RECOMMENDED INSECT CLASSIFICATION
FOR UGA ENTOMOLOGY CLASSES (2024)

In an effort to standardize the hexapod classification systems being taught to our students by our faculty in multiple courses across three UGA campuses, I recommend that the Entomology Department adopts the basic system presented in the following textbook:

> Triplehorn, C.A. and N.F. Johnson. 2005. Borror and DeLong's Introduction to the Study of Insects. 7th ed. Thomson Brooks/Cole, Belmont CA, 864 pp.

This book was chosen for a variety of reasons. It is widely used in the U.S. as the textbook for Insect Taxonomy classes, including our class at UGA. It focuses on North American taxa. The authors were cautious, presenting changes only after they have been widely accepted by the taxonomic community.

Below is an annotated summary of the T&J (2005) classification. Some of the more familiar taxa above the ordinal level are given in caps. Some of the more important and familiar suborders and families are indented and listed beneath each order. Note that this is neither an exhaustive nor representative list of suborders and families. It was provided simply to clarify which taxa are impacted by some of more important classification changes. Please consult T&J (2005) for information about taxa that are not listed below.

Unfortunately, T&J (2005) is now badly outdated with respect to some significant classification changes. Therefore, in the classification standard provided below, some well corroborated and broadly accepted updates have been made to their classification scheme.

Feel free to contact me if you have any questions about this classification. If you see an important omission that should be added, please let me know.

Thank you.

Sincerely,

Joseph V. McHugh

ANNOTATED CLASSIFICATION OF HEXAPODA
2024

PROTURA

COLLEMBOLA

DIPLURA
- Campodeidae
- Japygidae

Note: Entognatha is a paraphyletic group that is no longer recognized in formal classification. The three entognathous orders were raised to the level of class.

INSECTA (=ECTOGNATHA)
*Note: Historically, the term **INSECTA** has been used to refer to more or less inclusive groupings of hexapods. It is occasionally used as a synonym for **PTERYGOTA** only. It is often used synonymously with **HEXAPODA**. The most widespread use of the term today, however, is as a synonym of **ECTOGNATHA**. As such, it would include all of the hexapods that have an ectognathous cranium.*

*The order **Thysanura** was used historically to represent both the silverfish and bristletails until that group was found to be paraphyletic and **Microcoryphia** was pulled out and recognized as a separate order. Today, the remaining Thysanura are usually referred to as the order Zygentoma, although the old name still appears in Triplehorn and Johnson (2005).*

Microcoryphia
- Machilidae

Zygentoma
- Lepismatidae

PTERYGOTA
*Note: While **PTERYGOTA** is considered to be a natural group by most systematists, **APTERYGOTA** is not. As such APTERYGOTA is no longer recognized in formal classifications.*

Ephemeroptera

Odonata
Suborder: **Anisoptera**
- Aeshnidae
- Corduliidae
- Gomphidae
- Libellulidae
- Macromiidae

Suborder: **Zygoptera**
- Calopterygidae
- Coenagrionidae
- Lestidae

NEOPTERA
*Note: The jury is still out on whether the higher-level group **PALEOPTERA** (Odonata + Ephemeroptera) is monophyletic and worthy of formal recognition in classification. The higher-level group **NEOPTERA**, which includes all of the taxa listed below, is broadly accepted as monophyletic and is recognized formally.*

Plecoptera

Phasmida
- Pseudophasmatidae
- Heteronemiidae

Mantophasmatodea
Note: This is the recently discovered order of insects from west Africa that was first reported in 2002. They are commonly referred to as "gladiator insects".

Grylloblattodea (=Grylloblattaria)
- Grylloblattidae

*Note: In the past, **DICTYOPTERA** (Mantodea + Blattodea + Isoptera) was recognized as an order of insects. Today, it is still thought to be a natural (i.e., monophyletic) group, but it is recognized in classifications at the rank of superorder now.*

Mantodea
- Coptopterygidae
- Liturgusidae
- Mantidae
- Mantoididae
- Thespidae

Note: Mantidae was split up. There now are four families that occur in the Southeast.

Blattodea

Blaberidae
Blattidae
Cryptocercidae
Ectobiidae
Rhinotermitidae
Kalotermitidae

Notes:
*1) **Blattodea** classification has undergone dramatic revision. For decades there was growing phylogenetic evidence from multiple sources that termites **(Isoptera)** arose from the middle of the roach clade (**Blattodea**). Today, termites are widely recognized as highly modified, social roaches and are classified as part of Blattodea. The exact rank for the termite group is still unsettled, but they are often recognized at or near the level of superfamily. Until the familial ranks of the roach clade stabilize more, I recommend that we recognize the Isoptera as the superfamily Termitoidea (of Blattodea).*

*2) Cryptocercus was removed from **Polyphagidae** and is now recognized as a family, **Cryptocercidae**.*

*3) **Blattellidae** has been reduced to a subfamily within **Ectobiidae.***

Dermaptera

Anisolabididae (=Carcinophoridae)
Forficulidae
Labiduridae

Embiidina (=Embioptera)

Orthoptera

Suborder: **Caelifera**

Acrididae
Romaleidae
Tetrigidae
Tridactylidae

Suborder: **Ensifera**

Gryllacrididae
Gryllidae
Gryllotalpidae
Mogoplistidae
Tettigoniidae

*Note: Historically many of the lower neopteran orders (Mantodea, Blattaria, Isoptera, Dermaptera, Phasmida, etc.) were considered to be families of a much **more inclusive order Orthoptera**. Today the order is restricted to the taxa in the suborders Caelifera and Ensifera (i.e., grasshoppers, crickets, katydids, etc.).*

Zoraptera

Zorotypidae

Psocodea

Pediculidae
Pthiridae
Psocidae
Liposcelididae

Notes:
*1) The true lice (**Phthiraptera**) were traditionally divided into two orders **Mallophaga** and **Anoplura**. Phylogenetic studies show that Mallophaga is paraphyletic if Anoplura is not included within it. To complicate matters, it is clear that all of **Phthiraptera** falls deeply embedded within the **Psocoptera** (bark lice) clade. True lice and bark lice are now recognized within one order, **Psocodea**, with 7 suborders.*

Thysanoptera

Hemiptera

Suborder: **Auchenorrhyncha**

Acanaloniidae
Aphrophoridae
Cercopidae
Cicadellidae
Cicadidae
Clastopteridae
Delphacidae
Dictyopharidae
Flatidae
Fulgoridae
Issidae
Membracidae

Note: Cercopidae was recently split into multiple families, three of which occur in our area.

Suborder: **Sternorrhyncha**

Aleyrodidae
Aphididae
Asterolecaniidae
Coccidae
Diaspidae
Eriococcidae
Eriosomatidae

Kermisidae
Margarodidae
Psyllidae

Suborder: **Heteroptera**
Alydidae
Anthocoridae
Aradidae
Belostomatidae
Berytidae
Blissidae
Cimicidae
Coreidae
Corixidae
Cydnidae
Gelastocoridae
Geocoridae
Gerridae
Hydrometridae
Lygaeidae
Miridae
Naucoridae
Nepidae
Notonectidae
Pachygronthidae
Pentatomidae
Plataspidae
Pleidae
Reduviidae
Rhopalidae
Rhyparochromatidae
Scutelleridae
Thyreocoridae
Tingidae

Notes:
*1) The old 2-order classification system for the true bugs **(Hemiptera & Homoptera)** was replaced. Homoptera is not monophyletic and is no longer formally recognized in classifications. Instead, the entire group of true bugs is considered one order, Hemiptera sensu lato. What was Homoptera is now represented by two suborders, (Sternorrhyncha & Auchenorrhyncha), within the new, more inclusive order Hemiptera. What was the old Hemiptera is now recognized as the suborder Heteroptera within the more inclusive order Hemiptera. A fourth suborder of true bugs, Coleorrhyncha, occurs only in austral regions of the world. It is evolutionarily intermediate between the Auchenorrhyncha and Heteroptera.*

*2) **Lygaeidae** was broken up into 10 separate families. Some of the new families are **Geocoridae, Blissidae, Cymidae, Rhyparochromidae,** and **Pachygronthidae.***

ENDOPTERYGOTA (=HOLOMETABOLA)

Neuroptera
Suborder: **Planipennia**
Chrysopidae
Coniopterygidae
Hemerobiidae
Mantispidae
Myrmeleontidae

Suborder: **Megaloptera**
Corydalidae
Sialidae

Suborder: **Raphidioptera**
Raphidiidae

Notes:
1) Ascalaphidae has been subsumed within Myrmeleontidae.
*2) Currently, the order **Neuroptera** is used in two different senses. In the broader sense it includes the familiar members, as well as **Megaloptera** and **Raphidioptera**. As a result, the three former orders (o.) are reduced to subordinal ranks (s.o.) within Neuroptera sensu lato as follows:*
o. Megaloptera = s.o. Megaloptera;
o. Raphidioptera = s.o. Raphidioidea;
o. Neuroptera = s.o. Planipennia.
Each of the three suborders is thought to form a natural (i.e., monophyletic) group, so this is simply a ranking issue.

Coleoptera
Suborder: **Archostemata**
Cupedidae
Micromalthidae

Suborder: **Adephaga**
Carabidae (incl. Cicindellidae, Rhysodidae, Paussidae)
Dytiscidae
Gyrinidae
Halipidae
Noteridae

Suborder: **Polyphaga**

- Bostrichidae (incl. Lyctidae)
- Brentidae
- Buprestidae
- Cantharidae
- Chrysomelidae (incl. Bruchidae)
- Cerambycidae
- Cleridae
- Coccinellidae
- Cucujidae
- Curculionidae (incl. Scolytidae, Platypodidae)
- Dermestidae
- Elateridae
- Elmidae
- Endomychidae
- Erotylidae (incl. Languriidae)
- Heteroceridae
- Histeridae
- Hydrophilidae
- Lampyridae
- Lucanidae
- Lycidae
- Meloidae
- Melyridae
- Mordellidae
- Nitidulidae
- Passalidae
- Phalacridae
- Phengodidae
- Ptilodactylidae
- Ptinidae (incl. Anobiidae)
- Ripiphoridae (=Rhipiphoridae)
- Scarabaeidae
- Scirtidae (=Helodidae)
- Staphylinidae (incl. Silphidae, Pselaphidae, Scaphidiidae)
- Tenebrionidae (incl. Lagriidae, Alleculidae)

Notes:

*The classification of **Coleoptera** has had much revision since T&J (2005). Many families were redefined by splitting or lumping to reflect phylogenetic relationships. Here are some of the more dramatic changes.*

*1) **Curculionidae** has been extensively redefined. **Platypodidae and Scolytidae** fall out as internal branches of the weevil evolutionary tree. They now are recognized as subfamilies (Scolytinae and Platypodinae) of Curculionidae. Other weevil groups were raised to familial-level status and removed from Curculionidae, including: **Nemonychidae** (pine flower weevils), **Belidae** (cycad weevils), **Anthribidae** (fungus weevils), **Attelabidae** (leaf rolling weevils), and **Brentidae** straight snout weevils).*

*2) **Staphylinidae** now includes a few groups that were once recognized as separate families, including **Silphidae, Pselaphidae, Scaphidiidae, Micropeplidae,** and **Dasyceridae**.*

*3) **Scarabaeidae** has been divided into many new families, including **Bolboceratidae, Geotrupidae, Glaresidae, Hybosoridae, Pleocomidae,** and **Trogidae**. The most familiar scarab groups (Scarabaeinae, Melolonthinae, Aphodiinae, Rutelinae, Dynastinae, and Cetoniinae) remain in Scarabaeidae though.*

Strepsiptera

- Stylopidae

*Note: **Strepsiptera** was once considered to be a family (Stylopidae) of Coleoptera. The phylogenetic placement of this order is controversial. It is currently recognized at the ordinal level as the sister taxon to Coleoptera.*

Mecoptera

- Bittacidae
- Meropeidae
- Panorpidae

*Note: Recently, **Siphonaptera** has been found to be nested within the **Mecoptera** clade in various studies. It is likely that future versions of this document will classify the fleas as a suborder of Mecoptera.*

Siphonaptera

Diptera

Suborder: **Nematocera**

- Bibionidae
- Cecidomyiidae
- Ceratopogonidae
- Chironomidae
- Culicidae
- Mycetophilidae
- Psychodidae
- Ptychopteridae
- Simuliidae
- Tipulidae

Suborder: **Brachycera**
- Asilidae
- Bombyliidae
- Calliphoridae
- Diopsidae
- Ephydridae
- Hippoboscidae
- Muscidae
- Mydidae
- Phoridae
- Pyrgotidae
- Rhagionidae
- Sarcophagidae
- Sepsidae
- Stratiomyidae
- Syrphidae
- Tabanidae
- Tachinidae
- Tephritidae

Trichoptera

Lepidoptera
- Attevidae
- Bombycidae
- Cossidae
- Crambidae
- Drepanidae
- Erebidae (incl. Arctiidae & Lymantriidae)
- Geometridae
- Hesperiidae
- Lasiocampidae
- Limacodidae
- Lycaenidae
- Noctuidae
- Nymphalidae
- Papilionidae
- Pieridae
- Psychidae
- Pterophoridae
- Pyralidae
- Saturniidae (incl. Citheroniidae)
- Sesiidae
- Sphingidae
- Tortricidae
- Yponomeutidae

Major family changes:
*1) **Erebidae** now includes **Arctiidae, Ctenuchidae,** and **Lymantriidae**.*

*2) **Crambidae** has been removed from **Pyralidae** and is now recognized at the family level.*

*3) **Nymphalidae** now includes **Heliconidae, Morphidae, Danaidae, Satyridae,** and **Libytheidae.***

*4) Some species formerly classified within **Yponomeutidae** (e.g., Ailanthus Webworm moth) have been moved into **Attevidae**.*

Hymenoptera

Suborder: **Symphyta**
- Cephidae
- Cimbicidae
- Pamphiliidae
- Siricidae
- Tenthredinidae

Suborder: **Apocrita**
- Andrenidae
- Apidae (incl. Anthophoridae, Xylocopidae, Bombidae)
- Bethylidae
- Braconidae
- Chalcididae
- Chrysididae
- Colletidae
- Crabronidae
- Cynipidae
- Diapriidae
- Dryinidae
- Eucharitidae
- Evaniidae
- Figitidae
- Formicidae
- Gasteruptiidae
- Halictidae
- Ichneumonidae
- Megachilidae
- Mutillidae
- Pelecinidae
- Perilampidae
- Pompilidae
- Proctotrupidae
- Rhopalosomatidae
- Sapygidae

Scelionidae
Scoliidae
Sphecidae
Torymidae
Tiphiidae
Vespidae

Major family changes:

1) ***Apidae*** *now includes* ***Anthophoridae****,* ***Xylocopidae****, and* ***Bombidae****.*