
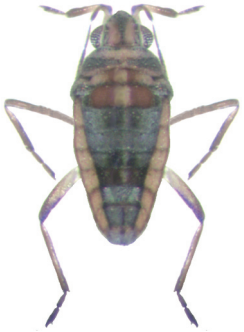


IDENTIFICATION MANUAL

FOR THE

AQUATIC AND SEMI-AQUATIC HETEROPTERA OF FLORIDA

(BELOSTOMATIDAE, CORIXIDAE, GELASTOCORIDAE, GERRIDAE, HEBRIDAE, HYDROMETRIDAE, MESOVELIIDAE, NAUCORIDAE, NEPIDAE, NOTONECTIDAE, OCHTERIDAE, PLEIDAE, SALDIDAE, VELIIDAE)

J.H. EPLER





On the cover:

Neoplea notana *Microvelia hinei* *Neoplea notana*

Notonecta uhleri *Gelastocoris oculatus* *Lethocerus uhleri*

Platyvelia brachialis *Rhagovelia torreyana*

State of Florida
Department of Environmental Protection
Division of Water Resource Management
Tallahassee

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10 January 2006

IDENTIFICATION MANUAL FOR THE AQUATIC AND SEMI-AQUATIC HETEROPTERA OF FLORIDA

(BELOSTOMATIDAE, CORIXIDAE, GELASTOCORIDAE, GERRIDAE, HEBRIDAE, HYDROMETRIDAE, MESOVELIIDAE, NAUCORIDAE, NEPIDAE, NOTONECTIDAE, OCHTERIDAE, PLEIDAE, SALDIDAE, VELIIDAE)

by

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Table of Contents

INTRODUCTION
materials, methods, glossary, key to families

1

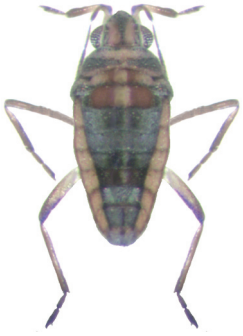
The aquatic and semi-aquatic Heteroptera (water bugs) are a common component of the insect/macroinvertebrate fauna of any aquatic ecosystem. In Florida, fourteen families of water bugs are found. The majority are predators (some may be important predators on mosquito larvae) or scavengers; one exception is the family Corixidae (water boatmen), most of which are collectors that feed on plant material and detritus (although they may be feeding on organisms in the ooze). Although none are known to be serious pests (to man), some species are capable of delivering nasty bites if mishandled. Giant water bugs (Belostomatidae) will often take up temporary residence in swimming pools and frighten swimmers. The role of water bugs as predators and scavengers makes them an important part of the fauna of any aquatic ecosystem and many, such as Corixidae, are important food items in the diet of many aquatic invertebrates and vertebrates.

One could ask "why bother with the aquatic and semi-aquatic bugs?" Few are known to be "indicator species", although some bugs, limited to rheocrenes and similar restricted habitats, are certainly indicative of such limited ecotypes. However, de Ruiter et al. (2005a) discuss how the complexity of a community buffers against perturbations – the more complex (or diverse) a community, the better its chances of withstanding perturbations, an idea initially put forth by MacArthur (1955a). Thus, it behooves ecologists to examine the diversity of any habitat in as much detail as possible. Water bugs are part of most aquatic and semi-aquatic habitats, and it appears that aquatic habitats in Florida will continue to be perturbed by the activities of man (not to mention hurricanes and similar events).

Although the taxonomy of most water bug families is relatively well known, there has been no comprehensive, up-to-date treatment of the water bug fauna of Florida. This manual should fulfill that role.

Heteroptera vs. Hemiptera

In an effort to make a long story short, consider that two names have been used for the order of bugs referred to as "Hemiptera", "Heteroptera" or even "Hemiptera-Heteroptera". We will not consider, with good reason, the name Homoptera here; this refers to a different group of bugs and will probably fall out of use as more studies demonstrate that it represents a polyphyletic grouping that will not stand up under the rigor of cladistic scrutiny. Although Hemiptera is the older of the two names, the Code of Zoological Nomenclature (the latest version of which is the Fourth Edition published in 1999; it took effect on 1 January 2000) does not deal with names above the family group level; thus the "Law of Priority", in which the oldest name published is the one which should be used, does not apply to orders. The general consensus among modern workers is to use Heteroptera, a convention we will follow here. For more details on this, see Henry & Froeschner (1988a: xii).



Microvelia hinei (Veliidae), probably the most common of Florida's small water striders (length about 1.5 mm).

A Brief History of Florida Water Bug Study

Although other entomologists had previously collected in Florida, it was the polymath entomologist (and geologist/malacologist/botanist!) Willis S. Blatchley (1926a) who first provided a broad basis for the study of the state's aquatic and semi-aquatic bugs. Beginning at the end of the nineteenth century and well into the twentieth, Blatchley, State Geologist for Indiana, made trips to Florida and eventually wintered most years at Dunedin (he purchased property there in 1913, when the population of Dunedin was 400 people). He also penned a number of popular books describing his journeys and collecting in Florida (Blatchley 1902a, 1931a, 1932a). These books offer a view of a Florida lost forever – how about a three week trip rowing a home-made boat down the unchannelized Kissimmee River from Kissimmee to Lake Okeechobee? Water hyacinth (*Eichhornia crassipes*) had previously been introduced and was already a problem. In his books Blatchley constantly decried the wanton rape and pillage of Florida by ignorant, greedy developers – it seems some things never change.

In the 1940's two more resident entomologists made their appearance on the Florida water bug stage. Jon Herring and Roland F. Hussey, professors at the University of Florida, contributed numerous papers dealing specifically with Florida aquatic Heteroptera. H.C Chapman (1958a) published an important paper covering many of the semi-aquatic families not covered by the earlier papers of Herring and Hussey.

One can not ignore the advances of our knowledge of water bugs made by H.B. Hungerford and his students at the University of Kansas. Although not "stationed" in Florida, Hungerford and his students produced monographs on many families and genera of aquatic and semi-aquatic Heteroptera based on material collected by a plethora of entomologists who visited the state (it's always been a bug collectors' dream here!).

Today there are no resident aquatic heteropterists in Florida, but the collecting efforts and vast additions to the literature made by John T. Polhemus and his son Dan Polhemus, as well as recent papers co-authored by Robert W. Sites, have made taxonomic life easier for those who wish to put names on water bugs. It is anticipated that the present manual will be a significant aid to those who wish to do so.

Throughout this manual, Sanderson (1982a) should be considered an additional reference for most taxa. Although somewhat out of date taxonomically, it is a treasure trove of biological information and additional references not presented in this present identification manual. Several other publications are extremely useful: Andersen 1982a; Bobb 1974a; Brooks & Kelton 1967a; Henry & Froeschner 1988a (although a catalogue, it also contains numerous illustrations of bugs); and Wilson 1958a. For help identifying terrestrial bugs that may fall into or on to the water, see Slater & Baranowski (1978a) or Borror, Triplehorn & Johnson (1989a).

Lethocerus uhleri, a Giant Water Bug (Belostomatidae); (length about 50 mm).

How to use this manual

Area covered: This manual was written for use in the state of Florida, and will identify all species known to me from the state, as well as many that will probably eventually be found here. The manual should identify all genera and many species of aquatic/semi-aquatic bugs encountered on what is commonly called the Southeastern Coastal Plain. Thus, many bugs collected in southern Alabama and Georgia, as well as the Coastal Plain of North and South Carolina, should be identifiable with this manual. Note that the further that one is from Florida, the less effective the manual will be.

Measurements. Ranges of total length measurements were taken from a number of sources, including measurements made by the author.

Taxonomy: In general, I have not used subgenera or subspecies throughout most of the text, or listed taxa in phylogenetic order. Persons interested in such taxonomy should consult the individual family chapters in Henry & Froeschner (1988a); these chapters are referenced on each beginning page of each family chapter in this manual.

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). A key to families for adult specimens of Florida's aquatic and semi-aquatic bugs starts on page 1.9 at the end of this chapter. In the keys, taxa that are probably erroneously reported from Florida or those not yet collected in Florida but which may eventually be found here are noted with an asterisk (*) before the name.

Morphological terms used are explained in the Glossary that begins on page 1.6., in addition to being illustrated in the keys.

The Layout: This manual is divided into seventeen chapters. This introduction is the first chapter, followed by fourteen family chapters, which are then followed by a **Bibliography** and a **Checklist** of the aquatic and semi-aquatic Heteroptera of Florida. All family chapters are arranged alphabetically; chapters are paginated separately. Each family chapter has a key to genera which is followed by "generic units" in alphabetical order. Each genus unit consists of several parts:

- A **Diagnosis**, or short descriptive summary, of the morphological characters of the genus 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. Illustrations of important body structures are included for each genus; a **Key to species** and a **Notes on species** section are included when possible.

A Word to the Wise

Insect identification, especially at the species level, is often not an easy task. The use of identification keys does not always insure that correct identifications will result.

Maintain a collection of voucher and/or reference specimens and be sure to have your identifications checked by a *bona fide* expert. For more information on this subject, see Epler (2001: 1.28-1.29).

Updates and corrections for this manual (and all my other manuals) will be available on my web site:

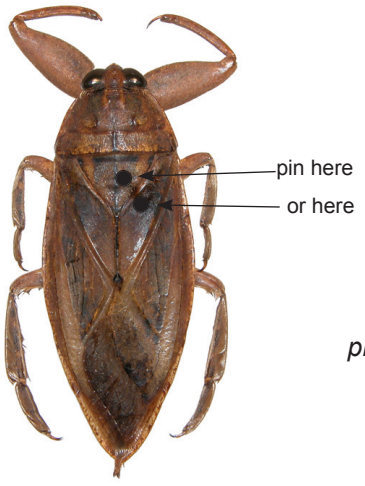
http://home.earthlink.net/~johnepler/index.html

Methods

Bugs may be preserved in 70-80% alcohol (ethanol is preferred) or pinned. Note that many colors will not show if the bug is in fluid. Note also that bugs kept in alcohol for an extended period will darken and it may be difficult to discern color patterns, even if the bug is removed from fluid and dried.

A bug may appear to be a tiny bit of gray dirt or a minuscule lump of charcoal while in your dish of alcohol, but allow it to dry and it becomes an almost entirely different creature. Bright shiny whites, silvers and blues appear, tiny golden setae may become visible on a dark velvet background, and the pits and sculpturing of the integument take on a different aspect.

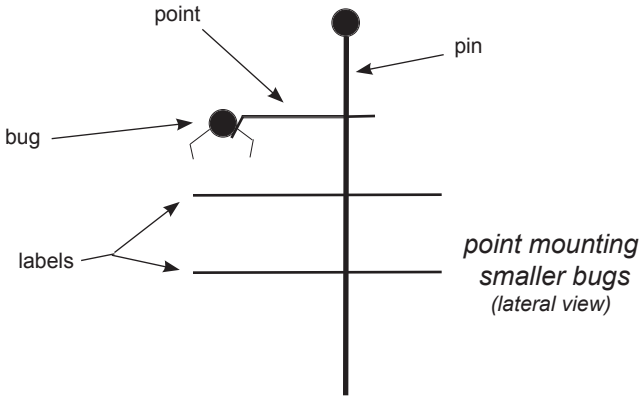
Pinning. When one has sufficient material, some specimens may be kept in alcohol and others may be pinned. If pinned, the pin should be placed through the scutellum or the clavus. Pinning through the scutellum may damage ventral structures such as the metaxyphus on corixids; such bugs should be pinned through the right clavus.



method for pinning larger bugs

Insect pins are numbered according to their diameter (or gauge); the higher the number, the thicker the pin. Most bugs should be pinned with # 1, 2 or 3 pins; the larger the bug, the larger the pin. I use # 2 pins most often. Note that only insect pins should be used to pin insects; other types of pins will rust or otherwise degrade due to the bug's body juices, etc.

Smaller bugs should not be pinned through the body; they should be mounted on points. Points are simply small triangular or elongate-elliptical pieces of heavy paper (index cards work well); special punches are available that will produce points. I punch out points from scrap ends of sheets of pin labels.



point mounting smaller bugs
(lateral view)

Bugs may be glued, on their right side, to points using regular white glue (such as Elmer's), clear nail polish, Canada balsam or shellac. Bend the very tip of the point before gluing.

Use a pinning block (a block of wood or plastic with three holes drilled in it to three depths: 7, 12 and 23 mm. The bug (or point) goes on the 23 mm level, the upper label at 12 mm, the lower label at 7 mm (measured up from the bottom of the pin).

Pinned insects must be kept in air tight boxes or drawers, or they will be eaten by dermestid beetles (Coleoptera: Dermestidae), roaches or book lice (Psocoptera).

Special Cases: Corixidae. Corixids may be preserved in alcohol or pinned. If one collects corixids in alcohol and later wants to pin them, one must first soak the bugs in ethyl acetate for several minutes; otherwise the wings will curl when the pinned insect dries. If a male, remember to pull out the genitalia first and glue them to a point or card on the pin; I usually glue the genitalia to the same point on which the corixid is glued or slide mount the genitalia in CMC-10, Euparal or Canada balsam. Be sure to label your slide to match the pinned insect, and be sure a note is on the pinned insect that

its genitalia (or other body parts) have been mounted on a slide. An alternative method of preserving the genitalia is to place them in glycerine in a polyethylene microvial; the pin on which the bug is mounted is inserted through the elongated stopper of the microvial. Note that microvials come in several sizes; larger ones for larger bugs, etc. One may also use microvials to keep dissected genitalia of fluid preserved bugs as well. If the microvial is to be placed in the same vial as the insect (which it should), plug the microvial to the bottom with some cotton; otherwise the loose vial may be jostled and damage the insect's body. Often it is possible to place the entire dissected insect in a microvial inside a vial – it is much easier to find all the parts in a small microvial than from a larger 2-4 dram vial.

Do not pin corixids through the scutellum or pronotum; it will damage important body parts, such as the metaxyphus, on the venter. Corixids that are large enough to be pinned (*Hesperocorixa* and a few others) may be pinned through the right clavus.

method for pinning larger corixids

Notonectidae. When pinning males of the notonectid genus *Buenoa*, it is advisable to remove one of the forelegs so that the rostral prong can be examined. Since most *Buenoa* are small, point mounting them is advised; glue the detached leg to the point (or an additional point) with the inner side facing up, so that the stridulatory comb may be examined.

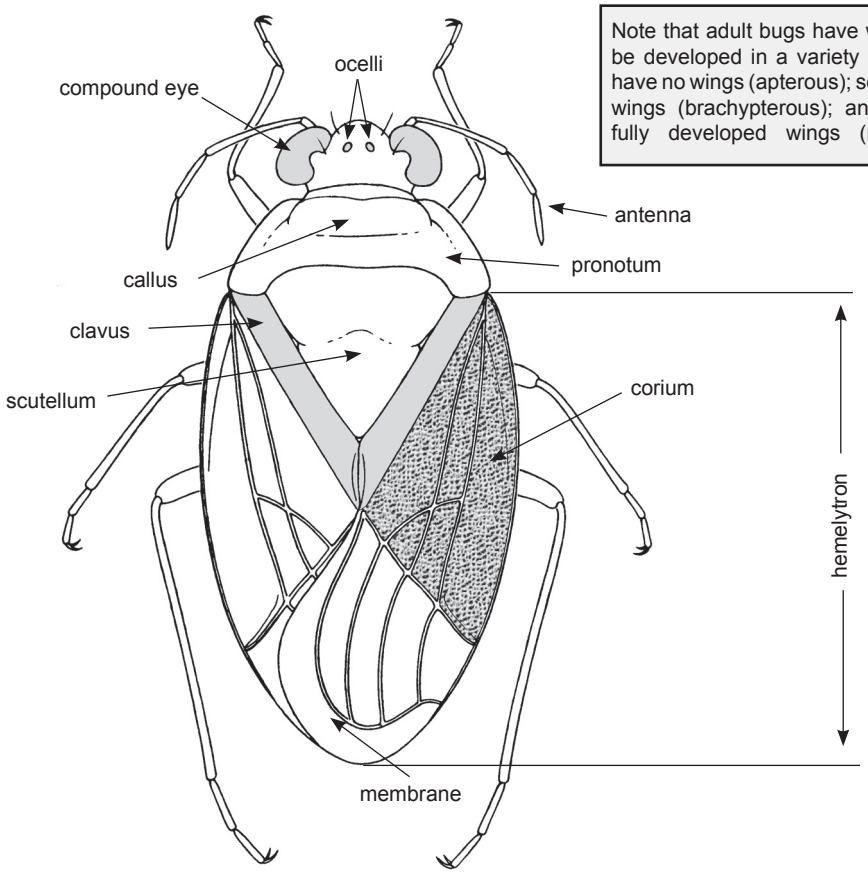
Labels. Always remember to include collection data with or on your specimens! This means the spot where it was collected, the date and who collected the specimen. Try to be concise with locality data; use State, County and a relatively exact spot. A locality label that reads only something like "Joe's back yard" won't mean much to anybody except Joe and maybe some of his friends. Please do not write dates as "5-6-99", etc. Does that mean May 6 1999 or 5 June 1999 - or 1899? In most of the world, dates are written in the format "day, month, year"; much of this country (U.S.A.) persists in using month, day, year. I find that using lower case Roman numerals for the month leaves little to doubt ... 4-ii-2004 is obviously 4 February 2004. If you choose not to use Roman numerals, write out the month. Do not use collection codes because if you leave your collection or specimens in a lab, etc., and move to another position, at a later date chances are nobody will know what those codes mean.

Illustrations: The majority of the illustrations in this manual were produced by the author from Florida specimens, but in many cases material from outside the area had to be used. Some are somewhat schematic in that all parts of a structure were not drawn or included; i.e., setae that are not needed for identification purposes are often omitted. ***NOTE*** *that all figures on any given page are not to the same scale.* Dr. John T. Polhemus made his general morphological figures available for me from his opus "Shore Bugs" (Polhemus 1985a).

Most of the illustrations are color digital photos taken with a Spot Insight Color digital camera mounted on a Leica photo tube mounted on a Leica-Wild MZ8 stereo microscope. Bugs that were too large to be photographed with this equipment were photographed with a Nikon Coolpix 5700 digital camera. Line drawings were made with a drawing tube attached to the Leica-Wild MZ8 or were traced from photos taken with the Spot camera (often photos did not have enough resolution or contrast, etc.). Images were processed in Adobe Photoshop CS on a dual processor Apple Power Mac G4. Some pictures were "enhanced" to better show some structures. Although tempting, no new species were created with Photoshop!

Morphology and Glossary of terms

Note that adult bugs have wings that may be developed in a variety of ways: some have no wings (apterous); some have short wings (brachypterous); and others have fully developed wings (macropterous).



DORSAL

[figure adapted from Polhemus (1985a); used with permission of author]

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aedaeagus - distal segment or portion of the penis of male genitalia. Also spelled aedeagus, aedoeagus, oedaeagus, oedeagus.

alate – with wings.

apterous – without wings.

brachypterous - with reduced wings.

callus - raised area or swelling on dorsal anterior portion of the pronotum (in Saldidae).

clavopruina - frosted area at lateral base of claval suture in Corixidae.

clavus (plural **clavi**) - the anterior inner portion of the hemelytron; when wings are folded, the clavus borders the scutellum.

corium - the (often) "leathery" portion of the hemelytron between the clavus and the membrane.

connexiva (singular **connexivum**) – the sharp, often raised, lateral margins of the abdomen; the border between the dorsal and ventral lateral sclerites.

dextral - terminal abdominal parts oriented to the right.

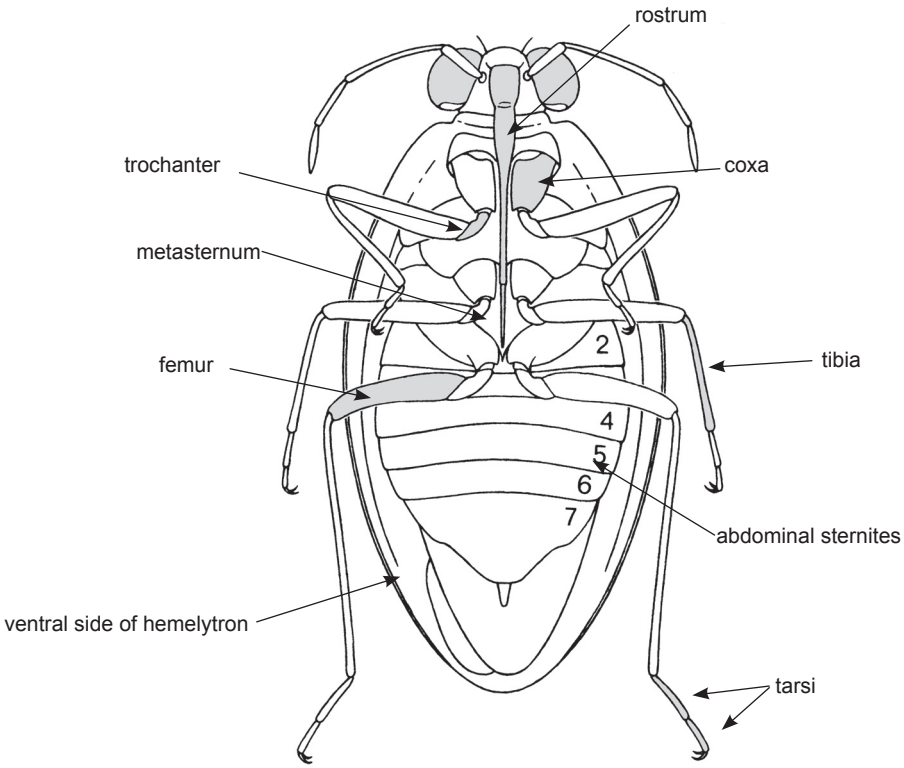
distal – towards the farther end, as opposed to proximal (closer).

embolium - the outer portion of the corium. Also termed exocorium.

hemelytra (singular **hemelytron**) - the anterior wings; in most aquatic bugs, more heavily sclerotized and with a reduced or absent membranous posterior portion.

hemelytral commissure - the median dividing line between the pair of hemelytra.

lateral - to the outside, as opposed to medial (to the middle).



[figure adapted from Polhemus (1985a); used with permission of author]

VENTRAL

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macropterous - with fully developed wings.

medial – towards the middle, as opposed to lateral (to the outside).

mesepimeron - sclerite of the mid thorax extending from lateral border of thorax to base of coxa.

metaxyphus - triangular structure located between the hind (meta) coxae; following Hungerford (1948a: 38) it is measured from the point where the metasternum joins with the inner extension of the metepisternum.

ostiole - opening of scent gland.

pala (plural **palae**) - in Corixidae, the modified fore tarsus.

proximal - towards the closer end, as opposed to distal (farther).

pruinose - frosted; appearing to be covered with a fine dust or powder, which does not rub off.

rastrate - marked with tiny longitudinal scratches.

rostrum - fancy term for the beak.

rostral prong - the proximal, dorsally directed lateral extension on each side of the rostrum (in the notonectid *Buenoa*).

rugulose - minutely wrinkled.

sinistral - terminal abdominal parts oriented to the left.

sclerite - a plate-like portion of the insect outer body wall, usually hardened ("sclerotized").

scutellum - the triangular dorsal portion of the mid thorax, located between the anterior portions of the hemelytra. The general location through which most bugs should be pinned.

sternite - the ventral sclerite of a segment.

strigil - in Corixidae, the darkened, sclerotized, comb-like structure on the posterior and/or lateral margin of abdominal tergite VI of the male. Note that this is not a stridulatory organ.

synthlipsis - interocular space, the minimum distance between the compound eyes.

tergite – the dorsal sclerite of a segment.

vertex - the top of the head between the eyes.

Acknowledgments

Usually, one of the first parts of a paper or monograph I read is the Acknowledgments. Why? Because I know how much authors depend on the assistance and guidance of other workers. I hope that you, as a user, will read this section and recognize that although I am the sole author of this manual (and thus, all the "blame" falls on me for errors, etc.), it was done with the help of numerous, kind people.

I am grateful to the Florida Department of Environmental Protection (FDEP) for providing the funding for this manual and for the numerous individuals with the Department (or formerly with the Department) who assisted me with the "paperwork". These include: Ellen McCarron, Ashley O'Neal, Erica Hernandez, Devan Cobb, and Johnny Richardson. Numerous FDEP biologists made specimens available for this study; these include Dana Denson, Peggy Morgan, Mike Heyn and Bob Rutter.

I also want to thank the following for the loan or gift of specimens: Dr. Susan Halbert, Dr. Mike Thomas and Julieta Brambila (Florida State Collection of Arthropods, Gainesville, FL); Dr. Zachary H. Falin (Snow Entomology Coll., University of Kansas); Rob Hood (USGS, Denver, CO); Dr. Marc Minno (St. Johns Water Management District, Palatka, FL); Dr. John Morse (Clemson University, Clemson, SC); Jan Peters and Dr. Andy Rasmussen (Florida A&M University, Tallahassee, FL); Dr. Robert W. Sites (University of Missouri, MO); Ethan Bright and Dr. Mark F. O'Brien (University of Michigan, Ann Arbor, MI); Dr. Steve W. Chordas III (Ohio State University, Columbus, OH); Samuel B. McCord (Arkansas State University, Jonesboro, AR); Vince Golia (West Palm Beach, FL); Brady Richards (Chico State University, Chico, CA); Theresa Thom (University of Georgia, Athens, GA); and Dr. John T. Polhemus (Colorado Entomological Museum, Englewood, CO).

Many thanks to Dr. Thomas J. Henry (USNM, Washington, D.C.) for providing photos of the holotype of *Paraplea nilionis*. Dana Denson provided the photo of my pair of *Rhagovelia plumbea* in amplexus, taken at the May 2004 aquatic and semi-aquatic Heteroptera workshop held in Gainesville.

Thanks also to many individuals for their help and companionship in the field: Dr. Carlos de la Rosa (formerly with Pinellas County, FL and The Nature Conservancy, Kissimmee, FL, now with The Catalina Conservancy, CA); Dr. Paul Gray (Ordway-Whittell Kissimmee Prairie Sanctuary, FL); Dr. John T. Polhemus; Dr. Marc Minno; Palmer Kinser (St. Johns Water Management District, Palatka, FL); and April Frederick, Steve Morrison, Beatriz (B) Pace-Aldana, and Parker Titus (all with The Nature Conservancy in Florida).

Mark Wetzel (Illinois Natural History Survey, Champaign, IL) provided copies of numerous papers – thanks, Mark!

Dr. John T. Polhemus provided the bulk of reviews of the chapters of this manual; Drs. Robert W. Sites, T.J. Henry and Carlos de la Rosa, and Brady Richards also provided reviews.

Many thanks to the following for permission to collect on their land or reserves or parks: Dr. Carlos de la Rosa; Dr. Paul Gray; Joe Reinman (St. Marks National Wildlife Refuge, St. Marks, FL); and Sandy Cook (Wakulla Springs State Park, FL). Special thanks to Jack Rudloe (Panacea, FL) for permission to collect *Rhagovelia plumbea* from his "Living Dock" and to Peter and Jennifer Mason for permission to collect on their land near Cody (Jefferson County, FL), the only known site in Florida for *Microvelia austrina* and *M. fontinalis*.

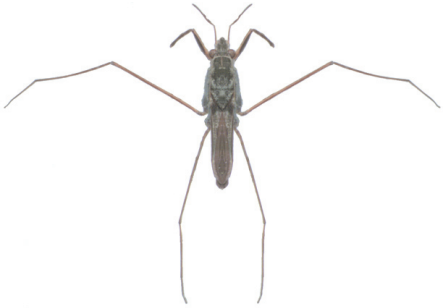
Again, many thanks to Dr. Barry & Judy Merrill (Merrill Consultants, Dallas, TX) for their gifts of laboratory equipment and computers.

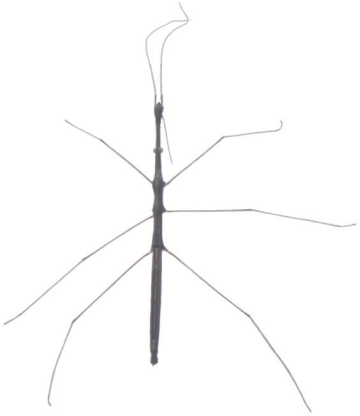
And, of course, countless thanks and eternal love to my wife Linda, who once again became a "manual widow" for the three years it took to prepare this manual.

Key to families for adult aquatic and semiaquatic Heteroptera of Florida

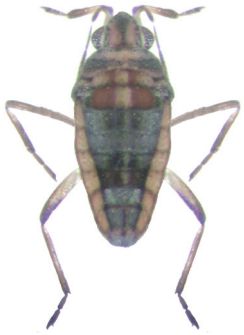
1 Antennae longer than width of head and visible from above; found on the water surface or shore-line dwellers 2

NOTE: you must have adults, i.e., specimens with 2-3-segmented tarsi on at least one pair of legs, to use this key! Nymphs will have a single tarsal segment on each leg.





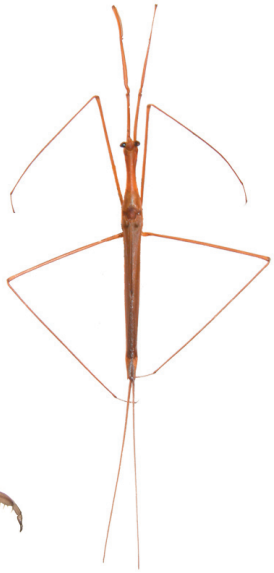




1' Antennae shorter than width of head, usually not visible from above (except in Ochteridae, but antennae still shorter than width of head); usually found below the water surface but two families are shoreline denizens 7



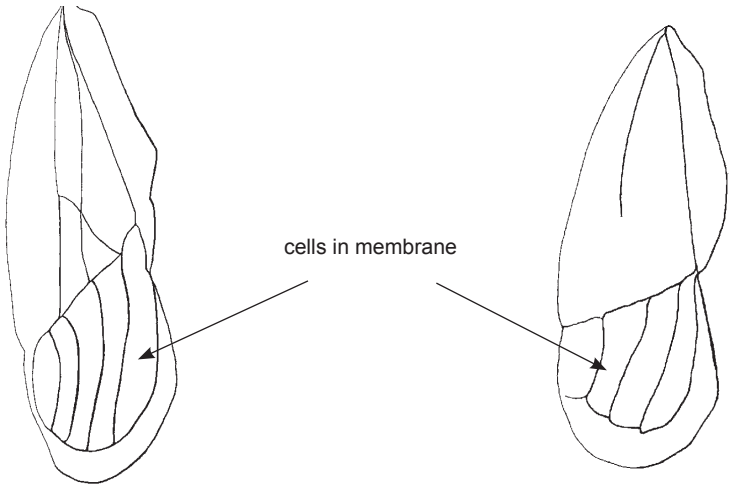


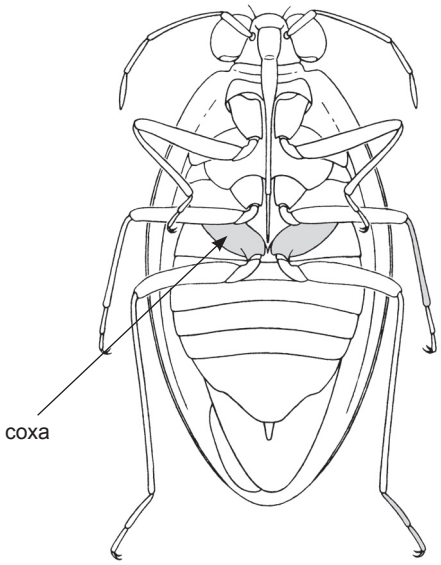



2(1) Claws of all legs inserted at tips of tarsi 3

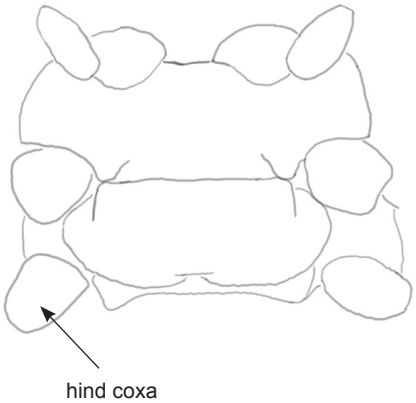
2' Claws of at least fore tarsi inserted before apex of tarsi 6

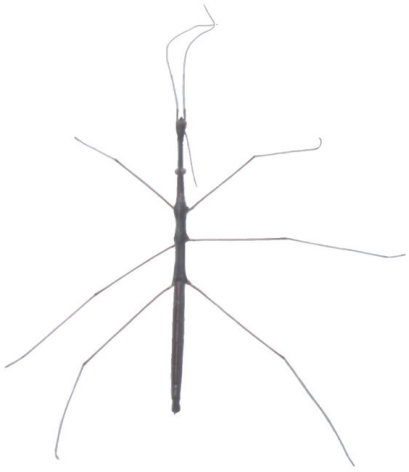
3(2) Membrane of fore wing (hemelytron) with 4-5 distinct similar cells; hind coxae large, transverse, with a broad coxal cavity .. .. **Saldidae**





3' Membrane of wing (if present) without distinct similar cells; hind coxae smaller, cylindrical or conical with coxal cavity socket-like 4

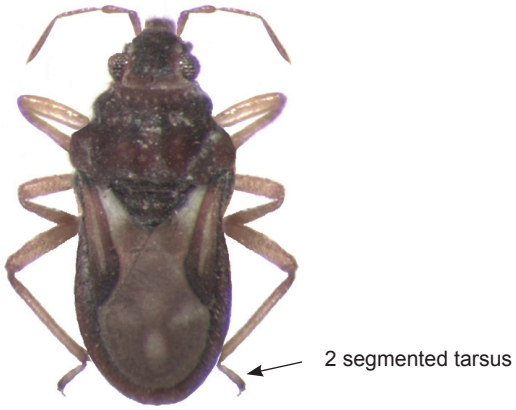


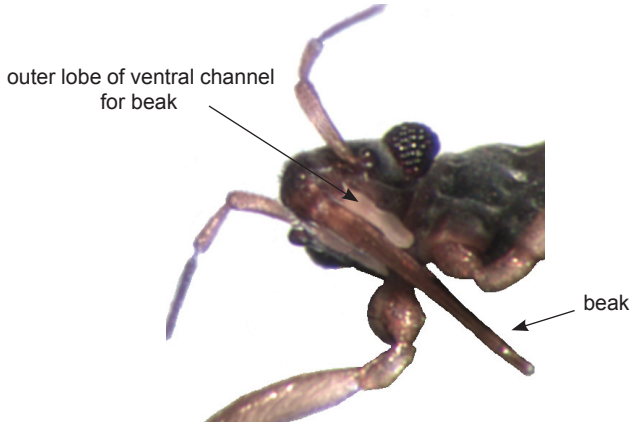


4(3') Head and body long and slender, head with eyes near middle; head as long as or longer than combined length of pronotum and scutellum ..... **Hydrometridae**

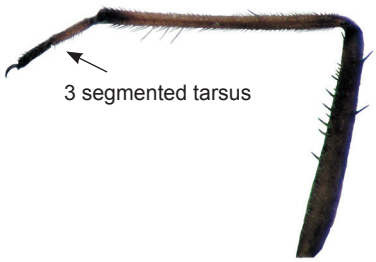
4' Body stout; head not as long as combined length of pronotum and scutellum 5

5(4') All legs with 2 segmented tarsi; head with a deep ventral channel for reception of beak .. .. **Hebridae**

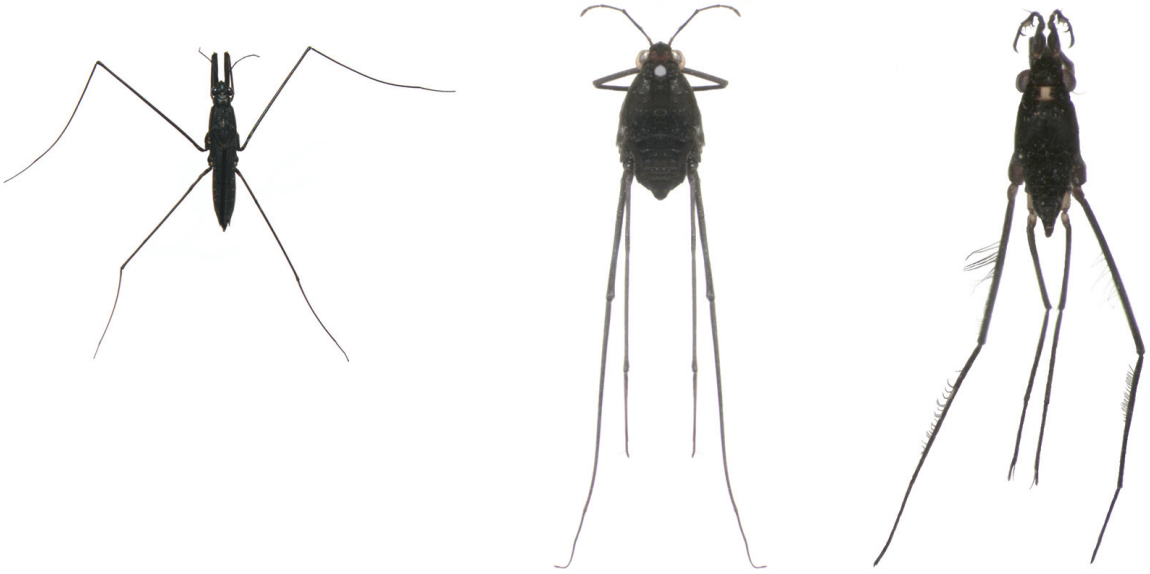




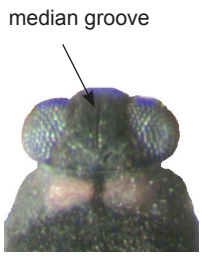
5' All legs with 3 segmented tarsi; head without a deep ventral channel for reception of beak ..... **Mesoveliidae**



6(2') Hind femur extends distinctly past the apex of the abdomen; head usually without a longitudinal median groove or smooth stripe; mid tarsi never deeply divided apically .. .. **Gerridae**



6' Hind femur does not extend distinctly past the apex of the abdomen or barely extends to apex; head with a longitudinal median groove or smooth stripe; mid tarsi sometimes deeply divided apically, with leaf-like blades or plume of setae arising from cleft .... **Veliidae**



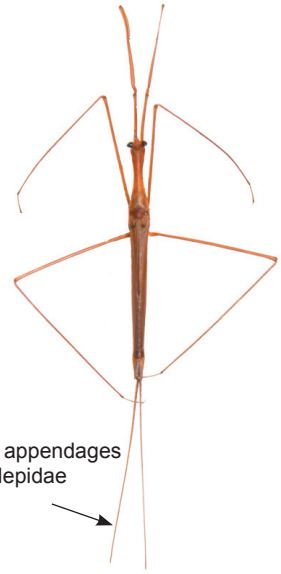
7(1') Apex of abdomen with strap-like or apparently tubular respiratory appendages (strap-like appendages may be withdrawn under membrane of hemelytron) 8

7' Apex of abdomen without respiratory appendages 9

strap-like appendages
Belostomatidae

8(7) Apex of abdomen with flat, strap-like respiratory appendages .. .. **Belostomatidae**

8' Apex of abdomen with long, apparently tubular respiratory appendages; body usually elongate and cylindrical .. **Nepidae**



tubular appendages
Nepidae

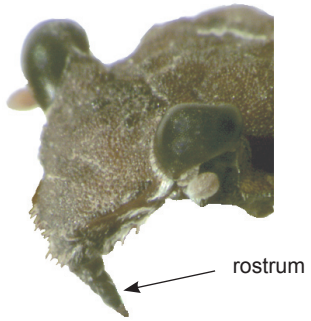
9(7') Body dorsoventrally flattened, about twice as long as wide or less 10

9’ Body somewhat cylindrical or ovoid, not flattened, about 3 or more times as long as wide 12

10(9) Mid and hind legs with fringe of swimming setae; fore femora grossly enlarged; ocelli absent; greenish, aquatic bugs ..... **Naucoridae**

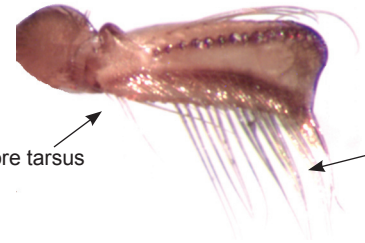
10’ Mid and hind legs without swimming setae; front femora enlarged or not; ocelli usually present; light sand-colored to dark brown or black, shore line dwelling or terrestrial bugs 11

11(10’) Front femora broad; rostrum short, not reaching hind coxae; dorsum warty, toad-like; fore leg with single tarsal segment ..... **Gelastocoridae**



11' Front femora not broad; rostrum long, reaching or extending past hind coxae; dorsum smoother, not warty; fore leg with 2 tarsal segments ..... **Ochteridae**

12(9') Fore tarsus one segmented, fringed with stiff setae that form a small rake; beak triangular, very short, non-segmented (although may have transverse striations); body somewhat flat dorsally ..... **Corixidae**



12' Fore tarsi with 2-3 segments, not fringed with stiff setae; beak more cylindrical, segmented; body semi-cylindrical to ovoid 13

13(12') Body ovoid, less than 3 mm in length; hemelytra with strong punctures and no apical membrane; all legs basically similar; hind legs with 2 well developed claws ..... **Pleidae**

13' Body semi-cylindrical, greater than 4 mm in length; hemelytra basically smooth, with apical membrane; hind legs long and oar-like, with tarsal claws inconspicuous .... **Notonectidae**

FAMILY BELOSTOMATIDAE 2

giant water bugs, electric light bugs, toe biters

DIAGNOSIS: Large, flattened bugs with large raptorial fore-legs; antennae short and hidden beneath head; mid and hind legs flattened and fringed with swimming hairs; tarsi 2 to 3 segmented; and apex of abdomen with a pair of flat, retractile, airstraps.

Abedus immaculatus

Belostoma lutarium

Lethocerus uhleri

NOTES: As their name implies, giant water bugs, especially the genus *Lethocerus*, are among the largest of Florida's insects. Adults and nymphs are found in lakes, ponds, swamps, ditches and marshes, where they feed on anything they can catch and hold, including small reptiles and amphibians, fish and a variety of insects.

Females of *Abedus* and *Belostoma* lay their eggs on the backs of males; *Lethocerus* lay their eggs on emergent vegetation and similar objects. Living belostomatids, especially *Lethocerus*, should be handled with care; they can inflict a very nasty bite!

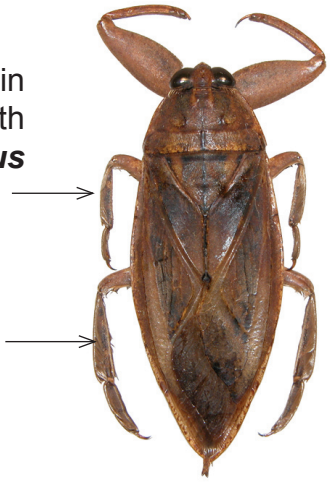
ADDITIONAL REFERENCES: Gonsoulin 1973a; Menke 1979c; Polhemus et al. 1988a.

Florida genera

Abedus Stål
Belostoma Latreille
Lethocerus Mayr

Key to genera of adult Belostomatidae of Florida

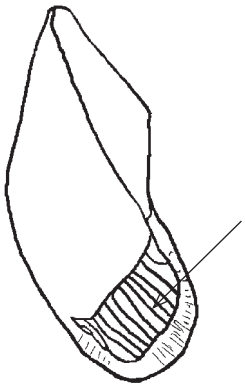
1 Large, length 40 mm or more; tibia and tarsus of hind leg thin and flattened, much broader than mid tibia and tarsus; beak with basal segment about 1/2 length of second ..... ***Lethocerus***



1' Smaller, length less than 30 mm; tibiae and tarsi of hind legs similar to those of mid legs; beak with basal segment subequal to second 2

2(1') Membranous area of forewing reduced; length about 14mm or less ..... ***Abedus***

2' Membranous area of forewing larger; length 15 mm or more ..... ***Belostoma***



GENUS *Abedus*

DIAGNOSIS: The small size (about 13 mm); beak with basal segment subequal to second segment; smaller clear area of the forewing (hemelytron); and similar tibiae and tarsi of mid and hind legs will distinguish this genus from other belostomatids in the Southeast.

A. immaculatus

NOTES: The single Florida species, *A. immaculatus*, was described from Florida by Hussey & Herring (1950a) as *A. cantralli*; they later (Hussey & Herring 1950c) found that this species had been described earlier as a *Belostoma* by Say; Say's name has priority so the species is now called *A. immaculatus.*

With a length of about 13-14 mm, this is the smallest of North America's belostomatids, and may be mistaken for a *Belostoma testaceum*. The small size of *A. immaculatus* is unusual for an *Abedus*, which are usually much larger (24 mm or more); it may be that *A. immaculatus* deserves separate generic rank.

Abedus immaculatus often has a pale mid-dorsal stripe, as figured to the right, but note that some *Belostoma* may also sport such a stripe.

A. immaculatus
with dorsal stripe

ADDITIONAL REFERENCES: Hussey & Herring 1950a, 1950c; Menke 1979c.

Florida species

A. immaculatus (Say)

GENUS *Belostoma*

DIAGNOSIS: Distinguished by the smaller size (18-25 mm); beak with basal segment subequal to second segment; larger clear area on the fore wing (hemelytron); and similar tibiae and tarsi of the mid and hind legs .

B. testaceum

B. lutarium

NOTES: Members of the genus *Belostoma* are the most commonly collected belostomatids in Florida. They are always associated with vegetation, usually in lakes, ponds, ditches and marshes. Three species are recorded from the state; an additional two may eventually be found in the Panhandle.

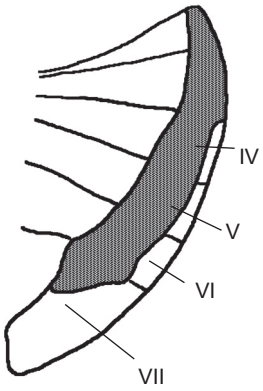
Menke (1958a) published a synopsis of *Belostoma* for North America; Lauck (1959a, 1962a, 1963a, 1964a) described several species and monographed the genus; Menke (1979c) further updated the taxonomy of the genus.

ADDITIONAL REFERENCES: Lauck 1964a; Menke 1958a, 1979c.

Florida species

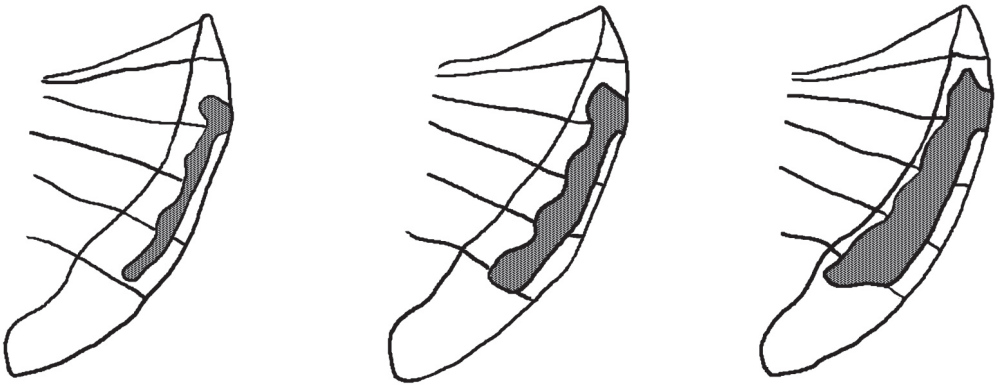
B. flumineum Say
B. lutarium Stål
B. testaceum (Leidy)

Key to adult *Belostoma* of the United States east of the Mississippi



1 Appressed pubescence of ventral paratergites II-VI reaching the inner margin of the paratergites, pubescence of VII extending about 1/2 way down inner margin 2

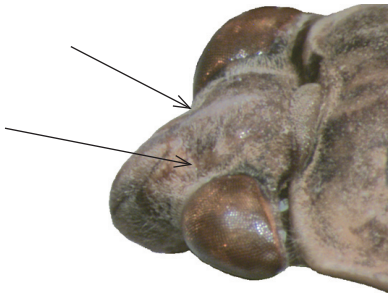
1' Appressed pubescence of paratergites not reaching inner margin (maybe close in one species) and not extending as far posteriorly 3

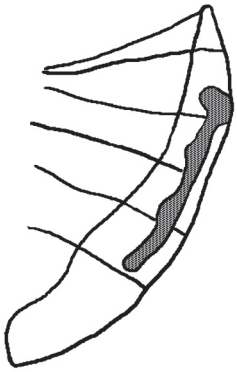


2(1) Lateral margins of pronotum usually concave; in lateral view, beak arising well before anterior margin of eye; common in Florida ..... ***B. flumineum***

2' Lateral margins of pronotum usually straight; in lateral view, beak arising below anterior margin of eye; not known from Florida ..... * ***B. bakeri***
(not known from Florida; see Notes on species)

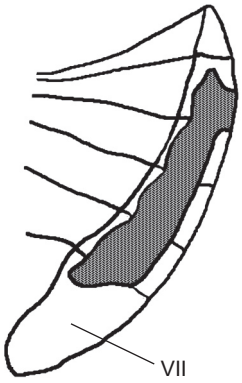
3(1') Forehead with large depression in front of each eye; appressed pubescence on paratergites in very narrow strip ..... **** B. fusciventre***
(not known from Florida)



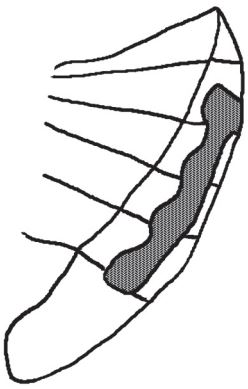


3' Forehead without depression in front of each eye; appressed pubescence on paratergites wider (figures in couplet below) 4

4(3') Appressed pubescence separated from inner margin by narrow space, pubescence extends on to paratergite VII; larger, 18-28 mm ..... ***B. lutarium***



4' Appressed pubescence separated from inner margin by much wider space, pubescence barely extends on to paratergite VII; smaller, 15-20 mm ..... ***B. testaceum***



Notes on species

B. flumineum - Length 18-25 mm. This species is similar to *B. bakeri* (which is not known from Florida; see below) but can be separated by characters of the head and pronotum given in the key. *Belostoma flumineum* appears to be the least common species of the genus in Florida.

B. lutarium - Length 18-28 mm. This appears to be the most common *Belostoma* in Florida.

B. testaceum - Length 15-20 mm. In general, the smallest *Belostoma* in Florida. Sometimes misidentified as an *Abedus* (and vice versa).

Other species

B. bakeri Montandon - Length 16-20 mm. Not known from Florida. This species is found from Louisiana westward, and may eventually be found in western Florida.

B. fusciventre (Dufour) - Length 16-21 mm. Not known from Florida. In the US this Central American/Mexican species is recorded from Louisiana and Texas; it may eventually be found in western Florida. It was treated as *B. thomasi* Lauck in Lauck (1964a).

GENUS *Lethocerus*

DIAGNOSIS: Distinguished by the large size (> 40 mm); beak with basal segment about half the length of the second; and tibia and tarsus of hind leg very flattened, much wider than tibia and tarsus of middle leg.

L. uhleri

NOTES: These are the largest bugs in Florida; two species are rather common, while another has only been collected once in the state.

Lethocerus nymphs have two well developed claws on the tarsus of the foreleg (nymphs and adults of *Abedus* and *Belostoma* have a single claw); adult *Lethocerus* have one large and one reduced claw on the foreleg.

Lethocerus are found in lentic habitats, usually with abundant vegetation. However, one of the easiest ways to collect *Lethocerus* is to go to well-lit parking lots or store fronts at night and collect those that have been attracted by the lights. To quote Blatchley (1926a: 1041): “When electric lights were first installed our larger species were attracted to them by hundreds and for the first time the average human learned that such bugs were denizens of the earth. To them he gave the name of “electric light bugs”, and their uncouth shape and sprawling motions, when on the ground beneath the lights, usually caused him to regard them with a ‘holy terror’”.

Lethocerus are eaten in SE Asia where they are sold fresh or canned, and often referred to as “ca goung” (or ca cuong). An extract is used in the preparation of such dishes as bap cai luo, banh trung or cha ca.

ADDITIONAL REFERENCES: Cummings 1933a; Menke 1963a, 1979c.

Florida species

L. annulipes (Herrich-Schaeffer)
L. griseus (Say)
L. uhleri (Montandon)

Key to adult *Lethocerus* of the eastern United States

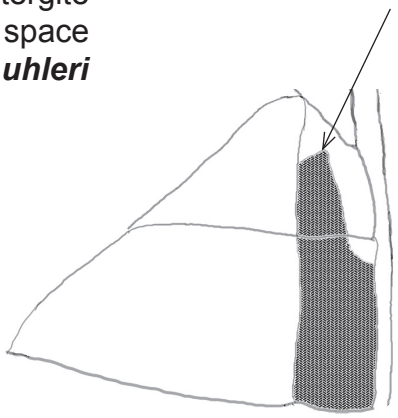
1 Fore femur without median grooves on anterior surface ..... ***L. griseus***

1' Fore femur with median grooves on anterior surface into which tibia fits 2

2(1') Venter of abdomen with 2 longitudinal reddish-brown stripes; very rare - see Notes on species ..... ***L. annulipes***

2' Venter of abdomen without stripes; common 3

3(2') Appressed pubescence of first visible ventral paratergite not reaching anterior margin of paratergite; width of space between eyes about 3/4 of width of one eye ..... ***L. uhleri***



3' Appressed pubescence of first ventral paratergite reaching anterior margin of paratergite; width of space between eyes about equal to width of one eye ..... * ***L. americanus***
(not known from Florida; see Notes on species)

Notes on species

L. annulipes - Length 53-75 mm. Cummings (1933a) gave an undated record for this Neotropical species from Palm Beach. If correctly identified and/or labeled, this specimen was most likely blown in by a storm.

L. griseus - Length 47-64 mm. The largest bug in Florida. This species was formerly placed in the genus *Benacus*, but *Benacus* was reduced to a subgenus of *Lethocerus* by Lauck & Menke (1961a).

L. uhleri - Length 40-53 mm. From collections I've seen and made, this species is the most common *Lethocerus* in Florida.

Other species

L. americanus (Leidy) has been reported from Florida by numerous authors, but apparently does not occur south of Virginia in the Southeast. All Florida material I've examined identified as *L. americanus* was either *L. griseus* or *L. uhleri*.

FAMILY CORIXIDAE
water boatmen

3

DIAGNOSIS: Very small to medium sized bugs that swim beneath the water surface; antennae short, not visible from above; beak triangular, short, unsegmented, appearing as ventral apex of head; fore tarsus comprised of one scoop-like segment (pala) lined with stiff setae on inner side; distal abdominal segments of male asymmetrical.


Hesperocorixa brimleyi


Micronecta ludibunda


Ramphocorixa acuminata


Sigara berneri


Trichocorixa sexcincta

NOTES: The corixids comprise the largest family of aquatic insects; nine genera (two introduced) occur in Florida. Corixids are common and often abundant; the majority feed on plants.

Most corixids with an exposed scutellum have been classified in the subfamily Micronectinae (another subfamily with an exposed scutellum occurs only in Australasia). In Florida this now includes the two exotic genera *Micronecta* and *Synaptonecta* and possibly *Tenagobia*. Nieser & Chen (1999a) and Nieser (2002a) proposed elevating the subfamily to a separate family, Micronectidae; they are treated as corixids in this manual.

Male corixids exhibit abdominal asymmetry; the segments may be skewed to the right (dextral) or the left (sinistral). Most male corixids possess a darkened comb-like structure, the strigil, on the 6th abdominal tergite; in taxa with dextral symmetry, the strigil is on the right side; it is on the left in taxa with sinistral symmetry. Note that occasional individuals may have their symmetry reversed. The strigil may lie on the edge of the tergite or on a short pedicel.

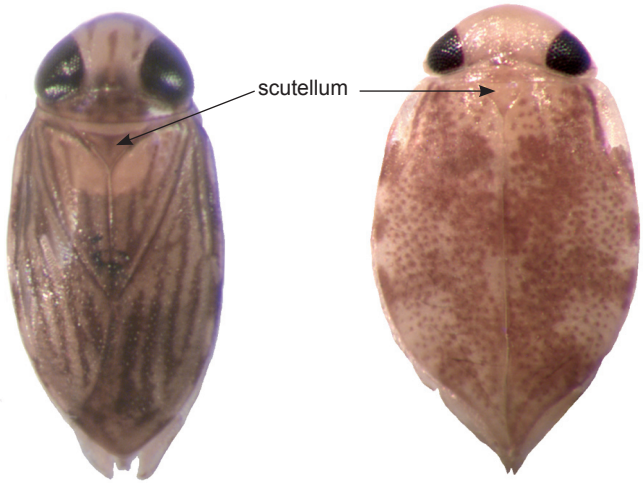
ADDITIONAL REFERENCES: Hungerford 1948a; Herring 1951a; Tinerella & Gundersen 2005a; Polhemus, Froeschner & Polhemus 1988a; Lauck 1979a.

Florida genera

Centrocorisa Lundblad
Corisella Lundblad
Hesperocorixa Kirkaldy
Micronecta Kirkaldy
Palmacorixa Abbott
Ramphocorixa Abbott
Sigara Fabricius
Synaptonecta Lundblad
Trichocorixa Kirkaldy

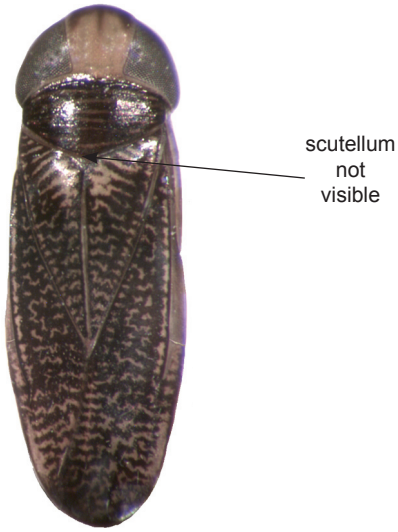
Key to genera of adult Corixidae of Florida

1 Scutellum exposed 2



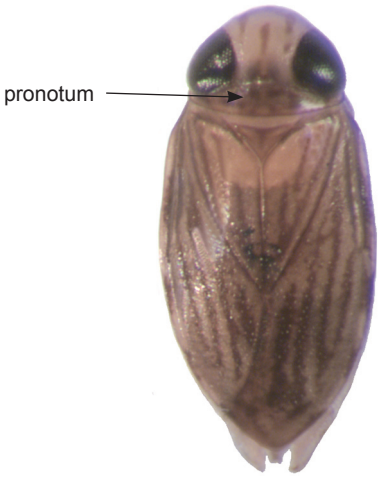
1' Scutellum hidden (although apex may be exposed in some taxa) 4

Note that some specimens preserved in alcohol or pinned will relax and expand, exposing the scutellum

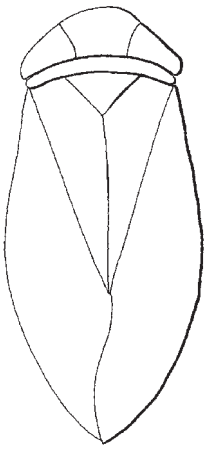


2(1) Hemelytra strongly tapered and pointed posteriorly; fore tibia and pala fused in both sexes ..... ***Synaptonecta***

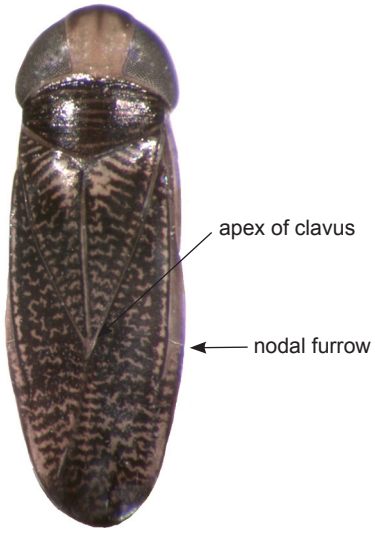
2’ Hemelytra rounded posteriorly; fore tibia and pala of males not fused 3



3(2’) Pronotum longer, subquadrate to elliptical; males with strigil ..... ***Micronecta***



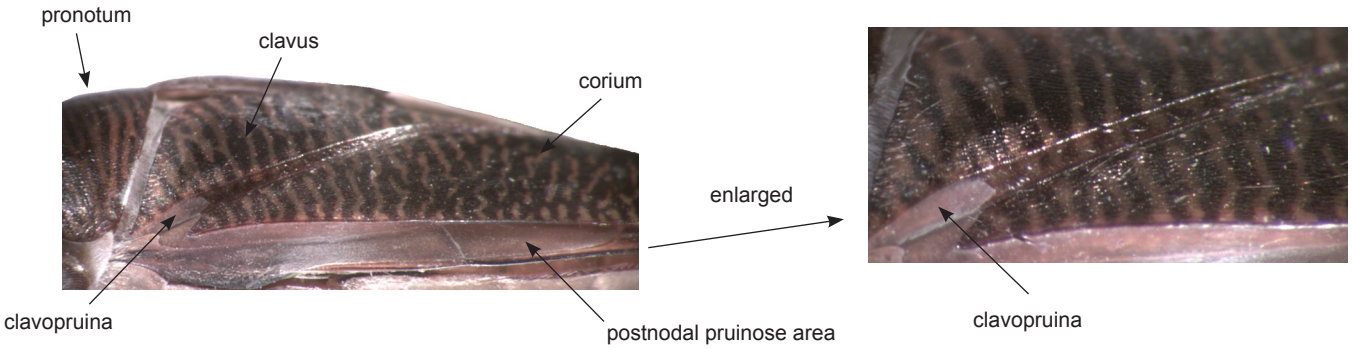
3’ Pronotum short, crescent shaped; males without strigil ..... ****Tenagobia***
(not recorded from Florida, but may eventually be found here; *T. mexicana* Deay is the only species known north of Central America. See Hungerford 1948a: 54)



4(1’) Males with sinistral symmetry, with strigil on left; females with apices of clavi not or barely exceeding a transverse line drawn between the nodal furrows, or nodal furrows apparently absent ..... ***Trichocorixa***

4’ Males with dextral symmetry, strigil (if present) on right; apices of clavi extending well beyond a transverse line drawn between the nodal furrows 5

5(4') Clavopruina (frosted area along the outside of the base of clavus) short, broadly rounded at apex, about 1/2 to 2/3 as long as the pruinose area posterior to the nodal furrow (postnodal pruinose area); clavus and corium rastrate (marked with tiny longitudinal scratches); larger corixids, length 7 mm or more ..... ***Hesperocorixa***



5' Clavopruina subequal to or longer than pruinose area posterior to nodal furrow; if shorter, than pointed apically and clavus smooth; length variable 6

6(5') Body short and broad, width at pronotum more than 1/3 body length; male without strigil; south Florida ..... ***Centrocorisa***

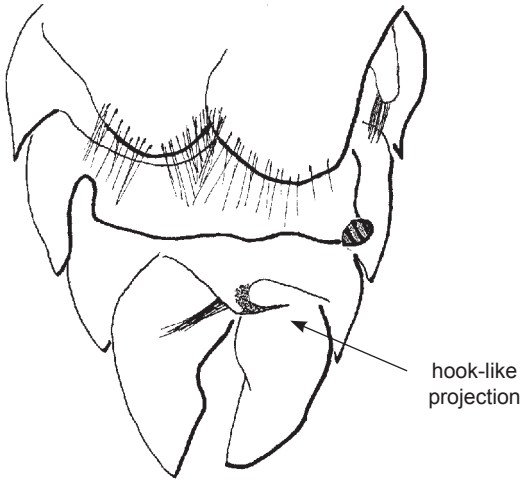
6' Body more elongate, width at pronotum distinctly less than 1/3 body length; male with strigil; throughout Florida 7

7(6') Reticulate pattern on hemelytra washed out; claws of foretarsus (pala) minutely serrate at base; males with pointed forehead and upper surface of pala deeply incised ..... ***Ramphocorixa***

male pala

7' Reticulate pattern usually well defined or hemelytra almost completely black; palar claws not serrate at base; males without pointed head and pala not deeply incised 8

8(7') Posterior margin of head strongly curved; interocular space less than width of one eye; pronotum very short; male with sclerotized hook-like projection on posteromedian margin of tergite VII ..... ***Palmacorixa***



8' Posterior margin of head not greatly curved; interocular space at least subequal to width of one eye; pronotum not as short; male without sclerotized hook-like projection on posteromedian margin of tergite VII ((a non-sclerotized projection is present on some *Sigara*) 9

9(8') Pronotum and clavus smooth and shining (fine setae are present); length > 6 mm ..... ***Corisella***

9' Pronotum and/or clavus rastrate (marked with tiny longitudinal scratches) or rugulose (wrinkled), or both; length 6 mm or less, usually < 5 mm ..... ***Sigara***

GENUS *Centrocorisa*

DIAGNOSIS: Head with space between eyes wider than the width of one eye; body short and broad, width at pronotum more than 1/3 body length; male foretarsus expanded distally; males with dextral symmetry, strigil absent.

C. nigripennis

NOTES: *Centrocorisa* is a Neotropical genus. One species, *C. nigripennis* (length about 6-8 mm), previously recorded from Texas, Mexico, Cuba, Jamaica and other Caribbean islands, has been collected in southern Florida. Because of the similarity in spelling, do not confuse this genus with *Cenocorixa*, a genus found far to our north.

The sole Florida specimen I've examined was collected by Bob Rutter from a newly created herbaceous wetland in Collier County in November 1992.

ADDITIONAL REFERENCES: Hungerford 1948a.

Florida species

C. nigripennis (Fabricius)

GENUS *Corisella*

DIAGNOSIS: Pronotum and clavus smooth, shining; clavopruina about 2/3 length of postnodal pruinose area; males with dextral symmetry, with strigil.

male pala

C. edulis

NOTES: One species, *C. edulis* (length 6.3-8.3 mm) is found in Florida. This species is noted by its smooth pronotum and clavus. Also note the male pala which bears two widely separated peg rows. *Corisella edulis* males are easily “eyeballed” in alcohol preserved samples by their size and bi-colored appearance in ventral view - the abdomen is quite dark, the thorax light.

In Mexico, this species, along with other *Corisella* species, some other corixid genera and a notonectid, were (are still?) consumed as human food (“ahuautle”). The specific epithet “*edulis*” is Latin for “edible”. They have also been used for bird and fish food.

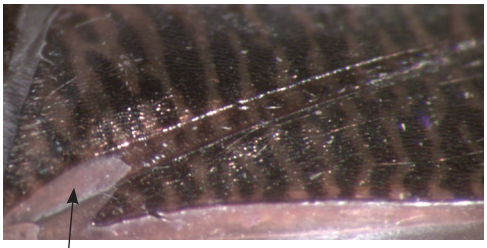
ADDITIONAL REFERENCES: Hungerford 1948a.

Florida species

C. edulis (Champion)

GENUS *Hesperocorixa*

DIAGNOSIS: Clavopruina short, broadly rounded at apex, about 1/2 to 2/3 as long as the pruinose area posterior to the nodal furrow; clavus and corium rastrate; males with dextral symmetry, with strigil.



clavopruina also note rastrate integument

H. brimleyi

NOTES: *Hesperocorixa* species comprise most of our largest common corixids; six species are recorded from Florida. The short clavopruina will separate them from the similarly stocky *Centrocorisa.*

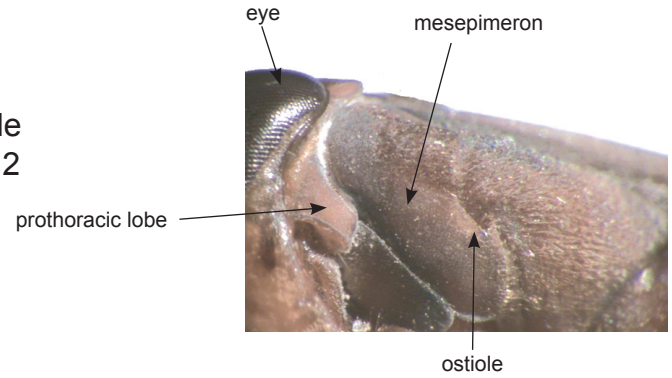
In the key below I have illustrated the male right paramere of the genitalia and the male palae for most species; using these structures will provide more accurate identifications for several similar species. Correctly identified comparative material will also help with several taxa.

ADDITIONAL REFERENCES: Hungerford 1948a; Herring 1951a; Dunn 1979a; Bobb 1953a.

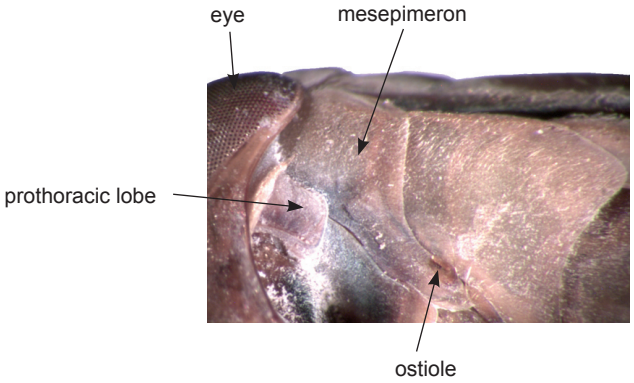
Florida species

H. brimleyi (Kirkaldy)
H. interrupta (Say)
H. lucida (Abbott)
H. martini (Hungerford)
H. nitida (Fieber)
H. semilucida (Walley)

Key to adult *Hesperocorixa* of Florida



1 Mesepimeron as wide at scent gland ostiole as width of prothoracic lobe 2

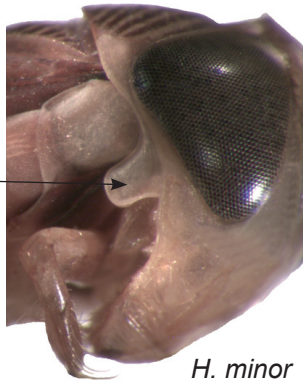


1' Mesepimeron narrower at scent gland ostiole than width of prothoracic lobe ... 3

2(1) Larger, length 8 mm or more; hemelytra orange to red with large black spots at base of clavus and distal portion of corium ..... ***H. brimleyi***

2' Smaller, length < 8 mm; hemelytra without black spots as above ..... ***H. semilucida***

3(2') Smaller, length < 8 mm; prothoracic lobe narrow, much longer than wide ..... ***H. minor***
(not known from Florida; see Notes on species)



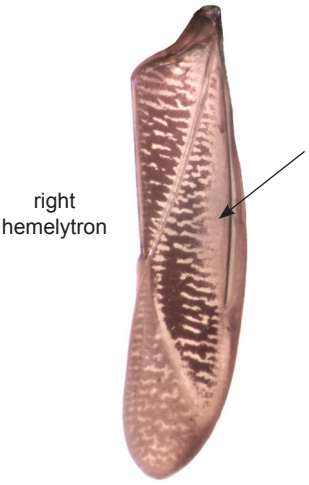
H. minor

3' Larger, length > 8 mm; prothoracic lobe broader 4

4(3') Outer portion of corium reddish, without pattern of black lines ..... ***H. lucida***

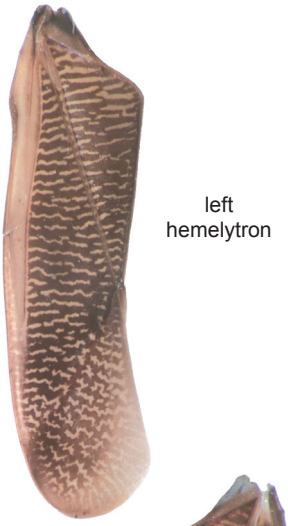

male right paramere

4' Outer portion of corium with pattern of black lines, may or may not be reddish 5



H. lucida

5(4') Pale bands of corium forming slender, transverse series, with corium and membrane not separated by a yellow line; pala of male with upper distal angle abruptly produced; male right paramere strongly curved and thin ..... ****H. vulgaris***
(not known from Florida; see Notes on species)

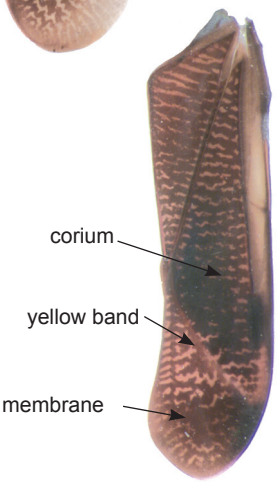


You may have to pull out or remove a wing to observe wing characters


male pala


male right paramere

5' If pale bands of corium form transverse series, then yellow band present separating corium from membrane; male pala with upper distal angle produced or not produced; male right paramere not as above 6



6(5') Pronotum with median pale yellow longitudinal line on posterior half ... ***H. georgiensis***
(not known from Florida; see Notes on species)

6' Pronotum without such a line 7

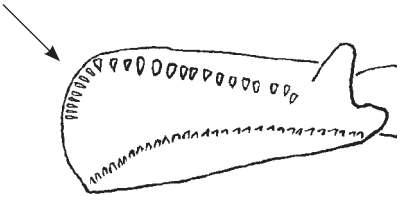
7(6') Hind femur with row of about 10 spines on distal portion of rear ventral margin ..... ***H. nitida***

male right paramere

7' Hind femur with row of at most 6-7 spines on distal portion of rear ventral margin 8

8(7') Hemelytra heavily rastrate (with minute, longitudinal scratches); middle femur stout and spinose; male pala with dorsal apical margin rounded; male right paramere stout, bent at right angle ..... ***H. martini***

middle femur

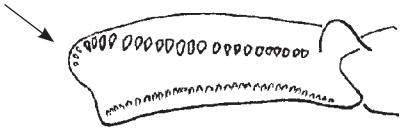


male pala
(setae omitted)

male right paramere

8' Hemelytra not heavily rastrate (appears a bit shinier than *H. martini*); middle femur not as stout and spinose; male pala with dorsal apical margin angulate; male right paramere more slender, more curved ..... ***H. interrupta***

middle femur



male pala
(setae omitted)

male right paramere

Notes on species

H. brimleyi - Length 8.2-8.8 mm. A striking, unmistakable species.

H. interrupta - Length 9.0-11.0 mm. Very similar to *H. martini*; see below.

H. lucida - Length 8.5-9.4 mm. The “worn-off” pattern of the lateral portion of the hemelytra is distinctive for Florida *Hesperocorixa*.

H. martini - Length 8.7-10.2 mm. This species is very similar to *H. interrupta*. In the University of Michigan collection are several specimens (from Gainesville, Alachua Co., leg. F.W. Walker, II-16-1924) determined by Hussey as *H. martini*, but later determined to be *H. interrupta* by the late corixid expert Antti Jansson. If one has only females, identifications of these two taxa may be difficult; it is best to have males, with their distinctive palae and genitalia, or comparative material of both species.

H. nitida - Length 8.0-9.0 mm. This species and *H. interrupta* appear to be the two most common species in Florida.

H. semilucida - Length 7.0-7.5 mm. An apparently uncommon species in Florida.

Other species

H. georgiensis (Egbert) - Length 8.8 mm. Apparently known only from the type, described, as its name implies, from Georgia (Baker Co.); it may eventually be found in Florida.

H. minor (Abbott) - Length 7.0-7.4 mm. Known from Alabama, Georgia, North Carolina and South Carolina in the Southeast, and may eventually be found in Florida.

H. vulgaris (Hungerford) - Length 9.2-10.1 mm. Recorded from Georgia and Mississippi in the Southeast, and may eventually be found in Florida.

GENUS *Micronecta*

DIAGNOSIS: Fore tibia and pala of male not fused; pronotum elliptical to subquadrate; scutellum exposed; hemelytra marked with longitudinal stripes and rounded posteriorly; males with dextral symmetry, with strigil.

M. ludibunda

NOTES: Another corixid species introduced from the Orient and Southeast Asia (in addition to *Synaptonecta issa*), probably via the aquarium plant trade. The small size (length about 1.9-2.2 mm), exposed scutellum and strong longitudinal striping easily identify this bug. It is a very common and widespread species in the Orient and Southeast Asia.

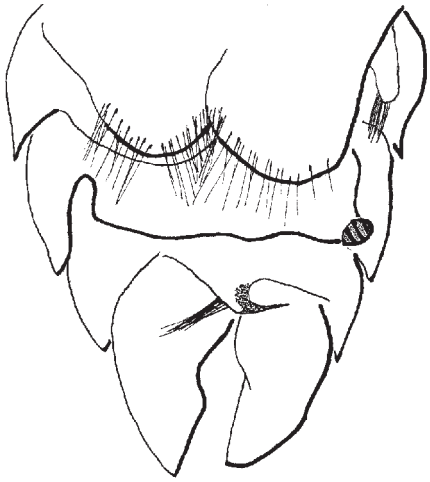
ADDITIONAL REFERENCES: Polhemus & Golia [in press]; Nieser 2002a; Nieser & Chen 1999a; Wroblewski 1972a.

Florida species

M. ludibunda Breddin

GENUS *Palmacorixa*

DIAGNOSIS: Posterior margin of head strongly curved; interocular space less than width of one eye; pronotum very short; male with two setose lobes on the posterior margin of tergite IV and a hook-like sclerotized projection on posteromedian margin of tergite VII; males with dextral symmetry, with a strigil.



male terminal abdominal segments

P. buenoi

NOTES: One species, *P. buenoi* (length 4.3-6.0 mm) is known from Florida. Three other species occur in North America; one of these, *P. nana* Walley, is recorded from North Carolina and might be found in Florida. It is separated from *P. buenoi* by having a longitudinal row of pegs on the male's mid femur; *P. buenoi* lacks these pegs.

ADDITIONAL REFERENCES: Hungerford 1948a; Herring 1951a.

Florida species

P. buenoi Abbbott

GENUS *Ramphocorixa*

DIAGNOSIS: Base of palar claw serrated in both sexes; hemelytral pattern very weak; male pala deeply incised dorsally; males with dextral symmetry, with strigil.

R. acuminata, male pala

R. acuminata, male

NOTES: One species, *R. acuminata* (length 5.0-5.5 mm), is known from Florida. Males are easily recognized by the pointed forehead ("acuminate", thus the species' name) and the deeply incised pala. Females are identified by their pallid appearance and the serrated basal portion of the palar claw (both characters also shared by the male).

This species is often associated with crayfish (*Orconectes* and *Procambarus*); Wilson (1958a) provided a review of the various papers dealing with this phoretic relationship.

ADDITIONAL REFERENCES: Hungerford 1948a; Wilson 1958a.

Florida species

R. acuminata (Uhler)

GENUS *Sigara*

DIAGNOSIS: Smaller corixids, length < 6 mm; pronotum and/or clavus rastrate or rugulose, or both; males with dextral symmetry, with strigil.

S. berneri

S. zimmermanni

NOTES: *Sigara* is one of the largest genera of corixids, with over 200 species divided into 17 subgenera (on a world-wide basis). With this current study, ten *Sigara* species are now recorded from Florida, and more will likely be found here. Along with some *Trichocorixa*, several *Sigara* species are our smallest corixids with a hidden scutellum.

In the key below I have adopted a conservative approach and have based the key on males, but females of some species will key up to couplet 5. For most species, I have included figures of the right paramere of the male genitalia; for more detailed genitalic figures, see Hungerford (1948a).

ADDITIONAL REFERENCES: Hungerford 1948a; Hungerford & Hussey 1957a; Herring 1951a.

Florida species

S. berneri Hungerford & Hussey
S. bradleyi (Abbott)
S. hubbelli (Hungerford)
S. macropala (Hungerford)
S. macrocepsoidea Hungerford
S. paludata Hungerford
S. scabra (Abbott)
S. sigmoidea (Abbott)
S. signata (Fieber)
S. zimmermanni (Fieber)

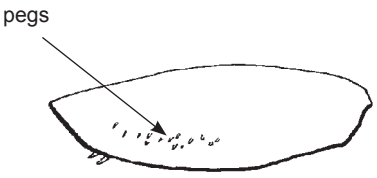
Key to adult male *Sigara* of Florida

S. berneri

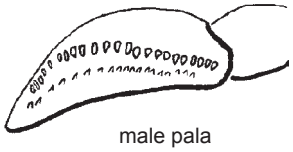
1 Pronotum with median longitudinal light stripe .. 2

1' Pronotum without median light stripe 3

2(1) Hind femur with a loosely organized row of numerous small pegs dorsally; pala with about 24 pegs; right paramere with blunter, straight apex ..... ***S. berneri***



hind femur

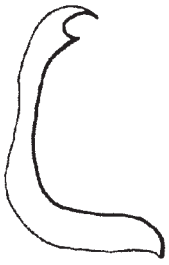


male pala
(setae omitted)

male right paramere

2' Hind femur without small pegs dorsally; pala with 15-18 pegs, with basal 3 smaller than others; right paramere with acute, curved apex .... ****S. mississippiensis***
(not known from Florida; see Notes on species)

male pala
(setae omitted)



male right paramere

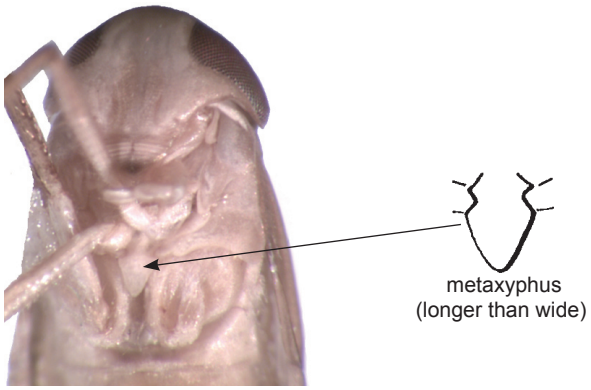
S. hydatotrephes

3(1') Clavus and corium almost solid black, with no reticulate or linear pattern ..... ****S. hydatotrephes***
(not known from Florida; see Notes on species)

3' Clavus and corium with reticulate or linear pattern of light and dark areas 4

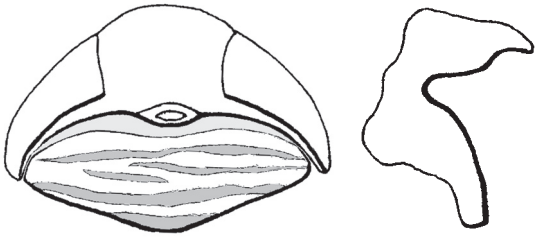
4(3') Metaxyphus longer than wide 5

4' Metaxyphus not longer than wide 6

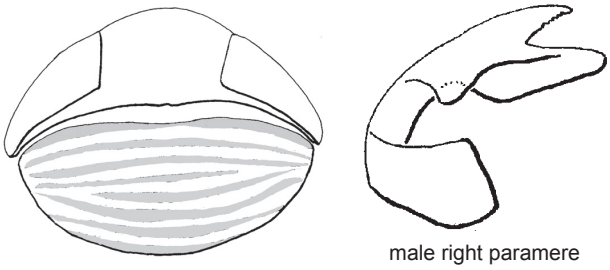


S. macrocepsoidea, ventral view

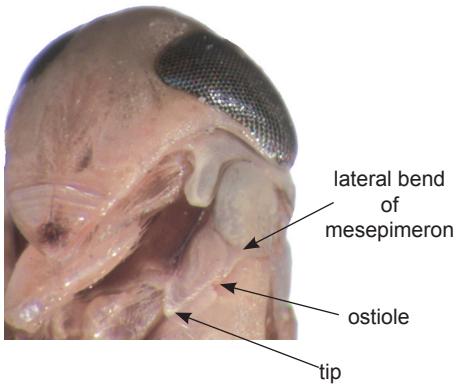
5(4) Very small, length 2.8-3.6 mm; pronotum shorter than head in dorsal aspect; pronotum with only about 3-4 transverse pale lines; right paramere without folds .... ***S. macrocepsoidea***



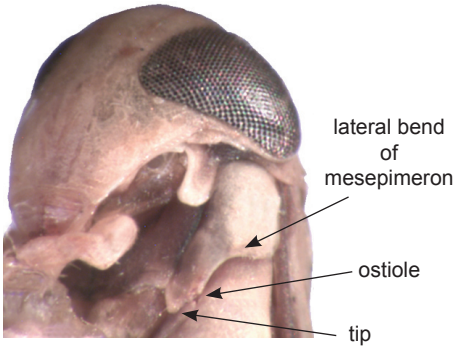
5' Much larger, length 4.6-5.2 mm; pronotum longer than head in dorsal aspect; pronotum with about 6-7 transverse pale lines; right paramere complexly folded ..... ***S. signata***



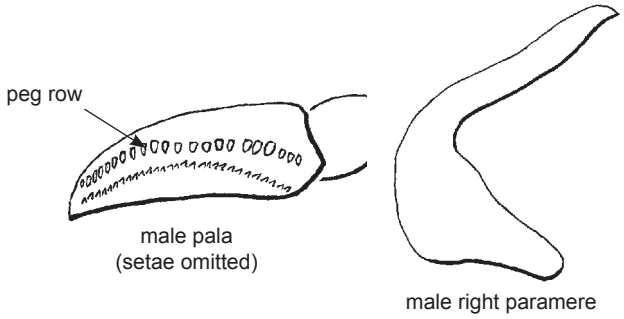
6(5') Scent gland ostiole located closer to lateral bend of mesepimeron than to its tip 7



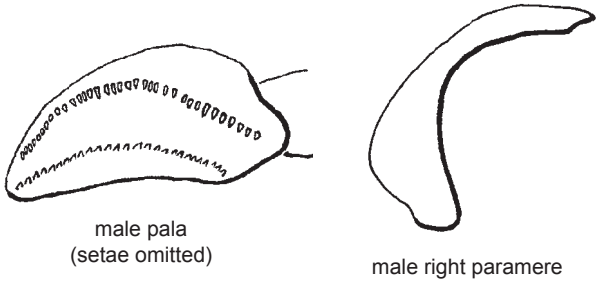
6' Scent gland ostiole closer to tip of mesepimeron than lateral bend 8



7(6) Peg row of male pala with about 22 pegs near center; pala of female slightly depressed dorsally; male right paramere . ..... ***S. gordita***
(not known from Florida; see Notes on species)

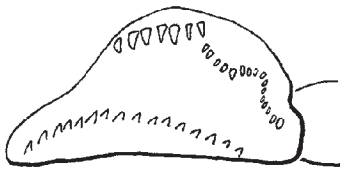


7' Peg row of male pala with 30 or more pegs near dorsal margin; pala of female not depressed ..... ***S. modesta***
(not known from Florida; see Notes on species)

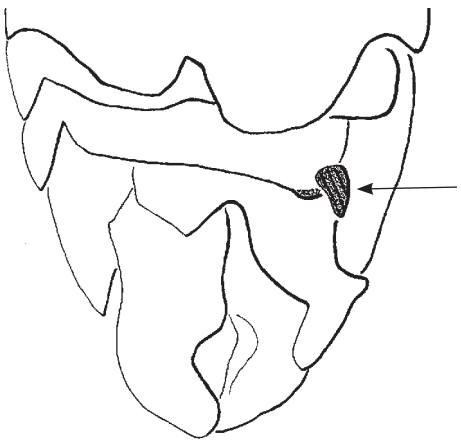


8(6') Dorsal margin of pala gradually curved from base to apex .. 9

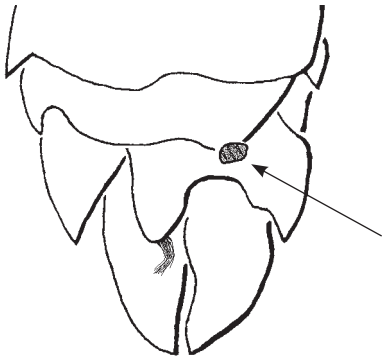
8' Dorsal margin of pala with a proximal or medial hump 13



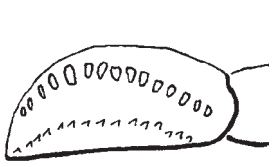
9(8) Strigil located on lateral margin of tergite VI 10



9' Strigil located on posterior margin of tergite VI 12



10(9) Length < 4 mm; male pala and right paramere as figured ..... ***S. bradleyi***

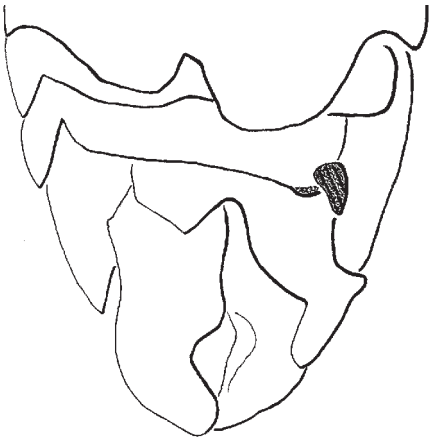


male pala
(setae omitted)

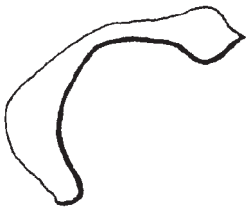
male right paramere

10' Length > 4 mm; pala and paramere not as above 11

11(10') Strigil triangular, wider at top than bottom; right paramere with expanded apex, with central point .... ***S. zimmermanni***

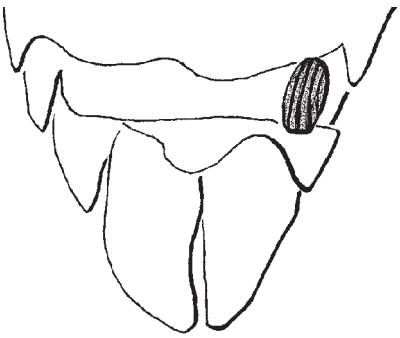


male pala
(setae omitted)



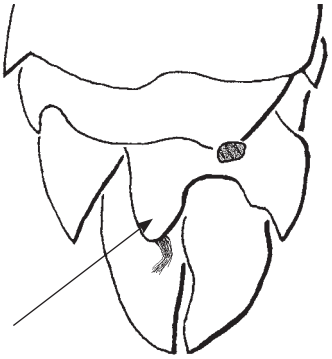
male right paramere

11' Strigil oval or wider at bottom than top; right paramere without expanded apex ..... ****S. virginiensis***
(not known from Florida; see Notes on species)



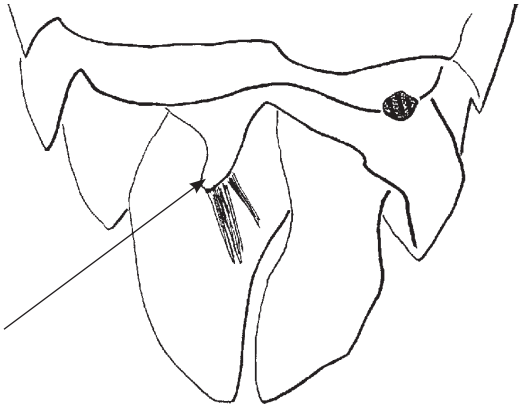
male right paramere

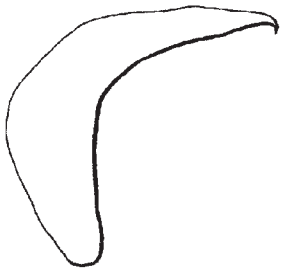
12(9') Transverse lines on clavus absent or incomplete at inner base; reticulate pattern on membrane well developed; posteromedial lobe of tergite VII with single tuft of setae; right paramere sinuate subapically, with straight pointed apex ..... ***S. hubbelli***



male right paramere

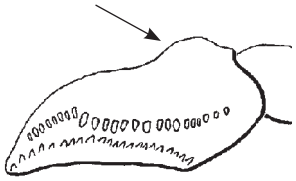
12' Transverse lines on clavus well developed across base; reticulate pattern on membrane weak or obscure; posteromedial lobe of T VII narrower, with 2 setal tufts; right paramere with tip deflexed ..... ***S. scabra***



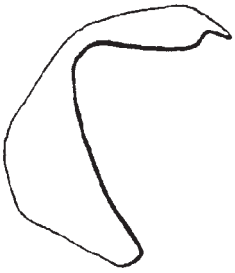


male right paramere

13(8') Pala with small proximal hump; right paramere expanded before pointed apex ..... ****S. pectenata***
(not known from Florida; see Notes on species)



male pala
(setae omitted)

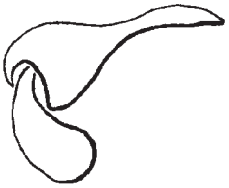


male right paramere

13' Pala with larger medial hump; paramere not as above 14

14(13') Peg row on pala discontinuous, with about 4 smaller separate pegs near dorsal margin; right paramere with apparent sheath ..... ***S. paludata***

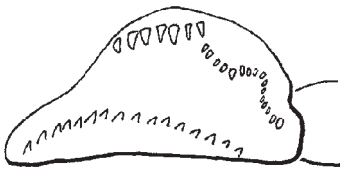
male pala
(setae omitted)



male right paramere

14' Peg row on pala continuous or almost so; paramere without sheath 15

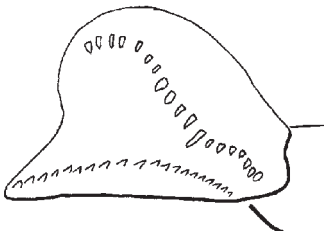
15(14') Pala with lower dorsal hump and peg row strongly sinuate near base; right paramere with simple acute apex; common ..... ***S. sigmoidea***



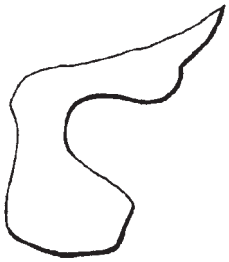
male pala
(setae omitted)

male right paramere

15' Pala with higher dorsal hump and peg row not as sinuate near base; right paramere with preapical ventral lobe; uncommon ..... ***S. macropala***



male pala
(setae omitted)



male right paramere

Note on species

S. berneri - Length 4.4-4.8 mm. A new record for Florida. Originally described (Hungerford & Hussey 1957a) and known only from a series taken from one pond in Seminole County, Georgia, that has since been flooded by the Jim Woodruff Dam. I have collected it from a pond on Bald Point in Franklin County, and Dr. John T. Polhemus has provided me with a record from the Chipola River in Calhoun County. This might lead one to believe that it is found only in north Florida and south Georgia. However, Bob Rutter has collected it from an herbaceous wetland near Stuart, St. Lucie County. Note that the name is misspelled *berenri* on page 91 of Hungerford & Hussey (1957a) (an obvious printer's error), but is spelled correctly on the plate on page 90.

S. bradleyi - Length 2.9-3.6 mm. The most common of the tiny (< 4 mm) *Sigara* in Florida, and one of the more common members of the genus in Florida.

S. hubbelli - Length 4.6-5.6 mm. Uncommon in Florida.

S. macrocepsoidea - Length 2.8-3.6 mm. A new record for Florida (but expected; the type series is from the Okefenokee Swamp in Georgia), with many specimens from the Camp Blanding Wildlife Management Area in Clay County, collected by Dr. Marc Minno and his wife Maria. Specimens were collected from a pitcher plant seep (along with *S. paludata*) and a sphagnum seep in April through June. This is the smallest of the North American *Sigara*.

S. macropala - Length 5.3-5.5 mm. I have not seen this species from Florida; Polhemus et al. (1988a) record it from Florida.

S. paludata - Length 3.4-3.9 mm. A new record for Florida. I've examined one male and two females collected in Walton County (Eglin Air Force Base) in April. I've also examined numerous specimens from the Camp Blanding Wildlife Management Area (Clay Co.), where it was collected from a pitcher plant seep along with *S. macrocepsoidea* (see above). The right paramere of the male genitalia is unlike that of any other Florida *Sigara.*

S. scabra - Length 4.0-5.0 mm. A new record for Florida; one male from the Camp Blanding Wildlife Management Area (Clay Co.), collected from a sphagnum depression in February.

S. sigmoidea - Length 4.1-4.5 mm. Relatively common in Florida.

S. signata - Length 4.6-5.2 mm. I have not seen this species from Florida; Dr. John T. Polhemus has provided me with a record from Levy County.

S. zimmermanni - Length 4.5-5.0 mm. One of the more common *Sigara* species in Florida.

Other species

S. gordita (Abbott) - Length 4.0-4.5 mm. Recorded from Georgia in the Southeast, and may eventually be found in Florida.

S. hydatotrephes (Kirkaldy) - Length 5.3-6.0 mm. Recorded from Alabama , Georgia and North Carolina in the Southeast, and may eventually be found in Florida.

S. mississippiensis Hungerford - Length 3.9-4.8 mm. Recorded from Alabama, Georgia, Mississippi and South Carolina in the Southeast, and may eventually be found in Florida.

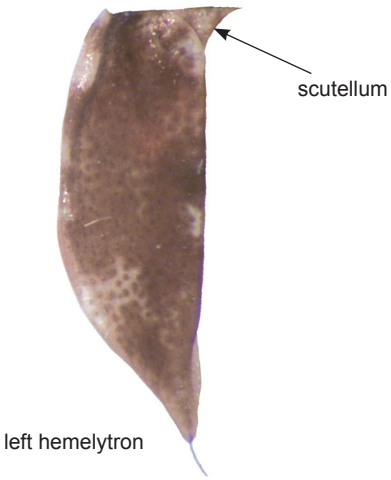
S. modesta (Abbott) - Length 4.6-5.7 mm. Recorded from Louisiana (Slidell) and Mississippi, and may eventually be found in Florida; also reported from Puerto Rico.

S. pectenata (Abbott) - Length 4.5-5.0 mm. Recorded from Alabama and Georgia in the Southeast, and may eventually be found in Florida.

S. virginiensis Hungerford - Length 4.2-5.7 mm. Recorded from Georgia and North and South Carolina in the Southeast, and may eventually be found in Florida.

GENUS *Synaptonecta*

DIAGNOSIS: Very small corixids; fore tibia and pala fused in both sexes; scutellum exposed; hemelytra with freckled/motled appearance and usually strongly tapered posteriorly; males with dextral symmetry, with strigil.



S. issa

NOTES: Introduced into Florida, probably via the aquarium plant industry, from Southeast Asia (Polhemus & Rutter 1997a). This tiny (length about 2.2 mm) oddball corixid resembles a flattened ostracod or pleid. Along with *Micronecta ludibunda*, it represents two recently (?) introduced taxa in Florida waters. Like *M. ludibunda, S. issa* is widespread and common in Southeast Asia.

Note that the specimens figured above represent the brachypterous (short-winged) form. This is the only form I have seen from Florida. Being brachypterous and incapable of flight, these bugs will only be collected by dip net or similar means; it may be possible to collect macropterous specimens, capable of flight, at black light traps, etc. The macropterous form is not as pointed and more resembles *Micronecta*, but still has the freckled appearance as opposed to the longitudinal stripes of *M. ludibunda*.

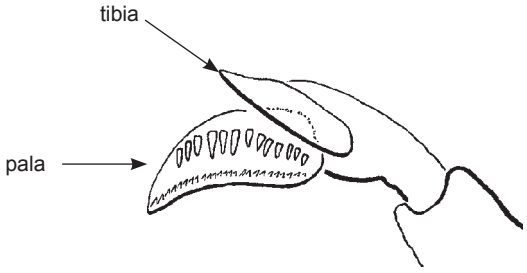
ADDITIONAL REFERENCES: Polhemus & Rutter 1997a; Nieser 2002a; Wroblewski 1972a.

Florida species

S. issa (Distant)

GENUS *Trichocorixa*

DIAGNOSIS: Smaller corixids, length < 5.6 mm; male tibia produced apically over the pala; apices of clavi do not reach or barely extend beyond a transverse line drawn across the nodal furrows, or nodal furrows apparently absent; males with sinistral symmetry, with strigil.



T. minima male pala
(setae omitted)

T. sexcincta

NOTES: *Trichocorixa* is the most commonly collected corixid genus in Florida; seven species are recorded from the state. It is not unusual to collect several species of *Trichocorixa* at the same site and time. These corixids are found in all types of water bodies, including brackish or salt water.

In the following key I have included figures of the left paramere of the male genitalia for most species. In most instances it is not necessary to dissect the male genitalia for identification, but for some taxa it may aid in that endeavor.

ADDITIONAL REFERENCES: Sailer 1948a; Herring 1951a.

Florida species

T. calva (Say)
T. kanza Sailer
T. louisianae Jaczewski
T. minima (Abbott)
T. reticulata Guérin-Méneville
T. sexcincta (Champion)
T. verticalis (Fieber)

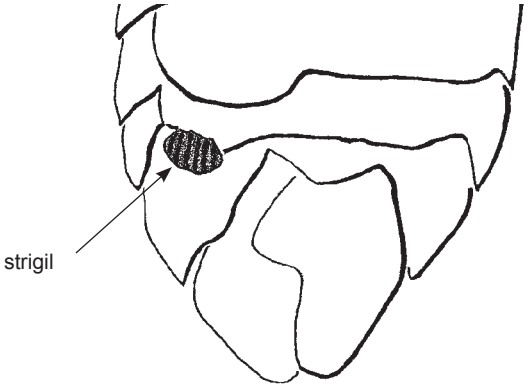
Key to adult *Trichocorixa* of Florida

1 Pronotum very short, length about 1/4 of width .. ***T. macroceps***
(not known from Florida, but may eventually be found here)

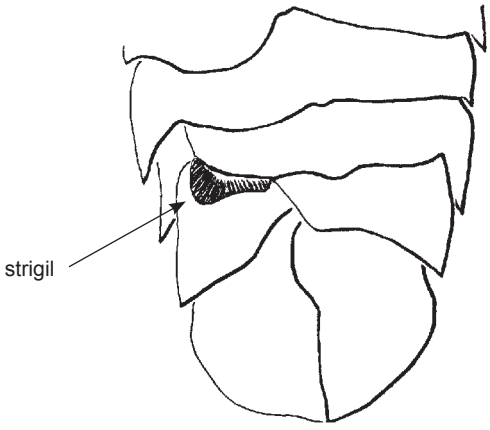
1' Pronotum normal, about 1/3 as long as wide .. 2

2(1') Males, with abdomen asymmetrical, with oval or linear strigil at left posterior margin of tergite VI (see figures below in couplet 3) 3

2' Females, abdomen symmetrical, without strigil 9

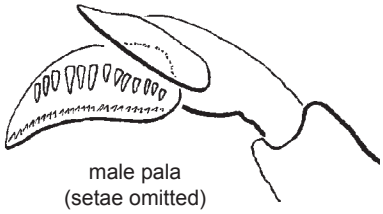


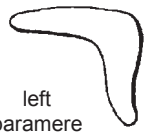
3(2') Strigil approximately circular or oval in outline 4



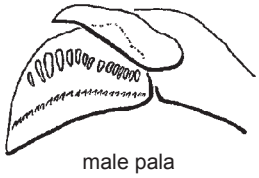
3' Strigil linear (straight or approximately L-shaped) 5

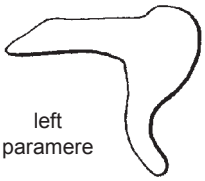
4 Pronotum with black crossbands separated by 5 or fewer yellow lines; pala with peg row almost straight and parallel to ventral margin; left paramere as figured ..... ***T. minima***



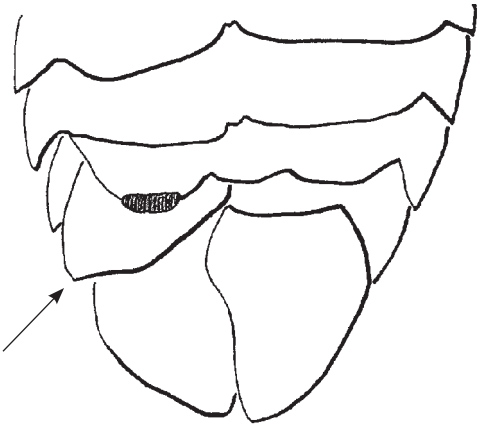


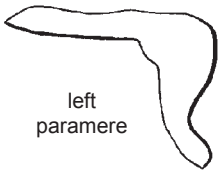
4' Pronotum with black crossbands separated by 6 or more yellow lines; pala with peg row more distinctly curved; left paramere as figured ..... ***T. sexcincta***



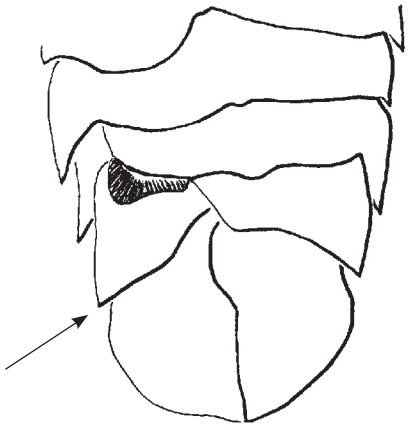


5(3') Left apex of tergite VII rounded; left paramere as figured ..... ***T. reticulata***

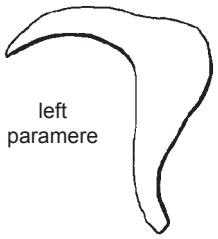


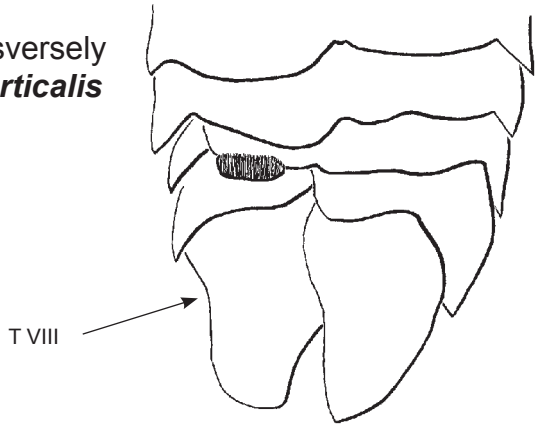


5' Left apex of tergite VII sharply pointed 6



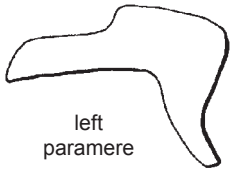
6(5') Left margin of tergite VIII slightly concave; strigil transversely straight; left paramere as figured ..... ***T. verticalis***

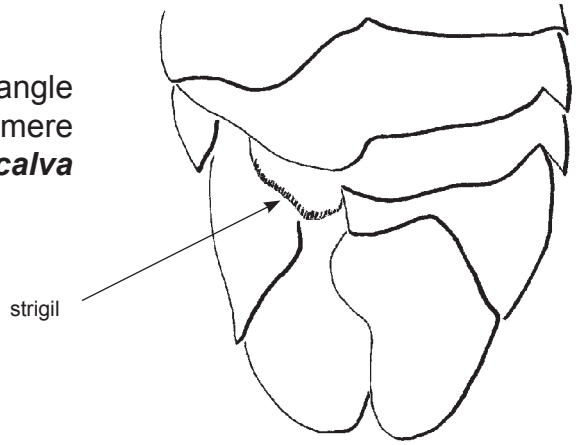




6' Left margin of tergite VIII rounded; strigil angled or curved anteriorly (figs. below) 7

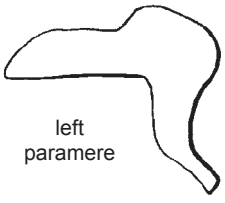
7(6') Strigil very thin, running at approximate 45° angle on left posterior margin of tergite VI; left paramere as figured ..... ***T. calva***

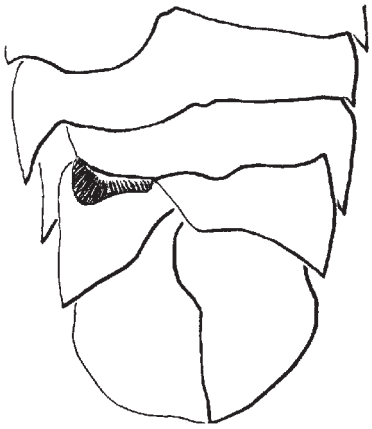




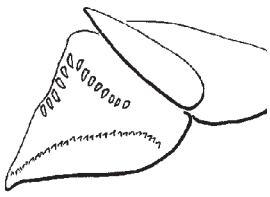
7' Strigil thicker, L-shaped, turning at approximate 90° angle (figs. below) 8

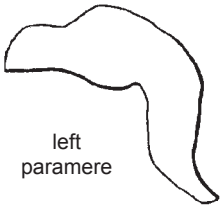
8(7') Strigil widest near upward bend, with bend at about 90° angle; anterior margin of pala less steeply sloped; left paramere as figured .. ***T. louisianae***

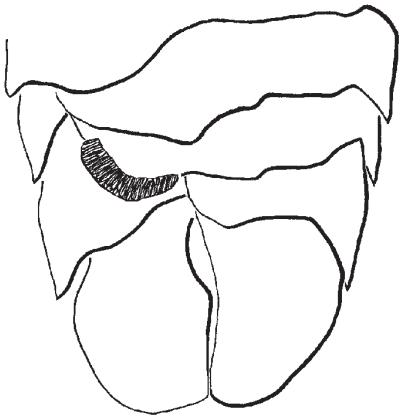




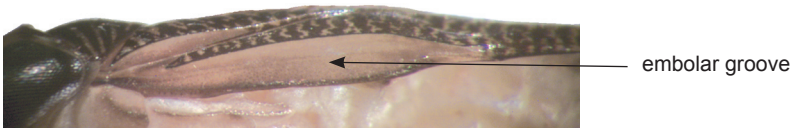
8' Strigil uniformly wide throughout most of length, with bend at approximate 45° angle; anterior margin of pala more steeply sloped; left paramere as figured ..... ***T. kanza***



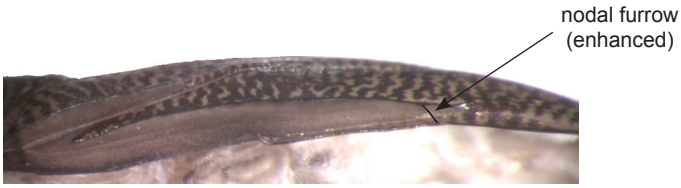




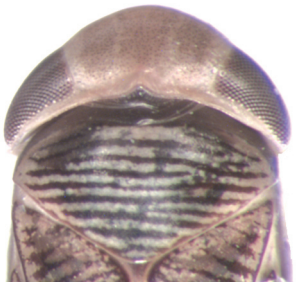
9(2') Nodal furrow apparently absent or located at very end of embolar groove 10



9' Nodal furrow divides embolar groove into proximal and distal portions (there may only be a very small distal portion) 12

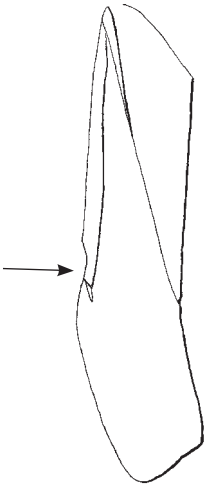


10(9) Interocular space greater than width of one eye along hind margin ..... ***T. reticulata***

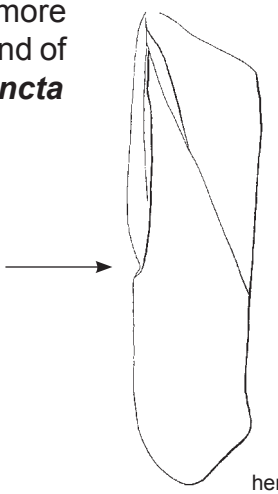


10' Interocular space less than width of one eye along hind margin 11

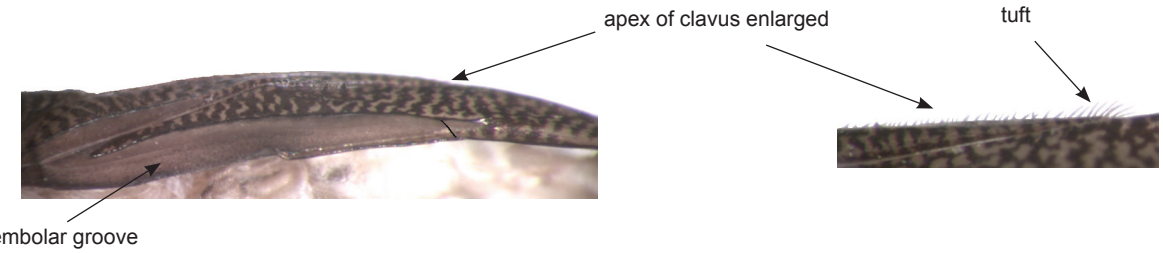
11(10') Pronotum with black crossbands separated by 5 or fewer yellow lines; hemelytron slightly indented laterally anterior to nodal furrow .... ***T. minima***



11' Pronotum with black crossbands separated by 6 or more yellow lines; hemelytron deeply indented laterally near end of nodal furrow ..... ***T. sexcincta***

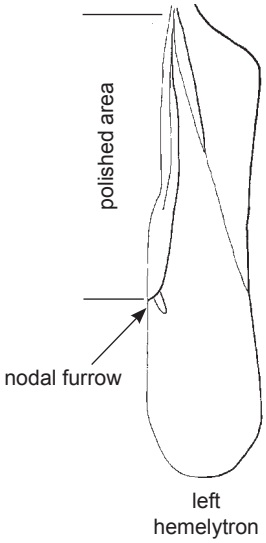


12(9') Clavus with tuft of setae at apex ..... ***T. louisianae***



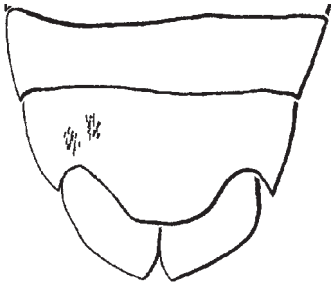
12' Clavus with at most 2 or 3 setae at apex 13

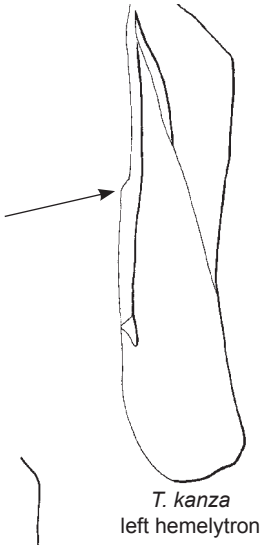
13(12') Polished area along costal margin of hemelytron anterior to nodal furrow less than or equal to length of mid tibia .... ***T. verticalis***



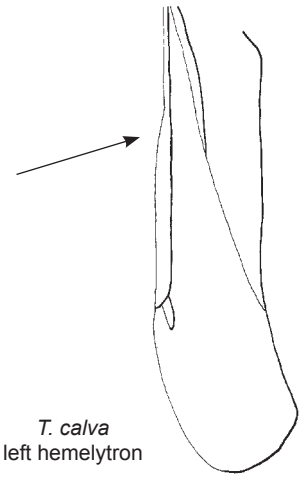
13' Polished area along costal margin of hemelytron anterior to nodal furrow greater than length of mid tibia 14

14(13') Outer margin of hemelytron widens abruptly; 2 or more patches of bristle-like setae on right side of sternite VII ..... ***T. kanza***





14' Outer margin of hemelytron widens more gradually; only slightly longer setae on right side of sternite VII ..... ***T. calva***



Notes on species

T. calva - Length 3.8-4.6 mm. This uncommon (in Florida) species appears to be found only in the northern part of the state, from about Gainesville northward.

T. kanza - Length 4.2-4.5 mm. Uncommon.

T. louisianae - Length 3.6-4.6 mm. A common species throughout Florida.

T. minima - Length 3.2-3.8 mm. Common in northern Florida.

T. reticulata - Length 2.8-5.2 mm. In Florida, *T. reticulata* is apparently found mostly in the southern portion of the state. This species, most often found in saline habitats, is not covered in the key of Sanderson (1982a) and thus may have been missed by workers using that key to identify Florida *Trichocorixa*.

T. sexcincta - Length 3.3-4.4 mm. A common species in northern Florida.

T. verticalis - Length 2.9-4.4 mm. One of the more common species in Florida; it appears to be more common through the peninsula than *T. minima* or *T. sexcincta*, which appear to be more common than *T. verticalis* in the more northern portion of the state (Suwannee River basin northward). Although Herring (1951a) stated that this taxon appeared to be confined to the coast in Florida, I have seen many specimens collected far from the coast (or at least as far as one can get from the coast in Florida!). There are several subspecies described for this taxon; ours is *T. verticalis verticalis*.

Other species

T. macroceps (Kirkaldy) - Length 2.8-3.2 mm. Not recorded from Florida, but with records from Alabama, southern Georgia (Okefenokee Swamp) and South Carolina, it should eventually be found here.

FAMILY GELASTOCORIDAE
toad bugs

4

DIAGNOSIS: Adults and nymphs are distinguished by the short, thick antennae inserted beneath the eyes and thus not visible from above; beak cylindrical and short, not reaching hind coxae; raptorial front legs, with one tarsal segment or with tarsus fused to tibia; fore femora broadened; mid and hind legs with two tarsal segments and not fringed with swimming setae; and general toad-like appearance.

Nerthra stygica adult

Gelastocoris oculatus adult

NOTES: The habit of hopping when disturbed, along with their warty appearance, gives these interesting insects the common name of “toad bugs”. The most common toad bugs (*Gelastocoris*) are usually found along the edges of streams, pond and lakes, where they prey on a variety of small insects; the more secretive *Nerthra* rarely move unless disturbed and may be found far from water.

This small family consists of only two genera; *Gelastocoris* is confined to the New World, while *Nerthra* is distributed world-wide.

ADDITIONAL REFERENCES: Todd 1955a; Menke 1979e; Polhemus & Polhemus 1988a.

Florida genera

Gelastocoris Kirkaldy
Nerthra Say

GELASTOCORIDAE

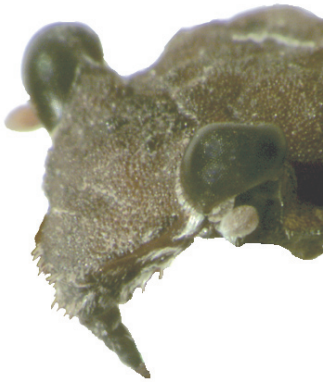
Key to adults and nymphs of Gelastocoridae of Florida

1 Fore leg with one apical claw ..... adult ***Nerthra***

1' Fore leg with 2 apical claws 2

2(1') Fore tarsus fused to fore tibia; pronotum at base of head wider at front than eyes; beak apparently arising from back of head; fore femora broadly triangular ..... nymphal ***Nerthra***

2' Fore tarsus separate from tibia; pronotum at base of head as wide as eyes; beak arising from front of head; fore femora not broadly triangular ..... ***Gelastocoris***

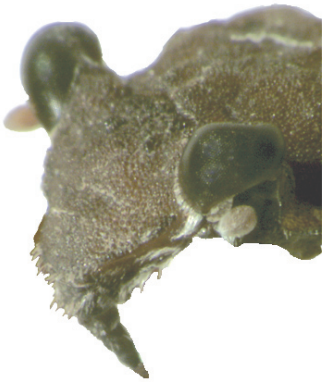


GENUS *GELASTOCORIS*

DIAGNOSIS: Adults and nymphs with fore tarsus separate from tibia, with 2 claws; fore femora not broadly expanded; beak arising from front of head; pronotum at base of head about as wide as eyes; color varies from drab brown to orangish yellow/brown to white.

NOTES: Only one species, *Gelastocoris oculatus* (length about 6-9 mm), is found in Florida; it occurs throughout the United States. The nominate subspecies, *G. o. oculatus*, is the only one found in eastern North America; another subspecies is found in Texas and an additional species of *Gelastocoris* occurs in the western US.

G. oculatus adult



G. oculatus adult, head

G. oculatus adult, foreleg

ADDITIONAL REFERENCES: Todd 1955a; Menke 1979e.

Florida species

G. oculatus oculatus (Fabricius)

GENUS *Nerthra*

DIAGNOSIS: Adults and nymphs with fore tarsus fused with tibia, adults with single claw, nymphs with 2 claws; fore femora broadly expanded; beak apparently arising from posterior of head; pronotum at base of head wider than eyes; color always drab.

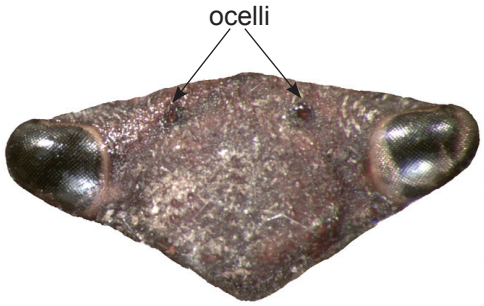
Nerthra sp. adult

NOTES: Three species of *Nerthra* are found in Florida. *Nerthra stygica* is the more common species, recorded from Pensacola to Jacksonville, south to the Keys. *Nerthra rugosa* is rare and *N. fuscipes* is known in the state from only one specimen.

Although most gelastocorids are shore line insects, *Nerthra* species (not those known from Florida) have been found in water under floating wood and under stones, in addition to terrestrial debris and rotting plants. Florida *Nerthra* are usually found under boards or stones, or in litter, often far from water. *Nerthra* species are very secretive and rarely move unless disturbed.

N. fuscipes adult female

Nerthra are often plated with dirt and detritus; this must be gently removed from the head in order to observe the presence or absence of ocelli (simple eyes).



frontal view of head

ADDITIONAL REFERENCES: Todd 1955a; Polhemus 1972a; Polhemus & Lindskog 1994a.

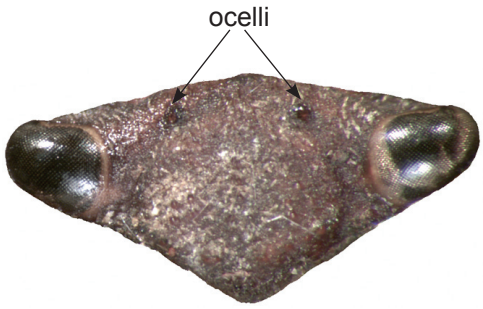
Florida species

N. fuscipes (Guérin-Méneville)
N. rugosa (Desjardins)
N. stygica Say

Key to adult *Nerthra* of Florida

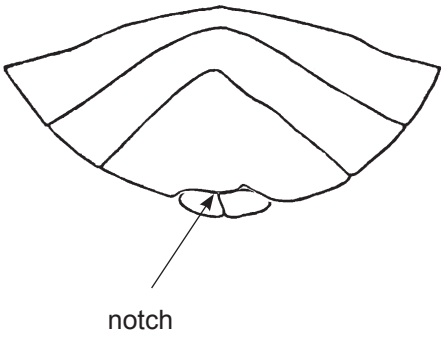
1 Ocelli absent; hemelytra (forewings) fused over back ..... ***N. rugosa***

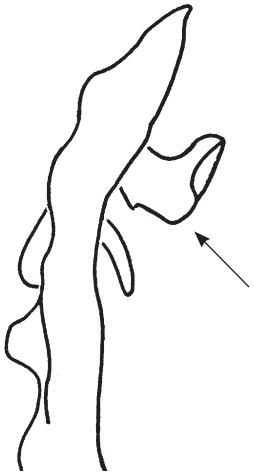
1' Ocelli present; hemelytra fused or not 2



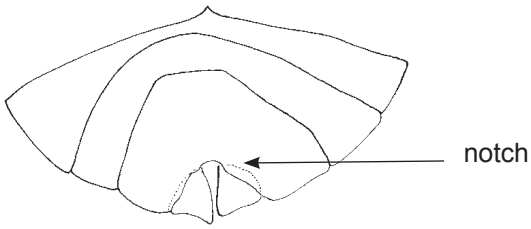
frontal view of head

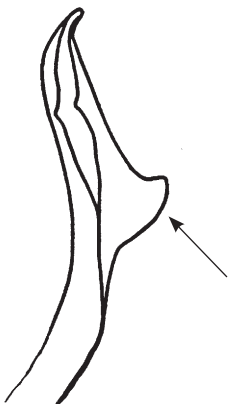
2(1') Hemelytra not fused; female apical sternites nearly symmetrical with shallow notch; male paramere with large subapical projection ..... ***N. fuscipes***





2' Hemelytra fused; female apical sternites asymmetrical with a deep triangular notch; male paramere with small subapical tooth ..... ***N. stygica***





Notes on species

N. fuscipes - Length 8-11 mm. One specimen of this species has been collected in the Tampa area. This bug is probably the result of an introduction; the species' normal range is Mexico through Central America south to Brazil. Polhemus (1972a) noted that this is the most abundant species throughout eastern and southern Mexico and Central America.

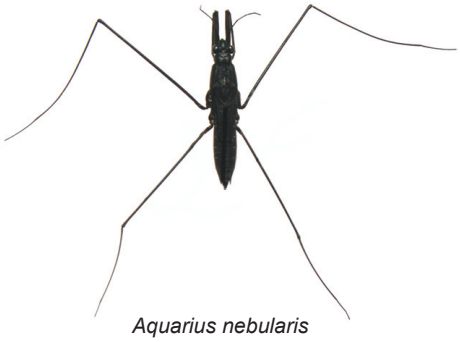
N. rugosa - Length 6-7 mm. Only the female of this species has been formally described, but it is now known from females and a male from Matheson Hammock (J.T. Polhemus, pers. comm.). Interestingly, *N. rugosa* was originally described from Mauritius, an island in the Indian Ocean; it is also recorded from Panama. In Florida, *N. rugosa* is known from specimens from the Miami area (Matheson Hammock), Biscayne and the Keys.

N. stygica - Length 6-8 mm. This is the species most likely to be encountered in Florida, recorded from Pensacola to Jacksonville, south to the Keys.

FAMILY GERRIDAE
water striders

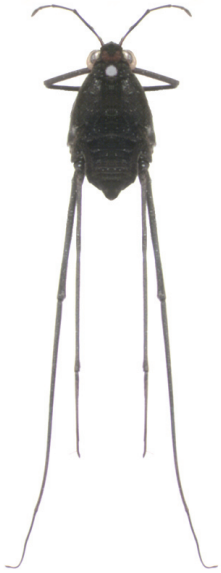
5

DIAGNOSIS: Very small to moderately large surface-dwelling bugs with antennae visible from above; head without dorsal median groove or stripe (except *Rheumatobates*); tarsal claws preapical; hind femora extend well beyond apex of abdomen.



Aquarius nebularis

Halobates micans



Metrobates anomalus

Trepobates inermis

NOTES: Gerrids are very common and familiar surface inhabitants of standing and flowing water; some are marine pelagic.

Hungerford & Matsuda (1960a) offered a key to genera of the world, but this has been superseded by the keys in Andersen (1982a). Matsuda (1960a) did an in depth analysis of gerrid morphology and classification.

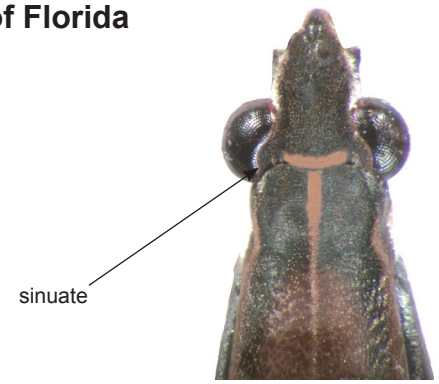
ADDITIONAL REFERENCES: Andersen 1982a; Herring 1950a; Polhemus & Chapman 1979f; Smith 1988a; Hungerford & Matsuda 1960a; Matsuda 1960a.

Florida genera

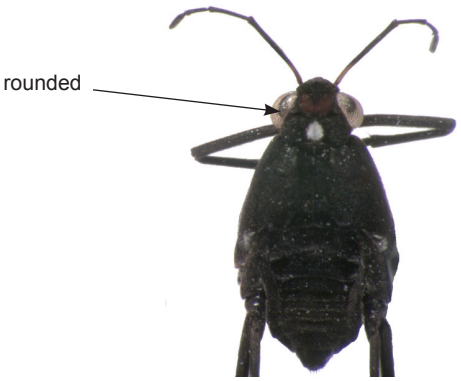
Aquarius Schellenberg
Gerris Fabricius
Halobates Eschscholtz
Limnogonus Stål
Limnoporus Stål
Metrobates Uhler
Neogerris Matsumura
Rheumatobates Bergroth
Trepobates Uhler

Key to genera of adult Gerridae of Florida

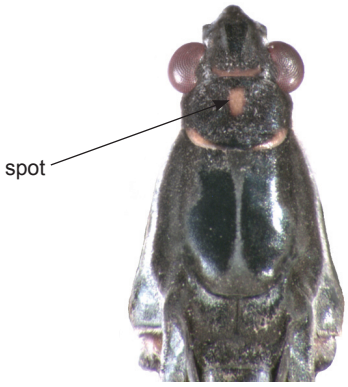
1 Dorsal inner margin of eye sinuate; body long and relatively narrow 2



1' Dorsal inner margin of eye rounded or almost straight; body short and broad 6



2(1) Pronotum shiny, with either a central spot or a pair of yellow-orange stripes 3



shiny pronotum

dull pronotum

2' Pronotum dull, with a single central stripe or no apparent markings 4

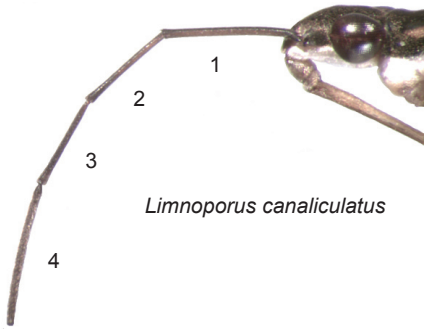
3(2) Pronotum with a central spot; common .... ***Neogerris***

3' Pronotum with a pair of stripes; rare .... ***Limnogonus***

Neogerris

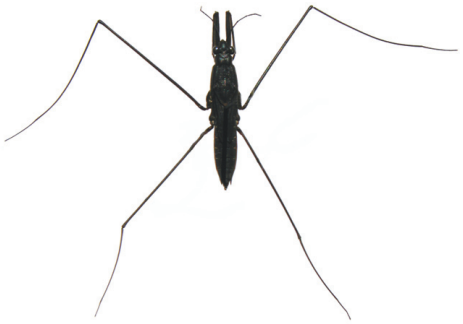
Limnogonus

4(2') Antennal segment 1 shorter, length at least 80% or less than combined lengths of segments 2 and 3 ..... ***Limnoporus***

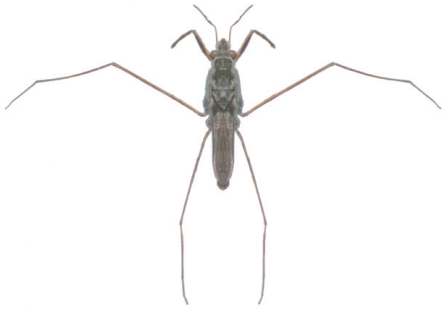


Limnoporus canaliculatus

4' Antennal segment 1 longer, length 90% or more than combined lengths of segments 2 and 3 5



5(4') Body length > 11 mm; hind tibia at least 4 times as long as first tarsal segment ..... ***Aquarius***



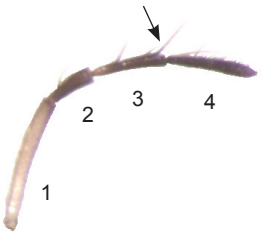
5' Body length ≤ 11 mm; hind tibia not more than 3.2 times as long as first tarsal segment ..... ***Gerris***

6(1) Tibia and 1st tarsal segment of middle leg with fringe of long setae; marine pelagic (but may be washed ashore after storms) ..... ***Halobates***

6' Tibia and 1st tarsal segment of middle leg without fringe of long setae; fresh or brackish water or marine coastal 7

7(6') Third antennal segment with several large bristles that are at least as long as width of segment; first antennal segment length much less than combined length of remaining segments; abdomen as long as rest of body; males often with complexly modified antennae and strongly arched hind femora; female with large serrated ovipositor ..... ***Rheumatobates***

male with modified mid and hind legs



unmodified antenna

modified male antenna


female venter

7' Third antennal segment with fine setae or an apical tuft of short setae, none as long as width of segment; abdomen shorter than rest of body OR if subequal, then first antennal segment length about equal to length of remaining segments; males without complexly modified antennae and strongly arched hind femora; female without large serrated ovipositor 8

8(7') Length of first antennal segment about the same as combined length of remaining 3 segments; antennal segments 2 and 3 swollen distally, with apical tufts of short setae, most noticeable in male; body mostly dark and dull, velvety ..... ***Metrobates***

8' First antennal segment length much shorter than combined length of remaining 3 segments; antennal segments not swollen distally and without apical tufts; body often brightly colored, if dark then appears somewhat shiny ..... ***Trepobates***

GENUS *Aquarius*

DIAGNOSIS: Large, length > 11.5 mm; dorsal inner margins of eyes sinuate; pronotum shiny, with a single central stripe or no apparent markings; hind tibia at 4 times as long as first tarsal segment.

A. nebularis

NOTES: The largest of our gerrids are those of the genus *Aquarius*, which was formerly considered a subgenus of *Gerris*.

Aquarius nebularius is the most commonly encountered species of the genus in Florida; it prefers swift flowing, sand bottomed creeks (Herring 1950a); the other two species appear to be quite rare in Florida.

ADDITIONAL REFERENCES: Drake & Harris 1928a; Herring 1950a; Polhemus & Chapman 1979f; Smith 1988a.

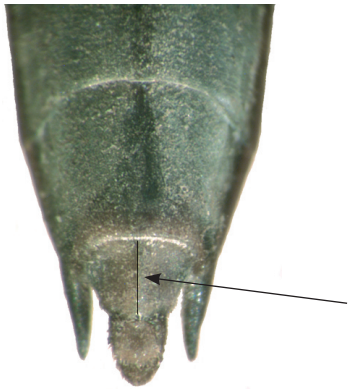
Florida species

A. conformis (Uhler)
A. nebularis (Drake & Hottes)
A. remigis (Say)

Key to adult *Aquarius* of Florida

1 Males (apparent 7th abdominal sternite not medially divided) 2

male



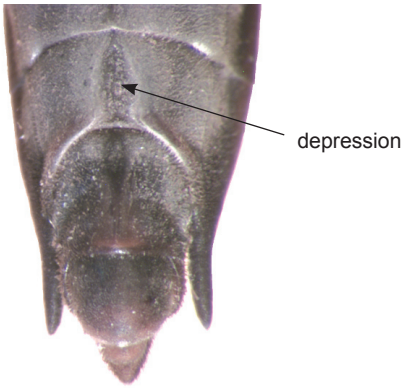
female

1' Females (apparent 7th abdominal sternite medially divided) 4

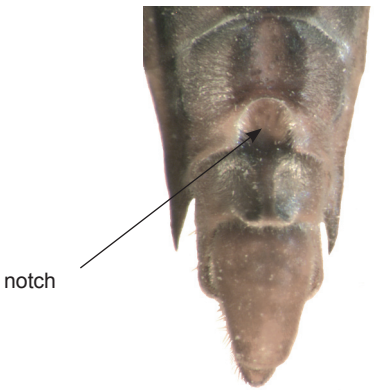
2(1) Posterior margin of apparent 6th abdominal sternite smoothly concave ..... ***A. conformis***

2' Posterior margin of apparent 6th sternite medially notched or depressed (see below) 3

3(2') Posterior margin of apparent 6th sternite with long medial depression; connexival spines long ..... ***A. nebularis***



A . nebularis



A . remigis

3' Posterior margin of apparent 6th sternite medially notched; connexival spines short .... ***A. remigis***

4(1') Antennal segment 1 distinctly longer than 2 and 3 combined ..... ***A. conformis***

4' Antennal segment 1 about as long as or shorter than 2 and 3 combined 5

5(4') Connexival spines short ..... ***A. remigis***

5' Connexival spines long ..... ***A. nebularis***

Notes on species

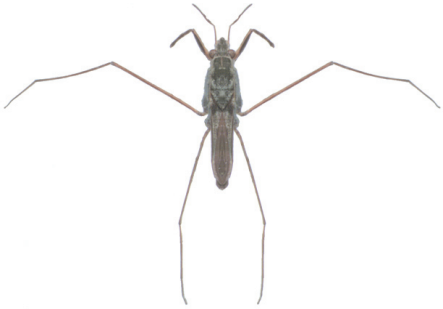
A. conformis - Length 15.0-16.5 mm. Obviously not common in Florida; I've seen material only from Columbia County.

A. nebularis - Length 14-16 mm. The most common *Aquarius* in Florida, it apparently does not occur in the southern portion of the peninsula; the southernmost specimens I've seen came from the Orlando area.

A. remigis - Length 11.5- 16.0 mm. This species is lauded as the most widespread and common gerrid in North America, but in Florida it is quite uncommon. I've seen specimens from Franklin and Liberty Counties.

GENUS *Gerris*

DIAGNOSIS: Smaller, length ≤ 11 mm; dorsal inner margins of eyes sinuate; pronotum shiny, with a single central stripe or no apparent markings; hind tibia not more than 3.2 times length of first tarsal segment.



G. comatus

NOTES: Four species of *Gerris* are recorded from Florida; none are common in the state. I know of no records of this genus south of Alachua County.

Gerris was once a much larger genus, but revisionary work has moved several taxa to other genera, such as *Aquarius* and *Limnoporus*.

Gerris species are more commonly found on ponds and other lentic water bodies, but may also be found along slow flowing streams, etc.

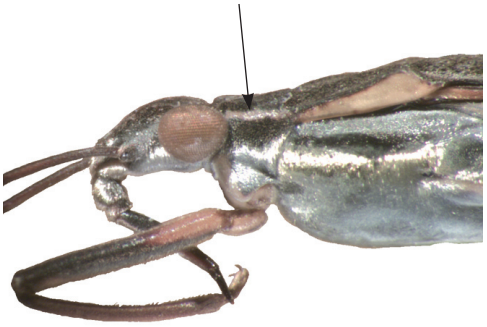
ADDITIONAL REFERENCES: Drake & Harris 1928a; Polhemus & Chapman 1979f; Smith 1988a.

Florida species

G. argenticollis Parshley
G. comatus Drake & Hottes
G. insperatus Drake & Hottes
G. marginatus Say

Key to adult *Gerris* of Florida

1 Pronotum with a yellowish/reddish/silvery lateral stripe ..... ***G. argenticollis***



1' Pronotum without such a stripe 2

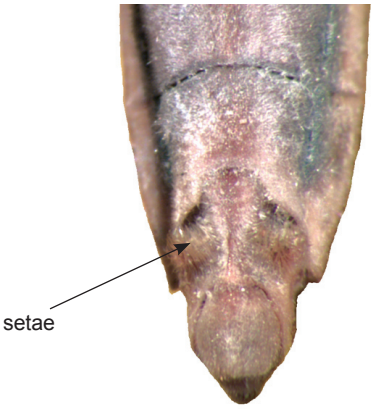
2 Males (apparent 7th abdominal sternite not medially divided) 3

male

female

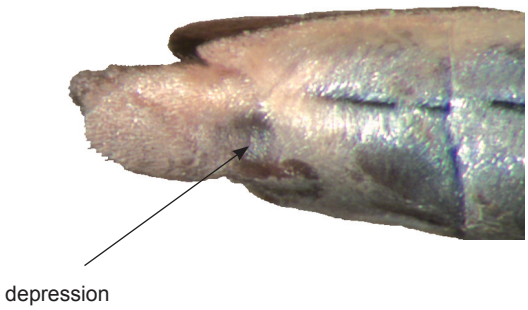
2' Females (apparent 7th abdominal sternite medially divided) 5

3(2') Genital capsule with ventrally directed long setae along each side (these setae mostly originate laterally) ..... ***G. comatus***

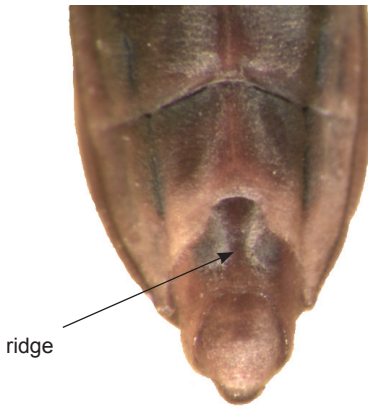


3' Genital capsule without long lateral setae, although whorls of shorter setae may be present near base of capsule (see figures in next couplet) 4

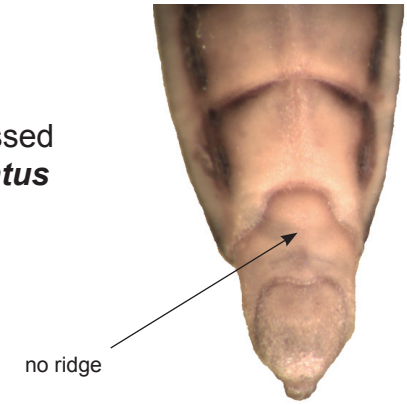
4(3') Venter of genital capsule with well defined median ridge, sides of capsule strongly impressed ..... ***G. marginatus***



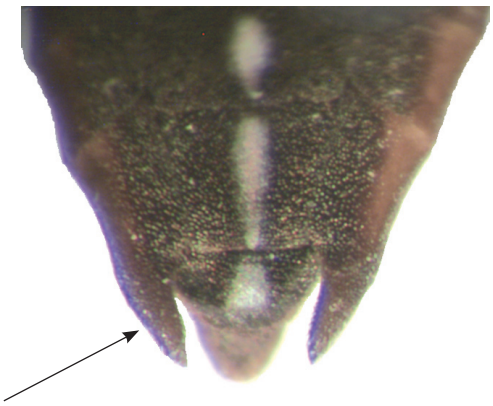
ventrolateral aspect



4' Venter of genital capsule rounded, not strongly impressed laterally ..... ***G. insperatus***



5(2') Connexival spines strongly incurved and directed dorsally ..... ***G. comatus***



5' Connexival spines not strongly incurved and usually not dorsally directed ..... ***G. insperatus/marginatus*** (females of these two species very difficult to separate) 6

6(5') Smaller, length about 7.4-8.6 mm; in dorsal view, connexival spines thinner, not reaching apex of tergite VIII ..... ***G. insperatus***

G. insperatus

G. marginatus

6' Larger, length about 8-11 mm; in dorsal view, connexival spines thicker, reaching apex of tergite VIII ..... ***G. marginatus***

Notes on species

G. argenticollis - Length 7.0-8.5 mm. An uncommon species in Florida. Do not confuse this species with *Limnoporus canaliculatus*, which also has a lighter colored stripe on the lateral margin of the pronotum.

G. comatus - Length 7-9 mm. I have not seen Florida material of this species. Males have areas of long, ventrally directed setae that arise laterally along the genital capsule. Note that males of *G. marginatus* may also have setae on the genital capsule, but they are usually arranged as small whorls near the base of the capsule.

G. insperatus - Length 7.4-8.6 mm. Recorded for Florida by Smith (1988a), but I have not seen any Florida material. Females of *G. insperatus* are very difficult, if not impossible, to separate from those of *G. marginatus*. The only characters used, the relative length, stoutness and pilosity of the connexival spines, are apparently subject to much variation, and it is probably only possible to "identify" individuals at the extreme ends of the range of variation.

G. marginatus - Length 8-11 mm. Like the other members of the genus, uncommon to rare in Florida. See comments on *G. comatus* and *G. insperatus* above.

GENUS *Halobates*

DIAGNOSIS: Dorsal inner margins of eyes convex; meso- and metanotum fused; tibia and first tarsal segment of middle leg with fringe of long setae; marine pelagic.

H. micans

NOTES: One species, *H. micans* (length 3.6-4.5 mm), has been found off shore of Florida's coasts. *Halobates* are exclusively marine, but are sometimes blown ashore after strong storms and may be found in wrack lines along beaches.

Few insects have invaded the ocean proper; there are many insects that are found at marine coastlines (in North America, several genera of Chironomidae, the veliids *Husseyella turmalis* and *Rhagovelia plumbea,* and some *Rheumatobates*), but *Halobates* are truly pelagic, occurring hundreds of kilometers off shore and never coming to land except when blown in by storms. Eggs are laid on almost anything that floats, even tar balls and feathers. Cheng & Pitman (2002a) reported finding a floating plastic gallon milk jug in the eastern tropical Pacific that was covered by approximately 70,000 eggs and accompanied by 833 adults; these captured adults (*H. sobrinus* White) made up about 1/5 of the total number observed at or on the jug.

ADDITIONAL REFERENCES: Herring 1961a; Cheng 1973a, 1975a; Cheng & Pitman 2002a; Polhemus & Chapman 1979f; Smith 1988a.

Florida species

H. micans Eschscholtz

GENUS *Limnogonus*

DIAGNOSIS: Dorsal inner margins of eyes sinuate; pronotum shiny, with a dorsal pair of yellow-orange stripes.

L. franciscanus

NOTES: *Limnogonus* is a largely pan-tropical genus, but one species, *L. franciscanus* (length 7-9 mm), makes it to Florida (and Texas). I have not seen any material from Florida, but have collected *L. franciscanus* in Costa Rica, where they were found along the shallow margins of a moderately sized river, about 1 km from the river's mouth at the Pacific Ocean.

Take care not to confuse this genus with the similarly spelled *Limnoporus*!

ADDITIONAL REFERENCES: Polhemus & Chapman 1979f; Smith 1988a.

Florida species

L. franciscanus Stål

GENUS *Limnoporus*

DIAGNOSIS: Dorsal inner margins of eyes sinuate; antennal segment 1 length at least 80% or less than combined lengths of segments 2 and 3; pronotum dull, with a single central stripe.

NOTES: Only one species, *L. canaliculatus* (length about 8.5-11.6 mm), is known from Florida. Note that in earlier literature this taxon was referred to as a *Gerris*. This species is the most commonly collected gerrid in Florida, where it is found in just about all aquatic habitats.

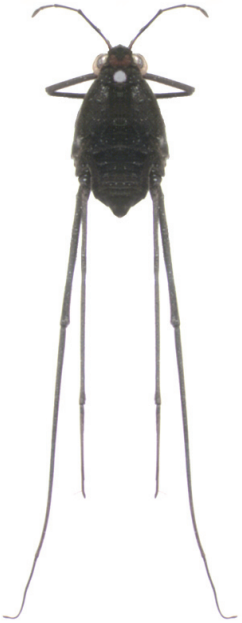
ADDITIONAL REFERENCES: Bobb 1951b; Herring 1950a; Polhemus & Chapman 1979f; Smith 1988a.

Florida species

L. canaliculatus (Say)

GENUS *Metrobates*

DIAGNOSIS: Dorsal inner margins of eyes convex; first antennal segment length about the same as combined lengths of remaining segments; antennal segments 2 and 3 swollen distally, with an apical tuft of setae, these setae most noticeable in males, in which the setae are long and peg-like; antennal segment 3 without large bristles that are at least as long as width of segment; meso- and metanotum of apterous forms divided by distinct suture; body mostly dark, dull, velvety.



M. anomalus
female

M. anomalus
female

M. hesperius
male

NOTES: Two species are recorded from Florida, with a third species, *M. alacris*, a possibility in the western portion of the state. The genus apparently does not occur on the peninsula south of the Orlando area.

Rivers and streams are the preferred habitats for *Metrobates*. *Metrobates* somewhat resemble small charcoal briquettes with long skinny legs.

ADDITIONAL REFERENCES: Anderson 1932a; Drake 1955a; Herring 1950a; Hussey 1948a; Hussey & Herring 1949a; Polhemus & Chapman 1979f; Smith 1988a.

Florida species

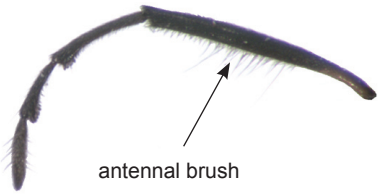
M. anomalus Hussey
M. hesperius Uhler

Key to adult male *Metrobates* of the eastern US

Note that males are only needed for the first couplet to separate *M. alacris* from species known to occur in Florida

1 First antennal segment and mid femora of male without ventral brush of long setae .... ***M. alacris***
(not known from Florida)

1' First antennal segment and mid femora of male with ventral brush of long setae 2



2(1') Pro- and mesonotum mostly black; first antennal segment subequal in length to last three segments combined and about 1/5 longer than the width of the head including the eyes ..... ***M. anomalus***

2(1') Pro- and mesonotum black with median grayish white stripe and mesonotum usually with grayish white stripe laterally; first antennal segment longer in length than last three segments combined and about 1/3 longer than the width of the head including the eyes ..... ***M. hesperius***


FL specimen GA specimen

Notes on species

M. anomalus - Length 3.6-4.3 mm. The most commonly seen *Metrobates* in Florida. Hussey & Herring (1949a) described subspecies for this taxon and *M. hesperius*. The two *M. anomalus* taxa are mainly separated by the presence of numerous long curved setae on the mid femur (*M. anomalus comatipes*) vs. few or no long curved setae on the mid femur (*M. a. anomalus*). See below. Note that the nymphs of both species possess a broad, light colored stripe on the dorsum of the thorax; take care not to confuse a nymph of *M. anomalus* with an adult *M. hesperius* or *M. alacris*. Females of *M. anomalus* are easily separetd from the other two *Metrobates* species in the key by their almost completely dark coloration.

M. hesperius - Length 3.8-5.0 mm. Hussey & Herring (1949a) described subspecies for this species and *M. anomalus*. Males of *M. hesperius depilatus* have but two long setae on the first antennal segment; *M. h. ocalensis* and *M. h. hesperius* bear a thin brush of long setae on the first antennal segment; *M. h. ocalensis* and *M. h. hesperius* are separated by the mid femur of *M. h. hesperius* having numerous long curved setae, while that *M. h. ocalensis* is basically bare of long curved setae. Kittle (1977b) noted that both *M. hesperius depilatus* and *M. h. ocalensis* occurred at the same locality and that the subspecies probably did not represent valid taxa.

Other species

M. alacris Drake - Length about 4.5 mm. Originally described from Louisiana and now recorded from Arkansas and Texas, this species may eventually be found in western Florida. The species is prominently marked dorsally with blue-gray and is thus easily separated from the mostly dark *M. anomalus*; the lack of long ventral setae on the antennae of the male separate it from *M. hesperius*.

GENUS *Neogerris*

DIAGNOSIS: Dorsal inner margins of eyes sinuate; pronotum shiny, with a central spot; very common in Florida.

NOTES: One species, *N. hesione* (length 4.5-8.0 mm), occurs in the eastern United States. Originally described in *Gerris*, it was formerly also placed in *Limnogonus*. This is a common gerrid in Florida, usually found on ponds and lakes and other bodies of standing water (ditches, canals, marshes, etc.); I have collected them often among *Nymphaea* and *Typha*. *Neogerris* also may be encountered on small streams and creeks.

ADDITIONAL REFERENCES: Herring 1950a; Polhemus & Chapman 1979f; Smith 1988a.

Florida species

N. hesione (Kirkaldy)

GENUS *Rheumatobates*

DIAGNOSIS: Dorsal inner margins of eyes convex; 3rd antennal segment with several large bristles that are at least as long as width of segment; first antennal segment length much less than combined length of remaining segments; abdomen as long as rest of body; meso- and metanotum of apterous forms divided by distinct suture; males often with complexly modified antennae and strongly arched hind femora; female with large serrated ovipositer.

R. tenuipes male

R. rileyi
male antenna

R. clanis female
genital segments

NOTES: Seven species of *Rheumatobates* are recorded from Florida; the genus includes the smallest gerrids known from North America. Males of several species feature bizarre modifications to their antennae and hind femora. *Rheumatobates* are found in lentic and lotic habitats, and may occur on coastal marine/estuarine/brackish water as well as fresh water.

ADDITIONAL REFERENCES: Hungerford 1954b; Spangler et al. 1985a; Herring 1949a, 1950a, 1958a; Polhemus & Spangler 1989a; Polhemus & Chapman 1979f; Smith 1988a.

Florida species

R. clanis Drake & Harris
R. minutus Hungerford
R. palosi Blatchley
R. rileyi Bergroth
R. tenuipes Meinert
R. trulliger Bergroth
R. vegatus Drake & Harris

Key to adult male *Rheumatobates* of Florida

1 Hind femora straight, simply cylindrical 2

1' Hind femora arched 5

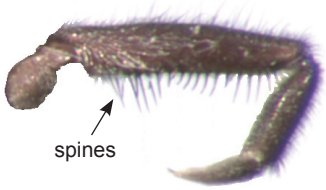
R. tenuipes with straight hind femora and modified antennae

arched hind femur

2(1) Antennae with 1st segment expanded, other segments complexly modified; larger species, length 2.4-3.0 mm ..... ***R. tenuipes***

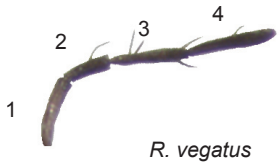
2' Antennal segments generally cylindrical; smaller species, length 2.4 mm or less 3

3(2') First antennal segment longer than either 2, 3 or 4; fore femur with row of long stout spines that is doubled near base ..... ***R. clanis***

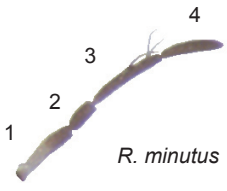


3' 3rd or 4th antennal segment longest; if fore femur with row of larger spines, row is NOT doubled near base 4

4(3') 4th antennal segment longest; fore femur considerably thicker than mid femur; sternite 9 with long lateral setal tufts ..... ***R. vegatus***



R. vegatus



R. minutus

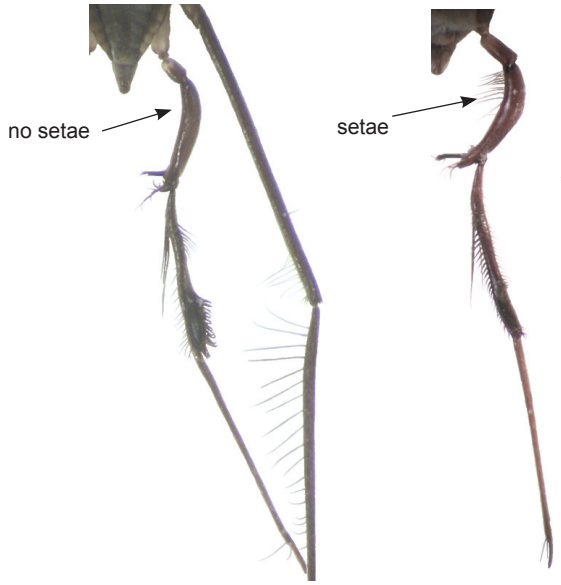
4' 3rd antennal segment longest; fore femur slightly thicker than mid femur; sternite 9 without long lateral setal tufts ..... ***R. minutus***

R. vegatus

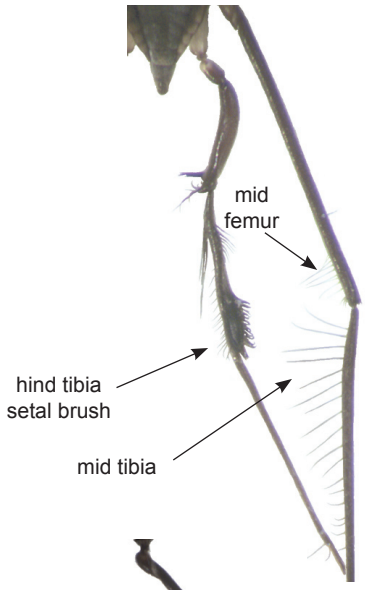
R. minutus

5(1') Hind femur without conspicuous long setae on inner margin 6

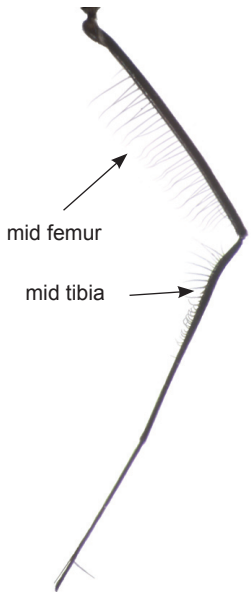
5' Hind femur with conspicuous long setae on inner dorsal margin of basal half 7



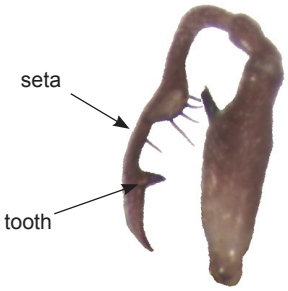
6(5) Mid femur with small group of longer setae near apex; mid tibia with longer row of long setae; hind tibia with well developed preapical brush ..... ***R. trulliger***



6' Mid femur with row of longer setae along most of its length; mid tibia with short row of longer setae near base; hind tibia with brush of setae near base ... **** R. hungerfordi***
(not known from FL but may occur)

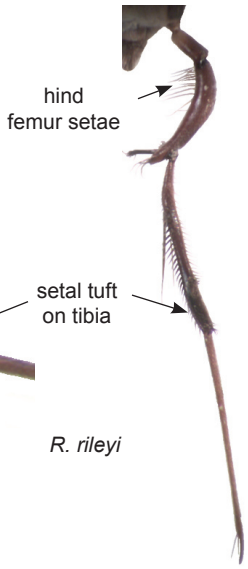


7(5') Last antennal segment with tooth at or slightly beyond middle; large seta on last segment closer to base than tooth; setae on inner margin of hind femur shorter; hind tibia with tuft of setae near apex ..... ***R. rileyi***



R. rileyi

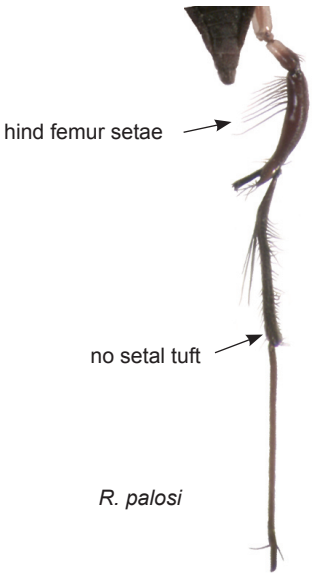
lateral view of hind tibia (leg at higher magnification than leg at right)



R. rileyi

R. palosi

7' Last antennal segment with tooth closer to base; large seta on last segment midway between base and tooth; setae on inner margin of hind femur longer; hind tibia without tuft of setae near apex .... ***R. palosi***



R. palosi

Notes on species

R. clanis - Length 2.1-3.2 mm. This mostly Central American species was first reported for Florida by Hussey (1955a) based on material collected by Herring in 1947. Herring (1958a) later posited that this species, along with *R. minutus* (and the veliid *Microvelia cubana*, as *M. portoricensis*), was present in Florida due to the action of hurricanes and did not represent breeding populations. However, as noted in Polhemus & Spangler (1989a), adults and nymphs of *R. clanis* and *R. minutus* were collected near Everglades City, thus indicating breeding populations. I have also examined males, females and nymphs of *R. clanis* collected from Hendry Creek, Lee Co., by Bob Rutter, thus further reinforcing the observation that the species does breed in Florida.

R. minutus - Length 1.6-2.2 mm. The smallest North American gerrid water strider, formerly considered as an accidental introduction (Herring 1958a) but demonstrated to be a resident by Polhemus & Spangler (1989a). I have in my collection a male and a probable nymph of this species from Water Conservation Area 2A in Palm Beach Co.

R. palosi - Length 2.3-3.4 mm. This species was originally described as a subspecies of *R. rileyi* by Blatchley (1926a); it was later elevated to species status by Bobb (1974a).

R. rileyi - Length 2.2-3.7 mm. Apparently an uncommon species in the state; easily confused with *R. palosi*.

R. tenuipes - Length 2.4-3.9 mm. This is probably the most common species of the genus in Florida. I've collected it from the surface of a moderate sized stream, where the gerrids were lounging in the shadow below a tree trunk that had fallen partially into the stream.

R. trulliger - Length 2.5-3.4 mm. Recorded for Florida by Smith (1988a); I have not seen Florida material of this species.

R. vegatus - Length 2.0-2.9 mm. A species fond of mangroves, in Florida this tiny water strider has only been found in the southernmost three counties of the state. Herring (1949a) described *R. crinitus* from Florida; this species was considered a junior synonym of *R. vegatus* by Hungerford (1954b).

Other species

R. hungerfordi Wiley - Length 2.6-3.8 mm. This species is known from Texas, South Carolina, Georgia and Louisiana in the SE US, as well as Central America, and probably will eventually be collected in Florida.

GENUS *Trepobates*

DIAGNOSIS: Dorsal inner margins of eyes convex; first antennal segment much shorter than combined lengths of remaining segments; antennal segments 2 and 3 not swollen distally and without apical tufts of setae; antennal segment 3 without large bristles that are at least as long as width of segment.

T. inermis male

NOTES: Four species of *Trepobates* are recorded from Florida, with the possibility of an additional species eventually being found in south Florida. These small gerrids are uncommon in Florida (when compared with taxa such as *Limnoporus canaliculatus* and *Neogerris hesione*); they are usually found on still waters but do occur along the quiet margins of streams and rivers. I have collected *T. pictus* from a pool in a small stream that was about half a meter wide.

The following key to *Trepobates* is adapted from the unpublished dissertation of Kittle (1977a).

ADDITIONAL REFERENCES: Kittle 1977a, 1982a; Drake & Harris 1932a; Drake & Chapman 1953b; Polhemus & Chapman 1979f; Smith 1988a.

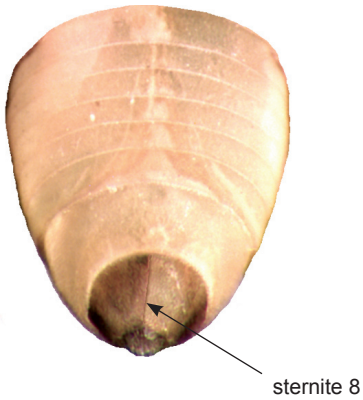
Florida species

T. floridensis Drake & Harris
T. inermis Esaki
T. pictus (Herrich-Schaeffer)
T. subnitidus Esaki

Key to wingless adult *Trepobates* of Florida

1 Males (8th abdominal sternite not medially divided) 2

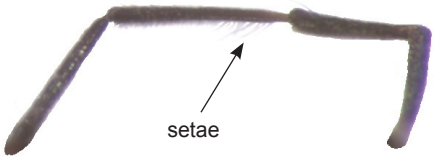
male



female

1' Females (8th abdominal sternite medially divided; note that genital segments often withdrawn into abdomen) 6

2(1) Antennal segment 3 with long setae proximally (best observed from dorsal aspect; the setae may be appressed to the segment) ..... ***T. inermis***



2' Antennal segment 3 without long setae 3

3(2') Thorax with a yellow lateral stripe that runs continuously from the behind the dark pronotal stripe to the posterior margin of the mesonotum 4

T. pictus

3' Thorax without yellow stripe behind dark pronotal stripe 5

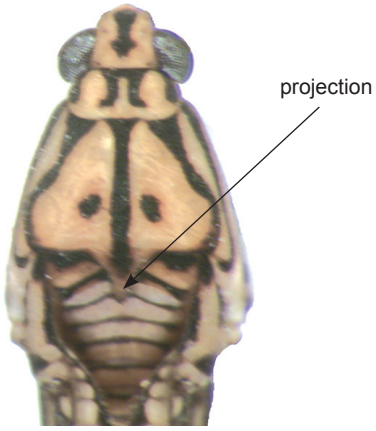
4(3) Ratio of total length/antennal segment 1 length 2.54-3.27 (3.04); found throughout the eastern US ..... ***T. pictus***

4' Ratio of total length/antennal segment 1 length 3.46-4.33 (3.80); not known from Florida, but may occur in extreme southern peninsula ..... **** T. carri***

5(3') Larger, length more than 3 mm; color variable ..... ***T. subnitidus***

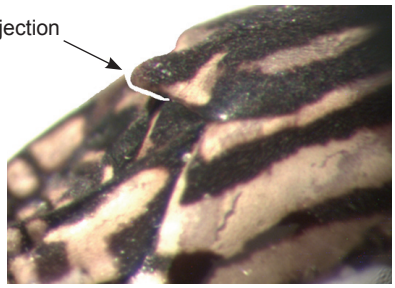
5' Smaller, length 2.5-2.8 mm; color usually dark ..... ***T. floridensis***

6(1') Mesonotum with posterior projection 7

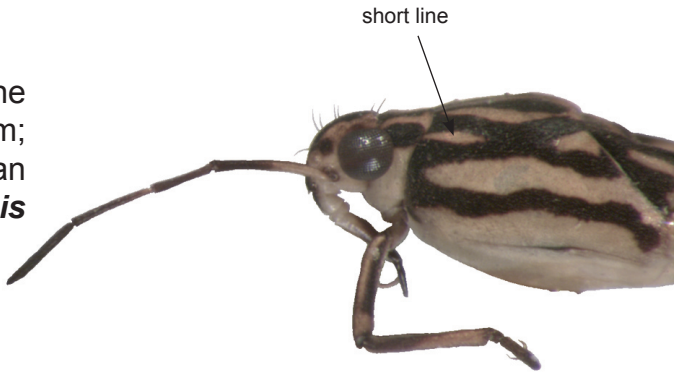


6' Mesonotum without posterior projection 8

7(6) Mesonotal projection long, usually sharply pointed and less setose; found throughout the eastern US (figures above) ..... ***T. pictus***



7’ Mesonotal projection short, blunt, very setose; not known from Florida, but may occur in extreme southern peninsula ..... **** T. carri***



8(6’) Thorax with yellow spot or short line posterior to black lateral line of pronotum; antennal segment 2 distinctly shorter than 3, about 75% length of 3 ..... ***T. inermis***

8’ Thorax coloration not as above; antennal segment 2 about 80-90% length of 3 9

dark specimen light specimen

9(8’) Larger, length 3.4-4.0 mm, mid tibia length 3.2-4.2 mm ..... ***T. subnitidus***

9’ Smaller, length 3.0-3.3 mm, mid tibia length 2.3-2.9 mm ..... ***T. floridensis***

Notes on species

T. floridensis - Length 2.5-3.3 mm A common species, but probably overlooked because the species is not keyed in any generally available literature. It occurs throughout the state and is also recorded from Alabama, Georgia and Mississippi. Note that although this species is usually darker in coloration, some individuals may display much more yellow than specimens illustrated in this manual (see Kittle 1977a: fig. 21).

T. inermis - Length 3.2-4.3 mm. This species has been confused with *T. subnitidus* mostly because earlier workers, including the original describer as well as Drake & Harris (1932a), failed to note the long setae on the male's third antennal segment. Note that these setae may be stuck to the segment, especially in dried material.

T. pictus - Length 3.0-4.1 mm. The rarest species of the genus in Florida, known to me in the state only from a record in Kittle (1977a) for Okaloosa County and a female I collected from a first/second order stream in Jefferson County. Herring (1950a: 30) recorded *T. pictus* from Rainbow River in Marion Co., and stated it was "one of the rarest of the north Florida water striders". He was correct, for it is quite rare in the state, but his *T. pictus* specimen was apparently referred to *T. subnitidus* by Kittle (1977a: 139).

T. subnitidus - Length 3.1-4.0 mm. Probably the most common *Trepobates* species in the US, and also the most misidentified species in the genus in the US, *T. subnitidus* being confused with *T. inermis* and *T. pictus*.

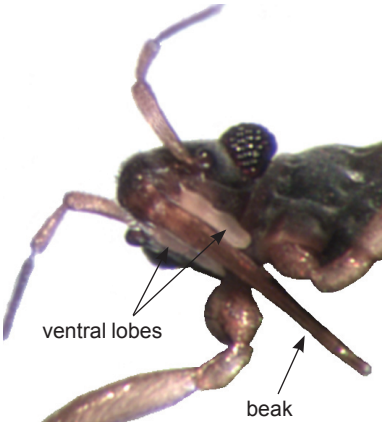
Other species

T. carri Kittle - Length 3.0-4.1 mm. Not known from Florida, but occurs in Texas, Cuba and Jamaica and may eventually be found in the southern portion of the state. Given the rarity of *T. pictus* in Florida, any specimens from south Florida that key to couplet 4 or 7 in the key will probably be *T. carri.*

FAMILY HEBRIDAE
velvet water bugs

6

DIAGNOSIS: Small to minute surface and shoreline dwelling bugs; antennae visible from above; head with ventral channel formed by a pair of ventral lobes for reception of beak; ocelli present; scutellum well developed; tarsi two segmented, with apical claws.



Hebrus consolidus

Lipogomphus brevis

Merragata brunnea

NOTES: Three genera of hebrids occur in Florida; all occur either on algal/plant mats on the water's surface, or are found along shorelines and other damp areas. They are covered with a thick, velvety pile of microtrichia which provides a waterproof surface and a common name for the family. Hebrids are ideal indicators of wetlands, for they are only found in or on water or in damp areas.

ADDITIONAL REFERENCES: Andersen 1981a, 1982a; Polhemus & Chapman 1979b; Polhemus & Polhemus 1988a; Drake & Chapman 1958a; Chapman 1958a.

Florida genera

Hebrus Curtis
Lipogomphus Berg
Merragata White

Key to genera of adults of Hebridae of Florida

1 Antennae apparently 5-segmented ..... ***Hebrus***

1' Antennae 4-segmented (see figures below) 2

2(1') 4th antennal segment about as thick as preceding segments and longer than first .... ***Lipogomphus***

2' 4th antennal segment swollen, thicker than preceding segments and subequal in length to first segment ..... ***Merragata***

GENUS *Hebrus*

DIAGNOSIS: Minute surface or shore line dwelling bugs; antennae apparently 5-segmented.

H. consolidus

NOTES: Four species of *Hebrus* are recorded from Florida, with the possibility of two additional species eventually being found here.

Our *Hebrus* have apparently five-segmented antennae, but actually the last (4th) antennomere is weakly divided by a membranous area.

Hebrus are more often found along shorelines than on the water's surface (but they occur there also) and may occur in brackish/estuarine habitats as well as in freshwater.

The key below works best with winged male adults, although most females can also be identified; I have included figures of the right paramere (clasper) of the male genitalia for those species in or expected from Florida; these figures are adapted from Drake & Chapman (1958a).

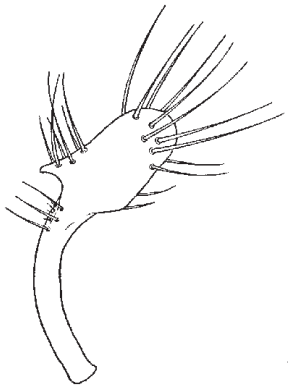
ADDITIONAL REFERENCES: Polhemus & Chapman 1979b; Polhemus & Polhemus 1988a; Polhemus & McKinnon 1983a; Drake & Chapman 1958a; Chapman 1958a.

Florida species

H. buenoi Drake & Harris
H. burmeisteri Lethierry & Severin
H. concinnus Uhler
H. consolidus Uhler

Key to adult *Hebrus* of Florida

1 Vertex of head with a well defined sulcus (longitudinal groove), best seen from anterior; apex of scutellum deeply notched ..... ***H. buenoi***


paramere

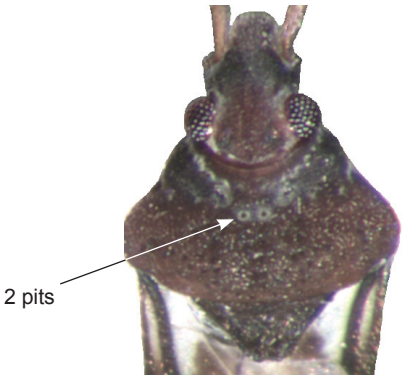

notched scutellum

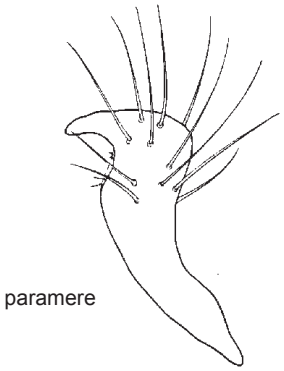
1’ Vertex of head without a well defined sulcus; scutellum apex rounded or truncate, at most slightly notched 2

2(1’) Base of clavus with bright white triangle or quadrilateral that extends to apex of scutellum or beyond 3

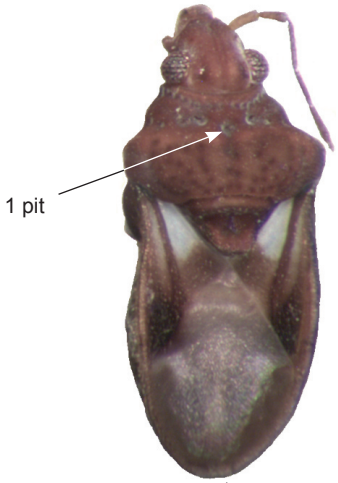
2’ Base of clavus dark or with diffuse white spot that does not extend to apex of scutellum (key for males only beyond this point) 4

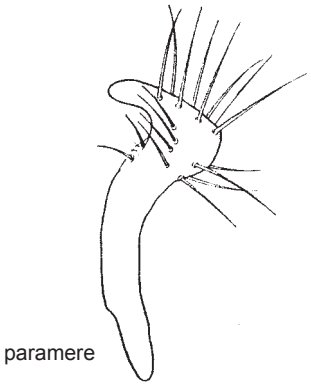
3(2) Median sulcus of pronotum wide and shallow, ending anteriorly in two distinct pits ..... ***H. consolidus***



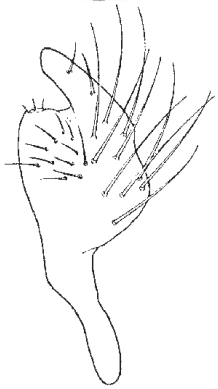


3' Median sulcus of pronotum deep and narrow, ending anteriorly in one pit ..... ***H. burmeisteri***





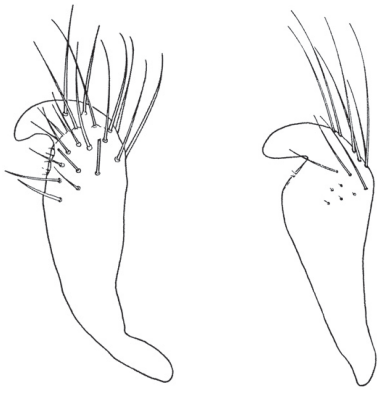
4(2') Male paramere broad throughout middle portion; not known from Florida but may occur in northern portion of state ..... **** H. sobrinus***



4' Male paramere more comma-shaped (see figures below) 5

5(4') Male paramere with numerous preapical setae .... ***H. concinnus***

5' Male paramere with fewer preapical setae; not known from Florida but may occur in northern portion of state ..... **** H. beameri***



H. concinnus *H. beameri*

Notes on species

H. buenoi - Length about 2.1 mm. A very distinctive species with a well defined dorsal sulcus on the head and a deeply notched scutellum. Chapman (1958a) collected this species from an area adjacent to a salt marsh, on algal mats in brackish water, and in the damp areas of lake shorelines and a cypress swamp.

H. burmeisteri - Length 1.8-2.1 mm. Chapman (1958a) found this species in roadside ditches and a calcareous spring.

H. concinnus - Length 2.0-2.3 mm. Chapman (1958a) reported this species from the damp margins of a lake and a fluctuating pond.

H. consolidus - Length 1.8-2.2 mm. The most commonly encountered *Hebrus* in the state, found in a variety of wet margins and damp areas.

Other species

H. beameri - Length 1.8-2.2 mm. Not known from Florida but may occur in the northern portion of the state. This species was recorded from Georgia as *H. amnicus* Drake & Chapman; Polhemus & McKinnon (1983a) considered *H. amnicus* a junior synonym of *H. beameri*. This species is known only in brachypterous form – the wings are shortened and do not reach the apex of the abdomen. Note that other species of *Hebrus* also occur in brachypterous form.

H. sobrinus - Length 1.9-2.0 mm. Not known from Florida but may occur in the northern portion of state.

GENUS *Lipogomphus*

DIAGNOSIS: Minute surface dwelling insects; antennae 4 segmented, with apical segment longer than the first segment and about as thick as preceding segments.

L. brevis

NOTES: A single species is found in the Southeast United States, *L. brevis* (length about 1.8-2.0 mm). This species was originally placed in *Merragata*; when *Lipogomphus* was resurrected as a genus by Andersen (1981a), the species was moved there.

Lipogomphus brevis is an inhabitant of salt marshes and brackish/saline habitats. Chapman (1958a) reported it from several sites along the Indian River in Brevard County; Wilson (1958a) recorded it from several sites in coastal Mississippi. This taxon should be expected anywhere along Florida's coast line.

ADDITIONAL REFERENCES: Andersen 1981a; Polhemus & Chapman 1979b; Polhemus & Polhemus 1988a; Drake & Chapman 1958a.

Florida species

L. brevis (Champion)

GENUS *Merragata*

DIAGNOSIS: Minute surface dwelling insects; antennae 4 segmented, with apical segment swollen and subequal in length to first segment.

M. brunnea

NOTES: Two species of *Merragata* occur in the Southeast US; both are common in Florida, but *M. brunnea* appears to be the more common of the two.

Although hebrids are considered predators, Shambu Katel at Florida A & M University has observed and videoed *M. brunnea* apparently feeding on the introduced water fern *Salvinia minima*.

ADDITIONAL REFERENCES: Polhemus & Chapman 1979b; Polhemus & Polhemus 1988a; Drake & Chapman 1958a;

Florida species

M. brunnea Drake
M. hebroides White

Key to adult *Merragata* of the eastern United States

1 Hemelytron milky-white, without clearly defined spots; pronotum with narrow median groove; apex of scutellum rounded; male paramere with more pronounced beak and fewer large setae (see Notes on species) ..... ***M. brunnea***

1' Hemelytron smoky brown, with 4 whitish spots; pronotum with deeper, broader median longitudinal sulcus; apex of scutellum truncate or slightly concave; male paramere with broader apex and more large setae (see Notes on species) ..... ***M. hebroides***

Notes on species

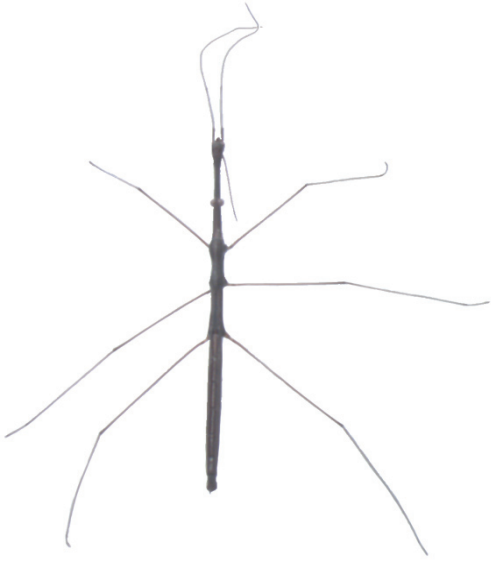
M. brunnea - Length 1.4-1.6 mm. Often found only as micropterous forms, *M. brunnea* can be abundant on *Lemna* and other floating vegetation on ponds, lakes and the quieter portions of streams and rivers. Micropterous forms might be identified by male genitalia, but note that the parameres of both *Merragata* species are very similar in shape and are easily mistaken for each other; the parameres must be oriented correctly. Most *M. brunnea* parameres I've slide mounted and observed look more like the paramere figured by Drake & Chapman (1958a: fig. 4b) for *M. hebroides*.

M. hebroides - Length 1.6-2.0 mm. This species is more often found in a winged form than *M. brunnea*. See cautionary notes above concerning forms without fully developed wings.

FAMILY HYDROMETRIDAE
water measurers, marsh treaders

7

DIAGNOSIS: Small, elongate-cylindrical, stick-like insects with thread-like legs. Antennae longer than head, placed anteriorly on head and visible from above; head about as long as thorax; eyes located about mid-length on head; front legs not raptorial; tarsal claws at apex of 3-segmented tarsus.



H. australis

NOTES: A small family consisting of seven genera world-wide, with only one genus, the cosmopolitan *Hydrometra*, found in North America. The common name for the family, water measurer (*hydro* + *metra*), refers to their slow measured gait over the surface of the water. Hydrometrids are most found often along the water's edge of swamps, swamp streams, ditches and on mats of floating or emergent vegetation in ponds and marshes, where they prowl the water's surface for injured, newly emerged or dead invertebrates.

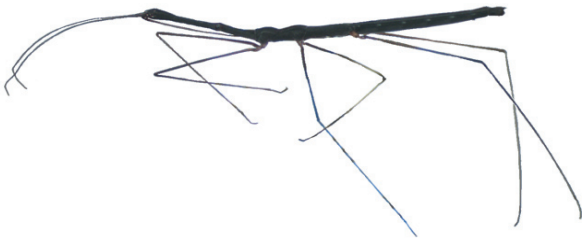
ADDITIONAL REFERENCES: Andersen 1982a; Polhemus & Chapman 1979d; Smith 1988b; Drake & Hottes 1952a; Herring 1948a; Bobb 1974a; Hungerford & Evans 1934a; Torre-Bueno 1926a.

Florida genera

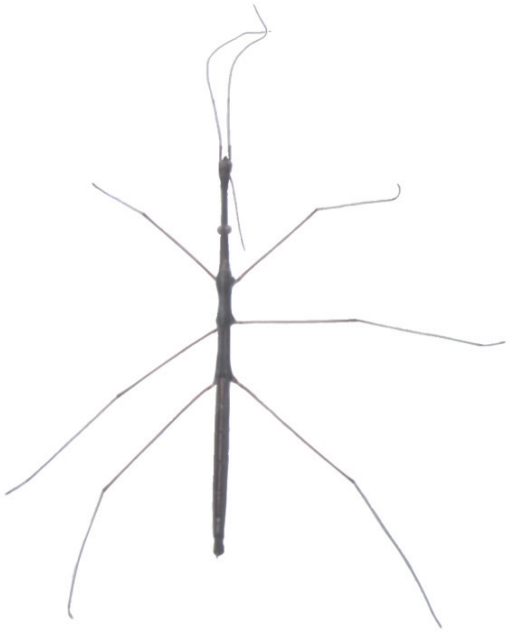
Hydrometra Latreille

GENUS *Hydrometra*

DIAGNOSIS: Small, elongate-cylindrical, stick-like insects with thread-like legs. Antennae longer than head, placed anteriorly on head and visible from above; head about as long as thorax; eyes located about mid-length on head; front legs not raptorial; tarsal claws at apex of 3-segmented tarsus.



H. hungerfordi, lateral



H. australis, dorsal

NOTES: Six species are recorded from Florida; *H. australis* is by far the most common. The taxonomy of several species, especially *H. australis* and *H. martini*, had been confused for many years but was clarified by Drake & Hottes (1952a).

Hydrometrids are common inhabitants of swampy stream sides and may be abundant on emergent or floating vegetation in marshes, swamps, ditches and ponds.

An important taxonomic character for *Hydrometra* are the small pits located on the flattened lobes above the fore and middle legs. Note that in earlier keys (i.e., Herring 1948a), the confusion over the identity of *H. australis, H. hungerfordi* and *H. martini* led to an incorrect placement for *H. australis.*

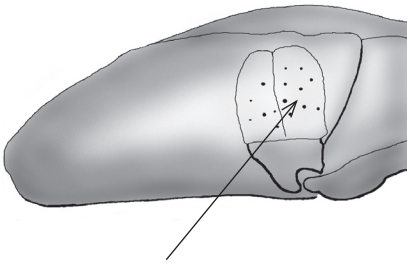
ADDITIONAL REFERENCES: Polhemus & Chapman 1979d; Smith 1988b; Herring 1948a; Drake & Hottes 1952a; Hungerford 1923a, 1927a, 1954a; Hungerford & Evans 1934a; Torre-Bueno 1926a.

Florida species

H. australis Say
H. barei Hungerford
H. consimilis Barber
H. hungerfordi Torre-Bueno
H. martini Kirkaldy
H. wileyae Hungerford

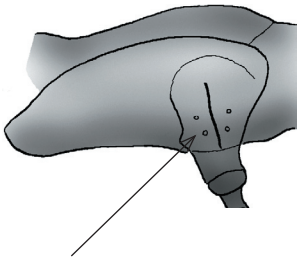
Key to adult *Hydrometra* of the eastern United States

1 Supracoxal lobes of middle leg with 4 or more pits on each side of median line; length over 12 mm …..... ***H. wileyae***

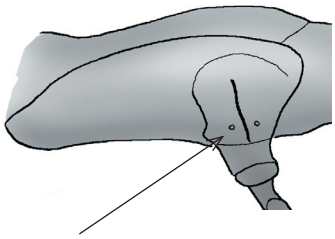


1’ Supracoxal lobes of middle leg with 1-2 pits on each side of median line (see figures below); length ≤ 12 mm 2

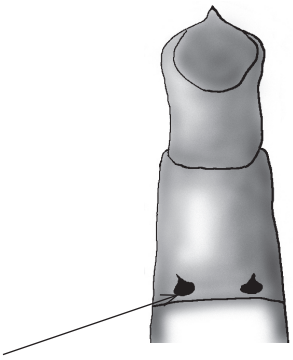
2 (1’) Supracoxal lobes of middle leg with 2 pits on each side of median line 3



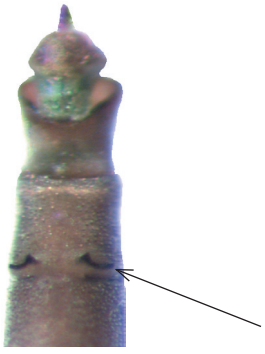
2’ Supracoxal lobes of middle leg with 1 pit on each side of median line 4



3 (2) Processes of male sternite VI thorn-like; pronotum without small punctures; found throughout Florida ..... ***H. hungerfordi***



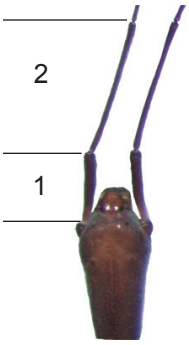
3’ Processes of male sternite VI linear; pronotum with small punctures; in Florida known only from the Keys ..... ***H. consimilis***



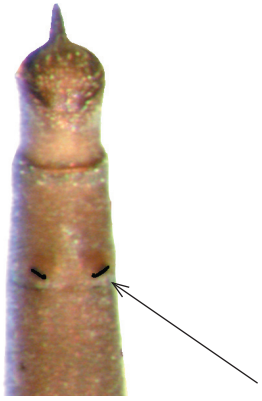
Note: sternite VI of *H. australis*, but similar to that of *H. consimilis*

4(2') Second antennal segment about 2.5 X length of first antennal segment ..... ***H. australis***

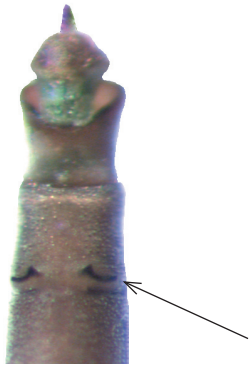
4' Second antennal segment about twice the length of first antennal segment 5



5(4') Processes of male sternite VI smaller, oblique to anterior margin of sternite ..... ***H. barei***



5' Processes of male sternite VI wider, parallel to anterior margin of sternite ..... ***H. martini*** (see Notes on species)



Note: sternite VI of *H. australis*, but similar to that of *H. martini*

Notes on species

H. australis - Length 8-12 mm. The most common species in Florida, this taxon's taxonomy has been quite confused. What is known today as *H. australis* has been called *H. martini*, *H. hungerfordi* and *H. myrae*. Drake & Hottes (1952a) settled much of the confusion of earlier authors such as Hungerford (1923a), Torre-Bueno (1926a) and Herring (1948a). Note that *H. hungerfordi* is a valid name for another species; the species called *H. australis* by Hungerford (1923a) is *H. hungerfordi*. Polhemus & Chapman (1979d: 45) suggested that *H. martini* may be a junior synonym of *H. australis*, citing that the differences in second versus first antennal segment lengths between the two taxa seemed to be clinal; those with a shorter second segment (i.e., *H. martini*) were more northern. The ventral processes of male sternite VI are linear in both taxa.

H. barei - Length 7.5-9.3 mm. In the US this species is known only from Florida, but this apparent distribution is more likely a reflection of this species being misidentified as *H. martini*. Herring (1948a) reported specimens of *H. barei* from Dog Island in Franklin County, which indicates that this species may be found further west along the Gulf Coast states, and it probably will eventually be found in Georgia and the Carolinas.

H. consimilis - Length 8.0-9.5 mm. A Caribbean/Mexican species; in Florida known from a few specimens from the Keys (Lower Matecumbe Key) reported by Hungerford (1954a). A search of the Snow Entomological Museum, where the Florida specimens were supposedly located, was unsuccessful.

H. hungerfordi - Length 9-11 mm. Rather than the drab brown of other Florida *Hydrometra* species, *H. hungerfordi* is usually a dark bluish-black (I have material from South Carolina that is yellow-brown with darker bluish-black areas.)

H. martini - Length 8.5-10.0 mm. Although recorded for the state by numerous authors, I have not seen any Florida material that fits the current definition of this species. See *H. australis* above.

H. wileyae - Length 13.5-15.5 mm. The largest hydrometrid in the Southeast, easily identified by its large size and numerous pits on the supracoxal lobes. Note that Hungerford (1923a) originally spelled the name "*wileyi*", but since the species is named for a female (Grace Wiley), the name should be spelled "*wileyae*".

FAMILY MESOVELIIDAE
water treaders

8

DIAGNOSIS: Generally elongate, surface-dwelling bugs; antennae 4 segmented, longer than head; winged forms with ocelli, wingless forms without ocelli; inner margins of eyes converge anteriorly; venter of head without a longitudinal groove for reception of beak; winged forms with exposed scutellum that is divided by a transverse groove; adult tarsi 3 segmented, with apical claws.

M. amoena, wingless adult

M. amoena, winged adult

NOTES: Mesoveliids are commonly seen walking, running and/or seemingly skimming on the water surface in most lentic habitats; they are almost always present on *Lemna* mats and on lily pads. Only one genus, *Mesovelia*, is found in North America north of Mexico. *Mesovelia* preys on dead and injured arthropods, and can be cannibalistic.

ADDITIONAL REFERENCES: Andersen 1982a; Andersen & Polhemus 1980a; Polhemus & Chapman 1979c; Smith 1988c.

Florida genera

Mesovelia Mulsant & Rey

GENUS *Mesovelia*

DIAGNOSIS: Generally elongate, surface-dwelling bugs; antennae 4 segmented, longer than head; winged forms with ocelli, wingless forms without ocelli; inner margins of eyes converge anteriorly; venter of head without a longitudinal groove for reception of beak; winged forms with exposed scutellum that is divided by a transverse groove; adult tarsi 3 segmented, with apical claws.

NOTES: Three species of *Mesovelia* are recorded from Florida; *M. mulsanti* is by far the most common.

It is most common to find wingless adults of *Mesovelia*, although winged forms are also easily found. Note that adults with wings have ocelli (simple eyes located on the top of the head between the compound eyes), while those without wings lack ocelli.

M. amoena, wingless adult

M. amoena, winged adult

M. mulsanti, winged adult

ADDITIONAL REFERENCES: Spangler 1990a.

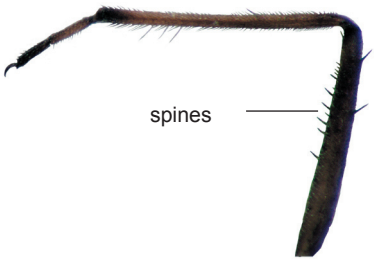
Florida species

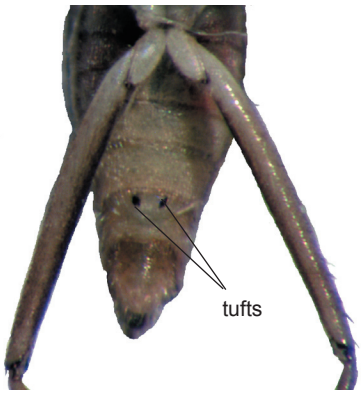
M. amoena Uhler
M. cryptophila Hungerford
M. mulsanti White

NOTE:
you must have adults, i.e., specimens with three-segmented tarsi, to use this key!

Key to adult *Mesovelia* of the eastern United States

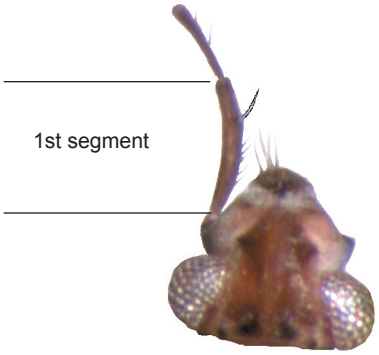
1 Fore and mid femora with posterior row of dark spines; male with 2 black tufts on abdominal sternite VIII .... ***M. mulsanti***

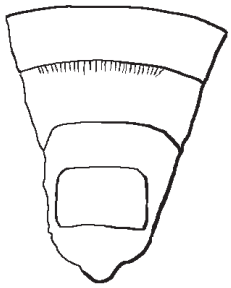




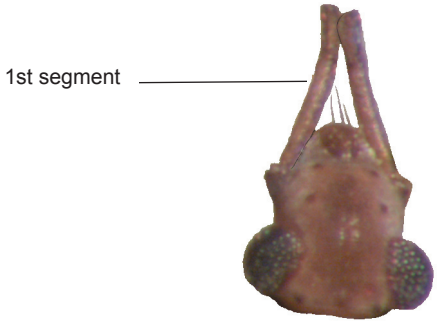
1’ Fore and mid femora without posterior row of dark spines; male sternite VIII without tufts of black setae 2

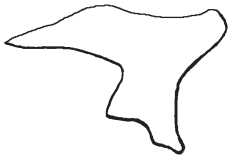
2(1’) First antennal segment shorter, length 3/4 or less the width of the head through the eyes; male with fine posterior fringe of setae most noticeable on abdominal sternite VI; male paramere with longer, thinner apex ..... ***M. amoena***





2’ First antennal segment longer, length about 0.9 the width of the head through the eyes; male without setal fringe on sternites; male paramere with shorter, thicker apex .... ***M. cryptophila***





Notes on species

M. amoena - Length 1.8-2.1 mm. An uncommon species that probably occurs throughout the state. This species has often been misidentified as *M. cryptophila*; see below. *Mesovelia amoena* is usually brown, rather than the green of most *Mesovelia* species (note that *M. mulsanti* may also be brown).

M. cryptophila - Length 2.1-2.8 mm. This species is recorded for Florida by Spangler (1990a), but I have not examined any Florida material; I have seen one paratype from Michigan. I have examined some *M. amoena* that were misidentified as *M. cryptophila*, probably because of the misleading couplet in the key by Sanderson (1982a). That key uses the character of a preapical spine on the femur, but both *M. amoena* and *M. cryptophila* possess such a spine (as well as *M. mulsanti*). The length of the first antennal segment appears to be a good character (see key) to separate the two species; the male genitalia provide the best characters for species separation. The paper by Spangler (1990a) provides additional characters.

M. mulsanti - Length 3-4 mm. The most common member of the genus throughout Florida and the eastern United States; it is found from southern Canada to Argentina. Found on most lentic water bodies, usually on the open water near margins; also found in salt marshes.

FAMILY NAUCORIDAE
creeping water bugs

9

DIAGNOSIS: Moderately small, dorsoventrally flattened, totally aquatic bugs. Antennae 4 segmented, not visible from above; ocelli absent; fore legs raptorial, with massive femora; fore tarsi 1-segmented, mid and hind tarsi 2-segmented; mid and hind legs fringed with swimming setae; membrane of hemelytra without veins; and apex of abdomen without respiratory appendages.

Pelocoris femoratus

NOTES: Four genera of Naucoridae occur in North America, but only one, *Pelocoris*, is known from Florida and the eastern United States. It is largely replaced by the more speciose genus *Ambrysus* in the western and southwestern US.

Naucorids are commonly associated with submerged vegetation in ponds, lakes, marshes, swamps, and rivers and streams. Adults and nymphs are predacious on a variety of macroinvertebrates. *Pelocoris* mostly crawl through vegetation, but some *Ambrysus* are only found in streams with pebbly bottoms where they cling to and crawl about stones.

ADDITIONAL REFERENCES: Sites & Polhemus 1995a; Polhemus 1979a; Polhemus & Polhemus 1988b;

Florida genera

Pelocoris Stål

GENUS *Pelocoris*

DIAGNOSIS: Moderately small, dorsoventrally flattened, totally aquatic bugs. Antennae 4 segmented, not visible from above; ocelli absent; lines drawn from inner margin of eyes converge anteriorly; anterior margin of pronotum slightly concave behind eyes; fore legs raptorial, with massive femora; fore tarsi 1-segmented, mid and hind tarsi 2-segmented; mid and hind legs fringed with swimming setae; membrane of hemelytra without veins; and apex of abdomen without respiratory appendages.

Pelocoris femoratus

NOTES: *Pelocoris* is the only naucorid genus known from the eastern US. The taxonomy of the genus is less than satisfactory, with the possibility of unrecognized or cryptic species being present among the taxa currently known as *P. carolinensis* and *P. femoratus*. Note that in this manual I am recognizing three species in Florida; I consider *P. balius* as a full species. There also appears to be considerable variation in *P. carolinensis* and *P. femoratus*, but for the present each will be treated as a single species.

Pelocoris mostly crawl through submerged vegetation in ponds, lakes, marshes, swamps, and rivers and streams, where they prey on a variety of macroinvertebrates.

Pelocoris can deliver a hot, stinging, but thankfully short-lived, bite, even through the mesh of an aquatic dip net (personal experience!). *Pelocoris* may be referred to as “alligator fleas” by the public.

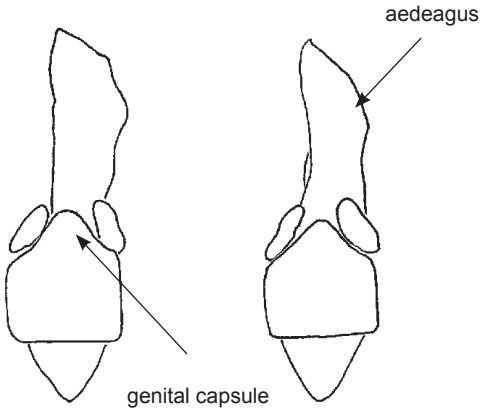
ADDITIONAL REFERENCES: La Rivers 1970a; Sites & Polhemus 1995a; Polhemus 1979a; Polhemus & Polhemus 1988b;

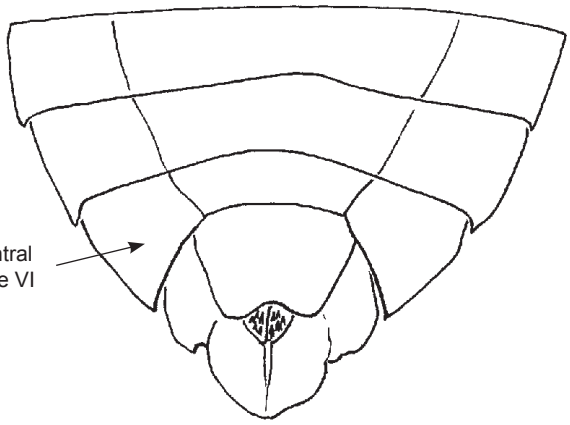
Florida species

P. balius La Rivers
P. carolinensis Torre-Bueno
P. femoratus (Palisot)

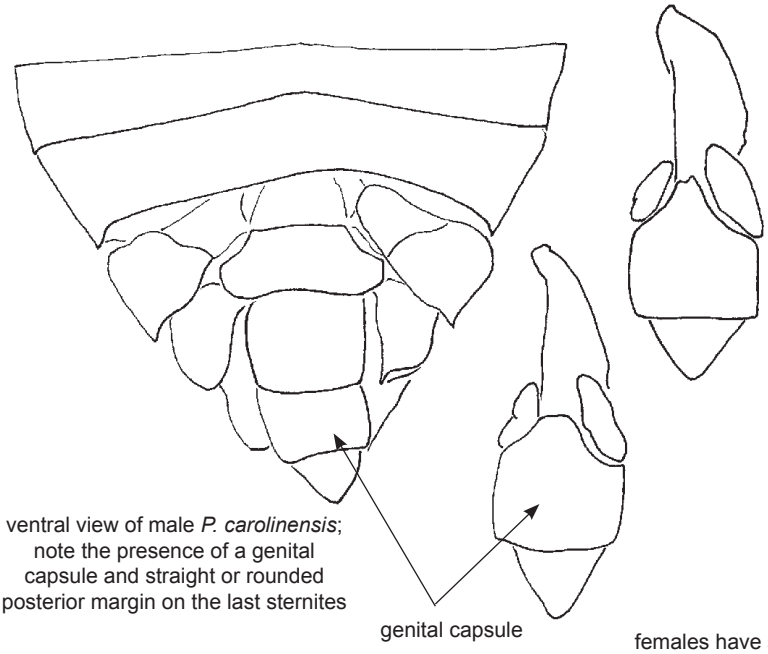
Key to adults of *Pelocoris* of Florida

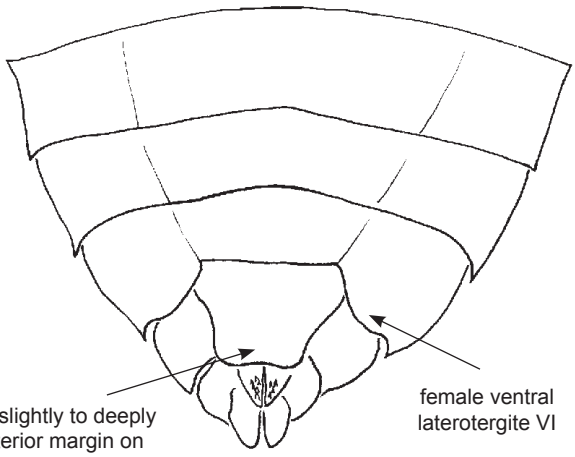
1 Fore femora and pronotum with numerous dark spots; male genital capsule with rounded, dome-like anterior apex, aedeagus widest in distal half; female with posterior margins of ventral laterotergite VI straight or slightly concave ..... ***P. balius***



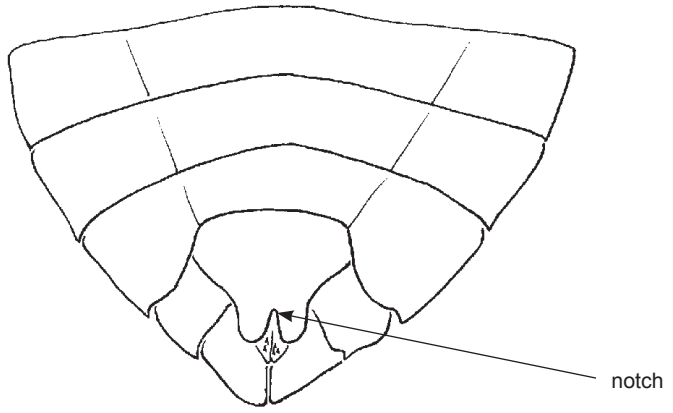


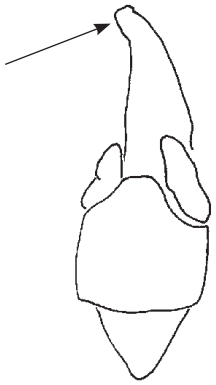
1' Fore femora and most of pronotum without numerous dark spots (a few spots may be present on pronotum); apex of male genital capsule truncate or shallowly notched, aedeagus widest in middle or proximal half; female with posterior margins of ventral laterotergite VI distinctly convex ... 2



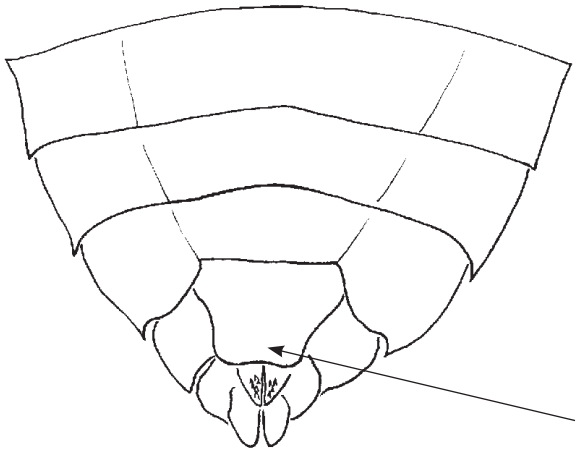


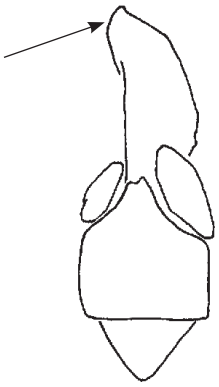
2(1') Female subgenital plate deeply notched; male aedeagus narrower apically, widest proximally ..... ***P. carolinensis***





2' Female subgenital plate weakly notched; male aedeagus stouter, widest near middle .. .. ***P. femoratus***





Notes on species

P. balius - Length about 9-10 mm. La Rivers (1970a) described this apparently uncommon taxon as a subspecies of *P. femoratus*. However, it is specifically distinct and easily recognizable; male and female genitalia differ and the mottled/spotted appearance (see *P. femoratus* below), especially on the fore femora and pronotum, is distinctive. Accordingly, I am considering *P. balius* a full species. A very similar species, *P. biimpressus* Montandon, occurs in Texas and Louisiana; with similar genitalia, *P. biimpressus* differs mainly in lacking the spotted mottling of *P. balius*. More work is needed to determine the status of these species, but for now, recognizing *P. balius* as a distinct species will make collectors aware of this taxon and should help to determine its range. I have examined Florida specimens ranging from Franklin and Wakulla Counties south to Palm Beach County.The species also occurs in Georgia; B. A. Caldwell (pers. comm.) has examined specimens from three Georgia counties (Charlton, Washington and Worth); it may range as far north as the Carolinas. I have collected *P. balius* from blackwater streams in a heavily wooded swamps, a flooded long leaf pine forest and from the somewhat oligotrophic northern Everglades at Water Conservation Area 2A.

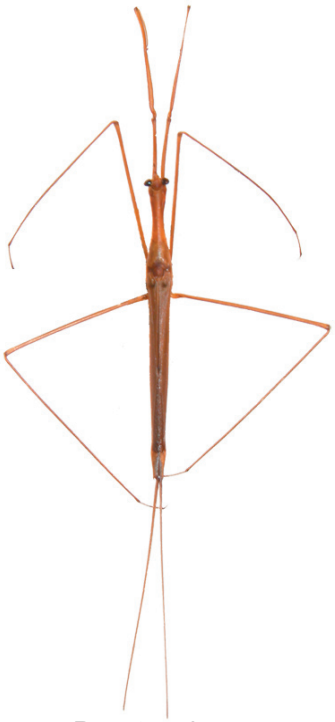
P. carolinensis - Length about 8-10 mm. Common. I have found *P. carolinensis* occurring with *P. balius* and with *P. femoratus*. Variation in the aedeagus of *P. carolinensis* and the following taxon may prove to be indicative of specific differences - there may be more than one species cryptically included with either. More work is needed on these nifty little bugs; be sure to keep oddball specimens or those which do not key easily ... and be sure to label them with complete collection data.

P. femoratus - Length about 8-11 mm. Common; probably the most often collected *Pelocoris* in the state. Note that some *P. femoratus* (especially pinned specimens) may have small bubble-like structures beneath the integument of the femora that may resemble surface spots; do not confuse these with the mottling/spotting of *P. balius*. Another similar *Pelocoris* species, *P. poeyi* (Uhler), is known from the Greater Antilles and may possibly occur here - or it may be a synonym of one of our species.

FAMILY NEPIDAE
water scorpions

10

DIAGNOSIS: Moderately large, elongate, stick-like or scorpion-like insects. Antenna shorter than head, inserted beneath eyes and not visible from above; beak with 3 visible segments; front legs raptorial; all legs with one tarsal segment; apex of abdomen with long, nonretractile cylindrical siphon.



Curicta scorpio

Nepa apiculata

Ranatra nigra

NOTES: Three genera occur in North America, but only *Ranatra* is found in Florida. The genus *Nepa*, with one US species, is recorded as far south as northern Alabama and Georgia; *Curicta,* with two US species, is known from Arizona, Texas and Louisiana. See the excellent publication by Sites & Polhemus (1994a) for the most current information on Nearctic Nepidae.

Water scorpions derive their name from the type genus for the family, *Nepa*, which is not known to occur in Florida. With its wider body, heavier femora and long breathing tube, *Nepa* does resemble a scorpion. However, most of our water scorpions here in the Southeast are cylindrical and stick-like; perhaps *Ranatra* species would be better termed “water sticks”.

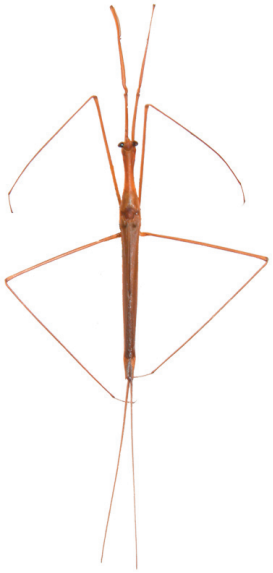
Water scorpions do not sting and one would be hard pressed to elicite a bite from one!

ADDITIONAL REFERENCES: Sites & Polhemus 1994a; Hungerford 1922a; Menke 1979b; Polhemus 1988a.

Florida genera

Ranatra Fabricius

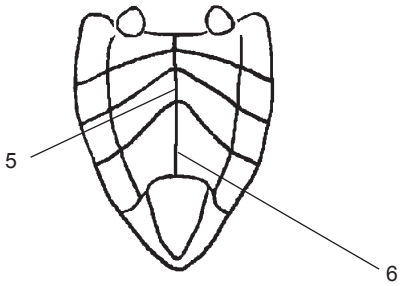
Key to genera of adult Nepidae of the United States



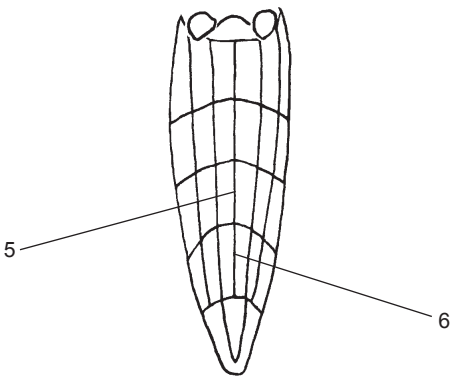
1 Head wider than anterior angles of pronotum; body elongate and cylindrical; common in Florida ..... ***Ranatra***

1' Head not wider than anterolateral angles of pronotum; body flattened; not known from Florida 2

2(1') 6th abdominal sternite twice as long as 5th sternite at midline; pronotum twice as wide as long; body (including respiratory tubes) 3.5-4.5 times longer than wide ..... * ***Nepa***
(not known from Florida; one species, *N. apiculata* Uhler, known from north central and northeastern US)



2' 6th abdominal sternite as long as 5th sternite at midline; pronotum 3/4 as wide as long; body (including respiratory tubes) 5.5-6.5 times longer than wide ..... * ***Curicta***
(not known from Florida, but one species, *C. scorpio* Stål, occurs in Louisiana and may eventually be found in northwestern Florida)



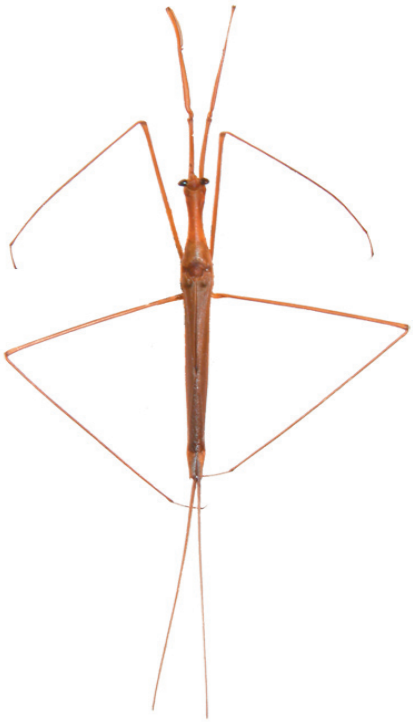
GENUS *Ranatra*

DIAGNOSIS: Elongate, stick-like insects. Antenna shorter than head, inserted beneath eyes and not visible from above; beak with 3 visible segments; anterolateral angles of pronotum not wider than head (including eyes); front legs raptorial; all legs with one tarsal segment; apex of abdomen with long, nonretractile cylindrical siphon.

NOTES: *Ranatra* is the only nepid genus known from Florida, with 5 species recorded from the state. Records of *R. fusca* from Florida are most likely erroneous, and usually attributable to *R. drakei* (q.v.). It is not unusual to collect two or more species at the same site.

Water scorpions are often collected in dip net samples, and when placed in a sorting pan will cease motion and can be overlooked as twigs or sticks. Their sedentary behavior (they are sit and wait predators, ambushing prey as it swims by) often leads to them being a substratum for other insects such as midge larvae and even naidid worms (see *R. buenoi* notes). *Ranatra* will prey on anything they can catch and hold; I've observed them catch and feed on tadpoles and baby catfish in addition to a variety of arthropods.

ADDITIONAL REFERENCES: Sites & Polhemus 1994a; Hungerford 1922a.



Ranatra nigra

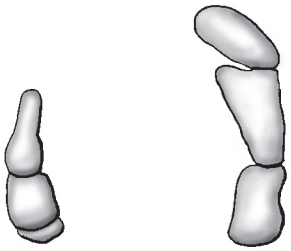
Florida species

R. australis Hungerford
R. buenoi Hungerford
R. drakei Hungerford
R. kirkaldyi Torre-Bueno
R. nigra Herrich-Schaeffer

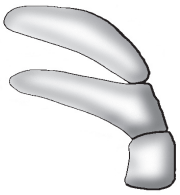
Key to adult *Ranatra* of Florida

1 Sternum of prothorax with wide longitudinal depression ..... ***R. buenoi***

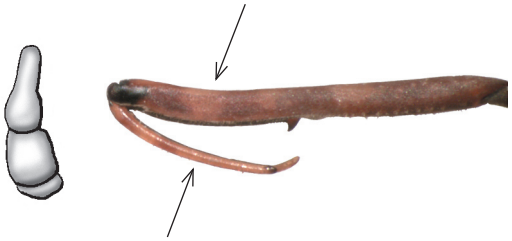
1' Sternum of prothorax without depression 2



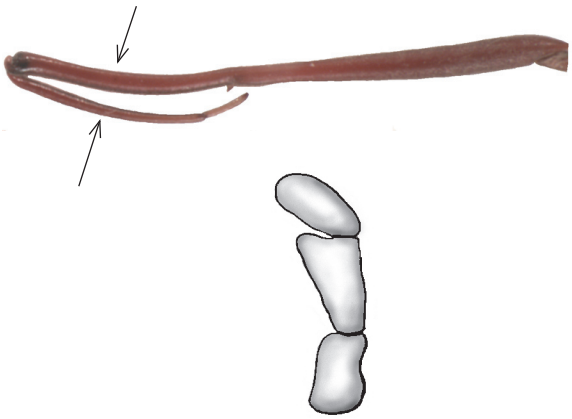
2 (1') Antennae simple, with second segment at most with short anterolateral extension 3



2' Second and third antennal segments with lateral extensions 4



3 (2) Antennae simple; fore femur stocky, about 3 times as wide as the opposing area of the tibia ..... ***R. kirkaldyi***



3' Antennae with slight apical elongation on second segment; fore femur narrower, about twice as wide as opposing area on tibia .... ***R. nigra***

4 (2') Fore femur without preapical ventral tooth; very common ..... ***R. australis***

4' Fore femur with small preapical ventral tooth; uncommon ..... ***R. drakei***
(*R. fusca*, which is not known from Florida, will key here. It can be distinguished by its shorter pronotum and narrower eyes; see Notes on species)

Notes on species

R. australis - Length 32-37 mm (excluding respiratory siphon). The most common species in the state.

R. buenoi - Length 32-38 mm (excluding respiratory siphon). A common species. Bowles & Locklin (2002) reported an *Oxyethira* (Trichoptera: Leptoceridae) pupa attached to the leg of a *R. buenoi.* On several specimens of this same species I have found single chironomid larvae (*Paratanytarsus* and *Tanytarsus*) as well the naidid worm *Dero* within the ventral channel on the thoracic sternite. Note that the antennae of *R. buenoi* are similar to those of *R. nigra*.

R. drakei - Length 35-46 mm (excluding respiratory siphon). An uncommon species, often mistakenly identified as *R. fusca* (a more northern species which does not occur in Florida). Note that *R. drakei* has larger eyes – measured from above, the width of one eye is slightly greater than the distance between the eyes; in *R. fusca*, the eye is subequal to or less than the interocular distance. Also, the pronotum of *R. drakei* is more slender, with the anterior portion being about 3 times the length of the posterior portion; in *R. fusca* the anterior portion is 1.5-2.5 times the length of the posterior portion. As noted above, *R. fusca* is not known from Florida, and all previous records are no doubt in error. The record for *R. fusca* in Mattson et al. (1995a) refers to *R. drakei.*

R. kirkaldyi - Length 23-31 mm (excluding respiratory siphon). The smallest *Ranatra* of North America, and not all that common.

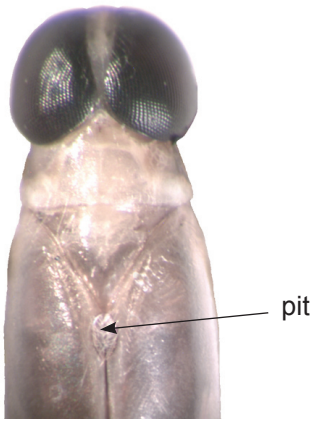
R. nigra - Length 30-32 mm (excluding respiratory siphon). A very common species. Despite its name, *R. nigra* is a brownish-yellow species.

FAMILY NOTONECTIDAE
backswimmers

11

DIAGNOSIS: Small to moderately sized, elongate sub-surface insects that swim upside down; antennae not visible from above (tips of antennae sometimes visible); fore and mid legs adapted for grasping, hind legs long and heavily fringed, rowed like oars; tarsal claws of hind legs reduced and inconspicuous.

Buenoa confusa



B. confusa

Notonecta uhleri

NOTES: Notonectids generally prefer standing water but can be found in the quieter areas of streams and rivers; they are often found in swimming pools. Many fly readily and may be collected at light traps.

Two notonectid genera are found in Florida. *Buenoa* is identified by its slimmer shape, smaller size (about 4-8 mm), three segmented antennae (with last segment longer than penultimate) and the presence of an elliptical pit near the anterior end of the hemelytral commissure (median line between the hemelytra). *Notonecta* is larger (about 9-16 mm) and more massive, has four segmented antennae (with last segment much shorter than penultimate) and lacks the elliptical pit on the hemelytral commissure.

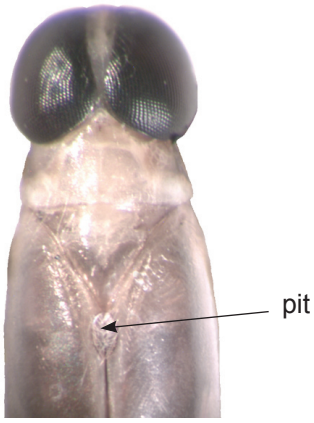
ADDITIONAL REFERENCES: Polhemus & Polhemus 1988b; Truxal 1953a, 1979a; Herring 1951a; Hungerford 1934a.

Florida genera

Buenoa Kirkaldy
Notonecta Linnaeus

GENUS *Buenoa*

DIAGNOSIS: Antennae three segmented, with last segment longer than penultimate; median line dividing hemelytra with an anterior elliptical pit.



B. confusa

B. confusa

NOTES: *Buenoa* are generally smaller and more slender than *Notonecta* and are easily distinguished by the elliptical pit at the anterior end of the hemelytral commissure. Note also that *Buenoa* have middle tarsi that are two segmented; those of *Notonecta* are three segmented, but the first segment is very small.

Unlike *Notonecta*, which float to the surface when not swimming, *Buenoa* can maintain neutral bouyancy and thus can remain stationary at any depth. This is apparently due to the presence of hemoglobin in tracheal cells in the abdomen.

Seven species are recorded from Florida. The key that follows applies only to males; males in our area can be easily recognized by the presence of a rostral prong, a triangular stridulatory area midway on the inner side of the fore femur and a proximal stridulatory comb on the fore tibia, all lacking in females. The length of the rostral prong, shape of the femur at its apex and the size of the stridulatory area/number of ridges are important characters for identification.

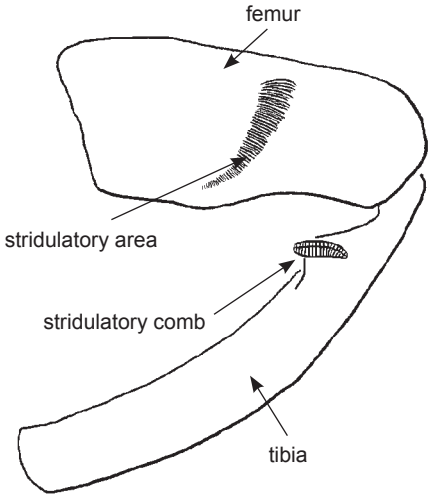
ADDITIONAL REFERENCES: Truxal 1953a, 1979a; Polhemus & Polhemus 1988b; Gittelman & Severance 1975a.

Florida species

B. artafrons Truxal
B. confusa Truxal
B. limnocastoris Hungerford
B. margaritacea Torre-Bueno
B. marki Reichert
B. platycnemis (Fieber)
B. scimitra Bare

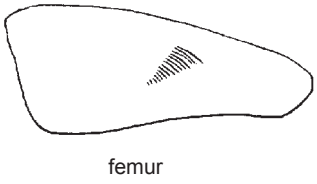
Key to adult male *Buenoa* of Florida

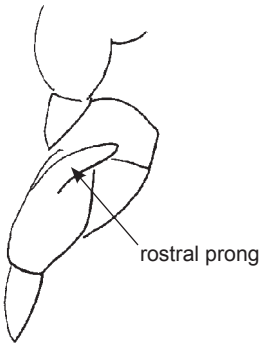
1 Stridulatory area on inner surface of fore femur large, scimitar-shaped, almost as long as width of femur, consisting of about 60 ridges ……..……..... ***B. scimitra***



1’ Stridulatory area on inner surface of fore femur smaller, consisting of less than 35 ridges (see figures below) 2

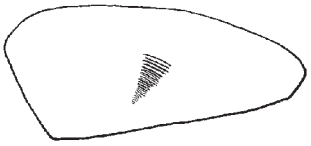
2(1’) Length of rostral prong equal to or shorter than the segment from which it arises; stridulatory area of fore femur with 15-18 ridges; greatest width of head about 5.5-6.5 X width of vertex ……..…..…… ***B. margaritacea***

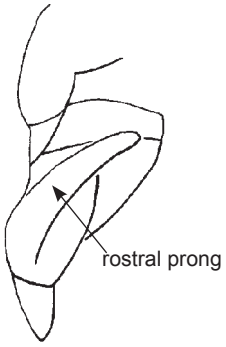




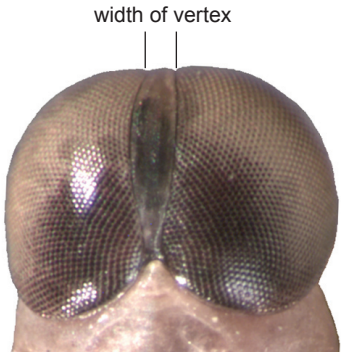
lateral view of rostrum

2’ Length of rostral prong longer than the segment from which it arises; stridulatory area of fore femur with 5-30 ridges; width of head variable …….. 3



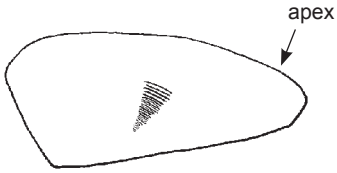


3(2') Shortest distance between the eyes about 1/2 or more the anterior width of the front of the head (vertex) viewed from above; stridulatory area of fore femur with 7 ridges; greatest width of head about 9 X width of vertex ……. ***B. artafrons***

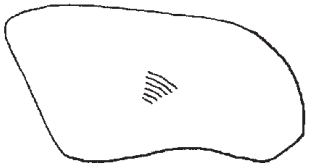


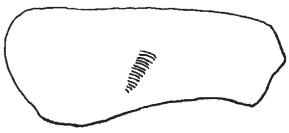
3' Shortest distance between the eyes less than 1/2 anterior width of the vertex; stridulatory area of fore femur with 5-30 ridges; greatest width of head less than 8 X width of vertex ……..……..……..…… 4

4(3') Fore femur narrower at apex, femur length more than 3X its width at its apex; stridulatory area of fore femur with 27-29 ridges ……..…….…… ***B. marki***

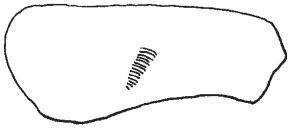


4' Fore femur wider at apex, femur length 3X or less its width at apex; stridulatory area of fore femur with 5-15 ridges ……..……..…… 5

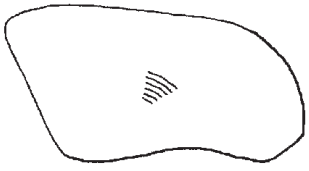




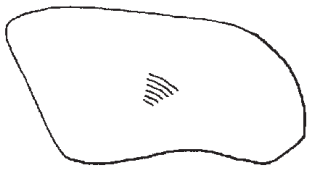
5(4') Head narrower than the posterior width of the pronotum at shoulders; stridulatory area of fore femur with 11-14 ridges ……..…… ***B. platycnemis***



5' Head equal to or wider than posterior width of pronotum at shoulders; stridulatory area of fore femur with 5-7 ridges ……..…… 7



6(5') Pronotum wider posteriorly, its median length equal to the posterior width of the pronotum at shoulders; greatest width of head less than 6X the width of vertex; rare ……..... ***B. limnocastoris***



6' Pronotum narrower posteriorly, its median length not more than 3/4 the posterior width of the pronotum at shoulders; greatest width of head 6.0-7.5 X the width of vertex; common …….. ***B. confusa***

Notes on species

B. artafrons - Length 5.0–6.0 mm. Recorded from Florida, Georgia and Mississippi; apparently rare. In addition to part of Truxal's type series, I have examined specimens from Polk County.

B. confusa - Length 4.2–7.0 mm. Along with *B. scimitra*, one of the more common *Buenoa* species in Florida.

B. limnocastoris - Length 4.7-7.5 mm. Herring (1951b) gave a maximum length of 7.5 mm for this species; Truxal (1953a) gave a maximum length of 6.37 mm. I have not seen Florida material of this species; Truxal (1953a) gave records for Wakulla Springs (Wakulla County) and Ponce de Leon in Holmes County.

B. margaritacea - Length 6.0-8.3 mm. A widespread species, but apparently rare in Florida. In the FAMU collection are two females from the Chipola River in Calhoun County determined as this species by D.A. Polhemus.

B. marki - Length 5.0–5.7 mm. Originally described from the Everglades; it has also been collected in Collier County, from a cypress hammock near the Turner River.

B. platycnemis - Length 4.5-5.4 mm. A Neotropical species that has been collected in the Keys.

B. scimitra - Length 4.5-7.5 mm. Common; probably the most easily recognized *Buenoa* species, with the large, scimitar-shaped stridulatory area on the fore femur of the male.

GENUS *Notonecta*

DIAGNOSIS: Antennae four segmented, with last segment much shorter than penultimate; median line dividing hemelytra without an anterior elliptical pit.

N. irrorata

N. uhleri

NOTES: *Notonecta* are stockier and larger than *Buenoa* species, and lack the elliptical pit at the anterior end of the hemelytral commissure. Four species are recorded from Florida, with the possibility of a fifth, *N. raleighi* Torre-Bueno, eventually being found in the state.

Notonecta are often found in swimming pools, where the careless human may pick one up and receive a nasty, stinging bite (once again, personal experience!).

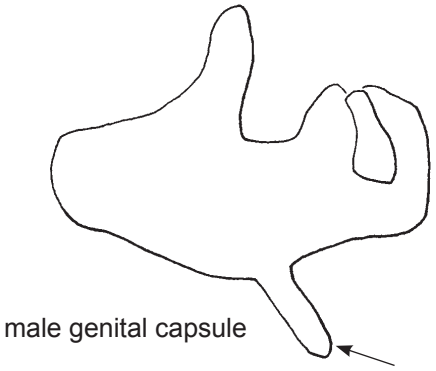
ADDITIONAL REFERENCES: Hungerford 1934a; Polhemus & Polhemus 1988b; Truxal 1979a.

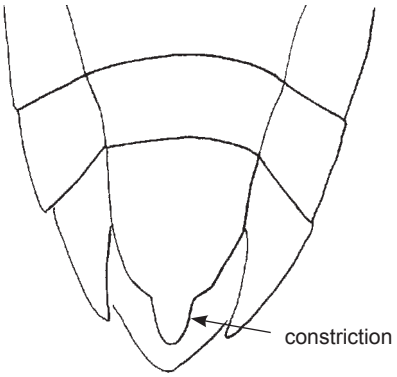
Florida species

N. indica Linnaeus
N. irrorata Uhler
N. uhleri Kirkaldy
N. undulata Say

Key to adult *Notonecta* of Florida

1 Large, length over 12.8 mm; hemelytra reddish-brown to orange, with dark mottling; male genital capsule with ventral digitiform extension; last abdominal sternite of female strongly constricted near apex ……. ***N. irrorata***

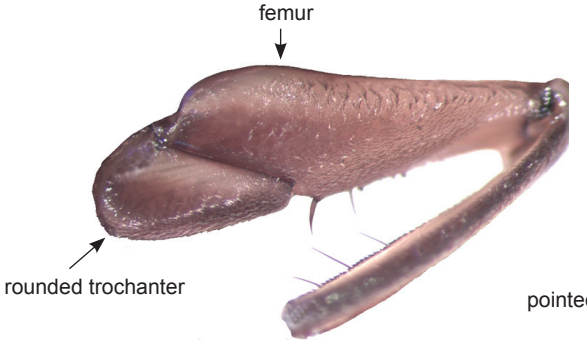


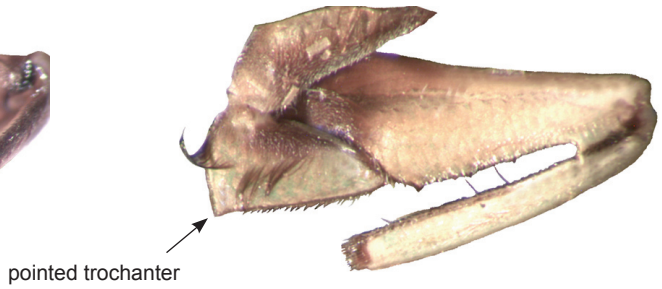


female venter

1’ Smaller, length less than 12.5 mm; hemelytra not mottled (dark bands may be present); male genital capsule without ventral digitiform extension; last abdominal sternite of female without large central projection ……..…… 2

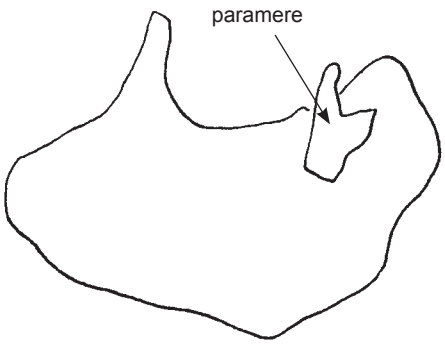
2(1’) Mid trochanter with outer angle rounded 3



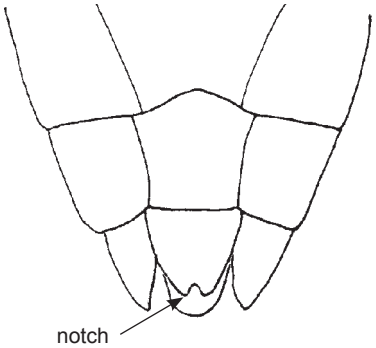


2’ Mid trochanter with outer angle sharply pointed or with tooth like projection ….....… 4

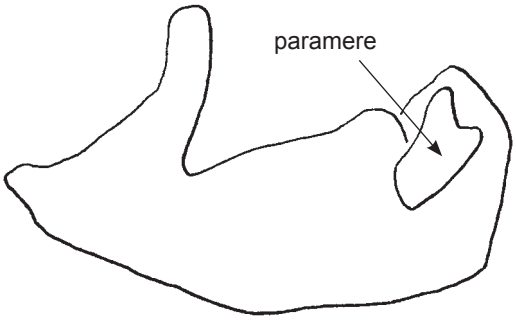
3(2) With W-shaped dark cross band near apical 3rd of hemelytra (but note that coloration is variable); male genitalia with paramere deeply bifid; last abdominal sternite of female with apex deeply notched, notch deeper than wide ……..…… ***N. undulata***



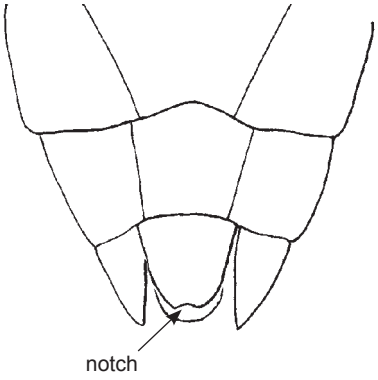
male genital capsule



3’ With more extensive, more or less straight dark cross band near apical 3rd of hemelytra (but note that coloration is variable); male genitalia with paramere shallowly bifid; last abdominal sternite of female with apex shallowly notched, notch wider than deep ……..... ..... ***N. indica***

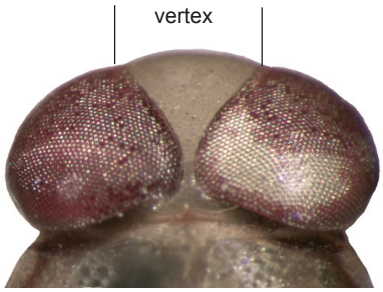


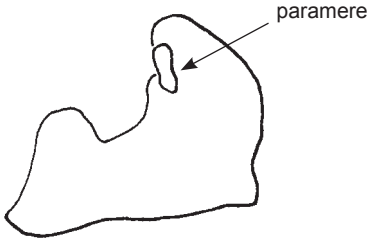
male genital capsule



color variation

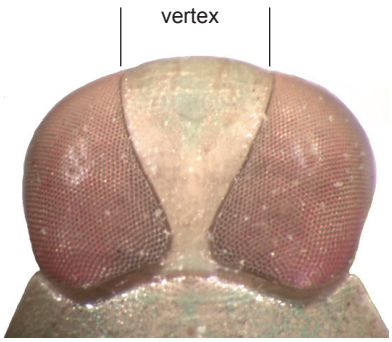
4(2’) Shortest distance between the eyes about 1/6 the anterior width of the front of the head (vertex) viewed from above; hemelytra red-orange, with dark markings; male fore trochanter with small tooth on outer angle; male genitalia with paramere short and rounded at apex; larger, length 10-12 mm …….... ***N. uhleri***

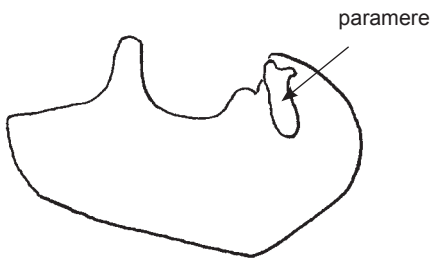




male genital capsule

4’ Shortest distance between the eyes about 1/3 the width vertex; hemelytra whitish, sometimes with dark markings; male fore trochanter with outer angle rounded; male genitalia with paramere slender and apically bifid; smaller, length 8-9 mm .. ****N. raleighi***
(not known from Florida)





male genital capsule

Notes on species

N. indica - Length 10-11 mm. Because of variation in coloration, this species is easily confused with *N. undulata*; rely on male genitalia and the female last ventral sternite for identification.

N. irrorata - Length 12.8-15.5 mm. The large size and reddish-brown to orange coloration with dark mottling (irrorate = freckled or speckled, hence the specific epithet "*irrorata*") easily distinguish this species; the digitiform ventral appendage of the male genital capsule is also distinctive for the southeastern US *Notonecta* fauna.

N. uhleri - Length 10-12 mm.

N. undulata - Length 10.5-12.6 mm. A widespread species; I've collected it from ponds in Florida and from a lake above 10,000 feet in Colorado.

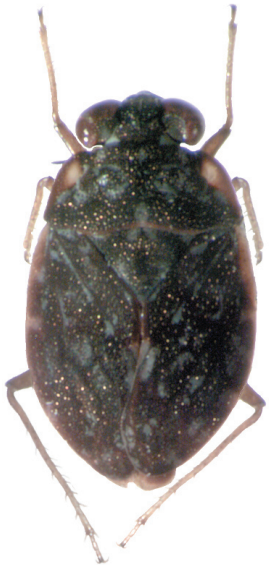
Other species

N. raleighi Torre-Bueno - Length 8-9 mm. Not recorded from Florida, but its presence in South Carolina (I've examined numerous specimens from Anderson County) indicates that it eventually may be found here. This is the smallest of the North American *Notonecta.*

FAMILY OCHTERIDAE
velvety shore bugs

12

DIAGNOSIS: Somewhat oval-shaped, flattened, shore-dwelling bugs. Antennae 4 segmented, longer than head; ocelli present; long 4 segmented beak that reaches or exceeds the hind coxae; front legs slender, not raptorial; fore and mid legs with 2 segmented tarsi, hind legs with 3 segmented tarsi; tarsi with apical claws.



Ochterus banksi

NOTES: Only one genus, *Ochterus*, of this small family is found in North America. The common name, velvety shore bugs, refers to the velvety appearance of the bug's dorsum. Ochterids are inhabitants of shore lines, where they may occur in the open or among grasses, etc. They are good runners and can also jump. They are predacious on other invertebrates.

ADDITIONAL REFERENCES: Schell 1943a; Menke 1979d; Polhemus & Polhemus 1988c.

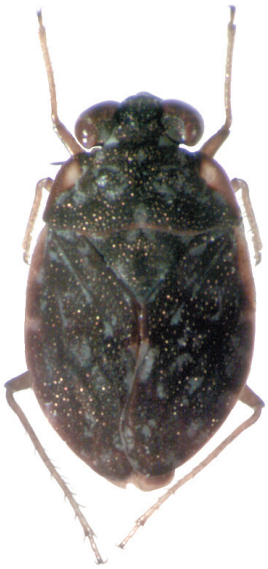
Florida genera

Ochterus Latreille

GENUS *Ochterus*

DIAGNOSIS: Somewhat oval shaped, flattened, shore-dwelling bugs. Antennae 4 segmented, longer than head; ocelli present; long 4 segmented beak that reaches or exceeds the hind coxae; front legs slender, not raptorial; fore and mid legs with 2 segmented tarsi, hind legs with 3 segmented tarsi; tarsi with apical claws.

Ochterus nymph head



Ochterus banksi adult

NOTES: Two putative species of *Ochterus* are recorded from Florida, with the possibility of a third species occuring here (see key and Notes on species). Ochterids are inhabitants of shore lines, where they may occur in the open or among grasses, etc. They are good runners and jumpers. Like toad bugs, velvety shore bugs are good at concealment. Ochterids are predators and have been observed feeding on their gelastocorid neighbors (Bobb 1951a).

Nymphs are similar to adults (but, of course, lack wings, etc.), with all legs bearing 2 segmented tarsi. Nymphs have a line of short stiff setae around the anterior margin of the head.

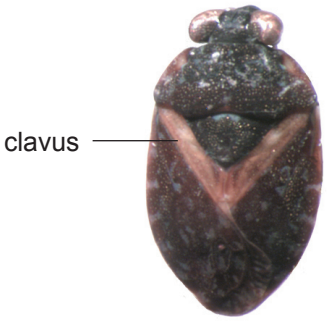
ADDITIONAL REFERENCES: Schell 1943a; Bobb 1951a.

Florida species

O. banksi Barber
O. flaviclavus Barber

Key to adult *Ochterus* of the eastern United States

1 Entire clavus of forewing yellow ..... ***O. flaviclavus***
(see Notes on species)



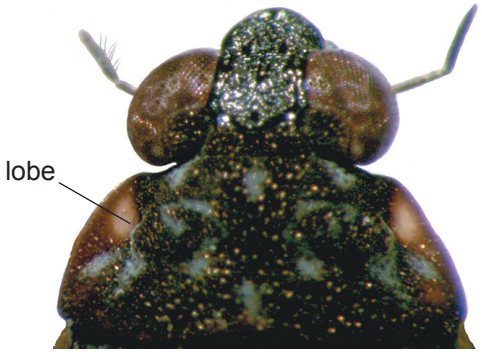
O. flaviclavus

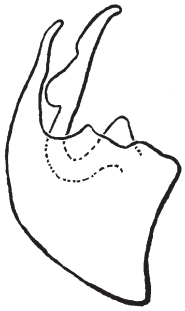
O. banksi

O. banksi variant

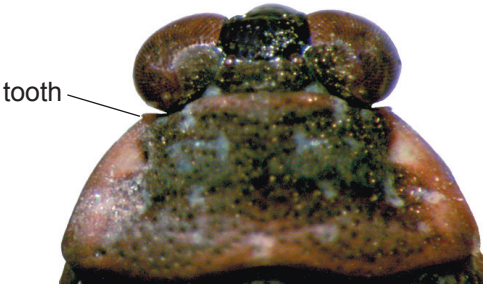
1' Clavus of forewing dark or with large spot near apex of clavus 2

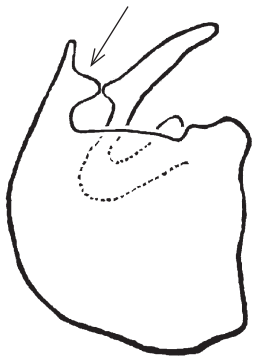
2(1') "Collar" of pronotum without small teeth; pronotum with small anterolateral lobe near inner side of flattened area; in ventral view, pronotal shelf almost entirely pale; right paramere of male genitalia with semi-heart shaped lobe, outer margin of genital capsule with longer, simple outer apex ..... ***O. banksi***





2(1') "Collar" of pronotum usually with small teeth; pronotum without small anterolateral lobe near inner side of flattened area; in ventral view, pronotal shelf with single pale spot; right paramere of male genitalia with smaller lobe, outer margin of genital capsule with shorter apex and bearing preapical tooth ..... * ***O. americanus***
(not known from Florida)





Notes on species

O. americanus from Missouri

O. americanus - Length about 4-5 mm. Not recorded from Florida, but may occur in the northern and panhandle portions of the state. Polhemus & Polhemus (1988c) noted that the records of this species from South Carolina needed confirmation. I've examined a series of *O. americanus* in the Clemson collection, some determined by Sanderson, that do appear to be *O. americanus*. All the Clemson specimens, however, were females. All had antepronotal denticles and lacked the small lobe on the inner side of the pronotal shelf that is characteristic of *O. banksi*. One of these specimens is figured in couplet 2 of my key. These South Carolina specimens are very similar to *O. americanus* specimens I examined from Missouri; the antepronotal denticles on the Missouri specimens are smaller than those of the South Carolina material (see figure above). Drake & Chapman's (1958b) Florida records for *O. americanus* were considered by Polhemus & Polhemus (1988c) to represent *O. banksi*.

O. banksi - Length about 4-5 mm. The most common species reported from Florida. This species is recorded from throughout the eastern US, but is apparently more common in the Southeast; *O. americanus* is apparently more common in the Northeast. Bobb (1951a) provided a life history study of *O. banksi*. Apparent intermediates between *O. banksi* and *O. flaviclavus* occur; see *O. flaviclavus* below.

O. flaviclavus - Length about 4-5 mm. An apparently uncommon species originally described from Florida (Ormond), but more recently (Polhemus & Polhemus 1988c) recorded from Kansas, Louisiana and Texas. Schell (1943a) noted that it was structurally similar to *O. banksi*, including the male genitalia, differing only by the lemon-yellow clavus. I have examined two examples of apparent intermediates between *O. banksi* and *O. flaviclavus* in which only a large yellow spot is present near the apices of the clavi; these forms have been found in Texas and I've collected one at Wakulla Springs in northern Florida. These forms may indicate that *O. flaviclavus* is a color variant of *O. banksi* and should be considered a junior synonym, but an official designation will have to wait until detailed examination of male and female genitalia of both taxa can confirm the synonymy. For this manual I am referring to these central-spotted specimens as "*O. banksi* variant". Note that I have also found a somewhat similar variant of *O. americanus*, which lends more credence to the idea that the yellow coloration in *O. americanus* and *O. banksi* is merely a variation.

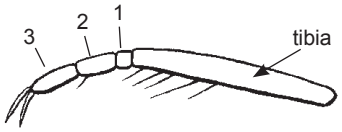
O. americanus variant from SC

O. banksi variant from Wakulla Springs

FAMILY PLEIDAE
pygmy backswimmers

13

DIAGNOSIS: Minute, upside-down swimming bugs; antennae not visible from above; hemelytra without membrane, strongly sclerotized and beetle-like; hind tarsus with two distinct apical claws.



Neoplea fore tarsus and tibia

Paraplea fore tarsus and tibia

Neoplea notana

NOTES: Two genera occur in North America; both are found in Florida. The family is badly in need of revision; species level identifications are not practically possible. The most recent comprehensive work on pleids is Drake & Chapman (1953a), which unfortunately includes neither keys nor illustrations.

Drake & Maldonado (1956a) elevated two of the subgenera of the genus *Plea*, *Neoplea* and *Paraplea*, to generic level. The two genera are easily separated: *Neoplea* has foretarsi with three segments, with the basal segment very small, so that the tarsus appears two segmented, and abdominal sternites 2-5 have a median keel. *Paraplea* has foretarsi with two segments, with the basal segment very small, so that the tarsus appears one segmented, and abdominal sternites 2-6 have a median keel.

ADDITIONAL REFERENCES: Drake & Chapman 1953a; Drake & Maldonado 1956a; Polhemus 1988b.

Florida genera

Neoplea Esaki & China
Paraplea Esaki & China

GENUS *Neoplea*

DIAGNOSIS: Fore and hind tarsi with three segments; sternites 2-5 with median keel.

N. apopkana *N. notana* *N. striola*

Note that these figures are not to scale; *N. striola* is a bit larger than the other species

NOTES: *Neoplea* was elevated from subgenus to genus by Drake & Maldonado (1956a). The taxonomy of *Neoplea*, and Nearctic pleids in general, is in a confused state. For many years, workers considered only one species, *Plea striola* Fieber, as occurring in North America, but three species of *Neoplea* are recorded from Florida.

It may be possible to separate *N. striola* by its slightly larger size, slightly more pointed posterior (in dorsal aspect) and slightly less rounded (in lateral aspect) appearance. I can not separate *N. apopkana* from *N. notana* with certainty. Color patterns are subject to great variation. Until the genus is revised, it is advisable to identify these tiny bugs only to the genus level.

ADDITIONAL REFERENCES: Drake & Chapman 1953a; Ellis 1950a, 1965a; Drake & Maldonado 1956a; Polhemus 1988b.

Florida species

N. apopkana (Drake & Chapman)
N. notana (Drake & Chapman)
N. striola (Fieber)

Notes on species

N. apopkana - Length 1.95 mm (Drake & Chapman 1953a). Described from several sites in Florida (including Apopka) and one in Mississippi. Supposedly separable from the very similar *N. notana* by "its more elongate form, darker color, and the elytra not so sharply declivous behind" (Drake & Chapman 1953a: 59). As one can see from the specimens of *N. apopkana* and *N. notana* illustrated in this chapter (from the FSCA and determined by Chapman), these differences do not appear to be readily apparent. Perhaps after examination of hundreds of specimens, some pattern of characters may make these taxa identifiable. Until the genus is revised, using perhaps genitalia or biomolecular data, it is (for me) not possible to identify this taxon or *N. notana* with certainty. Drake & Chapman (1953a: 53-54) stated: "… the species are difficult to identify, and often much confused. In a subsequent paper the authors plan to publish illustrations of antennae, opercula of male and female, elytra, male parameres, female ovipositers, and the median laminate carinae on sterna and venter." Unfortunately, this paper was never published. Studying these little critters is almost as bad as working with chironomid midges!

N. notana - Length 1.90 mm (Drake & Chapman 1953a). See *N. apopkana* above. Described from Mims, Florida, and Biloxi, Mississippi.

N. striola - Length 1.95-2.25 mm (from five specimens determined by J.T. Polhemus). *Neoplea striola* has been the subject of several papers concerning its identity and that of another species, *Plea harnedi* Drake. Blatchley (1926a) first suggested that *P. harnedi* was a variety of *P. striola*. Based on a series of 168 specimens from Louisiana, Ellis (1950a) placed *P. harnedi* as a junior synonym of *P. striola*. Drake & Chapman (1953a) disagreed and stated that *P. harnedi* was indeed a valid species, stating that Ellis had not had any *P. striola* in his sample and thus did not know what the "real" *P. striola* looked like. Ellis (1965a) replied that he had indeed examined and compared type material of *P. striola* to *P. harnedi* and re-instated the synonymy of the two species, a position with which Wilson (1958a) agreed (although he used *P. striola* in his 1958 monograph). Polhemus (1988b) maintained this synonymy.

As noted by Ellis (1950a), coloration of *Neoplea* is quite variable and is probably not useful to recognize species. *Neoplea striola* might be separable from *N. apopkana* and *N. notana* by its slightly larger size, slightly more pointed posterior (in dorsal aspect) and slightly less rounded (in lateral aspect) appearance. **However, I would exercise caution and not attempt species level identification of any Florida *Neoplea* until the genus is satisfactorily revised.**

GENUS *Paraplea*

DIAGNOSIS: Fore and hind tarsi with two segments; sternites 2-6 with keel.

P. nilionis holotype
(photos by T.J. Henry)

P. puella

NOTES: *Paraplea* was elevated from subgenus to genus by Drake & Maldonado (1956a). Two species have been described from the Nearctic; both occur in Florida. It does not appear, however, that these two species can be reliably identified; see Notes on species.

ADDITIONAL REFERENCES: Drake & Chapman 1953a; Barber 1923a; Drake & Maldonado 1956a; Polhemus 1988b.

Notes on species

P. nilionis - Length about 1.9 mm. It appears that only two specimens of this taxon are in existence, the male holotype (figures above) and the female allotype. Drake & Chapman (1953a:55) stated "Differs from *P. puella* (only other American member of the subgenus) by the more elongate form, larger scutellum (*nilionis*, 40:36; *puella* 34:30), distinctly longer elytra, thicker body dorso-ventrally and less prominent punctures." I can not see these differences and would suggest that **workers use caution and not attempt species level identification of any Florida *Paraplea* until the genus is satisfactorily revised.**

P. puella - Length about 1.9 mm. See *P. nilionis* above. Should *P. puella* and *P. nilionis* prove to be the same species, *P. puella* is the older name and would have priority.

Florida species

P. nilionis (Drake & Chapman)
P. puella (Barber)

FAMILY SALDIDAE
shore bugs

14

DIAGNOSIS: Small to medium sized, mostly shore-dwelling, running and jumping bugs with antennae visible from above; ocelli present; no channel beneath the head to receive the beak; membrane of hemelytron (fore wing) with 4-5 distinct similar cells; all tarsi 3 segmented, with apical claws; and large, transverse hind coxae.

Micracanthia hungerfordi

Pentacora sphacelata

Saldoida slossonae

NOTES: Five genera of this interesting family are found in Florida. Saldids are common denizens on shore lines of fresh or salt water bodies. Many of our species are associated with brackish or estuarine waters and may be common in *Spartina* marshes. Saldids prey on organisms that live just below the surface, as well as on the surface, using chemical and visual cues.

Saldids are not often collected using the conventional benthic sampling tools such as grabs, dredges and Hester-Dendy or other artificial substrate sampling devices. If one wants saldids, one must usually stalk them with a net, for they are most often found near the water's edge, scurrying among vegetation, running, jumping and flying away before capture.

ADDITIONAL REFERENCES: Chapman 1958a; Polhemus 1985a, 1988a; Polhemus & McKinnon 1983a; Polhemus & Chapman 1979a; Schuh 1967a; Drake & Chapman 1958b; Drake & Hottes 1950a.

Florida genera

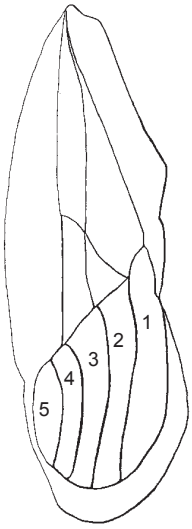
Micracanthia Reuter
Pentacora Reuter
Salda Fabricius
Saldoida Osborn
Saldula Van Duzee

Key to genera of adult Saldidae of Florida

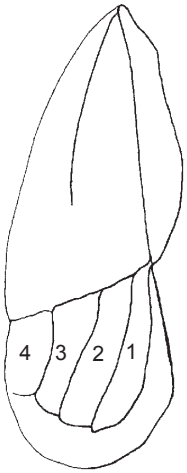
1 Dorsum of pronotum with a pair of large, sharply conical tubercles; antennal segments 3 and 4 swollen ..... ***Saldoida***

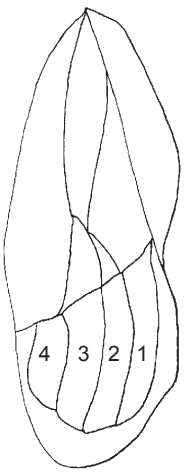
1' Dorsum of pronotum without such tubercles; antennal segments 3 and 4 not swollen 2

2(1') Membrane of hemelytron (forewing) with 5 terminal longitudinal closed cells .... ***Pentacora***



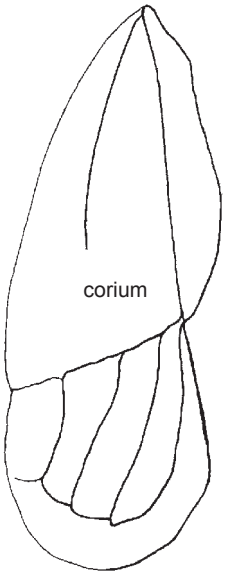
2' Membrane of hemelytron with 4 terminal closed cells 3





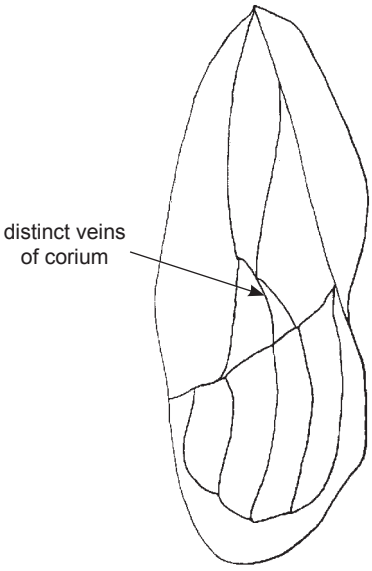
3(2') Larger species, males >5.5 mm, females > 6.0 mm in length ..... ***Salda***

3' Smaller species, males <5.5 mm, females < 6.0 mm in length 4



4(3') Veins of corium indistinct distally; smaller, length usually < 3.5 mm ..... ***Micracanthia***

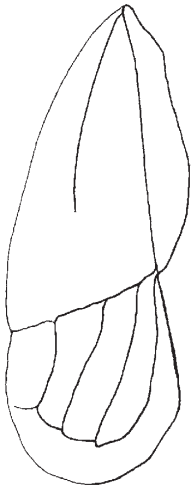
It may be necessary to remove or lift a wing in order to observe the veins of the corium.



4' Veins of corium distinct distally; larger, length usually > 3.5 mm ..... ***Saldula***

GENUS *Micracanthia*

DIAGNOSIS: Smaller, length usually less than 3.5 mm; corium with indistinct veins distally; hemelytron (forewing) membrane with four terminal closed cells.



M. humilis hemelytron

M. hungerfordi

NOTES: Five species of *Micracanthia* are recorded from Florida; a sixth, *M. quadrimaculata*, has been recorded in older literature but probably does not occur here (previous records referred to *M. floridana*).

Micracanthia are found near fresh and brackish/salt water, where they may be encountered along shore or on emergent vegetation. Identification of some *Micracanthia* species is difficult and is best done with access to reference specimens.

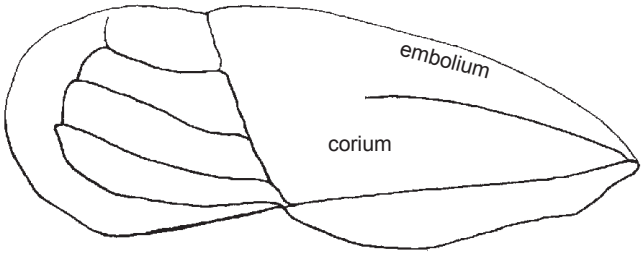
ADDITIONAL REFERENCES: Polhemus 1985a, 1988a; Drake & Chapman 1952a, 1953c; Hodgden 1949a; Schuh 1967a.

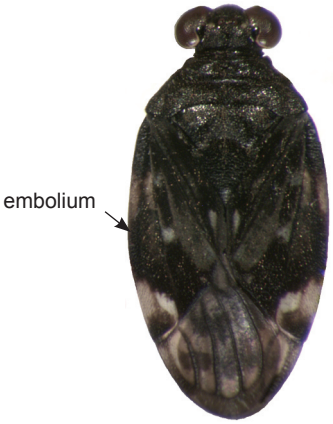
Florida species

M. floridana Drake & Chapman
M. humilis (Say)
M. hungerfordi (Hodgden)
M. husseyi Drake & Chapman
M. pumpila Blatchley

Key to adult *Micracanthia* of Florida

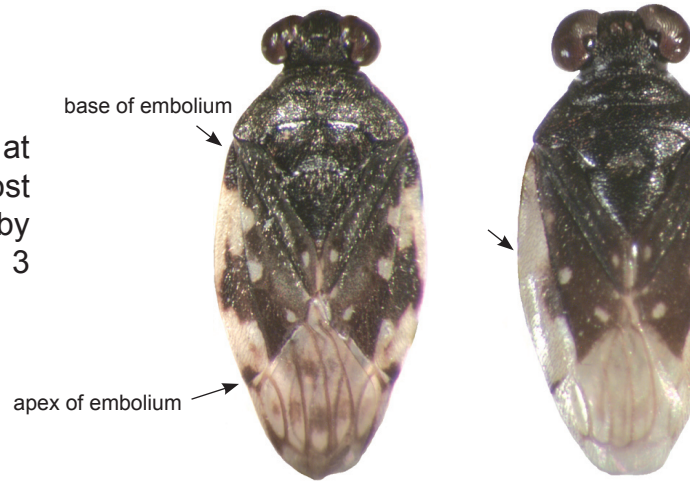
1 Outer margin of hemelytron (embolium) mostly dark, interrupted by two light blotches …… 2





M. floridana

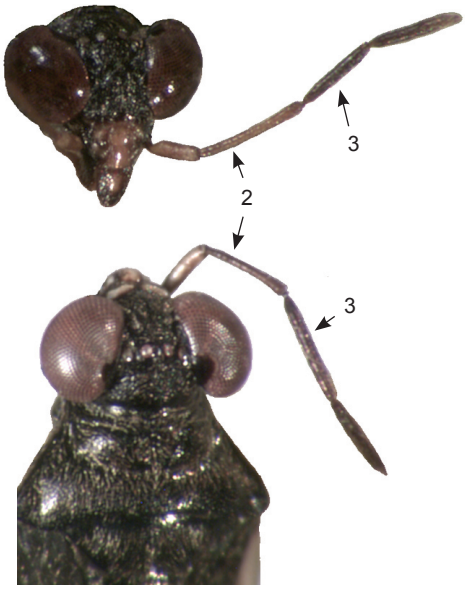
1' Except for darker spot near base and at apex, embolium mostly pale along most of its length, but sometimes interrupted by dark blotch near center …..... 3



2(1) Larger, length 3.0-3.5 mm (figure in couplet 1) ..... ***M. floridana***

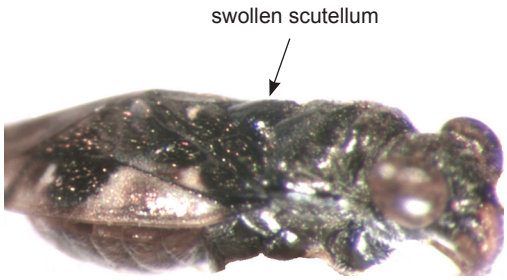
2' Smaller, length 2.5-3.0 mm ..... ****M. quadrimaculata***
(not known from Florida; see Notes on species)

3(1') 2nd antennal segment longer or subequal to 3rd …….. ***M. humilis***



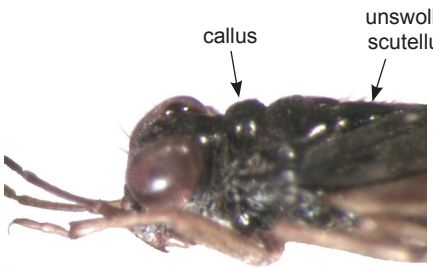
3' 2nd antennal segment shorter than 3rd …….. 4

4(3') Apex of scutellum swollen and sparsely setose ……. ***M. pumpila***

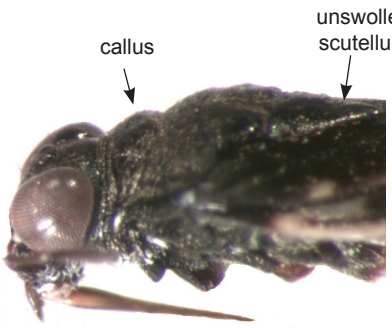


4' Apex of scutellum not swollen and mostly covered with setae (note that setae may be rubbed off but setal pits will remain visible) ……... 5

5(4') Callus well developed, deeply separated from posterior of pronotum; smaller, 2.2-2.7 mm; shape more oval .... ***M. hungerfordi***



5' Callus not as well developed, not as deeply separated from posterior of pronotum; larger, 2.5-3.0 mm; shape more elliptical-oval ..... ***M. husseyi***



Notes on species

M. floridana - Length 3.0-3.5 mm. The largest *Micracanthia* in Florida, often found on damp wood in or near fresh water.

M. humilis - Length 2.5-3.5 mm. This widespread species is more often found near fresh water rather than saline habitats.

M. hungerfordi - Length 2.2-2.7 mm. I have not seen any Florida material of this species; Hodgden (1949a) reported it from Lower Matecumbe Key. Specimens in which the third antennal segment may be only slightly shorter than the second segment may key to *M. humilis* but note that the scutellum of *M. humilis* is rugulose (transversely wrinkled); that of *M. husseyi* (and *M. pumpila*) is smooth (although lines of setal pits may appear as faint transverse striations). Note that *M. hungerfordi* is more oval in shape and browner than *M. husseyi*, which is more elliptical in shape (it looks leaner) and more distinctly black or darker brown and white.

M. husseyi - Length 2.5-3.0 mm. Found in fresh, brackish and salt water areas, where it lives "on grass which protrudes above the water line" (Chapman 1958a: 123). See *M. hungerfordi* above.

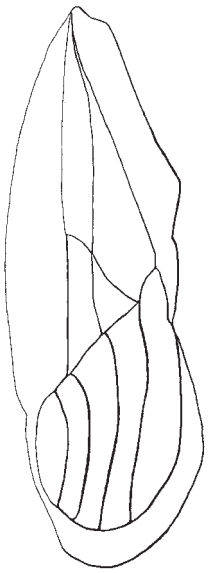
M. pumpila - Length about 2.8-3.0 mm. The almost bare, swollen scutellum is distinctive for this species. Note that scutellar setae may be rubbed off but setal pits will remain visible; such pits are few and scattered on *M. pumpila* but numerous and aligned in transverse rows in *M. husseyi* and *M. hungerfordi*. Note that the pronotal callus of *M. pumpila* is distinctly and deeply divided from the posterior of the pronotum, as is the callus of *M. hungerfordi*. This species is normally found in salt marshes, "where it abounds on damp and flooded areas beneath pickleweed and dead man's finger" (Chapman 1958a: 123).

Other species

M. quadrimaculata (Champion) - Length 2.5-3.0 mm. Drake & Chapman (1952a) stated that *M. quadrimaculata* occurred in Florida. However, Chapman (1958a) noted that former Florida records of this species referred to *M. floridana*. In the distribution for *M. quadrimaculata*, Polhemus (1988a) listed "Fla.(?)". This species probably does not occur in Florida, for other parts of the range listed for this species are all much farther west and north (CA, CO, ID, NM, OR, SD, WA, WY, and British Columbia, Central America and Mexico).

GENUS *Pentacora*

DIAGNOSIS: Membranous area of hemelytron with five terminal elongated, closed cells.



P. sphacelata hemelytron

P. sphacelata

NOTES: Three species had previously been recorded from Florida; with this study I add a fourth species, *P. ligata*.

Pentacora are usually associated with salt marshes or beaches, except for *P. ligata*, which is usually found on exposed stones, rocks, etc. in rivers. *Pentacora* are swift runners and quick to jump and fly off, making them difficult to capture.

ADDITIONAL REFERENCES: Polhemus 1985a, 1988a; Schuh 1967a.

Florida species

P. hirta (Say)
P. ligata (Say)
P. signoreti (Guérin-Méneville)
P. sphacelata (Uhler)

Key to adult *Pentacora* of Florida

P. hirta

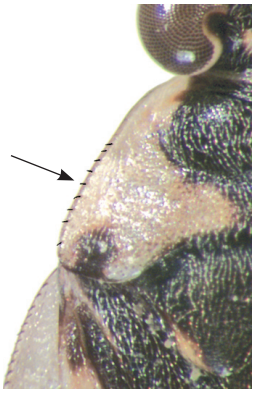
1 Dorsum of body with long erect setae that are at least as long as the medial width of the hind tibia 2

1' Dorsum of body without such long erect setae 3

2(1) Dorsal surface noticeably shiny; hind tibia with erect setae that are longer than the medial width of the tibia; usually found in saline habitats ..... ***P. hirta***

2' Dorsal surface dull to barely shining; most erect setae of hind tibia not longer than medial width of tibia; freshwater species ..... ***P. ligata***

3(1') Lateral margins of pronotum with short, black, peg-like setae .. .. ***P. signoreti***



3' Lateral margins of pronotum without short, black peg-like setae ..... ***P. sphacelata***

Notes on Species

P. hirta - Length about 4.8-6.6 mm. This species and *P. ligata* have longer dorsal setae than the other two species recorded from Florida. However, the setae of *P. hirta* are longer and the insect has an overall more bushy appearance than *P. ligata. Pentacora hirta* is also noticeably shinier and is most often (only?) found in saline habitats; *P. ligata* is duller (but may be shiny in spots) and is most likely to be found near freshwater.

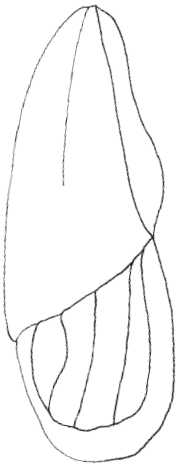
P. ligata - Length about 4.5-7.1 mm. Unlike the other three *Pentacora* species found in Florida, *P. ligata* is usually found in fresh water habitats, where they occur on exposed logs, pilings, rocks and large stones in rivers. My Florida specimens of this widespread species are from the Suwannee River near Benton, Columbia County; they were collected in August.

P. sphacelata - Length 3.8-5.8 mm . A common salt marsh species. I've collected it from sparsely vegetated grassy flats near the water's edge in *Spartina* marshes.

P. signoreti - Length about 5.7–8.2 mm. The short, black peg-like setae found on the margin of the pronotum also extend onto the outer anterior margin of the forewing.

GENUS *Salda*

DIAGNOSIS: Four closed longitudinal cells in hemelytron membrane; larger species, males >5.5 mm, females > 6.0 mm in length.



S. lugubris hemelytron

S. lugubris

NOTES: *Salda* is a Holarctic genus whose members are usually distributed far to our north. One species, *S. lugubris* (length 6.1-6.8 mm), is recorded from Florida. I have not seen any Florida material; Schuh (1967a) stated that he had examined one specimen from Florida, but did not give locality data for that specimen. It can be assumed that this species is rare in Florida.

Salda are usually associated with the margins of fresh water bodies: seeps, bogs and meadows.

Note that this species will not key correctly in Sandersen's (1982a) generic key; the amount that the inner cell of the forewing extends past the second cell is not as great in *S. lugubris* as in other species of the genus.

ADDITIONAL REFERENCES: Polhemus 1985a, 1988a; Schuh 1967a.

Florida species

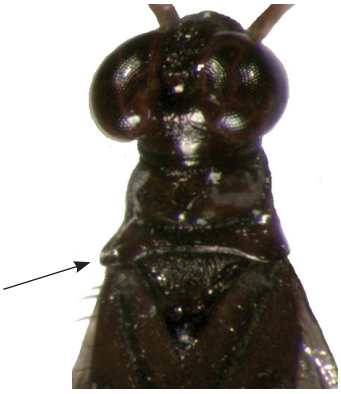
S. lugubris (Say)

GENUS *Saldoida*

DIAGNOSIS: Antennal segments 3 and 4 strongly swollen; dorsum of pronotum with two sharply conical tubercles.

S. slossonae

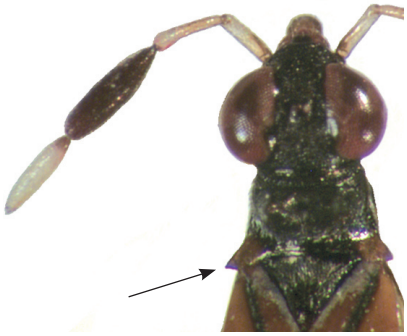
S. slossonae



S. slossonae

NOTES: Two species of this genus occur in Florida: *S. cornuta* (length 2.5-3.2 mm) and *S. slossonae* (length 2.6-3.3 mm). They are some of the niftiest bugs around, with a shiny appearance, inflated antennal segments 3 and 4, and the two large, sharply conical tubercles on the dorsum of the pronotum. They are prodigious jumpers and are very difficult to collect; all of the specimens in my collection were captured with a pitfall trap. *Saldoida* are inhabitants of shorelines, especially sandy ones with tussocks of vegetation.

The two species are separated by the shape of the posterolateral angle of the pronotum: that of *S. cornuta* is longer and sharper; that of *S. slossonae* is blunter; and the color of the conical pronotal tubercles: black in *S. cornuta*, yellowish-reddish brown to dark brown in *S. slossonae*. Note also that the scutellum of *S. slossonae* is swollen posteriorly while that of *S. cornuta* is scarcely swollen.



S. cornuta

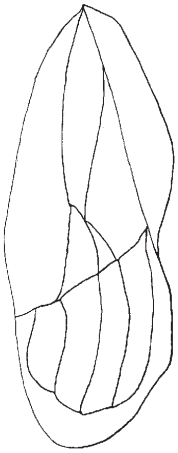
ADDITIONAL REFERENCES: Drake & Chapman 1958a; Schuh 1967a; Polhemus 1988a.

Florida species

S. cornuta Osborn
S. slossonae Osborn

GENUS *Saldula*

DIAGNOSIS: Larger, length usually more than 3.5 mm; hemelytron (forewing) with four terminal closed cells; corium with veins well developed distally.



hemelytron

S. lomata

NOTES: *Saldula* is the largest genus, in terms of numbers of species, of the Saldidae on a worldwide basis. Four species are recorded from Florida, although one, *S. opacula*, may be due to a mislabeled specimen.

Saldula occur in a wide variety of moist habitats, fresh, brackish and marine. Color patterns may vary geographically as well as by the type of habitat and substrata on which the bugs occur.

Correctly identified comparative material will help immensely in identifying *Saldula* species.

ADDITIONAL REFERENCES: Polhemus 1985a, 1988a; Drake & Hottes 1950a; Schuh 1967a.

Florida species

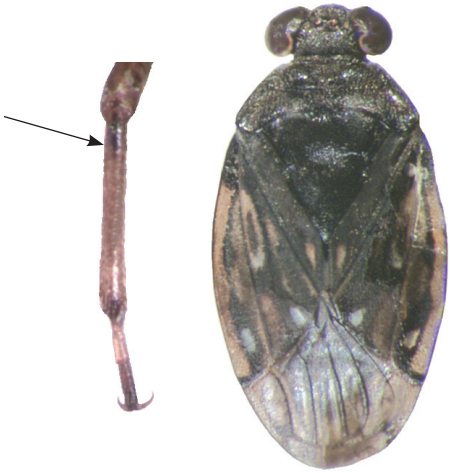
S. coxalis (Stål)
S. lomata Polhemus
S. opacula (Zetterstedt)
S. pallipes (Fabricius)

Key to adult *Saldula* of Florida

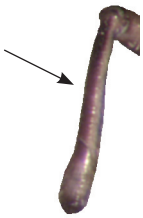
1 Outer margin of pronotum with pale stripe ..... ***S. coxalis***

1' Outer margin of pronotum without pale stripe 2

2(1') Fore tibia with fuscous spot near base only or with spot near base and weak marking near middle of tibia; rare ..... ***S. opacula***



2' Fore tibia with continuous fuscous stripe along most of segment; common 3



3(2') Vertex and forehead with long, semi-erect, apically curved setae in addition to normal 3 pairs of long, thicker setae; embolium usually entirely pale along outer margin, if dark blotch present, it does not extend to outer margin of embolium; common …. ***S. lomata***

3’ Vertex and forehead without long curved setae, except normal 3 pairs; embolium dark or if pale, with dark blotch usually reaching outer margin; uncommon .. ***S. pallipes***

color variation

Notes on species

S. coxalis - Length about 3.4 mm. A Central American species that has been recorded from Texas and Florida in the US. I have not seen any Florida material of this species. Chapman (1958a: 122) noted that Barber (1914a) recorded this species (as *Acanthia xanthochila* var. *limbosa* Horvath) from Florida. Chapman stated that “it is probable that his specimens were *S. coxalis* since *S. xanthochila* var. *limbosa* is known only from Europe”. The pale lateral border on the pronotum is distinctive for our Florida species of *Saldula*.

S. lomata - Length about 3.8-4.5 mm. The most common *Saldula* along the Gulf Coast; most previous records of *S. pallipes* from the Southeast refer to *S. lomata*. Note that some *S. lomata* may have lighter fore tibia and may key to *S. opacula*; note that *S. lomata* has numerous long setae on the vertex and forehead that *S. opacula* and *S. pallipes* lack.

S. opacula - Length about 2.8-4.0 mm. This is a northern species which may not occur in Florida. However, Chapman (1958a: 123) noted “the U.S. National Museum possesses one specimen of this bog inhabiting species from Paradise Key, Florida”. One might assume that this refers to Paradise Key, near Royal Palm in Everglades National Park. The possibility of a mislabeled specimen should also be considered.

S. pallipes - Length about 3.5-4.8 mm. Much taxonomic confusion has accompanied the name *Saldula pallipes*. The majority of records for this species from Florida and the southeastern United States are applicable to *S. lomata*, more recently described by Polhemus (1985a). Note, however, that *S. pallipes* does occur in Florida. *Saldula pallipes* is quite variable in coloration and is found in a variety of moist habitats, both fresh and saline. Polhemus (1985a: 198) noted that it is the most widely distributed saldid species in the world.

FAMILY VELIIDAE
riffle bugs, small water striders

15

DIAGNOSIS: Small to minute surface dwelling bugs with antennae visible from above; ocelli absent (in Nearctic genera); dorsum of head with median longitudinal groove or smooth stripe; tarsal claws preapical or tarsus deeply cleft, with fan-like plumes or leaf-like blades arising from cleft; short hind femora that rarely exceed the tip of the abdomen.

Husseyella turmalis

Microvelia hinei

Rhagovelia torreyana

Steinovelia stagnalis

Platyvelia brachialis

NOTES: Five genera of veliids occur in Florida. Veliids are found on all water body types, where they occur on the water's surface or on emergent vegetation; some may be found on plants away from water; two taxa are marine coastal inhabitants.

ADDITIONAL REFERENCES: Andersen 1982a; Herring 1950b; Polhemus & Chapman 1979e; Smith 1988d; Smith & Polhemus 1978a.

Florida genera

Husseyella Herring
Microvelia Westwood
Platyvelia Polhemus & Polhemus
Rhagovelia Mayr
Steinovelia Polhemus & Polhemus

VELIIDAE

Key to genera of adult Veliidae of Florida

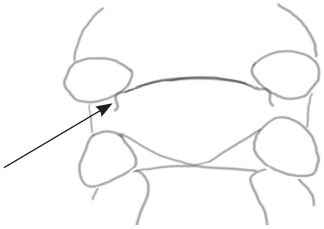
1 Last segment of middle leg tarsus deeply cleft (about 3/4), cleft bearing plume-like structures ..... ***Rhagovelia***

1' Last segment of middle leg tarsus not deeply cleft and not bearing plume-like structures 2

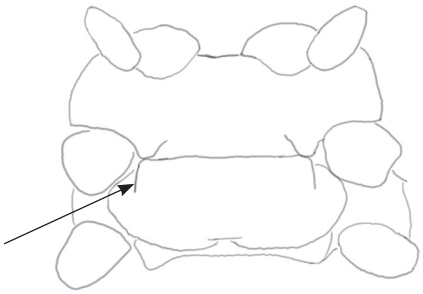
2(1') All legs with 3 tarsal segments 3

2' Fore leg with 1 tarsal segment, mid and hind legs each with 2 tarsal segments 4

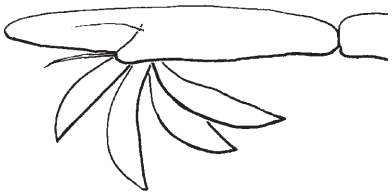
3(2) Body slender; metasternite with pair of anterior tubercles that oppose posterior margin of coxae; mid tarsus with last 2 segments subequal in length; bases of wings or wing pads brown, without white spots ..... ***Steinovelia***



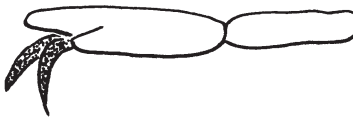
3' Body more stout; metasternite with pair of anterior tubercles that oppose tubercles at posterior margin of mesothorax; mid tarsus with 2nd segment much longer than 3rd; bases of wings or wing pads with white spots ..... ***Platyvelia***



4(2') Mid tarsi with 4 leaf-like blades arising from cleft in last segment ..... ***Husseyella***



4' Mid tarsi with simple claws in cleft of last segment .... ***Microvelia***



GENUS *Husseyella*

DIAGNOSIS: Fore leg with 1 tarsal segment, mid and hind legs each with 2 tarsal segments; mid tarsi with 4 leaf-like blades arising from cleft in last segment; estuarine/marine.

H. turmalis

NOTES: Three species are described for this genus; only one, *H. turmalis*, is known from the Caribbean, Mexico, Central America and southern Florida. *Husseyella* is a very small bug, ranging from about 1.9-2.5 mm. They are very active, swiftly zipping among mangrove roots, as well as in salt marshes and other marine coastal/estuarine habitats.

ADDITIONAL REFERENCES: Herring 1955a; Smith 1988d; Smith & Polhemus 1978a.

Florida species

H. turmalis (Drake & Harris)

GENUS *Microvelia*

DIAGNOSIS: Minute to very small surface dwelling bugs; fore leg with 1 tarsal segment, mid and hind legs each with 2 tarsal segments; mid tarsi with simple claws in cleft of last segment.

M. hinei

NOTES: Members of the genus *Microvelia* constitute our smallest water bugs. At the same time they are the largest genus, in terms of species, of the Veliidae in our area, with records for eleven species in the state. *Microvelia* are present on almost all still waters, including puddles, ditches, ponds, lakes, marshes and along the margins or slower areas of streams and rivers.

The key that follows is adapted from Smith & Polhemus (1979a). It is written for wingless adults and thus does not include *M. marginata*, which is known only in a winged form (see Notes on species).

Use caution when determining the number of apparent dorsal segments of the thorax; some taxa possess a line of setae that may be confused as a border of a segment.

ADDITIONAL REFERENCES: Herring 1950b, Polhemus 1974a; Polhemus & Chapman 1979e; Smith 1988d; Smith & Polhemus 1978a.

Florida species

M. albonotata Champion
M. americana (Uhler)
M. atrata Torre-Bueno
M. austrina Torre-Bueno
M. buenoi Drake
M. cubana Drake
M. fontinalis Torre-Bueno
M. hinei Drake
M. marginata Uhler
M. paludicola Champion
M. pulchella Westwood

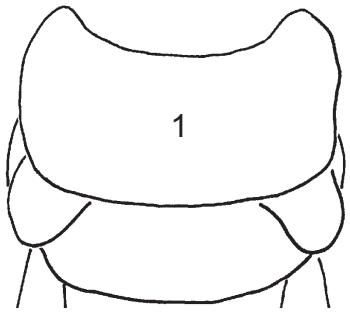
VELIIDAE

Key to wingless adult *Microvelia* of Florida

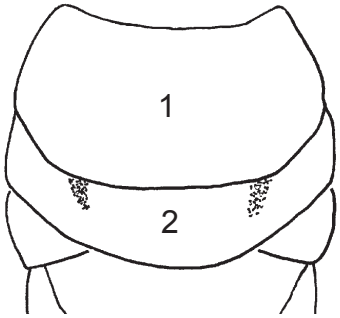
(*M. marginata* not included)

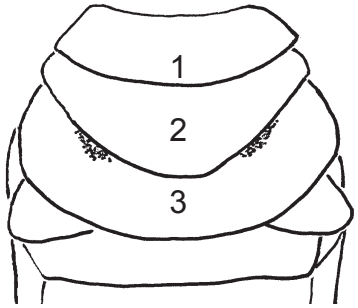
NOTE: to identify *Microvelia*, be sure you have an adult (with 1 foretarsal segment and 2 mid and rear tarsal segments) and that it is apterous (wingless). If in alcohol, dry the bug(s) on a small piece of tissue paper; you can not easily observe many important characters unless the bug is dry. When finished, point mount the bug or place back in alcohol.

1 Dorsum of thorax appearing to consist of only one segment 2



1' Dorsum of thorax appearing to consist of 2 or 3 segments 4

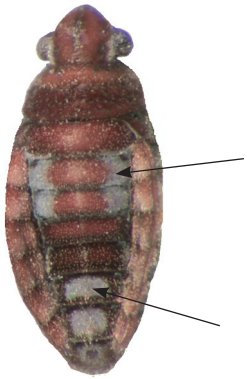




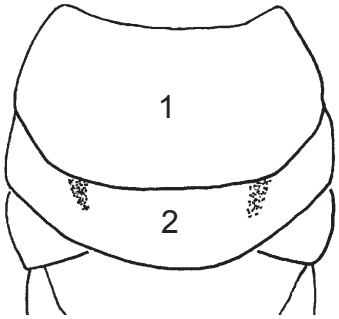
2(1) Tiny white vestigial wing pads present ... ***M. atrata***

2' Tiny white vestigial wing pads not present 3

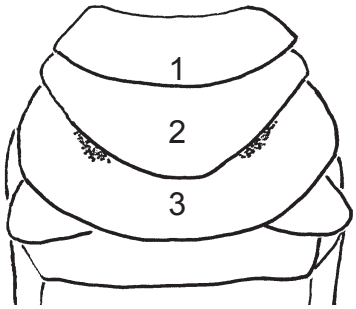
3(2') Shiny bluish-gray patches (pruinescence) present on abdominal terga 2 and 3 and usually 6 and 7; generally orange-brown to dark reddish-brown in color ..... ***M. fontinalis***



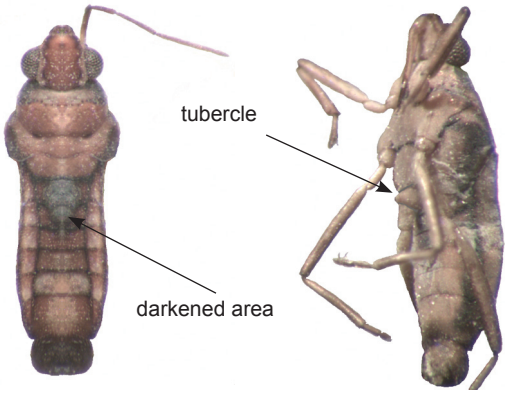
3’ Patches of bluish-gray pruinescence absent on all abdominal terga; generally sooty black in color, with an orange transverse band across anterior of pronotum ..... ***M. austrina***



4(2’) Dorsum of thorax with 2 apparent segments ... 5



4’ Dorsum of thorax with 3 apparent segments ... 8



5(4) Antennal segment 4 subequal (≥90%) to width of head through eyes; middle 1/3 of abdominal tergite 2 with darkened area (this area usually with central area of lighter pruinescence); male with large pointed tubercle on abdominal sternite 2 .... ***M. albonotata***

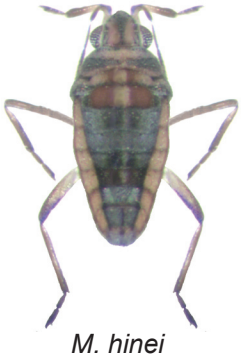
5’ Antennal segment 4 not more than 75% of width of head through eyes; abdominal tergite 2 without darkened area; male without large pointed tubercle on abdominal sternite 2 6

6(5') Last 3 abdominal tergites with broad, brownish shiny areas, covering 25-90% of at least 1 segment; rare in Florida (see Notes on species) ..... ***M. buenoi***

6' Abdomen not as above; usually with last abdominal tergites with silvery bluish-gray patches; common in Florida 7

M. buenoi

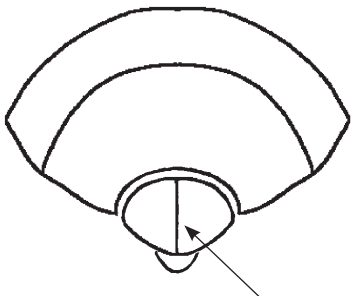
7(6') Tibia of middle leg < 75% as long as width of head through eyes; common ..... ***M. hinei***



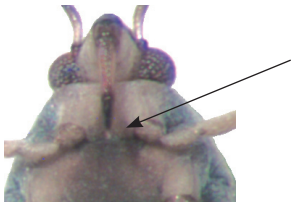
M. hinei

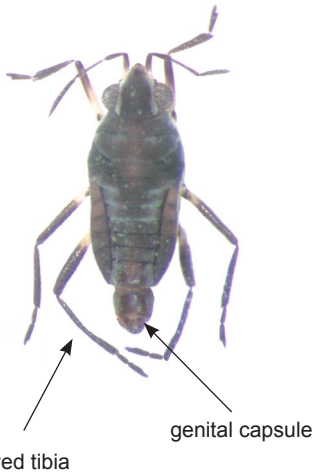
7' Tibia of middle leg subequal (≥90%) in length to width of head in eyes; rare, in US known from south Florida only (?) ..... ***M. cubana***

8(4') Hind tibiae of males curved; females with wide groove between widely separated front coxae for reception of rostrum (beak), groove with interior edges sloping gradually, diverging posteriorly; length usually < 2 mm (1.25-2.25 mm) .... ***M. pulchella***



female





male

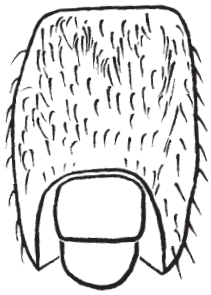
NOTE: In females, the apparent 7th abdominal sternite is longitudinally divided. Males possess a distinctive genital capsule, often exerted but sometimes withdrawn partially into the abdomen, with no longitudinal fissure.

8’ Hind tibiae of males straight; females with narrow groove through narrowly separated front coxae, groove with interior edges more vertical and parallel; length > 2 mm (2.00-3.75 mm) ..... (subgenus *Kirkaldya*) ... key for males only 9

NOTE:
you must have males in order to proceed further in the key

9(8’) Distal ventral margin of genital capsule with either a row or tufts of setae (tufts may occasionally be shortened and thus obscured) ..... ***M. americana***

9’ Distal ventral margin of genital capsule naked .... ***M. paludicola***



Notes on species

M. albonotata - Length 2.2-2.4 mm. Males are easily recognized by the large, pointed ventral tubercle on the second abdominal sternite. Drake & Hussey (1955a) recorded this species from pools in bat caves in Alachua and Gilchrist Counties in Florida; the species is “normally” found in wooded pools, cypress swamps and lake margins; I’ve also collected it on small streams in deeply shaded woods.

M. americana - Length 2.3-2.7 mm. This species is very similar to *M. paludicola*. Judging from Florida material I’ve examined, *M. americana* is much more common in Florida than *M. paludicola.*

M. atrata - Length 1.7 mm. Easily identified by the apparent one-segmented dorsum of the thorax and the minute white wing pads. These wing pads are most easily seen when the specimen is dried.

M. austrina - Length 1.6-1.9 mm. An uncommon species. I have found it in a first order spring-fed stream in Jefferson Co., where the stream flowed around and over moss, then dropped over an overhang into a shallow pool about half a meter below. The *M. austrina* were collected from the pool and/or moss, where they occurred with *M. americana* and *M. fontinalis.*

M. buenoi - Length about 1.7 mm. Herring (1950b) gave a record for this species from "Blues Creek Swamp" in Alachua Co. To my knowledge this is the only Florida record for this species, usually found much farther north. I have not been able to locate the specimen. I have seen several examples of *M. hinei* identified as this species; note that *M. hinei* (and *M. cubana*) has a silvery bluish-grey pubescence on the dorsum of the last few abdominal tergites, with a narrow bare line running down the middle of this pubescence; the dorsum of *M. buenoi* is shiny brown. Bugs should be dried to observe the pubescence.

M. cubana - Length 1.9-2.1 mm. A Caribbean species that also occurs in southern Florida, it is very similar to *M. hinei*, separable by the different mid tibial/head width ratio and perhaps the slightly larger size. From the few specimens of *M. cubana* I've examined (from Cuba and south Florida), it appears that *M. cubana* may have a less extensive silvery-gray dorsal pubescence.

M. fontinalis - Length 2.0-2.3 mm. Widespread in the eastern US, but uncommon in Florida. I have collected it in association with *M. americana* and *M. austrina* (q.v).

M. hinei - Length 1.3-1.6 mm. This is the smallest water bug in Florida. It is relatively common and has been misidentified as *M. buenoi* (see above).

M. marginata - Length 1.6-1.8 mm. This is a West Indies/South American species for which there is only one confirmed Florida record (Drake & Hussey 1955a) for a winged specimen collected at Key West in April of 1905. Smith (1988d) hypothesized that the specimen was introduced via a hurricane. However, the specimen was collected in April, which precedes hurricane season in Florida by about two months, so, if introduced by hurricane, it managed to survive about 6-9 months (or more). However, also note that a storm other than a hurricane could have provided the transportation, and other methods of introduction should also be considered. Matters are complicated by the lack of a wingless form in *M. marginata*; thus the species is not in the key. Drake & Hussey (1955a) also noted that *M. pulchella* has been misidentified as *M. marginata* – even by Uhler himself (he described the species!). Do not confuse winged *Microvelia* adults you may encounter with the species figured here - a resemblance in the pattern of wing spots is not sufficient for identification.

M. marginata
(from Ecuador)

M. paludicola - Length 2.5-3.5 mm. Very similar to the more common *M. americana*; male specimens are needed to distinguish the two taxa. It may be difficult to oberve the presence (*M. americana*) or absence (*M. paludicola*) of the tiny tufts or line of setae at the posterior margin of the genital capsule - use caution in identification!

M. pulchella - Length 1.3-2.3 mm. Widespread and common in Florida, males (winged and wingless) of this species are the only *Microvelia* in our area with curved hind tibiae. Herring (1950b) referred to this species as *M. borealis.*

GENUS *Platyvelia*

DIAGNOSIS: Body stout; metathorax with pair of anterior tubercles that oppose tubercles at posterior margin of mesothorax; all tarsi 3-segmented; mid tarsus with 2nd segment much longer than 3rd; bases of wings or wing pads with white spots.

P. brachialis

NOTES: *Platyvelia* was recently established as a new genus by Polhemus & Polhemus (1993a); species were formerly placed in *Paravelia* (see Polhemus 1976a). One species, *P. brachialis* (length about 4-6 mm), occurs in the eastern United States; several other species are found in the SW US and throughout Central and South America.

Platyvelia live among or on emergent plants rather than the surface of open water, and can sometimes be collected some distance from water.

ADDITIONAL REFERENCES: Polhemus & Polhemus 1993a; Polhemus 1976a; Smith & Polhemus 1978a; Smith 1988d.

Florida species

P. brachialis (Stål)

GENUS *Rhagovelia*

DIAGNOSIS: Last segment of middle leg tarsus deeply cleft (about 3/4), cleft bearing plume-like structures; hind tarsi 2 or 3 segmented.

mid leg tarsus

R. torreyana male

NOTES: Four species of *Rhagovelia* occur in the eastern United States; all are found in Florida. Polhemus (1997a) considered species of *Trochopus* to constitute the *salina* group within the genus *Rhagovelia*; thus *T. plumbeus* becomes *R. plumbea*.

Rhagovelia are very swift gliders on the water's surface and might be mistaken for flies skimming just above the water. It is not unusual to find more than one species at a collecting site, especially in northern and western Florida.

ADDITIONAL REFERENCES: Polhemus 1997a; Bacon 1956a; Gould 1931a; Smith & Polhemus 1978a; Polhemus & Chapman 1979e; Smith 1988d.

Florida species

R. choreutes Hussey
R. obesa Uhler
R. plumbea Uhler
R. torreyana Bacon

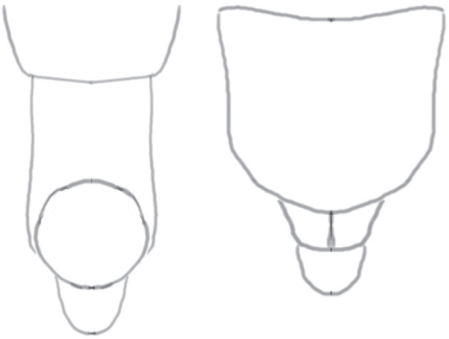
Key to wingless adult *Rhagovelia* of eastern United States

1 Hind tarsi 2 segmented (basal segment very small); eyes with long setae; marine coastal/estuarine species ..... ***R. plumbea***

1' Hind tarsi 3 segmented (basal segment very small); eyes without long setae; freshwater species 2

2(1') Males (apparent 7th sternite undivided) 3

2' Females (apparent 7th sternite divided longitudinally) 5



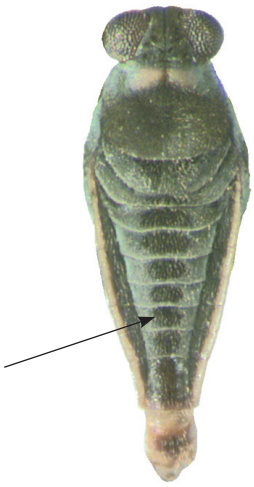
male female

3(2) Hind femora grossly swollen; dorsum of abdomen with only last abdominal tergite with median dorsal shiny area; northern Florida ..... ***R. torreyana***

NOTE: specimens should be dry to best observe shiny areas

3' Hind femora may be moderately swollen, but never to the extent above; abdomen with all abdominal tergites with dorsal median shiny areas **OR** abdomen without dorsal median shiny areas; not limited to northern Florida 4

4(3') Median shiny areas of brown integument on dorsum of abdominal segments; northern Florida ..... ***R. obesa***



4' Shiny areas on dorsum of abdomen absent; northern and peninsular Florida ..... ***R. choreutes***

5(2') Dorsal connexival ridges well separated; mid femur cylindrical; northern Florida ..... ***R. torreyana***

5' Dorsal connexival ridges meeting or almost touching at at least one point along dorsum; mid femur dorsoventrally flattened or constricted near middle; northern or peninsular Florida 6

6(5') Mid femur distinctly dorsoventrally constricted near middle (view laterally); with long tuft of setae on posterior mid-lateral margin of abdominal tergite VII; throughout Florida ..... ***R. choreutes***

6' Mid femur only slightly flattened dorsally near middle; without long tuft of setae on posterior mid-lateral margin of abdominal tergite VII (tuft may be present at apex of connexival ridges); northern Florida ..... ***R. obesa***

Notes on species

R. choreutes - Length 3.7-4.6 mm. This is the most common species throughout peninsular and north-central and northeastern Florida. I have seen numerous collections in which this species has been identified as *R. obesa*, which to the best of my knowledge, does not occur in most of peninsular Florida.

R. obesa - Length 3.7-4.5 mm. A widely distributed and common species throughout the eastern US east of the Appalachians; in Florida one is most likely to encounter this species west of the Apalachicola River, often in association with *R. torreyana*. Females of *R. obesa* I've examined from Florida lack a tuft of setae at the posterodorsal apices of the connexival ridges, but in *R. obesa* I've examined from Minnesota such tufts are present.

R. plumbea - Length 2.4-3.5 mm. A salt water species, found in estuaries and bay shorelines. Originally described as a *Rhagovelia*, this species has more recently been placed in the genus *Trochopus*. However, Polhemus (1997a) considered species of *Trochopus* to constitute the *R. salina* group; thus the taxon's current name is *R. plumbea*. My collections of this species in Wakulla Co. probably represent the northernmost known point of the species' range; this species probably occurs along the entire Gulf Coast. Note also the 2 segmented tarsi of adults. The "hairy" eyes are probably an adaptation to the harsh, unshaded sunlight of most marine habitats. They are often found around docks, where they seem to "appreciate" the shade.

R. torreyana - Length 3.7-3.8 mm. This species is most common west of the Apalachicola River. I have examined one specimen putatively from Poe Spring in Alachua Co. in the FSCA; this specimen bears a label from Herring stating “locality dubious”, a statement with which I tend to agree. This species often occurs with *R. obesa*. According to Polhemus (1997a), where the two species occur sympatrically, *R. obesa* was found skating on open, faster flowing water whereas *R. torreyana* was found more often in areas of slow current under overhanging banks. Where it occurred by itself, *R. torreyana* was found in both habitats. See Polhemus (1997a) for an explanation of why authorship of *R. torreyana* is referred to Bacon (1956a) rather than Drake & Hussey (1957a).

R. plumbea mating pair
(photo D.Denson)

GENUS *Steinovelia*

DIAGNOSIS: Body slender; metathorax with pair of anterior tubercles that oppose posterior margin of coxae; all tarsi 3-segmented; mid tarsus with last 2 segments subequal in length; bases of wings or wing pads brown, without white spots.

S. stagnalis

NOTES: *Steinovelia* was recently established as a new genus by Polhemus & Polhemus (1993a); species were formerly placed in *Paravelia* (see Polhemus 1976a). One species, *S. stagnalis* (length about 4-5 mm), occurs in the eastern United States; several other species are found in the Caribbean and South America.

Steinovelia, like *Platyvelia*, prefer to live among or on emergent plants rather than the water's surface, and can sometimes be collected some distance from water.

ADDITIONAL REFERENCES: Polhemus & Polhemus 1993a; Polhemus 1976a; Smith & Polhemus 1978a; Smith 1988d.

Florida species

S. stagnalis (Burmeister)

BIBLIOGRAPHY 16

Andersen, N.M. 1981a. Semiaquatic bugs: phylogeny and classification of the Hebridae (Heteroptera: Gerromorpha) with revisions of *Timasius, Neotimasius* and *Hyrcanus*. Sys. Ent. 6: 377-412.

- . 1982a. The Semiaquatic Bugs (Hemiptera, Gerromorpha). Phylogeny, Adaptations, Biogeography and Classification. Entomonograph 3: 455 pp. Scandinavian Science Press, Klampenborg, Denmark.

Andersen, N.M. & J.T. Polhemus. 1980a. Four new genera of Mesoveliidae (Hemiptera, Gerromorpha) and the phylogeny and classification of the family. Ent. Scand. 11: 369-392.

Anderson, L.D. 1932a. A monograph of the genus *Metrobates* (Hemiptera, Gerridae). Univ. Kansas Sci. Bull. 20: 297-311.

Bacon, J.A. 1956a. A taxonomic study of the genus *Rhagovelia* (Hemiptera: Veliidae) of the Western Hemisphere. Univ. Kans. Sci. Bull. 38: 695-913.

Barber, H.G. 1914a. Insects of Florida. II. Hemiptera. Bull. Am. Mus. Nat. Hist. 33: 495-535.

- 1923a. A preliminary report of the Hemiptera-Heteroptera of Porto Rico collected by the American Museum of Natural History. American Museum Novitates 75: 1-13.

Blatchley, W.S. 1902a. A Nature Wooing at Ormond by the Sea. The Nature Publishing Company, Indianapolis. 245 pp.

- . 1925a. Some additional new species of Heteroptera from the southern United States, with characterization of a new genus. Ent. News 36: 45-52.

- . 1926a. Heteroptera or True Bugs of eastern North America, with Especial Reference to the Faunas of Indiana and Florida. The Nature Publishing Co., Indianapolis. 1116 pp.

- . 1931. My Nature Nook or Notes on the Natural History of the Vicinity of Dunedin, Florida. The Nature Publishing Co., Indianapolis. 302 pp.

- . 1932. In Days Agone. Notes on the Fauna and Flora of Subtropical Florida in the Days When Most of Its Area was a Primeval Wilderness. The Nature Publishing Co., Indianapolis. 338 pp.

Bobb, M.L. 1951a. Life history of *Ochterus banksi* Barber (Hemiptera: Ochteridae). Bull. Brooklyn Ent. Soc. 46: 92-100.

- . 1951b. The life history of *Gerris canaliculatus* Say in Virginia (Hemiptera: Gerridae). Virginia J. Sci. 2: 102-108.

- . 1953a. Observations on the life history of *Hesperocorixa interrupta* (Say) (Hemiptera: Corixidae). Virginia J. Sci. 4: 111-115

- . 1974a. The aquatic and semi-aquatic Hemiptera of Virginia. Va. Polytech. Inst. Res. Div. Bull. 87: 1-195.

Borror, D.J., C.A. Triplehorn & N.F. Johnson. 1989a. An Introduction to the Study of Insects. Sixth Edition. Brooks/Cole Thomson Learning. 875 pp. (a 7th edition is now available).

Bowles, D.E. & J.L. Locklin. 2002a. Attachment of a microcaddisfly (Trichoptera: Hydroptilidae) pupa to the leg of a water scorpion, *Ranatra buenoi* (Heteroptera: Nepidae). Ent. News 113: 267-269.

Chapman, H.C. 1958a. Notes on the identity, habitat and distribution of some semi-aquatic Hemiptera of Florida. Fl. Ent. 41: 117-124.

Cheng, L. 1973a. The ocean strider *Halobates* (Heteroptera: Gerridae) in the Atlantic Ocean. Oceanology 13: 564-570.

- . 1975a. Insecta Hemiptera: Heteroptera, Gerridae, Genus *Halobates*. Fich. Ident. Zooplancton [sic]147. 4 pp.

Cheng, L. & R.L. Pitman. 2002a. Mass oviposition and egg development of the ocean-skater *Halobates sobrinus* (Heteroptera: Gerridae). Pacific Science

56: 441-445.

Cummings, C. 1933a. The giant water bugs (Belostomatidae, Hemiptera). Univ. Kans. Sci. Bull. 21: 197-219.

de Ruiter, P.C., V. Wolters, J.C Moore & K.O. Winemiller. 2005a. Food web ecology: playing Jenga and beyond. Science 309: 68-70.

Drake, C.J. 1955a. A new *Metrobates* from the Gulf states (Hemiptera: Gerridae). J. Kans. Ent. Soc. 28: 130-131.

Drake, C.J. & H.C. Chapman. 1952a. A new species of *Micracanthia* from Florida (Hemiptera: Saldidae). Fl. Ent. 35: 147-150.

- . 1953a. Preliminary report on the Pleidae (Hemiptera) of the Americas. Proc. Biol. Soc. Wash. 66: 53-60.

- . 1953b. A new species of *Trepobates* Uhler from Florida (Hemiptera: Gerridae). Fl. Ent. 36: 109-112.

- . 1953c. An undescribed saldid from the Gulf states (Hemiptera: Saldidae). Bull. Brooklyn Ent. Soc. 48: 64-66.

- . 1958a. New Neotropical Hebridae, including a catalogue of the American species (Hemiptera). J. Wash. Acad. Sci. 48: 317-326.

- . 1958b. The subfamily Saldoidinae (Hemiptera: Saldidae). Ann. Ent. Soc. Am. 51: 480-485.

Drake, C.J. & H.M. Harris. 1928a. Concerning some North American water striders with descriptions of three new species. Ohio J. Sci. 28: 269-276.

- . 1932a. A survey of the species of *Trepobates* Uhler (Hemiptera. Gerridae). Bull. Brooklyn Ent. Soc. 27: 113-123.

Drake, C.J. & F.C. Hottes. 1950a. Saldidae of the Americas (Hemiptera). Great Basin Naturalist 10: 51-61.

- . 1952a. Distributional and synonymical data and descriptions of two new *Hydrometra* (Hemiptera: Hydrometridae). J. Kans. Ent. Soc. 25: 106-110.

Drake, C.J. & R.F. Hussey. 1955a. Concerning the genus *Microvelia* Westwood, with descriptions of two new species and a check-list of the American forms (Hemiptera: Veliidae). Fl. Ent. 38: 95-115.

- . 1957a. Notes on some American *Rhagovelia*, with descriptions of two new species (Hemiptera: Veliidae). Occ. Papers Mus. Zool. Univ. Mich. 580: 1-6.

Drake, C.J. & J. Maldonado Capriles. 1956a. Some pleids and water-striders from the Dominican Republic (Hemiptera). Bull. Brooklyn Ent. Soc. 51: 53-56.

Dunn, C.E. 1979a. A revision and phylogenetic study of the genus *Hesperocorixa* Kirkaldy (Hemiptera: Corixidae). Proc. Acad. Nat. Sci. Philadelphia 131: 158-190.

Ellis, L.L. 1950a. The status of *Plea striola* and *harnedi* (Hemiptera, Pleidae). Proc. Ent. Soc. Wash. 52: 104-105.

- . 1965a. An unusual habitat for *Plea striola* (Hemiptera: Pleidae). Fl. Ent. 48: 77.

Epler, J.H. 2001. Identification Manual for the larval Chironomidae (Diptera) of North and South Carolina. A guide to the taxonomy of the midges of the southeastern United States, including Florida. Special Publication SJ2001-SP13. North Carolina Department of Environment and Natural Resources, Raleigh, NC, and St. Johns River Water Management District, Palatka, FL. 526 pp. Available on line, see my web site.

Gittelman, S.H & P.W. Severance. 1975a. The habitat preference and immature stages of *Buenoa confusa* and *B. margaritacea* (Hemiptera: Notonectidae). J. Kans. Ent. Soc. 48: 507-518.

Gonsoulin, G.J. 1973a. Seven families of aquatic and semiaquatic Hemiptera in Louisiana. Part III. Family Belostomatidae Leach, 1815. "Giant Water Bugs," "Fish Killers." "Electric Light Bugs," or "Toe Biters." Ent. News 84: 173-189.

Gould, G.E. 1931a. The *Rhagovelia* of the Western Hemisphere, with notes on world distribution (Hemiptera, Veliidae). Univ. Kans. Sci. Bull. 20: 5-61.

Henry, T.J. & R.C. Froeschner (eds.). 1988a. Catalog of the Heteroptera, or True Bugs, of Canada and the Continental

United States. E.J. Brill, Leiden, New York. 958 pp.

Herring, J.L. 1948a. Taxonomic and distributional notes on the Hydrometridae of Florida (Hemiptera). Fl. Ent. 31: 112-116.

- . 1949a. A new species of *Rheumatobates* from Florida (Hemiptera, Gerridae). Fl. Ent. 32: 160-165.

- . 1950a. The aquatic and semiaquatic Hemiptera of northern Florida. Part 1: Gerridae. Fl. Ent. 33: 23-32.

- . 1950b. The aquatic and semiaquatic Hemiptera of northern Florida. Part 2: Veliidae and Mesoveliidae. Fl. Ent. 33: 145-150.

- . 1951a. The aquatic and semiaquatic Hemiptera of northern Florida. Part 3: Nepidae, Belostomatidae, Notonectidae, Pleidae and Corixidae. Fl. Ent. 34: 17-29.

- . 1951b. The aquatic and semiaquatic Hemiptera of northern Florida. Part 4: classification of habitats and keys to species. Fl. Ent. 34: 146-161.

- . 1958a. Evidence for hurricane transport and dispersal of aquatic Hemiptera. Pan-Pacific Ent. 34: 174-175.

- . 1961a. The genus *Halobates* (Hemiptera: Gerridae). Pacific Insects 3: 223-305.

Hodgden, B.B. 1949a. New Saldidae from Western Hemisphere (Hemiptera). J. Kans. Ent. Soc. 22: 149-165.

Hungerford, H.B. 1922a. The Nepidae of North America. Kans. Univ. Sci. Bull. 14: 425-469.

- . 1923a. Some studies on the genus *Hydrometra* in America north of Mexico with description of a new species. Can. Ent. 55: 54-58.

- . 1927a. A new species of *Hydrometra* from North America. Ann. Ent. Soc. Am. 20: 262.

- . 1934a. [1933] The genus *Notonecta* of the World. Univ. Kansas. Sci. Bull. 21: 5-195. [Note: 1933 printed on paper, but not published until 1934.]

- . 1948a. The Corixidae of the Western Hemisphere (Hemiptera). Univ. Kans. Sci. Bull. 32: 1-827.

- . 1954a. First Florida record for *Hydrometra consimilis* Barber. J. Kans. Ent. Soc. 27: 80.

- . 1954b. The genus *Rheumatobates* Bergroth (Hemiptera-Gerridae). Univ. Kans. Sci. Bull. 36: 529-588.

Hungerford, H.B. & N.E. Evans. 1934a. The Hydrometridae of the Hungarian National Museum and other studies in the family (Hemiptera). Ann. Mus. Natl. Hung. 28: 31-112.

Hungerford, H.B. & R.F. Hussey. 1957a. A new corixid (Hemiptera) from Georgia. Quart. J. Fl. Acad. Sci. 20: 89-92.

Hungerford, H.B. & R. Matsuda. 1960a. Keys to subgenera, tribes, genera and subgenera of the Gerridae of the World. Univ. Kans. Sci. Bull. 41: 3-24.

Hussey, R.F. 1948a. A new *Metrobates* from Florida (Hemiptera, Gerridae). Fl. Ent. 31: 123-124.

- . 1955a. Some records of Hemiptera new to Florida. Quart. J. Fl. Acad. Sci. 18: 120-122.

Hussey, R.F. & J.L. Herring. 1949a. Notes on the variation of the *Metrobates* of Florida (Hemiptera, Gerridae). Fl. Ent. 32: 166-170.

- . 1950a. A remarkable new belostomatid (Hemiptera) from Florida and Georgia. Fl. Ent. 33: 84-89.

- . 1950b. A new *Microvelia* from Florida (Hemiptera, Veliidae). Fl. Ent. 33: 117-120.

- . 1950c. Rediscovery of a belostomatid named by Thomas Say (Hemiptera). Fl. Ent. 33: 154-156.

Jaczewski, T. 1930a. Notes on the American species of the genus *Mesovelia* Muls. (Heteroptera, Mesoveliidae). Annales Musei Zoologici Polonici 9: 3-12 + 3 plates.

Jansson, A. 1975. Comparison of *Sigara saileri* Wilson and *S. johnstoni* Hungerford. J. Kans. Ent. Soc. 48: 1-3.

Kittle, P.D. 1977a. A revision of the genus *Trepobates* Uhler (Hemiptera: Gerridae). unpublished Ph.D. dissertation, Univ.

Arkansas. xii + 255 pp.

- . 1977b. The biology of water striders (Hemiptera: Gerridae) in northwest Arkansas. Am. Midl. Nat. 97: 400-410.

- . 1982a. Two new species of water striders of the genus *Trepobates* Uhler (Hemiptera: Gerridae). Proc. Ent. Soc. Wash. 84: 157-164.

La Rivers, I. 1970a. A new subspecies of *Pelocoris femoratus* (Palisot-Beauvois) from Florida (Hemiptera: Naucoridae). Biol. Soc. Nevada Occ. Pap. 26: 1-3.

Lauck, D.R. 1959a. Three new species of *Belostoma* from Mexico and Central America with a list of North American species. Bull. Chicago Acad. Sci. 11: 1-9.

- . 1962a. A monograph of the genus *Belostoma*. Part I. Introduction and *B. dentatum* and *subspinosum* groups. Bull. Chicago Acad. Sci. 11: 34-81.

- . 1963a. A monograph of the genus *Belostoma*. Part II. *B. aurivillianum, stollii, testaceopallidum, dilatatum*, and *discretum* groups. Bull. Chicago Acad. Sci. 11: 82-101.

- . 1964a. A monograph of the genus *Belostoma*. Part III. *B. triangulum, bergi, minor, bifoveolatum* and *flumineum* groups. Bull. Chicago Acad. Sci. 11: 102-154.

- . 1979a. Family Corixidae/Water Boatmen. pp. 87-123 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

Lauck, D.R. & A.S. Menke. 1961a. The higher classification of the Belostomatidae (Hemiptera). Ann. Ent. Soc. Am. 54: 644-657.

MacArthur, R.H. 1955a. Fluctuation of animal populations and a measure of community stability. Ecology 36: 533-536.

Matsuda, R. 1960a. Morphology, evolution and a classification of the Gerridae (Hemiptera-Heteroptera). Univ. Kans. Sci. Bull. 41: 25-632.

Mattson, R.A., J.H. Epler & M.K. Hein. 1995a. Description of benthic communities in karst, spring-fed streams of north central Florida. J. Kans. Ent. Soc. Suppl. 68: 18-41.

Menke, A.S. 1963a. A review of the genus *Lethocerus* in North and Central America, including the West Indies (Hemiptera: Belostomatidae). Ann. Ent. Soc. Am. 56: 261-267.

- . (ed.). 1979a. The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1979b. Family Nepidae/Water Scorpions. pp. 70-75 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1979c. Family Belostomatidae/Giant Water Bugs, Electric Light Bugs, Toe Biters. pp. 76-86 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1979d. Family Ochteridae/Velvety Shore Bugs. pp. 124-125 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1979e. Family Gelastocoridae/Toad Bugs. pp. 126-130 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

Nieser, N. 2002a. Guide to aquatic Heteroptera of Singapore and peninsular Malaysia. IV. Corixoidea. Raffles Bull. Zool. 50: 263-274.

Nieser, N. & P. Chen. 1999a. Sixteen new species of Nepomorpha (Heteroptera) mainly from Sulawesi (Indonesia). Tijd. voor Ent. 142: 77-123.

Polhemus, D.A. 1988a. Family Nepidae Latreille, 1802. The Water Scorpions. pp. 528-532 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1988b. Family Pleidae Fieber, 1851. The Pygmy Backswimmers. pp. 608-610 in Henry, T.J. & R.C. Froeschner (eds.).

Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1997a. Systematics of the genus *Rhagovelia* Mayr (Heteroptera: Veliidae) in the Western Hemisphere (exclusive of the *angustipes* complex). Monographs, Thomas Say Publications in Entomology. Entomological Society of America, Lanham. Maryland. 386 pp.

Polhemus, D.A. & J.T. Polhemus. 1988a. Family Gelastocoridae Kirkaldy, 1897. The Toad Bugs. pp. 136-139 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1988b. Family Naucoridae Leach, 1815. The Creeping Water Bugs. pp. 521-527 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1988c. Family Ochteridae Kirkaldy, 1906. The Velvety Shore Bugs. pp. 541-543 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

Polhemus, J.T. 1972a. Notes on the genus *Nerthra*, including the description of a new species (Hemiptera: Gelastocoridae). Proc. Ent. Soc. Am. 74: 306-309.

- . 1974a. The *austrina* group of the genus *Microvelia* (Hemiptera: Veliidae). Great Basin Naturalist 34: 207-217.

- . 1976a. A reconsideration of the status of genus *Paravelia* Breddin, with other notes and a checklist of the species. J. Kans. Ent. Soc. 49: 509-513.

- . 1979a. Family Naucoridae/Creeping Water Bugs, Saucer Bugs. pp. 131-138 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1985a. Shore Bugs (Heteroptera, Hemiptera; Saldidae). A World Overview and Taxonomy of Middle American Forms. The Different Drummer, Englewood, Colorado. 252 pp.

- . 1988a. Family Saldidae Amyot and Serville, 1843. The Shore Bugs. pp. 665-681 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1996a. Aquatic and semiaquatic Hemiptera. pp. 267-297 in Merritt, R.W. & K.W. Cummins (eds.). An Introduction to the Aquatic Insects of North America. Third Edition. Kendall/Hunt, Dubuque, Iowa. 862 pp.

Polhemus, J.T. & H.C. Chapman. 1966a. Notes on some Hebridae from the United States with the description of a new species (Hemiptera). Proc. Ent. Soc. Wash. 68: 209-211.

- . 1979a. Family Saldidae/Shore Bugs. pp. 16-33 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1979b. Family Hebridae/Velvet Water Bugs. pp. 34-38 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1979c. Family Mesoveliidae/Water Treaders. pp. 39-45 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1979d. Family Hydrometridae/Marsh Treaders, Water Measurers. pp. 43-45 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

- . 1979e. Family Veliidae/Small Water Striders, Water Crickets, Riffle Bugs. pp. 49-57 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. Califor-

nia Insect Surv. 21: 1-166.

- . 1979f. Family Gerridae/ Water Striders, Pond Skaters, Wherrymen. pp. 58-69 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

Polhemus, J.T., R.F. Froeschner & D.A. Polhemus. 1988a. Family Corixidae Leach, 1815. The Water Boatmen. pp. 93-118 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

Polhemus, J.T. & V. Golia. [in press]. *Micronecta ludibunda* Breddin, the second Asian water bug introduced into Florida (Heteroptera: Corixidae: Micronectinae). Ent. News.

Polhemus, J.T. & P. Lindskog. 1994a. The stridulatory mechanism of *Nerthra* Say, a new species, and synonymy (Heteroptera: Gelastocoridae). J. New York Ent. Soc. 102: 242-248.

Polhemus, J.T. & C.N. McKinnon. 1983a. Notes on the Hebridae of the Western Hemisphere with descriptions of two new species (Heteroptera: Hemiptera). Proc. Ent. Soc. Wash. 85: 110-115.

Polhemus, J.T. & D.A. Polhemus. 1988a. Family Hebridae Amyot and Serville, 1843. The Velvet Water Bugs. pp. 152-155 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1988b. Family Notonectidae Latreille, 1802. The Backswimmers. pp. 533-540 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1993a. Two new genera of New World Veliinae (Heteroptera: Veliidae). J. N.Y. Ent. Soc. 101: 391-398.

Polhemus, J.T., D.A. Polhemus & T.J. Henry. 1988a. Family Belostomatidae Leach, 1815. The Giant Water Bugs or Electric Light Bugs. pp. 47-55 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

Polhemus, J.T & R.P. Rutter. 1997a. *Synaptonecta issa* (Heteroptera: Corixidae), first New World record of an Asian water bug in Florida. Ent. News 108: 300-304.

Polhemus, J.T. & P.J. Spangler. 1989a. A new species of *Rheumatobates* Bergroth from Ecuador and distribution of the genus (Heteroptera: Gerridae). Proc. Ent. Soc. Wash. 91: 421-428.

Porter, T.W. 1952a. Three new species of Hebridae (Hemiptera) from the Western Hemisphere. J. Kans. Ent. Soc. 25: 9-12.

Sailer, R.I. 1948a. The genus *Trichocorixa* (Corixidae, Hemiptera). pp. 289-407 in Hungerford, H.B. The Corixidae of the Western Hemisphere (Hemiptera). Univ. Kans. Sci. Bull. 32: 1-827.

Sanderson, M.W. 1982a. Aquatic and semiaquatic Heteroptera, pp. 6.1-6.94 in Brigham, A.R., W.U. Brigham & A. Gnilka (eds.). Aquatic Insects and Oligochaetes of North and South Carolina. Midwest Aquatic Enterprises, Mahomet, IL. 837 pp.

Schell, D.V. 1943a. The Ochteridae (Hemiptera) of the Western Hemisphere. J. Kans. Ent. Soc. 16: 29-47.

Schuh, T. 1967a. The shore bugs (Hemiptera: Saldidae) of the Great Lakes region. Contrib. Am. Ent. Inst. 2: 1-35.

Sites, R.W. & J.T. Polhemus. 1994a. Nepidae (Hemiptera) of the United States and Canada. Ann. Ent. Soc. Am. 87: 27-42.

Slater, J.A. & R.M. Baranowski. 1978a. How to Know the True Bugs (Hemiptera-Heteroptera). The Pictured Key Nature series, Wm. C. Brown Company Publishers, Dubuque, Iowa. 256 pp.

Smith, C.L. 1988a. Family Gerridae Leach, 1815. The Water Striders. pp. 140-151

in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1988b. Family Hydrometridae Billberg, 1820. The Marsh Treaders. pp. 156-158 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1988c. Family Mesoveliidae Douglas and Scott, 1867. The Water Treaders. pp. 247-248 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

- . 1988d. Family Veliidae Amyot and Serville, 1843. The Small Water Striders. pp. 734-742 in Henry, T.J. & R.C. Froeschner (eds.). Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E.J. Brill, Leiden, New York. 958 pp.

Smith, C.L. & J.T. Polhemus. 1978a. The Veliidae (Heteroptera) of America north of Mexico - keys and checklist. Proc. Ent. Soc. Wash. 80: 56-68.

Spangler, P.J. 1990a. A new species of halophilous water-strider, *Mesovelia polhemusi*, from Belize and a key and checklist of New World species of the genus (Heteroptera: Mesoveliidae). Proc. Biol. Soc. Wash. 103: 86-94.

Spangler, P.J., R.C. Froeschner & J.T. Polhemus. 1985a. Comments on a water strider, *Rheumatobates meinerti* from the Antilles and a checklist of the species of the genus (Hemiptera: Gerridae). Ent. News 96: 196-200.

Tinerella, P.P. & R.W. Gundersen. 2005. The Water Boatmen (Insecta: Heteroptera: Corixidae) of Minnesota. Publication Number 23, Schafer-Post Series: North Dakota Insects, vii + 119 pp.

Todd, E.L. 1955a. A taxonomic revision of the family Gelastocoridae (Hemiptera). Univ. Kansas Sci. Bull. 37: 277-475.

Torre-Bueno, J.R. de la. 1926a. The family Hydrometridae in the Western Hemisphere. Ent. Americana VII (n.s.): 83-128.

Truxal, F.S. 1953a. A revision of the genus *Buenoa* (Hemiptera, Notonectidae). Univ. Kansas Sci. Bull. 35: 1351-1523.

- . 1979a. Family Notonectidae/Backswimmers. pp. 139-147 in Menke, A. (ed.). The semiaquatic and aquatic Hemiptera of California (Heteroptera: Hemiptera). Bull. California Insect Surv. 21: 1-166.

Wilson, C.A. 1958a. Aquatic and semiaquatic Hemiptera of Mississippi. Tulane Stud. Zool. 6: 115-170.

Wroblewski, A. 1972a. Further notes on Micronectinae from Ceylon (Heteroptera, Corixidae). Bull. Entomol. Pologne 42: 3-52 + 3 plates.

CHECKLIST OF THE AQUATIC/SEMI-AQUATIC HETEROPTERA OF FLORIDA 17

* = may occur in Florida

BELOSTOMATIDAE
- *Abedus* Stål
  - *immaculatus* (Say)
- *Belostoma* Latreille
  - * *bakeri* Montandon
  - *flumineum* Say
  - * *fusciventre* (Dufour)
  - *lutarium* (Stål)
  - *testaceum* (Leidy)
- *Lethocerus* Mayr
  - *annulipes* (Herrich-Schaeffer)
  - *griseus* (Say)
  - *uhleri* (Montandon)

CORIXIDAE
- *Centrocorisa* Lundblad
  - *nigripennis* (Fabricius)
- *Corisella* Lundblad
  - *edulis* (Champion)
- *Hesperocorixa* Kirkaldy
  - *brimleyi* (Kirkaldy)
  - * *georgiensis* (Egbert)
  - *interrupta* (Say)
  - *lucida* (Abbott)
  - *martini* (Hungerford)
  - * *minor* (Abbott)
  - *nitida* (Fieber)
  - *semilucida* (Walley)
  - * *vulgaris* (Hungerford)
- *Micronecta* Kirkaldy
  - *ludibunda* Breddin
- *Palmacorixa* Abbott
  - *buenoi* Abbott
- *Ramphocorixa* Abbott
  - *acuminata* (Uhler)
- *Sigara* Fabricius
  - *berneri* Hungerford & Hussey
  - *bradleyi* (Abbott)
  - * *gordita* (Abbott)
  - *hubbelli* (Hungerford)
  - * *hydatotrephes* (Kirkaldy)
  - *macrocepsoidea* Hungerford
  - *macropala* (Hungerford)
- *Sigara* (continued)
  - * *mississippiensis* Hungerford
  - * *modesta* (Abbott)
  - *paludata* Hungerford
  - * *pectenata* (Abbott)
  - *scabra* (Abbott)
  - *sigmoidea* (Abbott)
  - *signata* (Fieber)
  - *zimmermanni* (Fieber)
- *Synaptonecta* Lundblad
  - *issa* (Distant)
- *Trichocorixa* Kirkaldy
  - *calva* (Say)
  - *kanza* Sailer
  - *louisianae* Jaczewski
  - * *macroceps* (Kirkaldy)
  - *minima* (Abbott)
  - *reticulata* (Guérin-Méneville)
  - *sexcincta* (Champion)
  - *verticalis* (Fieber)

GELASTOCORIDAE
- *Gelastocoris* Kirkaldy
  - *oculatus* (Fabricius)
- *Nerthra* Say
  - *fuscipes* (Guérin-Méneville)
  - *rugosa* (Desjardins)
  - *stygica* Say

GERRIDAE
- *Aquarius* Schellenberg
  - *conformis* (Uhler)
  - *nebularis* (Drake & Hottes)
  - *remigis* (Say)
- *Gerris* Fabricius
  - *argenticollis* Parshley
  - *comatus* Drake & Hottes
  - *insperatus* Drake & Hottes
  - *marginatus* Say
- *Halobates* Eschscholtz
  - *micans* Eschscholtz
- *Limnogonus* Stål
  - *franciscanus* (Stål)

GERRIDAE (continued)
- *Limnoporus* Stål
  - *canaliculatus* (Say)
- *Metrobates* Uhler
  - * *alacris* Drake
  - *anomalus* Hussey
  - *hesperius* Uhler
- *Neogerris* Matsumura
  - *hesione* (Kirkaldy)
- *Rheumatobates* Bergroth
  - *clanis* Drake & Harris
  - * *hungerfordi* Wiley
  - *minutus* Hungerford
  - *palosi* Blatchley
  - *rileyi* Bergroth
  - *tenuipes* Meinert
  - *trulliger* Bergroth
  - *vegatus* Drake & Harris
- *Trepobates* Uhler
  - * *carri* Kittle
  - *floridensis* Drake & Harris
  - *inermis* Esaki
  - *pictus* (Herrich-Schaeffer)
  - *subnitidus* Esaki

HEBRIDAE
- *Hebrus* Curtis
  - * *beameri* Porter
  - *buenoi* Drake & Harris
  - *burmeisteri* Lethierry & Severin
  - *concinnus* Uhler
  - *consolidus* Uhler
  - * *sobrinus* Uhler
- *Lipogomphus* Berg
  - *brevis* (Champion)
- *Merragata* White
  - *brunnea* Drake
  - *hebroides* White

HYDROMETRIDAE
- *Hydrometra* Latreille
  - *australis* Say
  - *barei* Hungerford
  - *consimilis* Barber
  - *hungerfordi* Torre-Bueno
  - *martini* Kirkaldy
  - *wileyae* Hungerford

MESOVELIIDAE
- *Mesovelia* Mulsant & Rey
  - *amoena* Uhler
  - *cryptophila* Hungerford
  - *mulsanti* White

NAUCORIDAE
- *Pelocoris* Stål
  - *balius* La Rivers
  - *carolinensis* Torre-Bueno
  - *femoratus* (Palisot)

NEPIDAE
- *Ranatra* Fabricius
  - *australis* Hungerford
  - *buenoi* Hungerford
  - *drakei* Hungerford
  - *kirkaldyi* Torre-Bueno
  - *nigra* Herrich-Schaeffer

NOTONECTIDAE
- *Buenoa* Kirkaldy
  - *artafrons* Truxal
  - *confusa* Truxal
  - *limnocastoris* Hungerford
  - *margaritacea* Torre-Bueno
  - *marki* Reichert
  - *platycnemis* (Fieber)
  - *scimitra* Bare
- *Notonecta* Linnaeus
  - *indica* Linnaeus
  - *irrorata* Uhler
  - *uhleri* Kirkaldy
  - *undulata* Say

OCHTERIDAE
- *Ochterus* Latreille
  - *banksi* Barber
  - *flaviclavus* Barber

PLEIDAE
- *Neoplea* Esaki & China
  - *apopkana* (Drake & Chapman)
  - *notana* (Drake & Chapman)
  - *striola* (Fieber)
- *Paraplea* Esaki & China
  - *nilionis* (Drake & Chapman)
  - *puella* (Barber)

SALDIDAE
- *Micracanthia* Reuter
  - *floridana* Drake & Chapman
  - *humilis* (Say)
  - *hungerfordi* (Hodgden)
  - *husseyi* Drake & Chapman
  - *pumpila* Blatchley
  - * *quadrimaculata* (Champion)
- *Pentacora* Reuter
  - *hirta* (Say)
  - *ligata* (Say)
  - *signoreti* (Guérin-Méneville)
  - *sphacelata* (Uhler)
- *Salda* Fabricius
  - *lugubris* (Say)
- *Saldoida* Osborn
  - *cornuta* Osborn
  - *slossonae* Osborn
- *Saldula* Van Duzee
  - *coxalis* (Stål)
  - *lomata* Polhemus
  - *opacula* (Zetterstedt)
  - *pallipes* (Fabricius)

VELIIDAE
- *Husseyella* Herring
  - *turmalis* (Drake & Harris)
- *Microvelia* Westwood
  - *albonotata* Champion
  - *americana* (Uhler)
  - *atrata* Torre-Bueno
  - *austrina* Torre-Bueno
  - *buenoi* Drake
  - *cubana* Drake
  - *fontinalis* Torre-Bueno
  - *hinei* Drake
  - *marginata* Uhler
  - *paludicola* Champion
  - *pulchella* Westwood
- *Platyvelia* Polhemus & Polhemus
  - *brachialis* (Stål)
- *Rhagovelia* Mayr
  - *choreutes* Hussey
  - *obesa* Uhler
  - *plumbea* Uhler
  - *torreyana* Bacon
- *Steinovelia* Polhemus & Polhemus
  - *stagnalis* (Burmeister)

County Distribution List

On the following two pages is a list of the aquatic and semi-aquatic Heteroptera of Florida listed in a county by county format. The list includes records of specimens I have examined, trustworthy records from the literature and a number of records provided by Dr. John T. Polhemus. It is anticipated that many of the empty blocks will be filled!

CHECK LIST

S: specimen examined P: J.T. Polhemus record L: trustworthy literature record ?: questionable record	Alachua	Baker	Bay	Bradford	Brevard	Broward	Calhoun	Charlotte	Citrus	Clay	Collier	Columbia	DeSoto	Dixie	Duval	Escambia	Flagler	Franklin	Gadsden	Gilchrist	Glades	Gulf	Hamilton	Hardee	Hendry	Hernando	Highlands	Hillsborough	Holmes	Indian River	Jackson	Jefferson	Lafayette	Lake	Lee	Leon	Levy	Liberty	Madison	Manatee	Marion	Martin	Miami-Dade	Monroe	Nassau	Okaloosa	Okeechobee	Orange	Osceola	Palm Beach	Pasco	Pinellas	Polk	Putnam	St. Johns	St. Lucie	Santa Rosa	Sarasota	Seminole	Sumter	Suwannee	Taylor	Union	Volusia	Wakulla	Walton	Washington
BELOSTOMATIDAE																																																																		
Abedus *immaculatus* (Say)	S									S	L													S			P																S			S						S	L	L													
Belostoma *flumineum* Say																																																			L															
lutarium (Stål)	S			S	L	P			L	S	S	S						S			S			S	L	L	S	S			L			L	L	S							L					L		LP		L				L		L			S			S	S		
testaceum (Leidy)	S			L				S	L	S									L					S			LP	S			L							L		S					L					LP		S	L					L						L	S		
Lethocerus *annulipes* (Herrich-Schaeffer)																																																	L																	
griseus (Say)							S																			P								S	S														L		S															
uhleri (Montandon)						S	S				S															S			L						S																	S														
CORIXIDAE																																																																		
Centrocorisa *nigripennis* (Fabricius)										S																P																																								
Corisella *edulis* (Champion)																										P											S								S																					
Hesperocorixa *brimleyi* (Kirkaldy)	L																															S														S																				S	
interrupta (Say)	S									S																																																									
lucida (Abbott)	L																															L						S																													
martini (Hungerford)	S									S																P		L								S					L																										
nitida (Fieber)	L									S																																				S																S					
semilucida (Walley)	L																																																																		
Micronecta *ludibunda* Breddin										S														S		S								S															S																	
Palmacorixa *buenoi* Abbott	L																								L																L											L															
Ramphocorixa *acuminata* (Uhler)	P																										P																													S											
Sigara *berneri* Hungerford & Hussey						P											S																																						S											
bradleyi (Abbott)	P		S	L						S		L		L									S		L		P	L	L			L			L		L			S	L							L	S	S	L	L	L	S					S	L	L			L	S		
hubbelli (Hungerford)	L									S																																				S																			L		
macrocepsoidea Hungerford										S																																																									
macropala (Hungerford)	L												L																																																						
scabra (Abbott)										S																																																									
paludata Hungerford										S																																																								S	
sigmoidea (Abbott)	P		S	L	L			L		S			S	L	L				S								P	L	L						L					S	L					S					L	L	L	L					L	L				L	L		
signata (Fieber)																																					P																														
zimmermanni (Fieber)	L		S							S																			L							S		S			L																				L						
Synaptonecta *issa* (Distant)																										S																				S									S											
Trichocorixa *calva* (Say)	L																																				S							L	S																					
kanza Sailer																												L																																						
louisianae Jaczewski	S							S							S				S					S			S	L							L	S		S								S	S	L			L	L	L						S					S	S		
minima (Abbott)	L				S	S					L	L		L	L			S							L			L	L			S	L		L		S	S		L	L		L								L		L						L	L	L	L		S	S		
reticulata (Guérin-Méneville)																																											L						P																	
sexcincta (Champion)	S			S	S	L						S							S					S	L		S	L				S	L		L		S	S		L	L		L			S		L		P	L							L	S						S		
verticalis (Fieber)							S			L							L									P			S							L						S	S									L						S								
GELASTOCORIDAE																																																																		
Gelastocoris *oculatus* (Fabricius)						S	S	L							L		S			S						P							S		S		S					L					L						L		L								S	S		
Nerthra *fuscipes* (Guérin-Méneville)																											S																																							
rugosa (Desjardins)																																										L	L																							
stygica Say														L	L		S																	L													S				L															
GERRIDAE																																																																		
Aquarius *conformis* (Uhler)											S																																																							
nebularis (Drake & Hottes)	L			S			S			S				L					S																	S	L				L					S								L					S		S				S	S	
remigis (Say)																	S																				S																													
Gerris *argenticollis* Parshley	S																		S																			S																													
comatus Drake & Hottes																																																																		
insperatus Drake & Hottes																		?																																																
marginatus Say	S																																																																		
Halobates *micans* Eschscholtz																																										L							L		S															
Limnogonus *franciscanus* (Stål)																																																																		
Limnoporus *canaliculatus* (Say)	S			S						S		S		S					S							L		S								S	L	S		S	S												S	S											S		
Metrobates *anomalus* Hussey			S						S			S							S					S				S													S					S							S	L			S										
hesperius Uhler																		S							S												S			L					S											S									S	
Neogerris *hesione* (Kirkaldy)	S			S				S	S	S		S		S												L	S				S																			S												S			S		
Rheumatobates *clanis* Drake & Harris										L															S									S																																
minutus Hungerford										L																																	S				L		S																	
palosi Blatchley	S								S		S																																		L								L														
rileyi Bergroth	L								S																																																										
tenuipes Meinert	L			S					S					S								L				S		L							S		S				L												S	L													
trulliger Bergroth																																																																		
vegatus Drake & Harris										S																																L	L						L																	
Trepobates *floridensis* Drake & Harris	S	L						S		S	L				L												S	L			S			S							L		L	L				L									L	L	L					L			
inermis Esaki						S											S																																																	
pictus (Herrich-Schaeffer)																															S														L																					
subnitidus Esaki								S	S								S													S			L	S		S				L							S																L			
HEBRIDAE																																																																		
Hebrus *buenoi* Drake & Harris				L																																											L																			
burmeisteri Lethierry & Severin				L														S																													L												L							
concinnus Uhler																																															L					S														
consolidus Uhler	S				L				L												S				S		P																						S	P			S							L				L			
Lipogomphus *brevis* (Champion)				S																																																											S			
Merragata *brunnea* Drake				L														S					S			PS					S				S								S				L																L			
hebroides White				L			S																																																								S	S		
HYDROMETRIDAE																																																																		
Hydrometra *australis* Say	S	S								S	S				L				S	S					S		S	L									S	S				S		S	S			S		S	S		S	S	S				S						S	S		
barei Hungerford	L							S			L							L																									L				S			S									L								
consimilis Barber																																											L																							
hungerfordi Torre-Bueno	S			S						S																										S	S																	S											S		
wileyae Hungerford							S				S														S																											S										S				

S: specimen examined
P: J.T. Polhemus record
L: trustworthy literature record
?: questionable record

	Alachua	Baker	Bay	Bradford	Brevard	Broward	Calhoun	Charlotte	Citrus	Clay	Collier	Columbia	DeSoto	Dixie	Duval	Escambia	Flagler	Franklin	Gadsden	Gilchrist	Glades	Gulf	Hamilton	Hardee	Hendry	Hernando	Highlands	Hillsborough	Holmes	Indian River	Jackson	Jefferson	Lafayette	Lake	Lee	Leon	Levy	Liberty	Madison	Manatee	Marion	Martin	Miami-Dade	Monroe	Nassau	Okaloosa	Okeechobee	Orange	Osceola	Palm Beach	Pasco	Pinellas	Polk	Putnam	St. Johns	St. Lucie	Santa Rosa	Sarasota	Seminole	Sumter	Suwannee	Taylor	Union	Volusia	Wakulla	Walton	Washington
MESOVELIIDAE																																																																			
Mesovelia *amoena* Uhler	S			S						S		S															S			S		S								S						S				P			S											S			
cryptophila Hungerford																																																																			
mulsanti White	S								S	S		S	S					S	S	S				S		S	S			S	S	S			S	S	S			S	S		S							P									S					S	S		
NAUCORIDAE																																																																			
Pelocoris *balius* La Rivers										S			S					S						S	S											S								S						S									L						S		
carolinensis Torre-Bueno										S																	P									S																															
femoratus (Palisot)	S							S		S		S						S			S			S	S		S	S				S				S													S			S												S	S		
NEPIDAE																																																																			
Ranatra *australis* Hungerford	S			S				S		S	S	S							S					S			S	S				S											S	S								S				S						S	S	S			
buenoi Hungerford	S			S						S	S	S												S								S				S	S	S					S								S	S	S		S						S	S	S				
drakei Hungerford	S			S						S		S															S				S				S						S																										
kirkaldyi Torre-Bueno	S									S																						S				S					S													S													
nigra Herrich-Schaeffer	S											S							S		S			S			S									S				S				S																					S		
NOTONECTIDAE																																																																			
Buenoa *artafrons* Truxal																																											L							S									L	L							
confusa Truxal	P									S														S	L		SP	L									L			S			L						S	P	L		L						L	L							
limnocastoris Hungerford																													L																									L											L		
margaritacea Torre-Bueno							?																																																												
marki Reichert											S																																L																								
platycnemis (Fieber)																																												L																							
scimitra Bare	P									S														S			P					S											L	L		S							L			S			L						L		
Notonecta *indica* Linnaeus	L							S	L	S																	P	L									L				L											L							L	L							
irrorata Uhler	P									S																	P									S																										S					
uhleri Kirkaldy	L									S																																												S													
undulata Say																											P																																								
OCHTERIDAE																																																																			
Ochterus *banksi* Barber																											P																										S			S									S		
banksi Barber variant																																																																	S		
flaviclavus Barber																														S																												L						L			
PLEIDAE																																																																			
Neoplea *apopkana* (Drake & Chapman)					L																																											S												L				L			
notana (Drake & Chapman)					S																																																														
striola (Fieber)																											S																																								
Paraplea *nilionis* (Drake & Chapman)																																																																L			
puella (Barber)																																																												S							
SALDIDAE																																																																			
Micracanthia *floridana* Drake & Chapman	L																																			S												S																			
humilis (say)					S						S																																										S											S			
hungerfordi (Hodgden)																																												L																							
husseyi Drake & Chapman					S																					S																								S			S														
pumpila Blatchley					S																S						P																	S						P																	
Pentacora *hirta* (Say)					L																																							S														L									
ligata (Say)												S																																																							
signoreti (Guérin-Méneville)					L									S				S																																																	
sphacelata (Uhler)					L																																							S									S			S		L							S		
Salda *lugubris* (Say)																																																																			
Saldoida *cornuta* Osborn																																																L																			
slossonae Osborn					L																						P																				S	L					S														
Saldula *coxalis* (Stål)																																																																			
lomata Polhemus						S														S							S							S		S					S		S																S			S		S	S		
opacula (Zetterstedt)																																											?																								
pallipes (Fabricius)																											P																							P																	
VELIIDAE																																																																			
Husseyella *turmalis* (Drake & Harris)																																			S																																
Microvelia *albonotata* Champion	S							S		S													S				S					S				S													S	P			S														
americana (Uhler)										S		S							S				S									S														S																					
atrata Torre-Bueno					S					S														S																																									S		
austrina Torre-Bueno																																S																																			
buenoi Drake	?																																																																		
cubana Drake																																												S																							
fontinalis Torre-Bueno																																S																																			
hinei Drake	S									S								S	S									S			S																						S			S								S	S		
marginata Uhler																																												L																							
paludicola Champion										S													S																																												
pulchella Westwood	LP									S		S											S	S			S					S				S																												S	S		
Platyvelia *brachialis* (Stål)				S						S		S						S									P													S																							S	S	S		
Rhagovelia *choreutes* Hussey										S																														S													S												S		
obesa Uhler			S																S																											S																					
plumbea Uhler								S			L																																	S																					S		
torreyana Bacon	?																		S																			S								S																				S	
Steinovelia *stagnalis* (Burmeister)								S																			P																							S																	