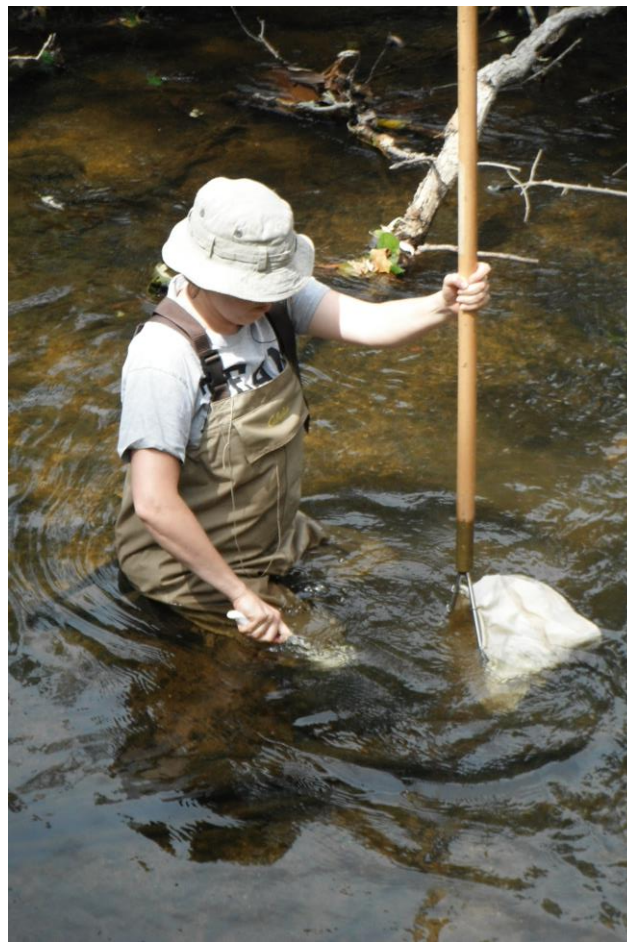




Michigan Clean Water Corps Volunteer Stream Monitoring Program

Macroinvertebrate Identification June 17, 2021



MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Tamara Lipsey
Aquatic Biologist
Water Resources Division
517-342-4372
lipseyt@michigan.gov

MiCorps Program Organization



Find more information at
MiCorps.net



**Volunteer
Stream Cleanup
Program**

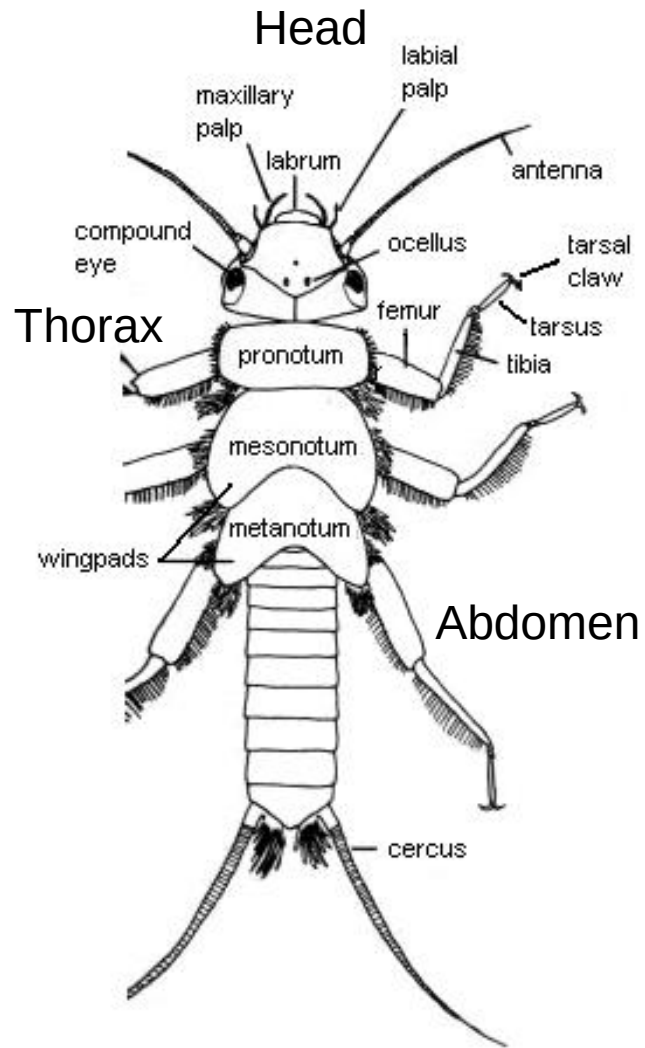
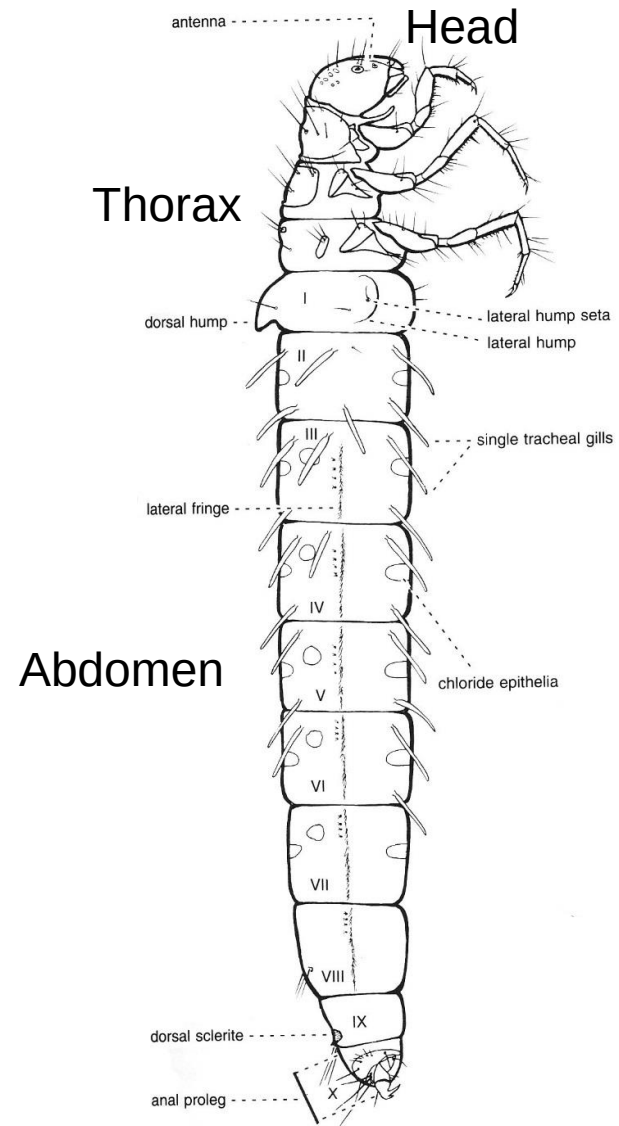
Aquatic Macroinvertebrate Animal Classification System



Macroinvertebrates.org

	Tamara	Mosquito
Kingdom	Animalia	Animalia
Phylum	Vertebrata	Arthropoda
Class	Mammalia	Insecta
Order	Primates	Diptera
Family	Hominidae	Culicidae
Genus	Homo	??
Species	sapiens	??

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



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

Aquatic Macroinvertebrate Identification Resources

- THIS PRESENTATION!!!!
- Aquabugs App
- Creek Critters App
 - <https://anshome.org/creek-critters/>
- Carnegie Museum of Natural History
 - <http://macroinvertebrates.org/>
- Stroud Water Research Center on-line identification key
 - <http://Stroudcenter.org/macros/key>
- <http://troutnut.com> photo library
- Bouchard, R.W. and L.C. Ferrington Jr. Guide to Aquatic Invertebrates of the Upper Midwest
 - <https://midge.cfans.umn.edu/midwest-guide>
- Voshell, J.R. Jr. 2002. A guide to common freshwater invertebrates of North America. McDonald & Woodward, Blacksburg, VA. 442 pp.



Coleoptera
"Beetles"



Diptera
"True Flies"

The Atlas of Common Freshwater Macroinvertebrates of Eastern North America



Ephemeroptera
"Mayflies"



Hemiptera
"True Bugs"



Lepidoptera
"Butterflies
& Moths"



Plecoptera
"Stoneflies"



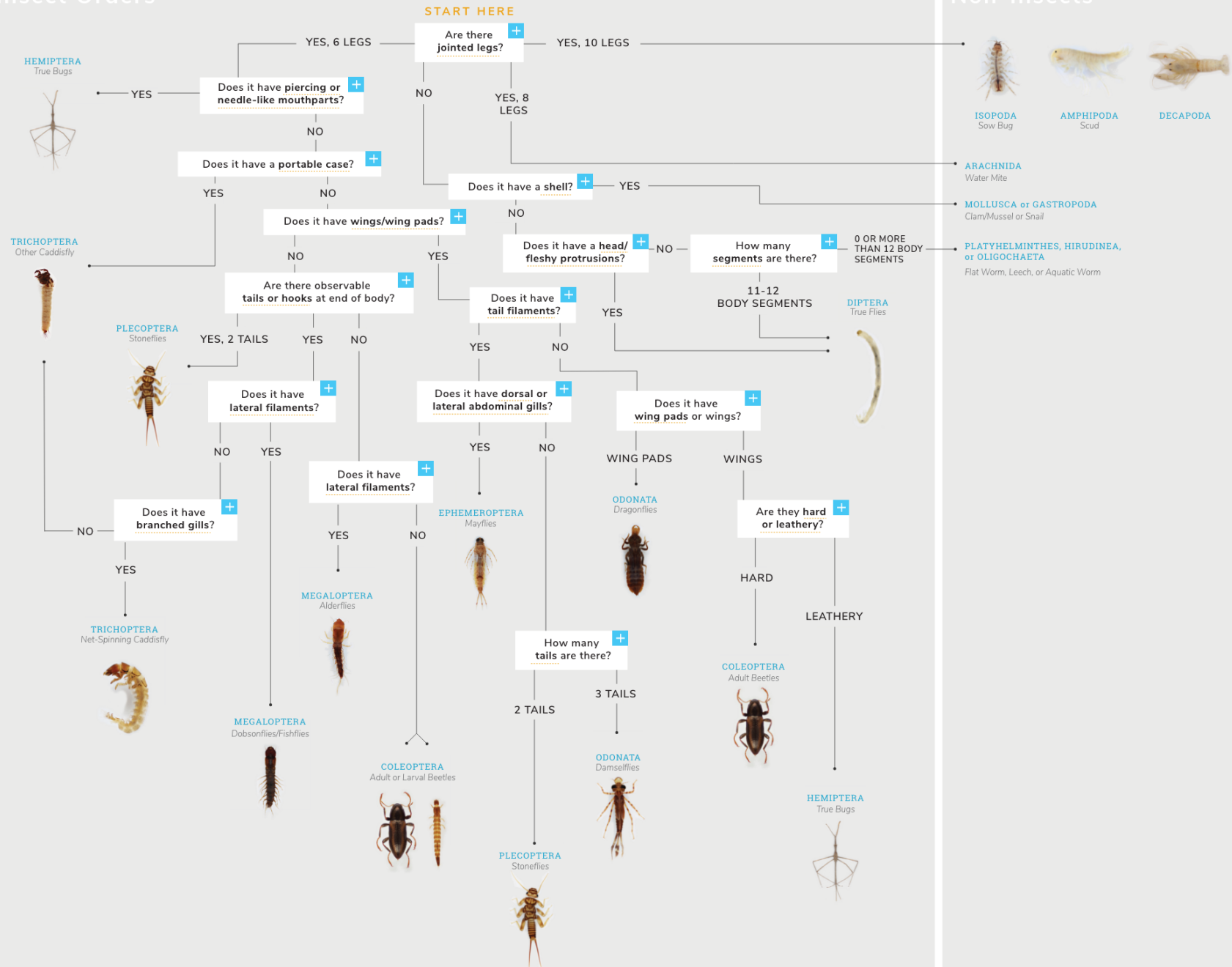
Megaloptera
"Alderflies,
Dobsonflies,
& Fishflies"



Odonata
"Dragonflies & Damselflies"



Trichoptera
"Caddisflies"



Learning your “BUGs”

- Find your favorite reference materials
- Collect some for fun!!
- PRACTICE, PRACTICE, PRACTICE
- Consider taking a college course
- Find a local expert
- Get a local expert to volunteer!



Goals

1. Today- introduction to required MiCorps group identifications.

2. End of Year- identifying these groups to order level.

3. Future- consider learning them to family level!

MiCorps VSMP simplified Taxa List

- listed by sensitivity
0 = least tolerant
10 = most tolerant

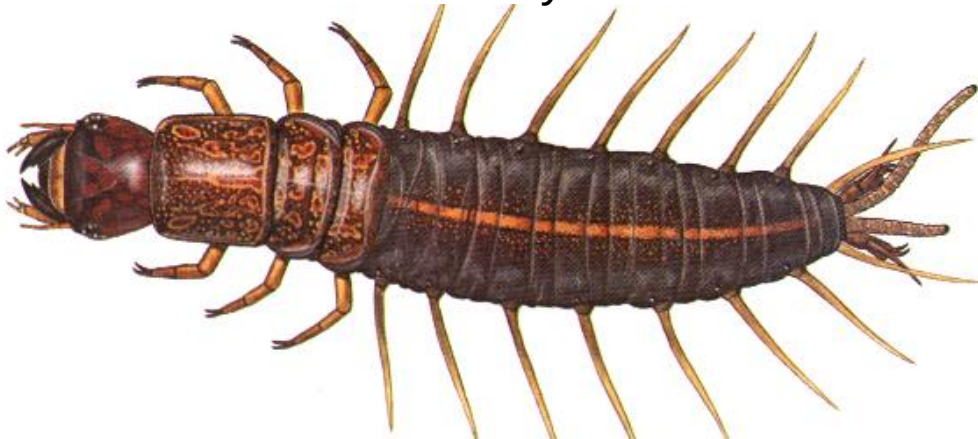
Common Name	Scientific Taxa	Sensitivity Rating (0-10)
Hellgrammite (Dobsonfly)	Megaloptera, Corydalidae	0.0
Clubtail Dragonfly	Odonata, Gomphidae	1.0
Sensitive True Flies (water snipe fly, net-winged midge, dixid midge)	Athericidae, Blephariceridae, Dixidae	1.0
Stonefly	Plecoptera	1.3
Caddisfly	Trichoptera	3.2
Mayfly	Ephemeroptera	3.5
Alderfly	Megaloptera, Sialidae	4.0
Scud	Amphipoda	4.0
Dragonfly	Odonata	4.0
Beetle	Coleoptera	5.1
Somewhat Sensitive True Flies	Dipterans (those not listed elsewhere)	6.0
Crayfish	Decapoda	6.0
Bivalves/Snails	Pelecypoda, Gastropoda	6.9
True Bug	Hemiptera	7.7
Damselfly	Odonata	7.7
Sowbug	Isopoda	8.0
Tolerant True Fly (mosquito, rat-tailed maggot, soldier fly)	Culicidae, Syrphidae, Stratiomyidae	8.7
Leech	Hirudinae	10.0
Aquatic Worm	Oligochaeta	10.0

Phylum: Arthropoda
Class: Insecta

Order-Megaloptera: Two families

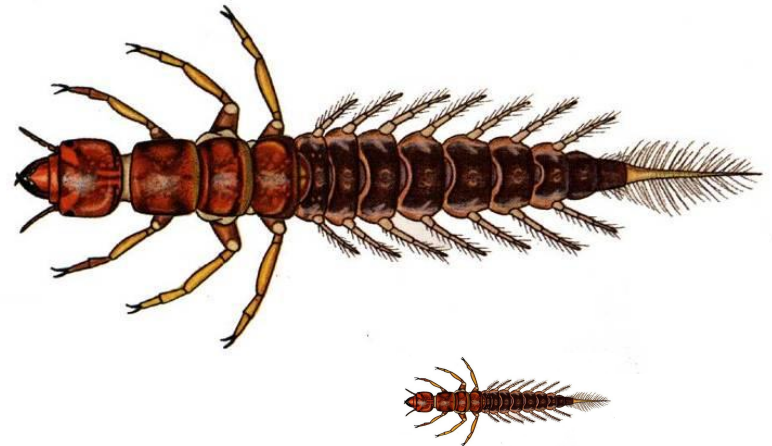
Hellgrammite-Dobsonfly/Fishfly

- **Family-Corydalidae**
- lateral projections and 3 pairs legs
- No distinct, single tail have prolegs instead
- Generally larger
- Often found on wood
- Pollution Sensitivity = 0



Alderfly

- **Family-Sialidae**
- lateral projections and 3 pairs legs
- Distinct single tail
- Generally smaller
- Often found in silt
- Pollution Sensitivity = 4



Hellgrammite/Dobsonfly & Fishfly



<https://entnemdept.ufl.edu/>

Photo Credit E. Stieber



Photo Credit E. Stieber



Macroinvertebrates.org

Alderfly

Phylum: Arthropoda
Class: Insecta

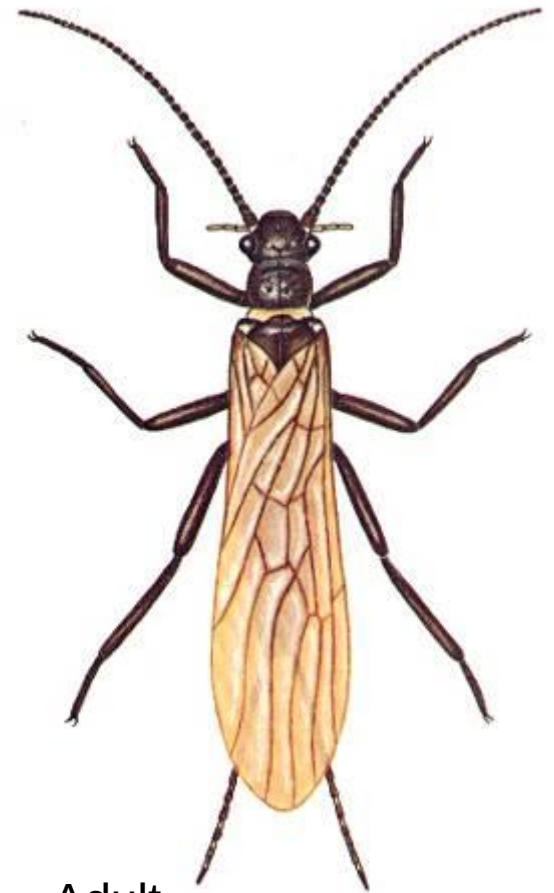
Order-Plecoptera: Stoneflies

Pollution Sensitivity = 1.3

- Two tails
- 3 pairs of legs
- Two tarsal claws
- Long antennae
- Sometimes gills are on underside of thorax but never running up and down the top of the abdomen
- Often found in gravel or on cobble and wood.



Nymph



Adult



Chloroperlidae
Green Stonefly



Nemouridae
Forestfly, Spring
Stonefly



Perlodidae
Stripetails, Springflies,
Yellowstones



Taeniopterygidae
Winter Stonefly



Pteronarcyidae
Giant Stonefly



Perlidae

English Fly Fishing Shop





www.macroinvertebrates.org Nemouridae



Some Stoneflies have
Thoracic Gills



Phylum: Arthropoda
Class: Insecta

Order-Trichoptera: Caddisflies
Pollution Sensitivity =3.2



Typical adult

- 3 pairs of legs
- Wormlike
- Often with plates on thorax
- Prolegs on end of abdomen with claw
- Often in a case (sand, leaves, twigs)
- Some types are free-living
- Found in many habitats

Size ranges:

 3 mm



Caddisfly Cases



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



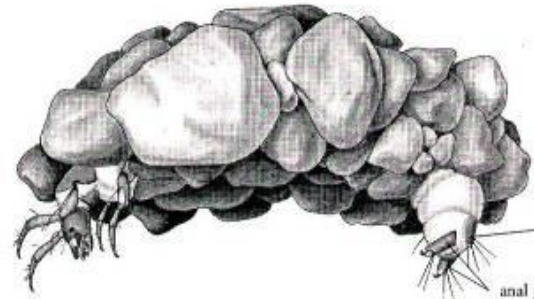
Figure 14.63. *Neophylax* larval case



Figure 14.64. *Farula* larval case



Figure 14.65. *Manophylax* larval case





Odontoceridae



Heliocopsychidae



Phryganeidae

Caddisfly with Cases



Limnephilidae



Leptoceridae



Brachycentridae

Caddisfly and their “glue”





Philopotamidae

E. Stieber



Polycentropodidae

E. Stieber



Hydropsychidae

Macroinvertebrates.org

Free living caddis (no case)



Widlifetrusts.org Ephemera



Mayflies!

Phylum: Arthropoda
Class: Insecta

Order-Ephemeroptera: Mayflies
Pollution Sensitivity = 3.5

- Three tails*
- Long antennae*
- 3 pairs of legs
- Feathery or plate like gills on abdomen
- Found in many habitat types



Nymph



Adult



Baetidae sp. (two tails)



Baetiscidae (armored mayfly)
No visible gills

*...of course, there
are always
exceptions



Isonychiidae
Brush-legged Mayfly



Potomanthidae
Hackle gills



Caenidae
Small Square-gilled Mayflies



Ephemeridae
Hexagenia
Common Burrowing
Mayflies



Heptageniidae
Flat-headed Mayfly



Baetidae
Small Minnow Mayflies

Gills on Abdomen not Thorax

Adult
Damselfly
and
Adult
Dragonfly



Calopterygid-
Photo Unknown



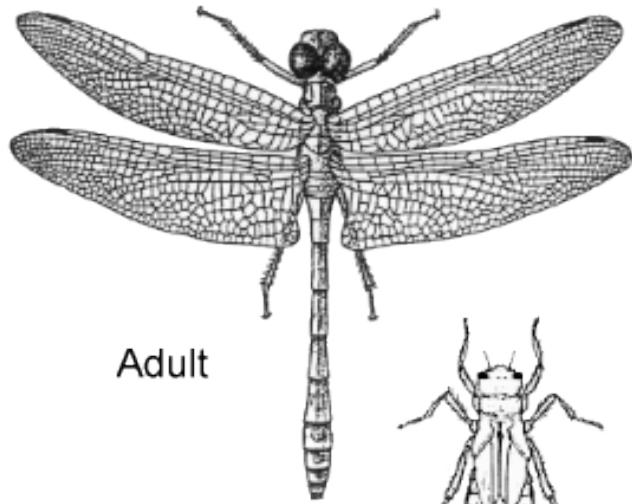
Corduliid Photo by-E. Stieber

Phylum: Arthropoda
Class: Insecta

Order-Odonata

Sub-order Anisoptera

Dragonfly



Adult

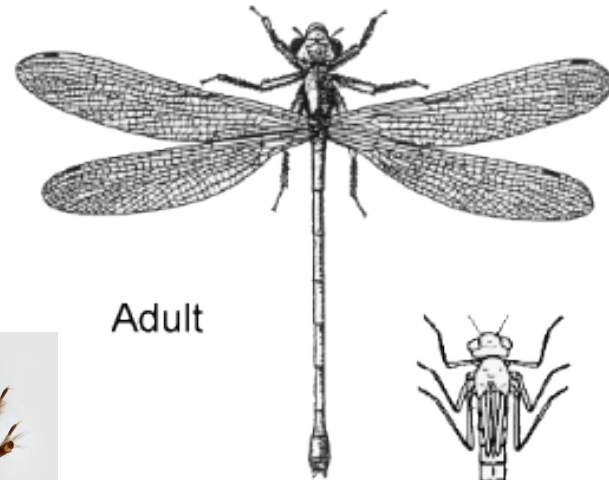


Naiad

projects.ncsu.edu

Sub-order Zygoptera

Damselfly



Adult



Naiad



Phylum: Arthropoda

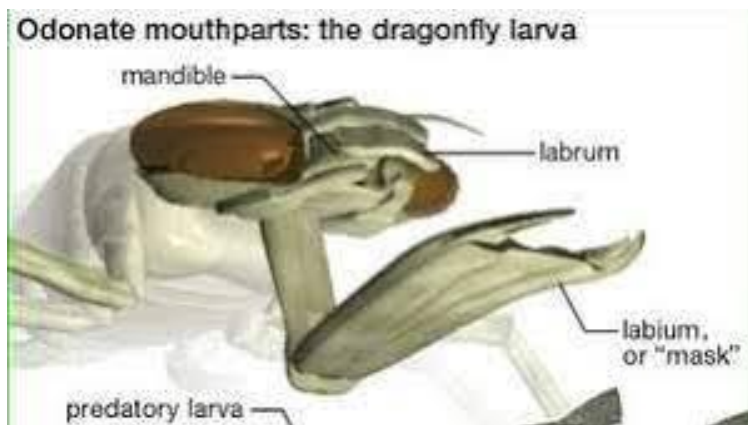
Class: Insecta

Order-Odonata

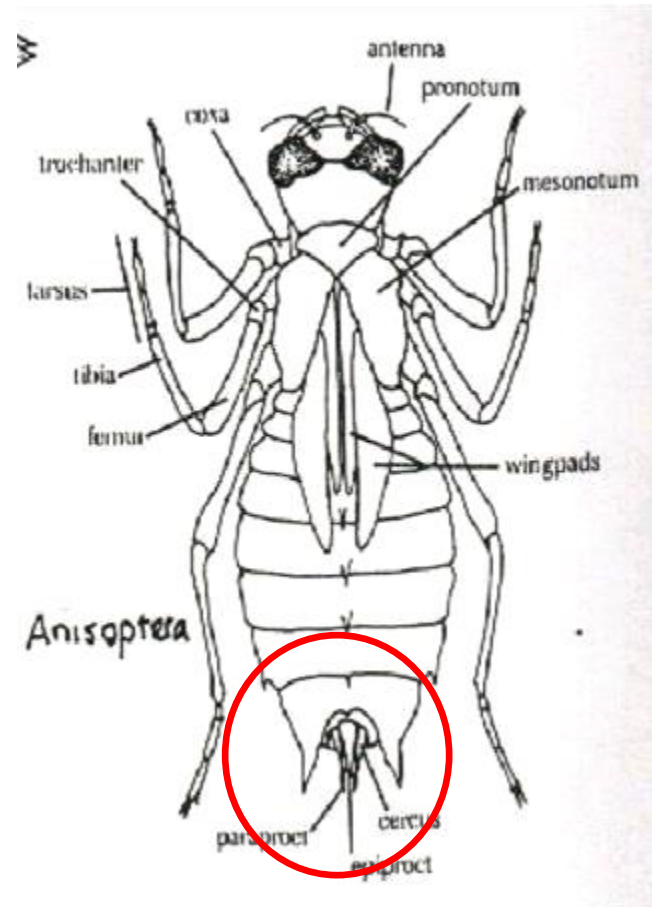
Sub Order-Anisoptera (Dragonflies)

Pollution Sensitivity= 4.0 (except one family)

- Stout body
- Labium “mask” to catch prey
- Two Pairs of Wing Pads
- Large eyes, 3 pairs of legs
- End of Abdomen with 5 Stiff Points



Britannica.com



Video of Dragonfly Eating



Dragonflies



Phylum: Arthropoda

Class: Insecta

Order-Odonata

Suborder-Anisoptera

Family-Gomphidae (Clubtail Dragonfly)

Pollution Sensitivity= 1.0

- 4-Segmented Antennae
- Flat labial mask





Photo Credit E. Stieber



Photo Credit E. Stieber



Photo Credit E. Stieber

Clubtail Dragonfly

Phylum: Arthropoda
Class: Insecta

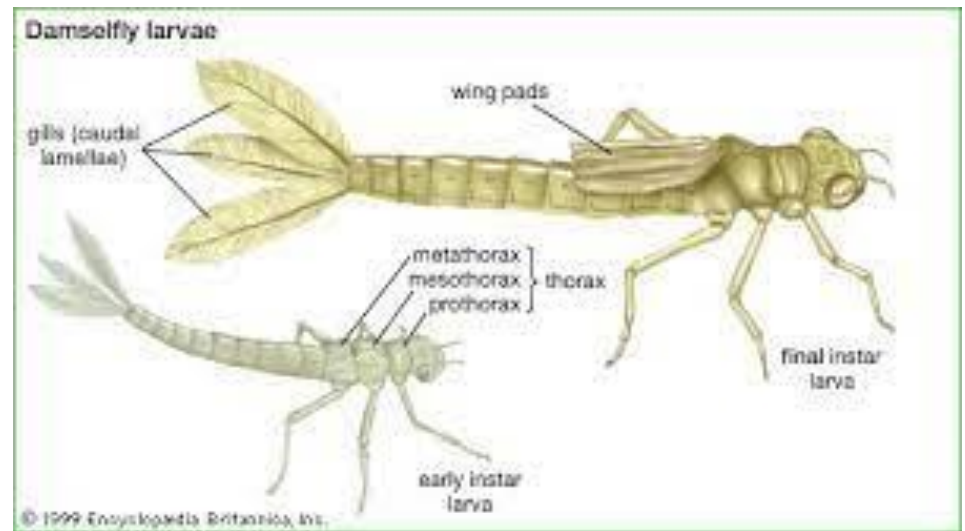
Order-Odonata

Suborder: Zygoptera

Pollution Sensitivity = 7.7

- Slender body
- 2 pairs wingpads and 3 pairs of legs
- Labial mask
- Three tails (gills)

Damselfly





Macroinvertebrates.org

Narrow Winged Damselfly
Coenagrionidae



Nhpbs.org



Macroinvertebrates.org

Broad Winged Damselfly
Calopterygidae



Nhpbs.org



Macroinvertebrates.org

Spread Winged Damselfly
Lestidae



Bugguide.net

Three Tail Confusion...

Damselfly



Does not have gills along abdomen...Damselfly

Mayfly



Has gills along abdomen...Mayfly

Phylum: Arthropoda
Class: Insecta

Order-Coleoptera: Beetles
Pollution Sensitivity = 5.1

- Generally harder bodies (Elytra)
- Oval shaped
- Chewing mouthparts
- Well developed eyes
- 3 pairs of legs
- Found in many habitats, but many like slower flowing water and vegetation
- Both adults and larvae live in water, look very different.



Adult

Beetle Mouthparts

- crunching and
chewing...
many complex
parts





“Water Scavenger Beetle”



“Whirligig Beetle”



“Riffle Beetle”



“Crawling Water Beetle”



“Predacious Diving Beetle”

Beetle Adults

www.macroinvertebrates.org



Hydrophilidae
Water Scavenger Beetle



Elmidae
Riffle Beetle



Haliplidae
Crawling Water Beetle



Gyrinidae
Whirligig Beetle



Dytiscidae
Predacious Diving Beetle

Beetle Larvae

- Eye spots and antennae usually visible
- Mandibles often visible
- 3 pairs segmented legs (4-5 segments each)
- Sometimes lateral appendages
- Sometimes hooks (4) or appendages at anus

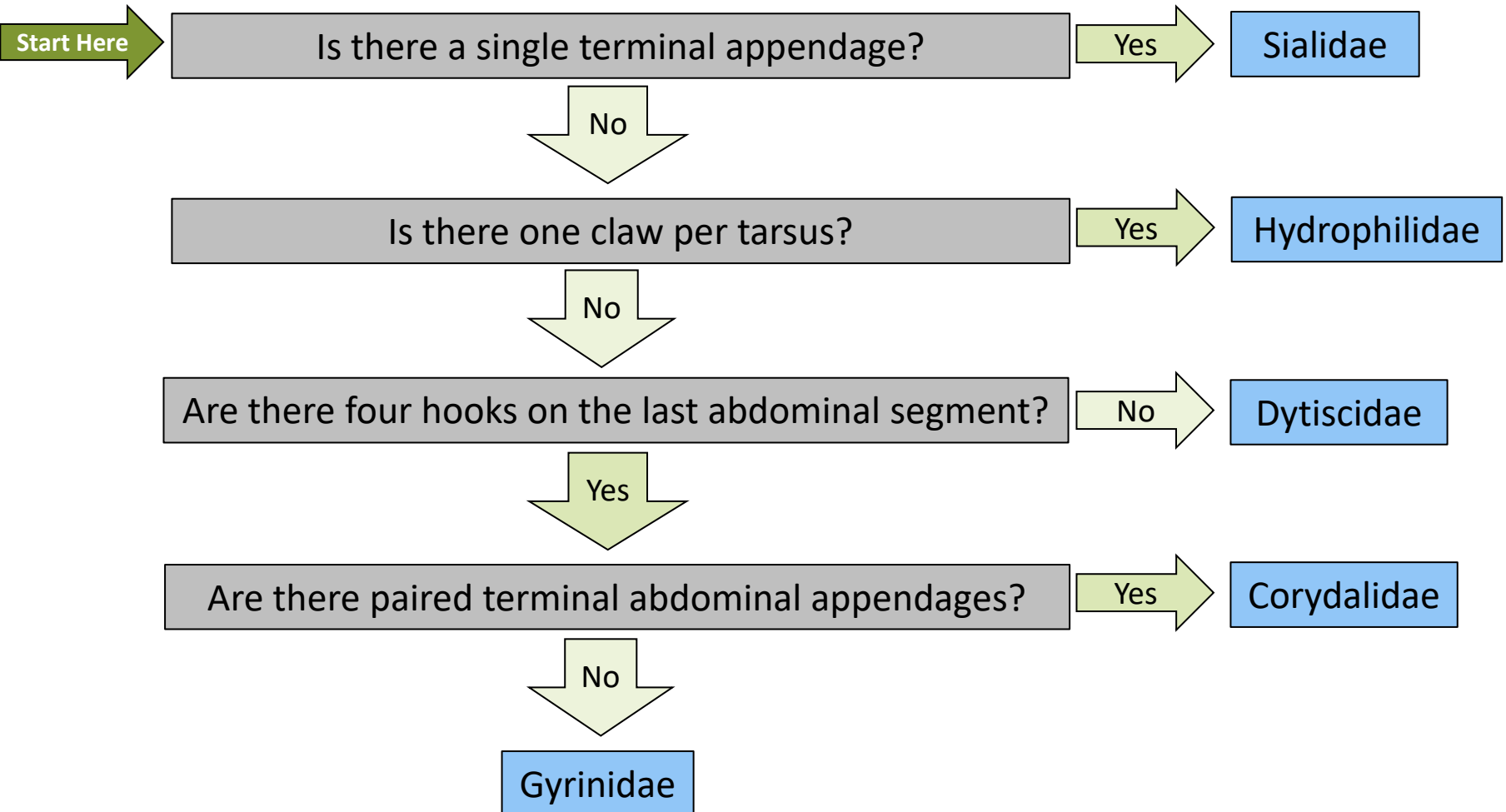
Confusion Expected!!!

Beetles, Alderflies, and Dobson or Fish Flies

1. Beetle (Hydrophilidae)
2. Beetle (Dytiscidae)
3. Alderfly (Sialidae)
4. Dobson Fly (Corydalidae)
5. Beetle (Gyrinidae)



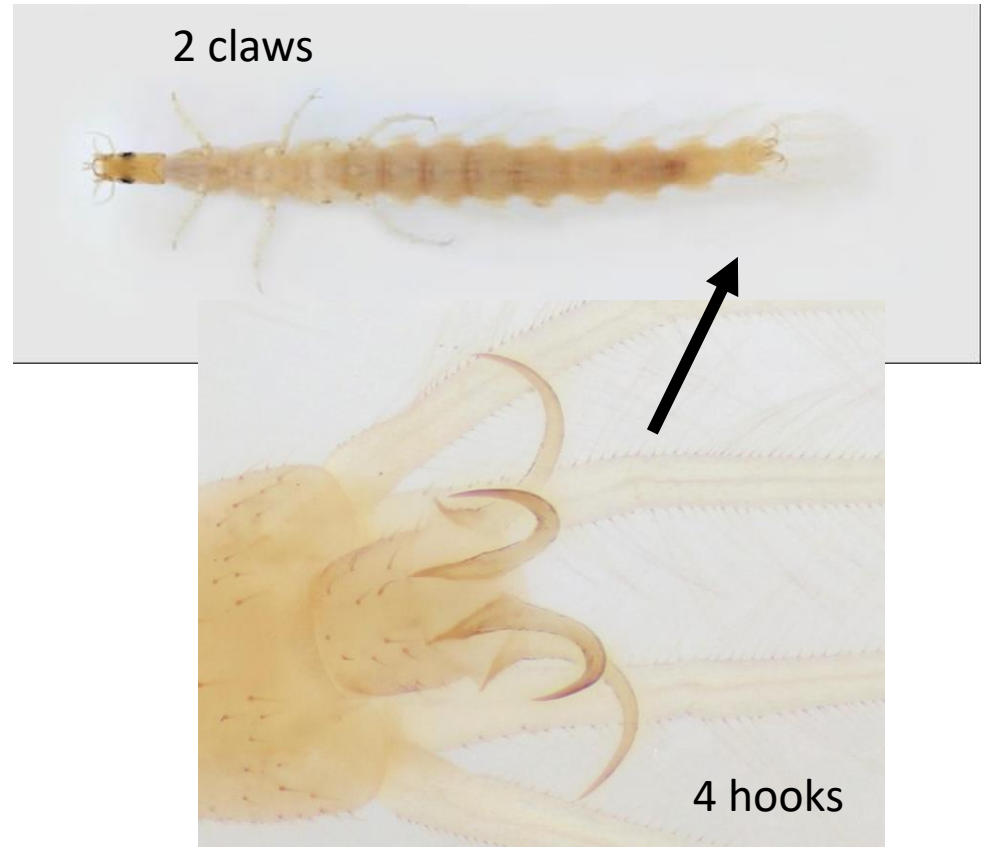
Megaloptera or Coleoptera Larvae?



Caddisfly Larvae



Coleoptera Larvae



The Unique Water Penny Beetle

Phylum: Arthropoda
Class: Insecta

Order-Coleoptera

Family-Psephenidae

- Found attached to rocks
- Adults not found in water

WATER PENNIES
(Psephenidae)



Figure 13.41. Eubriinae larva (ventral)

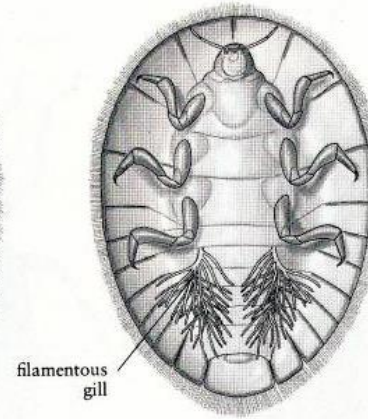


Figure 13.42. Psepheninae larva (ventral)



Figure 13.43. *Psephenus* adult



Phylum: Arthropoda

Class: Insecta

Order-Diptera “True Fly”

Larvae General Characteristics

- So many kinds!!!
- Very small
- Soft bodied/worm like
- No legs
- No visible wing pads
- Many have poorly developed head
- Some have fleshy or filamentous things that may look like a tail

Macroinvertebrates.org

ORDER -
Diptera
“True Flies”



MiCorps VSMP simplified Taxa List

- listed by sensitivity
0 = least tolerant
10 = most tolerant

Common Name	Scientific Taxa	Sensitivity Rating (0-10)
Hellgrammite (Dobsonfly)	Megaloptera, Corydalidae	0.0
Clubtail Dragonfly	Odonata, Gomphidae	1.0
Sensitive True Flies (water snipe fly, net-winged midge, dixid midge)	Athericidae, Blephariceridae, Dixidae	1.0
Stonefly	Plecoptera	1.3
Caddisfly	Trichoptera	3.2
Mayfly	Ephemeroptera	3.5
Alderfly	Megaloptera, Sialidae	4.0
Scud	Amphipoda	4.0
Dragonfly	Odonata	4.0
Beetle	Coleoptera	5.1
Somewhat Sensitive True Flies	Dipterans (those not listed elsewhere)	6.0
Crayfish	Decapoda	6.0
Bivalves/Snails	Pelecypoda, Gastropoda	6.9
True Bug	Hemiptera	7.7
Damselfly	Odonata	7.7
Sowbug	Isopoda	8.0
Tolerant True Fly (mosquito, rat-tailed maggot, soldier fly)	Culicidae, Syrphidae, Stratiomyidae	8.7
Leech	Hirudinae	10.0
Aquatic Worm	Oligochaeta	10.0

Phylum: Arthropoda
Class: Insecta

Order-Diptera: Three Families of True Flies

Pollution Sensitivity = 1

WATER SNIPE FLY
(ATHERICIDAE)



NET-WINGED MIDGE
(BLEPHARICERIDAE)



DIXID MIDGE
(DIXIDAE)



Water Snipe Fly



Bugguide.net

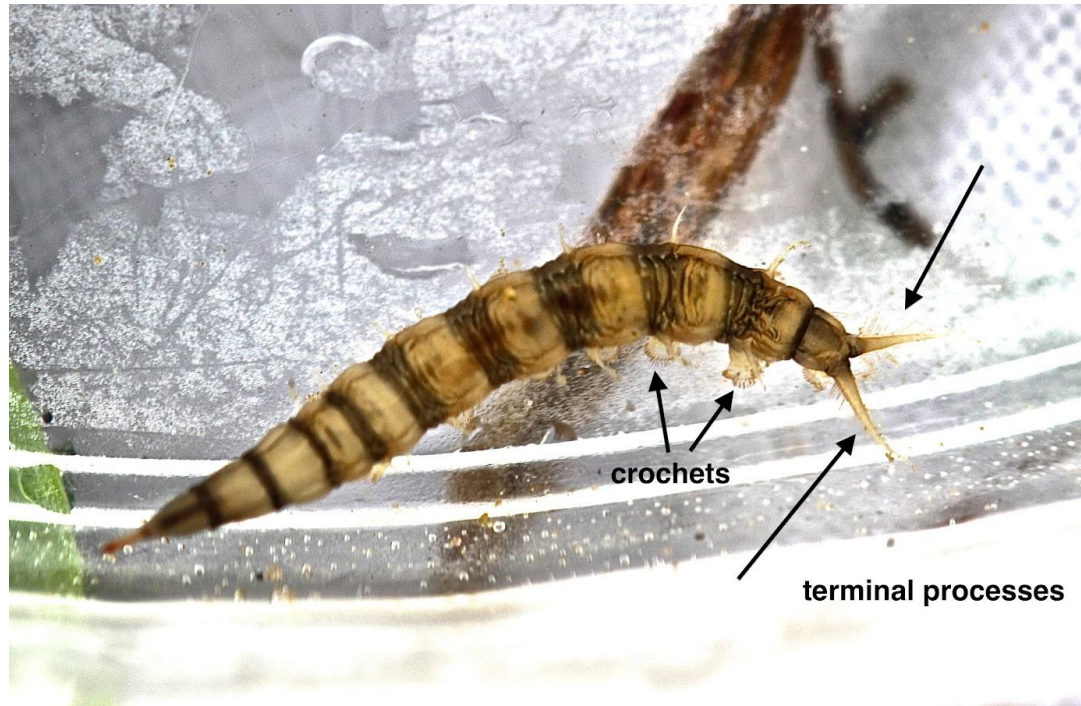
Phylum: Arthropoda

Class: Insecta

Order-Diptera

Family-Athericidae

- Found in fast flowing water
- Burrow in gravel





Net-Winged Midge



Phylum: Arthropoda

Class: Insecta

Order-Diptera

Family-Blephariceridae

- Suction Cups on each body division



Dorsal/topside



Ventral/underside

Dixid Midge



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

- Flat terminal lobes fringed with hair
- Prolegs with hooks on abdominal sections 1-2
- Can see head
- Found in shallow/slow water with plants
- Found on surface of water when picking



Phylum: Arthropoda
Class: Insecta

Order-Diptera: True Flies tolerant to pollution
Pollution Sensitivity = 8.7

MOSQUITO
(CULICIDAE)



RAT-TAILED
MAGGOT/HOVER FLY
(SYPHRIDAE)



SOLDIER FLY
(STRATIOMYIDAE)



Mosquito

Phylum: Arthropoda

Class: Insecta

Order-Diptera

Family-Culicidae

- Head capsule visible
- Fused thoracic segments
- Found in slow water
- Breathe air with spiracle



Dixid Midge

Sensitivity =1

VS.

Mosquito

Sensitivity =8.6





Rat-tailed Maggot/Hover Fly

Phylum: Arthropoda

Class: Insecta

Order-Diptera

Family-Syphridae

- Can not see head
- Mouth hooks
- Long spiracle to breath air
- Pollution Tolerant



Soldier Fly



Phylum: Arthropoda
Class: Insecta
Order-Diptera

Family- Statiomyidae

- Body flattened
- Leathery looking
- Can see head
- Found in muck
- Pollution Tolerant



Phylum: Arthropoda
Class: Insecta

Order-Diptera: True Flies not listed as sensitive (1) or Tolerant (8.7)

Pollution Sensitivity = 6 (Somewhat Sensitive)

These are three of the most common.

BLACK FLY
(SIMULIDAE)

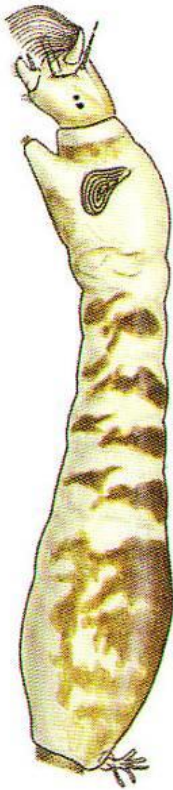


CRANEFLY
(TIPULIDAE)



MIDGES
(CHIRONOMIDAE)





<https://extension.entm.purdue.edu/>



Image from Westfly

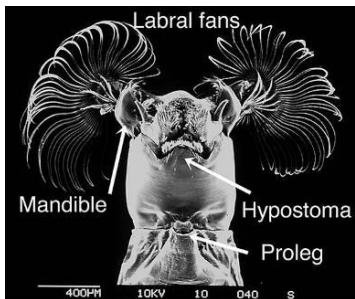
Black Flies

Phylum: Arthropoda

Class: Insecta

Order-Diptera

- **Family-Simuliidae**
- Bowling pin shape
- Stand up in water column
- Filter Fans at head
- Found attached to vegetation, rocks, logs



Macroinvertebrates.com



Crane Flies

Phylum: Arthropoda

Class: Insecta

Order-Diptera

Family- Tipulidae

- Found in leaf packs
- Can't see its head
- Abdomen end varies
- Can get large



Lewis-Clark.org

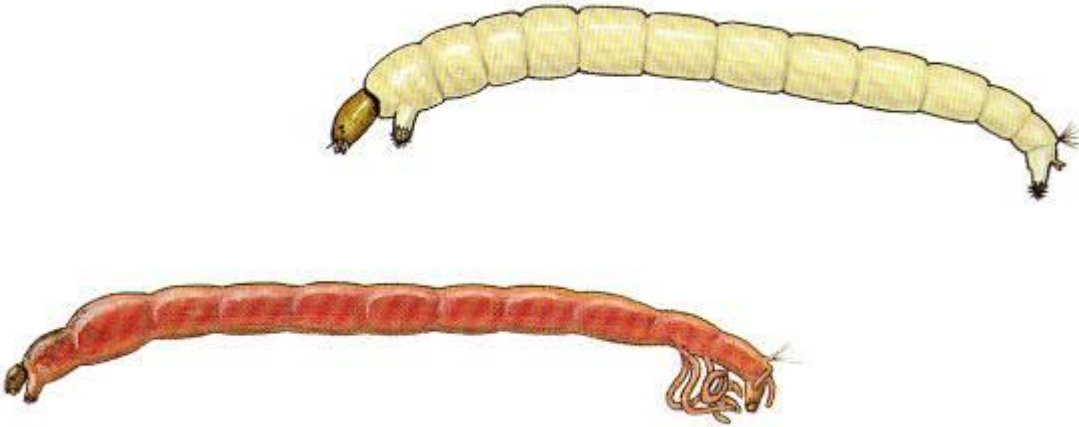
Midges

Phylum: Arthropoda

Class: Insecta

Order-Diptera

- **Family-Chironomidae**
- Head exposed
- Thoracic & Anal Prolegs

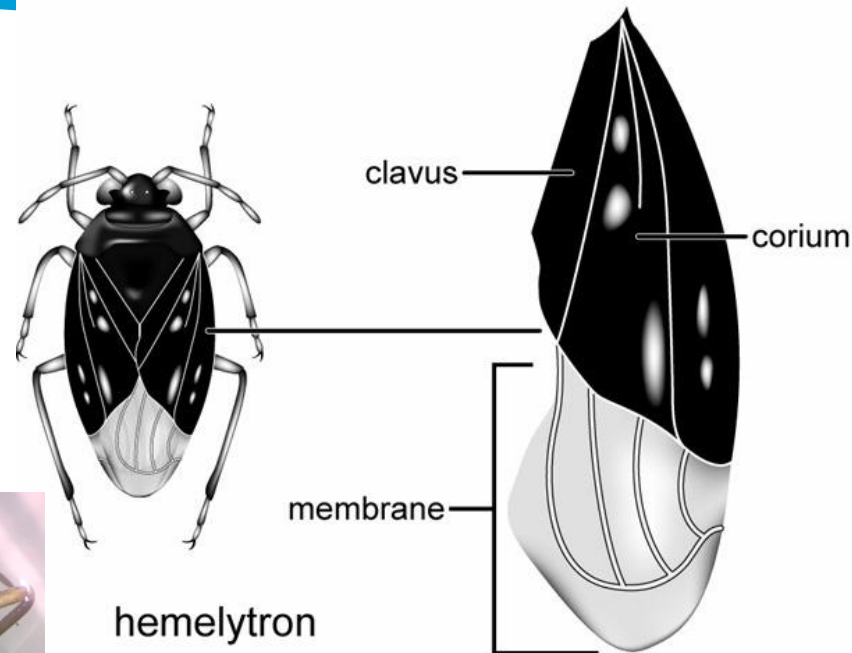


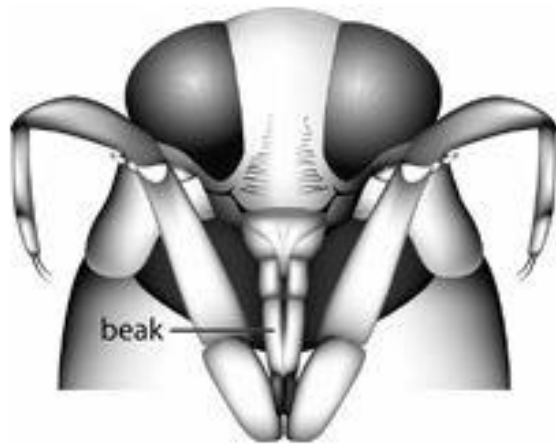
Phylum: Arthropoda
Class: Insecta

Order-Hemiptera: True Bugs

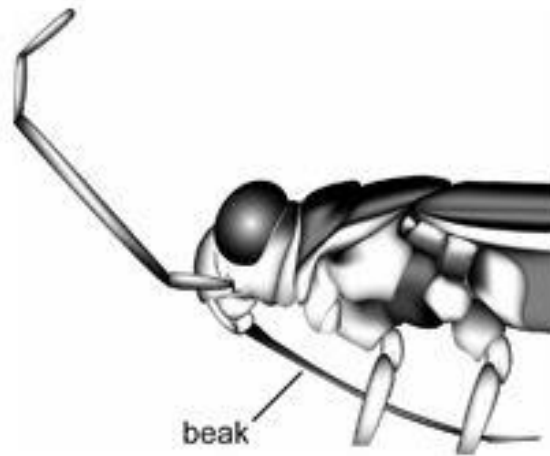
Pollution Sensitivity = 7.7

- Piercing/sucking mouthparts
- Wings hardened near the base and membranous everywhere else
- 3 pairs of legs
- Adults look same and young
- Found in many habitats, but many like slower flowing water and vegetation

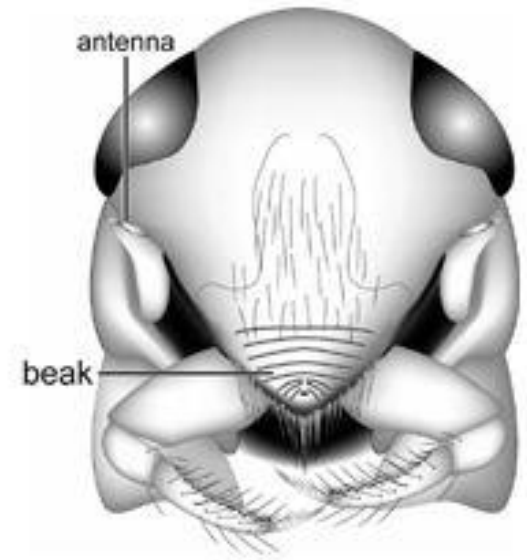




Piercing-sucking beak
(Hemiptera: Notonectidae)



Piercing-sucking beak
(Hemiptera: Saldidae)



Piercing-sucking beak
(Hemiptera: Corixidae)

True Bugs Adults



Giant Water Bug
Belostomatidae



Water Scorpions
Nepidae



Water Striders
Gerridae



Water Boatman
Corixidae



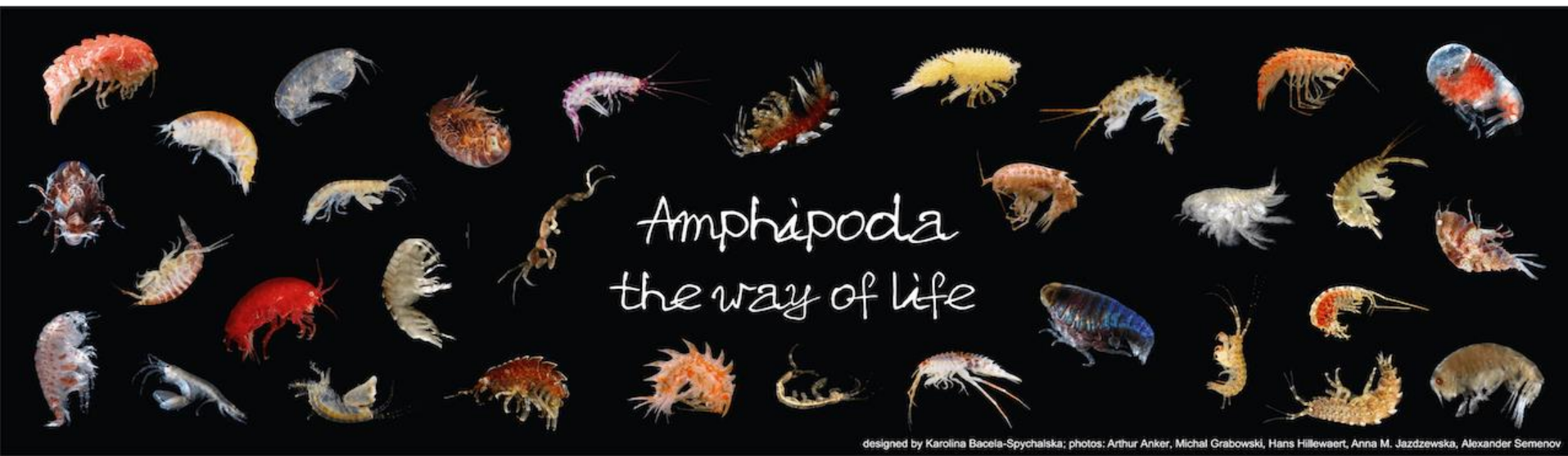
Backswimmers
Notonectidae

Phylum: Arthropoda
Class: Crustacea (NOT Insecta)

Order-Amphipoda: Scud (freshwater shrimp, sideswimmers)

Pollution Sensitivity = 4.0

- 2 pairs antennae
- 7 pairs of legs
- Flattened (laterally)
- Often found in silt or along stream banks



Phylum: Arthropoda

Class: Crustacea

Order-Isopoda

Pollution Sensitivity = 8.0

Sowbugs

- 2 pairs antennae
- 7 pairs of legs
- Flattened (dorsally-ventrally)
- Leg-like gills on posterior end
- Adults same as young



Phylum: Arthropoda
Subphylum: Crustacea
Class: Malacostraca

Order-Decapoda: Crayfish
Pollution Sensitivity = 6.0

- Don't collect, but count them

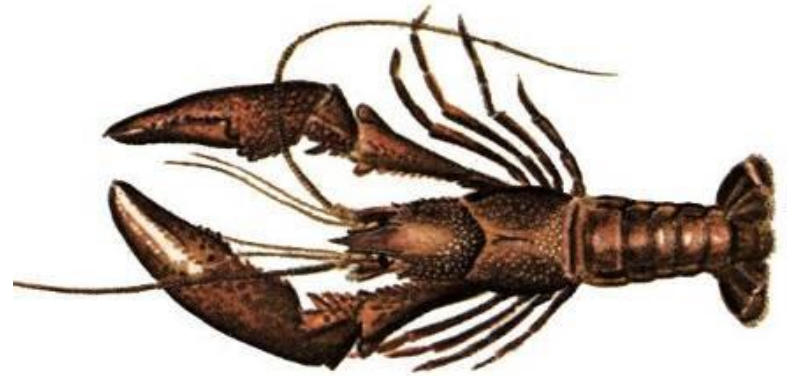




Photo E. Stieber

Photo E. Stieber

Phylum: Mollusca
Class: Pelycopoda

Order-Variou Clams and
Freshwater Mussels (bi-valves)
Pollution Sensitivity = 6.9

- Don't collect, but count them
- Very old, slow growth
- Many are special concern
- Place carefully back into sediment
- Don't count empty shells
- Some are tiny

Phylum: Mollusca
Class: Gastropoda

Order-Various Snails

Pollution Sensitivity = 6.9

- Many types
- Don't collect, but count them
- Watch for New Zealand Mudsnaill.
- If you suspect a mudsnail at a location that is not known to be infested, please contact Paul or EGLE
- Don't count empty shells



Left-handed snail



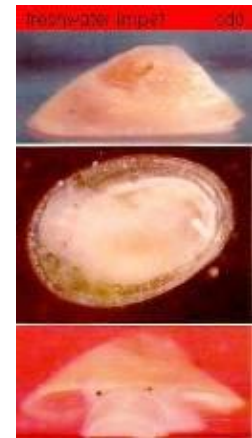
Planorbidae



New Zealand Mudsnaill-
Image EGLE



©2006 University of Colorado Museum of Natural History



Limpets

Phylum: Annelida
Subclass: Hirudinea

Leeches

Order-Various

Pollution Sensitivity = 10

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



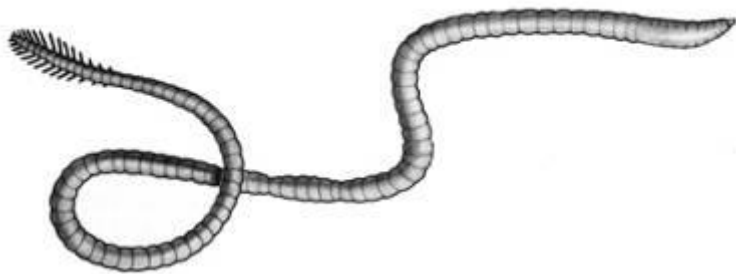
Phylum: Annelida
Subclass: Oligochaeta

Aquatic Worm

Order-Variou

Pollution Sensitivity = 10

- Segmented
- May look like earth worm

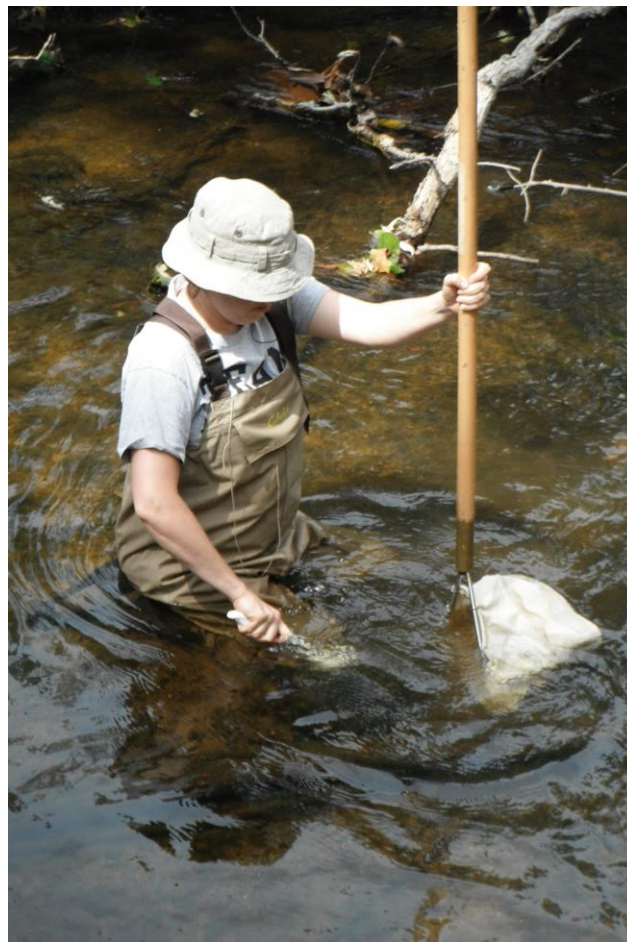


<https://nwnature.net/>

THANK
YOU



CONGRATULATIONS



MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Tamara Lipsey
Aquatic Biologist
Water Resources Division
517-342-4372
lipseyt@michigan.gov