2.4a Common Macroinvertebrates Pictorial Guide

Snails

When scoring, students will need to determine the "handedness" of their snails. You can tell the difference by holding the shell so that its tip is upward and the opening toward you. If the opening is to the right of the axis of the shell, the snail is right-handed; if it's to the left of the shell axis, it's left-handed.

Right-handed snails are Group 1 – Sensitives because they are **gill-breathing snails.** They possess a chalky plate called an "operculum" on top of their foot, which they use as a door to close the shell opening. This type of snails is very sensitive to pollution. They need plenty of oxygen in the water to survive.

Photograph credit: Udo Schmidt

Figure 1 Right- handed snail

Left-handed snails are also known as "sinistral," or pouch snails. They do not have gills and so **get air from the surface**. Since they are not dependent on oxygen levels in the water, they are able to tolerate poorly oxygenated and polluted water.

Source: http://rock.geo.csuohio.edu/norp/bmi1.htm#SNAIL

Photograph credit: Francisco Welter Schultes

Figure 2 Left-handed snail

Diptera (True Flies)

Figure 3 Snipe Fly

Photograph credit: Jason Neuswanger (troutnut.com)

Diptera are similar to worms in that they do not have true legs. Most Diptera are tolerant to pollution. However, there are three that are less tolerant.

- The least tolerant Diptera is the **Snipe Fly**, which is classified in Group 1, Sensitive. They are between 10-20 mm and can be identified by their pointed head, prolegs, and two tail-like appendages coming from their abdomen.
- **Crane Fly Larvae** are classified in Group 2, Somewhat-Sensitive. The larvae of crane flies are large (up to 100 mm), look like segmented plump worms or grubs, and have tiny, fleshy projections at the hind end.

Figure 4 Crane Fly Larvae

Photograph credit: Missouri Dept of Conservation

- Black Fly Larvae are classified in Group 2, Somewhat-Sensitive. They are small (5-10 mm), with a larger posterior end. Their head has two brush-like appendages that they use to filter organic matter from the water in fast currents

Figure 4 Black Fly Larvae

Photograph credit: F. Christian Thompson for USDA

Caddis Fly

When scoring, students will need to distinguish between **case building** (Group I - Sensitive) and **net-spinning** caddisfly (Group II - Somewhat Sensitive). If a caddisfly is found with a case, it is automatically a Group I. To determine if a caddisfly found without a case is a net-spinning caddisfly, a strong indicators is bushy gills along the abdomen

Figure 5 Caddis Fly

Photograph credit: Jason Neuswanger (troutnut.com)

Megaloptera

There are only two insects commonly found in the Megaloptera Order: the **Dobsonfly Larvae** and they **Alderfly Larvae**. While they are similar in structure, the Alderfly is much smaller (max 25 mm) and thinner, more dainty, than the Dobsonfly (up to 100 mm).

Figure 7 Alderfly

Photograph credit: Jason Neuswanger (troutnut.com)

Figure 6 Dobson Fly

Photograph credit: The National Park Service

True Bug (Hepiptera) vs. Beetles (Coleptera)

It is sometimes hard for students to determine if a bug has a piercing mouthpart. Most students will not have a problem distinguishing True Bugs from other groups based on general body shape. However, distinguishing between True Bugs and Beetles can be somewhat harder. Any easy rule that works in most cases it to look for an elytra. These are the hard wings that act as protection for the flying wings of beetles. The elytra will completely cover hind wings in most beetles. Only a few true bugs have an elytra that completely covers the hind wings. An insect with an elyltra most students will be familiar with is the ladybug.

Figure 8 Ladybug

Photograph courtesy of Josef Mohyla

Adult Riffle Beetle Breathing

Source: Elliott, J. Malcolm. The ecology of riffle beetles Coleoptera: Elmidae. Freshwater https://www.fba.org.uk/journals/index.php/FRJ/article/viewFile/107/36

Students may wonder how beetles breathe underwater as they do not have gills. The plaston of the adults is a remarkable structure that acts as a physical gill. When adults first enter the water, most of their body is covered by a thin layer of air which functions like a gill, being in contact with air spaces under the elytra (hardened forewings). This plastron is facilitated by a dense coating of hyrdofuge, hair-like setae that trap a film of air on the ventral surface of the adult. As oxygen is removed from this reservoir for respiration, it is replaced by diffusion of dissolved oxygen from the surrounding water. Adult riffle beetles maintain a plastron indefinitely under considerable water pressure and can thus remain submerged in well-oxygenated water without having to resurface.