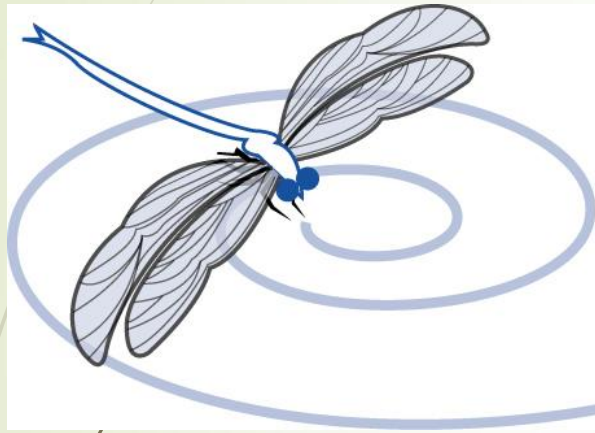


# Field Techniques & Bug ID



Michigan Clean  
Water Corps

# Safety Guidelines for Stream Work

## Tell your teams:

- Keep your collector in sight
- Move slowly and cautiously
- Beware of instream items that could be scientific equipment, or dangerous (like rebar and chunks of concrete)
- To wear life jackets if appropriate

## Prior to going out, the coordinator should:

- Obtain permission from landowners
- Contact Health Department for specific stream warnings
- Send teams out with first aid kit
- Have volunteers sign waivers

# Habitat Assessment

- We will discuss more extensively in the field.
- HRWC does a habitat assessment at every site once every 5 years.
- Do it at least once during the course of a 2 year MiCorps grant
- Teams should do the habitat assessment AFTER collecting macroinvertebrates so the group is familiar with the stream...
- ... or hold the habitat assessment at a different time of year and treat it as a different event.
- You are not required to do a habitat assessment every time you go out, although if you feel the site is threatened in some way you may choose to do so.

# Habitat Assessment

## Keep In Mind...

- It serves as a primer for people who don't know anything about stream ecology... *What is important for a stream?*
- Many questions are subjective; teams should answer the best you can.
- We encourage teams to talk through the answers. If two people in a group disagree, write down both answers.
- Tell teams to NOT stress about any measurement.
- The data is qualitative and sometimes subjective.
- It can point out some areas for potential restoration projects (eroding banks).
- The best use I have for the habitat assessment are the optional pebble counts- provides quantitative data and is more objective, valuable to track over time.





**Aquatic Insects are Diverse and Interesting**



# Why collect “bugs”?

## Good science

- Good indicators of stream conditions (live there all the time!)
- Diversity = Healthy stream
- Threats to bug diversity
  - Sedimentation
  - Habitat loss
  - Chemical pollution

## Good for volunteers

- Easy sampling techniques
- Generally abundant communities
- It is a unique experience



# How do we collect bugs?

- Each team member gets a job- collector, scribe, picker, shuttler, leader, etc.
- Collector works upstream collecting along ~300 foot reach. Collector samples a variety of microhabitats.
- Store in 70% ethanol or isopropyl alcohol until identification.
- KEEP THE BUGS LONG TERM
- Hold identification events
  - After the event or...
  - On a different day.





# How do we collect bugs?

- No set bug number or time limit to allow flexibility in site conditions and volunteer experience. This differs from DEQ Procedure 51.
- Some rules of thumb:
  - Generally, 40 minutes with a single collector actively sampling... and flexibility may be required.
  - HRWC data- at least 50 creatures(100 preferable)
  - You can pick the bugs longer than 40 minutes but keep the overall time at a site to an hour.
  - You do not need to keep more than 11 specimens of each type—after that something is considered common.
    - BUT— can your volunteers do the identification and do they know exactly what the rest of the team are keeping?
    - Usually— no.
    - Therefore it is safer to keep everything found, to a maximum of one hour of picking.



# Variations in procedure

- 
- 
- ▶ Each group tends to do things a little differently. i.e.
    - ▶ Two collector vs. One collector
    - ▶ Picking on a bank vs. Putting everything in a bucket
    - ▶ When ID happens
  - ▶ But certain things need to be done in certain ways
    - ▶ Total effort should be ~40 minutes no matter the collector number
    - ▶ 300 foot stream sections
    - ▶ Don't pick for more than an hour, and it can be less if it isn't needed.
    - ▶ Collectors need a class room/field training or at least a practice sampling session before official collection.
    - ▶ Pickers should not be extensively trained. It can hurt recruitment and retention.
    - ▶ Don't do your official ID's out in the field. Kill the specimens, id in a controlled setting, keep the specimens.
  - ▶ QAPPs and side-by-sides are the way to ensure generally consistent procedures from group to group.

# Aquatic Macroinvertebrate Overview

## Classification System

MiCorps ID Level

**Kingdom**- Animalia

**Phylum**- Arthropoda, Mollusca, Annelida

**Class**- Insecta (Crustacea, Pelecypoda, Gastropoda, Oligochaeta, Hirundea)

**Order**- i.e. Diptera (true flies)

**Family**- i.e. Tipulidae (crane flies)

**Genus**- Do-able but takes a lot of effort.

**Species**- Hope you have lots of time and will power.

# Complete Metamorphosis

**Aquatic Pupae**

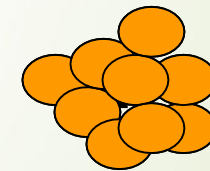


**Midge**  
(True Fly)  
**Life Cycle**

**Flying Adults**



Typically  
terrestrial and  
therefore not  
collected in  
MiCorps  
(beetles are  
an exception)



**•Eggs**

Mostly  
what you  
will find  
and id in  
stream  
systems

**Aquatic Larvae**  
(many growth  
instars)



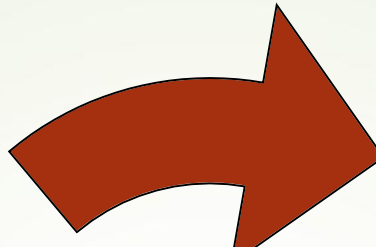
- Other groups:
- Beetles
- Alderflies
- Dobsonflies
- Caddisflies

# Incomplete Metamorphosis



**Nymph  
(aquatic)**  
**Numerous  
growth  
instars**

Mostly  
what you  
will find  
and id in  
stream  
systems



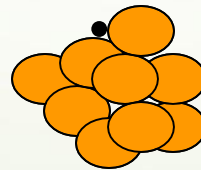
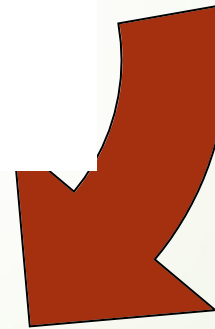
## Dragonfly Life Cycle



**Flying**

Typically terrestrial  
and therefore not  
collected in  
MiCorps

(true bugs are an  
exception)

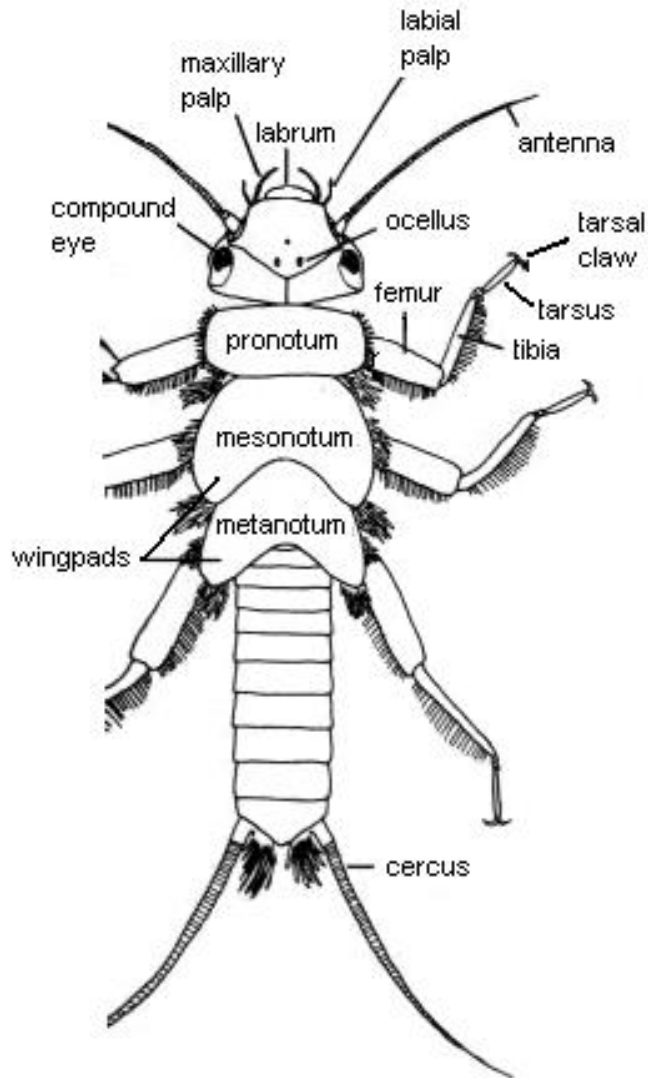


**Eggs**

**Other groups:**  
**Mayflies**  
**Stoneflies**  
**True Bugs**

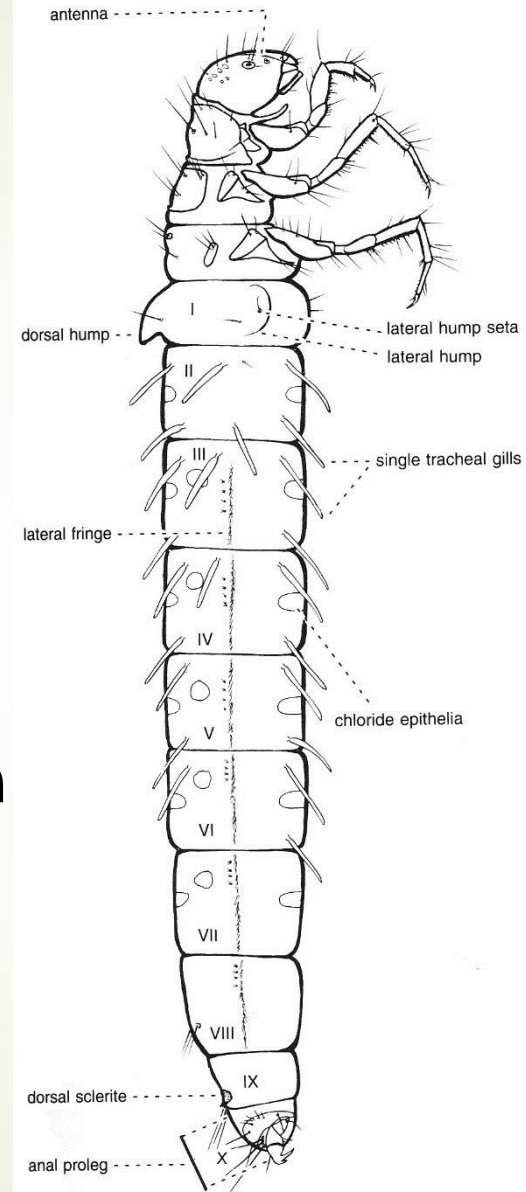


•Peckarsky, et al. Freshwater Macroinvertebrates of Northeastern North America. 1990.




**Head**  
**Thorax**

**Abdomen**




•Wiggins. Larvae of the North America Caddisfly Genera (Trichoptera). 2<sup>nd</sup> ed. 1998.

# Tips for learning identification?



- PRACTICE. Time and patience.
- Consider taking a class at a local college
- Find a local expert to coach you.
- Even better: Get that local expert or professor to VOLUNTEER for you!



1. Goal for today— become generally familiar with the level of required MiCorps identification

2. Goal by the end of the year- comfortable identifying these groups.

3. Then— consider making the effort to learn all insects at the family level

# Stream Macroinvertebrate Datasheet

- Collection Information
- Stream Conditions
- Habitats Sampled
- Identification & Assessment

## STREAM QUALITY SCORE

Group 1:

\_\_\_\_\_ # of R's \* 5.0 = \_\_\_\_\_

\_\_\_\_\_ # of C's \* 5.3 = \_\_\_\_\_

Group 1 Total = \_\_\_\_\_

Group 2:

\_\_\_\_\_ # of R's \* 3.0 = \_\_\_\_\_

\_\_\_\_\_ # of C's \* 3.2 = \_\_\_\_\_

Group 2 Total = \_\_\_\_\_

Group 3:

\_\_\_\_\_ # of R's \* 1.1 = \_\_\_\_\_

\_\_\_\_\_ # of C's \* 1.0 = \_\_\_\_\_

Group 3 Total = \_\_\_\_\_

Total Stream Quality Score = \_\_\_\_\_  
(Sum of totals for groups 1-3; round to nearest whole number)

Check one:

\_\_\_\_\_ Excellent (>48)  
\_\_\_\_\_ Good (34-48)  
\_\_\_\_\_ Fair (19-33)  
\_\_\_\_\_ Poor (<19)



# Advanced Identification

MiCorp Site ID# \_\_\_\_\_

Identification verified by: \_\_\_\_\_ (optional)



## AQUATIC MACROINVERTEBRATE IDENTIFICATION WITH INSECT FAMILIES

Use letter code [**R** (rare) = 1-10, **C** (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach. Only use the blank by the main taxa heading (i.e. ANNELIDA, COLEOPTERA) when there are organisms that cannot be identified to the lower taxonomic levels.

ANNELIDA— Segmented Worm \_\_\_\_\_

Hirudinea \_\_\_\_\_

Oligochaeta \_\_\_\_\_

COLEOPTERA — Beetles \_\_\_\_\_

Chrysomelidae \_\_\_\_\_

Curculionidae \_\_\_\_\_

Dryopidae \_\_\_\_\_

Dytiscidae \_\_\_\_\_

Elmidae \_\_\_\_\_

Gyrinidae \_\_\_\_\_

Halplidae \_\_\_\_\_

DIPTERA— continued

Syrphidae \_\_\_\_\_

Tabanidae \_\_\_\_\_

Tipulidae \_\_\_\_\_

EPHEMEROPTERA — Mayflies \_\_\_\_\_

Acanthametropodidae \_\_\_\_\_

Ameletidae \_\_\_\_\_



Ametropodidae \_\_\_\_\_

Arthropleidae \_\_\_\_\_

Baetidae \_\_\_\_\_

Baetiscidae \_\_\_\_\_

Let's meet the bugs!



## **Group 1: Sensitive**

# Caddisflies



- 3 legs
- Wormlike
- Often with plates on thorax
- Often in a case (sand, leaves, twigs)
- Some types are free-living

- Phylum: Arthropoda
- Class: Insecta
- Order: Trichoptera

**Size ranges:**

 3 mm



**44 mm**



Figure 14.58. *Dicosmoecus* larval case

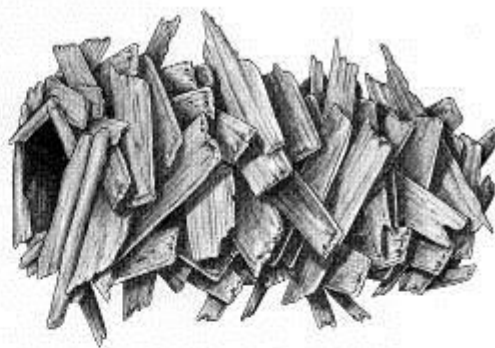


Figure 14.59. *Limnephilus* larval case



Figure 14.60. *Limnephilus* larval case



Figure 14.62. *Apatania* larval case

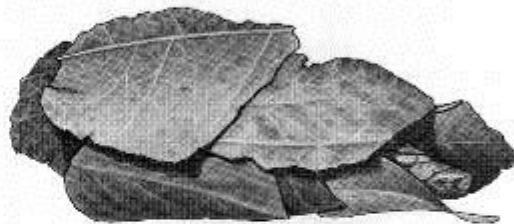


Figure 14.61. *Pycnopsyche* larval case



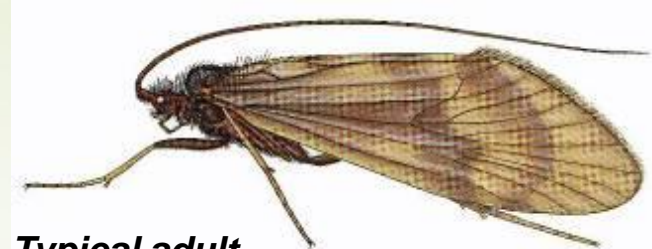
Figure 14.64. *Farula* larval case



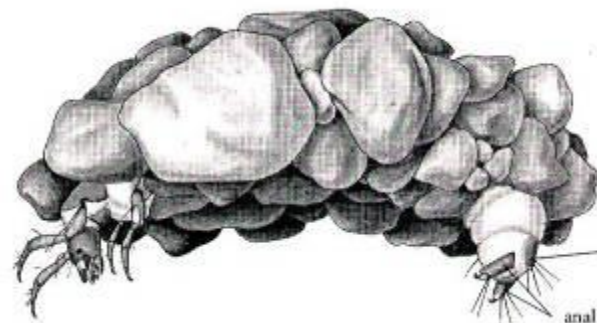
Figure 14.63. *Neophylax* larval case



Figure 14.65. *Manophylax* larval case



**Typical adult**



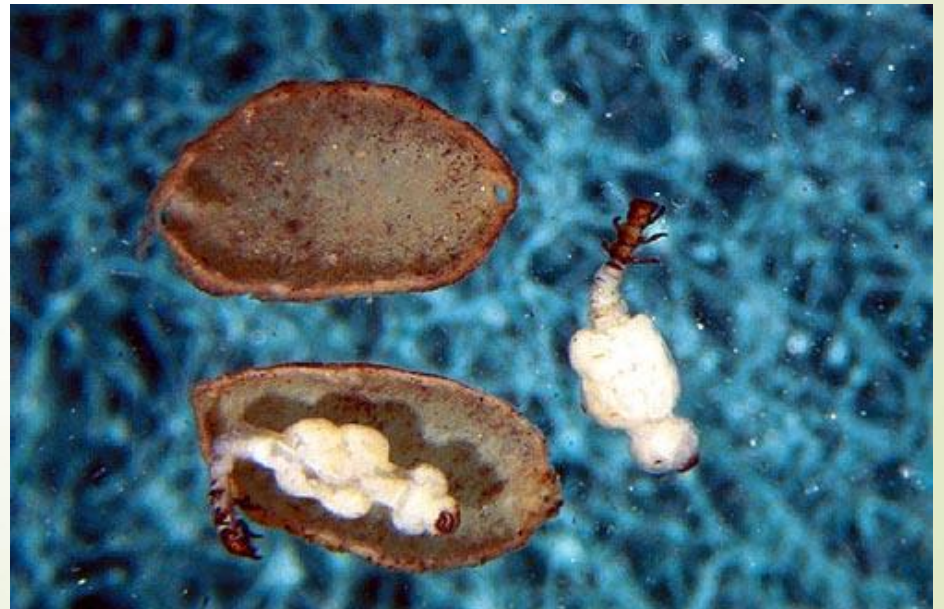


## Caddis jewelry



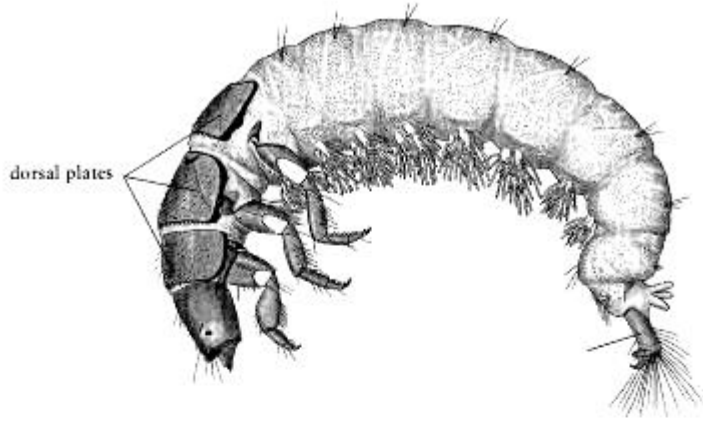
## Hydroptilidae- an overlooked, tiny caddis

About 3 mm in length

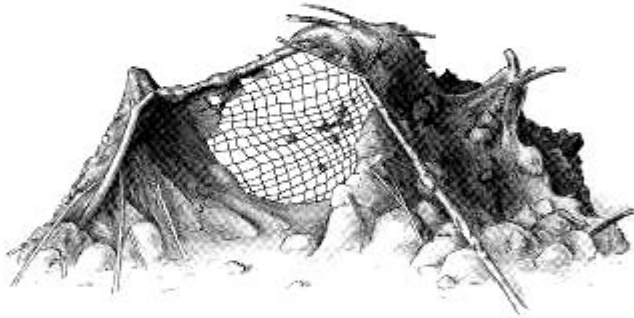


# Common Net-spinning Caddisfly

*NOT a sensitive species*



•10 mm

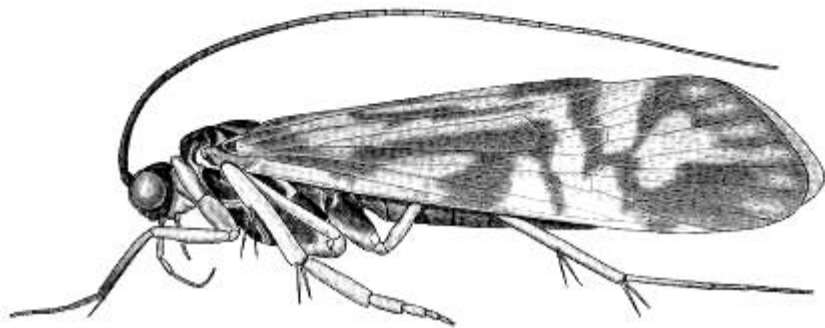


Phylum: Arthropoda

Class: Insecta

Order: Trichoptera

Family: Hydropsychidae





# Easy to mix up these free living caddis:

## Hydropsychidae



**Hydropsychidae has 3 thoracic plates and brushy gills**

**The others have 1 or 0 plates, no brushy gills.**



## Polycentropodidae

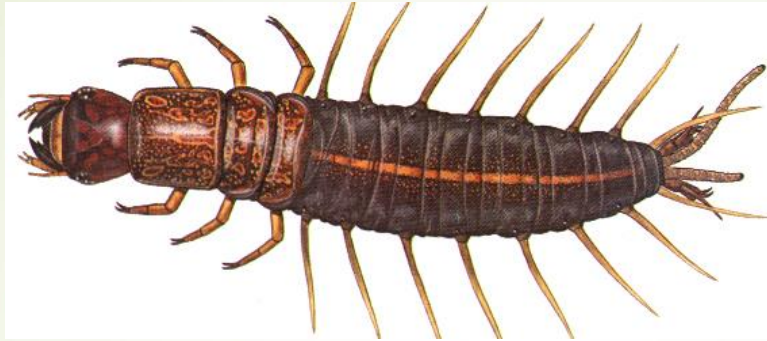
## Philopotamidae



© 2006 Chironomidae Research Group

# Order Megaloptera: Note the Differences!

## Group 1: Sensitive



### Hellgrammite

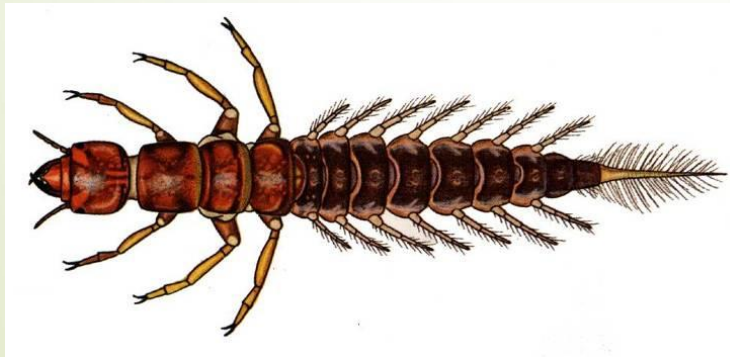
- Family Corydalidae
- No distinct, single tail
- Generally larger

Phylum: Arthropoda

Class: Insecta

Order: Megaloptera

## Group 2: Somewhat Sensitive



### Alderfly

- Family Sialidae
- Distinct, single tail
- Generally smaller



**Dobsonfly- Up to 4 inches**

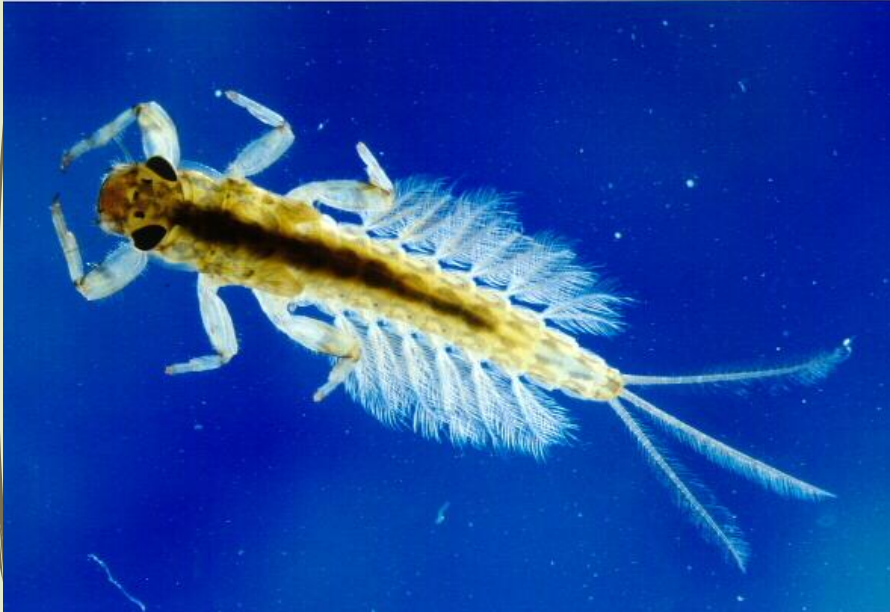


**Alderfly- < 1 inch**



**Relative Size Differences**  
(Dobsonfly varies greatly however)

# Mayflies



- 3 tails
- 6 legs
- Feathery or platelike gills on abdomen



- Phylum: Arthropoda
- Class: Insecta
- Order: Ephemeroptera



**...of course, there are always exceptions**



***Baetis tricaudatus* (two tails)**

***Baetiscidae* (armored mayfly)**



**No visible gills**

# Mayfly swarms!



# Gilled Snail

- **Phylum: Mollusca**
- **Class: Gastropoda**
- **Order: various**

- Have an operculum or plate-like door that protects the opening of the shell and can be quickly closed to avoid predators.
- Coiled shells that usually open on the right-hand side (coils spin clockwise)
- Don't collect empty shells— who knows how long that shell has been sitting there, or where it came from?





# Stonefly

- **Phylum: Arthropoda**
- **Class: Insecta**
- **Order: Plecoptera**
- Two tails
- Long antennae
- 3 pairs of legs
- Sometimes gills are on underside of thorax but never running up and down the top of the abdomen



**Nymph**



**Adult**

- Two tails
- Long antennae
- 3 pairs of legs
- Sometimes gills are on underside of thorax but never running up and down abdomen



Figure 1 - Abdominal and thoracic gills of *Pteronarcys* sp. larvae (Pteronarcyidae)



# Water Penny (beetle)

**Phylum: Arthropoda**

**Class: Insecta**

**Order: Coleoptera**

**Family: Psephenidae**



Figure 13.41. Eubriinae larva (ventral)

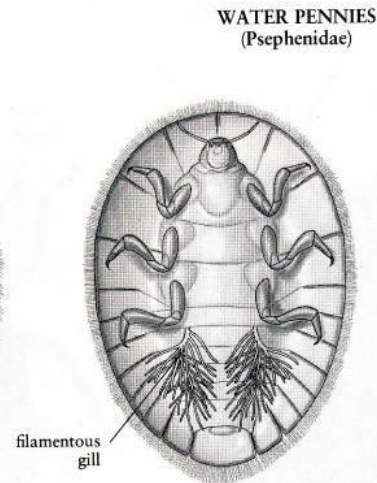


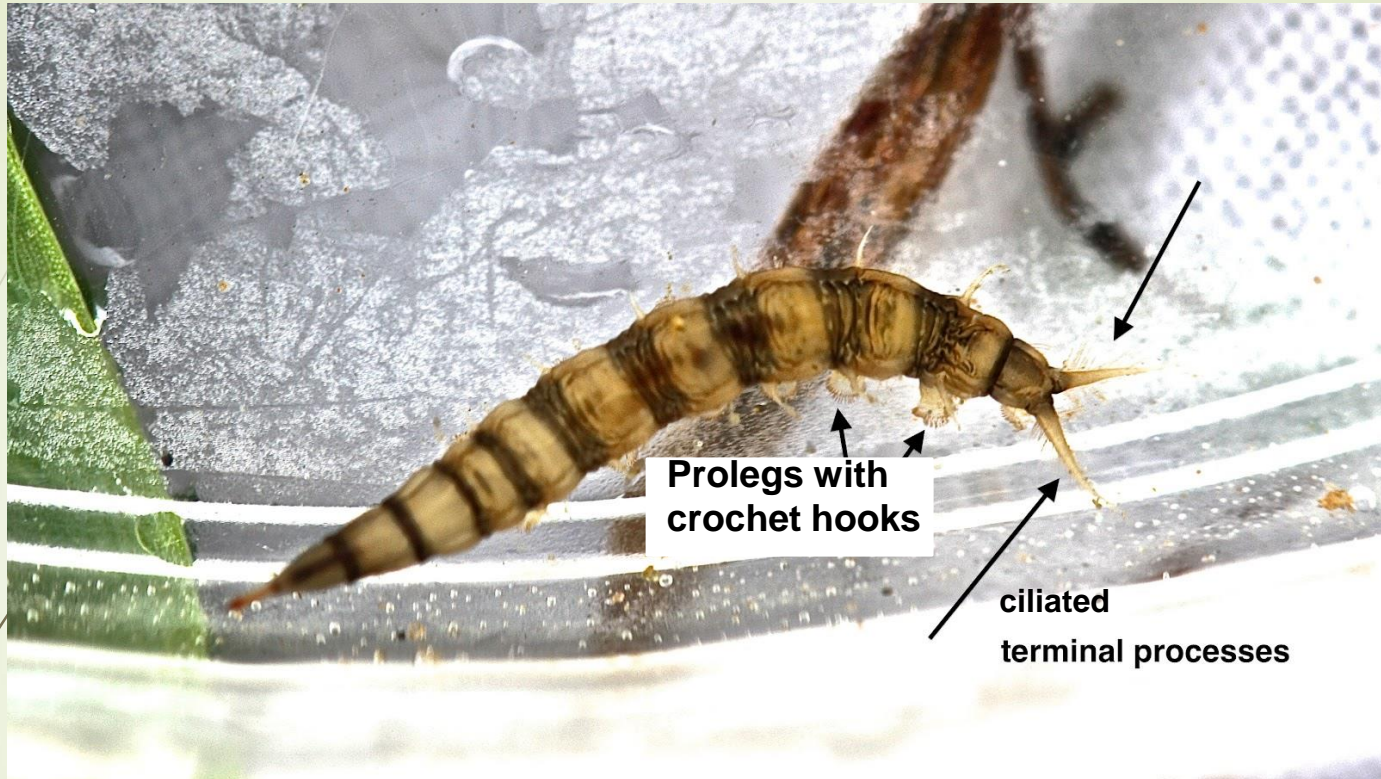
Figure 13.42. Psepheninae larva (ventral)



Figure 13.43. *Psephenus* adult



# Watersnipe Fly



- **Phylum: Arthropoda**
- **Class: Insecta**
- **Order: Diptera**
- **Family: Athericidae**

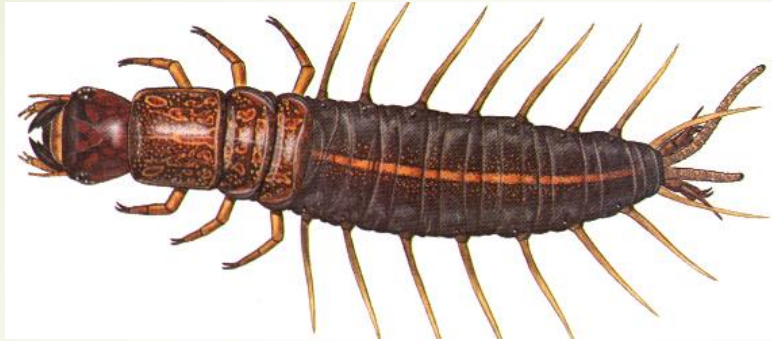


## Group 2: Somewhat-Sensitive



# Order Megaloptera: Note the Differences!

## Group 1: Sensitive

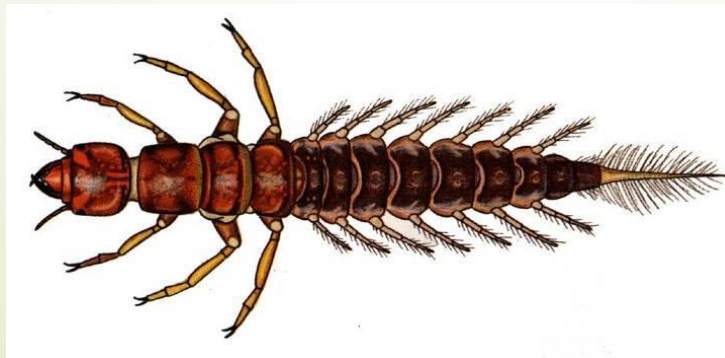


## Hellgrammite

- Family Corydalidae
- No distinct, single tail
- Generally larger

- Phylum: Arthropoda
- Class: Insecta
- Order: Megaloptera

## Group 2: Somewhat Sensitive



## Alderfly

- Family Sialidae
- Distinct, single tail
- Generally smaller

**Dobsonfly- Up to 4 inches**



**Alderfly- < 1 inch**



**Relative Size Differences**  
(Dobsonfly varies greatly however)



# Beetles

**Chewing or biting mouthparts**

**3 Pairs of legs**

**Generally well sclerotized**



**Phylum: Arthropoda**

**Class: Insecta**

**Order: Coleoptera**



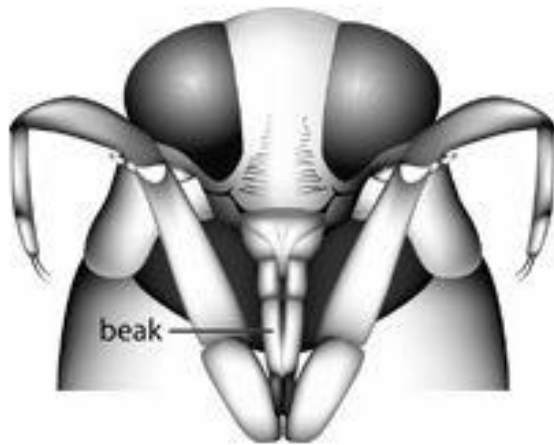
# Mouthparts- beetles

- Beetles- crunching and chewing... many complex parts

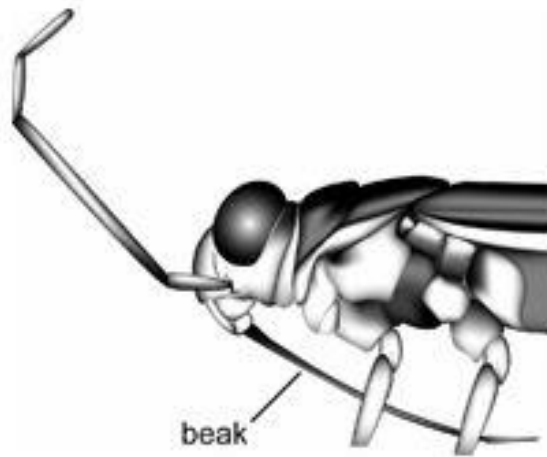


# Mouthparts– true bugs

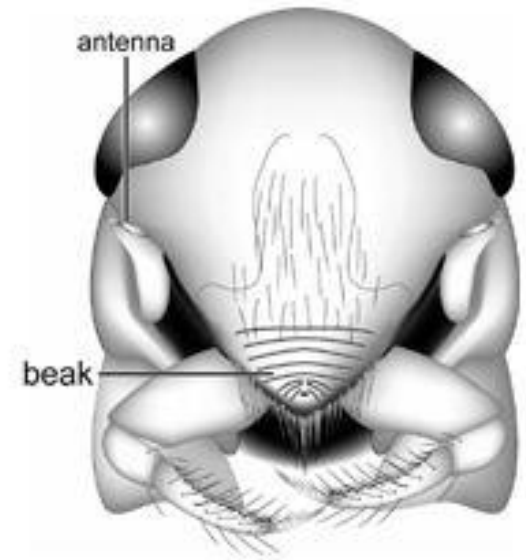
- True bugs- piercing and sucking... a simple tube or beak.



**Piercing-sucking beak**  
(Hemiptera: Notonectidae)



**Piercing-sucking beak**  
(Hemiptera: Saldidae)



**Piercing-sucking beak**  
(Hemiptera: Corixidae)

**Note that this  
one is a little  
different**



# Beetle larvae (order Coleoptera)

Often misidentified. They can be tricky



# Beetle Larvae vs. Caddis Larvae

How are they similar?



# Beetle Larvae vs. Caddis Larvae

How are they different?



**Scleritization**



# Beetle Larvae vs. Caddis Larvae

How are they different?



Gina Mikel  
www.scientificillustrator.com

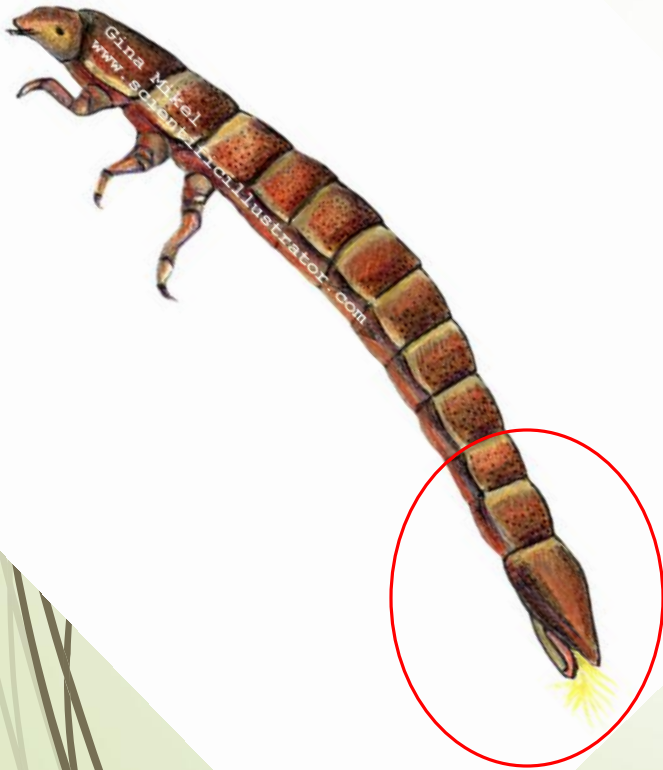


**Not always though.**



# Beetle Larvae vs. Caddis Larvae

How are they different? Pair of prolegs hooks



# Beetle Larvae vs. Caddis Larvae

How are they different? ANTENNA

Half-broken



# Beetle Larvae vs. Caddis Larvae

**Not official- this is not in keys**

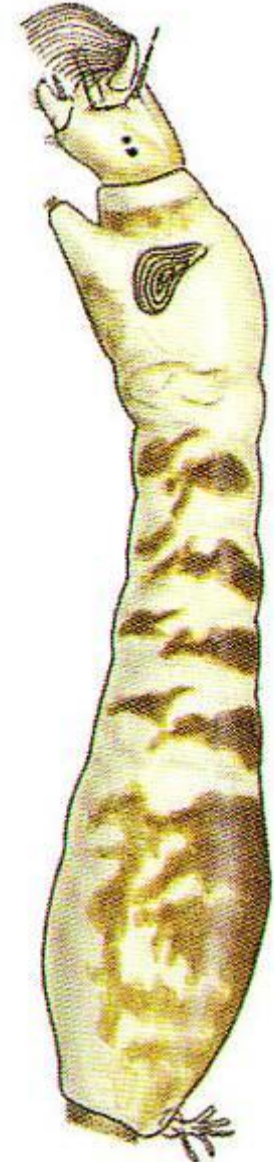
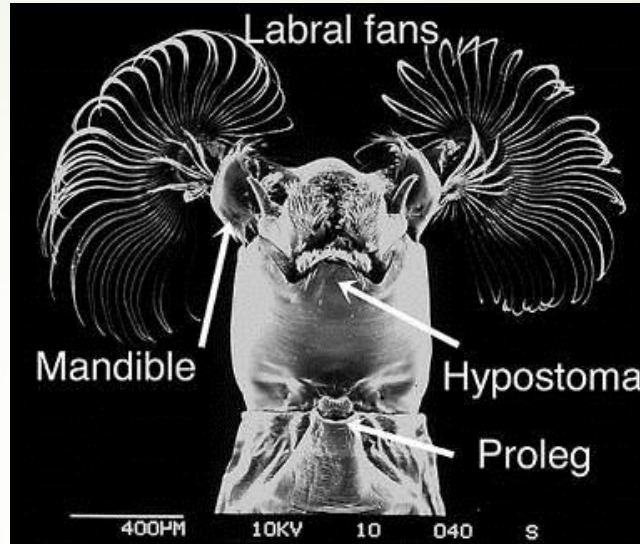
How are they different? EYES





# Black Fly

- Phylum: Arthropoda
- Class: Insecta
- Order: Diptera
- Family: Simuliidae





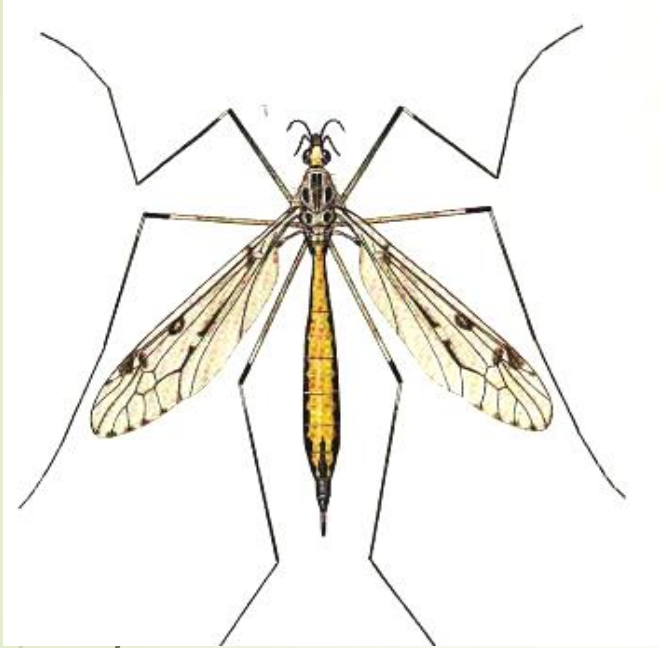
# Clams & other bivalves (phylum Mollusca, class Pelecypoda)

- **Phylum: Mollusca**
- **Class: Pelecypoda**
- **Order: various**



• **Please ask that your volunteers do not take these from the river**

# Crane Fly



**Huge Diversity in sizes**  
(one useful character:  
mandibles on horizontal  
plane)



**Phylum:**  
**Arthropoda**  
**Class: Insecta**  
**Order: Diptera**  
**Family: Tipulidae**



# Cranefly Diversity

*Hexatoma*



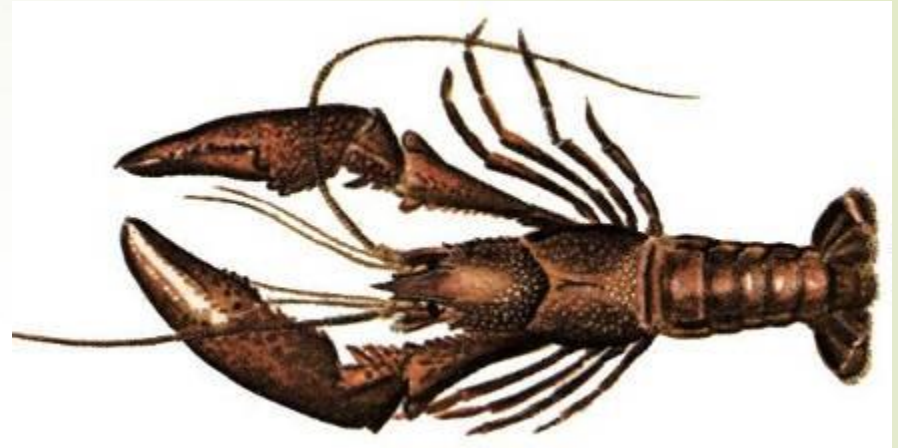
*Tipula*



*Antocha*



# Crayfish- Don't collect these either (limited jar room)

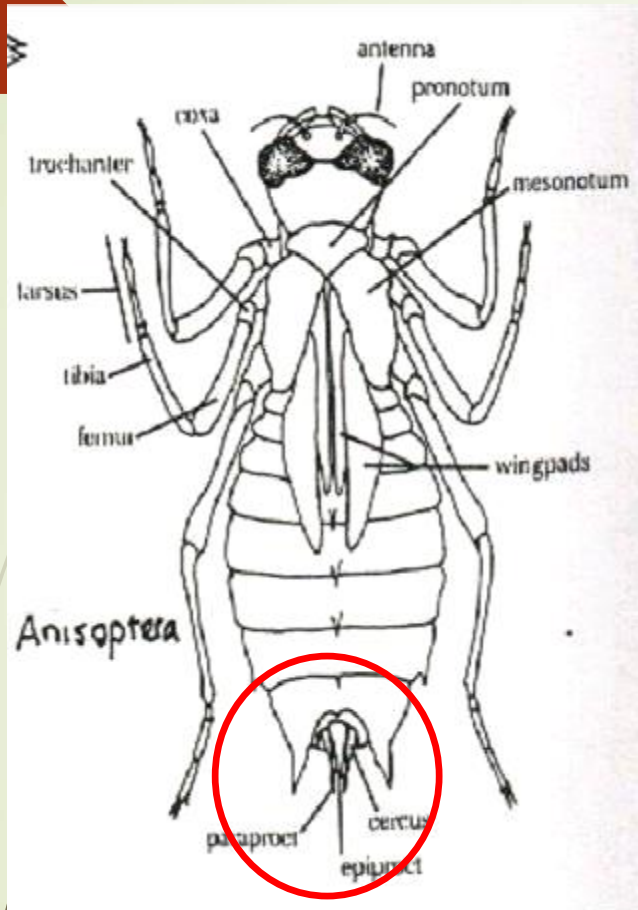


- **Phylum: Arthropoda**
- **Class: Insecta**
- **Order: Decapoda**

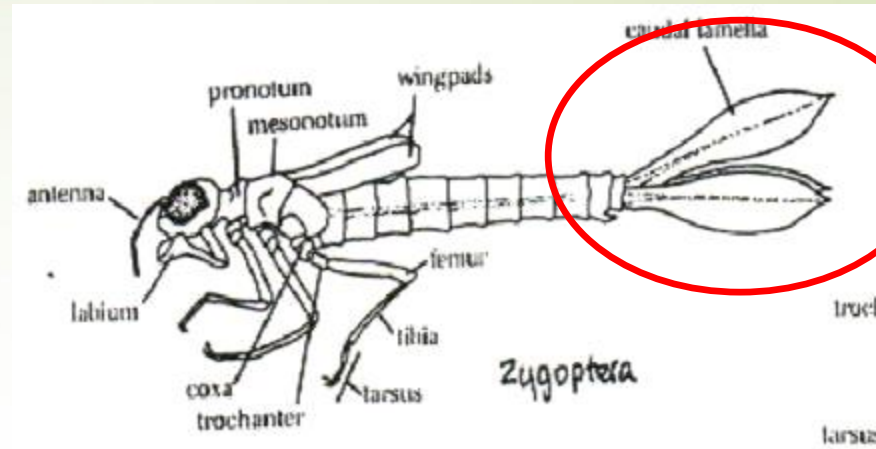




# Dragonflies & Damselflies



**Stout body**  
**No tails**  
**Extendable lower lip**



**Slender body**  
**Three tails**  
**Don't confuse with mayfly**  
**Extendable lower lip**

**Phylum: Arthropoda**  
**Class: Insecta**  
**Order: Odonata**  
**Suborder: Anisoptera & Zygoptera**

# Dragonflies

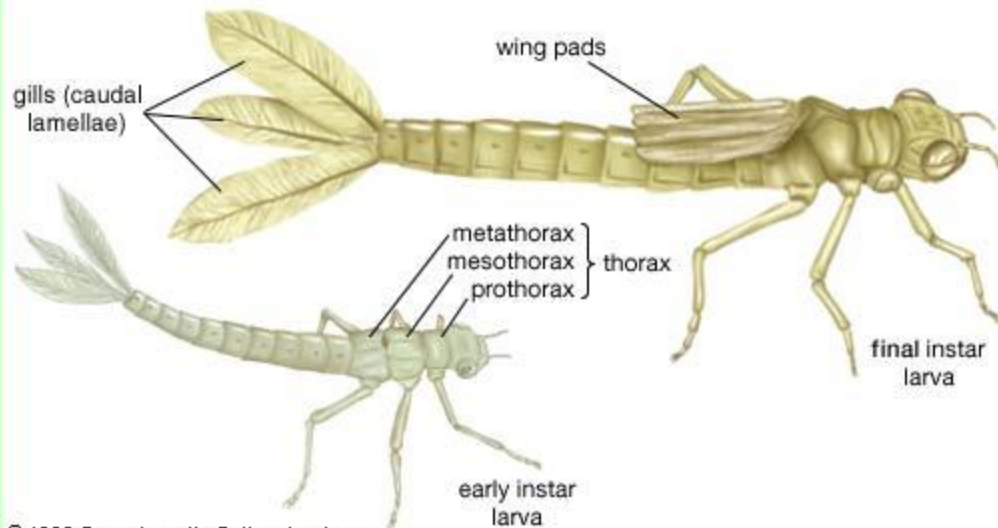


# Damselflies

(missing leg piece)



Damselfly larvae





# Adults



**Dragonfly**

Wings held out from body



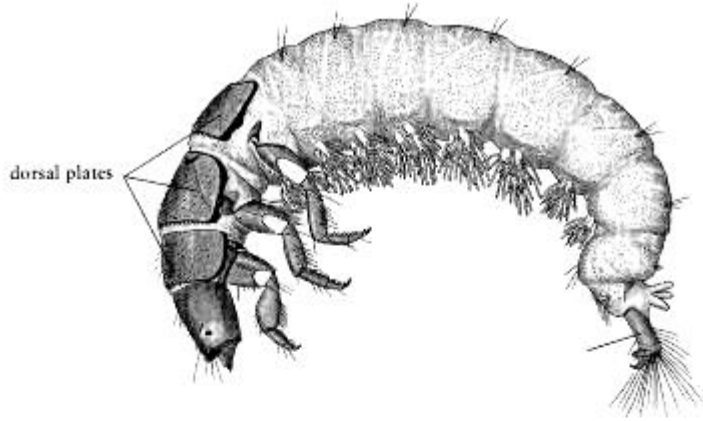
**Damselfly**

Wings held over body pressed together

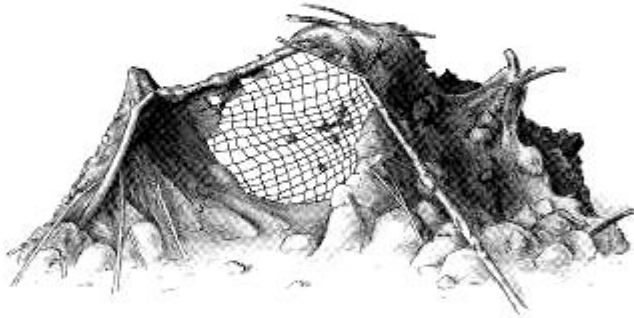


# Common Net-spinning Caddisfly

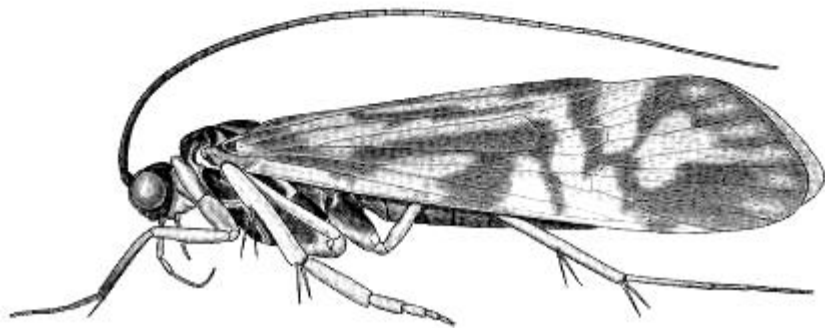
*NOT a sensitive species*



•10 mm



- Phylum: Arthropoda
- Class: Insecta
- Order: Trichoptera
- Family: Hydropsychidae



# Easy to mix up these:

Hydropsychidae



**Hydropsychidae has 3 thoracic plates and brushy gills**

**The others have 1 or 0 plates, no brushy gills.**



**Philopotamidae**



# Scuds, Sideswimmers



- **Phylum: Arthropoda**
- **Class: Crustacea**
- **Order: Amphipoda**

- **2 pairs antennae**
- **7 pairs of legs**
- **Flattened (laterally)**




# Sowbugs



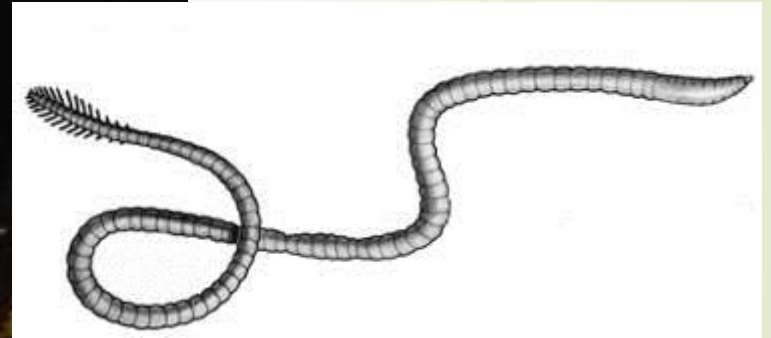
- **Phylum: Arthropoda**
- **Class: Crustacea**
- **Order: Isopoda**
- **2 pairs antennae**
- **7 pairs of legs**
- **Flattened (dorsally-ventrally)**
- **Leg-like gills on posterior end**





# Group 3: Tolerant

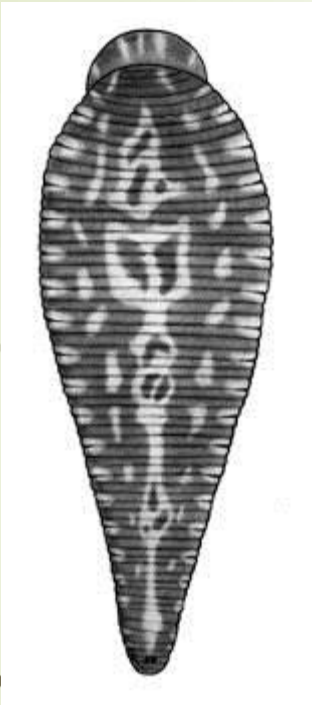
# Aquatic Worms (class Oligochaeta)



• **Note the segments!**

- **Phylum: Annelida**
- **Class: Oligochaeta**
- **Order: various**

# Leeches

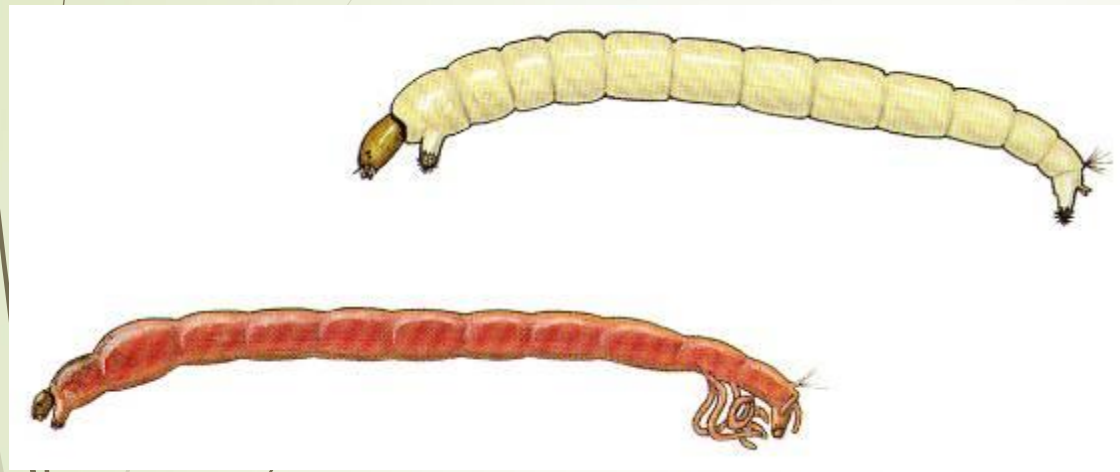


- Many, many striations (surficial only)
- 2 suckers- front and back

- Phylum: Annelida
- Class: Hirundae
- Order: various



# Midges



- **Phylum: Arthropoda**
- **Class: Insecta**
- **Order: Diptera**
- **Family: Chironomidae**



# Miscellaneous Snails

- Does not have a plate-like covering over the shell opening.
- Has shell that spirals with opening usually on your left side (counter-clockwise), or shell that is coiled in one plane, or shell that is dome or hat shaped with no coils.

- **Phylum: Mollusca**
- **Class: Gastropoda**
- **Order: various**



**Left-handed snail**



**Planorbidae**



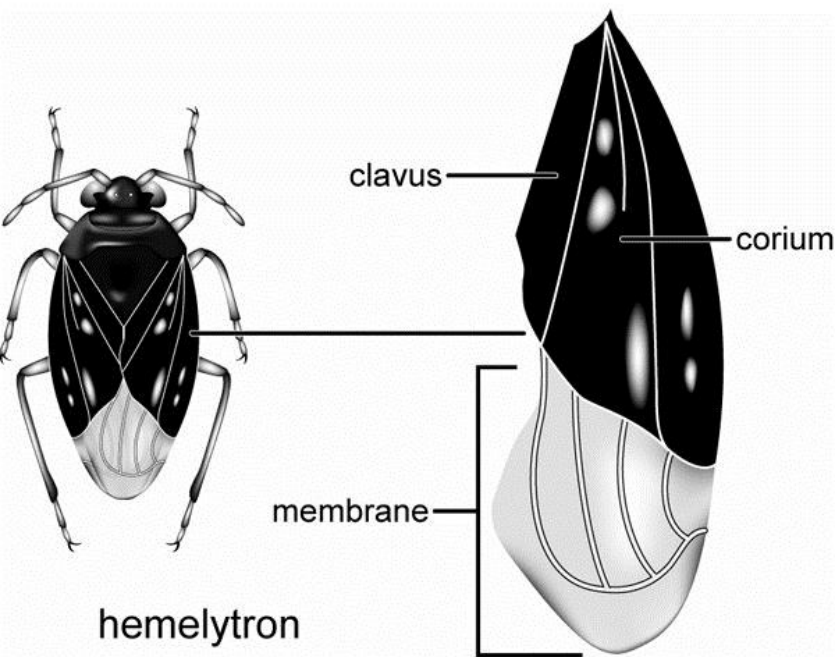
**Limpets**

# True Bugs

**Wings hardened near the base and membranous everywhere else**



**Tube-like sucking mouthparts (except in water boatman)**



**Phylum:**  
**Arthropoda**  
**Class: Insecta**  
**Order: Hemiptera**



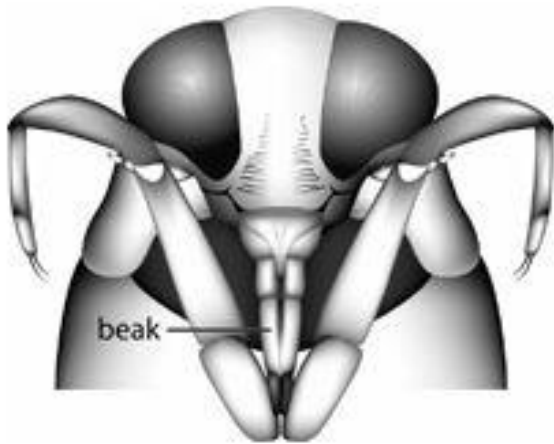
# Mouthparts- beetles

- Beetles- crunching and chewing... many complex parts

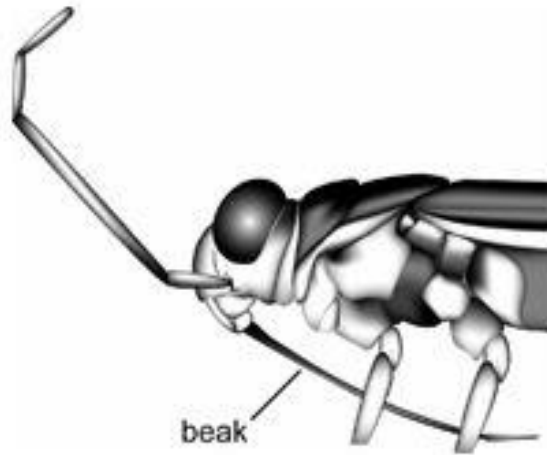


# Mouthparts– true bugs

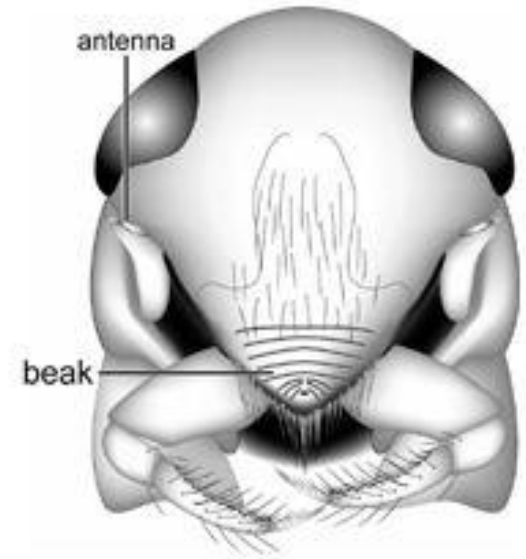
True bugs- piercing and sucking... a simple tube or beak.



**Piercing-sucking beak**  
(Hemiptera: Notonectidae)



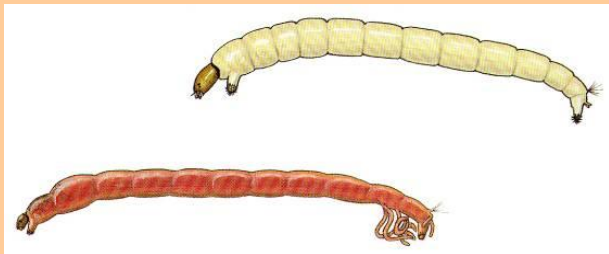
**Piercing-sucking beak**  
(Hemiptera: Saldidae)



**Piercing-sucking beak**  
(Hemiptera: Corixidae)

**Note that this  
one is a little  
different**

# Other True Flies... a catch all category



**Already seen...**



- **Phylum: Arthropoda**
- **Class: Insecta**
- **Order: Diptera**



# Paul's neighbors

