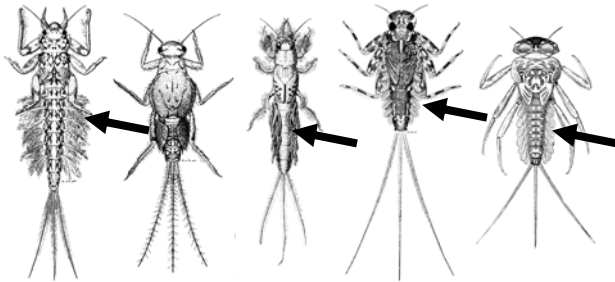


# Student Handout #2

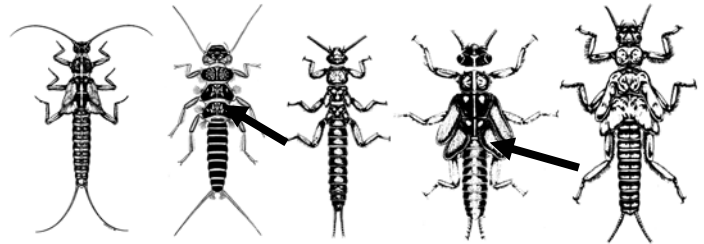
## Using Abiotic and Biotic Parameters to Monitor Water Quality: A Field Experiment

### Group One Taxa

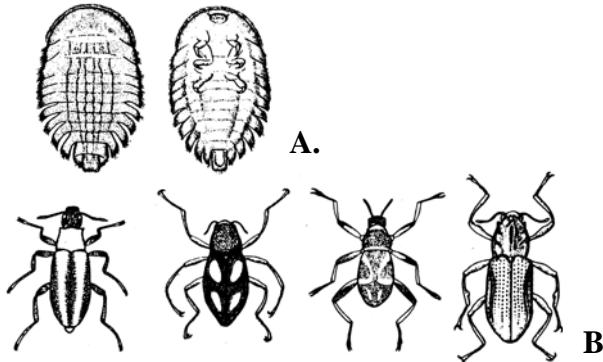
Pollution sensitive organisms found in good quality water, index value is 3.



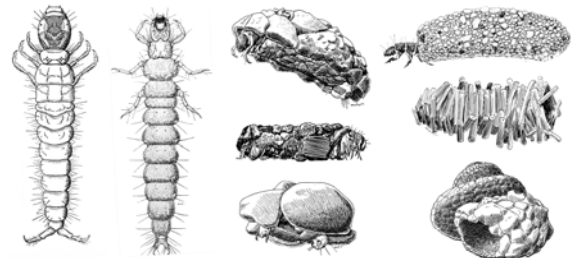
The order **Ephemeroptera** contain the mayflies. The most distinguishing characteristics of this order is where the gills are located, along the abdomen (see arrows); the gills can look like feathers or leaves. Their body length ranges from 3 to 33mm. They can also be identified by their three “tails” located at the end of their abdomen (sometimes, however, they can have only two).



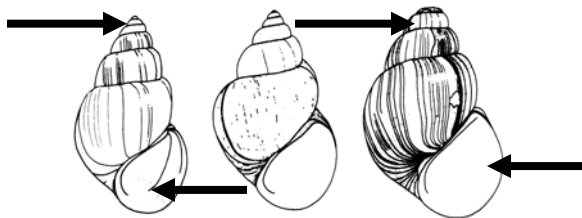
The order **Plecoptera** contain the stoneflies. The most distinguishing characteristics of this order is where the gills are located, along the thorax (see arrows); the gills can look like feathers or leaves. Their body length ranges from 4 to 30mm. They can also be identified by their two “tails” located at the end of their abdomen. To distinguish Plecoptera from Ephemeroptera, remember that Plecoptera have their gills in their “armpits”, while Ephemeroptera have their gills on their abdomen.



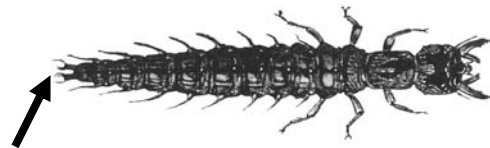
In group 1 taxa, the order **Coleoptera** contain the water pennies and the riffle beetles. Water pennies (A.) have a flat, saucer shaped body with a fringe of short, fine hair around the edge. Their body length ranges from 3-10mm. Their legs are located on their underside and cannot be seen from the top. They are found clinging to stones and are hard to dislodge using only a kick net. Look on the rocks in your area for water pennies. Riffle beetles (B.) look like beetles you find in your yard. Their body length ranges from 1-8mm, they have three pair of legs, two pair of wings (the first of which has evolved into a hard covering called the elytra which protects the second pair), and variable mouthparts. The elytra comes together and forms a line down the middle of the back.



The order **Trichoptera** contain the caddisflies. They resemble grubs or caterpillars, with body lengths ranging from 3 to 45mm. Many species make cases out of woody debris, sand, or even small rocks which they fasten together with silk which they produce. They can also use silk to make a pupal case or to modify their existing case during metamorphosis. Immature Lepidoptera (butterflies and moths) also produce silk; in fact, Lepidoptera is closely related to Trichoptera.



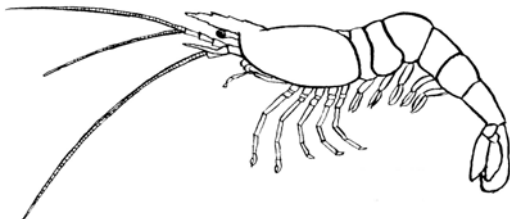
Gilled snails with shells that spiral to the right finish the last of group 1 taxa. Point the point away from you to determine whether it opens to the right or left.



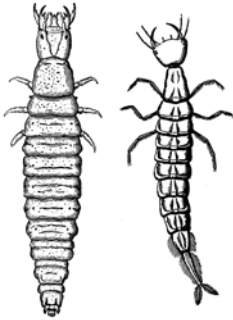
In group 1 taxa, the order **Neuroptera** contain the dobsonflies or hellgrammites. They can be quite large (25-90mm) with robust, toothed jaws. They have a pair of stout, yet flexible filaments that project from almost each segment of the abdomen. Under each of these projections, the gill “tufts” can be seen (they look like little bits of cottonballs). At the end of the abdomen are 2 fleshy appendages with 2 claws at the end of each one (see arrow).

## Group Two Taxa

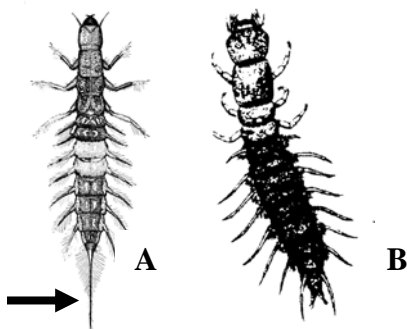
Somewhat pollution tolerant organisms that can be found in good or fair quality water, index value is 2.



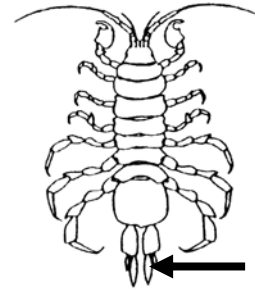
The order **Decapoda** contain the crayfish or crawdads, which resemble small lobsters. Their body length ranges from 10-150mm. Be careful of their claws as they can pinch pretty hard.



The larvae of the order **Coleoptera** (beetles) can be found in group 2 taxa. Body length ranges from 2 to 70mm. They have 3 pair of legs and an obvious head.



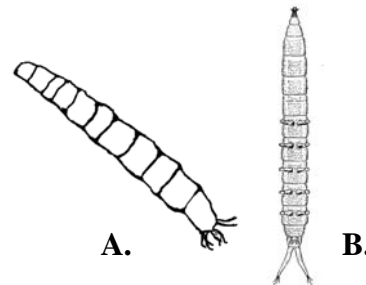
The alderfly larvae and the fishfly larvae belong to the order **Neuroptera**. The alderfly larva (A.) resembles the dobsonfly (see group 1 taxa) except it has a long, tapering filament fringed with fine hairs extending from its abdomen (see arrow). Its body length ranges from 10-25mm. The fishfly larva (B.) also resembles a small dobsonfly, however, it does not have the gill "tufts" located beneath each of the stout filaments extending out from each of the abdominal segments.



The order **Isopoda** contain the sowbugs. Their body length ranges from 5-20mm. Their bodies are flattened from top to bottom and they are dark gray in color with occasional mottling of black or brown. They have 2 pair of antennae, one being longer than the other and they have 7 pair of walking legs, with the first pair having a hinged claw. They also have 2 flat, fork-like structures that stick out at the end of the abdomen (see arrow).



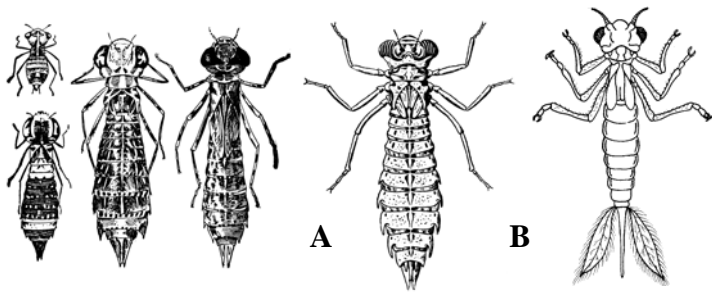
The order **Amphipoda** contain the scuds or sideswimmers. Their body length ranges from 5-20mm and is flattened from side to side. They are creamy, translucent, or light gray to brown in color. They have 2 pair of antennae which are about the same length and 7 pairs of walking legs.



Crane fly (A.) and watersnipe fly (B.) larvae are found in the order **Diptera**. Crane fly larvae ranges from 10-25mm in body length, has no obvious head capsule or legs, and several finger-like lobes located at the end of its abdomen. Watersnipe fly larvae also has no obvious head capsule or legs, however, they do have short, fleshy outgrowths on each segment of the abdomen, and 2 larger ones at the end of the abdomen with a fringe of hairs.

## Group Two Taxa (cont'd)

Somewhat pollution tolerant organisms that can be found in good or fair quality water, index value is 2.



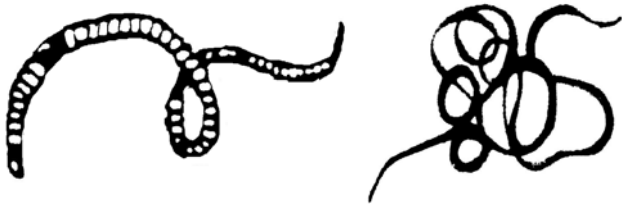
The order **Odonata** contain the dragonflies (A.) and damselflies (B.). The dragonfly nymphs (some people may call them larvae) are stout bodied with a wide, flat abdomen and large eyes. Their body length ranges from 20-45mm. Damselfly nymphs have a narrower abdomen, large eyes, and 3 leaf-like gills located at the end of the abdomen. Their body length ranges from 20 to 50mm).



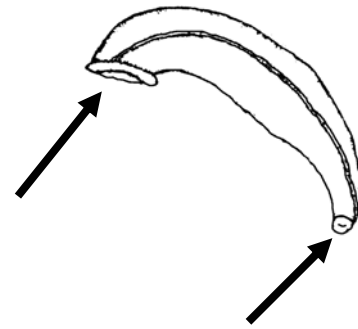
Clams are the last representative of group 2 taxa.

## Group Three Taxa

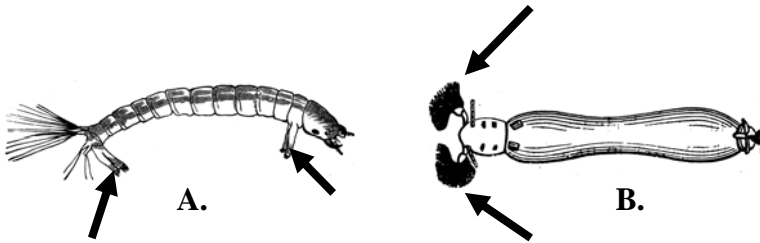
Pollution tolerant organisms that can be in any quality water, index value is 1.



Aquatic worms in the phylum Annelida and the class Oligochaeta can vary in body length from 1 to 30mm. They are usually brown in color, but they can be red also.



Leeches are found in the phylum Annelida and the class Hirudinea. They vary in body length from 4-450mm when fully extended. They have soft bodies that are flattened from top to bottom, are usually dark brown and slimy, and they have two distinct suckers, one at the front, and one at the rear (see arrows).



Midge fly larvae (A.) and Blackfly larvae (B.) belong to the order **Diptera**. Midge fly larvae range from 2-20mm in body length, usually have an obvious head capsule, and 2 pairs of fleshy, short leg-like appendages, one just behind the head, and one at the end of the abdomen (see arrows). They may also have a fan of hairs at the end of the abdomen. Some can be bright red in color, but they may also vary from white to dark green. Blackfly larvae range from 3-15mm in body length, have an obvious head capsule, and two distinct clumps of hair located on either side of the mouth (see arrows). They also have one fleshy, short leg-like appendage located just behind the head.



Pouch snails, pond snails, and other snails are the last representatives of group 3 taxa. Pouch snails and pond snails (A.) have shells that spiral to the left, while other snails (B.) have shells that coil in a single plane. Point the point away from you to determine whether it opens to the right or left.

## References

Images used in this key are public domain images from the following sources:

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