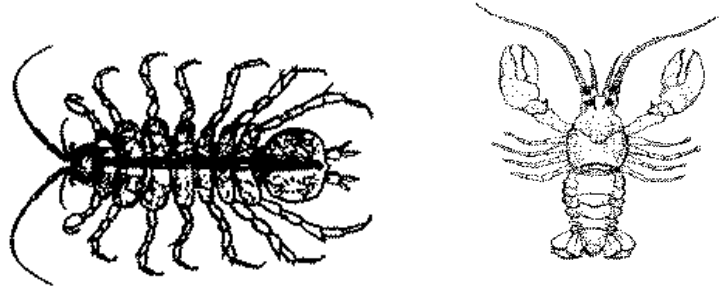


# Identification Key for Most Benthic Macroinvertebrate Orders and Families



Key to Major Orders _____	Page 3
Mayflies _____	Page 10
Stoneflies _____	Page 15
Caddisflies _____	Page 19
Beetles _____	Page 22
True Flies _____	Page 26
Crustaceans _____	Page 28
Dragonflies _____	Page 29
Damselflies _____	Page 31
Clams _____	Page 33
Snails _____	Page 34

Thanks to Joy Andrews (Illustrations) Rose Brown (Text and Layout)  
Frank Persico and Marilyn Smith (Graphic Editing)



Updated: 9/10/2021

## **How To Use This Key:**

This key is designed to help RCA's benthic monitoring volunteers identify common macroinvertebrate families found within the Rivanna Watershed in Virginia. The key covers the families that are relatively easy to identify. Many families are not represented in this key, and those invertebrates *must be preserved for lab identification*.

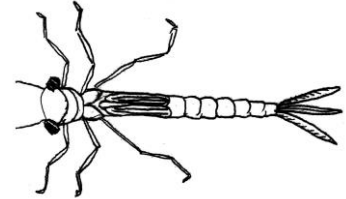
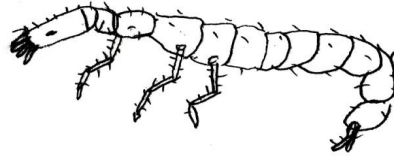
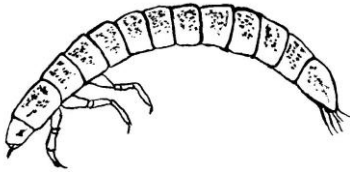
To use the key, always start at the beginning and answer each question in order. If you realize that you have mis-identified the invertebrate, you can go backwards in the key by referring to the notation in the upper right of the page (below the page number).

## **This Key Belongs To:**

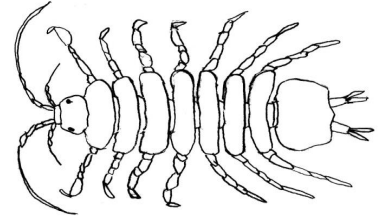
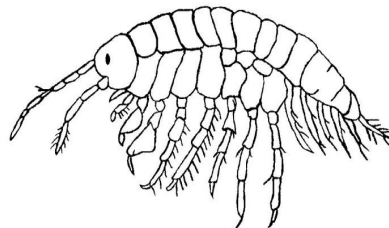
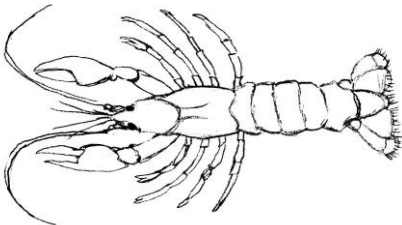
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# Key to Orders

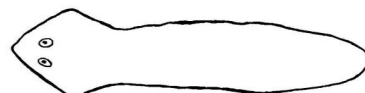
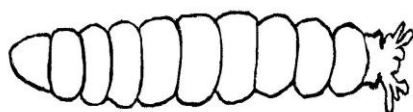
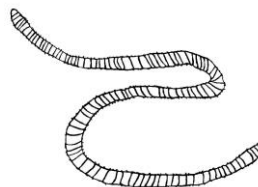
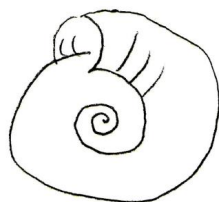
A. Thorax with 3 pairs of segmented, jointed legs = go to page 6



B. Thorax with more than 3 pairs of jointed legs = Crustaceans - go to page 28

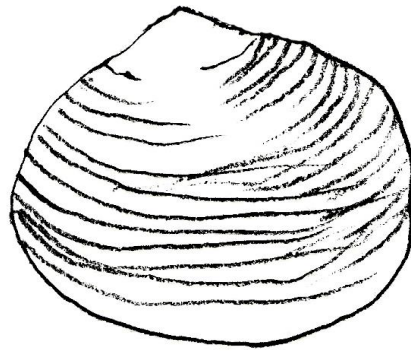


C. No segmented, jointed legs (there might be prolegs) = go to page 4

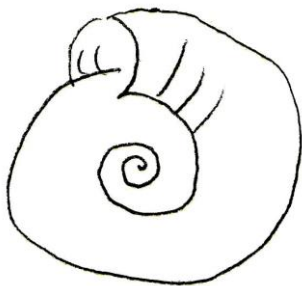


## Orders (Continued)

A. Inside a shell that is composed of 2 halves that join to form a hinge = Clam – go to page 33



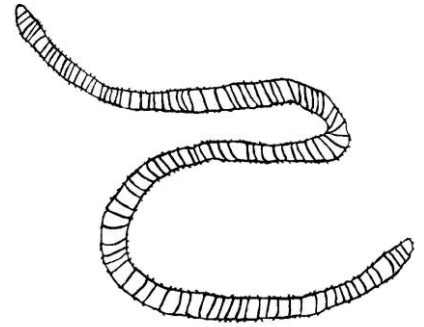
B. Inside a shell that is coiled on one plane like a hose, forms a flattened cone, or forms a spiral = Snails – go to page 34



C. Not inside a shell = go to page 5

## Orders (Continued)

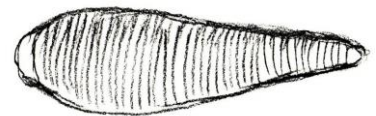
A. Body like an earthworm, tapered at both ends with fleshy segments = Aquatic Worm (Oligochaeta)



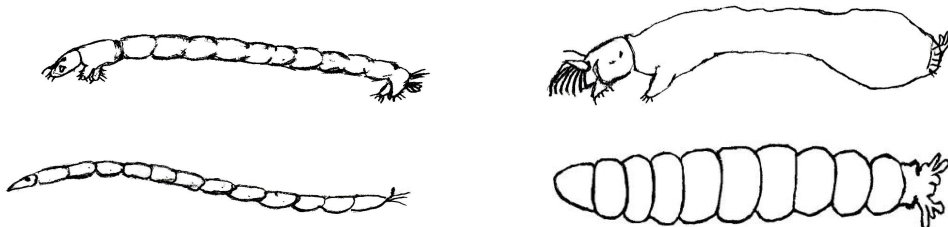
B. Body like a small grey blob on the net; in water, resembles a small slug with triangular head and eyespots = Flatworm (Planariidae)



C. Body is dark and sluglike with suckers on both end = Leech (Hirudinidae)

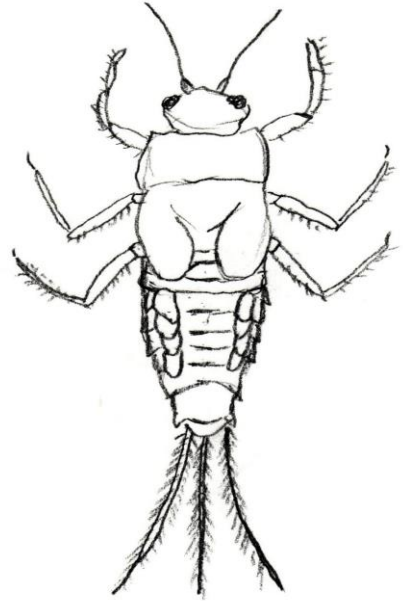
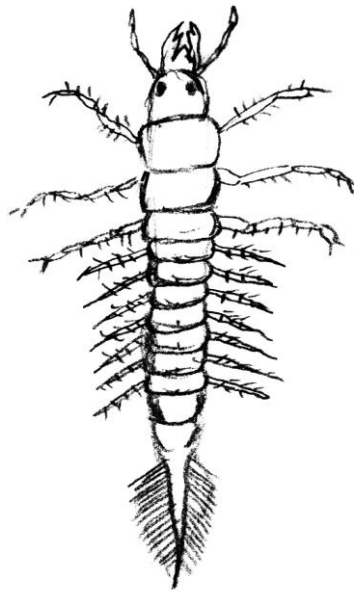
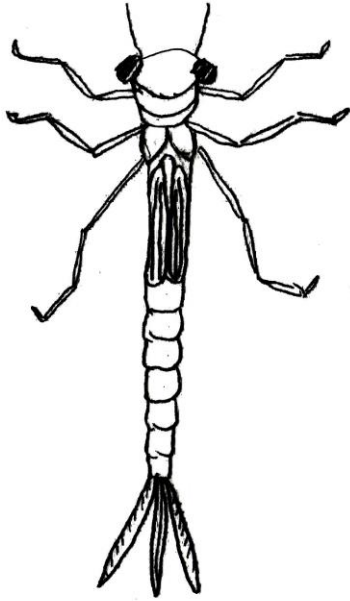


D. Fleshy, squishy body; may have a distinct head, or head may be retracted; may have prolegs, fleshy protuberances, and/or suckers = True Flies – go to page 26

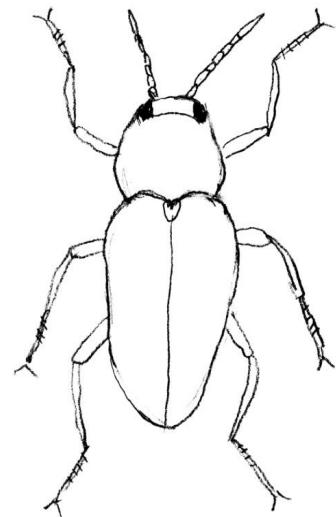
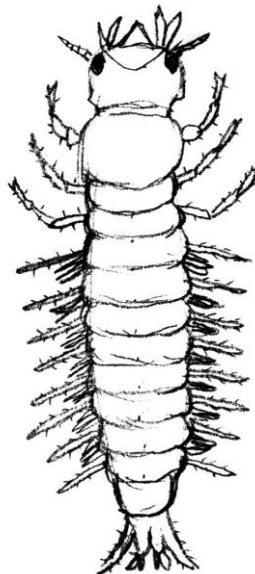
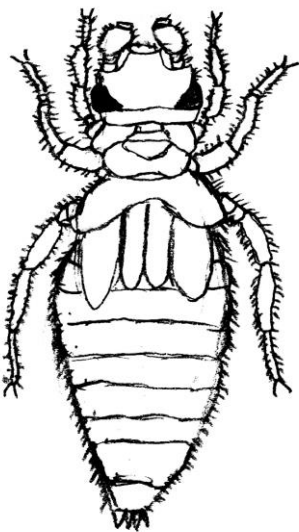


## Orders (Continued)

A. End of abdomen with long tail(s) = go to page 7

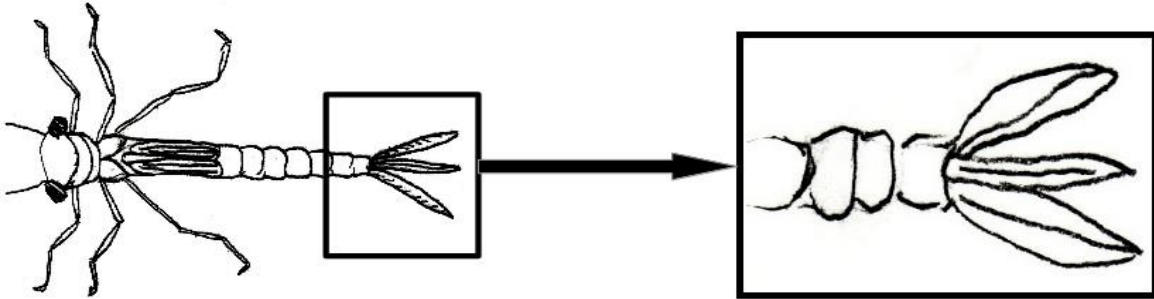


B. End of abdomen with no tails or very short tails  
= go to page 8

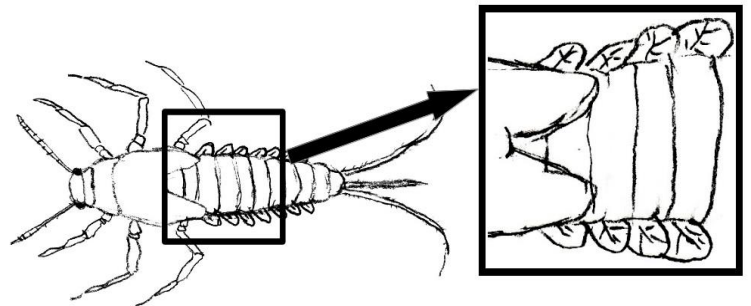


## Orders (Continued)

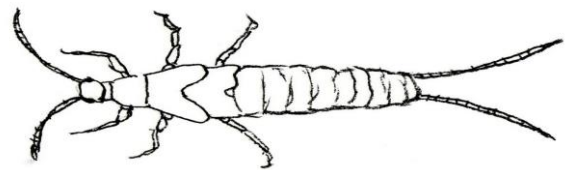
A. 3 tails that look like paddles when viewed from the side; no gills on abdomen = Damselfly – go to page 31



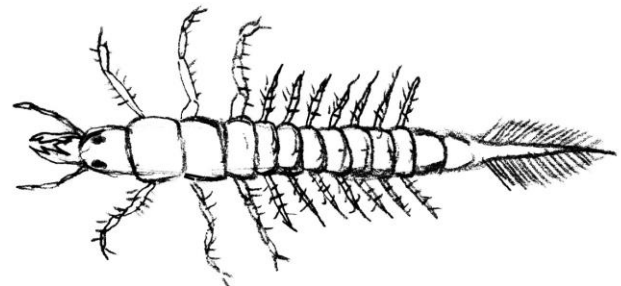
B. 2 or 3 thin, long tails; gills attached to abdomen = Mayfly – go to page 10



C. 2 thin, long tails; No gills on abdomen = Stonefly – go to page 15



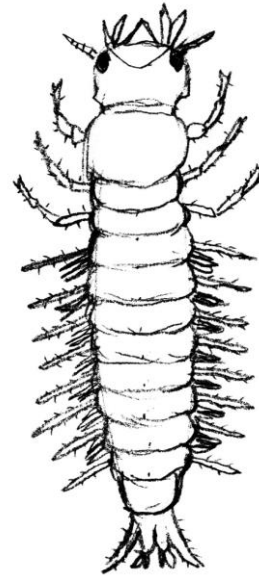
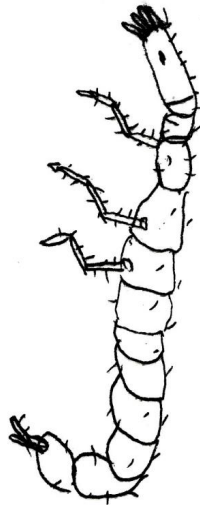
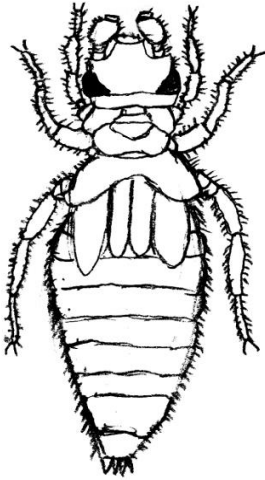
D. One long tail at end of abdomen; body is long with filaments on sides of abdomen; large, pinching jaws = Alderfly (Sialidae)



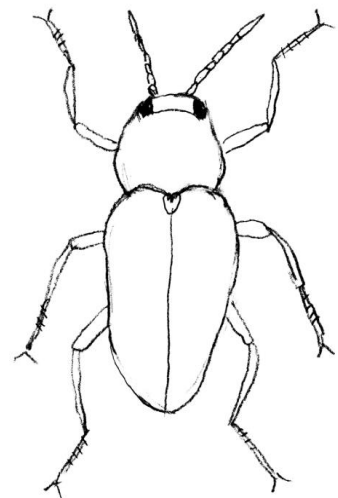
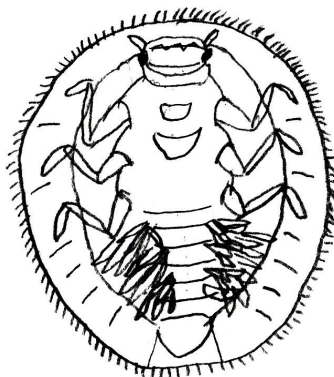
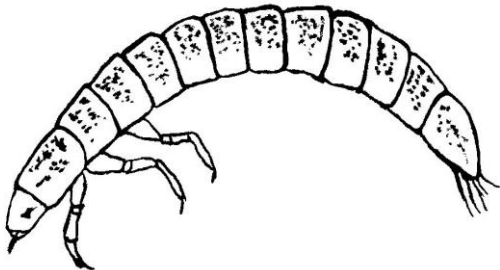


## Orders (Continued)

A. Body without a hardened exoskeleton = go to page 9



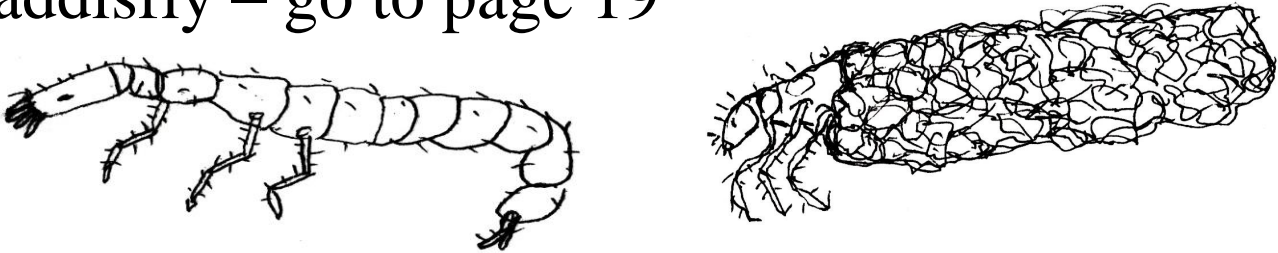
B. Hardened exoskeleton; body may be in the shape of a comma or a penny; may have a rounded or blunt abdomen with hardened wing coverings = Beetles – go to page 22



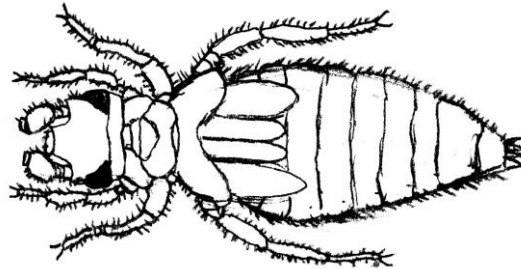


## Orders (Continued)

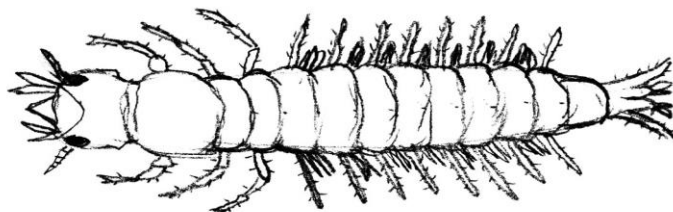
A. Thorax with 3 pairs of jointed legs; long, soft abdomen. May live in a case constructed of tiny pebbles, leaves, sticks, sand or pine needles = Caddisfly – go to page 19



B. Blunt abdomen, can look like a beetle, but has no hardened wing coverings. Large predaceous jaw when viewed from underneath = Dragonfly – go to page 29

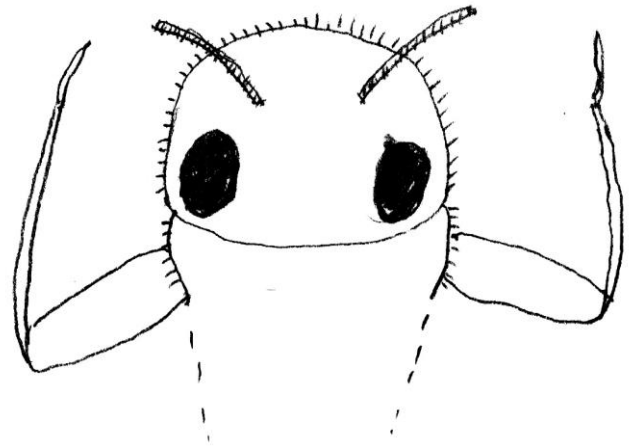
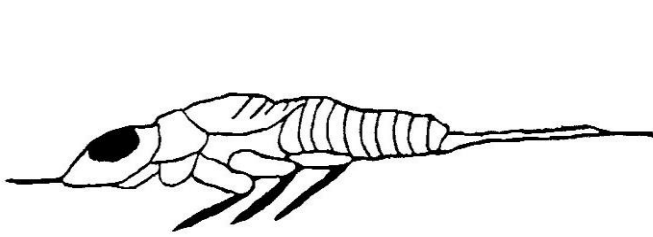


C. Body is long, with filaments coming off sides of abdomen; large, pinching jaws, short tails with hooks at end of abdomen = Hellgrammite (Coryalidae)

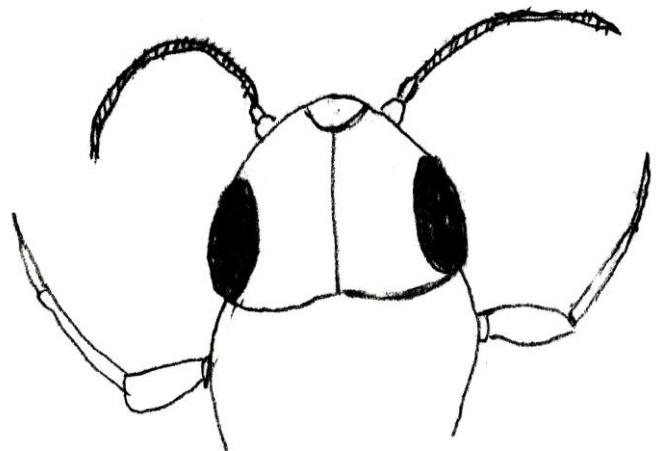
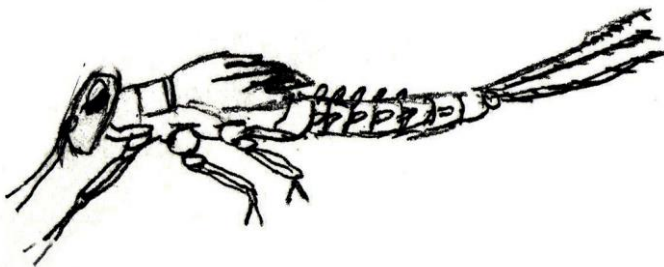


## Mayflies (Ephemeroptera)

A. Head and body flattened; eyes and antennae on top of head (not side) = Flathead (Heptageniidae)

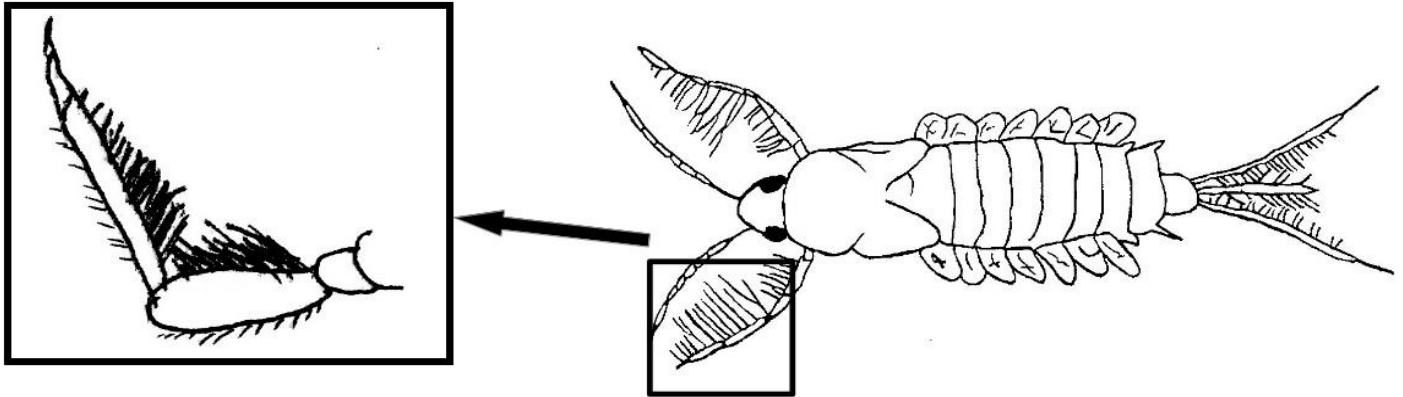


B. Head and body not flattened; eyes and antennae on side of head = go to page 11

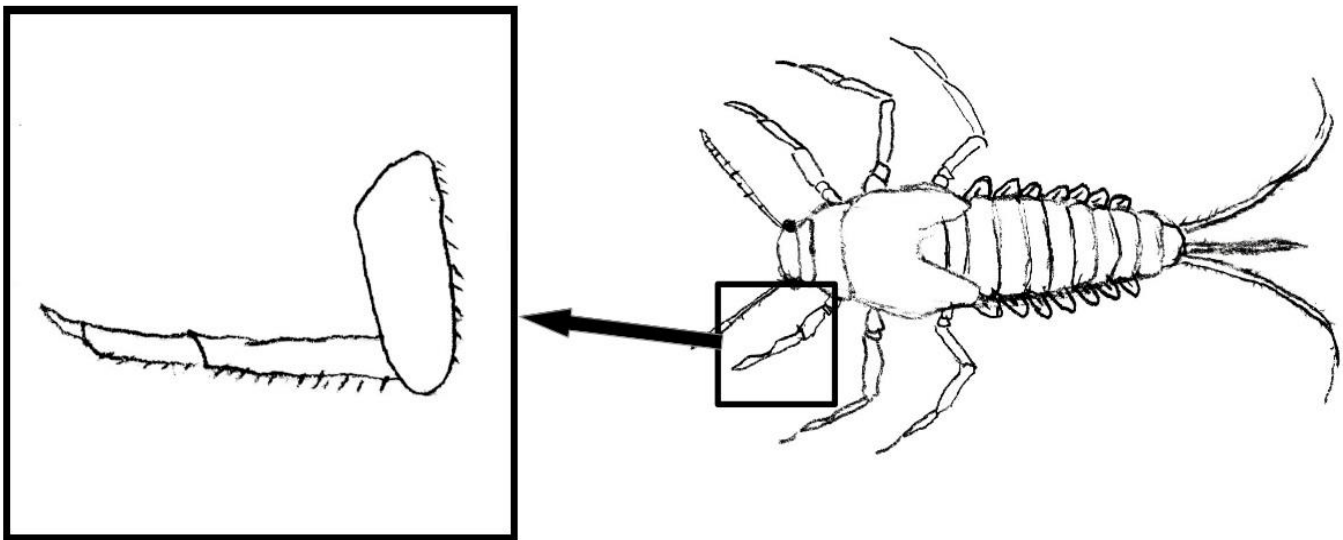


## Mayflies (Continued)

A. First set of legs with a dense row of hair along inner surface = Brushlegged (Isonychiidae)

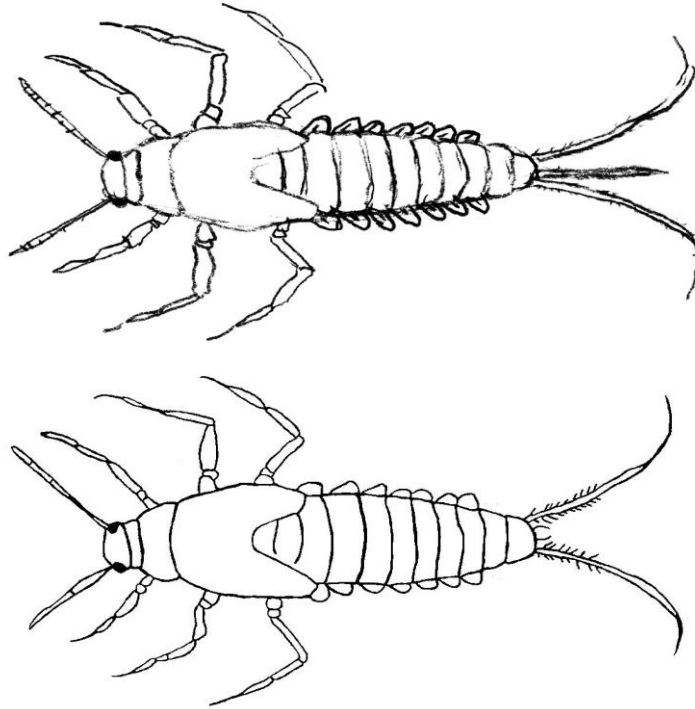


B. No dense hair on inner surface of first set of legs  
= go to page 12

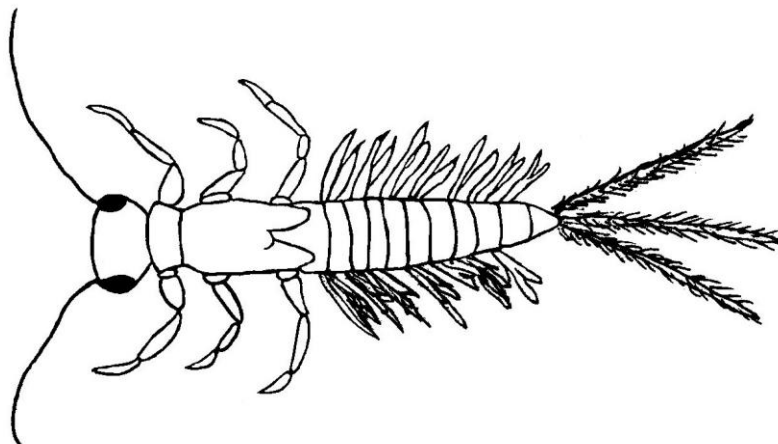


## Mayflies (Continued)

A. Middle tail short or lacking = Small Minnow  
(Baetidae)

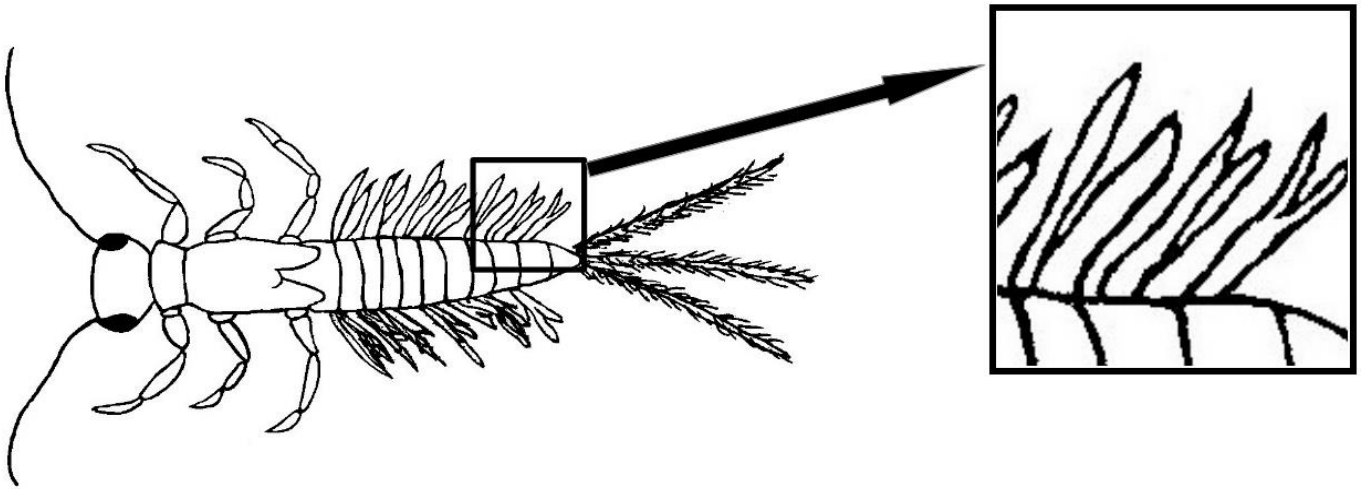


B. Middle tail same length as others = go to page 13

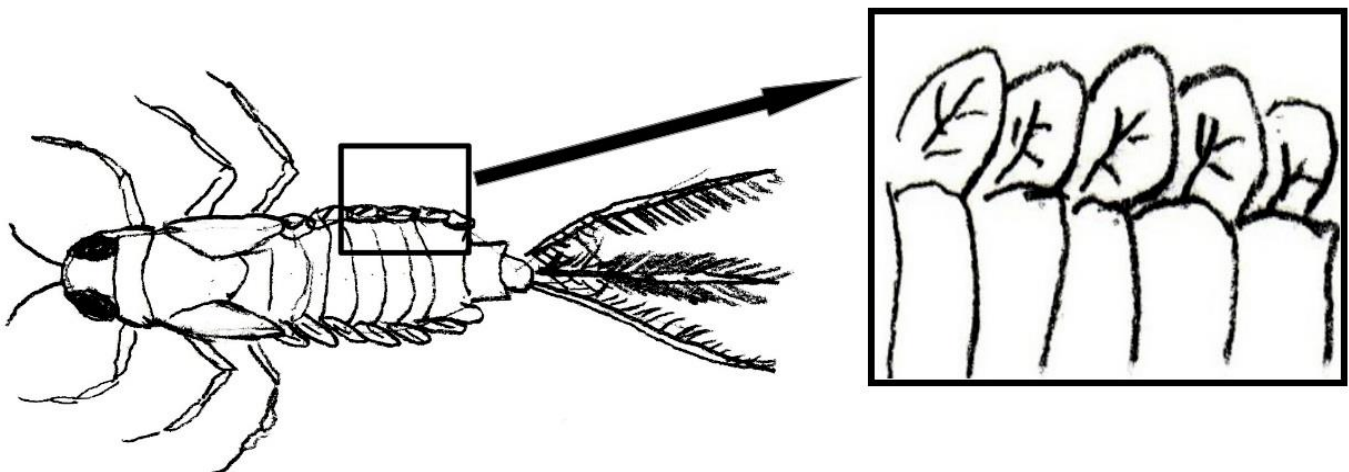


## Mayflies (Continued)

A. Gills pronged or forked =  
Prong-gilled (Leptophlebiidae)

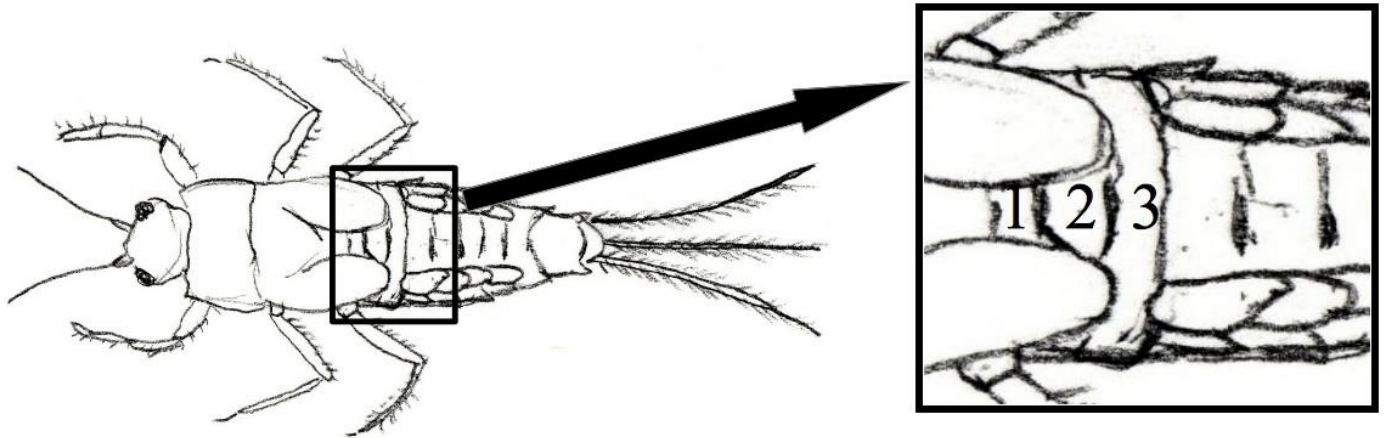


B. Gills round, oval or heart-shaped (not forked) =  
go to page 14

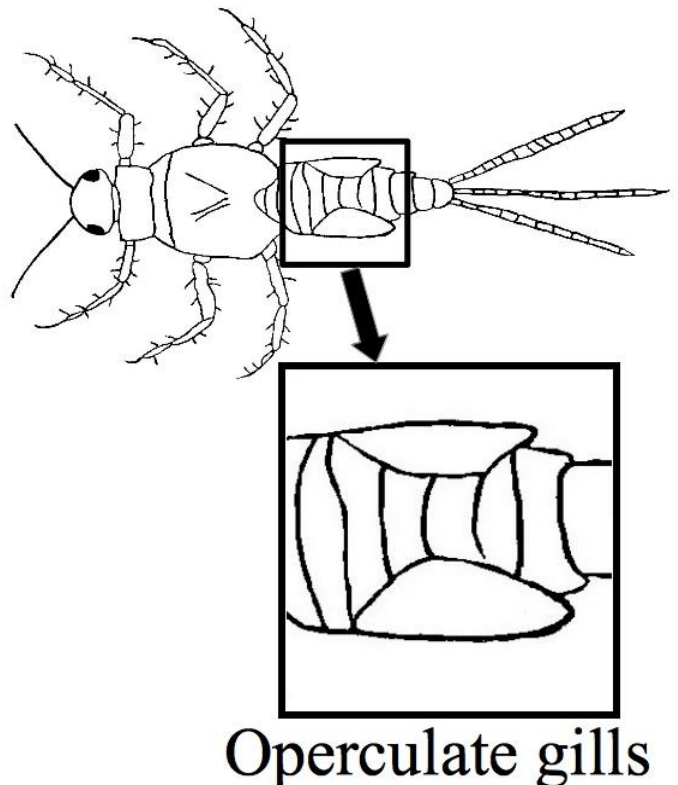
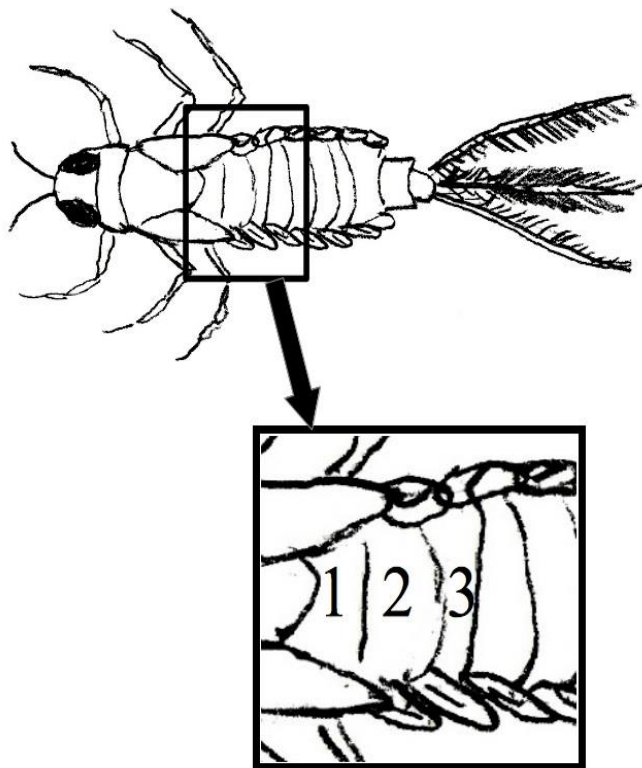


## Mayflies (Continued)

A. Gills absent from abdominal segments 1 and 2, sometimes 3 = Spiny Crawler (Ephemerellidae)



B. Gills present on segments 1-3, or operculate gills = preserve

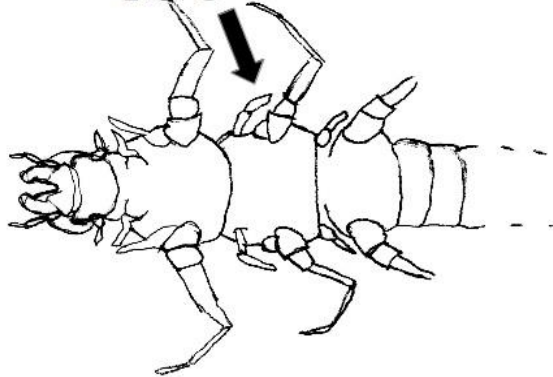




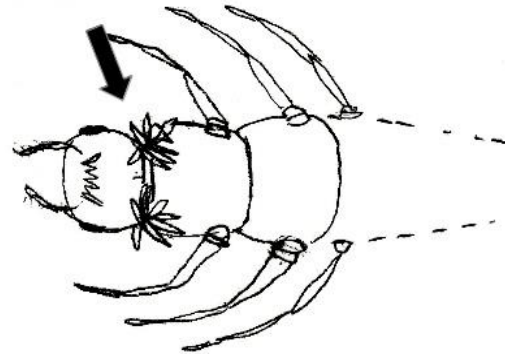
# Stoneflies (Plecoptera)

A. Tufted or telescoping gills present on neck and/or thorax (ventral view) = go to page 16

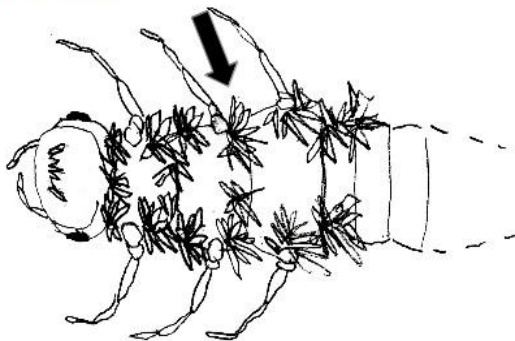
telescoping



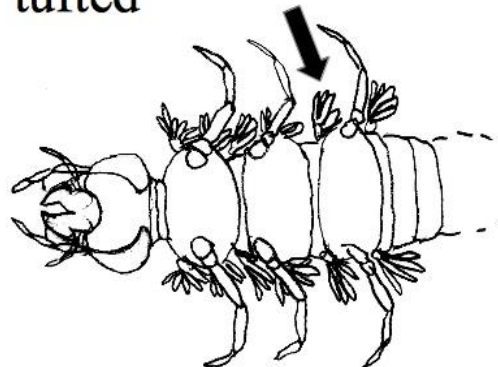
tufted



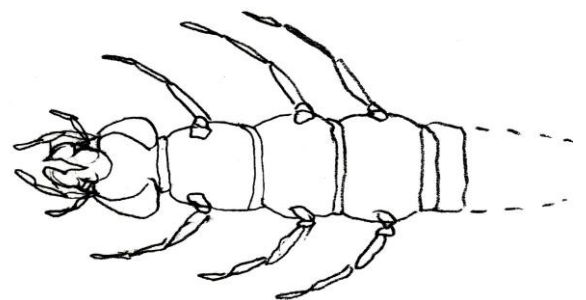
tufted



tufted

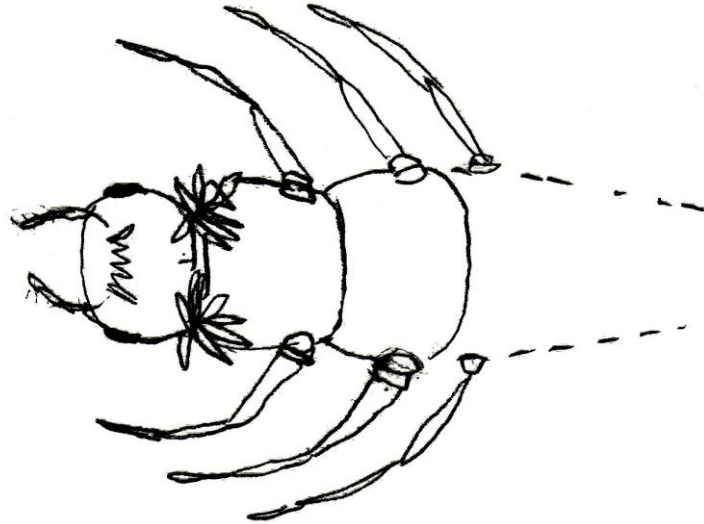


B. Gills absent (ventral view)  
= preserve

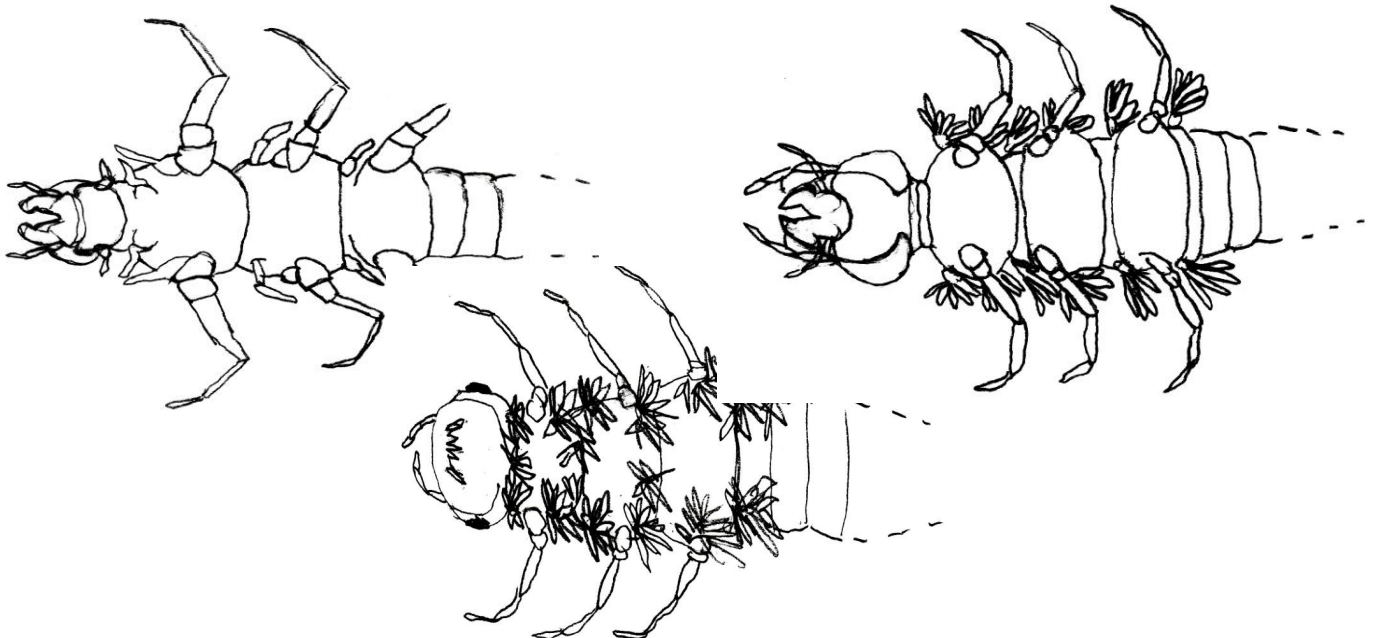


## Stoneflies (Continued)

A. Tufted gills present only on neck (ventral view)  
= Nemourid (Nemouridae)

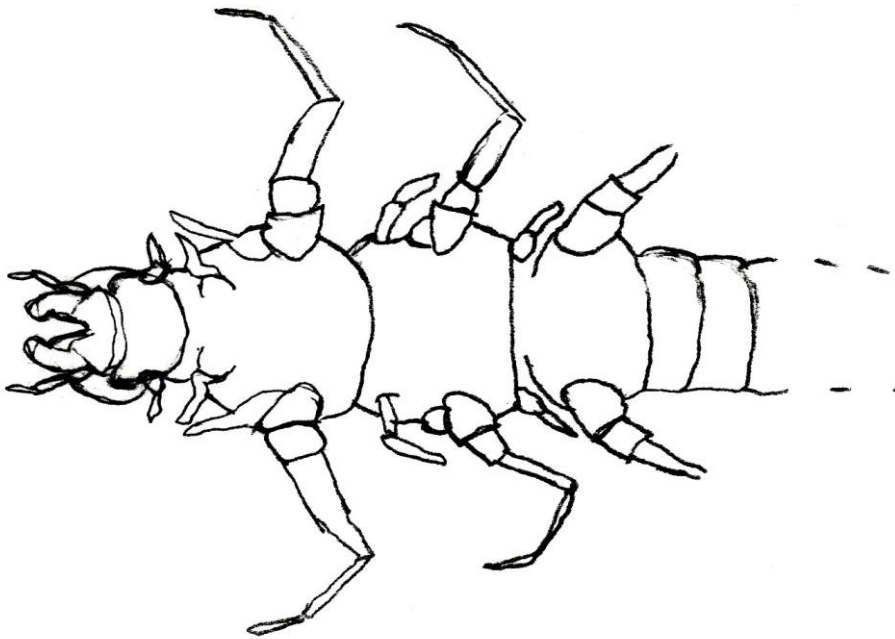


B. Tufted or telescoping gills on thorax (ventral view) = go to page 17

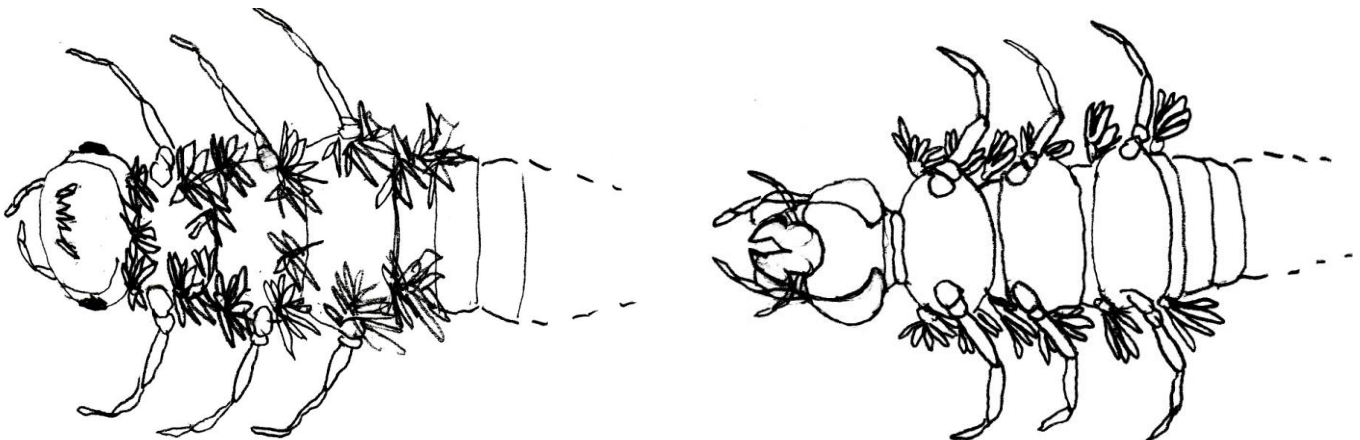


## Stoneflies (Continued)

A. Telescoping gills at base of each leg (ventral view) = Large Winter (Taeniopterygidae)

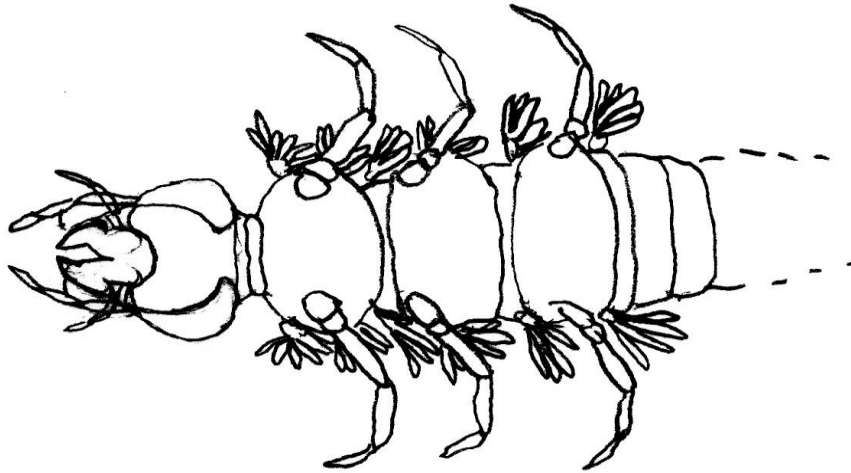


B. Tufted gills on thorax (ventral view) = go to page 18

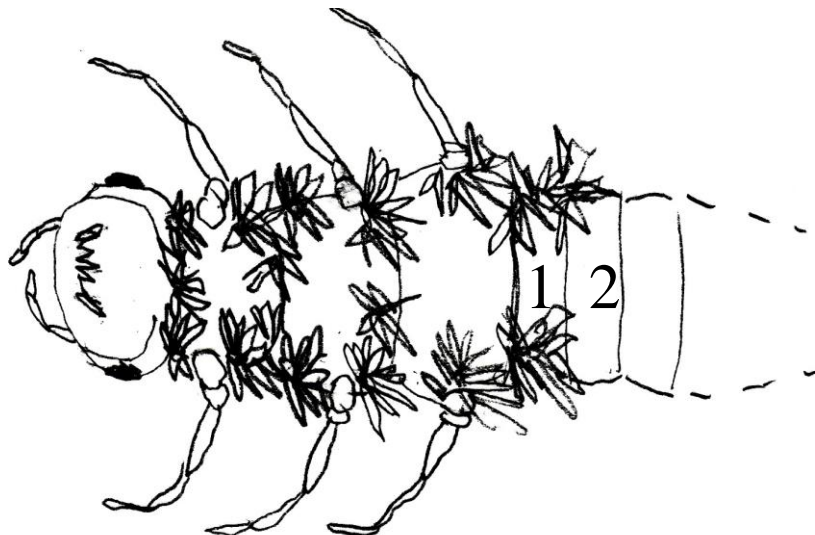


## Stoneflies (Continued)

A. Tufted, filamentous gills only at base of legs;  
“Hairy armpits” (ventral view) = Common  
(Perlidae)

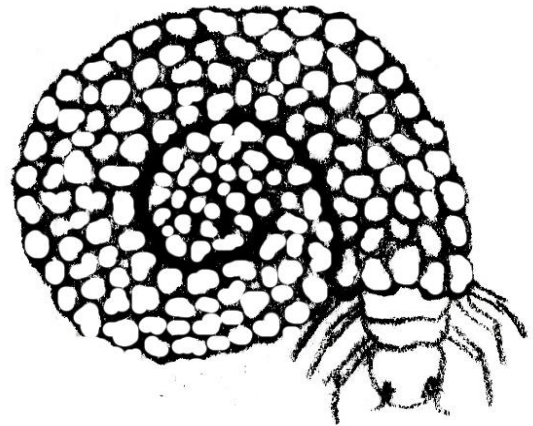
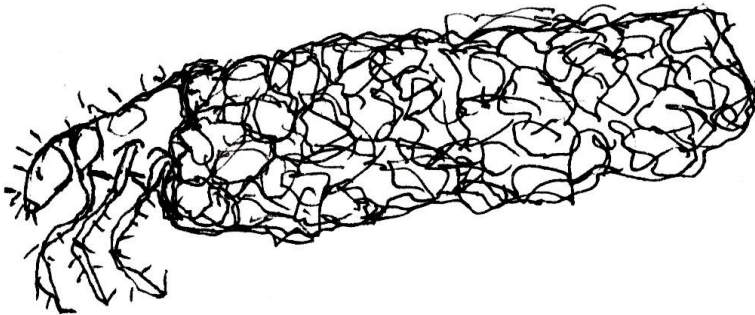


B. Tufted, filamentous gills at base of legs, on  
ventral thorax, AND on ventral abdomen segments  
1 and 2 = Giant (Pteronarcyidae)

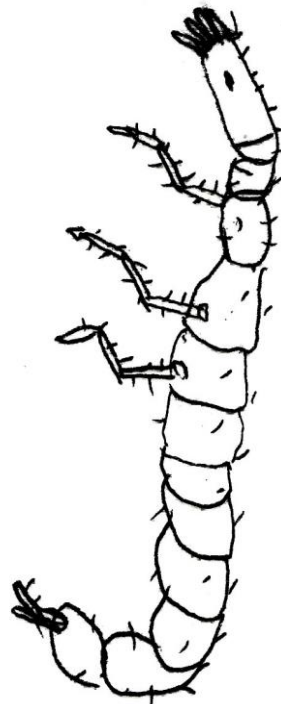
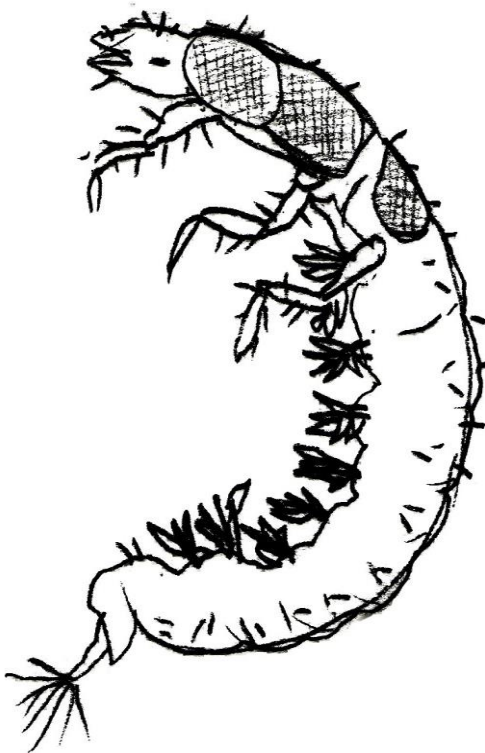


## Caddisflies (Trichoptera)

A. Caddisfly in a case = go to page 20



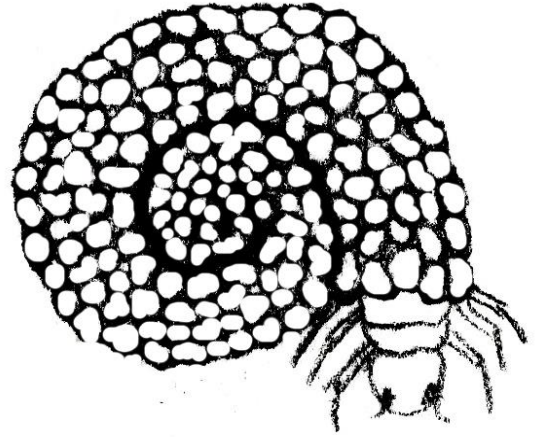
B. Caddisfly not in a case = go to page 21



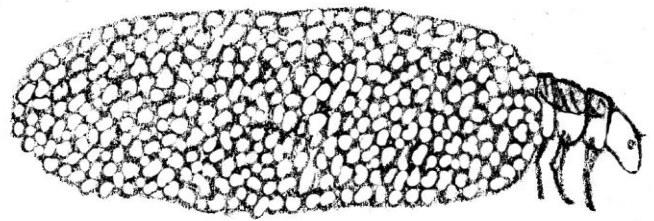


## Caddisflies (Continued)

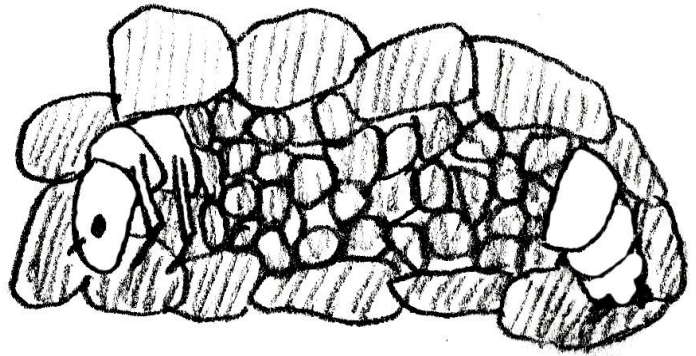
A. Case is like a snail shell =  
Snail case maker  
(Helicopsychidae)\*



B. Case is tiny and purse-like; composed of sand or silt = Micro  
(Hydroptilidae)\*



C. Case is a dome of rocks that covers larva like a turtle shell; the head and end of abdomen are visible underneath = Saddle case maker (Glossosomatidae)\*



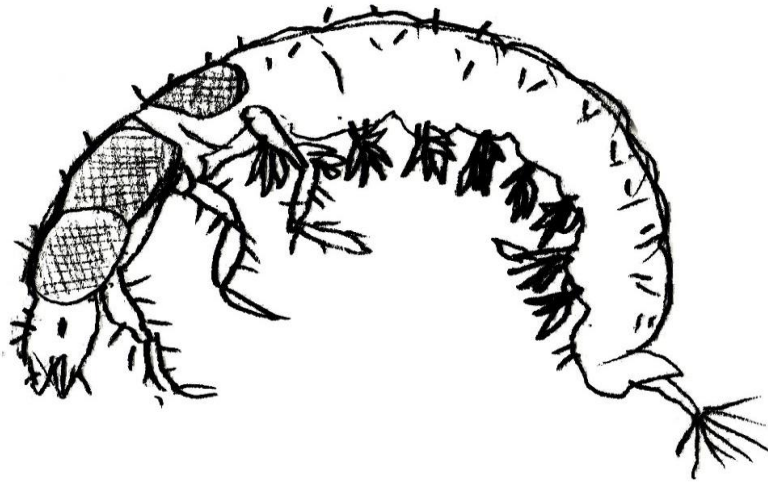
**D. All other cases = preserve**

*\* Please preserve these as well!*

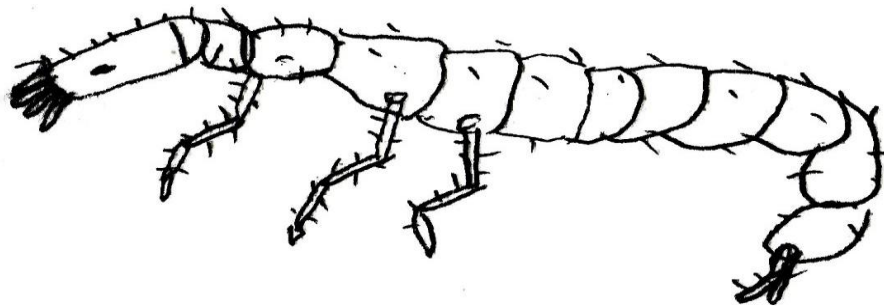


## Caddisflies (Continued)

A. Gills on abdomen (“Fuzzy belly”); all three segments of thorax are covered by hardened plates = Common Netspinner (Hydropsychidae)



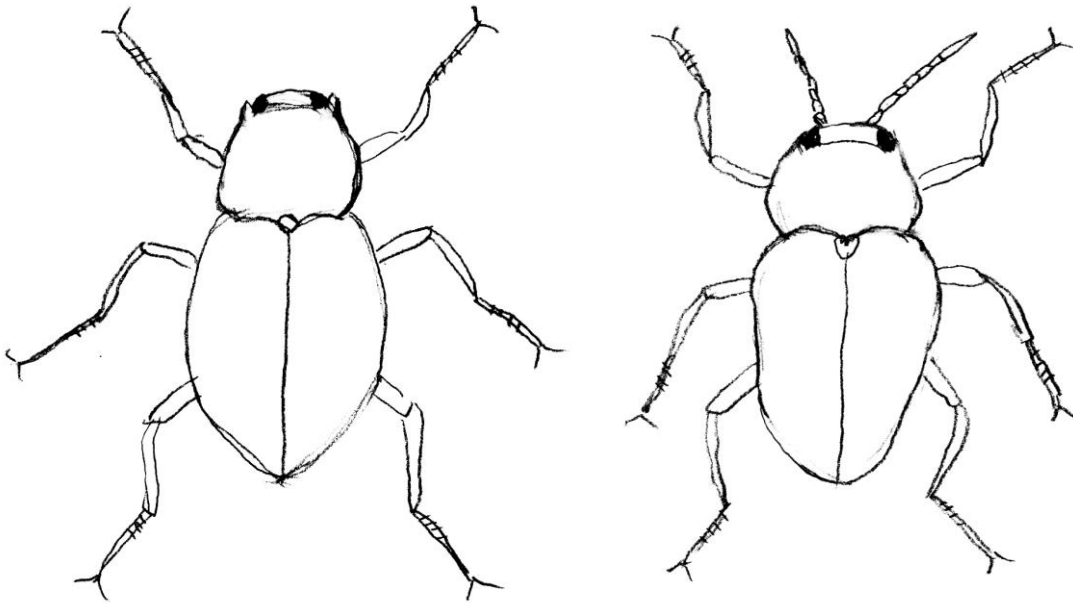
B. No gills on abdomen; head is bright orange and body is bright yellow; only first segment of thorax is covered by a hardened plate, labrum (mouthpart) is T-shaped = Fingernet (Philopotamidae)



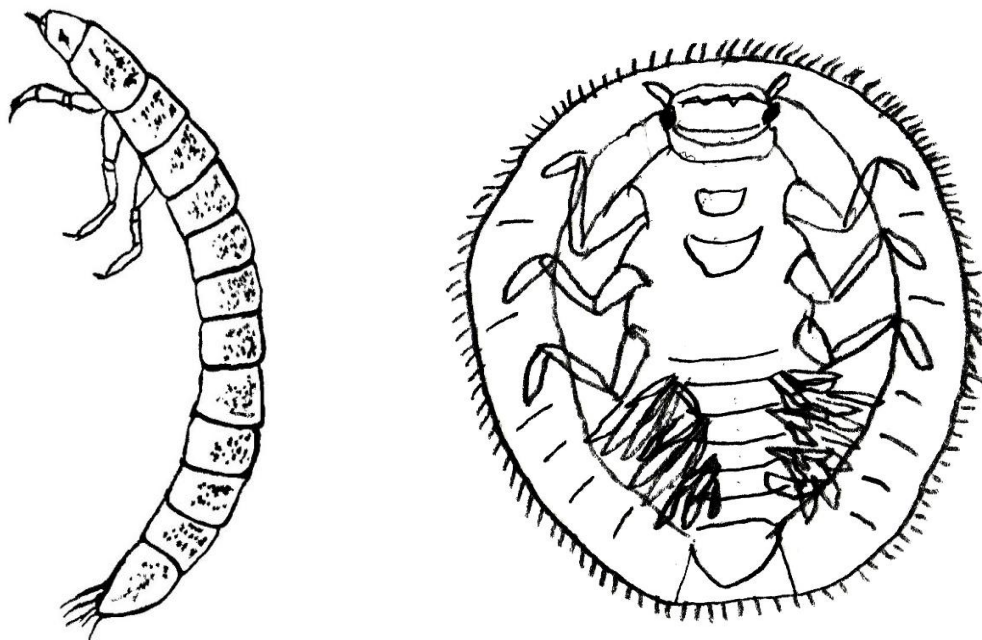
C. All other caddisflies = preserve

## Beetles (Coleoptera)

A. Adult beetle = go to page 23

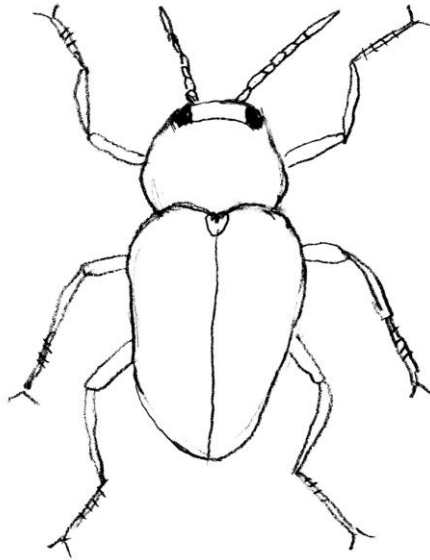


B. Beetle larva = go to page 24

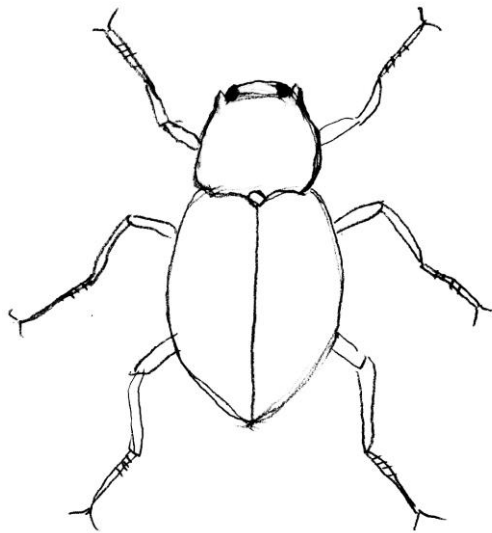


## Beetles (Continued)

A. Visible antennae that are longer than the head =  
Riffle (Elmidae)



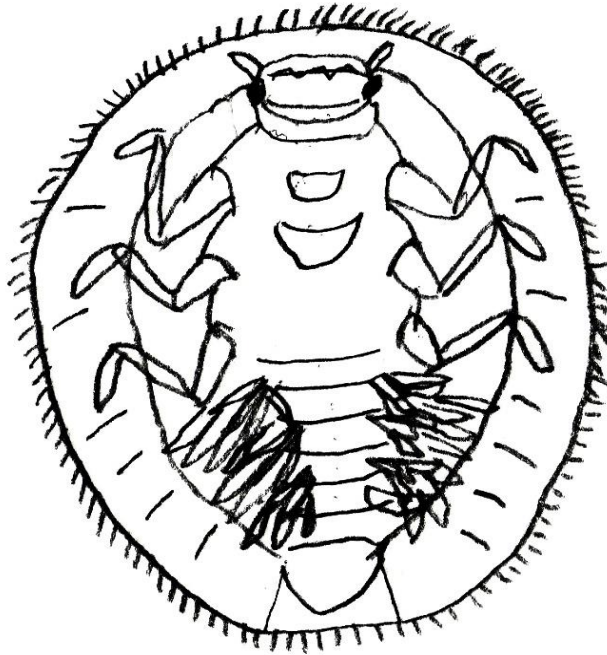
B. Short, thick antennae that are shaped like teeth  
on a comb = Long Toed (Dryopid)



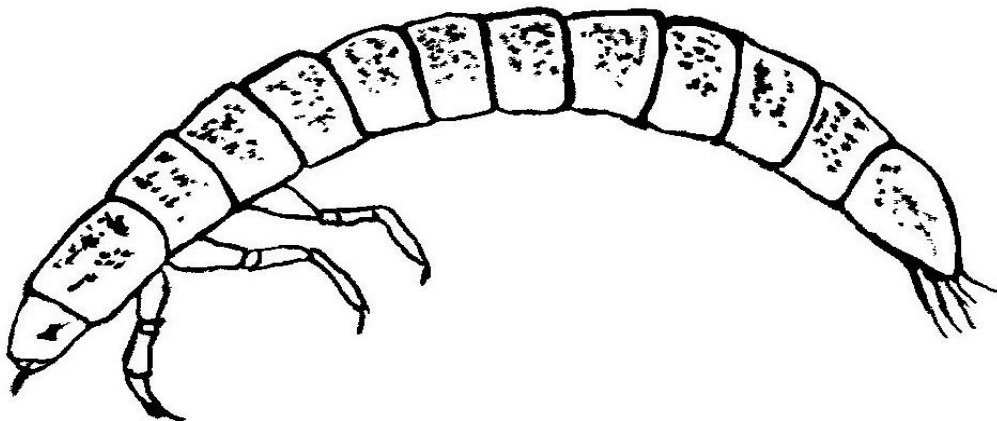
**C. If antennae are not visible = preserve**

## Beetles (Continued)

A. Round, flat shell that covers the beetle = Water penny (Psephenidae)

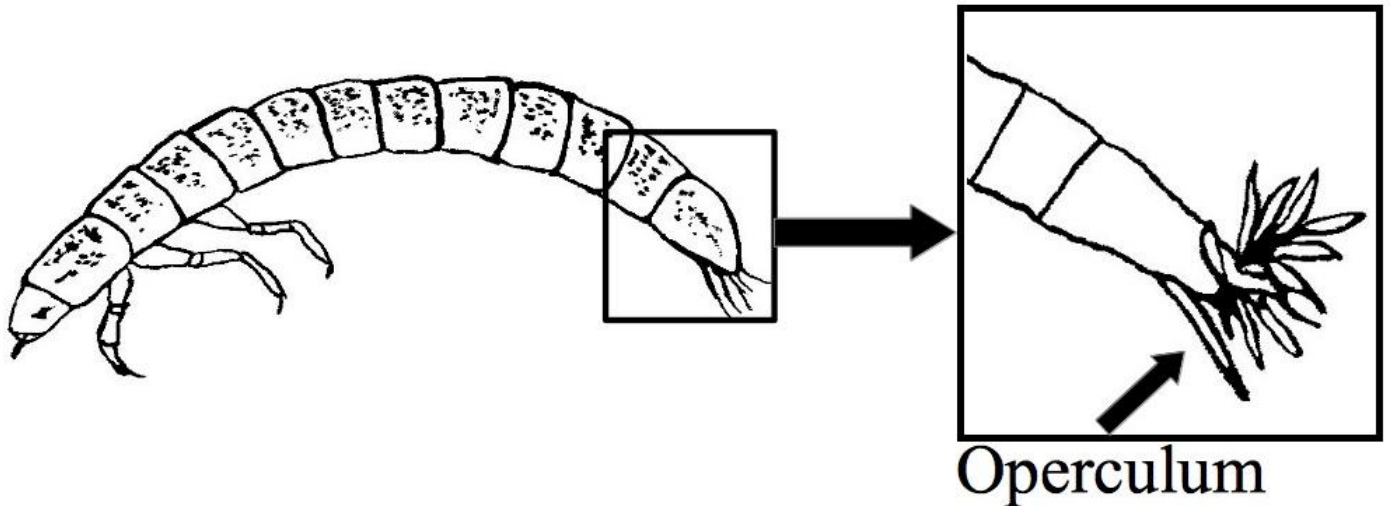


B. Long and skinny larva = go to page 25

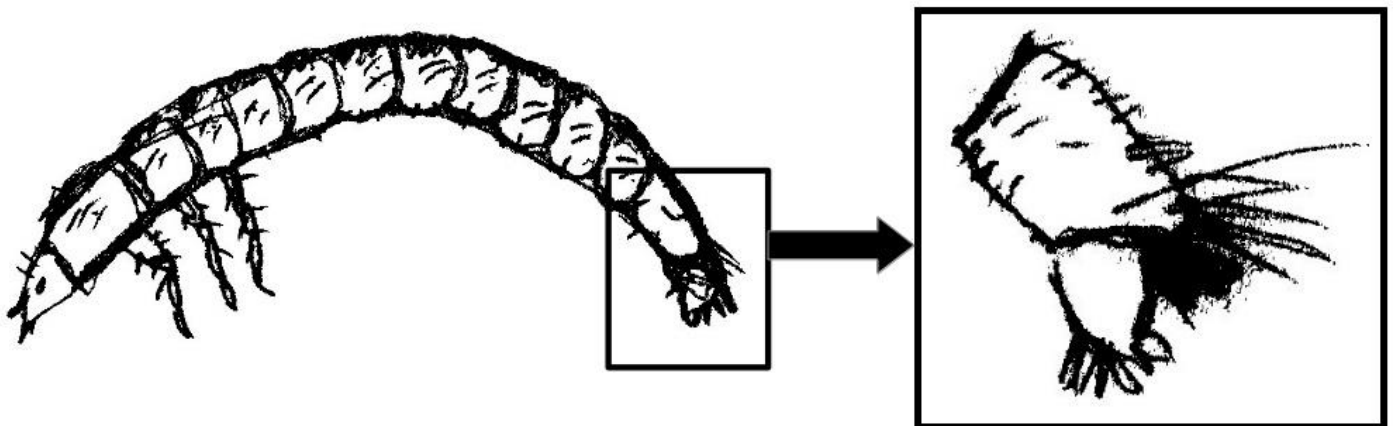


## Beetles (Continued)

A. Abdominal segment 9 with tufted gills and an operculum (hardened cover) = Riffle (Elmidae)



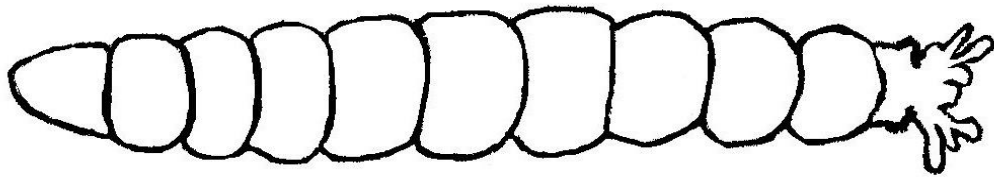
B. Abdominal segment 9 with tufted gills and NO operculum; longer antennae than Elmidae larvae = Ptilodactylidae



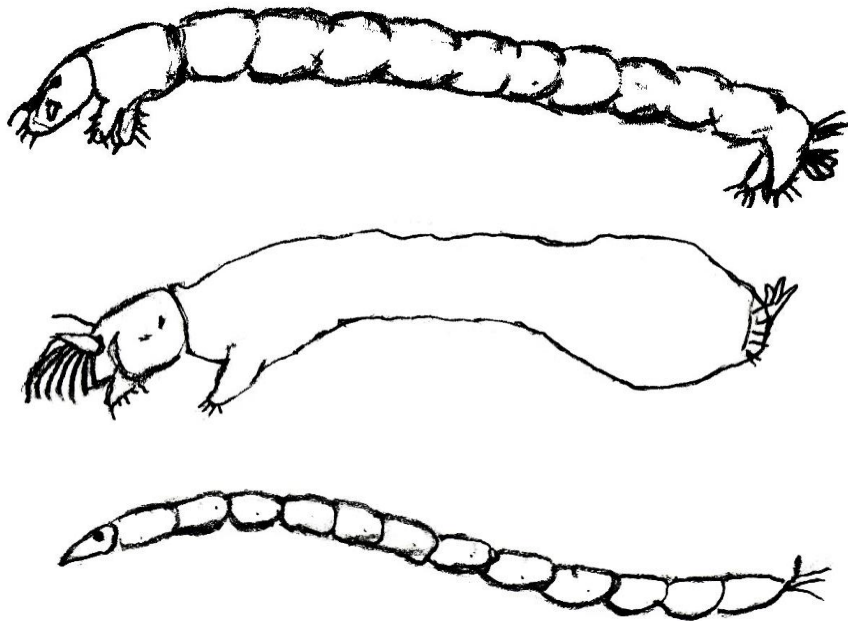
C. All other beetle larvae = preserve

## True Flies (Diptera)

A. Grub-like body; leathery skin with welts; no pro-legs; last abdominal segment with hairs/projections; head usually not visible = Cranefly (Tipulidae)



B. Visible head = go to page 27



C. All other true flies = preserve

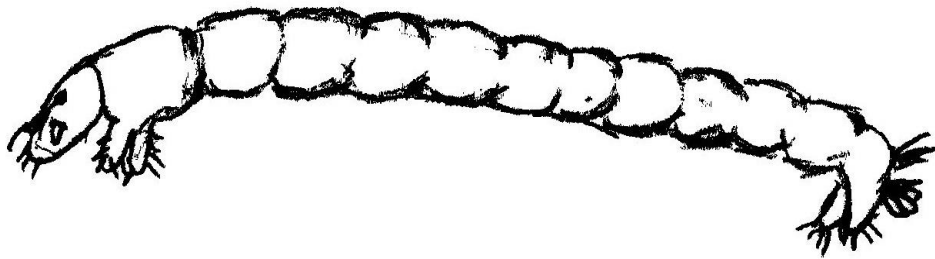


## True Flies (Continued)

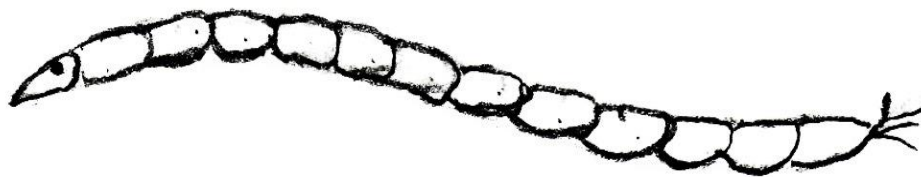
A. Pro-legs on first segment of thorax; body like a bowling pin = Blackfly (Simuliidae)



B. Pro-legs on first segment of thorax and last segment of abdomen; body segmented, squishy and small = Midge (Chironomidae)

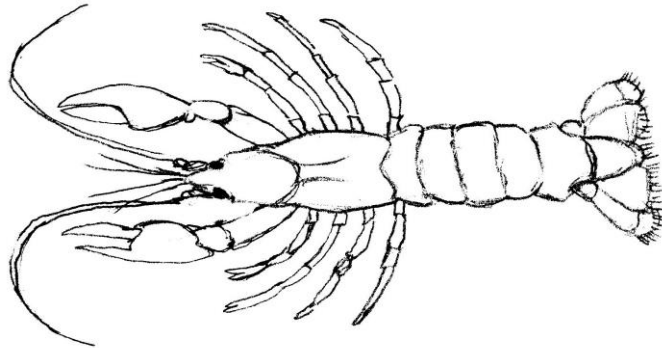


C. NO pro-legs; body segmented, squishy and small = Biting Midge (Ceratopogonidae)

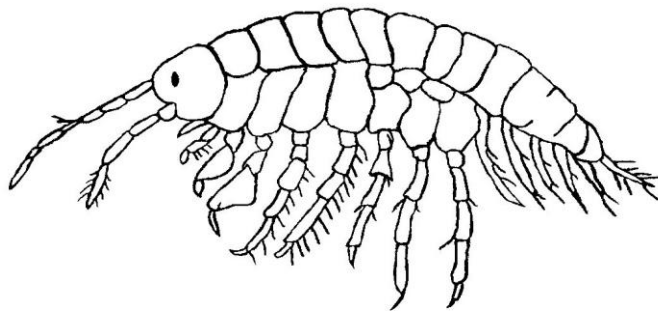


## Crustaceans

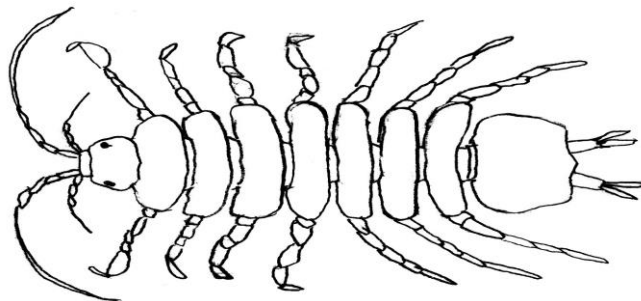
A. Large pinching claws; scoots/swims backwards  
= Crayfish (Cambaridae)



B. Different length legs; skinny body; swims like a shrimp = Scud – **MUST PRESERVE**

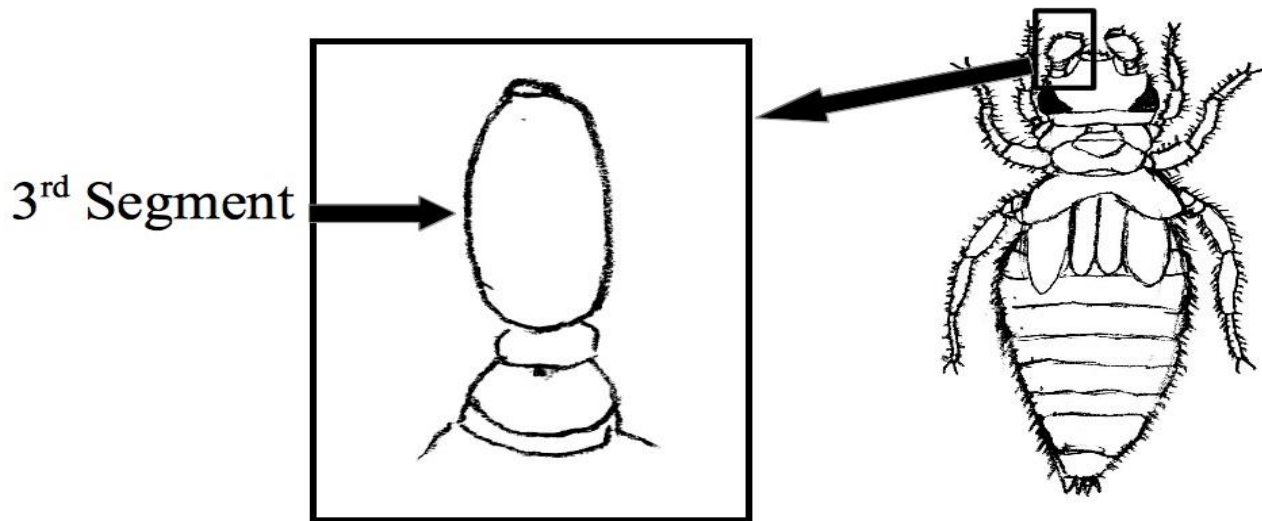


C. Same (or similar) length legs; flat body; curls up or crawls = Sowbug (Asellidae)

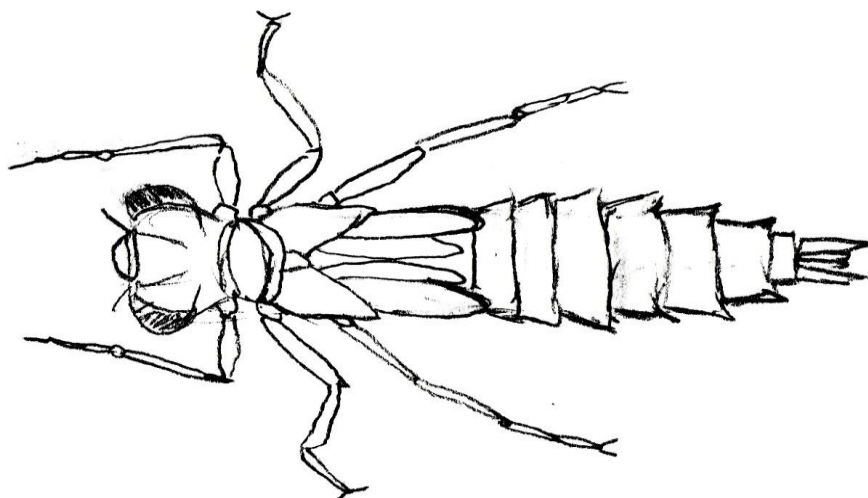


## Dragonflies (Odonata)

A. Third segments of antennae are much larger than other segments (might look like pinchers) = Clubtail (Gomphidae)

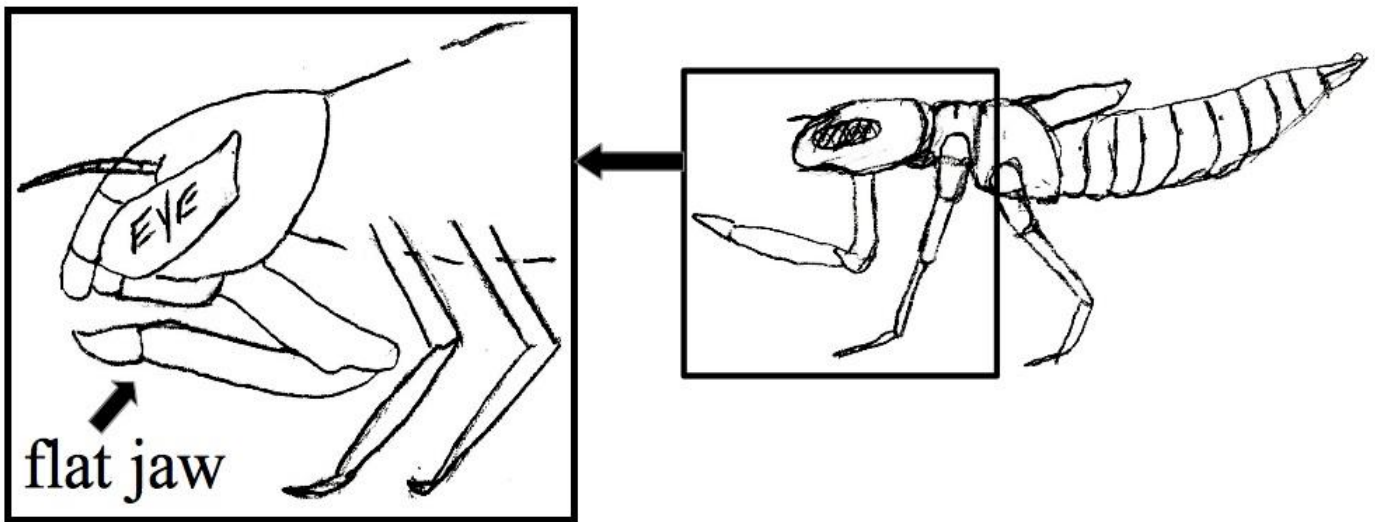


B. Third segments of antennae are the same as the others; antennae are thin = go to page 30

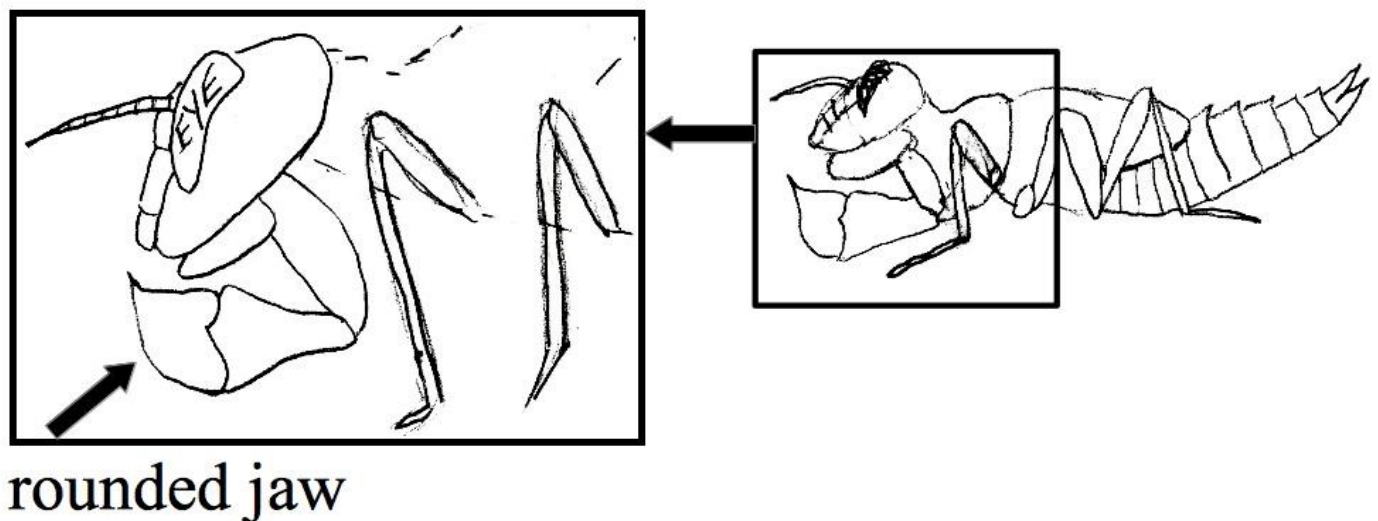


## Dragonflies (Continued)

A. Lower jaw is flat when viewed from the side = Darner (Aeshnidae)



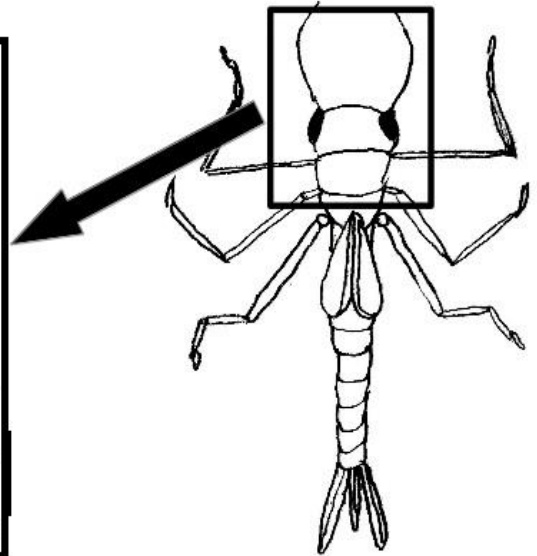
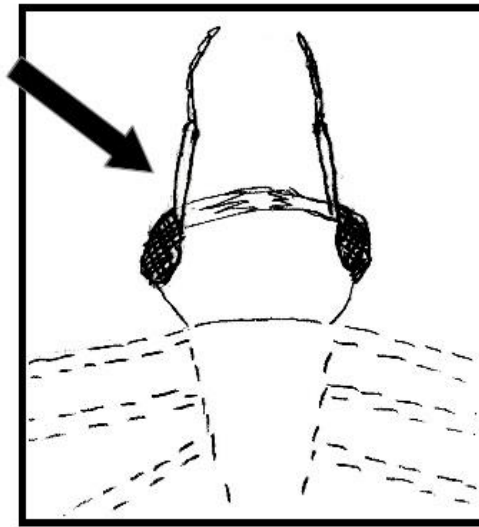
B. Lower jaw is rounded like a scoop when viewed from the side = preserve



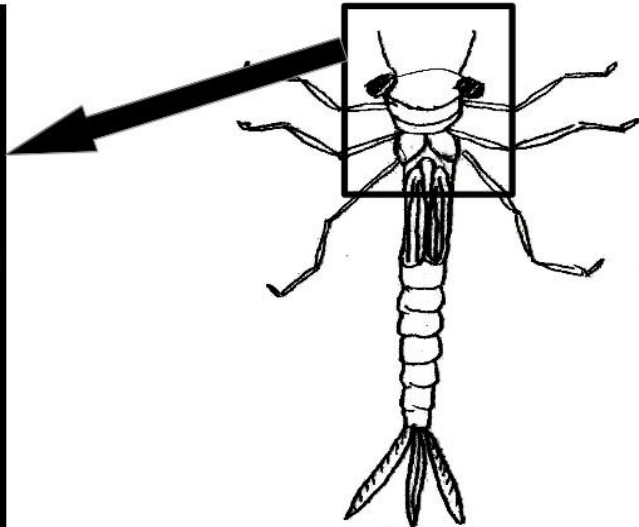
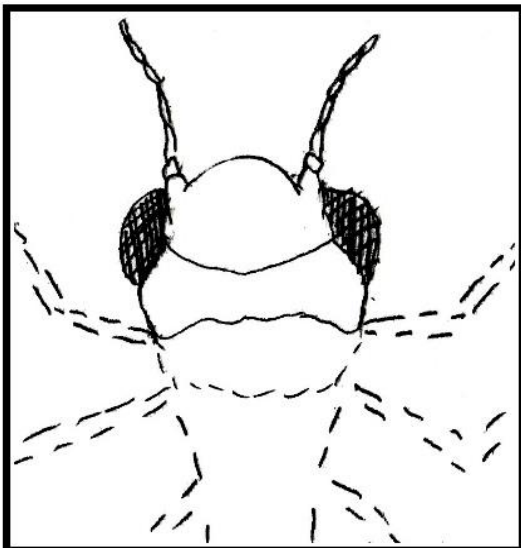
## Damselflies (Odonata)

A. First segments of antennae are as long as, or longer than, the other segments combined = Broadwinged (Calopterygidae)

1<sup>st</sup> segment



B. All segments of antennae are about the same length; antennae are thin = go to page 32

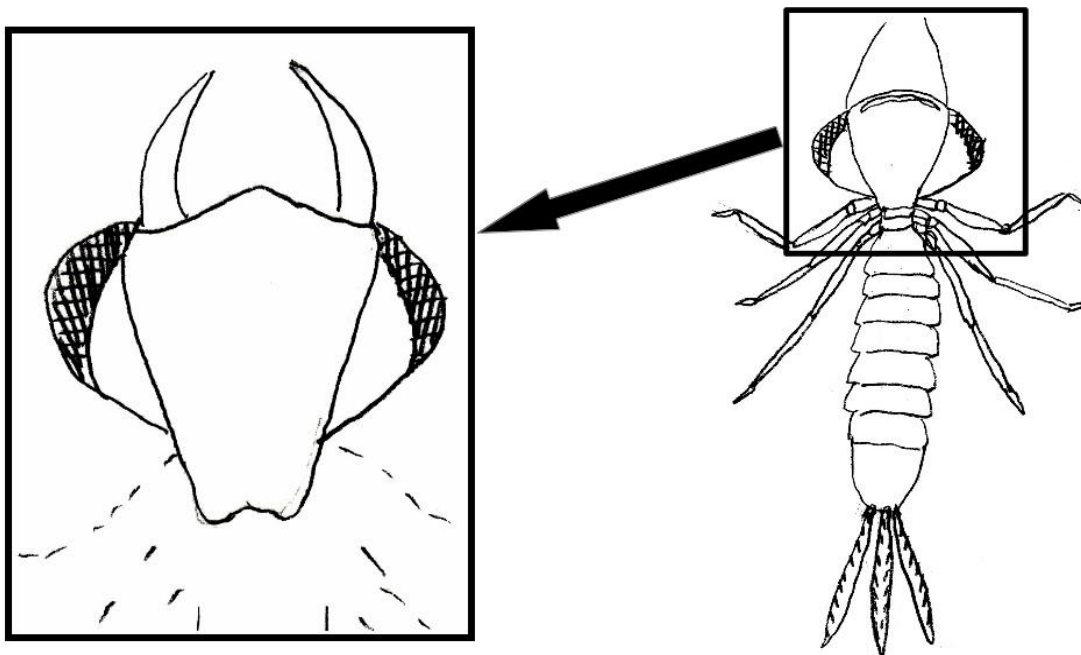


## Damselflies (Continued)

A. Lower jaw is long and narrow when viewed from underneath (ventral view) = Spreadwinged (Lestidae)



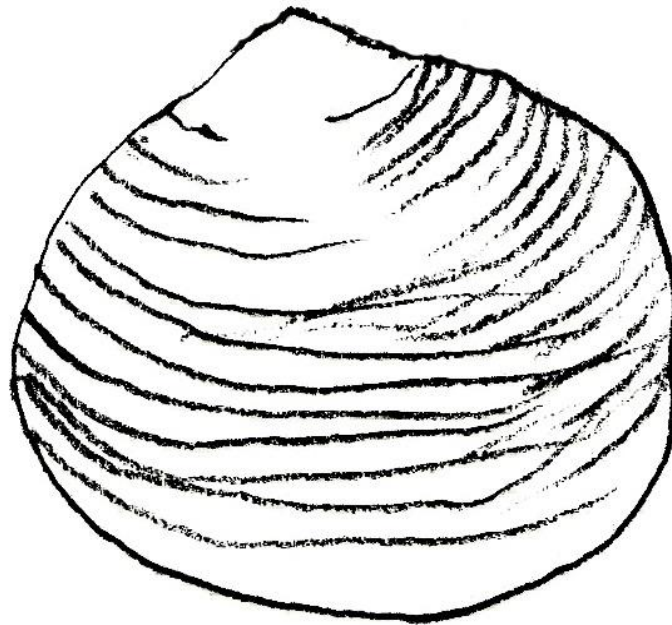
B. Lower jaw tapers slowly; not greatly narrowed when viewed from underneath (ventral view) = Narrowwinged (Coenagrionidae)



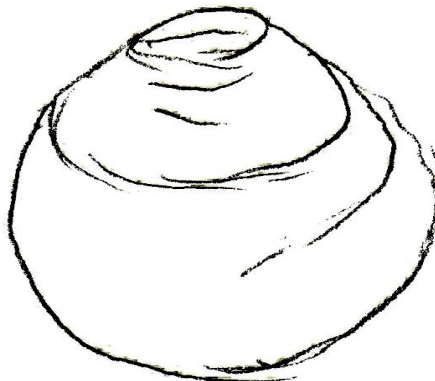


## Clams

A. Ridges are visible and can be felt on the shell = Asian clam (*Corbiculidae*)

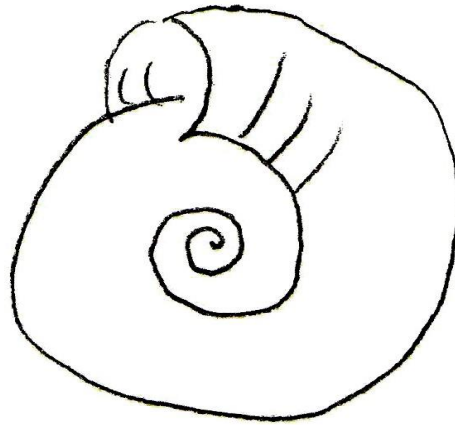


B. Ridges are barely visible and cannot be felt, usually very small clam = Pea clam (*Pisidiidae*)

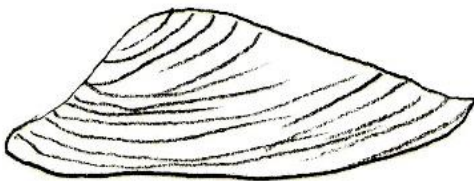


# Snails

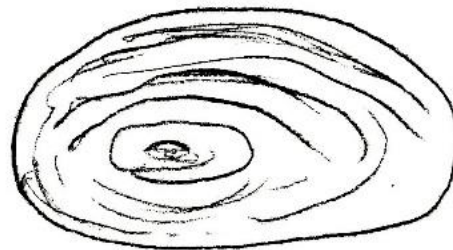
A. Shell is coiled on one plane like a hose =  
Planorbidae (lunged)



B. Shell shaped like a cone; not coiled = Limpet  
(Ancylidae) (lunged)



side view



top view

C. All other snails = preserve (gilled or lunged)



# RIVANNA

## CONSERVATION ALLIANCE

1150 River Road, Suite One  
Charlottesville, VA 22901  
(434) 97-RIVER

[www.rivannariver.org](http://www.rivannariver.org)

The Rivanna Conservation Alliance (RCA) is a 501(c)(3) nonprofit watershed organization created to provide the community with a set of tools and programs specifically designed to help clean and protect the Rivanna River and its tributaries.

**Our Vision:** We envision a healthy Rivanna River and watershed that benefits an engaged community.

**Our Mission:** Working with the community to conserve the Rivanna River and its tributaries through monitoring, restoration, education, and advocacy.

### **Monitoring Partners:**

Albemarle County  
City of Charlottesville  
Fluvanna County  
Rivanna Water and Sewer  
Authority

The Nature Conservancy  
Thomas Jefferson Planning  
District Commission  
Thomas Jefferson Soil and  
Water Conservation District

# THANK YOU VOLUNTEERS!

**Quick Family ID Reference:****Mayflies (Page 10)**

Flathead = head and body flattened, eyes and antennae on top of head

Brushlegged = first set of legs with dense row of hair

Small Minnow = middle tail short or lacking; gills hang off the sides of the abdomen

Prong-gilled = gills pronged or forked

Spiny Crawler = gills absent from abdominal segments 1 and 2; gills lay flat on back of abdomen

**Stoneflies (Page 15)**

Nemourid = tufted gills present on neck

Large Winter = telescoping gills at base of each leg

Common = tufted gills at base of each leg (“hairy armpits”)

Giant = tufted gills on thorax, base of legs, and abdominal segments 1 and 2

**Caddisflies (Page 19)**

Snail case maker = case in the shape of a snail shell

Micro caddisfly = tiny, purse-like case made of sand or silt

Saddle case maker = case is a dome of rocks; head and end of abdomen are visible

Netspinner = gills on abdomen (“fuzzy belly”) and all three thorax segments hardened

Fingernet = no gills on abdomen, head is bright orange and body bright yellow

**Beetles (Page 22)**

Adult Riffle = visible antennae

Adult Long-Toed = short, thick antennae that are difficult or impossible to see

Water Penny = round, flat shell covers beetle body

Riffle larvae = “comma bug” – last abdominal segment with tufted gill and operculum

Ptilodactilidae = last abdominal segment with tufted gill and NO operculum

**True Flies (Page 26)**

Crane fly = grublike, no prolegs, last abdominal segment with hairs/projections; head not visible

Blackfly = bowling pin shape with visible head and prolegs near head

Midge = visible head, prolegs near head and at last abdominal segment

Biting Midge = visible head, no prolegs, long and skinny

**Crustaceans (Page 28)**

Crayfish = pinching claws, scoots/swims backwards

Scud = different length legs, skinny body, swims like a shrimp (MUST PRESERVE)

Sowbug = same length legs, flat body, curls up or crawls

**Dragonflies (Page 29)**

Clubtail = third segment of antennae much larger than other segments

Darner = antennae are thin and long; lower jaw is flat when viewed from the side

**Damselflies (Page 31)**

Broadwinged = first segment of antennae is longer than other segments combined

Spreadwinged = antennae segments are the same length; lower jaw is long and narrow

Narrowwinged = antennae segments are the same length; lower jaw tapers slowly

**Clams (Page 33)**

Asian = ridges are visible and can be felt | Pea = ridges are barely visible and cannot be felt

**Snails (Page 34)**

Planorbis = shell is coiled one plane like a hose | Limpet = shell shaped like a cone, not coiled