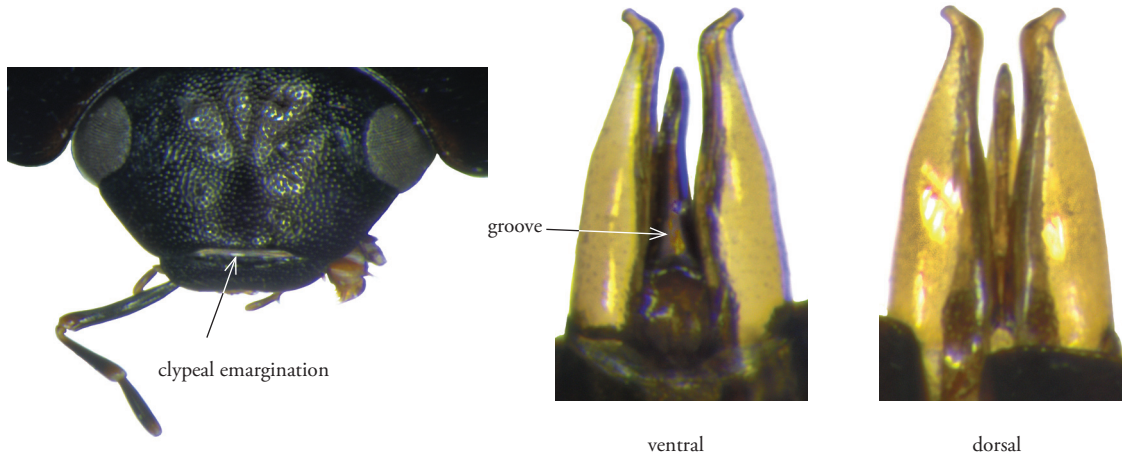
- 7(6) Emargination on 5th abdominal sternite wide and very shallow, about 11 times as wide as deep, or essentially absent; inner margin of parameres smooth; apex of dorsal strut/median lobe/penis not expanded in lateral view *E. fimbriatus*



- 7' Emargination on 5th abdominal sternite distinct but shallow, about 4 times as wide as deep; inner margin of parameres with notch; apex of dorsal strut expanded in lateral view *E. interruptus*



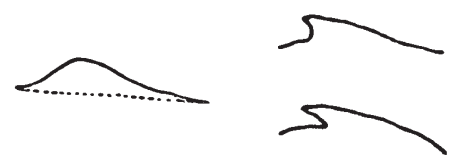
- 8(6') Uniformly black dorsally; maxillary palpi complete black or almost so; central portion of clypeal emargination straight; dorsal strut wider, with ventral groove *E. consors*



- 8' Margins of pronotum and elytra brown to yellow; maxillary palpi yellow or brown; central portion of clypeal emargination rounded; dorsal strut narrower, without ventral groove *E. consortus*



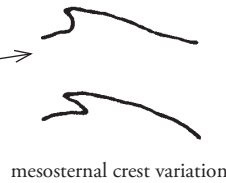
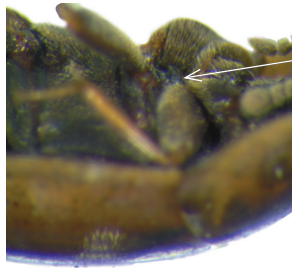
- 9(4') Mesosternal crest small and rounded with no tooth or only a small posteriorly directed one 10



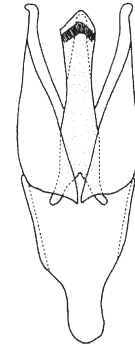
- 9' Mesosternal crest large, triangular or rectangular with a sharp anterior angle 12



- 10(9) Mesosternal crest with a small posteriorly directed tooth; male genitalia with apices of parameres directed outward and dorsal strut almost as long as parameres * *E. pseudochraceus*
(Neotropical species not recorded from Florida but could possibly occur in extreme southern peninsula)



mesosternal crest variation

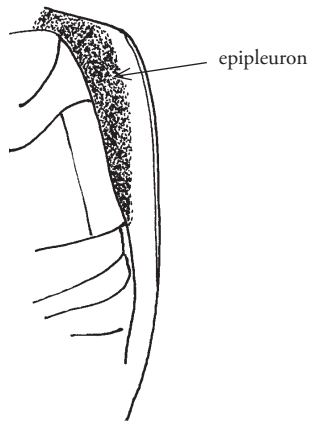


(adapted from Short 2005)

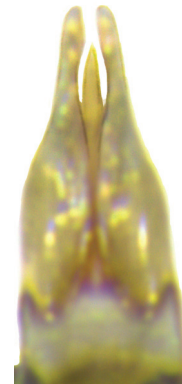
- 10' Mesosternal crest without a tooth; male genitalia with apices of parameres straight and dorsal strut much shorter than parameres (see below) 11



- 11(10') Length 2.5-3.5 mm (rarely < 2.9 mm); epipleura usually dark; emargination of 5th visible abdominal sternite medium to large, easily discerned; clypeal center usually light, but may be clouded; genitalia with parameres tapering more gradually, dorsal strut thicker *E. ochraceus*



epipleuron



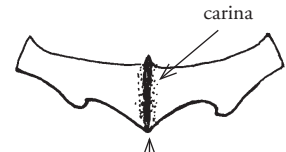
- 11' Length 2.3-2.7 mm; epipleura normally pale; emargination of 5th visible abdominal sternite very small but deep; clypeal center dark; genitalia with parameres tapering more abruptly, dorsal strut thinner ..
..... *E. sublongus*



12(9') Prosternum without a median carina *E. blatchleyi*



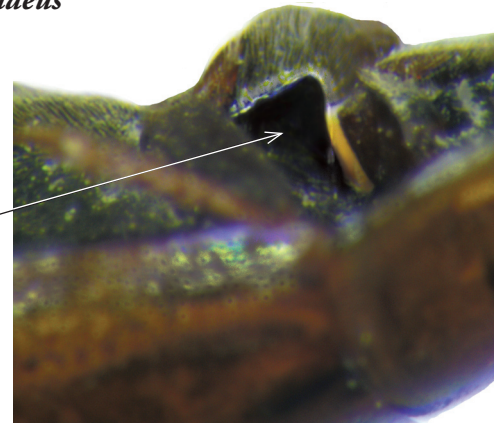
12' Prosternum with a median carina 13



13(12') Prosternum paler than metasternum; mesosternal crest obtusely angled anteriorly, posterior edge with a slight hump *E. sayi*



13' Prosternum and metasternum dark; mesosternal crest triangular, with a posterior hump *E. pygmaeus*



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 4.9-8.7 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. Our darkest *Enochrus* species, it occurs throughout the state. This species may be difficult to separate from the similar *E. consortus*. The differences in clypeal emargination can be difficult to discern; male genitalia provide the best means to separate the two taxa. Note that the dorsal strut of *E. consors* is stouter than that of *E. consortus* and has a ventral groove lacking in *E. consortus*. Females may be best separated by the more complete dark coloration of *E. consors*, including the much darker maxillary palpi.
- E. consortus* – Length 6.0-7.6 mm. This species occurs throughout the state, but may be difficult to separate from *E. consors*; see *E. consors* above. Note that *E. consortus* has lighter margins on the pronotum and elytra that are basically absent in *E. consors*.
- E. fimbriatus* – Length 4.2-6.0 mm. Formerly referred to as *E. perplexus*. Gundersen (1977, 1978) recognized the synonymy between *Philhydrus perplexus* LeConte, 1855 and *P. fimbriatus* Melsheimer, 1844, but mistakenly chose *perplexus* as the senior synonym. Short (2003a) recognized this and corrected the error. This species is easily confused with *E. interruptus*, but lacks the expanded tip to the dorsal strut and the small notches on the inner sides of the parameres. Found throughout the state.
- E. grossi* – Length 4.3-5.7 mm. Recently described by Short (2003), this species has been confused with *E. hamiltoni*. This species is unusual in that it lacks a medial emargination and fringe of stout golden setae on the 5th visible abdominal sternite, character states usually associated with the subgenus *E. (Lumetus)*, but has genitalia similar to members of *E. (Methydrus)*.
- E. hamiltoni* – Length 4.3-6.1 mm. Gundersen (1977) synonymized several species with *E. hamiltoni*. He considered the species polymorphic, recognizing three 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. However, separation of *E. hamiltoni* and some *E. reflexipennis* remains difficult, especially with putative *E. reflexipennis* that are a bit darker than average. Definite resolution of the taxonomy of these species must await a revision of the subgenus *E. (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. fimbriatus*; note the expanded tip of the dorsal strut of *E. interruptus*, visible in lateral view, and the small notches on the inner sides of the parameres.
- 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 Florida *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*! The amount of darkening in the center of the clypeus is also variable, but generally the center of the clypeus is lighter in *E. ochraceus* than in *E. sublongus*; most *E. sublongus* I’ve examined had a very distinctive dark center to the clypeus.

- 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 Florida 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 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 was also recognized by Short (2004a). It 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, deep emargination of the clypeus 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. Be aware that teneral *E. ochraceus* may not have the darkened epipleura, and in some *E. sublongus* the epipleura may appear dark. The dorsal strut (penis) of *E. sublongus* appears to be narrower than that of *E. ochraceus*. See also *E. ochraceus* above for more comments on separating the two taxa. *Enochrus sublongus* appears to be more common in running water.

Other species

- E. pseudochraceus* Gundersen – 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.

Several other species occur in the West Indies that could conceivably be found in Florida. If you have specimens that don’t fit any of the taxa above, see Short (2004a and 2005)

GENUS *Helobata*

DIAGNOSIS: Larvae are distinguished by the antennae with basal segment shorter than remaining segments, with sensorium at apex of segment 2; labroclypeus with deep medial emargination; ligula shorter than or subequal to basal segment of labial palp; symmetrical mandibles, each with 2 inner teeth; and well developed legs.

Adults are distinguished by the small size (5-6 mm); flattened, limpet-like appearance; long maxillary palpi with pseudobasal segment curved outwardly when extended, and with last segment subequal to 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; mesosternum without a longitudinal ridge or crest; and all tarsi with 5 segments.



H. larvalis: adult head, adult, larva

NOTES: One species, *H. larvalis* (formerly called *H. striata*) (length 5-6 mm), of this mostly Neotropical genus (5 other species, plus *H. larvalis*, occur in South America) is found across southern North America from North Carolina to Texas. Adults are found on the surfaces of submerged vegetation, wood and other objects, where they appear much like limpets. Young (1954) noted this species is frequently associated with the leaves of *Pontederia*, “on which it sticks like a small suction cup”; Ciegler (2003) also reported it from *Pontederia* in South Carolina. It is also found in brackish water (Young 1954). The larva was described by Spangler & Cross (1972).

Florida species

H. larvalis (Horn)

ADDITIONAL REFERENCES: Spangler & Cross 1972.

GENUS *Helochares*

DIAGNOSIS: Larvae are distinguished by the antennae with basal segment slightly longer than remaining segments, with sensorium on apex of segment 2; labroclypeus with 6 distinct teeth placed in two groups, with 2 in left group, 4 in right group; ligula much longer than first palpal segment; symmetrical mandibles, each with 2 inner teeth; and well developed legs.

Adults are distinguished by the small size (4-7 mm); convex body form; visible labrum; eyes forming part of lateral margin of head; long and slender maxillary palpi, with last segment shorter than preceding segment, and pseudobasal segment concave inwardly when extended forward; mesosternum without definite carina; and all tarsi 5 segmented.



H. maculicollis



H. sallaei



Helochares sp. larva

NOTES: *Helochares* is a speciose, widespread genus, but only two species are found in Florida. The most common is *H. maculicollis* (length 4.0-6.0 mm), found throughout the state. A second species, *H. sallaei* (length 5.5-6.9 mm), is found in the southern peninsula. Young (1954) stated that this species was only known in Florida from the west coast from a few specimens from the Dunedin area (described as *Enochrus estriatus* by Blatchley (1917)), and may have been introduced from Mexico via the lumber trade. However, more material has been found, from Miami-Dade, Monroe and Palm Beach Counties, which may mean this species may have been here for some time but uncollected.

The two species are easily separated by the 10 elytral striae in *H. maculicollis*; *H. sallaei* lacks elytral striae.

Young (1954: 174) 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 and lakes.

Short (2005) reviewed the genus for Central America.

ADDITIONAL REFERENCES: Short 2005.

Florida species

H. maculicollis Mulsant
H. sallaei Sharp

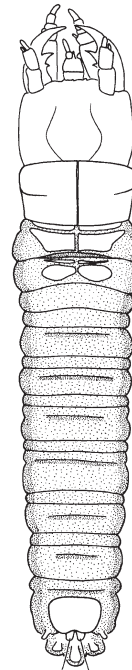
GENUS *Helocombus*

DIAGNOSIS: Larvae are distinguished by the antennae with basal segment slightly shorter or subequal to remaining segments, with sensorium on apex of segment 2; labroclypeus with 2 larger teeth on each side with numerous smaller central teeth; symmetrical mandibles, each with 2 inner teeth; ligula subequal to length of first palpal segment; and well developed legs.

Adults are distinguished by the long and slender maxillary palpi (distinctly longer than antennae), with last segment shorter than preceding segment, and pseudobasal segment concave inwardly when extended; elytra with distinct striae; a pyramidal projection medially on mesosternum; 4 segmented mid and hind tarsi; and tarsal claws with basal tooth in both sexes, very small in female.



H. bifidus



H. bifidus larva
(adapted from Archangelsky 1997)

NOTES: A monotypic genus with the only species, *H. bifidus* (length 5.5-7.8 mm), occurring at least as far south as Highlands County. It is found in emergent vegetation at the margins of ponds and lakes as well as in slow moving streams; Young (1954) noted that it seemed to be a “characteristic form of woods ponds and similar situations”.

ADDITIONAL REFERENCES: Perkins & Spangler 1981.

Florida species

H. bifidus (LeConte)

GENUS *Hydrobiomorpha*

DIAGNOSIS: Larvae are distinguished by the rectangular head capsule; long basal segment of the antennae, about 3 X length of remaining segments; labroclypeus with 5 poorly defined medial teeth; ligula longer than first palpal segment and shallowly bifid apically; symmetrical mandibles, each with one large and one small inner tooth; meso- and metanotal sclerites not much reduced, with trapezoidal posterior margins almost as wide as anterior margins; and the conspicuous lateral gills on segment 9.

Adults are distinguished by the moderately large size (> 13 mm); anteriorly broadly emarginate clypeus; antennomeres 6 and 7 very asymmetrical, 7th deeply grooved, bearing long yellow setae; prosternum with long, posteriorly directed spine; mesosternal keel with posteriorly directed spine that does not exceed 1st abdominal sternite; and 5 segmented mid and hind tarsi, with 1st segment shorter than second.



H. casta larva



prosternal spine



H. casta adult

NOTES: One species, *H. casta* (length 13-17 mm), of this mostly tropical genus occurs in the US and Florida; it was previously placed in *Neohydrophilus*, a generic junior synonym. The genus was reviewed by Bachmann (1988); the larva of *H. casta* was described by Spangler (1973b).

The species is found throughout the state in standing water such as ditches, ponds and swamps.

Florida species

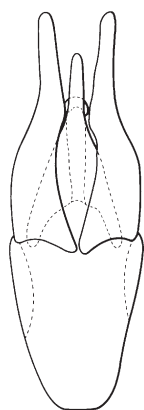
H. casta (Say)

ADDITIONAL REFERENCES: Bachmann 1988; Short 2004b; Spangler 1973b.

GENUS *Hydrobius*

DIAGNOSIS: Larvae are distinguished by the antennae, with basal segment slightly longer than remaining segments; a very small sensorium on apex of 2nd antennal segment; symmetrical mandibles with 3 inner teeth (2 distal teeth much larger than proximal tooth); clypeus with 5 median subequal teeth, the left outer tooth a bit distant from the other 4; prosternum with a mesal longitudinal suture; and well developed legs.

Adults are distinguished by the moderate size (6-8 mm); short maxillary palpi with last segment longer than preceding; clypeus with entire anterior margin; smooth lateral margins on pronotum and elytra; 5 segmented tarsi with 1st segment shorter than 2nd on mid and hind legs; and dorsomedial fringe of natatory setae on mid and hind tarsal segments.



H. melaenus male genitalia
(adapted from Smetana 1988)



H. tumidus male genitalia



H. tumidus male



H. tumidus larva

NOTES: One species, *H. tumidus* (length 6-8 mm) is known from Florida. This apparently uncommon species is quite convex and lacks deeply impressed striae, although the elytral punctations are arranged in 10 longitudinal rows. Two other species occur in the Southeast as far south as South Carolina: *H. fuscipes* (Linnaeus) is more elongate and has deeply impressed striae on the elytra; *H. melaenus* (Germar) appears similar to *H. tumidus*. Matta (1974) and Ciegler (2003) separated the two by the presence of fine setae on the base and anterior margin of the hind femur of *H. melaenus*, supposedly lacking in *H. tumidus*. However, this does not hold, for my Florida *H. tumidus* bear setae on the hind femora similar to, but not quite as extensive as, those illustrated by Ciegler (2003: fig. 6.60) for *H. melaenus*. Males of the two species can be separated by their genitalia; the parameres of *H. tumidus* bear subapical lateral projections lacking in *H. melaenus*. If *H. melaenus* does occur in Florida, it will most likely be limited to the northern tier of counties.

Young (1954) noted that all specimens he had seen were from “stagnant ponds or sloughs among dead leaves or other submerged debris”.

ADDITIONAL REFERENCES: Ciegler 2003; Matta 1974.

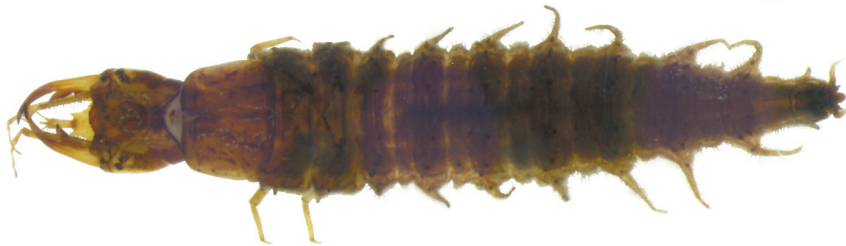
Florida species

H. tumidus LeConte

GENUS *Hydrochara*

DIAGNOSIS: Larvae are distinguished by the subrectangular head shape; antennae without a sensorium and basal segment more than twice as long as remaining segments; symmetrical mandibles with 2 inner teeth; ligula longer than first palpal segment; femora with fringe of swimming setae; and with abdominal segments 1-7 each bearing a pair of well developed, pubescent lateral gills.

Adults are distinguished by the moderately large size (12-20 mm); truncate clypeus, not exposing articulation of labrum; slightly asymmetrical 6th and 7th antennomeres; carinate prosternum with at most a small tooth posteriorly; 5 segmented tarsi with 1st segment shorter than 2nd on mid and hind legs; and metasternal spine not reaching hind margin of 1st abdominal sternite.



H. soror, larva and adult

NOTES: The genus was revised by Smetana (1980); nine species are known from North America north of Mexico, of which four are known from 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 are found in Florida.

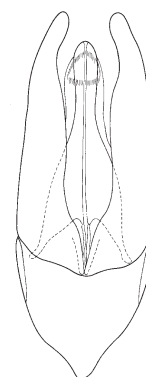
ADDITIONAL REFERENCES: Ciegler 2003; Hilsenhoff 1995c; Matta 1982; Testa & Lago 1994; Smetana 1980.

Florida species

H. brevipalpis Smetana
H. occulta (d'Orchymont)
H. soror Smetana
H. spangleri Smetana

Key to adult *Hydrochara* of Florida
(genitalia figures adapted from Smetana 1980)

- 1 Total length of maxillary palp distinctly shorter than width of clypeus at anterior margin of the eyes; body length 16-20 mm; male genitalia as figured *H. brevipalpis*



H. brevipalpis male genitalia



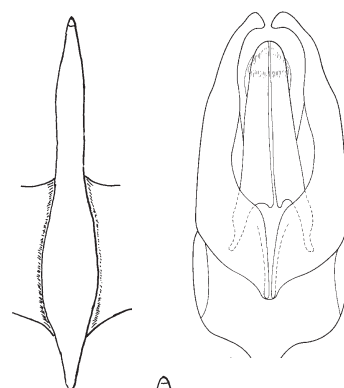
H. brevipalpis



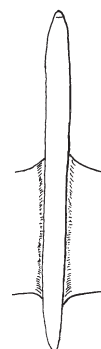
H. soror

- 1' Total length of maxillary palp at least as long as width of clypeus at anterior margin of eyes; body 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 narrower and sharply incurved *H. occulta*

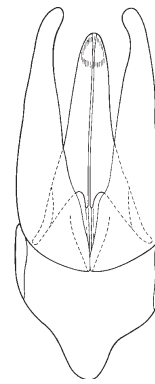


- 2' Sternal keel with metasternal portion not distinctly widened, at most 1.5X width of mesosternal portion at its widest point; last segment of maxillary palp apically darkened or not; genitalia with apices of parameres not as narrow or sharply incurved (see below) 3

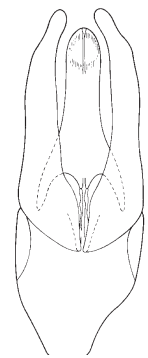


3(2') Maxillary palp with last segment darkened apically, with penultimate segment about 1.3X length of last segment; dorsal surface of aedeagus with a median groove, not broadly excavated basally *H. soror*

3' Maxillary palp with last segment uniformly pale, not darkened apically, with penultimate segment about 1.5X length of last segment; dorsal surface of aedeagus with median groove, but broadly excavated basally *H. spangleri*



H. soror



H. spangleri



H. soror

Notes on species

H. brevipalpis - Length 16-20 mm. The large size and short maxillary palps easily distinguish this species, the largest *Hydrochara* species occurring in Florida. To date the only record for this species remains a single specimen from the FAMU Biological Station near Holt in Okaloosa County.

H. occulta - Length 12-17 mm. Considered by Smetana (1980) to be a coastal species, *H. occulta* occurs from southernmost Florida north to Massachusetts and along the Gulf to Texas, with records from Oklahoma and Tennessee. In Florida it is most common in the southernmost part of the state.

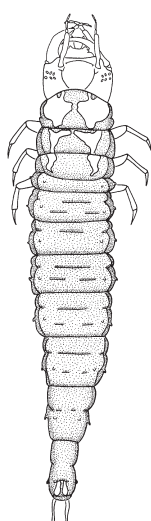
H. soror - Length 14-19 mm. The most common species of the genus at least in northern Florida; *H. occulta* is more common in the southern portion of the peninsula. In north Florida, this species will apparently colonize any small body of water deeper than about 5 cm. In Wakulla County I've collected half a dozen adults and numerous larvae from a wheel barrow filled with rainwater, and have also collected several adults and larvae from water that had pooled in a boat parked in the woods.

H. spangleri - Length 12-18 mm. An uncommon species, in Florida recorded from Alachua, Liberty and Santa Rosa Counties. I have not seen material of this species.

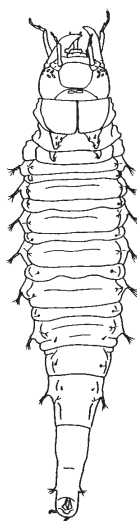
GENUS *Hydrophilus*

DIAGNOSIS: Larvae are distinguished by the rounded head shape; antennae without a sensorium and basal segment more than twice as long as remaining segments; asymmetrical mandibles, in *H. (Dibolocelus)* right mandible stout, with large blunt tooth, left mandible stout, with deep notch; in *H. (Hydrophilus)* right mandible thin, with bifid tooth, left mandible much stouter, with 1 tooth; ligula shorter than first palpal segment; and well developed legs, femora with fringe of swimming setae; and abdominal segments of *H. (Dibolocelus)* with a pair of lateral setiferous lobes, *H. (Hydrophilus)* without setiferous abdominal lobes.

Adults are distinguished by the very large size (> 30 mm); maxillary palpi longer than antennae; 5 segmented tarsi with 1st segment shorter than 2nd on mid and hind legs; and meso- and metasternum with a continuous median longitudinal keel that is prolonged posteriorly into a spine that extends beyond the hind coxae.



H. (Hydrophilus) sp. larva



H. (Dibolocelus) ovatus larva



H. (Hydrophilus) triangularis

NOTES: *Hydrophilus* is now considered to consist of three subgenera, two of which, *H. (Hydrophilus)* and *H. (Dibolocelus)*, occur in Florida and North America. The latter subgenus was treated as a full genus by many earlier authors (e.g., Epler 1996; Testa & Lago 1994; Young 1954). Three species of *Hydrophilus* are known to occur in Florida, with the possibility of two additional species eventually being found in the extreme southern portion of the state.

The genus contains the largest water beetles in the state, rivaled only by the dytiscid *Cybister*. These large beetles are apparently more often collected at lights, such as well-lit parking lots, than in aquatic sampling. Young (1954) noted that the species prefer deeper water, such as weedy ponds and deep drainage ditches.

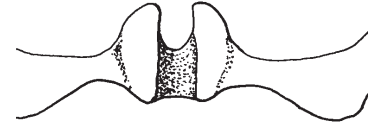
ADDITIONAL REFERENCES: Archangelsky & Durand 1992a; Richmond 1920; Testa & Lago 1994.

Florida species

- H. (H.) insularis* Castelnau
- H. (D.) ovatus* (Gemminger & Harold)
- H. (H.) triangularis* Say

Key to adult *Hydrophilus* of Florida

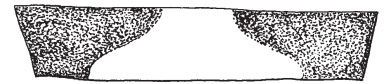
- 1 Prosternum open anteromedially so that anterior point of mesosternal keel can touch head *H. (Dibolocelus) ovatus*



- 1' Prosternum hooded anteriorly, with a pocket to receive the anterior edge of the mesosternal keel ... *H. (Hydrophilus)* 2



- 2(1') Bare area of 2nd visible abdominal sternite smaller, roughly triangular in shape * *H. (H.) ensifer duvali*
(not recorded from Florida, but may occur in extreme southern part of state)



- 2' Bare area of 2nd visible abdominal sternite larger, trapezoidal in shape 3



- 3(2') Elytral apex with a fine tooth; anterior tarsi of male with last tarsomere greatly expanded and angulate anteriorly; S FL only *H. (H.) insularis*



- 3' Elytral apex without a tooth; anterior tarsi of male with last tarsomere moderately expanded and simply convex anteriorly; widespread *H. (H.) triangularis*



Notes on species

- H. (Dibolocelus) ovatus* - Length 30-35 mm. Larvae are specialized for feeding on snails; the notch on the left mandible holds the snail while the blunt tooth on the right mandible crushes the shell.
- H. (Hydrophilus) insularis* - Length 33-36 mm. In Florida, known only from Miami-Dade and Monroe Counties; it is found throughout the Caribbean and also in Texas, Arizona and California. This species has been collected from brackish pools in the Keys, as well as cattail marshes and a swimming pool.
- H. (H.) triangularis* - Length 32-40 mm. The largest water beetle in Florida. It has been recorded from marshy lakes, weedy ponds, swales and streams, but is most likely to be found under the lights of a parking lot.

Other species

- H. (D.) smaragdinus* Brullé - A Neotropical species that occurs in Cuba and could conceivably be found as a vagrant/accidental in southern Florida. Young (1954) keyed this species based on a doubtful record for Tampa given by Leng & Mutchler (1918) (as *H. violaceonitens* Jacquelin du Val, a junior synonym). It can be separated from *H. ovatus* by its (usually) iridescent violet/blue color (*H. ovatus* is black to greenish black), and the carinate median line of abdominal sternites 3-5, each of which has a toothlike process at the median hind margin, especially on sternites 3-4; in *H. ovatus* the sternites are moderately angulate and not strongly produced medially.
- H. (H.) ensifer duvali* Hansen - Not recorded from Florida, but known from Cuba and the Bahamas, and thus likely to be found eventually in southern Florida (especially after a hurricane, etc.). The fore tarsus of the male is not as strongly dilated as our other *Hydrophilus* species. It is a senior synonym of *H. ater* Olivier.

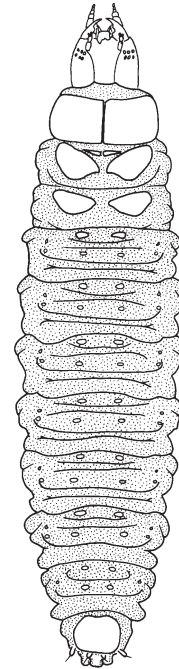
GENUS *Laccobius*

DIAGNOSIS: Larvae are distinguished by the antenna with basal segment shorter than remaining segments; labroclypeus with 3-5 teeth medial teeth on small projection (nasale) and with large epistomal lobe on left side; asymmetrical mandibles, right mandible with 2 large inner teeth, left with 2 large and 1 small inner teeth; ligula absent; truncate posterior margin of frons; and well developed legs.

Adults are distinguished by the small size (< 4 mm); maxillary palpi shorter than antennae; elytra without striae; arcuate hind tibiae; 5 segmented tarsi, mid and hind tarsi with natatory setae; and abdomen with 6 visible sternites.



L. reflexipennis



L. minutoides larva
(adapted from Archangelsky 1997)

NOTES: One species, *L. reflexipennis* (length 2.3-3.4 mm), has been collected in extreme western Florida (Escambia County). Other species may eventually be found in Florida; at least three other species are recorded from the Southeast, and another occurs in Cuba (Spangler 1968). Steiner (1980) reported *L. minutoides* d'Orchymont (length 2.3-3.2 mm) from Alabama just north of the Florida border; Ciegler (2003) reported *L. agilis* (Randall) (length 2.4-3.8 mm) from South Carolina.

These beetles resemble small, slightly flattened *Berosus*, but note the gracefully curved hind tibiae that lack a fringe of natatory setae. Species are very similar externally; identifications are only safely made utilizing male genitalia.

Laccobius adults seem to prefer sand bottomed streams.

ADDITIONAL REFERENCES: Cheary 1971; Ciegler 2003; Epler 2009; Hardy et al. 1981; Malcolm 1979; Smetana 1988; Spangler 1968; Testa & Lago 1994.

Florida species

L. reflexipennis Cheary

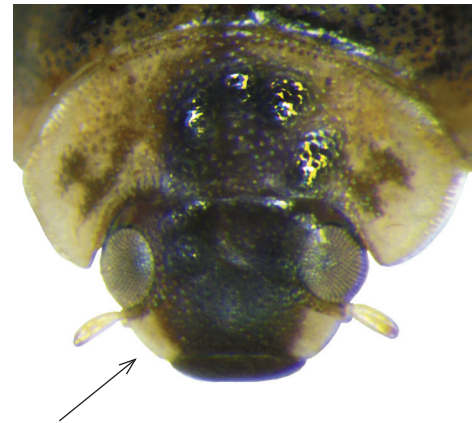
Key to adult male *Laccobius* of the Southeast United States

- 1 Head without a pale spot in front of each eye; male genitalia with apically expanded parameres * *L. agilis*
(not recorded from Florida, but may occur in northern part of state)



(adapted from Smetana 1988)

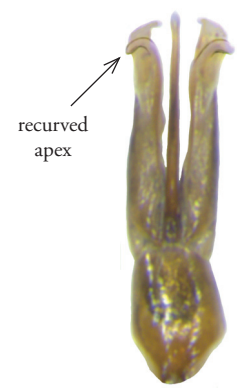
- 1' Head with a pale spot in front of each eye; genitalia not as above 2

*L. reflexipenis*

- 2(1') Male genitalia with recurved ventral apices on parameres ..
..... *L. reflexipenis*



dorsal



ventral

- 2' Male genitalia parameres not reflexed * *L. minutoides*
(not recorded from Florida, but may occur in northern part of state)



GENUS *Paracymus*

DIAGNOSIS: Larvae are distinguished by the antenna with basal segment subequal to remaining segments, with sensorium at apex of segment 2; labroclypeus with off-center group of 4 teeth; lyriform frontal sulcus; symmetrical mandibles, each with 3 inner teeth, proximal tooth much smaller; mentum with an anterior group of large setae; and the well developed but short (not visible from above) legs.

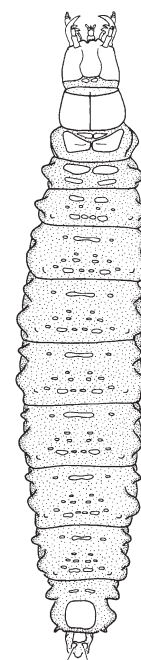
Adults are distinguished by the very small size (< 3 mm); metallic sheen; carinate prosternum; last segment of maxillary palp distinctly longer than preceding segment; mesosternum with a medial transverse ridge with central pyramidal protuberance, with longitudinal ridge posterior to it, this ridge either continuous with or separated from transverse ridge; elytron with sutural stria on posterior 2/3, no other striae present; hind femur without dense basal pubescence; and all tarsi 5 segmented, with first tarsomere of mid and hind legs slightly shorter than or subequal to 2nd tarsomere.



P. confusus paratype



P. nanus



P. subcupreus larva
(adapted from Archangelsky 1997)

NOTES: Of the 15 Nearctic species of *Paracymus*, at least seven occur in Florida. Some *Paracymus* could be confused with some Sphaeridiinae such as *Phaenonotum* because the basal tarsomere of the mid and hind legs is almost as long as the second tarsomere. Their small size makes them difficult to identify (genitalia may have to be dissected and viewed under a compound microscope) and collect (they will pass through the mesh of many aquatic nets). For several species, males are necessary for species level identification. The genus requires modern revision.

Paracymus are found at the margins of lakes and ponds, as well as in swamps, ditches and sand-bottomed streams, often associated with thin-bladed aquatic vegetation. I've taken numerous *P. nanus* from a flooded lawn. Specimens are also reported from under wet debris along shorelines.

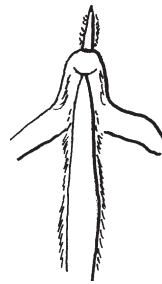
ADDITIONAL REFERENCES: Ciegler 2003; Smetana 1988; Testa & Lago 1994; Wooldridge 1966, 1978; Winters 1926.

Florida species

P. confusus Wooldridge
P. degener (Horn)
P. dispersus Wooldridge
P. lodingi (Fall)
P. nanus (Fall)
P. reductus (Fall)
P. subcupreus (Say)

Key to adult *Paracymus* of Florida

- 1 Mesosternum with a continuous medial laminal ridge that meets the transverse ridge; antennae with 7 segments 2



- 1' Mesosternum with the medial laminal ridge not meeting the pyramidal central projection of the transverse ridge; antennae with 7 or 8 segments 5



ventral view

lateral view

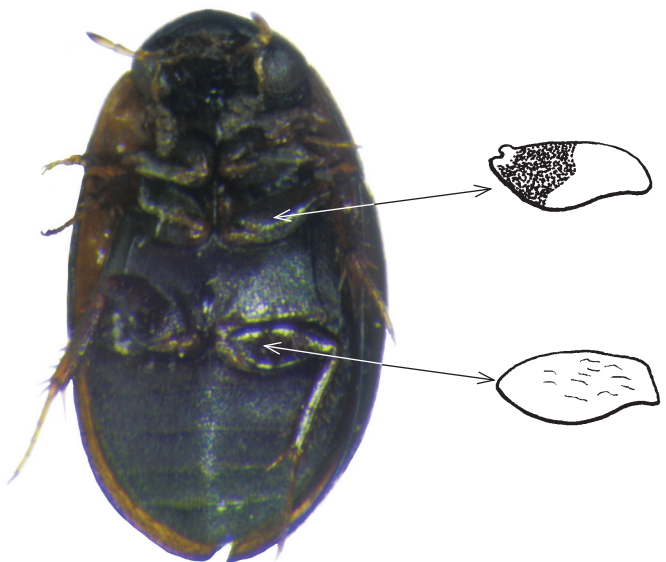
- 2(1) Elytra densely microreticulate, appearing dull between the difficult to discern punctures ... *P. degener*
- 2' Elytra smooth and shining between the well defined punctures (as below) 3

- 3(2') Pronotum and elytra with a wide, well defined pale border *P. lodingi*



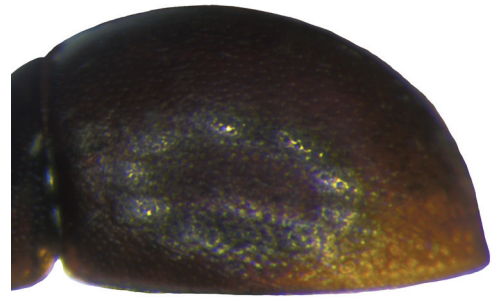
- 3' Pronotum and elytra without a well defined pale border, although the lateral margins may become gradually paler in some specimens 4

- 4(3') Ventral surfaces and femora brownish-yellow to reddish-brown; mid femora pubescent on basal half; hind femora with minute longitudinal scratches (strigae) *P. nanus*

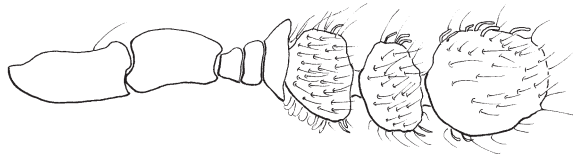


- 4' Ventral surfaces and femora black; mid femora pubescent on basal 2/3; hind femora smooth and polished, with minute punctures but without strigae **P. seclusus*
(not recorded from Florida, but may occur in western part of state)

- 5(1') Elytra densely microreticulate, appearing dull between the punctures; antennae with 7 segments .. ***P. reductus***



- 5' Elytra smooth and shining between punctures; antennae with 8 segments 6

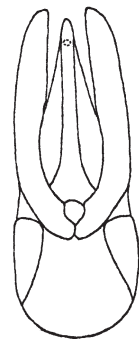


P. subcupreus antenna



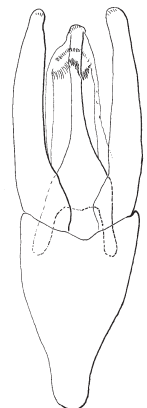
P. confusus paratype

- 6(5') Male genitalia with parameres mostly flat and straight, angled inward only near apex and median lobe subequal to parameres; male foretarsal claws equal and thin ***P. dispersus***

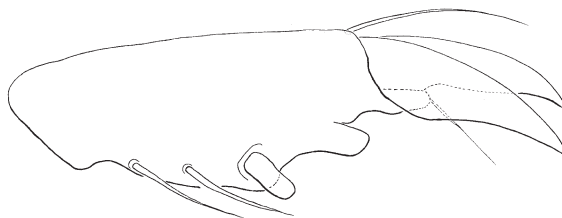


(adapted from Wooldridge 1966)

- 6' Male genitalia with parameres more rounded apically, curved throughout length or median lobe shorter than parameres; male foretarsal claws either equal and thick or dissimilar 7



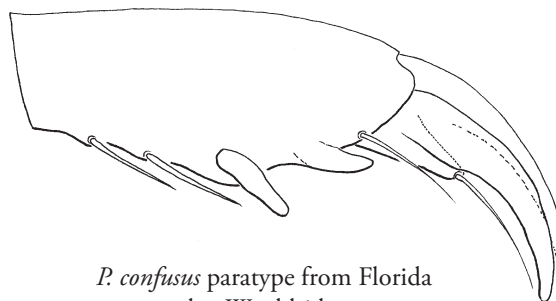
- 7(6') In dorsal view, male foretarsal claws equal, thickened; length usually > 2.2 mm *P. subcupreus*



P. subcupreus from Indiana
det. Wooldridge

Males of these two species have expanded foretarsi, each bearing 2 preapical spines; females have simple cylindrical foretarsi and are apparently inseparable.

- 7' In dorsal view, male foretarsal claws dissimilar, outer claw noticeably thinner than inner claw; length usually < 2.2 mm *P. confusus*



P. confusus paratype from Florida
det. Wooldridge

Notes on species

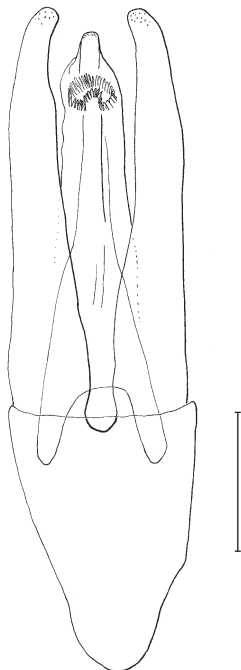
P. confusus – Length 1.9-2.1 mm. An apparently uncommon species found throughout the state. This species has been identified in part as *P. reductus* in the past (several specimens from Young collection in FSCA later determined by Wooldridge), although it is most easily confused with *P. subcupreus*. Many characters have been utilized by various authors to separate *P. confusus* from *P. subcupreus*. The punctuation of the pronotum was originally used by Wooldridge (1966). In many *P. confusus*, the punctuation of the pronotum is confused, i.e., there are areas without punctuation and/or where punctures are coalesced; pronotal punctuation in *P. subcupreus* is more uniform. However, Testa & Lago (1994: 37) 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”. Aedeagal differences have been cited by Smetana (1988) and Testa & Lago (1994), but these differences are subject to distortion in dried genitalia and compression in slide mounted material and do not appear to be reliable (see figures below). Another character that has been used is the presence of one or two ventral preapical spines on the male foretarsus. However, both species have two preapical spines. It appears that only the thinner posterior (outer) foretarsal claw (when viewed from a directly dorsal aspect) of the male will separate males of these two taxa; females are basically inseparable. This pair of species would be excellent candidates for molecular analysis to determine if they actually represent two different taxa. See also *P. dispersus* and *P. subcupreus*.

P. degener – Length 1.6-1.8 mm. Similar to *P. reductus*, but according to Wooldridge (1966) the longitudinal mesosternal ridge is complete; in *P. reductus*, the ridge is interrupted before the transverse crest. This interruption may be difficult to observe and may require high magnification of 100X, or breaking the beetle apart at the juncture of the pro- and mesosternum. This species was described from a single individual from Tampa by Horn (1890), who stated that “the elytra have no punctures whatever”. According to Winters (1926), who examined a series from “Everglade, Fla.”, the elytral “punctuation is extremely fine and variable, it is discernible with a high power lens”. Wooldridge (1966: 715) noted that the elytral punctuation of *P. degener* “is almost invisible through the microreticulation”. Young (1954: 169) claimed to have seen specimens from several Florida counties, with doubtful records from Okaloosa and Taylor Counties. A series of 17 specimens from Palm Beach County in the FSCA identified as *P. degener* by Young are all *P. reductus*. I have not seen any material of *P. degener*, but an examination of the holotype and Winters’ series is warranted.

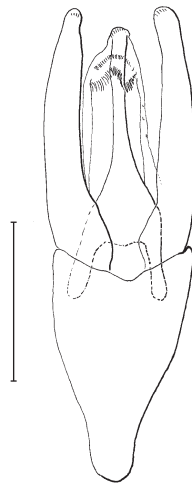
- P. dispersus* – Length about 1.9 mm. Originally described from South Carolina and Jackson Co., I've seen additional material from Gadsden, Hardee and Leon Counties. An apparently uncommon species that can be confused with *P. confusus* and *P. subcupreus* (q.v.), but can be separated by male genitalia 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, well 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 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. The most common and widespread *Paracymus* species in Florida, found throughout the state. This species possesses a very well developed longitudinal mesosternal crest.
- P. reductus* – Length 1.6-2.2 mm. An uncommon species that apparently 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. Although Peck & Thomas (1998) considered *P. reductus* to be a Florida endemic, it was recorded from Mississippi by Testa & Lago (1994) and has also been found in South Carolina (Ciegler 2003). Winters (1926: 57) believed *P. reductus* to be a "form of *degener* with the punctuation more pronounced."
- 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*. The foretarsal claws of the male, when viewed from directly overhead, provide the only useful character to separate these taxa. 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*.

Other species

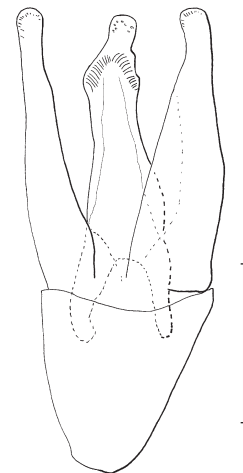
- P. seclusus* Wooldridge – Length 1.8-2.2 mm. Not recorded from Florida but may eventually be found in the Panhandle of the state. This species is known from only 3 specimens from coastal Mississippi.



P. subcupreus from Indiana
det. Wooldridge



P. subcupreus from Florida
det. Epler



P. confusus paratype from Florida
det. Wooldridge

[bars = 0.05 mm]

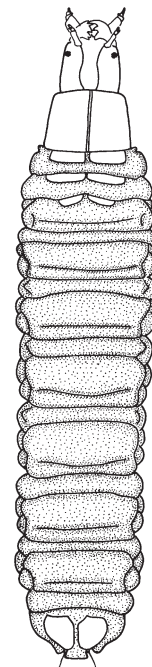
GENUS *Phaenonotum*

DIAGNOSIS: Larvae are distinguished by the basal antennal segment slightly, longer than remaining segments, with sensorium at apex of segment 2; labroclypeus with 1 median tooth (may appear trifid); ligula shorter than palpi; symmetrical mandibles, each with 2 teeth; and well developed but small legs.

Adults are distinguished by the small size (≤ 4 mm); antennal bases concealed from above by expanded lateral margin of head; lateral margins of head not abruptly narrowed before eyes; 9 segmented antennae; maxillary palpi shorter than antennae, with 2nd palpomere much thicker than 3rd and 4th; elytra completely without striae; and the 5 segmented mid and hind tarsi with the 1st segment longer than the 2nd.



P. exstriatum



P. exstriatum larva
(adapted from Archangelsky 1997)

NOTES: *Phaenonotum* is a mostly Neotropical genus, with 2 species found in North America; both occur in Florida. The most common 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. minus* (length 1.6-2.4 mm) is smaller, more broadly oval and has the apical portion of the clypeus finely but sparsely punctate.

Phaenonotum, along with *Cercyon*, is a member of the mostly terrestrial subfamily Sphaeridiinae. Both Florida *Phaenonotum* species and several *Cercyon* species are considered at least semiaquatic. Archangelsky & Durand (1992b) reported the larvae of *P. exstriatum* from rotting plant debris and, in Florida, on the floating aquatic fern *Salvinia*.

Florida species

P. exstriatum (Say)
P. minus Smetana

ADDITIONAL REFERENCES: Archangelsky & Durand 1992b; Smetana 1978; Testa & Lago 1994.

GENUS *Sperchopsis*

DIAGNOSIS: Larvae are distinguished by the antenna with basal segment slightly longer than remaining segments, with sensorium at apex of segment 2; labroclypeus with 5 medial teeth, middle tooth much smaller than others; symmetrical mandibles, each with 3 inner teeth, proximal tooth much smaller; entire prosternum; and well developed legs.

Adults are distinguished by the moderate size (~ 7 mm); strongly convex body from and reddish-brown coloration; anteriorly emarginate clypeus and labrum; maxillary palp with last segment longer than preceding; serrate lateral margins of pronotum and elytra; striate elytra; and all tarsi 5 segmented with first tarsomere of middle and hind legs shorter than second.



NOTES: A monotypic Nearctic genus. The sole species, *S. tessellata* (length 6.0-7.5 mm), occurs throughout the eastern US and southeastern Canada; the southernmost records are from Alachua and Putnam Counties.

Unusual for most hydrophilids, *Sperchopsis* prefers swiftly running sand-bottomed streams, where it occurs around rootlets below undercut banks, in leaf packs and on submerged logs and branches.

ADDITIONAL REFERENCES: Spangler 1961.

Florida species

S. tessellata (Ziegler)

GENUS *Tropisternus*

DIAGNOSIS: Larvae are distinguished by the long basal antennal segment, 2-3 X length of remaining segment, with no sensorium at apex of segment 2; asymmetrical mandibles, each with 3 teeth, apical tooth semi-bifid, 2 basal teeth on right mandible adjacent to each other, 2 basal teeth on left mandible in line; ligula longer than basal palpomere, apex not bifid; meso- and metanotal sclerites reduced, triangular; and short lateral gills on abdominal segment 9.

Adults are distinguished by the medium size (7-13 mm); last segment of maxillary palp as long as or longer than preceding segment; medially sulcate prosternum; meso- and metasternal keel that projects posteriorly as a spine past the posterior margin of the 1st abdominal segment; and all tarsi 5 segmented with first tarsomere of mid and hind legs shorter than second.



T. lateralispinus



T. blatchleyi



Tropisternus sp. larva

NOTES: Fourteen species of this large New World genus occur in North America north of Mexico; five are known from Florida. Peck & Thomas (1998) list *T. mixtus* LeConte from Florida, but this species is not known to actually occur in the state. Spangler (1960) revised the genus but his excellent study has not been published.

Tropisternus is one of the most ubiquitous water beetle genera in Florida, occurring in almost any standing water habitat; occasionally individuals are collected from dense vegetation in running water. Several species may occur together at one site.

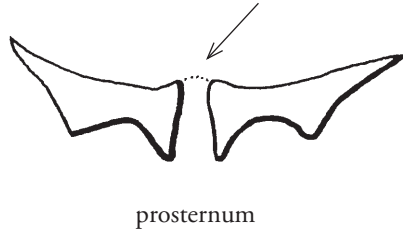
ADDITIONAL REFERENCES: Ciegler 2003; Spangler 1960; Torres et al. 2008.

Florida species

T. blatchleyi blatchleyi d'Orchymont
T. collaris (Fabricius)
T. lateralispinus (Say)
T. natator d'Orchymont
T. quadristriatus Horn

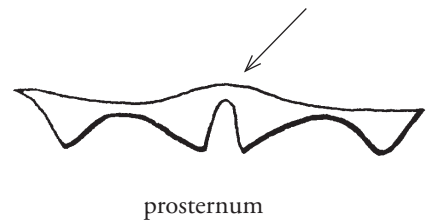
Key to adult *Tropisternus* of Florida

- 1 Prosternal sulcus open anteriorly; elytra with numerous, variable longitudinal stripes *T. collaris*



T. collaris
color variation

- 1' Prosternal sulcus closed anteriorly; elytra immaculate or with marginal stripe only 2



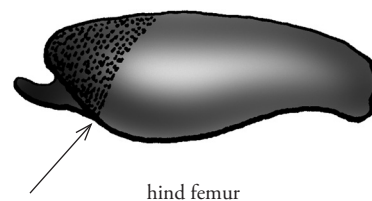
- 2(1') Head, pronotum and elytra with yellow border *T. lateralis nimbatus*



- 2' Head, pronotum and elytra completely dark 3



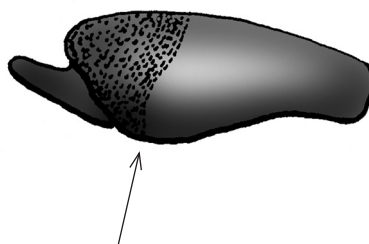
- 3(2') Legs mostly black or very dark reddish-brown; pubescent area at base of hind femur small, beginning near apex of trochanter forward to anterior margin of femur; total length larger, usually > 11 mm *T. natator*



- 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 further distally along posterior margin adjacent to apex of trochanter; total length smaller, < 11 mm 4

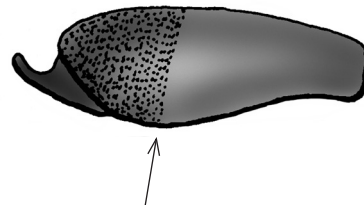


- 4(3') Tibiae dark with reddish-brown to brownish-yellow medial band; hind femora with basal pubescent area smaller, somewhat triangular; mesosternal portion of ventral keel wider; ventral spine of last abdominal sternite well developed; widespread, usually freshwater species *T. blatchleyi*



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 argument of couplet 4 should lead to couplet 6, not 5; the second argument 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. It is the only member of the subgenus *T. (Streptotornus)* in the US; our other species are placed in *T. (Tropisternus)*. 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. This species 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. Following Hansen (1999) we have two subspecies in Florida: *T. collaris striolatus* (LeConte) and *T. collaris viridis* Young & Spangler, but consistent separation of these two taxa does not seem possible; thus the two subspecies are not considered here. Spangler (1966c) and Torres et al. (2008) described the larva of *T. collaris*.
- 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 south Georgia 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**
burrowing water beetles

13

DIAGNOSIS: Larvae are distinguished by head which is partially hidden by the pronotum; basally stout mandible with an enlarged molar area; short, stout, apparently five-segmented legs; tarsi with two claws; abdomen with eight visible segments that are capable of telescoping; last abdominal segment with a pair of terminal spiracles; and short one-segmented urogomphi.

Adults are distinguished by the filiform antennae; maxillary palpi shorter than the antennae; concealed scutellum; distinctly five-segmented fore and mid tarsi; first abdominal sternite completely divided by hind coxae; and hind tarsi with two equal claws.



Hydrocanthus oblongus



Hydrocanthus sp. larva



Suphisellus gibbulus



Suphis inflatus

NOTES: Six genera of this mostly tropical family occur in North America north of Mexico; all six are found in Florida, including 13 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 omnivorous.

Most noterids are easily identified by the well developed ventral “noterid platform”, a large, flattened V-shaped platform formed by the conjoined prosternal process, metasternal “keel” and the inner hind coxal laminae; this platform is reduced in *Notomicrus*, consisting only of the inner hind coxal laminae. Many noterids also bear a large hooked spur at the apex of the fore tibia; this hook is absent in *Notomicrus* and reduced in *Mesonoterus* and *Pronoterus*.

The larvae of *Notomicrus*, *Mesonoterus* and *Pronoterus* are undescribed. However, larvae that resemble *Hydrocanthus* have been collected at several sites in Florida; these larvae probably represent *Mesonoterus* or *Pronoterus* (they are too large to be *Notomicrus*). These larvae are included in the larval key below as “*Mesonoterus/Pronoterus?*”.

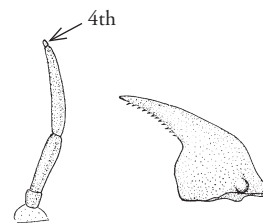
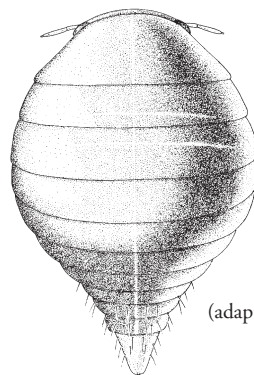
ADDITIONAL REFERENCES: Ciegler 2003; Miller 2009; Nilsson 2005; Roughley 2001c.

Florida genera

Hydrocanthus Say
Mesonoterus Sharp
Notomicrus Sharp
Pronoterus Sharp
Suphis Aubé
Suphisellus Crotch

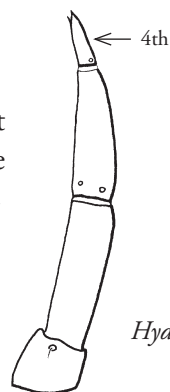
Key to genera of Noteridae larvae of Florida(larvae of *Mesonoterus*, *Notomicrus* and *Pronoterus* are undescribed)

- 1 Body globular; 3rd antennal segment over 10X length of 4th; mandible serrulate ***Suphis***



(adapted from Spangler & Folkerts 1972)

- 1' Body cylindriform, not globular; 3rd antennal segment about 3-4X length of 4th, or not longer than 4th; mandible with or without inner teeth 2

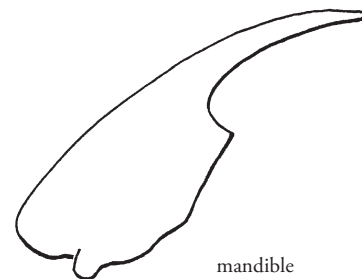
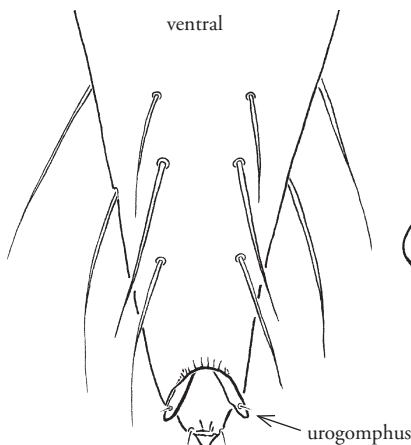
*Hydrocanthus*

antenna



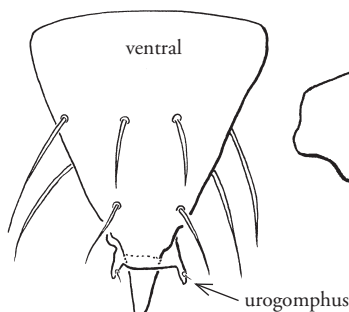
- 2(1') 3rd antennal segment not longer than 4th; mandible with stout preapical tooth ***Suphisellus***
 2' 3rd antennal segment about 3-4X length of 4th; mandible without stout preapical tooth 3

- 3(2') Last abdominal segment longer, with short dorsal spine; urogomphi barely extending past lateral margin of segment; mandible without inner teeth ***Hydrocanthus***



mandible

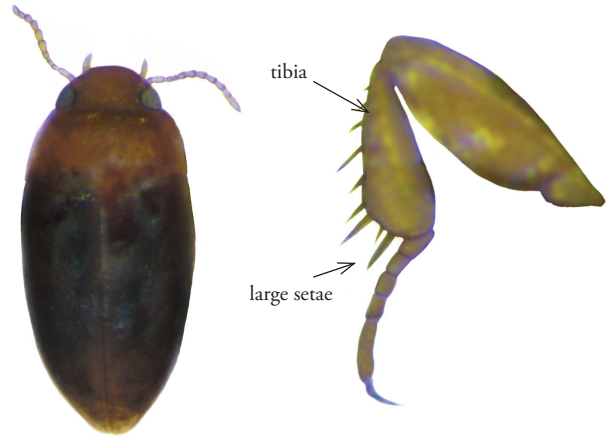
- 3' Last abdominal segment shorter, stouter, with longer dorsal spine; urogomphi may extend well past lateral margin of segment; mandible with inner teeth ***Mesonoterus/Pronoterus?***



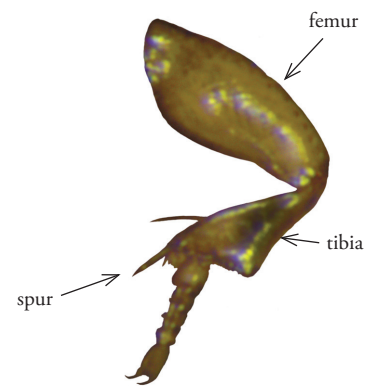
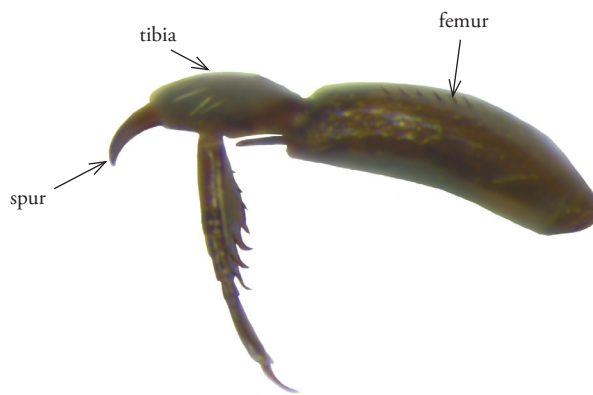
antenna

Key to genera of Noteridae adults of Florida

- 1 Minute, length < 1.5 mm; fore tibia without an apical curved hook or spur (large setae are present) *Notomicrus*



- 1' Larger, 1.9 mm or more; fore tibia with an apical curved hook or spur 2



- 2(1') Body broad, globose; hind coxae widely separated; color dull black with irregular reddish markings (sometimes indistinct) *Suphis*

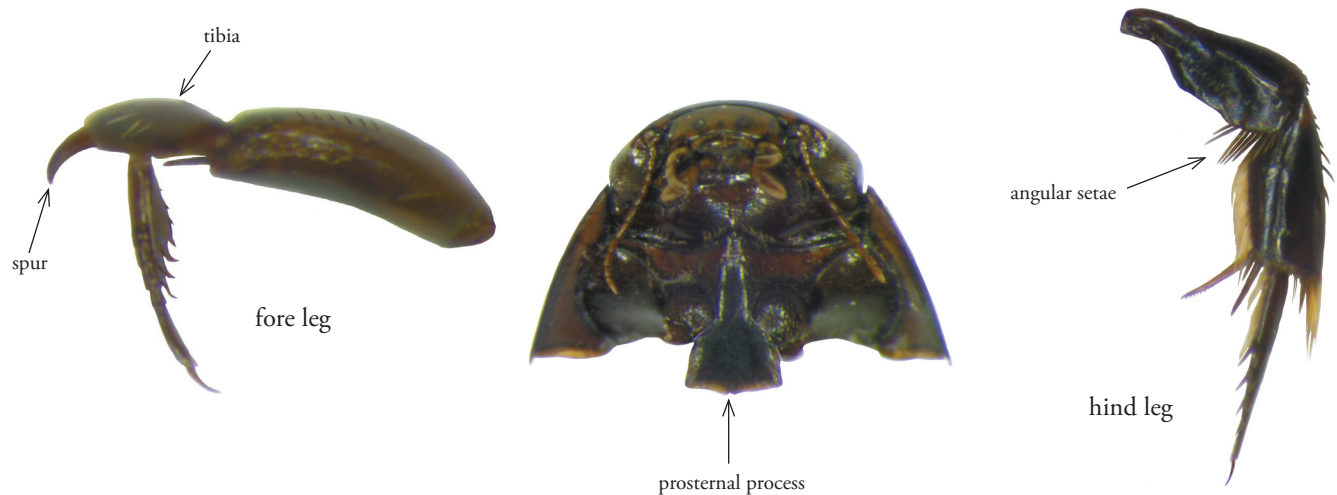


- 2' Body more elongate; hind coxae contiguous or approximate; unicolored or bicolored, sometimes with weak spots, but never black with irregular reddish markings 3

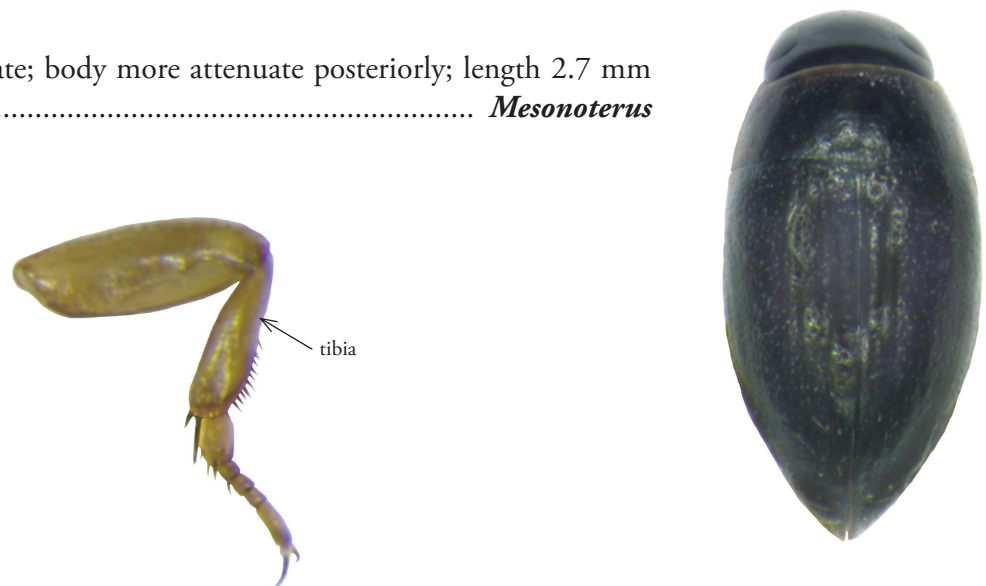
- 3(2') Fore tibial spurs weak; prosternal process rounded apically; hind femora with weak angular setae ... 4



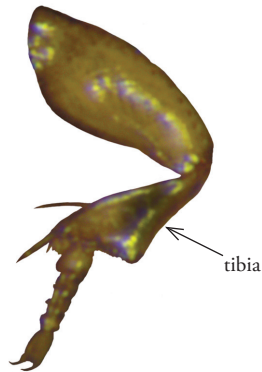
- 3' Fore tibial spurs strong, curved and conspicuous; prosternal process widened and truncate or slightly triangular apically; hind femora with strong angular setae 5



- 4(3) Fore tibia elongate; body more attenuate posteriorly; length 2.7 mm or more *Mesonoterus*



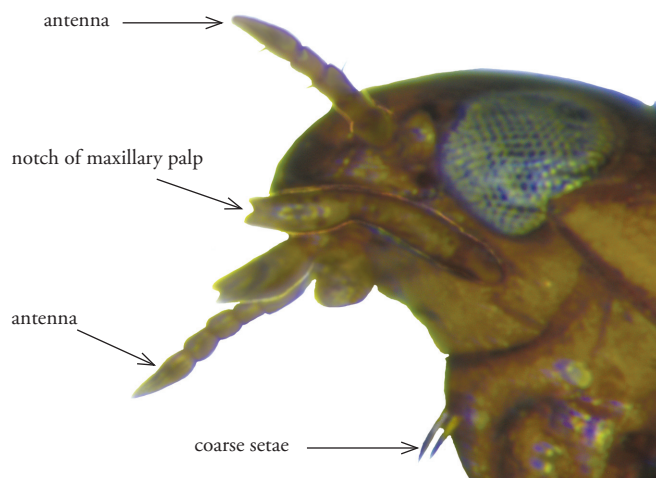
- 4' Fore tibia broader, triangular; body more oval; length 2.6 mm or less ...
 *Pronoterus*



- 5(3') Length > 3.6 mm; apical segment of maxillary palp truncate or very shallowly notched; prosternum without row of coarse setae (fine short setae may be present) *Hydrocanthus*



- 5' Length 3 mm or less; apical segment of maxillary palp deeply notched; prosternum with row of coarse setae *Suphisellus*



GENUS *Hydrocanthus*

DIAGNOSIS: Larvae are distinguished by the cylindriform body form; mandible without inner teeth; 3rd antennal segment about 3-4 times longer than 4th; and the long conical last abdominal segment with urogomphi barely extending past lateral margin, and a short dorsal projection.

Adults are distinguished by the larger size, 3.7 mm or more; truncate to shallowly notched apex of maxillary palp; very broad truncate apex of the prosternal process; well developed curved hook/spine on fore tibia; contiguous hind coxae; and hind femur with well developed angular setae.

*H. regius**Hydrocanthus* sp. larva

NOTES: Five species of *Hydrocanthus* are known from North America; three species occur in Florida. The variation among *Hydrocanthus* species is considerable; there is overlap in coloration and other characters, sometimes making identification difficult. *Hydrocanthus* are commonly found in most lentic habitats, where they are often associated with floating mats of algae and other vegetation.

Males are distinguished by a set of small suction cups at the apex of the enlarged first tarsal segment of the fore and mid tibiae.

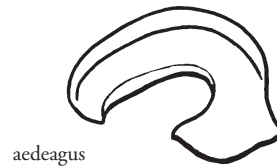
ADDITIONAL REFERENCES: Ciegler 2003; Young 1953e, 1985.

Florida species

H. atripennis Say
H. oblongus Sharp
H. regius Young

Key to adult *Hydrocanthus* of Florida

- 1 Typically bicolored, with pronotum yellowish/reddish brown and elytra darker, brown to blue-black; male and female with prosternum and prosternal process distinctly punctate/setose; aedeagus as figured *H. atripennis*



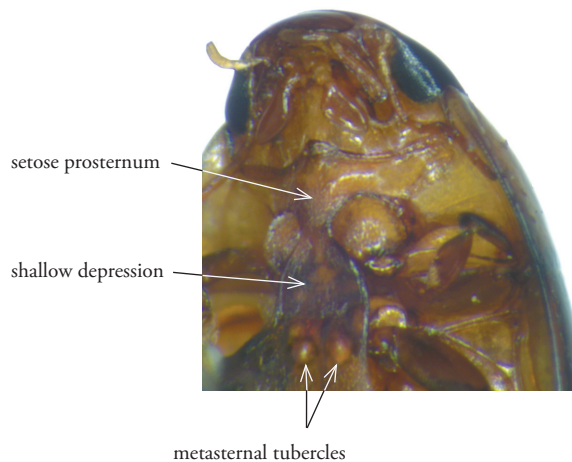
aedeagus

(adapted from Young 1985)



- 1' Typically unicolored, either light to dark reddish-brown or dark brown/blue-black; prosternum and prosternal process distinctly punctate/setose OR smooth 2

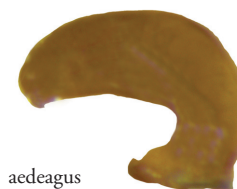
- 2(1') Color usually light reddish-brown; male with prosternal-metasternal area shallowly depressed, with metasternal tubercles; male and female with prosternum and prosternal process punctate/setose; aedeagus slightly thinner before apex *H. oblongus*



aedeagus



- 2' Color usually dark brown to bluish-black; male with prosternal-metasternal area deeply depressed, without metasternal tubercles (except in some small specimens); male with prosternum punctate/setose, female with prosternum and prosternal process bare or nearly so; aedeagus slightly wider before apex *H. regius*



aedeagus



Notes on species

- H. atripennis* - Length 4.2-5.2 mm. Young (1985: 97) noted that “the typical bicolorous form [is] rare eastward in Florida ...”, but did not state where in the state the species was found. All Florida *H. atripennis* I’ve seen, all bicolored, have been from the northern tier of counties (Clay, Columbia, Hamilton, Jefferson, Santa Rosa, Wakulla), which may represent the southern extent of its range in the eastern US (the species ranges from eastern Mexico to southern Canada). The prosternal/metasternal depression is shallow in *H. atripennis*. Males may possess metasternal tubercles in small individuals, but tend to lack them in large specimens. Males and most females have a distinctly punctate/setose prosternum and prosternal process, but some females may have this punctation/setation reduced.
- H. oblongus* - Length 3.7-4.8 mm. The most abundant and common *Hydrocanthus* in the state. The elytra may sometimes be slightly darker than the head and pronotum, which may confuse such specimens with *H. iricolor*. Observing the well developed metasternal tubercles (on males only) of *H. oblongus* should separate them, but females may be inseparable. See *H. iricolor* below. Note that older alcohol preserved specimens may be considerably darker than fresh material or pinned/pointed specimens; I’ve seen some alcohol preserved *H. oblongus* that were as dark as *H. regius*.
- H. regius* - Length 4.2-5.8+ mm. The deeply impressed prosternal/metasternal region will help identify lighter colored males of this species; such males may resemble *H. atripennis*, which has a shallow prosternal/metasternal depression. Females are easily identified by the lack of punctation/setae on the prosternum and prosternal process. Note that males have punctate/setose prosterna.

Other species

- H. iricolor* Say - Length 4.3-5.5 mm. Although listed by many authors as present in Florida (Ciegler 2003, Downie & Arnett 1996, Nilsson 2005), this species apparently does not occur in the state. Young (1985: 97) gave its range as “from Maine and Ontario to Michigan, northern Indiana, and south to Virginia and North Carolina east of the Appalachians; probably intergrades with *H. atripennis* in Indiana, Ohio, and North Carolina and possibly with *H. regius* in Georgia and South Carolina ...”. Ciegler (2003) reported numerous records of *H. iricolor* from South Carolina. The species is similar to *H. oblongus* but the elytra are usually slightly darker than the head and pronotum (a difference that may be difficult to discern, plus some *H. oblongus* may be similarly colored); males of *H. iricolor* have the prosternal-metasternal area shallowly depressed, but lack distinct metasternal tubercles. Light colored males of *H. regius* (most males of this species also lack metasternal tubercles) may resemble *H. iricolor*, but have the prosternal-metasternal area deeply depressed. To further confuse matters, the prosternum and prosternal process of *H. iricolor* may be densely setose/punctate (males and females) or the area may be smooth (females), as noted by Young (1985) and Ciegler (2003).

GENUS *Mesonoterus*

DIAGNOSIS: Larvae are undescribed; see *Pronoterus*.

Adults are distinguished by the more apically attenuate elytra; males with four intermediate antennal segments enlarged; rounded apex of the prosternal process; more elongate fore tibia with a weak apical spine; and the hind femora with weak angular setae.



aedeagus

*M. addendus*

NOTES: A single species, *M. addendus* (length 2.7-3.0 mm), of this mostly tropical genus occurs in Florida; it was formerly placed in *Pronoterus*. It differs from the somewhat similar *P. semipunctatus* in its larger size and the more darkly colored elytra with denser punctation; in addition, the genitalia are entirely different.

Young (1954) noted that the species is commonly associated with the roots of water hyacinths in canals. In the U.S. it is apparently confined to peninsular Florida (northernmost record is from Alachua County); it is also known from Cuba. Note that *Mesonoterus* was omitted from the key to noterid adults in White & Roughley (2008).

ADDITIONAL REFERENCES: Guignot 1948.

Florida species

M. addendus (Blatchley)

GENUS *Notomicrus*

DIAGNOSIS: Larvae are undescribed.

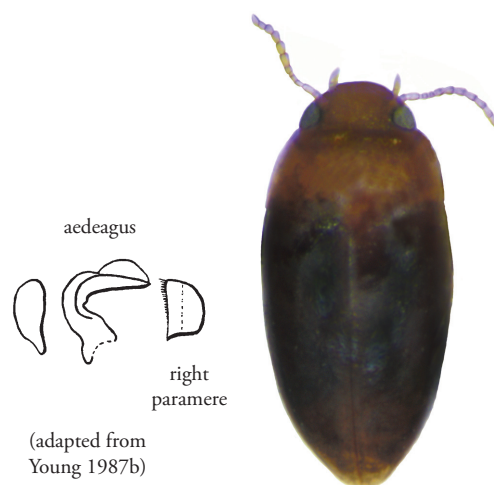
Adults are distinguished by the tiny size (< 1.5 mm); absence of a curved hook/spur on the fore tibia; and the reduced “noterid platform”.

NOTES: Two species of this predominantly tropical genus occur in Florida. These beetles are so small they often pass through ordinary mesh nets.

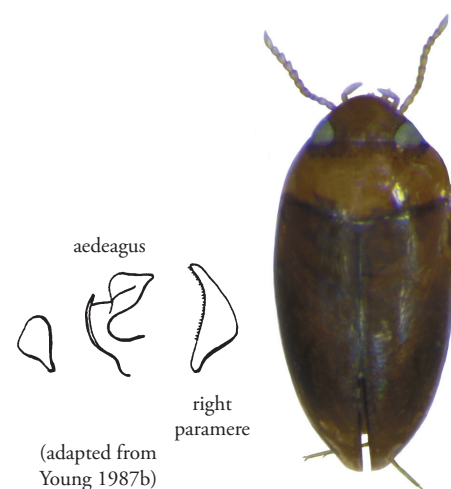
Notomicrus nanulus (length 1.2-1.4 mm) is more narrowly ovate and has deeply impressed dorsal microreticulation (it appears duller); the pronotum is light brownish-yellow and the elytra dark reddish-brown (teneral specimens may appear lighter). In dorsal view, the eyes are about 6-8 ommatidia (facets) wide. The male's right paramere is apically rounded. Young (1978b) stated that the species occurs abundantly in woods ponds in northern and central Florida; Young (1954) stated that it also is sometimes found along the margins of streams. The most widespread and common of the two US species, *N. nanulus* is also known from Alabama, Louisiana and Georgia. Note that the figure of *N. nanulus* in Ciegler (2003: fig. 4.4) is not a *Notomicrus*.

N. sharpi (length 1.2-1.4 mm) is more broadly ovate and has shining, less impressed microreticulation (it appears shinier); the pronotum is yellow and elytra are a light reddish-brown. In dorsal view, the eyes are about 10-12 ommatidia (facets) wide. The males's right paramere is apically attenuate. 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 peninsula (Miami-Dade and Monroe Counties). Turnbow & Thomas (2008) reported it from several sites in the Bahamas; it is found throughout the Greater Antilles, Mexico and Central America.

ADDITIONAL REFERENCES: Beutel & Roughley 1987; Young 1978b.



N. nanulus



N. sharpi

Florida species

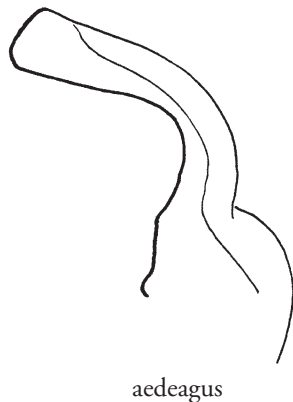
N. nanulus (LeConte)

N. sharpi J. Balfour-Browne

GENUS *Pronoterus*

DIAGNOSIS: Larvae are undescribed, but putative larvae are distinguished by the cylindric body, mandible with well developed inner teeth; last abdominal segment short, stout, with long dorsal spine and urogomphi that may extend well past the lateral margin of segment.

Adults are distinguished by more oval body form; males with one intermediate antennal segment slightly dilated; rounded apex of the prosternal process; the broadened, triangular fore tibia with a weak apical spine; and the hind femora with weak angular setae.



aedeagus

*P. semipunctatus*

NOTES: One species, *P. semipunctatus* (length 2.3-2.6 mm), occurs in Florida. It was originally described from Michigan, but has only been recorded since from Florida, Georgia and South Carolina.

Pronoterus semipunctatus is somewhat similar to *Mesonoterus* but is smaller, more oval, and has more lightly colored elytra with fewer, coarser punctations that are arranged in several weak striae. It is a species of standing water; I've collected numerous individuals from a pond choked with lily pads and submerged vegetation.

The larva keyed above as "*Mesonoterus/Pronoterus?*" is probably *Pronoterus*, although larvae have not been reared and associated with the adult. I have seen similar material from several Florida counties, including two (Leon and Walton) that are north of the known range of *Mesonoterus* (northernmost record for *Mesonoterus* is from Alachua County).

ADDITIONAL REFERENCES: Young 1953g.

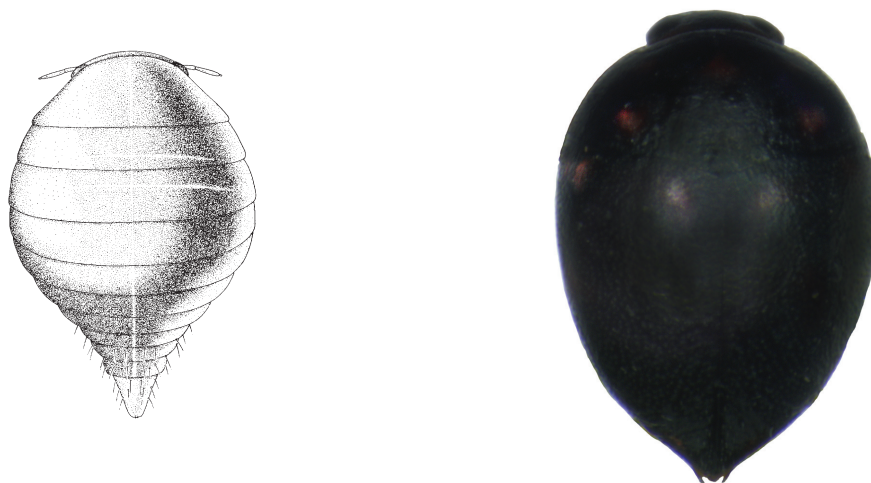
Florida species

P. semipunctatus (LeConte)

GENUS *Suphis*

DIAGNOSIS: Larvae are distinguished by the globose shape; serrulate mandible; and the 3rd antennal segment being over 10 times the length of the 4th.

Adults are distinguished by the globose body; apex of foretibia with well developed hook/spur; and hind coxae separated.



NOTES: A single species, *S. inflatus* (length 3.0-3.5 mm) of this predominantly Neotropical genus is found throughout Florida; it occurs north to the Carolinas. Originally described as the only member of the genus *Colpius*, Spangler & Folkerts (1973) placed the species in with the Neotropical genus *Suphis* and considered *Colpius* a junior synonym of *Suphis*. It is commonly found in ditches, ponds, lakes and marshes; Young (1954: 125) noted that it apparently preferred “relatively permanent bodies of water, often of low pH”. The dull reddish markings on the adult may be difficult to discern, especially on alcohol-preserved material.

ADDITIONAL REFERENCES: Spangler & Folkerts 1973.

Florida species

S. inflatus (LeConte)

GENUS *Suphisellus*

DIAGNOSIS: (based on literature) Larvae are distinguished by the cylindriform body form; mandible with stout preapical tooth; and the 3rd antennal segment not longer than 4th.

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; row of coarse setae at base of prosternum; prosternal process that is not broader than long, with a truncate apex; and the hind femur with well developed angular setae.



S. puncticollis



S. gibbulus

NOTES: Six species of this mostly tropical genus are known from North American north of Mexico; five occur in Florida.

These common beetles most often occur in standing water, where they are usually found in decaying vegetation and among root masses. They may also be 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 occurring in southern Florida can not be discounted; be sure to check the key and descriptions in Young (1979a) (especially figures of the aedeagus) if specimens will not key below.

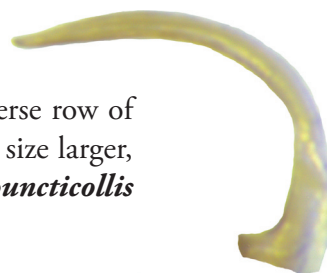
ADDITIONAL REFERENCES: Young 1979a.

Florida species

S. bicolor (Say)
S. gibbulus (Aubé)
S. insularis (Sharp)
S. parsonsi Young
S. puncticollis (Crotch)

Key to adult *Suphisellus* of Florida

- 1 Elytra pitchy black to dark brown, with a transverse row of irregular light spots, or a band, near the middle; size larger, 2.7-3.0+ mm; aedeagus as figured *S. puncticollis*



aedeagus



- 1' Elytra uniformly light brown to dark reddish-brown, without light spots/band on a dark background; size smaller, ≤ 2.8 mm; aedeagus not as figured 2

- 2(1') In lateral view, lateral margin of pronotum and elytra strongly arched; prosternum with medial groove; typical coloration of pronotum yellowish with a reddish medial blotch near the front margin; aedeagus as figured *S. insularis*



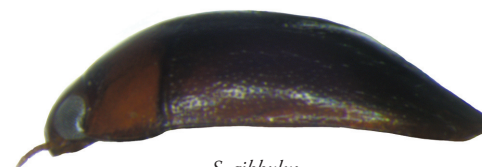
groove



aedeagus

*S. insularis*

- 2' In lateral view, lateral margin of pronotum and elytra feebly arched or straight; prosternum without medial groove; typical coloration of pronotum reddish or yellowish brown, rarely with a conspicuous medial blotch; aedeagus not as figured 3

*S. gibbulus*

- 3(2') Elytra coarsely and closely punctate, with noticeable microreticulation between the punctures; aedeagus as figured *S. parsonsi*



aedeagus

(adapted from Young 1979a)

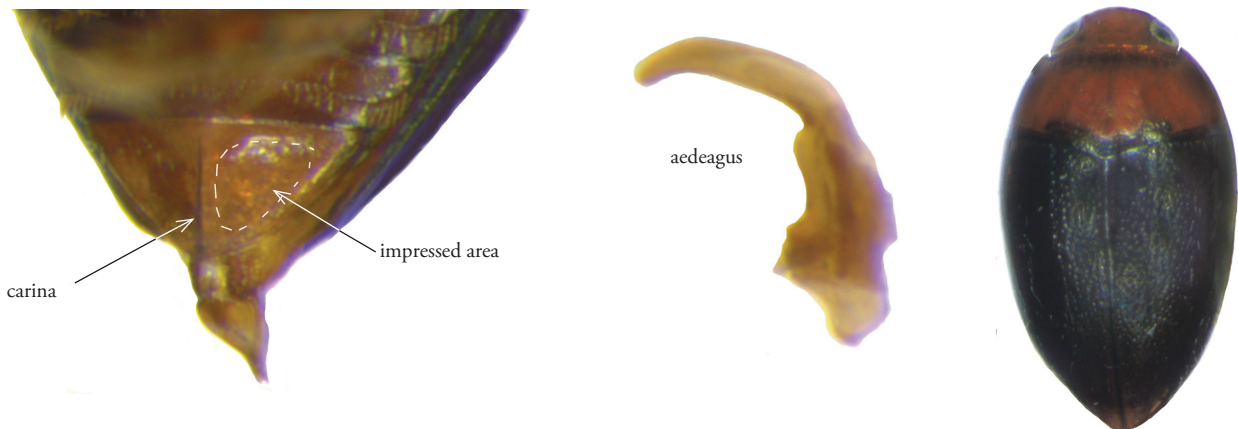


- 3' Elytra not as closely punctate, the space between the punctures not noticeably microreticulate; aedeagus not as above 4

- 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 females so that sternite may appear medially carinate; aedeagus slightly thicker with a rounded apex ..
..... *S. bicolor*



Notes on species

S. bicolor - Length 2.4-2.8+ mm. Young (1979a) considered *S. bicolor* to consist of two subspecies: the typical *S. b. bicolor*, with yellow pronotum and very dark pitchy-brown to blue-black elytra, and *S. b. punctipennis*, a more unicolorous species that may also have dark brown elytra (but not pitchy brown to blue-black). Young (ibid: 425) went on to write that the “strongly bicolorous form extends as far north as Indiana, but it replaced to the east by a paler form which is only feebly bicolorous or uniformly yellowish brown above”. He (ibid: 425) stated that *S. b. bicolor* ranged on the Coastal Plain from eastern Texas to Mobile Bay, Alabama, where it was “replaced by the feebly bicolorous or unicolorous *S. gibbulus* in the lower coastal plain, and to the north by *punctipennis*”; he also stated that *S. b. punctipennis* was an inland (from the coastal plain) species that ranged from Alabama north to Illinois and east to Delaware; his southernmost record was from Montgomery Co., AL. He (ibid:426) also wrote that specimens referred to as “*S. punctipennis* Sharp (?)” in Young (1954) were reclassified as teneral, lightly colored specimens of *S. gibbulus*; he thus considered that *S. bicolor* did not occur in Florida. 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 seen through the integument. To date, it appears the only valid records for *S. bicolor* for Florida is a series of males and females from a fish pond in Santa Rosa County that Epler (1996) referred to as *S. b. bicolor*. This identification is somewhat problematic in that it is difficult to discern whether these specimens represent “feebly bicolorous” *S. b. bicolor* (the elytra on these specimens is not dark, pitchy black, but could be considered very dark brown or “light” black; one of these specimens is illustrated in the key above) or *S. b. punctipennis*. In 1996 I originally point mounted some of this series, freshly collected and stored in alcohol that same year. In 2009 I point mounted another specimen from the same series/vial, and because of the darkening caused by years of storage in alcohol, would not consider the specimen to be bicolored. This subspecies identification problem is “solved” by identifying specimens just as *S. bicolor* - which, by the male genitalia and the morphology of the last abdominal sternite, is a taxon distinctly different from *S. gibbulus*.

- 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 weakly bicolorous, and may sport a weak medial blotch on the pronotum. The apically attenuated aedeagus of the male 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 County. This species is often abundant in decaying masses of water hyacinth. The pronotal medial blotch may be joined by dark markings at the base and apex in some specimens. Note that this is the only Florida species with a longitudinal groove on the prosternum - but also note that this groove is rather weakly developed in some specimens.
- S. parsonsi* - 2.5-2.7 mm. The obvious microreticulation between the dense punctures on the elytra of this species is distinctive; the elytra appear rough compared to other *Suphisellus* species. An uncommon species, it is known from Highlands County north to Georgia. Young (1979a) 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 not as obvious. The species' name is misspelled as “*S. parsoni*” throughout Young (1979a).
- 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 through the state northward to Michigan and Ontario. The two spots on each elytron are sometimes coalesced into a single transverse band that does not reach the sutural line of the elytra. Elytral markings may be difficult to discern on specimens that have been stored for a long period; it may be necessary to gently lift an elytron so that it is backlit in order to see markings.

FAMILY **PSEPHENIDAE***water pennies***14**

DIAGNOSIS: Larvae are distinguished by the dorsoventrally flattened, oval body form with the thoracic and abdominal tergites greatly extended laterally; and head completely hidden beneath the pronotum.

Adults are distinguished by the soft body; concealed mandibles; labrum not visible from above; transverse fore coxae; 5-segmented tarsi with unlobed 3rd tarsomere; and first abdominal sternite not divided by hind coxae.

*Ectopria* adult*Ectopria* larva

NOTES: The flattened, limpet-like larvae, usually found attached to rocks or vegetation, can not be confused with any other aquatic beetle larvae in Florida. Adults are not aquatic, but are commonly found resting on vegetation or rocks in riparian areas, and are often collected in streamside light traps.

The sole species known from Florida, *Ectopria thoracica*, was previously placed in the family Eubriidae. This family is now considered a subfamily, Eubriinae, of the Psephenidae. Two other genera, *Psephenus* and *Dicranopselaphus*, are found in the Southeast; there is a slight chance they may occur in the Panhandle.

ADDITIONAL REFERENCES: Barr & Chapin 1988; Barr & Spangler 1994; Brigham 1982 (in part as Eubriidae); Brown 1972; Brown & Murvosh 1974; Hilsenhoff & Schmude 1992; Murvosh 1970; Shepard 2002c; White & Brigham 1996.

Florida genera

Ectopria LeConte

Key to genera of Psephenidae larvae of the Southeastern United States

- 1 With several pairs of exposed gills on venter of abdomen * *Psephenus*
(not known from Florida; one species, *P. herricki* DeKay, known from SE US)



Psephenus



Ectopria

- 1' Gills covered by an operculum on 9th sternite, not visible 2

- 2(1') 9th abdominal sternite truncate or rounded apically, without a deep notch (a slight notch may be present) *Ectopria*

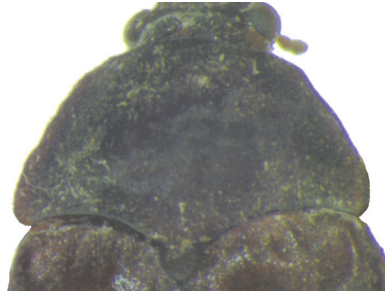


- 2' 9th abdominal sternite with distinct, deep, apical notch * *Dicranopselaphus*
(not known from Florida; one species, *D. variegatus* Horn, known from SE US)



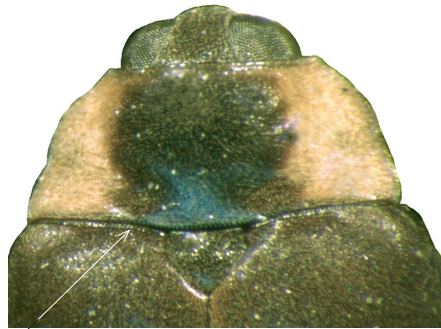
Key to genera of Psephenidae adults of the Southeastern United States

- 1 Posterior margin of pronotum smooth * *Psephenus*
(not known from Florida; one species, *P. herricki* DeKay, known from SE US)



Psephenus herricki

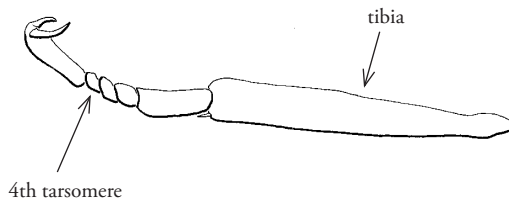
- 1' Posterior margin of pronotum crenulated or beaded ... 2



crenulations

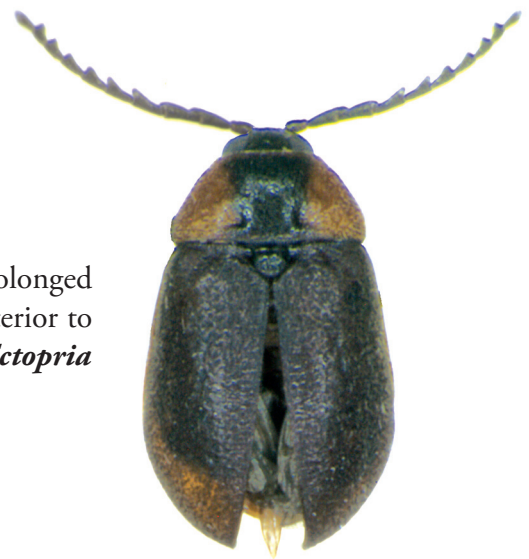
Ectopria

- 2(1') Tarsomeres parallel-sided, not emarginate apically, not prolonged beyond base of next tarsomere; body elongate, widest posterior to middle *Ectopria*



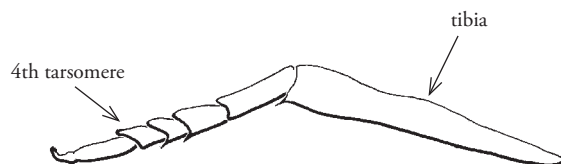
4th tarsomere

tibia



Ectopria thoracica
(elytra spread due to drying)

- 2' Tarsomeres 2-4 slightly dilated, slightly emarginate apically, fourth tarsomere slightly prolonged beneath fifth; body semispherical, widest at middle * *Dicranopselaphus*
(not known from Florida; one species, *D. variegatus* Horn, known from SE US)



4th tarsomere

tibia



Dicranopselaphus sp. from Panama

GENUS *Ectopria*

DIAGNOSIS: Larvae are distinguished by flattened oval form; a ventral operculum on the 9th abdominal sternite enclosing the gills (gills not visible); and the rounded to truncate apex of the 9th abdominal segment.

Adults are distinguished by the elongate body, with greatest width posterior to middle; crenulate or beaded posterior margin of the pronotum; males with at least the anterior protarsal claw apically bifid; and slender tarsi with the 4th tarsomere smaller than the third and not extended beneath the fifth tarsomere.



larva, dorsal

larva, ventral

NOTES: Three species are known from North America; only one species, *E. thoracica* (length 3-5 mm), is known from Florida. Adult *E. thoracica* are distinguished by the bicolored prothorax and brownish-black to black elytra; they somewhat resemble fireflies (Lampyridae). Ciegler (2003) recorded *E. nervosa* (Melsheimer) from South Carolina; adults of this species are distinguished from *E. thoracica* by a completely dark pronotum. Ciegler (2003: 178) listed *E. nervosa* for Florida and did not list *E. thoracica* for Florida. However, I have seen only *E. thoracica* adults from Florida; Ciegler's listings for the two taxa are probably switched, at least for Florida records.

Hilsenhoff & Schmude (1992) keyed the larvae of two *Ectopria* species, but had no associated adults and could not assign species names to their taxa; they hypothesized that their larvae represented *E. leechi* (a more northern species) and *E. nervosa*. They had also examined larvae from Louisiana, probably *E. thoracica* (the only species recorded for the state by Barr & Chapin (1988)) and noted that the putative *E. thoracica* larvae lacked asperities (dark, dot-like elevations). Thus, should *E. nervosa* larvae be found in Florida, they could probably be distinguished from those of *E. thoracica* by the presence of these asperities. However, it will be necessary to associate larvae with adults to confirm this.

I've seen *E. thoracica* adults from Gadsden, Leon, Okaloosa and Santa Rosa Counties, and unassociated larvae that are probably *E. thoracica* from Bay, Gadsden and Liberty Counties, and the Suwannee River Basin. An unusual record is an unassociated larva from the Hillsborough River at Crystal Springs Road (Pasco Co.), collected by Jim Hulbert on 25-vii-2006.

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

Florida species

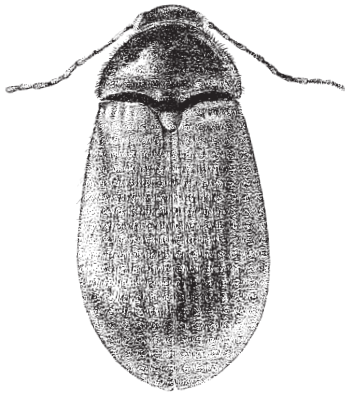
E. thoracica (Ziegler)

FAMILY **PTILODACTYLIDAE**
ptilodactylid beetles

15

DIAGNOSIS: Larvae of the sole 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 external lobate anal gills, but lacking an operculum.

Adults are not aquatic; *Anchytarsus* is distinguished by its 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.



Anchytarsus bicolor adult
 (from Stribling 1986)



Anchytarsus bicolor larva



A. bicolor larva, anal end



Paralichas trivittis larva

NOTES: Three genera of Ptilodactylidae are known from Florida but only one, *Anchytarsus*, is considered aquatic. For information on the other two genera, *Lachnodactyla* Champion and *Ptilodactyla* Illiger, see Ciegler (2003) and Ivie (2002).

Anchytarsus larvae feed on decaying wood or vegetation in streams.

An additional genus, *Paralichas* White, is known to have aquatic larvae (Funk & Fenstermacher 2002). One rare species, *P. trivittis* (Germar), is known from the eastern US as far south as Georgia (Ivie 2002), and may occur in the Panhandle or northern counties of Florida. The larva is distinctive, with a cone-shaped terminal segment.

ADDITIONAL REFERENCES: Ciegler 2003; Funk & Fenstermacher 2002; Ivie 2002; LeSage & Harper 1976b; Stribling 1986.

Florida genera

Anchytarsus Guérin-Ménéville

Florida species

A. bicolor (Melsheimer)

FAMILY **SCIRTIDAE**
marsh beetles

16

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 distinguished by the 11 segmented antennae that may be filiform, serrate or bipectinate; antennal bases not covered by an anterior extension of the pronotum; pronotum not crenulate or beaded posteriorly; conical prothoracic coxae; 5 segmented tarsi with 4th segment deeply bilobed; and the abdomen with 5 visible sternites, the first sternite not divided by the hind coxae.

*Cyphon* sp. 2*Scirtes orbiculatus**Ora texana**Prionocyphon* sp. larva

NOTES: Previously known as Helodidae or Cyphonidae, six genera of scirtids including about 22 species are known from Florida. In an unpublished Ph.D. dissertation, Tetrault (1967) revised the family for America north of Mexico; he described several new species of *Cyphon*, two of which occur in Florida. Because his study was never published, his names are not available. Tetrault's revision is weak; many species descriptions are non-existent or incomplete; many lack measurements. A serious, published revision of the family for North America is badly needed, especially for the genus *Cyphon*; in addition to Tetrault's two unavailable species, at least one other undescribed *Cyphon* occurs in Florida. The most recent comprehensive work on the family is Klausnitzer (2009) (in German); Yoshitomi's (2005) (in English) excellent revision of the Japanese fauna is also quite useful.

Larvae are common inhabitants of water bodies with decomposing plant material, including marshes, swamps, ponds, streams, springs, ditches and phytotelmata (water held by plants). Larvae may go through as many as 11 instars (Zwick & Zwick 2008b).

Adults are not aquatic, but may be found on emergent vegetation or in rotting plant material on shorelines, etc.; they may be abundant in light traps run near water bodies.

ADDITIONAL REFERENCES: Champion 1897; Ciegler 2003; Klausnitzer 2009; Tetrault 1967; Yoshitomi 2005; Young 2002; Zwick 2008; Zwick & Zwick 2008a.

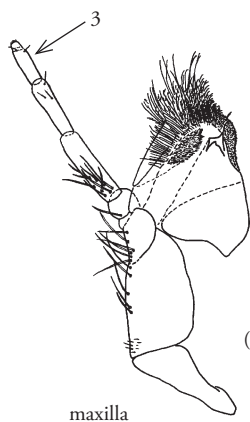
Florida genera

Cyphon Paykull
Ora Clark
Prionocyphon Redtenbacher
Sacodes LeConte
Sarabandus Leech
Scirtes Illiger

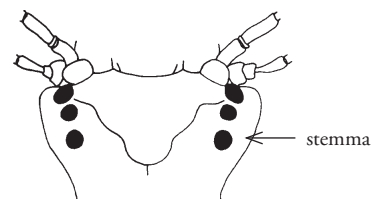
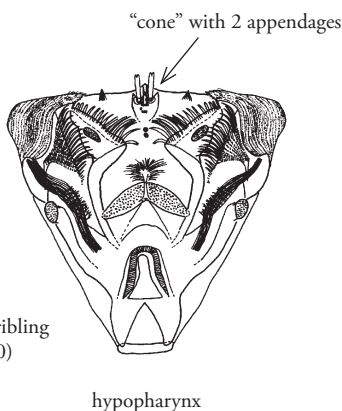
Key to genera of Scirtidae larvae of Florida

(the larva of *Sarabandus* is undescribed)

- 1 Maxillary palp with 3 segments; hypopharynx with a central cone near anterior margin bearing 2 leaf-like appendages; each side of head with 3 easily discerned stemmata (simple eyes) ***Sacodes***

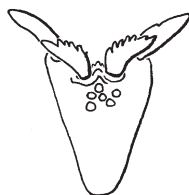
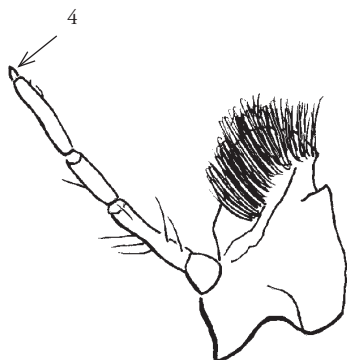


(adapted from Stribling & Young 1990)

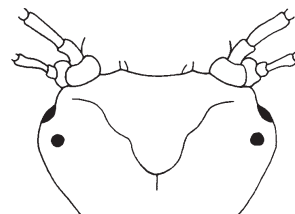


(adapted from Bertrand 1972)

- 1' Maxillary palp with 4 segments (4th may be very small); hypopharynx with a central cone bearing 4 leaf-like appendage; each side of head with 2 easily discerned stemmata 2



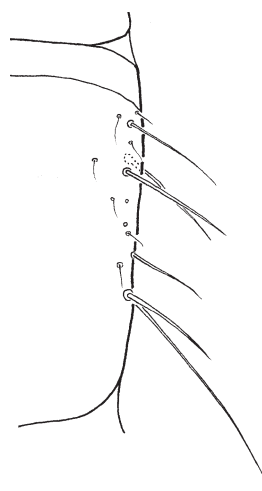
"cone" with 4 appendages



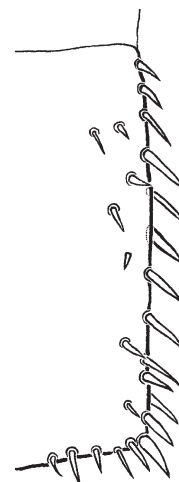
(adapted from Bertrand 1972)

- 2(1') Lateral margin of abdominal segments with scattered, thin setae only ***Cyphon***

- 2' Lateral margin of abdominal segments with a row of short, robust setae 3

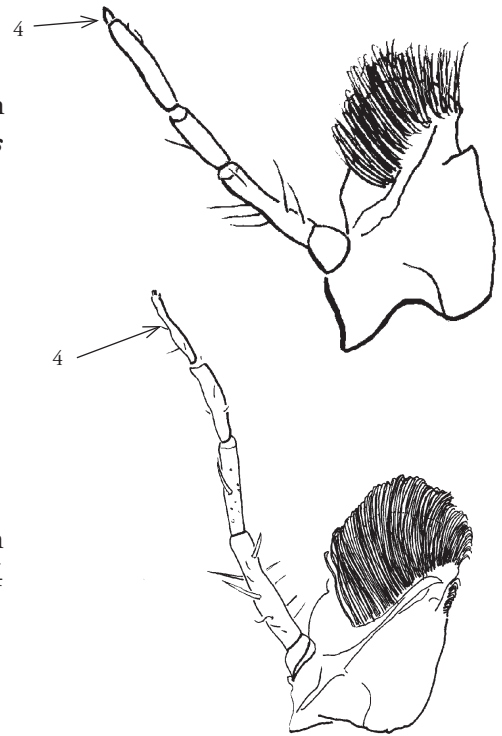


Cyphon



Ora

- 3(2') Last segment of maxillary palp very short, $1/4$ or less length of penultimate segment ***Scirtes***



- 3' Last segment of maxillary palp longer, $1/2$ or more length of penultimate segment 4

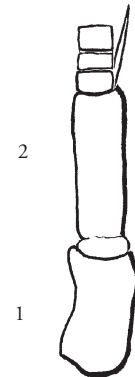
- 4(3') Anterior margin of labrum straight, with anterior angles bent under; mandible of last instar produced to an apical tooth; 1st antennal segment (scape) about $4/5$ length of 2nd (pedicel) ***Prionocyphon***



labrum

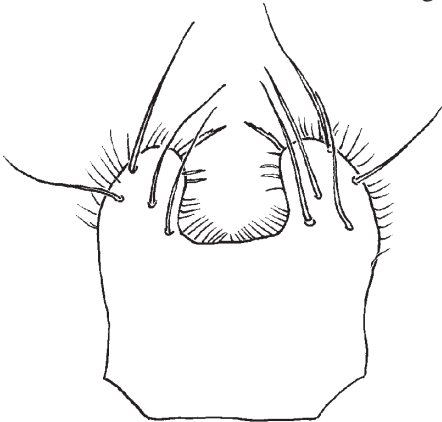


mandible

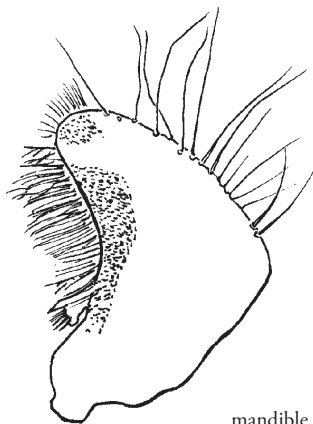


basal antennal segments

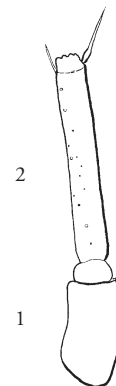
- 4' Anterior margin of labrum deeply concave, anterior angles not bent under; apex of mandible rounded in all instars; 2nd antennal segment (pedicel) more than twice length of 1st (scape) ***Ora***



labrum



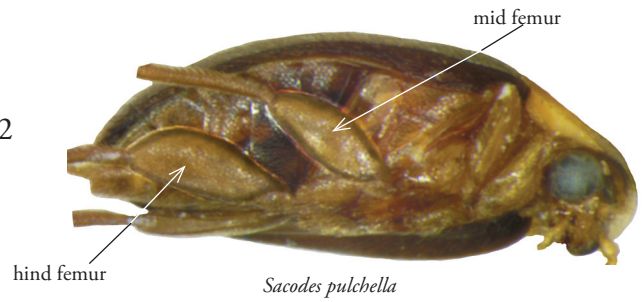
mandible



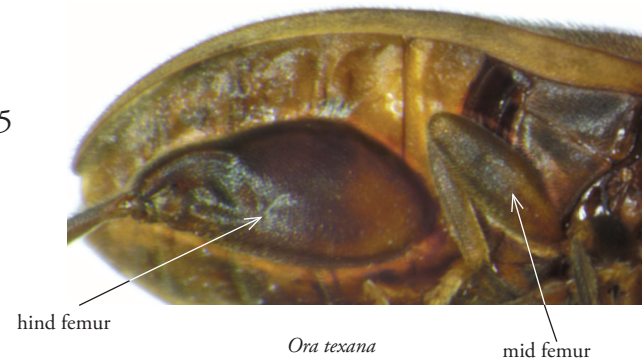
basal antennal segments

Key to genera of Scirtidae adults of Florida

1 Hind femora slightly larger than mid femora 2



1' Hind femora much larger than mid femora 5

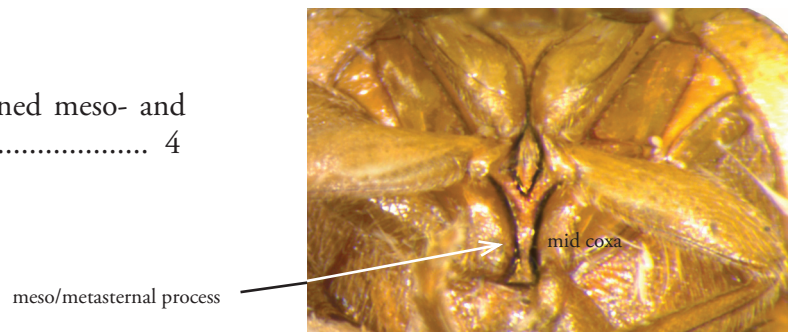


2(1) Mesosternal process short, not contacting metasternal process so that middle coxae may touch only near apices 3



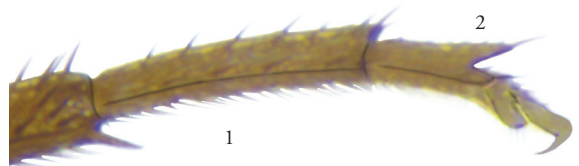
venter of *Sacodes pulchella*

2' Middle coxae separated by combined meso- and metasternal processes 4



venter of *Prionocyphon limbatus*

- 3(2) Hind tarsi with 1st tarsomere flattened dorsally and with a ridge along upper margins; 2nd tarsomere produced posterodorsally to long points bearing a large seta; labial palp with 3rd segment arising from side of 2nd ***Sacodes***



- 3' Hind tarsi with 1st tarsomere rounded dorsally, without marginal ridge; and 2nd tarsomere not produced dorsally; labial palp with 3rd segment arising from apex of 2nd ***Sarabandus***



- 4(2') First antennomere twice as broad as following antennomeres; 2nd antennomere arises from under outer angle of 1st; 3rd antennomere very small, 1/2 as large as 2nd; generally larger, length 3.5-5.5 mm ***Prionocyphon***



- 4' First antennomere less than twice as broad as other antennomeres; 2nd antennomere arises from apex of 1st; 3rd antennomere small but longer than 1/2 length of 2nd; generally smaller, length 1.8-4.0 mm ***Cyphon***



- 5(1') Smaller, length 2.5-5.0 mm (usually < 3.7 mm); hind coxae contiguous medially or opposed along entire inner margin; base of hind trochanter partially hidden by posteroventral margin of hind coxa ***Scirtes***

*Scirtes**Ora*

- 5' Larger, length 5.0-6.5 mm; hind coxae touching or approximate only near anterior; base of hind trochanter fully exposed, not hidden by posteroventral margin of hind coxa ***Ora***

GENUS *Cyphon*

DIAGNOSIS: Larvae are distinguished 2 stemmata; hypopharynx with 4 leaf-like appendages; 4 segmented maxillary palp, with last segment $<1/4$ length of penultimate segment; and lateral margin of abdominal segments with few, long thin setae.

Adults are distinguished by the smaller size (1.4-4.0 mm); 1st antennomere much less than twice as broad as other antennomeres; 2nd antennomere arises from apex of 1st; 3rd antennomere small but longer than $1/2$ length of 2nd; middle coxae not contiguous; hind femora similar to fore and mid femora; and hind tibiae without elongate spurs.



C. perplexus



C. sp. 2

NOTES: Six described species of this speciose genus are recorded for Florida, with an additional three undescribed taxa; two of these were described in Tetrault's (1967) dissertation, but since it has remained unpublished, his names are not available. I have included Tetrault's manuscript names for those two taxa (*Cyphon* spp. 1 and 2) solely as a guide for those who may seek further information on those taxa; do not use Tetrault's names! It is unfortunate that the most common species of *Cyphon* in Florida (*C. sp. 2*) does not have a valid name.

The majority of adult *Cyphon* are externally similar; with few exceptions dissection of male and/or female genitalia is necessary for species level identifications. Females are recognized by the two digitiform styli that usually extend posteriorly from the abdomen. Females possess an internal, usually sclerotized, organ termed the "prehensor" that requires dissection, usually located in the anterior part of the abdomen. Males have a variety of genitalic and abdominal appendages which may include broad plates and sword-like parameres; some of these structures may protrude, but usually require dissection.

Cyphon adults can be abundant in light traps run near water bodies, but larvae are rarely collected in standard sampling programs.

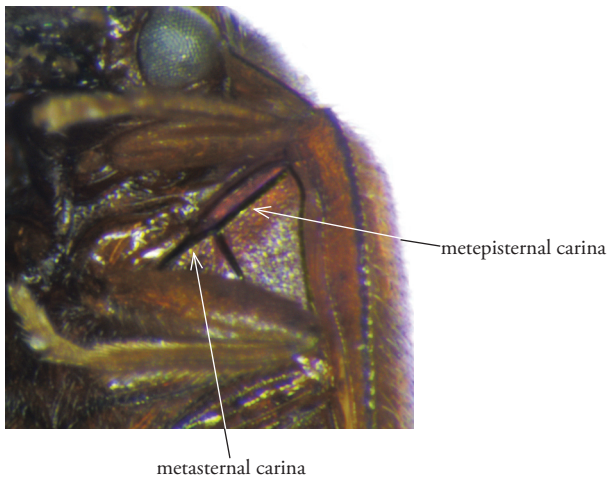
ADDITIONAL REFERENCES: Ciegler 2003; Klausnitzer 1976, 2009; Nyholm 1972b; Tetrault 1967; Young & Stribling 1990.

Florida species

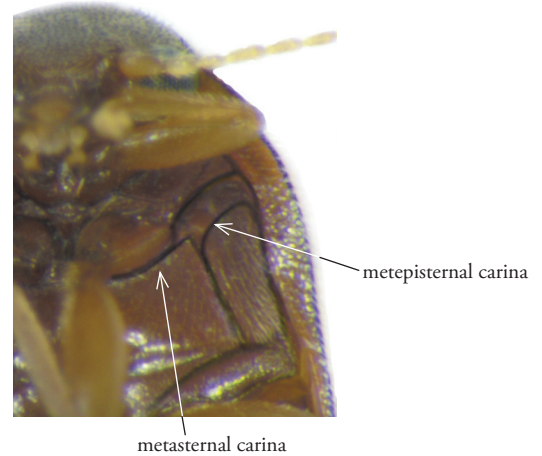
C. americanus Pic
C. cooperi Shaeffer
C. nebulosus (LeConte)
C. perplexus Blatchley
C. punctatus (LeConte)
C. sp. 1 Epler
C. sp. 2 Epler
C. sp. 3 Epler

Key to adult *Cyphon* of Florida

- 1 Metasternal carina continuous with metepisternal carina 2



continuous



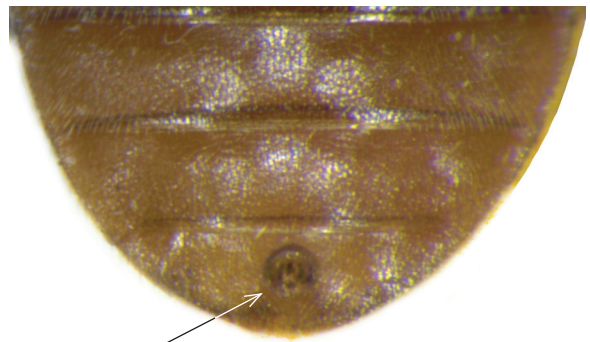
not continuous

- 1' Metasternal carina not continuous with metepisternal carina 3

- 2(1) Pronotum yellow to light reddish-brown, elytra much darker; female without medial depression on abdominal sternite VII
 * *C. collaris complex*
 (not recorded from Florida, but may eventually be found in northern/western part of the state; see Notes on species for *C. bicolor* and *C. collaris*)



- 2' Pronotum and elytra yellowish-brown; female with circular medial depression on abdominal sternite VII that contains an anteromedial, posteriorly directed spinous process *C. sp. 3*



- 3(1') Posterior fourth to third of elytra much lighter than darker anterior portion ...
 * *C. neopadi*
 (not known from Florida; see Notes on species)



- 3' Elytra unicolorous or with darker areas anteriorly, medially and/or laterally 4
- 4(3') Elytra with a pair of distinct, broad, shallow depressions near posterior fourth and a pair posterolaterally to the scutellum; females 5
- 4' Elytra without distinct depressions as above; males or females 6
- 5(4) Apex of last visible abdominal sternite notched; elytral depressions transverse *C. cooperi*
- 5' Apex of last visible abdominal sternite rounded; elytral depressions obliquely angled .. *C. americanus*

Male and female genitalia in *Cyphon*

The genitalia of *Cyphon* species are complex and offer several good characters for identification (see Nyholm 1972a).

Females are recognized by the two digitiform styli that usually extend posteriorly from the abdomen, especially in specimens that have been collected in alcohol. The most useful structure of the female genitalia is the prehensor, an internal structure usually located near the middle or anterior portion of the abdomen. The easiest way to observe the prehensor is to slice open the abdomen from above, between the elytra, and probe for it among the visceral mass within.

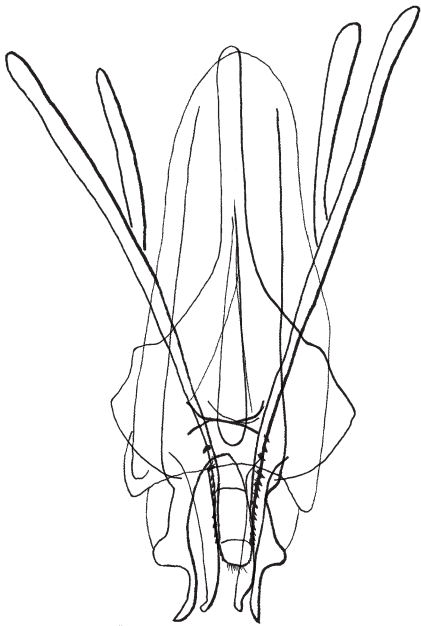
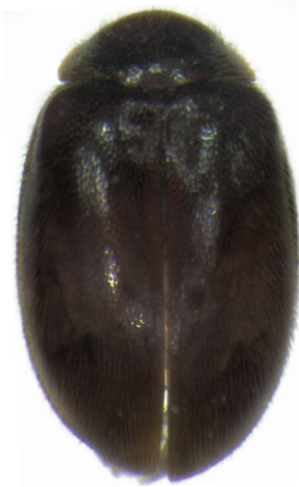
For males (on opposite page), the shape of tergite VIII, sternite IX, the tegmen, parameres and the penis can be distinctive. These structures may sometimes be partially exerted, but often dissection is required.



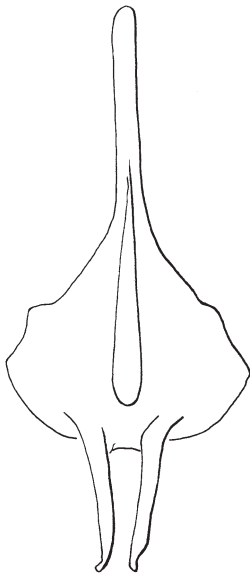
female genitalic tract

6(4') Color reddish-brown; males only, with genitalia dark, well sclerotized, as illustrated below *C. americanus/cooperi*

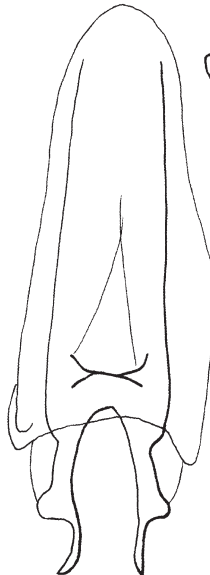
See Notes on species for explanation of "type 1" and "type 2" genitalia for *C. americanus/cooperi*



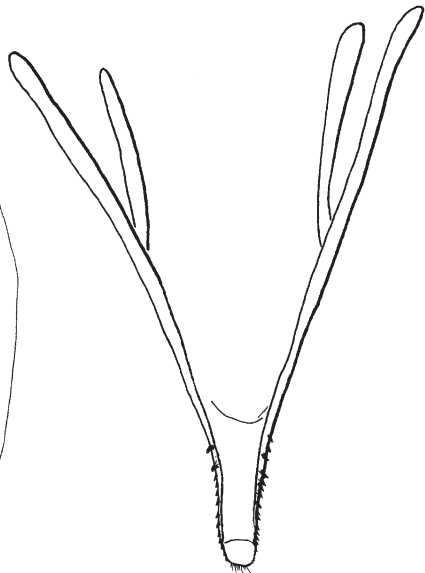
male genitalia *in situ*



sternite IX



penis

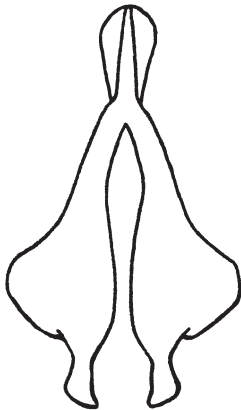


tergite VIII

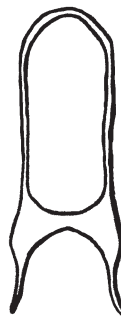
male genitalia with parts separated

type 1

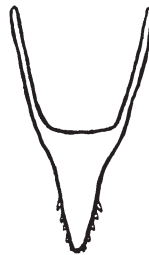
type 2
(adapted from Tetrault 1967)



sternite IX



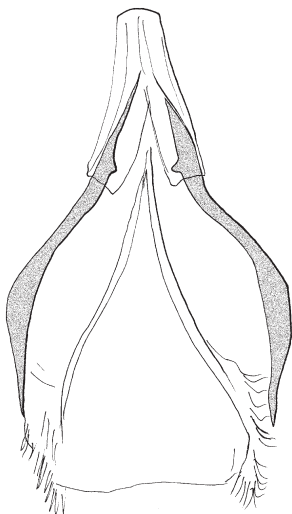
penis



tergite VIII

6' Color brownish or yellow-brown; males or females; genitalia not as dark and sclerotized, not as illustrated above 7

- 7(6') Smaller, length 2.0-2.5 mm; elytra yellowish and unmarked, except sometimes with diffuse dark area near base, genitalia as illustrated *C. perplexus*



male genitalia



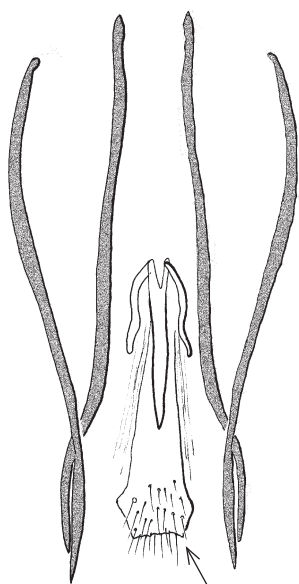
female prehensor



- 7' Usually larger, 2.0-3.6 mm; yellow-brown to brown, elytra unmarked or marked; genitalia not as above ... the *Cyphon variabilis* complex (stop here if you do not dissect the genitalia) 8

NOTE: the following species are externally similar but there is variation and overlap in coloration and size. Without extensive experience and familiarity with these taxa, identification is possible only by dissection and examination of male and female genitalia and associated structures, which are generally distinctive for all the following species. Thus identification from this point forward is basically by matching illustrations to the genitalia of your specimen(s).

- 8(7') Usually yellow-brown with darker markings at base of elytra, discal area and laterally (but may be unmarked); genitalia as figured *C. sp. 2*



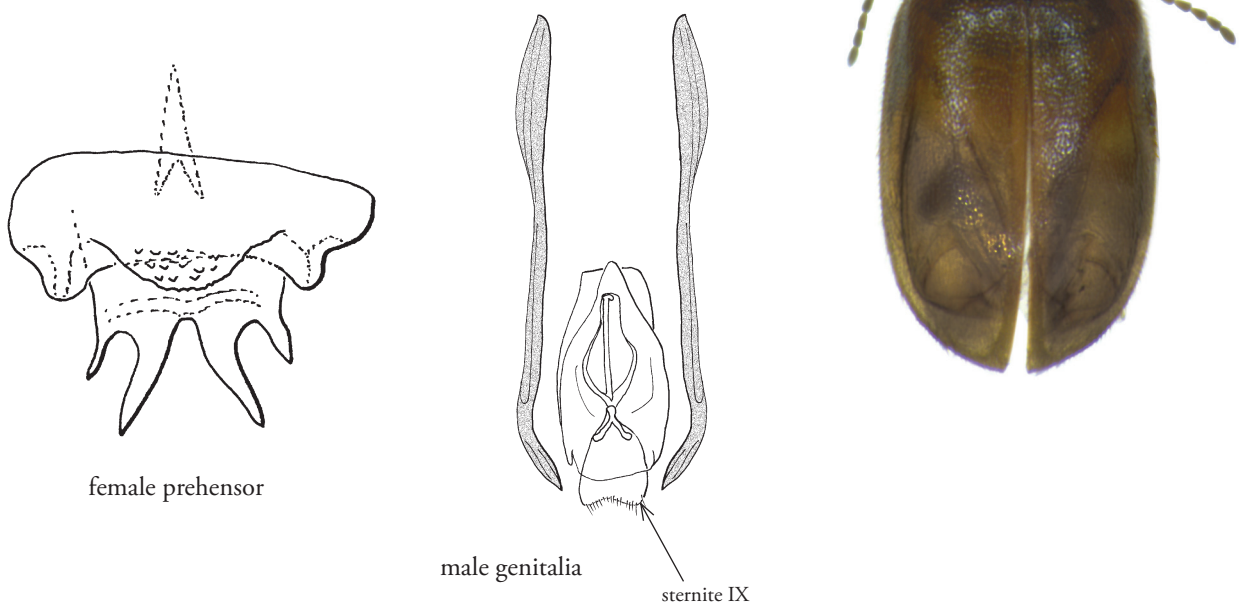
male genitalia



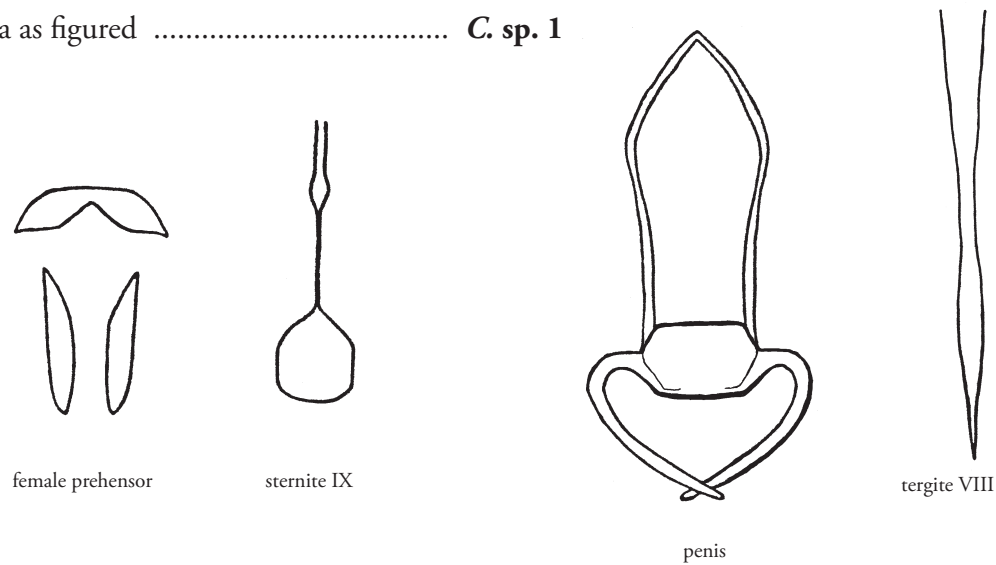
female prehensor



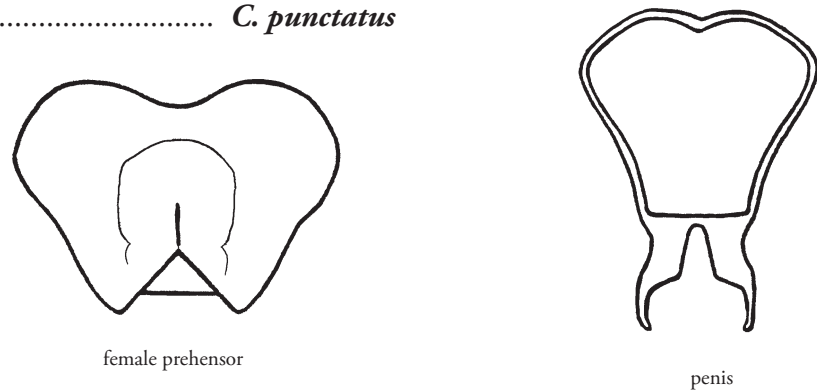
8' Usually brown to yellow-brown, elytra plain or marked; genitalia as figured *C. nebulosus*



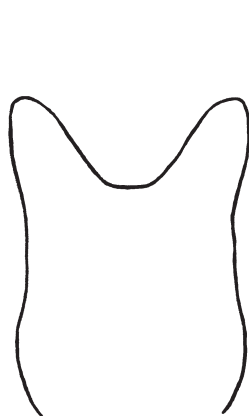
8'' Genitalia as figured *C. sp. 1*



8''' Genitalia as figured *C. punctatus*



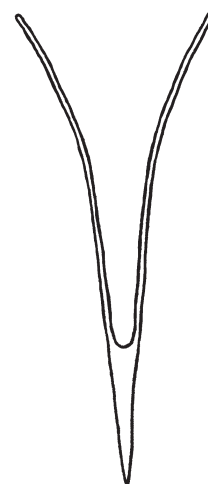
- 8''' Genitalia as figured * *C. modestus*
 (not recorded from Florida, but may eventually be found in northern/western part of the state)



female prehensor



penis



tergite VIII

(adapted from Tetrault 1967)

Notes on species

- C. americanus* - Length 2.5-3.1 mm. This species and *C. cooperi* were originally described from females, which can be distinguished from each other without dissection. Males for both species are known, with different genitalia, but they have not been positively associated with females. I have called the genitalia of the first taxon illustrated by Tetrault (1967: 131: figs. 1-3) "type 1"; the genitalia illustrated on p. 141: figs. 1-3 are called "type 2". To date I have seen only males of "type 1" from Florida; Tetrault records *C. americanus* and *C. cooperi* from Florida. Both species share the same range, from Florida to New York. Since males still can not be identified with certainty, they should be identified as "*C. americanus/cooperi*".
- C. cooperi* - Length 2.3-2.7 mm. See *C. americanus* above.
- C. nebulosus* - Length 2.6-3.2 mm. Formerly considered a synonym of *C. variabilis*, but Tetrault (1967) noted distinct genitalic differences and restored it to separate species status, a position adopted in this manual. Most of Tetrault's descriptions lack measurement ranges; for this species, despite having 159 specimens, he gave only measurements for the holotype (2.6 mm). In mixed light trap samples I've examined with *C. perplexus* and *C. sp. 2*, *C. perplexus* is smaller, lighter, and usually unmarked; *C. sp. 2* is usually intermediate in size between the other two, and often marked with diffuse dark areas adjacent to the scutellum, the discal area posterior to the middle and laterally (but may be entirely pale); and *C. nebulosus* is larger, darker and may be marked in a similar manner to *C. sp. 2*. Until one is quite familiar with these taxa, genitalic examination is necessary.
- C. perplexus* - Length 2.0-2.5 mm. Usually unmarked and smaller than most other Florida *Cyphon*, but dissection of genitalia is necessary for accurate identification.
- C. punctatus* - Length about 2.5-3.0 mm? Formerly considered a synonym of *C. variabilis*, but Tetrault (1967) noted distinct genitalic differences and restored it to separate species status, a position adopted in this manual. Most of Tetrault's descriptions lack measurement ranges; for this species, despite having 73 specimens, he gave no measurements. He listed one specimen from Alachua County; I have not seen any Florida material of this taxon.
- C. sp. 1* - Length around 2.9 mm. Described by Tetrault (1967: 37) as "*C. alvahi*". Most of Tetrault's descriptions lack measurement ranges. For this species, despite having 89 specimens, he gave only measurements for the holotype, but noted that variation in size and color was slight. This species lacks

the diffuse dark markings on the elytra typical for *C. sp. 2*. I have not seen Florida material of this taxon; Tetrault (1967: 39) listed nine specimens from Florida, from Pinellas County north to Liberty County. The species occurs as far north as Manitoba and Quebec in Canada.

- C. sp. 2* - Length 2.4-3.6 mm. Described by Tetrault (1967: 55) as "*C. diffusus*". This appears to be the most common species of *Cyphon* in Florida, based on material collected by black light. The taxon ranges from Texas to Florida, north to Michigan and New York. This species is quite variable externally; it may be light or dark colored, unmarked or the elytra may be marked with diffuse dark areas adjacent to the scutellum, the discal area and laterally. Males can often be identified without dissection by their sternite IX which often protrudes from the abdomen (note that this structure is similar to that of the extralimital *C. neopadi* and *C. variabilis*). See also *C. nebulosus*.
- C. sp. 3* - Length 2.6-3.4 mm. An undescribed species known from several sites in peninsular Florida, Grand Cayman Island and the Bahamas; my northernmost record is from Orange County (RCID). The female is distinctive among the North American *Cyphon* for the anteromedial circular pit on the last visible abdominal sternite (S VII); this pit bears a posteriorly directed spinous projection that arises from beneath its anteromedial margin. This species will be described in a future publication.

Other species

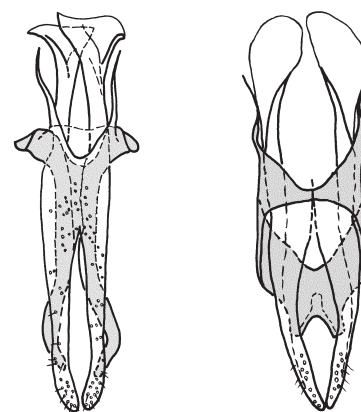
C. bicolor (LeConte) - This species was described by LeConte (1853) from "Georgia"; it could possibly occur in northern/western Florida. It is externally similar to *C. collaris* but males can be separated by their genitalia. See Young & Stribling (1990).

C. collaris (Guérin-Ménéville) - Length 3.5-4.0 mm. Not known from Florida, but Ciegler (2003) recorded it from the Piedmont of South Carolina; there is a possibility that it may occur in northern/western Florida. The combination of yellow pronotum, dark elytra and the metasternal carina continuous with metepisternal carina is distinctive. It is externally similar to *C. bicolor* but males can be separated by their genitalia. See Young & Stribling (1990).

C. modestus (LeConte) - Length around 2.5 mm. Formerly considered a synonym of *C. variabilis*, but Tetrault (1967) noted distinct genitalic differences and restored it to separate species status, a position adopted in this manual. This species is not known from Florida, but Tetrault (1967: 63) recorded it from Aiken County in South Carolina; thus there is a possibility that it may occur in northern/western Florida.

C. neopadi Klausnitzer - Length 2.0-2.4 mm. Klausnitzer (1976) described *C. neopadi* from three specimens from Massachusetts collected in 1913; this species is only separable from the similar *C. padi* (L.) by the male genitalia. Klausnitzer (2009) noted that *C. padi* is strictly a Palearctic species; Tetrault (1967) stated that *C. padi* did not occur in North America. All North American records of *C. padi* most likely refer to *C. neopadi*. I have not seen this species from Florida, but it may occur here; *C. padi* is listed for Florida by Ciegler (2003) (who recorded it from the Piedmont and Coastal Plain in South Carolina) and Peck & Thomas (1998). The male specimen illustrated in the key above is from New Jersey, courtesy of Vince Golia. The light areas on the posterior third of the dark elytra are distinctive.

C. variabilis (Thunberg) - Length 2.0-3.5 mm. This taxon has been recorded for Florida, but as defined by Tetrault (1967) this northern species does not occur in Florida; Tetrault's southernmost record for *C. variabilis* is from Delaware. Many species have been included in *C. variabilis*, but Tetrault removed several of them from synonymy. For Florida taxa, this includes *C. nebulosus* and *C. punctatus*; two new species described by Tetrault, referred to in this manual as *C. sp. 1* and *C. sp. 2*, also would be included.



C. bicolor

C. collaris

(adapted from Young & Stribling 1990)

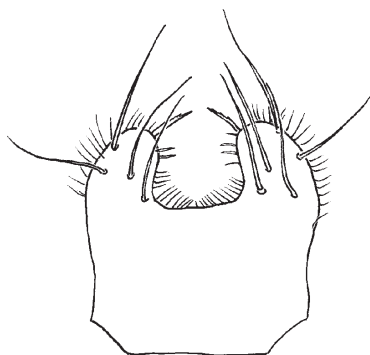
GENUS *Ora*

DIAGNOSIS: Larvae are distinguished by the deeply concave anterior margin of labrum; 2 stemmata on each side of the head; apex of mandible rounded; 2nd antennal segment (pedicel) more than twice length of 1st (scape); 4 segmented maxillary palp, with last segment about as long as penultimate; tibiotarsal organ a group of fimbriate setae, many of which are apically clavate; and lateral margins of abdominal segments with a row of short, robust setae.

Adults are distinguished by the larger size (length 3.6-8.6 mm); elytra flattened and reflexed laterally; hind coxae that are in contact only anteriorly; base of hind trochanter fully exposed, not partially hidden by postero-ventral margin of hind coxa; greatly enlarged hind femora; and hind tibiae with an elongate spur.



maxilla and labrum of larval *O. texana*



O. texana

NOTES: Three described species are known from Florida; a fourth form that may only represent a variant or sexual dimorphism is also keyed below. Several other species of *Ora* occur in the Neotropics; it is also known from Japan, Africa, Australia and the Orient (Yoshitomi 2005).

Ora species have a large laminate prosternal process that has been given generic significance by some authors (Blatchley 1914; Ciegler 2003). However, several species currently assigned to *Scirtes* (*S. oblongus* and *S. sp. 1*) also possess such a prosternal process; these taxa also have hind coxae that are not contiguous but are narrowly separated and opposed along their entire inner margin, with the posterior face at an approximate right angle to subquadrate ventral face. More work is needed to refine the generic concepts of *Ora* and *Scirtes*.

The larva of *Ora* has undoubtedly been mistakenly identified previously as *Scirtes*; larval figures included here are from larvae of *O. texana* that I collected from the marshy margins of a swamp and subsequently reared.

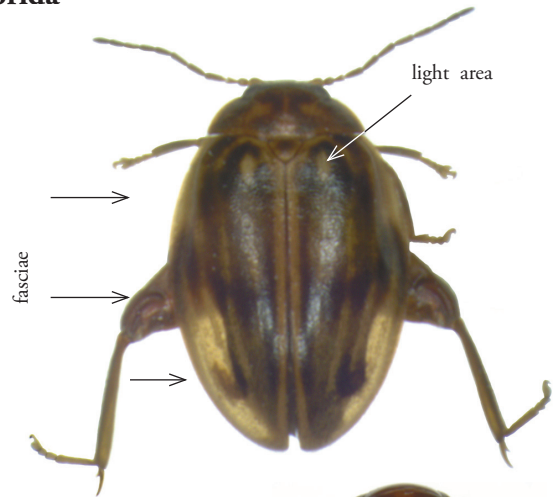
ADDITIONAL REFERENCES: Blatchley 1914; Champion 1897; Ciegler 2003; Horn 1880; Tetrault 1967.

Florida species

- O. hyacintha* Blatchley
- O. texana* Champion
- O. troberti* Guérin-Méneville

Key to adult *Ora* of Florida

- 1 Head, pronotum and elytra pubescent; elytra with brownish longitudinal vittae, with 3 faint irregular transverse fasciae, and a light area on each elytron just laterad of the scutellum; body convex *O. texana*



- 1' Head, pronotum and elytra mostly glabrous dorsally; elytra without vittate pattern as above; body convex or depressed 2

- 2(1') Elytra moderately to weakly costate, without definite pattern of stripes, but may be irregularly infuscated between costae; body moderately convex *O. hyacintha*



- 2' Elytra not costate, patterned with partial or complete longitudinal stripes, with a light transverse bar adjacent to scutellum; body flatter *O. troberti*

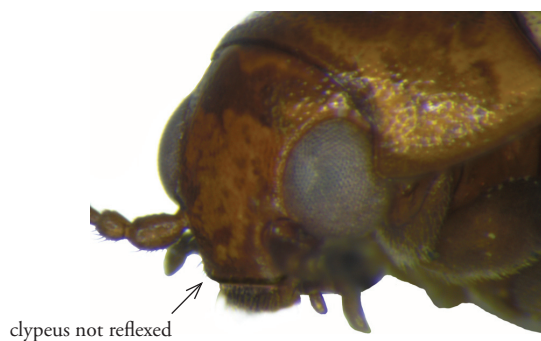
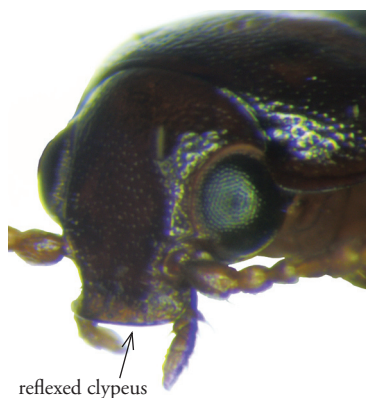


from S Texas

darker Florida forms

Notes on species

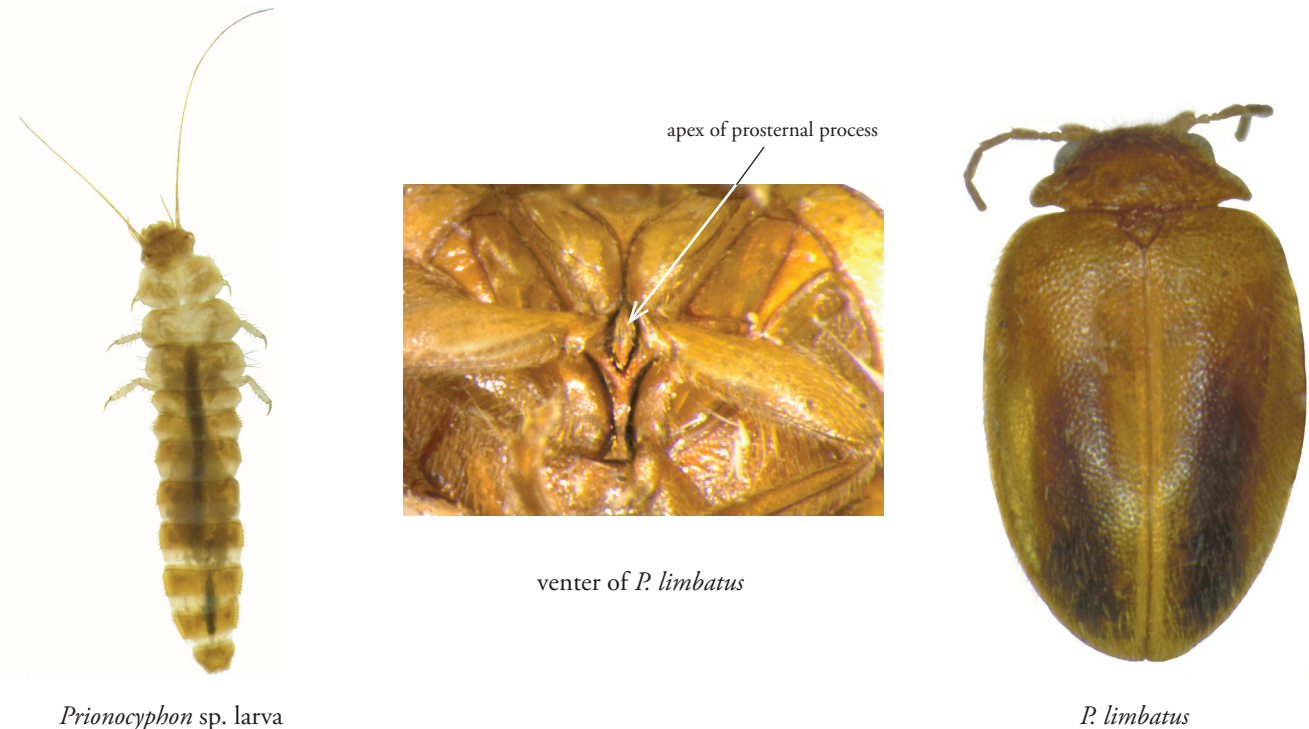
- O. hyacintha* - Length 4.1-5.6, mean 5.0 mm (measured Florida pinned material, n=11); Blatchley gave 5.5-6.5 mm. A rather distinctive species, glabrous dorsally, with costate elytra. The elytra may be marked with diffuse darker areas between the costae and can resemble *O. troberti*, but that species is generally flatter and lacks costae. The anterior margin of the clypeus is reflexed (may be reflexed in *O. troberti*; see below). Blatchley (1914) described this species from adults he collected after breaking open stems of water hyacinth. Through the kindness of Jan Ciegler, I've examined the specimen keyed by Ciegler (2003: 145) as *O. hyacintha*; it is a teneral or very light *O. texana*.
- O. texana* - Length 4.3-5.6, mean 4.9 mm (measured Florida, Georgia and Texas pinned material, n=50). This is the most common of our three species of *Ora*; the pattern of stripes and especially the diffuse transverse fasciae may be weak, but the light area on each elytron just laterad of the scutellum is present on all material I've examined (not to be confused with the light transverse anterior bar present on *O. troberti*). Some specimens may be very dark and stripes/fasciae not easily discernible, but the light area is always present. In contrast to the other two species of *Ora* in Florida, *O. texana* is noticeably pubescent. The anterior margin of the clypeus is not reflexed. This species was first noted by Horn (1880: 102), but incorrectly assigned to the previously described *O. troberti*. Horn (1880) gave a description and a figure, but did not give any listing of specimens or specific localities, other than "occurs in Texas and Mexico". Champion (1897) noted the misidentification and in a footnote (p. 604) wrote "The name *texanus* is here proposed for the Texan insect"; no type specimen was designated. However, following Article 74.4 of the ICZN, Horn's illustration (Plate I, fig. 15) can be considered the lectotype.
- O. troberti* - Length 3.6-5.6, mean 4.2 mm (measured Florida, Texas and Alabama pinned material, n=12); Champion (1897) gave 6 mm; Ciegler (2003) gave 6.0-8.6 mm. I have not seen any *Ora* from the US that was over 5.6 mm in length. I've examined many specimens in museum collections misidentified as this species that were *O. texana* and vice versa. This species is quite variable in coloration, varying from very light individuals with thin stripes to others that are almost completely dark reddish-brown. Three specimens I examined had a reflexed clypeus, 18 did not, and two were intermediate. This is probably a variation, as nothing else about the specimens indicated they represented a different taxon.

*O. troberti*

GENUS *Prionocyphon*

DIAGNOSIS: Larvae are distinguished by the straight anterior margin of the labrum; 2 stemmata; hypopharynx bearing 4 leaf-like appendages; last maxillary palpomere longer, 1/2 or more length of penultimate segment; 1st antennal segment (scape) about 4/5 length of 2nd (pedicel); tibiotarsal organ a group of apically attenuate simple setae; and lateral margins of abdominal segments with a row of short, robust setae.

Adults are distinguished by the first antennomere about twice as broad as following antennomeres; 2nd antennomere arises from under outer angle of 1st; 3rd antennomere very small, 1/2 as large as 2nd; non-contiguous middle coxae; and hind femora similar to fore and mid femora.



Prionocyphon sp. larva

P. limbatus

NOTES: One species, *P. discoideus* (length 3.5-4.5 mm) is recorded for Florida, with a second species, *S. limbatus* LeConte (length 4-5 mm) also being a possibility. The two species can be separated by the prosternal process, which is an apically thin lamina in *P. discoideus* (apically spear-shaped in *P. limbatus*); the completely yellow antennae in *P. discoideus* (antennomeres 4-11 usually dark in *P. limbatus*); and the length of the fossa (pit) on the first antennomere into which the second is inserted - in *P. discoideus* the fossa is about 3/5 the length of the first antennomere, in *P. limbatus* it is only about 1/4. In addition, male *P. discoideus* have bipectinate antennae, while the females of this species and males and females of *P. limbatus* have simple antennae.

The larvae of *Scirtes* are often misidentified as “*Prionocyphon*”, most likely due the variability of the anterior margin of the clypeus in *Scirtes*, while ignoring the extremely short last maxillary palpomere of *Scirtes*. *Prionocyphon* larvae are most likely to be found in phytotelmata (tree holes); *Scirtes* larvae are found in marshes, swamps, ponds, ditches, the margins of streams/rivers - and phytotelmata.

Florida species

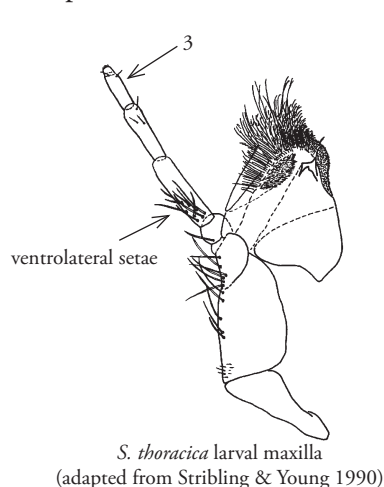
P. discoideus (Say)

ADDITIONAL REFERENCES: Ciegler 2003; Tetrault 1967.

GENUS *Sacodes*

DIAGNOSIS: Larvae are distinguished by the 3 stemmata; 3 segmented maxillary palp; and the hypopharynx bearing 2 leaf-like appendages.

Adults are distinguished by the labial palp with 3rd segment arising from side of 2nd; mesosternal process short, middle coxae touch only near apices; hind tarsi with 1st tarsomere flattened dorsally and 2nd produced to a point; and hind femora similar to fore and mid femora.



S. pulchella, showing color variation; middle and right specimens were collected at same place (Marion Co, FL) and date

NOTES: One species, *S. pulchella* (length 3.5-5.0 mm), is recorded from Florida; the elytra usually have one small spot anteriorly and a larger spot behind it, but the spots may be confluent (as above). This dark variant may be the same as *S. mexicanus* (Champion). A second species, *S. thoracica* (Guérin-Méneville) (length 2.5-3.8 mm) may also eventually be collected here; it differs from *S. pulchella* in being smaller, broader, lacking a well developed central spot on the pronotum and having the elytra entirely dark. These species, along with *S. fuscipennis* (Guérin-Méneville) (length 4.5-5.0 mm, with elytra dark but with two dark spots on pronotum), were formerly placed in *Elodes*, but that genus does not occur in Florida. Species were also formerly classified as *Flavohelodes* (see Stribling & Young 1990 and Klausnitzer 1987).

Following Yoshitomi (1997), the larvae of *Sacodes* may be distinguished from those of *Elodes* by the emarginate labrum (transverse, not deeply emarginate, in *Elodes*) and numerous long ventrolateral setae on the first maxillary palpomere (a few short setae on first maxillary palpomere of *Elodes*). Adult *Sacodes* are more ovate (width greater than half length) than the more elongate-oval *Elodes* (width less than half length).

Sacodes larvae are phytotelmatic, living in water in tree holes.

ADDITIONAL REFERENCES: Ciegler 2003; Klausnitzer 1987; Stribling & Young 1990; Tetrault 1967; Yoshitomi 1997.



S. thoracica

Florida species

S. pulchella (Guérin-Méneville)

GENUS *Sarabandus*

DIAGNOSIS: Larvae are undescribed.

Adults are distinguished by the labial palp with 3rd segment arising from apex of 2nd; mesosternal process short, middle coxae touch only near apices; hind tarsi with 1st tarsomere rounded dorsally and 2nd not produced to a point that hides basal portion of 3rd tarsomere; elytra with faint costae; and hind femora similar to fore and mid femora.



NOTES: A monotypic genus with the single species *S. robustus* (length 5.6 mm). I've examined one male specimen collected in a "malaise trap in swamp" at Paynes Prairie State Preserve, Alachua County. This is a new state record; the previous southernmost record was for South Carolina (Ciegler 2003).

The larva is undescribed but is probably similar to those of *Sacodes*.

ADDITIONAL REFERENCES: Ciegler 2003; Tetrault 1967.

Florida species

S. robustus (LeConte)

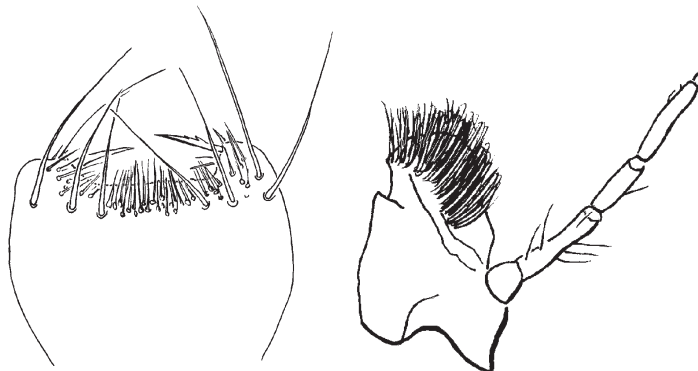
GENUS *Scirtes*

DIAGNOSIS: Larvae are distinguished by the emarginate anterior margin of the labrum; 2 stemmata; hypopharynx bearing 4 leaf-like appendages; last maxillary palpomere very short, less than 1/4 length of penultimate segment; mandible with apical tooth (last instar only); and lateral margins of abdominal segments with a row of short, robust setae.

Adults are distinguished by the smaller size (length 2.3-5.2 mm, usually < 4 mm); elytra usually not obviously laterally explanate; hind coxae contiguous medially or opposed along entire inner margin; base of hind trochanter partially hidden by posteroventral margin of hind coxa; greatly enlarged hind femora; and hind tibiae with an elongate spur.



S. orbiculatus adult female



labrum and maxilla of larval *S. orbiculatus*

NOTES: With the addition of the Neotropical *S. oblongus* to the Florida fauna, and the apparently undescribed *S. sp. 1*, four species of *Scirtes* are now recorded from the state; at least two additional species of *Scirtes* are found in the western US. Note that taxonomic uncertainty clouds the picture of just how many species are valid; I am considering *S. piceolus* and *S. ovalis* to be junior synonyms of *S. tibialis*; see below. *Scirtes oblongus* is unusual in that it appears intermediate between *Scirtes* and *Ora*.

Note that the larva does not develop a mandible with an apical tooth until the last instar; the mandible in earlier instar larvae is apically rounded. Zwick & Zwick (2008b) observed 11 larval instars in the Palearctic *S. hemisphaericus* (L.); Kraatz (1918) observed at least seven instars in *S. tibialis*.



S. orbiculatus larval mandible

ADDITIONAL REFERENCES: Beerbower 1943; Champion 1897; Ciegler 2003; Epler 2009; Kraatz 1918; Zwick & Zwick 2008a, 2008b.

Florida species

S. oblongus Guérin-Ménéville
S. orbiculatus (Fabricius)
S. tibialis Guérin-Ménéville
S. sp. 1 Epler

Key to adult *Scirtes* of Florida

- 1 Larger, length 4-5+ mm; elongate *S. oblongus*



vittate form



immaculate form

S. oblongus

- 1' Smaller, 2.4-3.7 mm; oval or slightly elongate 2

- 2(1') Color variable, usually bicolored with central spot on discal portion of elytra, but with at least outer margin of pronotum always white or yellowish (indicated below by arrows) *S. orbiculatus*

typical *S. orbiculatus**S. orbiculatus* with large discal spot*S. orbiculatus* with no discal spot

- 2' Dorsally unicolorous; pronotum without white/yellow lateral areas 3

- 3(2') Body elongate; large laminate prosternal process present between fore coxae that reaches apices of coxae; very small, length 2.4 mm ***S. sp. 1***



- 3' Body oval; laminate prosternal process does not reach apices of coxae; larger, length ≥ 2.5 mm ***S. tibialis***



typical dark *S. tibialis*



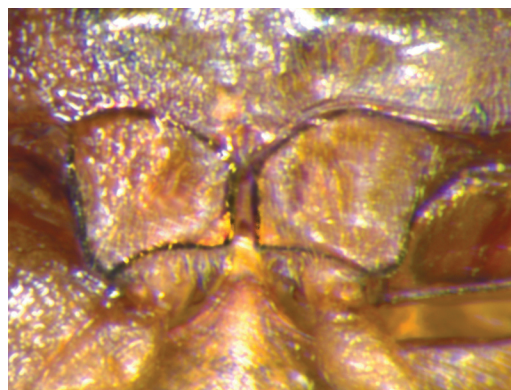
typical light *S. "ovalis"*



S. piceolus holotype

Notes on species

S. oblongus - Length 4.4–5.2 mm. Champion (1897) considered there to be two forms of this species: the immaculate "pallid form" originally described by Guérin-Méneville (1861: 546) and a vittate form described and illustrated by Champion (1897: 609 and Plate 26, figs. 28, 28a). I follow Champion (1897) in considering these two forms of a single species. I've also examined specimens from Cuba, Mexico and Costa Rica of a third form in which the vittae are coalesced into a single broad dark stripe on each elytron, with a thin light sutural stripe and outer margin; there are also intermediates between the vittate and this broadly striped form. I've seen two Florida specimens of the immaculate form: a female, from Lake Gentry in Osceola Co., collected by Dana Denson; the other, also a female, from Delray Beach in Palm Beach County, collected by Vince Golia. I've examined vittate forms from Highlands Co. (Archbold Biological Station) and Palm Beach Co. (Delray Beach and a male from Lake Worth), all collected by Vince Golia. This is a new record for the US; previously



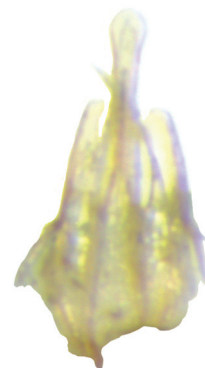
hind coxae of *S. oblongus*

known from Mexico and Guatemala (Champion 1897); see Epler (2009). There is also material from the Cayman Islands in the FSCA, and I have examined numerous specimens from Cuba, as well as material from Mexico, Guatemala, Costa Rica and Brazil ((USNM). Its elongate shape is unusual for a *Scirtes*, which are usually more broadly oval (there are other *Scirtes* species that are elongate, see Yoshitomi 2005). As in species of *Ora*, it also has a large laminate prosternal process that reaches the apices of the fore coxae, and the pronotum and elytra are moderately explanate laterally. The hind coxae are more typical for a *Scirtes*; they are not contiguous but are narrowly separated and opposed along their entire inner margin, with the base of the trochanter partially hidden by posteroventral margin of coxae (the trochanter base is fully exposed in *Ora* species). This taxon was mistakenly placed in *Ora* by Pic (1914) (as *O. sexlineata* (Chevrolat) and *O. interrupta* (Chevrolat)).

S. orbiculatus - Length 2.3-3.2 mm. The elytra are usually dark, and share a central light spot, but I've examined many specimens in which the elytra are completely dark. The pronotum is always yellow/ivory laterally at least; Ciegler (2003) noted that it may be entirely yellow. A laminate prosternal process is present, but it is smaller and does not reach the apex of the coxae.

S. tibialis - Length 2.5-3.7 mm. I am considering *S. ovalis* Blatchley and *S. piceolus* Blatchley to be synonyms of this species. *Scirtes piceolus* (length 2.7 mm) is known only from the type specimen, which according to Blatchley (1924) has elytra that are not pubescent. Tetrault (1967: 117) noted that it appeared that "the hairs have been rubbed off." I have examined the type specimen, a male, housed at Purdue University. It appears to me to be an "*S. ovalis*" with most of its setae rubbed off, as it did to Tetrault. Separation of *S. ovalis* and *S. tibialis* is an exercise in frustration. Following keys in Tetrault (1967), Brigham (1982) and Ciegler (2003) – the latter two based on Tetrault's key - *S. tibialis* is basically piceous (glossy black) with lighter tibiae and tarsi, while *S. ovalis* is dull reddish-brown to yellowish brown. Ciegler (2003) also added relative length of setae; those of *S. tibialis* about as long as the width of the tarsus, those of *S. ovalis* about twice as long as the width of the tarsus. I can see no consistent differences between these two taxa. Dark Florida specimens that would key to *S. tibialis* based on color have genitalia indistinguishable from those of typical light colored *S. ovalis*. Blatchley (1924: 166) described *S. ovalis* as "relatively broader, more depressed and much paler than our northern *tibialis*, the pubescence of upper surface more dense." I could discern no consistent differences in setal length (I found no differences such as those used by Ciegler 2003: 146) or color, decumbency, or density of pubescence, based on specimens from Indiana, New York, Oklahoma, Maryland, South Carolina and many sites in Florida. I could also discern no difference in general habitus. These two taxa appear to represent the extremes of color variation of one species; *S. tibialis* is the older name and has precedence. Examination of more material, with biomolecular data and genitalia from the entire range of the two "species", may show them to be separate, but the existence of so many intermediate specimens makes this seem unlikely to me. It certainly would do no harm to at least keep specimens and notes on light colored "*S. ovalis*", just in case the two do prove to be separate species.

S. sp. 1 - Length 2.4 mm. A very small, somewhat elongate, undescribed species. It also has a large laminate prosternal process, as in *S. oblongus*, and distinctive male genitalia. Known from five specimens from extreme southern Florida (Matheson Hammock, Plantation Key, Key West) and several specimens from several locations on Grand Cayman Island and the Bahamas; it may be associated with mangroves. This species will be described in a future publication.



S. sp. 1 genitalia

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CHECKLIST OF THE WATER BEETLES OF FLORIDA

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This checklist registers species known to occur in Florida, based on literature citations and material examined by the author. It also includes taxa that may occur in Florida; many of these taxa occur on the U.S. Southeastern Coastal Plain but have not been positively identified from Florida. Note also that some literature records may be considered doubtful; some species recorded in earlier literature but misidentified are not listed. Only important synonyms pertaining to Florida water beetles are listed. Only aquatic or semi-aquatic species are listed. The families, genera and species are listed in alphabetic order. Undescribed taxa are assigned letter or number designators.

KEY: [] = synonym; * = may occur in Florida; § = recorded from Florida, but identification doubtful, not confirmed or incorrect; {I} = introduced.

CHRYSOMELIDAE

Agasicles Jacoby, 1904

hygrophila Selman & Vogt, 1971 {I}

Disonychia Chevrolat in Dejean 1836

collata (Fabricius, 1801)

conjugata (Fabricius, 1801)

fumata (LeConte, 1858)

glabrata (Fabricius, 1781)

pennsylvanica (Illiger, 1807)

xanthomelas (Dalman, 1823)

Donacia Fabricius, 1775

assimilis Lacordaire, 1845

biimprensa Melsheimer, 1847

caerulea Olivier, 1795

cincticornis Newman, 1838

dissimilis Schaeffer, 1925

edentata Schaeffer, 1919

hypoleuca Lacordaire, 1845

militaris Lacordaire, 1845

palmata Olivier, 1795

parvidens Schaeffer, 1919

piscatrix Lacordaire, 1845

proxima Kirby, 1837

rufescens Lacordaire, 1845

rugosa LeConte, 1878

subtilis Kunze, 1818

texana Crotch, 1873

* *vicina* Lacordaire, 1845

Galerucella Crotch, 1873

nymphaeae (Linnaeus, 1758)

Lysathia J. Bechyné, 1959

ludoviciana (Fall, 1910)

* *Neohaemonia* Székessy, 1941

* *nigricornis* (Kirby, 1837)

Plateumaris Thomson, 1859

metallica (Ahrens, 1810)

shoemakeri (Schaeffer, 1925)

Prasocuris Latreille, 1802 [= *Hydrothassa* Thomson, 1859]

vittata (Olivier, 1807)

Pseudolampsis Horn, 1889

guttata (LeConte, 1884)

CURCULIONIDAE

Auleutes Dietz, 1896

nebulosus (LeConte, 1876)

Bagous Germar, 1817

affinis Hustache, 1926 {I}

americanus LeConte, 1876

bituberosus LeConte, 1876

blatchleyi Tanner, 1943

cavifrons LeConte, 1876

floridanus Tanner, 1943

hydrillae O'Brien, 1992 {I, not established}

lunatoides O'Brien, 1979

lunatus Blatchley, 1916

maculatus Blatchley, 1916

magister LeConte, 1876

mamillatus Say, 1876

obliquus LeConte, 1876

pictus Blatchley, 1920

pusillus LeConte, 1876

restrictus LeConte, 1876

stellatus LeConte, 1876

tanneri O'Brien, 1979

texanus Tanner, 1943

transversus LeConte, 1876 [= *carinatus* Blatchley, 1925]

Brachybamus Germar, 1836

electus Germar, 1836

Cyrtobagous Hustache, 1929

salviniae Calder & Sands, 1985 {I}

Lissorhoptrus LeConte, 1876

lacustris Kuschel, 1952

longipennis Kuschel, 1952

oryzophilus Kuschel, 1952

simplex (Say, 1831)

Listronotus Jekel, 1864

crypticus O'Brien, 1981

cryptops (Dietz, 1889)

elegantulus O'Brien, 1981

fasciatus O'Brien, 1981

marshalli O'Brien, 1981

neocallosus O'Brien, 1981

turbatus O'Brien, 1981

Lixus Fabricius, 1801

merula Suffrian, 1871

punctinatus LeConte, 1876

Neobagoidus O'Brien, 1990

carlsoni O'Brien, 1990 {I}

Neochetina Hustache, 1926

bruchii Hustache, 1926 {I}

eichhorniae Warner, 1970 {I}

Neohydronomus Hustache, 1926

affinis Hustache, 1926 {I}

Notiodes Schoenherr, 1838

cribricollis (LeConte, 1876)

laticollis (Blatchley, 1916)

ovalis (LeConte, 1876)

punctatus (LeConte, 1876)

Onychylis LeConte, 1876

longulus LeConte, 1876

nigrirostris (Boheman, 1843)

Parenthis Dietz, 1896

vestitus (Dietz, 1896)

Perigaster Dietz, 1896

alternans Blatchley, 1928

cretura (Herbst, 1797)

obscura (LeConte, 1876)

Perigasteromimus Colonnelli, 1999,

tetracanthus (Champion, 1907)

* *Phytobius* Schoenherr, 1833

* *leucogaster* (Marsham, 1802) {I}

Rhinoncus Schoenherr, 1825

longulus LeConte, 1876

Sibariops Casey, 1920

about 10 species

Sphenophorus Schoenherr, 1838

pontederiae Chittenden, 1905

Stenopelmus Schoenherr, 1836

rufinus Gyllenhal, 1836

Tanysphyrus Germar, 1817

ater Blatchley, 1928

lemnæ (Fabricius, 1792)

Tyloderma Say, 1831

aereoides Wibmer, 1981

aquaticum Wibmer, 1981

capitale Wibmer, 1981

circumcaribbeum Wibmer, 1981

lecontei Wibmer, 1981

minimum Blatchley, 1920

myriophylli Wibmer, 1981

punctatum Casey, 1884

rufescens Casey, 1892

sphaerocarpeae Wibmer, 1981

* *subpubescens* Casey, 1892

variegatum (Horn, 1873)

DRYOPIDAE

Helichus Erichson, 1847

* *basalis* LeConte, 1852

fastigiatus (Say, 1824)

lithophilus (Germar, 1824)

Pelonomus Erichson, 1847

obscurus LeConte, 1852

DYTISCIDAE

Acilius Leach, 1817

confusus Bergsten, 2006

fraternus (Harris, 1828)

mediatus (Say, 1823)

Agabetes Crotch, 1873

acuductus (Harris, 1828)

Agabus Leach, 1817

punctatus Melsheimer, 1844

xyztrus Larson, 2000 [split from *aeruginosus* Aubé, 1838]

Anodocheilus Babington, 1841

exiguus (Aubé, 1838)

Bidessonotus Régimbart, 1895

inconspicuus (LeConte, 1855)

longovalis (Blatchley, 1919)

pulicarius (Aubé, 1838)

Brachyvatus Zimmermann, 1919

apicatus (Clark, 1862) [= *seminulum* LeConte, 1878]

Celina Aubé, 1837

angustata Aubé, 1838

contiger Guignot, 1947

grossula (LeConte, 1863)

hubbelli Young, 1979

imitatrix Young, 1979

palustris Young, 1979

slossonae Mutchler, 1918

Copelatus Erichson, 1832

blatchleyi Young, 1953

caelatipennis princeps Young, 1963

chevrolati chevrolati Aubé, 1838

chevrolati renovatus Guignot, 1952

cubaensis Schaeffer, 1908

glyphicus (Say, 1823)

punctulatus Aubé, 1838

Coptotomus Say, 1830

interrogatus (Fabricius, 1801)

longulus lenticus Hilsenhoff, 1980

loticus Hilsenhoff, 1980

venustus (Say, 1823)

Cybister Curtis, 1827

fimbriolatus fimbriolatus (Say, 1823)

fimbriolatus crotchii Wilke, 1920

occidentalis Aubé, 1838

Derovatellus Sharp, 1882

floridanus Fall, 1932

Desmopachria Babington, 1841

aspera Young, 1981

cenchramis Young, 1981

granum (LeConte, 1855)

leechi Young, 1981

mutchleri Blatchley, 1919

seminola Young, 1951

striola Sharp, 1887

Dytiscus Linnaeus, 1758

carolinus Aubé, 1838

Eretes Laporte, 1833

explicitus Miller, 2002

Graphoderus Dejean, 1833

liberus (Say, 1825)

* *Hoperius* Fall, 1927

* *planatus* Fall, 1927

Hydaticus Leach, 1817

cinctipennis Aubé, 1838

Hydrocolus Roughley & Larson, 2000
deflatus (Fall, 1923) [= *ruficeps* Aubé, 1838 in Young 1954]
filiolus (Fall, 1923)
oblitus (Aubé, 1838)
 sp. A Epler
Hydrodytes Miller, 2001
dodgei (Young, 1989)
Hydroporus Clairville, 1806
brevicornis Fall, 1917
 § *dichrous* Melsheimer, 1844
falli Blatchley, 1925
floridanus Young, 1940
 § *niger* Say, 1823
pseudoniger Nilsson & Fery, 2006 [nom. nov. for *ruficeps* Aubé, 1838]
rufilabris Sharp, 1882
signatus youngi Gordon, 1981
Hydrovatus Motschulsky, 1853
inexpectatus Young, 1963
peninsularis Young, 1953
platycornis Young, 1963
pustulatus (Melsheimer, 1844)
Hygrotus Stephens, 1828
berneri Young & Wolfe, 1984
marginipennis (Blatchley, 1912)
nubilis (LeConte, 1815)
Ilybius Erichson, 1832
incarinatus Zimmermann, 1928
oblitus Sharp, 1882
Laccodytes Régimbart, 1895 [see Notes under *Laccodytes*]
pumilio (LeConte, 1878)
Laccophilus Leach, 1815
fasciatus rufus Melsheimer, 1844
gentilis gentilis LeConte, 1863
proximus Say, 1823
vacaensis Young, 1953
Laccornis Gozis, 1914
 probably *difformis* (LeConte, 1855)
 * *nemorosus* Wolfe & Roughley, 1990
 * *schusteri* Wolfe & Spangler, 1985
Liodessus Guignot, 1939
crotchii Nilsson, 2001 [nom. nov. for *fuscatus* Crotch, 1873]
flavicollis (LeConte, 1855)
hobbsi Young, 1950
noviaffinis Miller, 1998
Lioporeus Guignot, 1950
pilatei (Fall, 1917)
triangularis (Fall, 1917)
Matus Aubé, 1836
bicarinatus (Say, 1823)
leechi Young, 1953
ovatus blatchleyi Leech, 1941
Megadytes Sharp, 1882
fraternus Sharp, 1882
Neobidessus Young, 1967
pullus floridanus (Fall, 1917)
pullus pullus (LeConte, 1855)

Neoporus Guignot, 1931
asidytes (Young, 1984)
aulicus (Aubé, 1838)
baelus (Young, 1984)
blanchardi (Sherman, 1913)
carolinus (Fall, 1917)
cimicoides (Sharp, 1882)
chypealis (Sharp, 1882)
dilatatus (Fall, 1917)
dixianus (Fall, 1917)
effeminatus (Fall, 1923)
gaudens (Fall, 1923)
hebes (Fall, 1923)
helocrinus (Young, 1967)
hybridus (Aubé, 1838)
 * *latocavus* (Wolfe, 1984)
lobatus (Sharp, 1882)
lynceus (Sharp, 1882)
mellitus (LeConte, 1855)
 * *lecontei* Nilsson, 2001 [= *mixtus* (LeConte, 1855)]
 * *psammodytes* (Young, 1978)
rheocrinus (Young, 1967)
shermani (Fall, 1917)
striatopunctatus (Melsheimer, 1844)
uniformis (Blatchley, 1925)
venustus (LeConte, 1855)
vittatipennis (Gemminger & von Harold, 1868)
Pachydrus Sharp, 1882
princeps (Blatchley, 1914)
Platambus Thompson, 1859
astrictovittatus (Larson & Wolfe, 1998) [= *Agabus* sp. A Epler]
johannis (Fall, 1922)
stagninus (Say, 1823)
Prodaticus Sharp, 1882
bimarginatus (Say, 1830)
 * *rimosus* (Aubé, 1838)
Rhantus Dejean, 1833
calidus (Fabricius, 1792)
Thermonectus Dejean, 1833
basillaris (Harris, 1829)
nigrofasciatus ornaticollis (Aubé, 1838)
Uvarus Guignot, 1939
falli (Young, 1940)
cf. granarius (Aubé, 1838)
inflatus (Young, 1950)
lacustris (Say, 1823)
rogersi (Young, 1941)
 * *suburbanus* (Fall, 1917)

ELMIDAE

Ancyronyx Erichson, 1847
variegatus (Germar, 1824)
Dubiraphia Sanderson, 1954
vittata (Melsheimer, 1844)
Gonielmis Sanderson, 1954
dietrichi (Musgrave, 1933)
Macronychus Müller, 1806
glabratus Say, 1825

Microcylloepus Hinton, 1935
pusillus (LeConte, 1852)
Optioservus Sanderson, 1954
ovalis (LeConte, 1863)
 * *trivittatus* (Brown, 1930)
Oulimnius des Gozis, 1886
latiusculus (LeConte, 1866)
nitidulus (LeConte, 1866)
Promoresia Sanderson, 1954
 * *elegans* (LeConte, 1852)
tardella (Fall, 1925)
Stenelmis Dufour, 1835
antennalis Sanderson, 1938
convexula Sanderson, 1938
crenata (Say, 1824)
decorata Sanderson, 1938
fuscata Blatchley, 1925
grossa Sanderson, 1938
hungerfordi Sanderson, 1938
lignicola Schmude & Brown, 1992
mera Sanderson, 1938
morsei White, 1982
musgravei Sanderson, 1938
sinuata LeConte, 1852
xylonastis Schmude & Barr, 1992
 sp. C Epler
 sp. D Epler

GYRINIDAE

Dineutus MacLeay, 1825
americanus (Linnaeus, 1788)
angustus LeConte, 1878
assimilis Kirby, 1937
carolinus LeConte, 1868
ciliatus (Forsberg, 1821)
discolor Aubé, 1838
emarginatus (Say, 1823)
nigrior Roberts, 1895
 § *productus* Roberts, 1895
serrulatus LeConte, 1868 [= *analys* Régimbart, 1882]
Gyretes Brullé, 1834
iricolor Young, 1947
 * *sinuatus* LeConte, 1851
Gyrinus Müller, 1764
analys Say, 1825
elevatus LeConte, 1868
gibber LeConte, 1868 [= *frosti* Fall, 1922; *floridensis* Ochs, 1929]
marginellus Fall, 1922
pachysomus Fall, 1922
 § *parcus* Say, 1834
rockinghamensis LeConte, 1868
woodruffi Fall, 1922
Spanglerogyrus Folkerts, 1979
albiventris Folkerts, 1979

HALIPLIDAE

Haliphus Latreille, 1802
annulatus Roberts, 1913
confluentus Roberts, 1913
fasciatus Aubé, 1838
havaniensis Wehncke, 1880
 * *leopardus* Roberts, 1913
mutchleri Wallis, 1933
 * *pantherinus* Aubé, 1838
pseudofasciatus Wallis, 1933
punctatus Aubé, 1838
triopsis Say, 1823
Peltodytes Régimbart, 1878
bradleyi Young, 1961
dietrichi Young, 1961
dunavani Young, 1961
floridensis Matheson, 1912
muticus (LeConte, 1863)
oppositus Roberts, 1913
sexmaculatus Roberts, 1913

HELOPHORIDAE

Helophorus Fabricius, 1775
 * *linearis* LeConte, 1855
lineatus Say, 1823
 * *marginicollis* Smetana, 1985

HYDRAENIDAE

Gymnochthebius d'Orchymont, 1943
fossatus (LeConte, 1855)
seminole Perkins, 1980
Hydraena Kugelann, 1794
marginicollis Kiesenwetter, 1849
spangleri Perkins, 1980
youngi Perkins, 1980
Ochthebius Leach, 1815
attritus LeConte, 1878

HYDROCHIDAE

Hydrochus Leach, 1817
callosus LeConte, 1855
excavatus LeConte, 1855
inaequalis LeConte, 1855
minimus Blatchley, 1919
rufipes Melsheimer, 1844
rugosus Mulsant, 1844 [= *hanoewanti* Makhan, 1994]
simplex LeConte, 1855 [= *equicarinatus* Blatchley, 1928]
 sp. 1 Epler
 sp. 2 Epler
 sp. 3 Epler
 sp. 4 Epler
 sp. 5 Epler
 sp. 6 Epler
 sp. 7 Epler
 sp. 8 Epler

HYDROPHILIDAE

Anacaena Thomson, 1859 [includes *Crenitulus* Winters, 1926]
 * *limbata* (Fabricius, 1792)
suturalis (LeConte, 1866)
Berosus Leach, 1817
aculeatus LeConte, 1815
arnetti Van Tassell, 1990
corrini Wooldridge, 1964
exiguus (Say, 1825)
infuscatus LeConte, 1855
ordinatus LeConte, 1855
pantherinus LeConte, 1855
peregrinus (Herbst, 1797)
pugnax LeConte, 1863
sayi Hansen, 1999 [nom. nov. for *striatus* (Say, 1825)]
youngi Wooldridge, 1964
Cercyon Leach, 1817
crocatus Smetana, 1978
floridanus Horn, 1890
herceus Smetana, 1978
mendax Smetana, 1978
nigriceps (Marsham, 1802) [= *atricapillus* Marsham, 1802]
praetextatus (Say, 1825)
quisquilius (Linnaeus, 1761)
variegatus Sharp, 1882
versicolor Smetana, 1978
Chaetarthria Stephens, 1835
pallida (LeConte, 1861)
Cymbiodyta Bedel, 1881
chamberlaini Smetana, 1974
 * *minima* Notman, 1919
vindicata Fall, 1924
Derallus Sharp, 1882
altus (LeConte, 1855)
Enochrus Thomson, 1859
blatchleyi (Fall, 1924)
cinctus (Say, 1824)
consors (LeConte, 1863)
consortus Green, 1946
fimbriatus (Melsheimer, 1844) [= *perplexus* LeConte, 1855]
grossi Short, 2003
hamiltoni (Horn, 1890)
interruptus Gundersen, 1977
ochraceus (Melsheimer, 1844)
 * *pseudochraceus* Gundersen, 1977
pygmaeus nebulosus (Say, 1824)
pygmaeus pygmaeus (Fabricius, 1792)
reflexipennis (Zimmermann, 1869)
sayi Gundersen, 1977
sublongus (Fall, 1926)
Helobata Bergroth, 1888
larvalis (Horn, 1873) [= *striata* Brullé, 1841]
Helochares Mulsant, 1844
maculicollis Mulsant, 1844
sallaei Sharp, 1882
Helocombus Horn, 1890
bifidus (LeConte, 1855)

Hydrobiomorpha Blackburn, 1888
casta (Say, 1835)
Hydrobius Leach, 1815
tumidus LeConte, 1855
Hydrochara Berthold, 1827
brevipalpis Smetana, 1980
occulta (d'Orchymont, 1933)
soror Smetana, 1980
spangleri Smetana, 1980
Hydrophilus Geoffroy, 1762
 * *ensifer duvali* Hansen, 1999 [= *ater* Olivier, 1792]
insularis Castelnau, 1840
ovatus (Gemminger & Harold, 1868)
 § *smaragdinus* Brullé, 1837
triangularis Say, 1823
Laccobius Erichson, 1837
reflexipennis Cheary, 1971
Paracymus Thomson, 1867
confusus Wooldridge, 1966
degener (Horn, 1890)
dispersus Wooldridge, 1966
lodingi (Fall, 1910)
nanus (Fall, 1910)
reductus (Fall, 1910)
 * *seclusus* Wooldridge, 1978
subcupreus (Say, 1825)
Phaenonotum Sharp, 1882
exstriatum (Say, 1835)
minus Smetana, 1978
Sperchopsis LeConte, 1861
tessellata (Ziegler, 1844)
Tropisternus Solier, 1834
blatchleyi blatchleyi d'Orchymont, 1922
collaris (Fabricius, 1775)
lateralis nimbatus (Say, 1823)
natator d'Orchymont, 1938
quadristriatus Horn, 1871

NOTERIDAE

Hydrocanthus Say, 1823
atripennis Say, 1830
oblongus Sharp, 1882
regius Young, 1953
Mesonoterus Sharp, 1882
addendus (Blatchley, 1920)
Notomicrus Sharp, 1882
nanulus (LeConte, 1863)
sharpi J. Balfour-Browne, 1939
Pronoterus Sharp, 1882
semipunctatus (LeConte, 1882)
Suphis Aubé, 1836
inflatus (LeConte, 1863)
Suphisellus Crotch, 1873
bicolor (Say, 1830)
gibbulus (Aubé, 1838)
insularis (Sharp, 1882) [= *floridanus* Blatchley, 1914]
parsonsi Young, 1952
puncticollis Crotch, 1873

PSEPHENIDAE

Ectopria LeConte, 1853
thoracica (Ziegler, 1845)

PTILODACTYLIDAE

Anchytarsus Guérin-Méneville, 1843
bicolor (Melsheimer, 1846)

SCIRTIDAE

Cyphon Paykull, 1799
americanus Pic, 1913
cooperi Shaeffer, 1931
nebulosus (LeConte, 1853)
 * *neopadi* Klausnitzer, 1976
perplexus Blatchley, 1914
punctatus (LeConte, 1853)
 sp. 1 Epler ["*alvahi* Tetrault"]
 sp. 2 Epler ["*diffusus* Tetrault"]
 sp. 3 Epler

Ora Clark, 1865

hyacintha Blatchley, 1914
texana Champion, 1897
troberti Guérin-Méneville, 1861
Prionocyphon Redtenbacher, 1858
discoideus (Say, 1825)
 * *limbatus* (LeConte, 1866)

Sacodes LeConte, 1853

pulchella (Guérin-Méneville, 1843)
 * *thoracica* (Guérin-Méneville, 1843)

Sarabandus Leech, 1955

robustus (LeConte, 1875)

Scirtes Illiger, 1807

oblongus Guérin-Méneville, 1861
orbiculatus (Fabricius, 1801)
tibialis Guérin-Méneville, 1843 [= *ovalis* Blatchley, 1924 &
piceolus Blatchley, 1924]
 sp. 1 Epler

Florida County Distribution List

The following pages provide a county by county distribution list of Florida's water beetles, excluding the Curculionidae. This list includes records of specimens I have examined and trustworthy records from the literature.

[illegible]

[illegible]

18.11

[illegible]

[illegible]