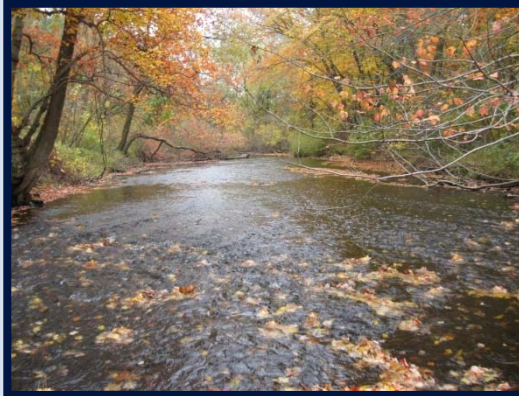


CT Envirothon Aquatics Workshop:

Freshwater Macroinvertebrates



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Riffle-Dwelling Benthic Macroinvertebrates

(Say what??)



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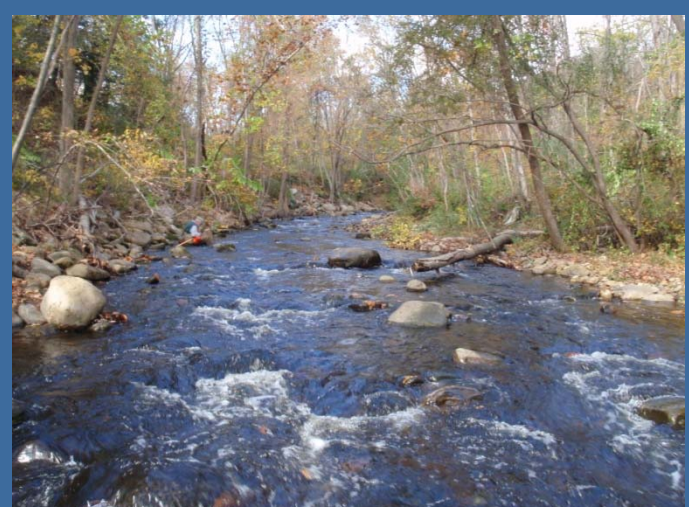
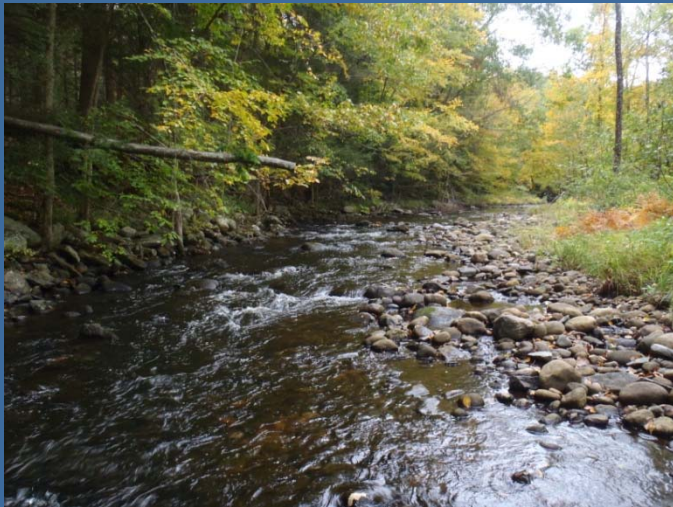
“Riffle-Dwelling”

RIFFLE: an erosional section of a stream or river characterized by rapid, turbulent flow, and a stable rocky substrate. Riffles are typically wadeable most of the year.

DWELLING: to spend at least part of the life cycle living (within the riffle).



Examples of Riffles



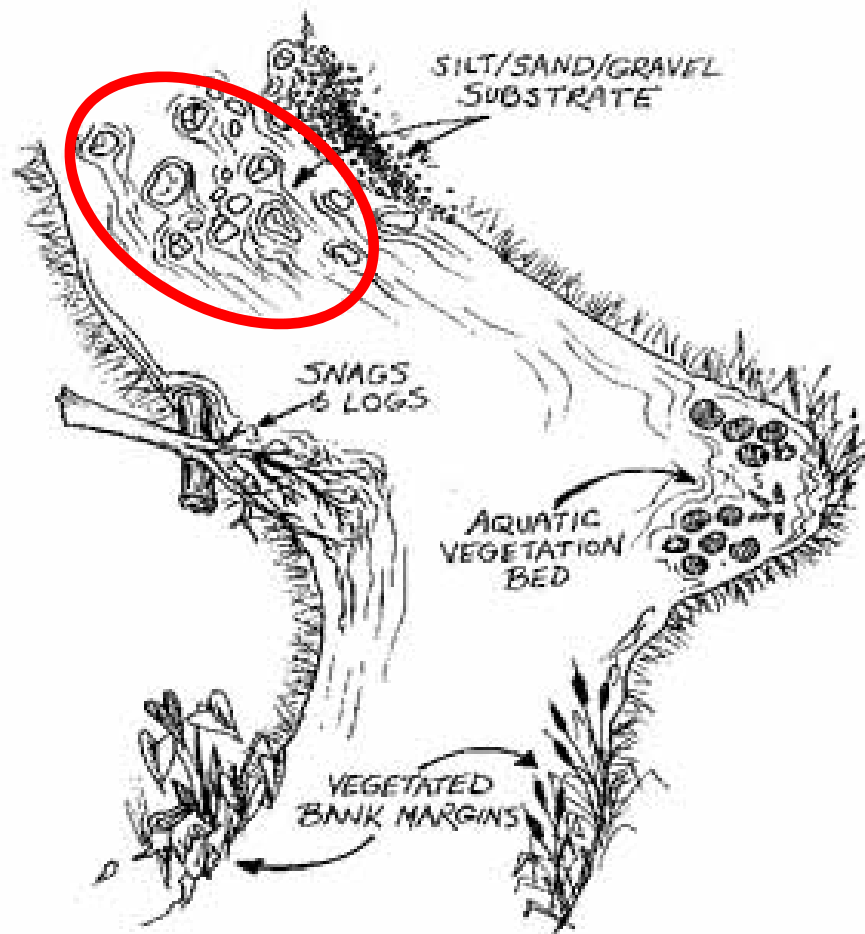
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“Benthic”

BENTHIC: In or on the substrate (bottom) of an aquatic environment.

The macroinvertebrates in the riffle are typically found clinging to materials on the stream bottom or buried in the sediment (e.g. sand).





Courtesy US EPA.
<http://water.epa.gov/type/rsi/monitoring/images/fig410.jpg>



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“Macroinvertebrate”

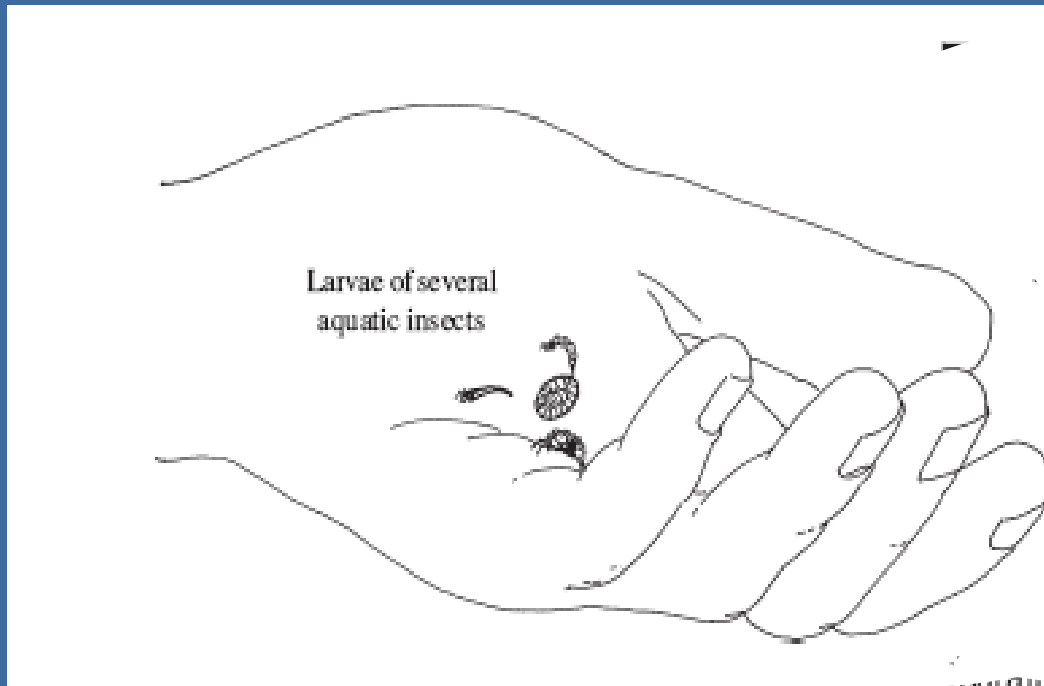
MACRO: Large enough to be seen with the unaided eye. (The US EPA further defines macro as capable of being retained in a standard number 30-mesh sieve.)

INVERTEBRATE: An animal without a backbone.

Examples: insect larvae, crayfish, worms, clams, and mussels.



“Macroinvertebrate”



Most are smaller than an inch

- Very young individuals can be the size of an eyelash
- Some of the largest (e.g. Dobsonflies and crayfish) can approach 6 inches long!



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Common Riffle-Dwelling Benthic Macroinvertebrates

Class
Insecta

Mayflies

Ephemeroptera

Stoneflies

Plecoptera

Caddisflies

Trichoptera

Dobsonflies and Alderflies
Megaloptera

True Flies

Diptera

Beetles

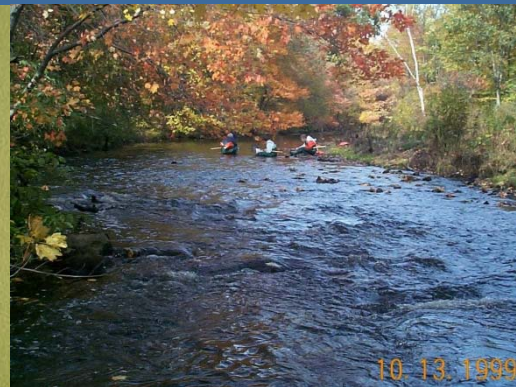
Coleoptera



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Using Bioassessments to Monitor Water Quality



What is a Biological Assessment?

BIOLOGICAL ASSESSMENTS: Evaluations of the condition of waterbodies using surveys and other direct measurements of resident biological organisms (macroinvertebrates, fish, and plants).

i.e. “Bioassessments”



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Benefits of Bioassessments

- Results provide insight regarding the long term health of a waterway
- Results reflect effects of a wide range of pollutants versus chemically testing for one specific pollutant
- Relatively inexpensive method
- Preserved specimens allow verification of results



Movie time!

Macroinvertebrate Madness w/ the Kent Land
Trust & Kent Conservation Commission

www.youtube.com/watch?v=GuMZQDa5UKs



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Aquatic Macroinvertebrates and Water Quality

- Live in wide range of water quality
- Characteristic responses to environmental stresses
- Established collection methodologies
- Ease of capture
- Rapid recovery from repeat sampling
- Life history/Limited mobility



Water penny larvae



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Pollution Tolerance Values

Tolerance Value	Example Organisms
0	Some Stoneflies, Some Caddisflies
1	Some Stoneflies, Some Caddisflies, Some Mayflies
2	Some Stoneflies, Some Caddisflies, Some Mayflies, One True Fly
3	No Stoneflies, Some Caddisflies, Some Dragonflies
4	Many Mayflies, Some Caddisflies, Some Beetles
5	Some Caddisflies, Some Beetles, Fishflies
6	Several True Flies, Some Caddis, Some Crustaceans
7	No Caddis, No True Flies, Gastropods, One Mayfly
8	No Mayflies, Aquatic Earthworms, One Crustacean
9	Several Damselflies
10	Leeches



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Using Pollution Tolerance to Determine Stream Health

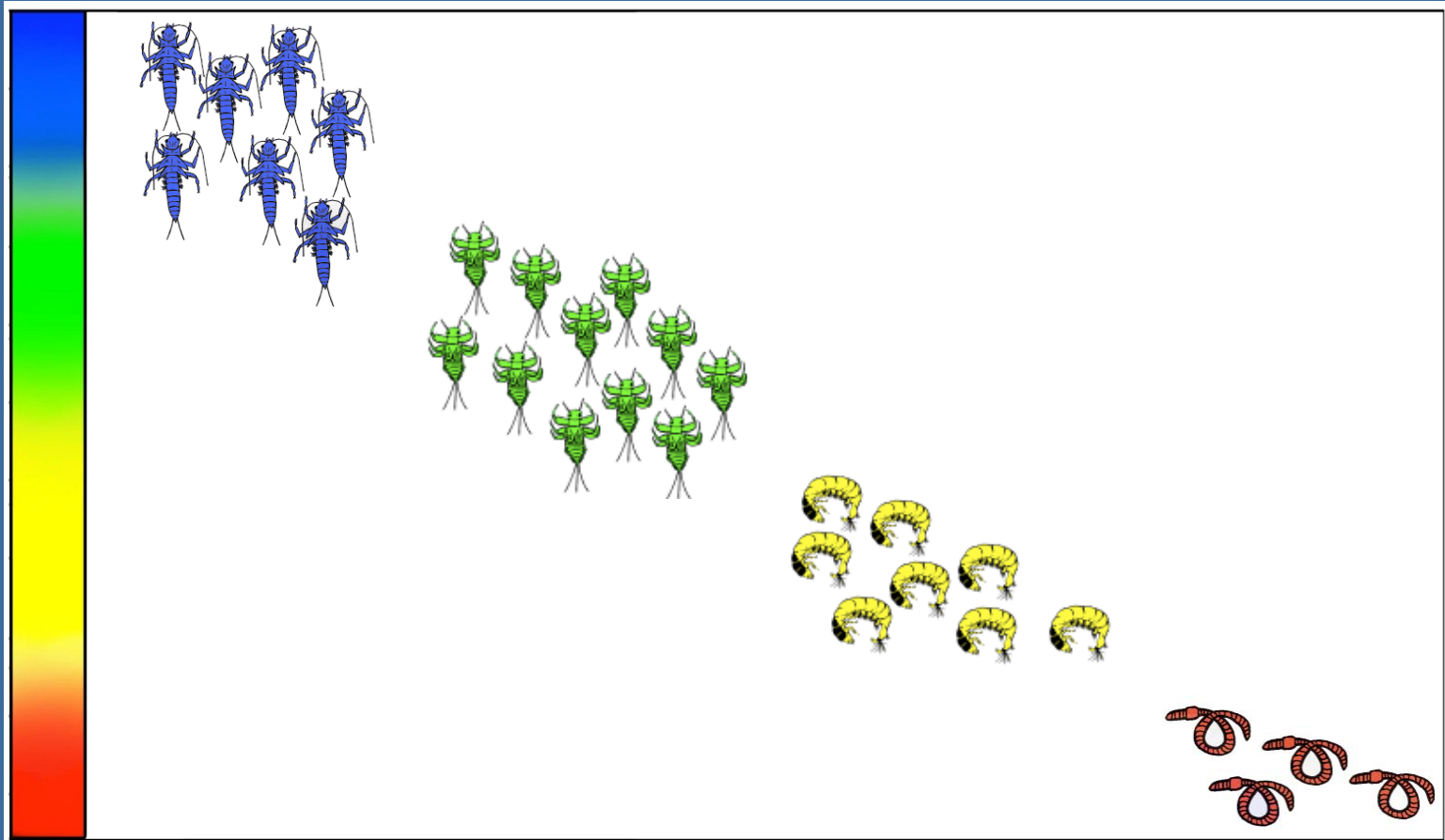
Biological Integrity

Natural

Fair

Poor

Degraded



Low

Moderate
Level of Stress

High



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Before we continue - questions?



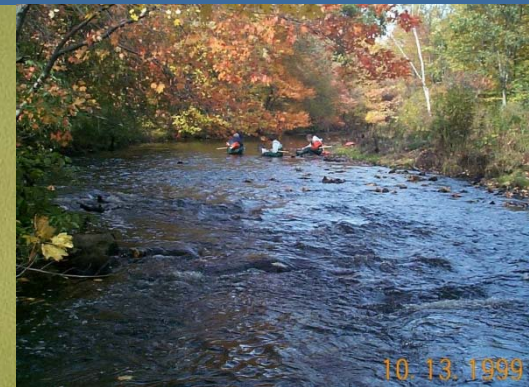
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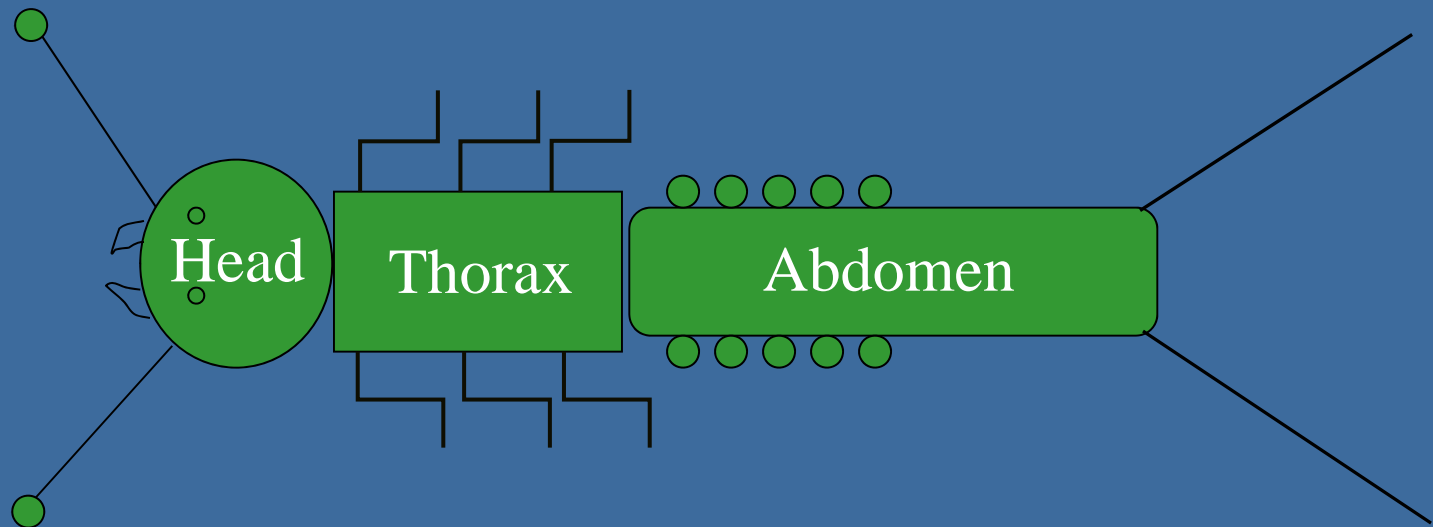
MACROINVERTEBRATE IDENTIFICATION



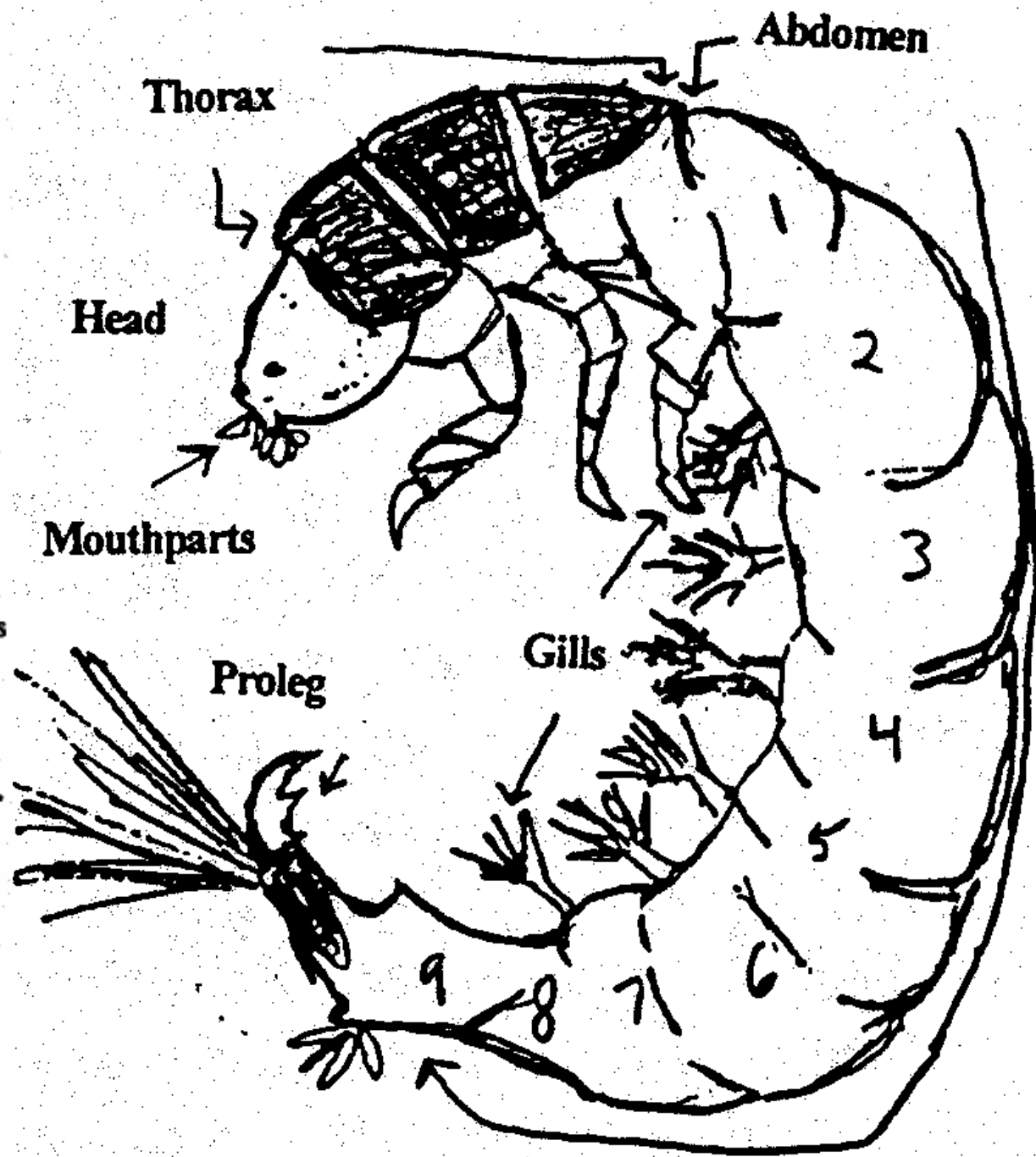
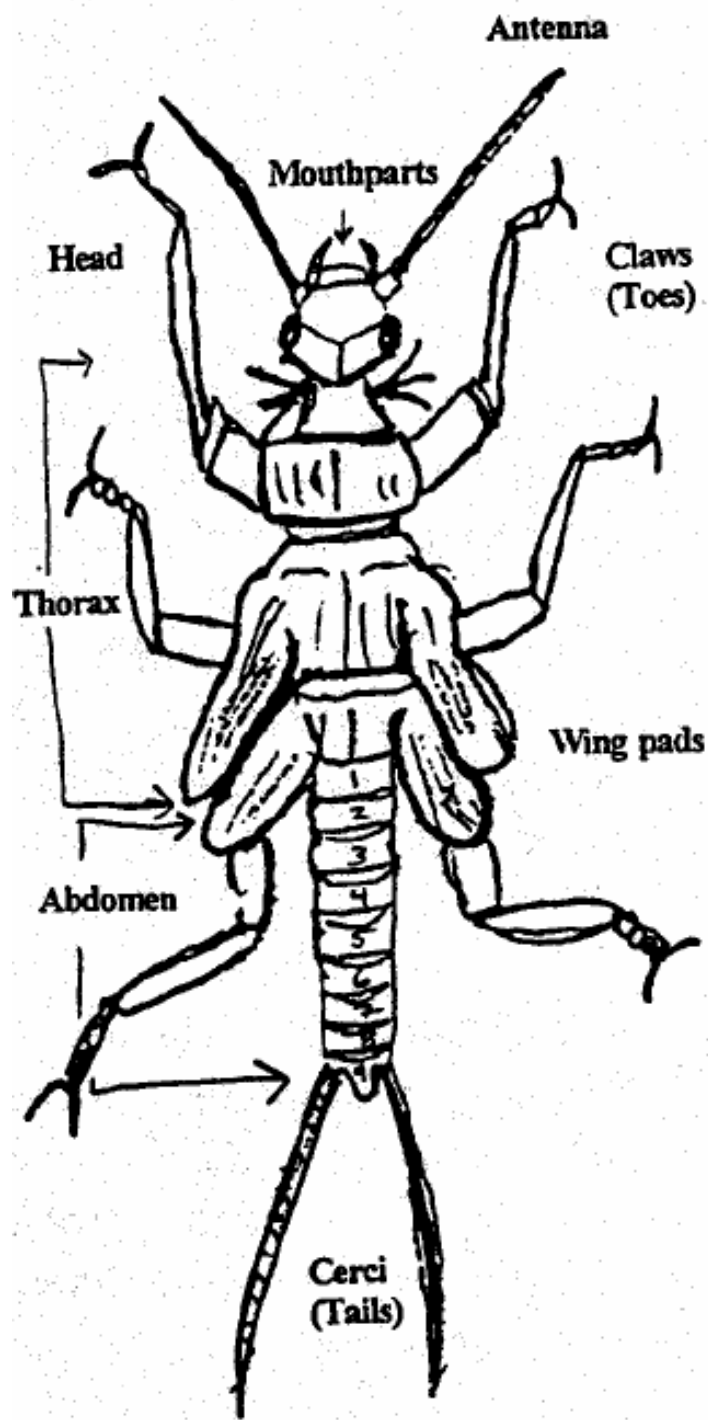
Macroinvertebrate Anatomy

To use the key you must be familiar with insect anatomy.

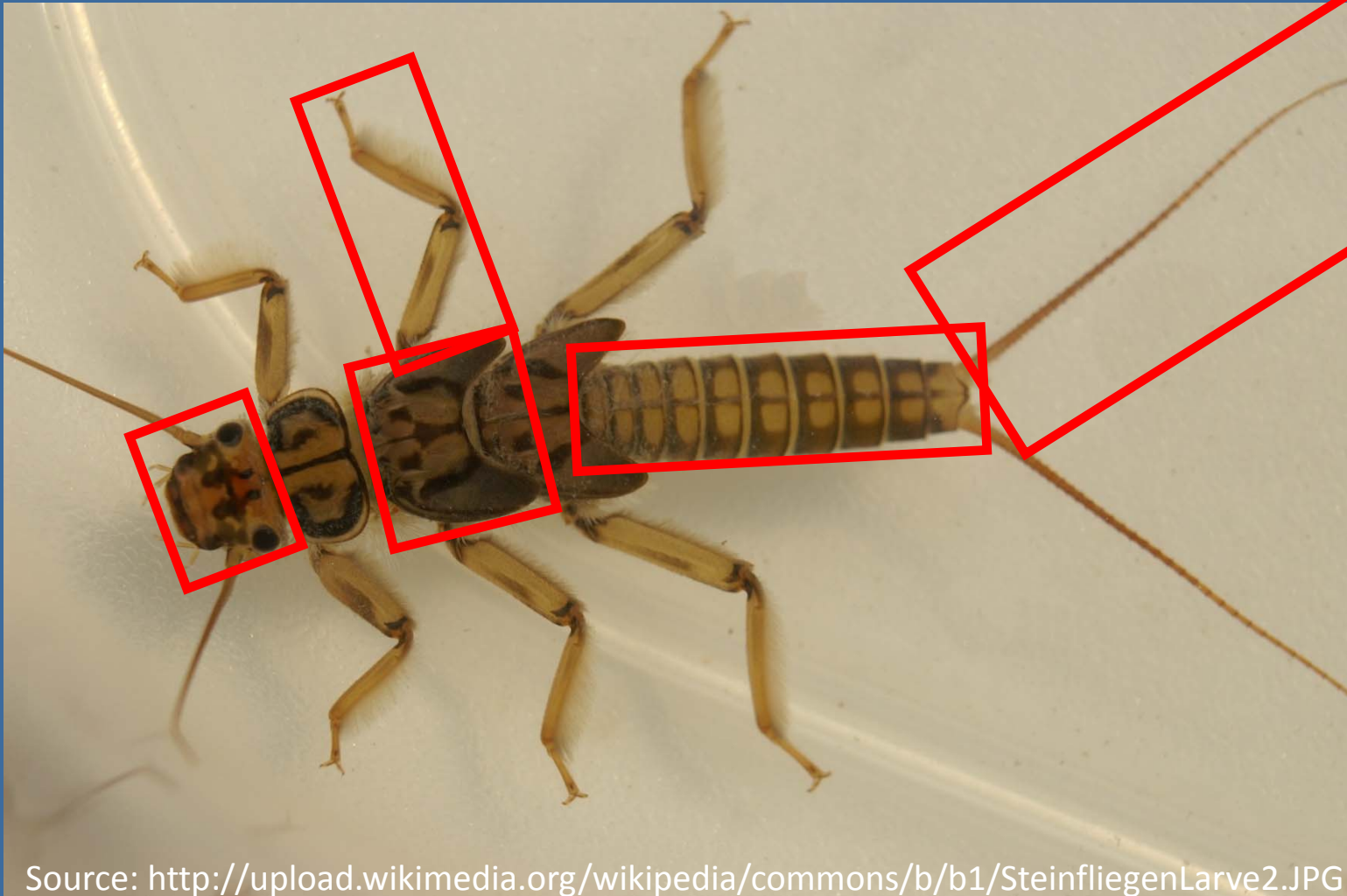
Start with the Basics:



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Macroinvertebrate Anatomy



Source: <http://upload.wikimedia.org/wikipedia/commons/b/b1/SteinfliegenLarve2.JPG>




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1	Which body type does the organism have?	a. Flattened (NOT cylindrical or worm-like), with large segmented legs Go to #2	
		b. Cylindrical, fleshy or worm-like, and may or may not have legs or tails Go to #32	
		c. Round, triangular, or another shape Go to #53	
		d. Body is inside of stick or stone case/shelter Go to #55	





2	The organism has a flattened (not cylindrical) body, longer than it is wide, with large segmented legs AND	a. 2-3 long <u>hair-like</u> tails, with 1 hook/toe at the end of each leg Go to #3	
		b. 2 long <u>hair-like</u> tails, with 2 hooks/toes at the end of each leg Go to #11	
		c. Any of the following: No tails; 1 hair-like tail; Wide, paddle-like tails; or Hooks at the end of the body Go to #19	



11	Does the organism have a tuft of fluffy gills at the base of each leg?	Yes.....Go to #12	
		No.....Go to #13	



12	Is the organism jet-black?	Yes..... <i>Pteronarcyidae</i> (Go to #102) [Giant Stonefly/0/Occasional]	
		No..... <i>Perlidae</i> (Go to #100) [Common Stonefly/1/Probable]	



Plecoptera Order

Common Name: Stoneflies

Trivia: All stoneflies are very intolerant of organic pollutants. They have two tails and two tarsal claws (toes) at the end of each leg. They are all dorsally flattened. Stoneflies prefer to live in very fast moving water under rocks and in organic debris. All stoneflies indicate high water quality.

100

Family: Perlidae

Pollution tolerance: 1 (low)

Feeding group: Predator

Location in stream: Burrowed in substrate

Common Name: Common Stonefly

Probability: Probable

Type of stream: Moderate to fast flows, High gradient

Location in key: #12

Trivia: This stonefly is very common in the streams of CT. The nymph can grow to 1.5 inches long and comes in a variety of brown color patterns. Perlid stoneflies have a tuft of gills where the leg meets the body, which may look like hairy armpits. When these organisms are in an oxygen-stressed environment, they will try to physically move water over their gills by doing push-ups.



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Let's Try It! Independent Practice

Break into teams

Each Team Should Have:

- ✓ Petri dish
- ✓ Tweezers
- ✓ Magnifying glass
- ✓ Identification Key
- ✓ Worksheet and pencil



Answer Key

- Container A= Hydropyschidae
- Container B= Tipulidae
- Container C= Elmidae (larva)
- Container D= Corydalidae
- Container E= Psephenidae
- Container F= Philopotamidae
- Container 2= Chironomidae
- Container 3= Simuliidae
- Container 4= Elmidae (adult)
- Container 5= Aeshnidae
- Container 6= Amphipoda



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