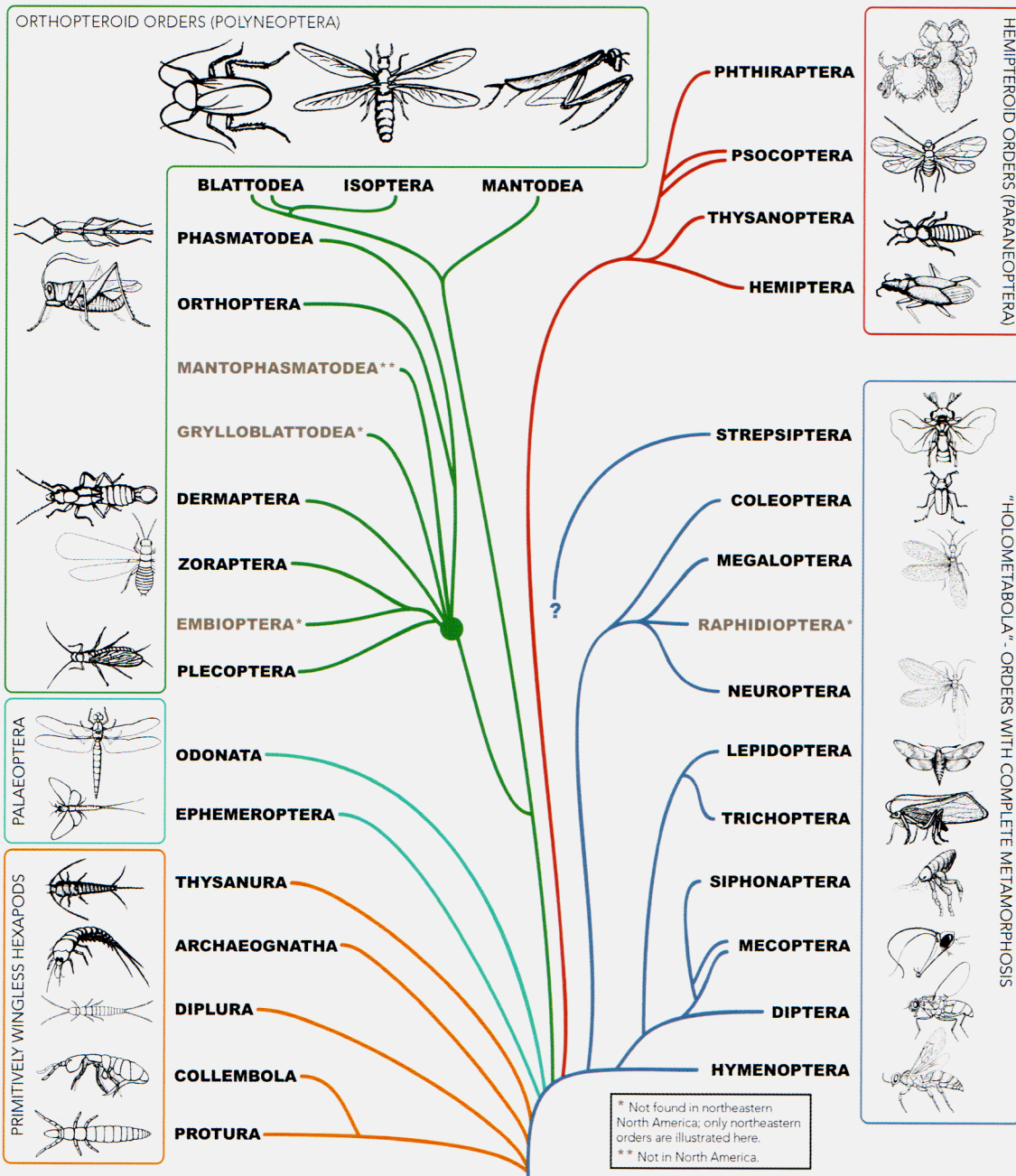


# Tree of Six-legged Life

## Insect Orders



This insect “family tree” illustrates the probable relationships between the hexapod orders. Single branches comprise natural (monophyletic) groups (such as the hemipteroids); multiple separate lines indicate artificial (paraphyletic) groups (such as the primitively wingless insects).

# Insect Picture Keys

1. **Tools for Insect Identification:** The main groups of insects. 616
2. **Insect Orders Key One:** Wingless or almost wingless adults and common nymphal forms. 618
3. **Insect Orders Key Two:** Winged insects other than flies, moths and butterflies, beetles, grasshoppers and crickets, mayflies, earwigs, mantids, and dragonflies. 620
4. **Key to the most Commonly Encountered Insect Larvae.** 622
5. **Ephemeroptera Key One:** Mayfly adults. 624
6. **Ephemeroptera Key Two:** Mayfly nymphs. 626
7. **Odonata Key One:** Dragonfly and damselfly adults. 628
8. **Odonata Key Two:** Dragonfly and damselfly nymphs. 629
9. **Plecoptera Key One:** Stonefly adults. 630
10. **Plecoptera Key Two:** Stonefly nymphs. 631
11. **Orthoptera Key:** Grasshoppers and crickets. 632
12. **Hemiptera Key One:** Suborders of Hemiptera and families of aquatic, shore and surface bugs (Hemiptera – Heteroptera). 634
13. **Hemiptera Key Two:** Terrestrial true bugs (Heteroptera). 636
14. **Hemiptera Key Three:** "Homopterans"  
(Suborders Sternorrhyncha and Auchenorrhyncha). 638
15. **Trichoptera Key One:** Caddisfly adults. 640
16. **Trichoptera Key Two:** Caddisfly larvae. 642
17. **Beetle Key One:** Suborders of Coleoptera, families of Adephaga, and selected families of Polyphaga. 644
18. **Beetle Key Two:** Miscellaneous beetles. Start here if you know your beetle is not in the Adephaga, Archostemata, Scarabaeoidea, Chrysomeloidea or Curculionoidea. 646
19. **Beetle Key Three:** At least hind leg with no more than four tarsomeres OR elytra short. 648
20. **Beetle Key Four:** From Beetle Keys Two and Three (Beetles with more than 5 abdominal segments visible ventrally, plus selected groups with the head hidden from above). 650
21. **Key to Coleoptera Larvae:** Aquatic beetle larvae and larvae of the most commonly encountered terrestrial families. 652
22. **Diptera Key One:** The main groups of flies and the calyptrate families. 654
23. **Diptera Key Two:** The long-horned flies (suborder Nematocera). Use this key for flies with 6 or more antennal segments. 656
24. **Diptera Key Three:** Lower Brachycera and Aschiza. 658
25. **Diptera Key Four:** Acalyptrate Diptera. 660
26. **Key to Diptera Larvae:** Aquatic families and some commonly encountered terrestrial fly larvae. 662
27. **Hymenoptera Key One:** Sawflies, horntails and miscellaneous families. 664
28. **Hymenoptera Key Two:** Most Aculeata and Parasitica (from Hymenoptera Key One). 666




## Tools for Insect Identification


If you have observed, photographed or captured an insect and you want to find out more about it, you need to identify your insect to a useful level. Sometimes just knowing the order is enough, but in most cases the first step towards understanding the habits and importance of an insect is a correct **family** identification. Knowing the family is usually enough to make some useful generalizations, and even an approximate family identification will make it easier to scan photos in search of a generic or specific identification or to search the web for further information.

**To identify an insect to family, start with the seven simple questions on this page.** They will either send you directly to a set of photographs to which you can compare your insect, or they will direct you to a picture key. The keys are like roads with a pair of signs at each junction; pick the sign that best matches your insect and follow the road to the next junction or to your destination (a family name).

Sometimes a key will lead you to a group of families, or uncertainty about a character will leave you undecided between two families. In those cases, a look at the photographs for each family under consideration should lead you to a correct identification.

Bear in mind that these are simplified keys designed for the northeastern fauna. Some small families that occur in western but not eastern North America are excluded, and some atypical and rarely encountered forms have been ignored to make the keys more user-friendly. Easily seen but occasionally imprecise characters (which work for most, but not all specimens) are often used instead of precise but difficult characters. Despite these caveats, the keys, used in conjunction with the photographs, should guide you quickly and easily to a useful identification for almost all routinely encountered insects.

 Look for this icon to find corresponding photographs.

 Look for this icon to find further keys.

### Which Photos or Picture Keys Should I Start With?

#### 1) Is it one of these five distinctively shaped orders?

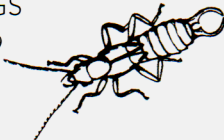
With long tails and large, triangular front wings held above the body. **ADULT MAYFLIES**


 Pg. 624



With forceps-like tails; adults with short leathery wings. **EARWIGS**


 Pg. 69



Hind legs enlarged for jumping. Mouthparts with stout mandibles for chewing. **GRASSHOPPERS AND CRICKETS**  Pg. 632



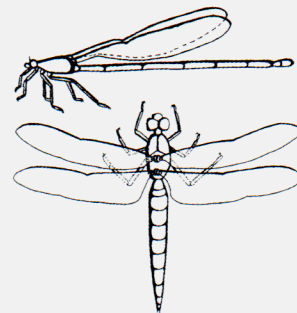
Front legs long and grasping, head separated from body by a long, thin neck. **MANTIDS**

 Pg. 68

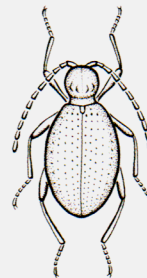
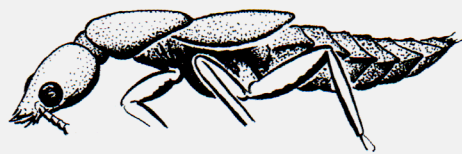
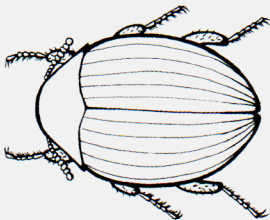
See also photos of similar mantisflies (Neuroptera), page 255.



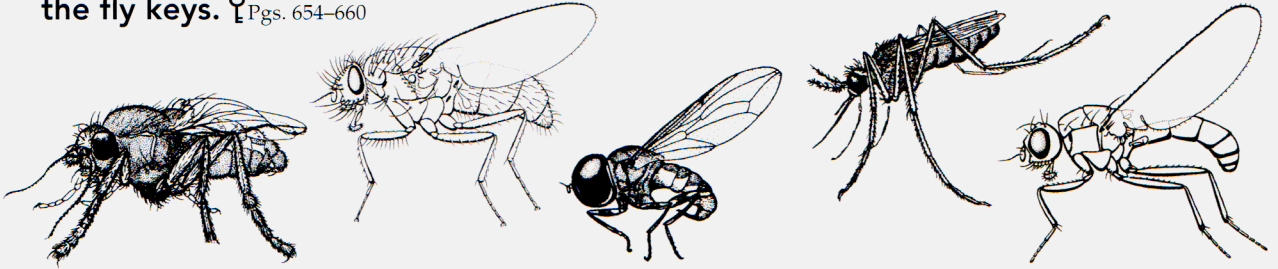
Antennae very short, body long, wings outstretched and non-folding. **ADULT DRAGONFLIES AND DAMSELFLIES**  Pg. 628



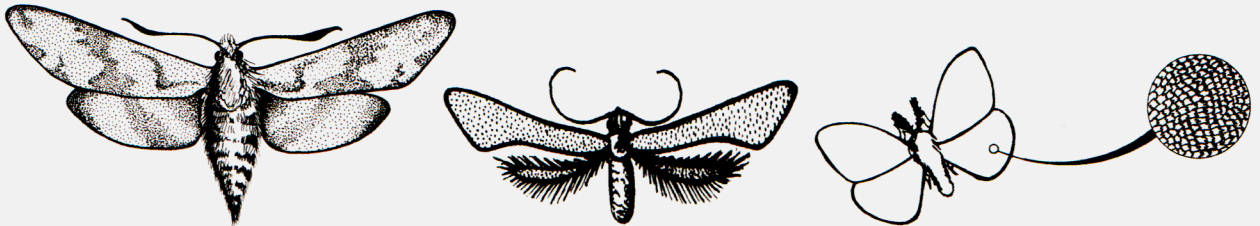
#### 2) Does it have a hard shell made by the front wings meeting in a straight line down the back? Try the beetle keys. Pgs. 644-650



3) Does it have only one pair of wings, with the hind wings reduced to knobs? Try the fly keys. ♀ Pgs. 654-660



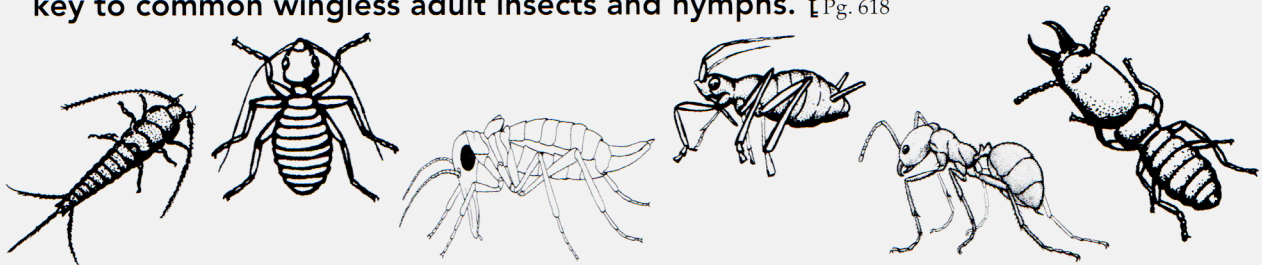
4) Is it a butterfly or moth, with wings and body mostly covered with powdery scales? See the photographs of butterflies and moths. 📷 Pgs. 180-236



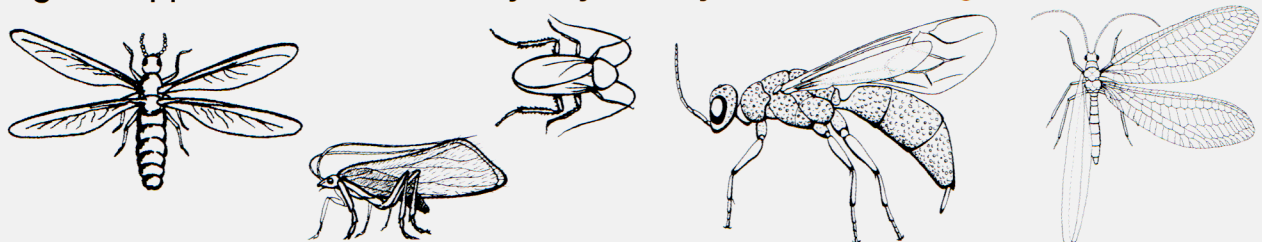
5) Is it a larva, completely wingless, elongate, no compound eyes and usually worm-like or caterpillar-like? Try the key to larval insects. ♀ Pg. 622



6) Is your insect a flightless adult, or a nymph with small wing buds? Start with the key to common wingless adult insects and nymphs. ♀ Pg. 618

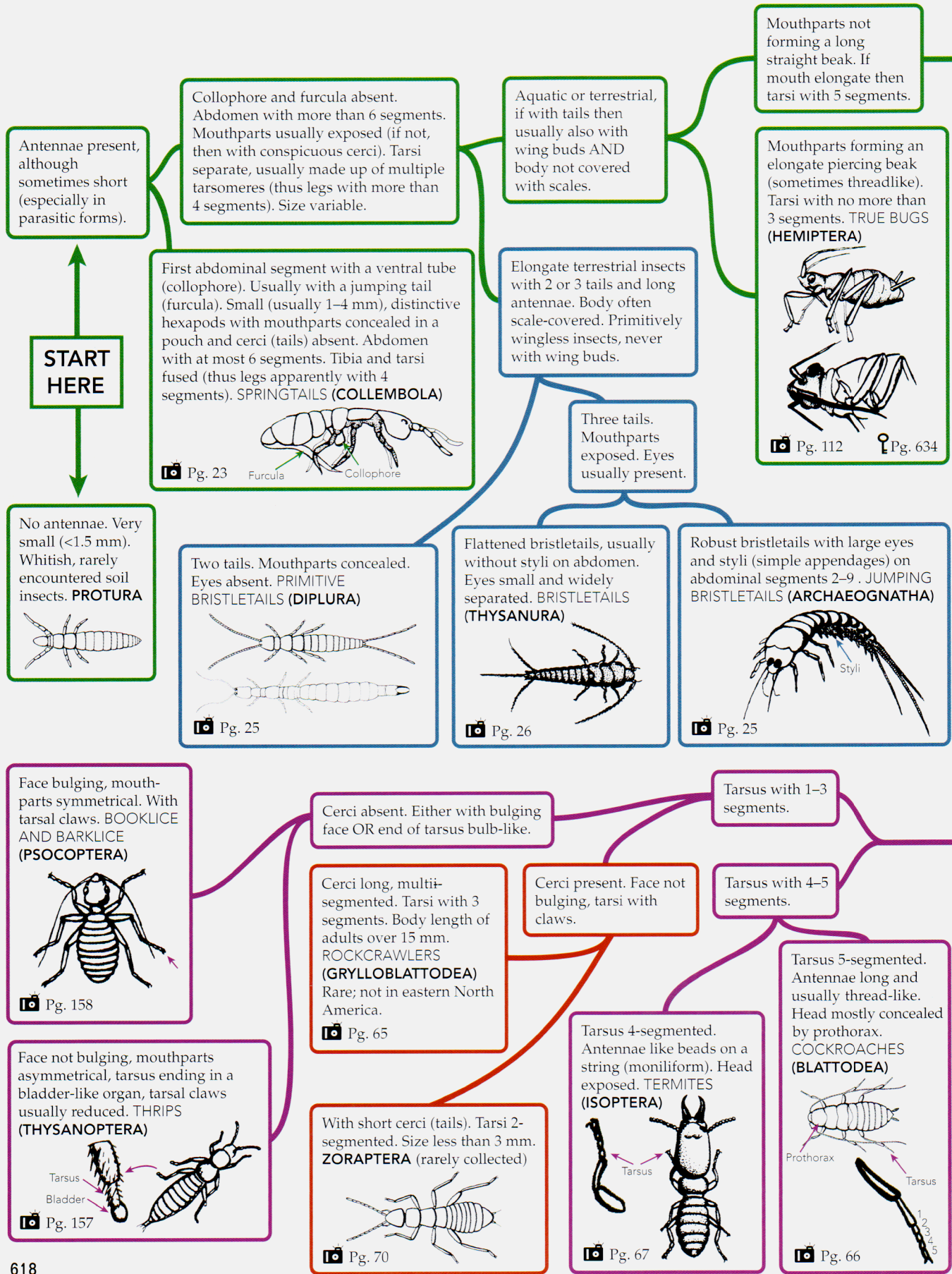


7) Is it a winged insect, but not a mayfly, earwig, dragonfly, damselfly, mantid, grasshopper, beetle, moth, or fly? Try the key to common winged insects. ♀ Pg. 620





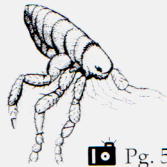
**INSECT ORDERS KEY ONE:** Wingless or almost wingless adults and common nymphal forms.



Parasitic on birds or mammals; flea-like or louse-like (flattened).

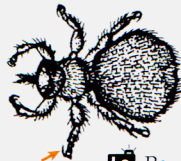
Flattened top to bottom.

Flattened side to side. FLEAS (SIPHONAPTERA)



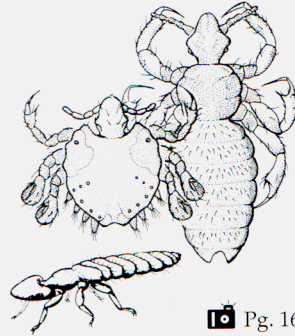
Pg. 517

Tarsus with 5 segments, size usually over 5 mm. LOUSE FLIES (DIPTERA)



Pg. 493

Tarsus with 1-2 segments. Small, usually less than 4 mm. LICE (PHTHIRAPTERA)



Pg. 160

Not parasitic on birds or mammals.

Antennae with fat basal segments and hair-like arista OR halter (knob-like remnant of hind wing) present. MOST WINGLESS FLIES (DIPTERA)

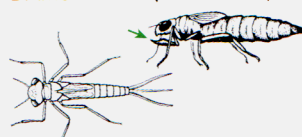


Pg. 654

Pg. 427

Antennae without hair-like arista AND halter absent.

Lower lip scoop-like and prominent. Tails absent or paddle-like. Aquatic. NYMPHS OF DRAGONFLIES AND DAMSELFLIES (ODONATA)



Pg. 629

Pg. 40

Lower lip not scoop-like. If aquatic, then with thread-like tails.

Terrestrial, gills absent. Thread-like tails (cerci) almost always short or absent. (Cerci moderately developed in Grylloblattodea, North American species of which are restricted to western mountains.)

Abdomen with 2 or 3 long thread-like tails. Aquatic, often with gills.

Elongate, stick-like insects. WALKINGSTICKS (PHASMATODEA)



Pg. 70

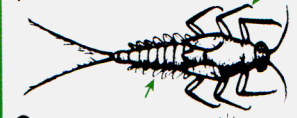
Body covered with powder-like scales. Mouthparts often like a coiled straw. WINGLESS MOTHS (LEPIDOPTERA)



Pg. 233

Body without scales. Mouthparts not coiled.

Gills in rows along abdomen (sometimes covered by flaps). Each tarsus with 1 claw. MAYFLY NYMPHS (EPHEMEROPTERA)



Pg. 626

Pg. 34

Not stick-like.

Basal segment of front tarsus not swollen.

Basal segment of front tarsus strikingly swollen. WEBSPINNERS (EMBIOPTERA) Not present in northeastern North America.

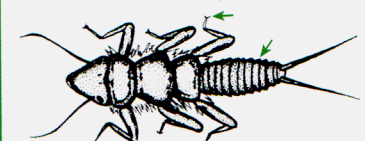


Pg. 70

Mandibles not at the end of a long snout.

Abdomen without constriction.

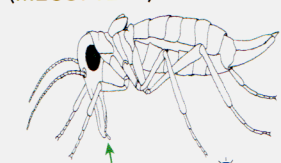
Abdomen without rows of gills (sometimes gills on first 2 segments only). Each tarsus with 2 claws. STONEFLY NYMPHS (PLECOPTERA)



Pg. 631

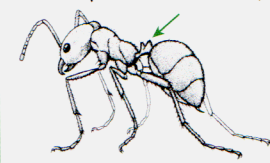
Pg. 54

Mandibles at the end of a long snout. SNOW SCORPIONFLIES (MECOPTERA)



Pg. 516

Abdomen with a waist-like constriction. ANTS AND OTHER FLIGHTLESS WASPS (HYMENOPTERA)

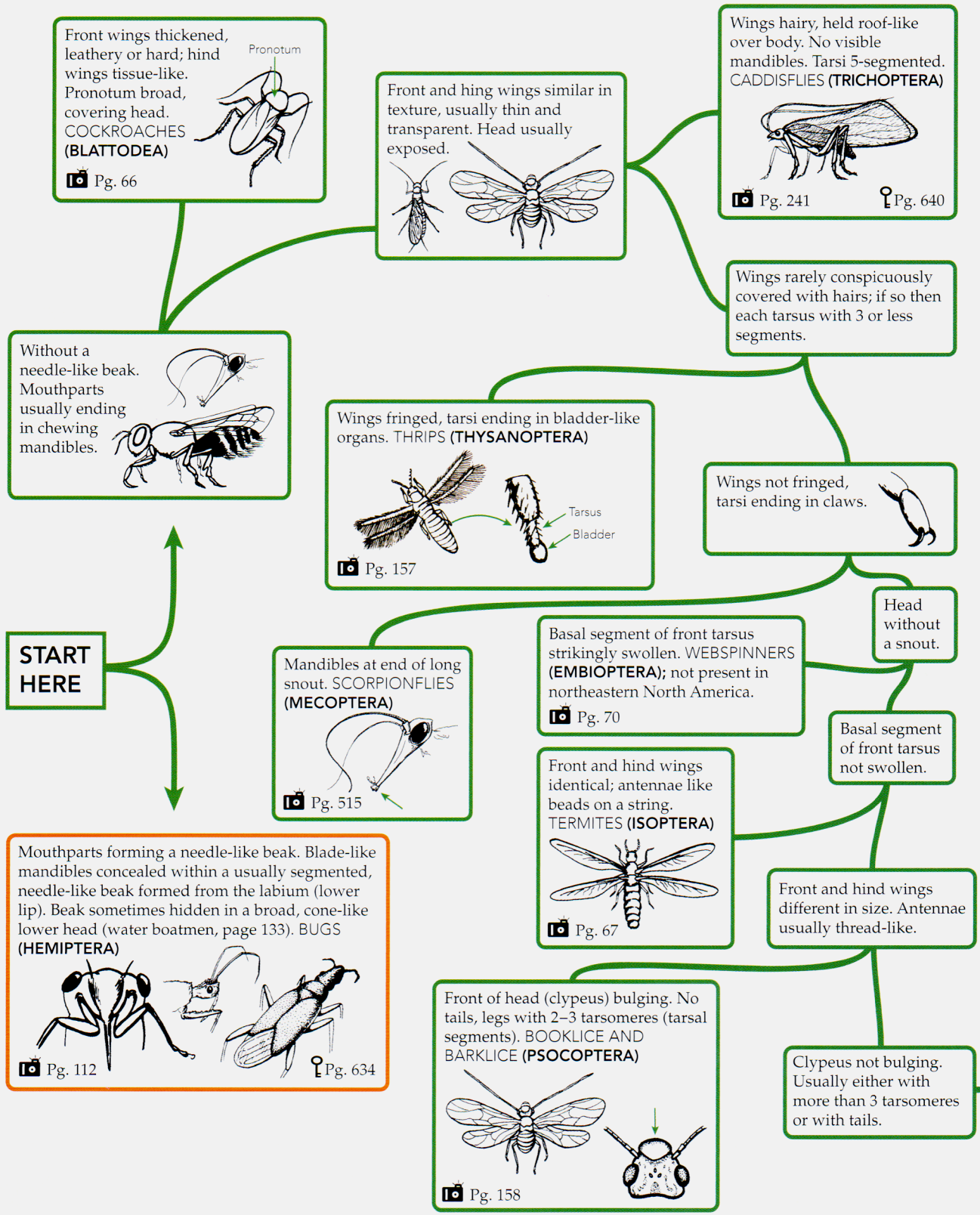


Pg. 664

Pg. 579



**INSECT ORDERS KEY TWO:** Winged insects other than flies, moths and butterflies, beetles, grasshoppers and crickets, mayflies, earwigs, mantids, and dragonflies.



Only front wings developed. With a long tail. MALE SCALE INSECTS (HEMIPTERA)

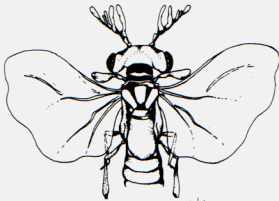


Pg. 638

Pg. 155

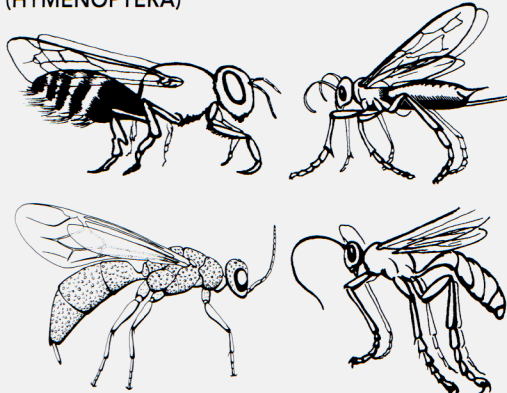
One pair of wings. (Minute and rarely encountered.)

Front wings minute, hind wings twisted. No tails. MALE TWISTED WING PARASITES (STREPSIPTERA)



Pg. 380

Hard shining insects often with a "wasp waist." Wings with relatively few veins (less than 20 cells); hind wings smaller, with fewer veins. Wings never covered with white, waxy powder. WASPS AND RELATIVES (HYMENOPTERA)



Pg. 664

Pg. 537

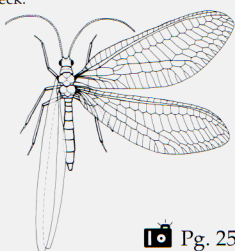
At least abdomen usually soft. No waist-like constriction in abdomen. Wings with dense network of veins. If relatively few wing veins then wings covered with waxy powder (family Coniopterygidae, Neuroptera).

Cerci absent but median ovipositor often present. Tarsi usually with 5 segments.

Two pairs of wings.

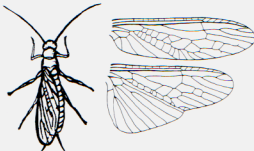
Two widely separated tails (cerci) present, sometimes inconspicuous. Tarsi with at most 3 segments.

Hind wings not broader than front wings at base. Usually terrestrial. NERVE-WINGED INSECTS (NEUROPTERA) Snakeflies (Order Raphidioptera, page 250) will also key out here, but they do not occur in eastern North America. Snakeflies differ from Neuroptera in having the head (but not the fore legs) at the end of a long, snake-like neck.



Pg. 252

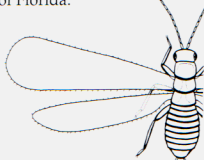
Hind wings broad and folded over body at rest. Found near water. Size over 4 mm, usually much larger. STONEFLIES (PLECOPTERA)



Pg. 630

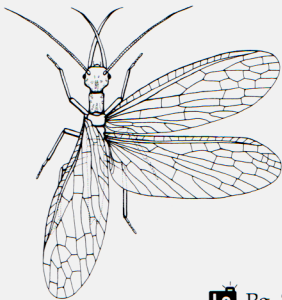
Pg. 54

Hind wings narrow, with few veins (wings often broken off, leaving stubs). Rare, usually under bark. Size under 3 mm. ZORAPTERA Two species in U.S., both southeastern; only *Zorotypus (=Usazoros) hubbardi* north of Florida.



Pg. 70

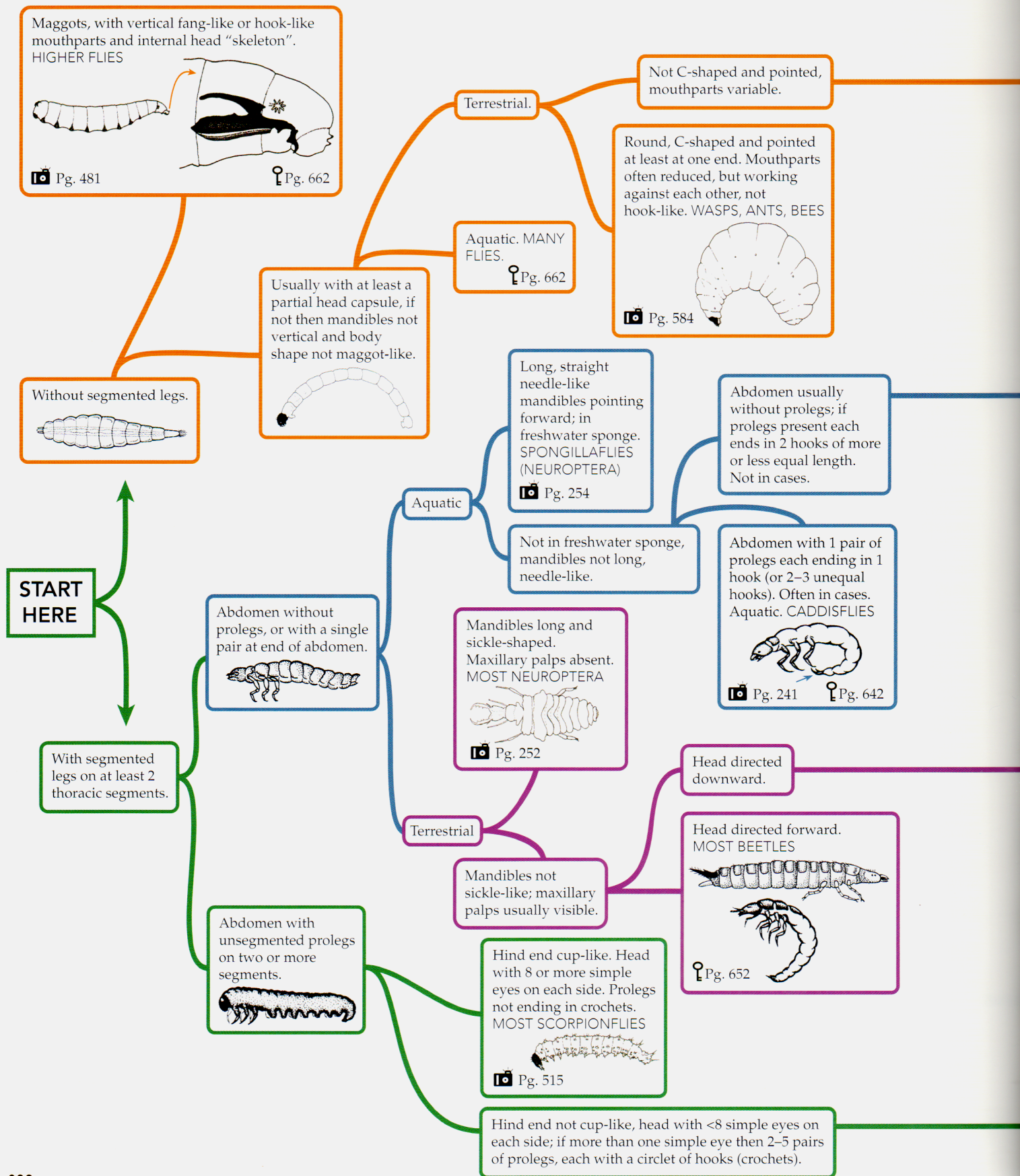
Hind wings broad at base, anal area pleated. Larvae aquatic. DOBSONFLIES, FISHFLIES AND ALDERFLIES (MEGALOPTERA)



Pg. 256



# KEY TO THE MOST COMMONLY ENCOUNTERED INSECT LARVAE



With circlets of hooks on remnants of abdominal prolegs. SOME MOTHS, MOSTLY SMALL LEAF MINERS



Pg. 192

Body U-shaped, mouthparts directed downwards. SOME BEETLES



Pg. 652 Pg. 364

Mandibles small, not exposed. Usually elongate, rarely wood-borers.

Chewing mandibles clearly visible. Often flattened wood-borers. SOME BEETLES



Pg. 652 Pg. 323

Without transverse rows of hairs. Prolegs present or absent. Various habitats. LOWER FLIES



Pg. 662 Pg. 439

Without proleg remnants or hooks on abdominal segments.

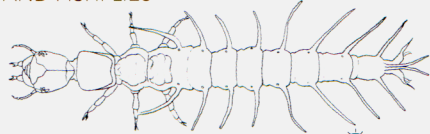
Body not U-shaped. Mouthparts variable.

11 abdominal segments each with 1-2 transverse rows of long hairs. Abdomen with 2 short processes at tip. No prolegs. In animal nests or homes. FLEAS



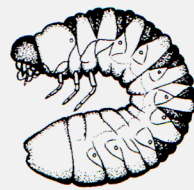
Pg. 517

Abdomen with long gills or filaments AND ending in a long filament or in prolegs each with two hooks. DOBSONFLIES, ALDERFLIES AND FISHFLIES



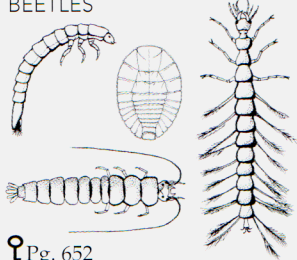
Pg. 256

Body strongly U-shaped. All legs similar. SOME BEETLES



Pg. 652 Pg. 309

If abdominal gills present then abdomen not ending in filament or pair of 2-hooked prolegs. Sometimes disk-like. BEETLES



Pg. 652

Head usually with several simple eyes; sometimes eyeless.

Head with single pair of simple eyes. SOME SAWFLIES AND HORNTAILS

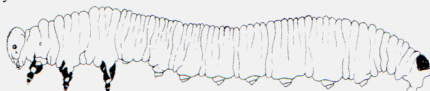


Pg. 537

Body not strongly U-shaped. Fore legs small ventral, other legs larger and lateral. SNOW SCORPIONFLIES

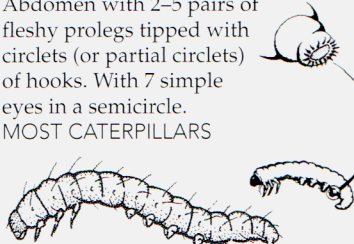


Abdomen with over 5 pairs of prolegs, not tipped with circlets of hooks. At most one simple eye on each side. MOST SAWFLIES



Pg. 537

Abdomen with 2-5 pairs of fleshy prolegs tipped with circlets (or partial circlets) of hooks. With 7 simple eyes in a semicircle. MOST CATERpillARS



Pg. 183