Name:

Date:

Student Handout 1B:
Biodiversity Worksheet

Directions in the field:

You will compare the biodiversity of two ecosystems. To do this, your group will sample the insects living in these two areas using one of three different methods. Remember, Class Insecta is found in the Domain Eukarya, Kingdom Animalia and the Phylum Arthropoda and contains many different orders. Within these orders of insects, you may have several different life cycles that can occur. The results of which are that immature and mature stages may or may not look similar. For this activity, we will focus on the adult stage of some of the more common orders.

Your teacher will assign a sampling method to your group.

The first sampling method involves a visual search of the area including turning over rocks or logs, looking at flowers, looking on tree bark, etc. You will collect all the arthropods you find and place them in the vials provided.

The second sampling method is using a beat sheet. Take the white sheet and lay it underneath a woody shrub or tree with low lying branches. Using the stick provided, you will beat the vegetation hanging over the sheet 5 times. Hit the vegetation hard enough to dislodge any arthropods, but not hard enough to damage the vegetation. You will collect all the arthropods you find and place them in the vials provided.

The third sampling method involves a sweep net. Using the technique shown to you by your teacher, collect the arthropods that you find in your net. You are restricted to using the sweep net on non-woody vegetation only – no woody shrubs and especially nothing that has thorns (briers, roses, etc.). You will collect all the arthropods you find and place them in the vials provided.

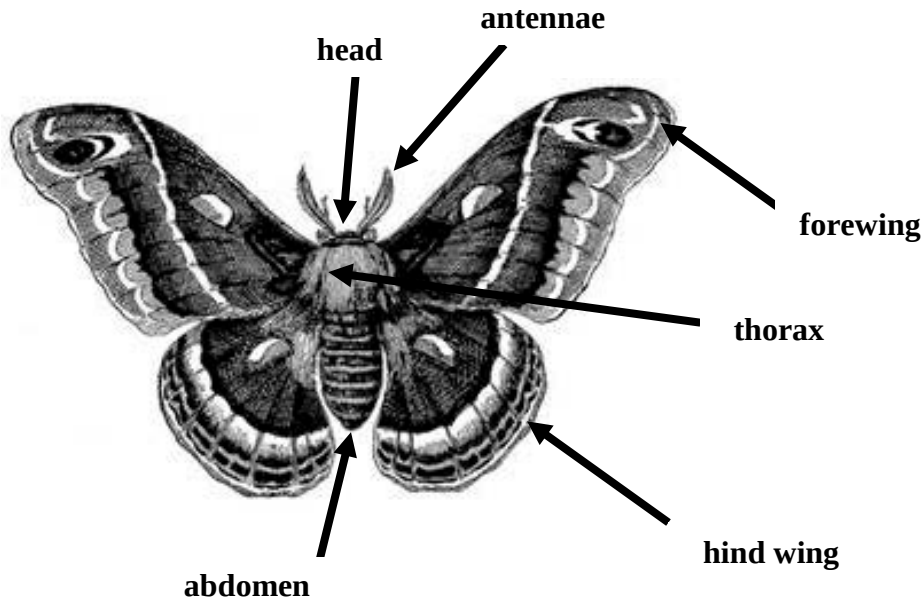
When your vials have several arthropods in them, label the vials with your collection data (names, date, collection site, and method of collecting) and bring them back to your teacher. She will freeze your specimens overnight or put them in alcohol so that you can identify them later.

You will repeat these same directions in the next ecosystem.

Directions in the lab:

With your partner and using the key provided, sort the specimens you collected from the first area and identify to which insect order they belong. Then separate them further using a short description. For example, this organism is a hymenoptera (discovered using the key). It has yellow and black stripes and a skinny abdomen. You would record that in the following chart (you may use additional paper if needed).

Next, count how many of the hymenoptera with the yellow and black stripes and skinny abdomen you have and record that. If you cannot identify your organism using this key, report it as unknown and provide a description for it. Then count how many of them you have. Repeat the process for the second area.



Adult Key to Common Insect Orders

1a. Organism has six legs, 1 pair of antennae, and 3 body parts: head, thorax, and abdomen .....Go to 2

1b. Organism not as above.....**Unknown**

2a. Organism has one or two pair of obvious wings .....Go to 3
2b. Organism has no wings or the wings are not obvious .....Go to 6

3a. Organism has only one pair of obvious wings; you may be able to see the halteres located behind the wings, they are usually white and look like knobs attached to a stalk; it may or may not be hairy; it has large eyes (approximately the height of the head) and usually has very short "V" shaped antennae (less than half the height of the eye) located between the eyes; it ranges in size from 6 to 65mm (see Figure 1).....
.....**Diptera** (flies)
3b. Organism has two pair of obvious wings.....Go to 4

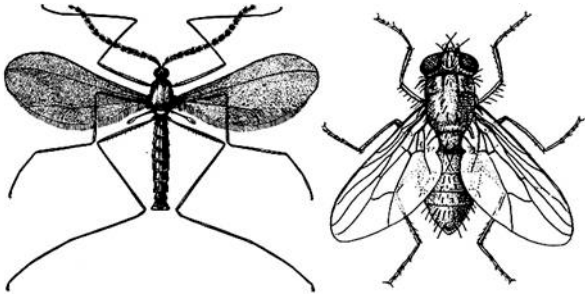


Figure 1.

Figure 2.

4a. If you held this organism in your hand, the scales from their wings would fall off and look like glitter on your fingers; you can usually see the long siphoning mouthparts (that can be curled up under the head like a party favor); its body can be slender and with little hair or chunky and covered in hair; its antennae vary from being feathery to being long and slender, some may even be shaped like a shepherd's hook at the end; its size ranges from 10 to 150mm (see Figure 2).....
.....**Lepidoptera** (butterflies, moths, and skippers)
4b. Not as above.....Go to 5

5a. Organism has wings that are similar in size with lots of veins running through them and usually held out straight from the body although some can lay their wings flat along the body; it has a long, slender hairless abdomen; it has large eyes (appearing larger than the head itself!); with 2 short, thin, hair-like antennae located below each eye (measures less than half the diameter of the eye); dragonflies range in size from 28 to 150mm, damselflies range in size from 25 to 65mm (see Figure 3)..... ..... **Odonata** (damselflies and dragonflies)

5b. Organism has hind wings that are smaller than forewings; the abdomen is narrow (even threadlike); antennae are located between the eyes and are long and thin (never feathery) and usually elbow shaped; females can have a stinger (which is a modified ovipositor); its size ranges from 3 to 55mm (see Figure 4) ..... **Hymenoptera** (wasps, ants and bees)

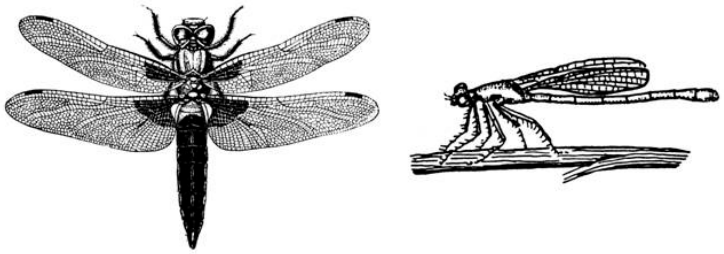


Figure 3.

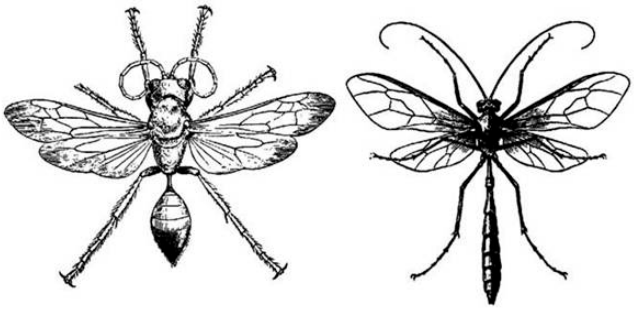


Figure 4.

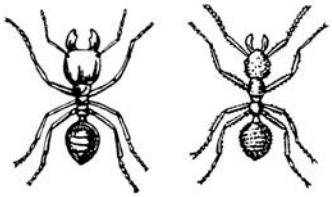


Figure 5.

6a. Organism has no wings that can be hidden under any body part; the abdomen is narrow (even threadlike); antennae are located between the eyes and are long and thin (never feathery) and usually elbow shaped; females can have a stinger (which is a modified ovipositor); its size ranges from 3 to 55mm (see Figure 5)..... ..... **Hymenoptera** (wasps, ants and bees)

6b. Not as above.....Go to 7

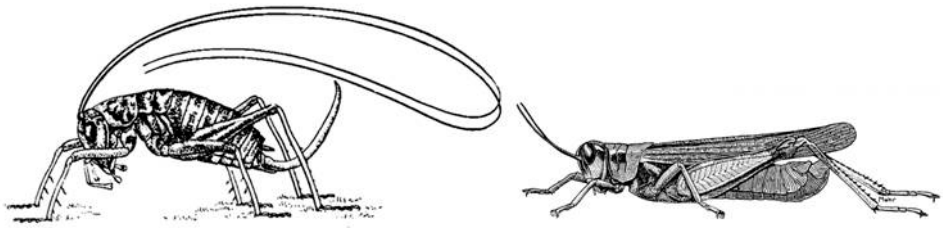


Figure 6

7a. Organism has hind legs that are often enlarged and adapted for jumping; it has 1 pair of antennae that is long and slender; it also has chewing mouthparts; you may be able to see the hind wings through their leathery covering (which is the modified forewings); both pair of wings are held roof-like or alongside the body when at rest; its size ranges from 9 to 80mm (see Figure 6) ....**Orthoptera** (grasshoppers, katydids, and crickets)

7b. Not as above.....Go to 8

8a. Organism comes in two forms: it either has forewings that are leathery at the base (part closest to body) which form an "X" on its back, a long piercing, sucking mouthpart (that begins at the top of its head), 1 pair of antennae that are highly variable in size, and ranges in size from 2 to 60mm **OR** it has wings that may have a partial leathery covering cover that are held rooflike over the body, a short piercing mouthpart begins at the bottom of the head, 1 pair of antennae that are highly variable in size, and ranges in size from 2 to 60mm (see Figure 7)..... .....**Hemiptera** (true bugs)

8b. Organism has forewings that form a hard shell-like covering and meet in a straight line down the middle of the back (if you lift these "wings" you will see the hind wings that it flies with underneath); 1 pair of antennae that are highly variable in size, shape, and length; its size ranges from 0.25 to 200mm (see Figure 8)..... .....**Coleoptera** (beetles**)**

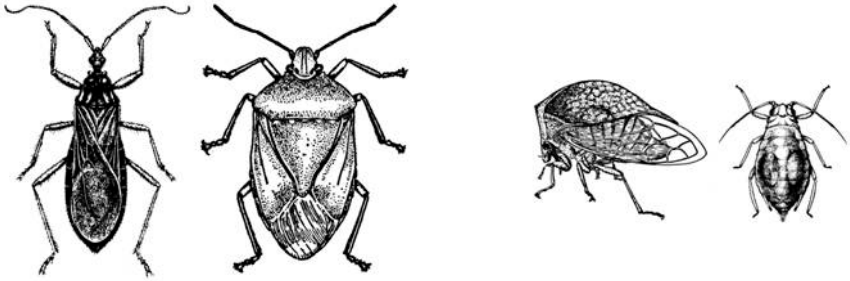


Figure 7.

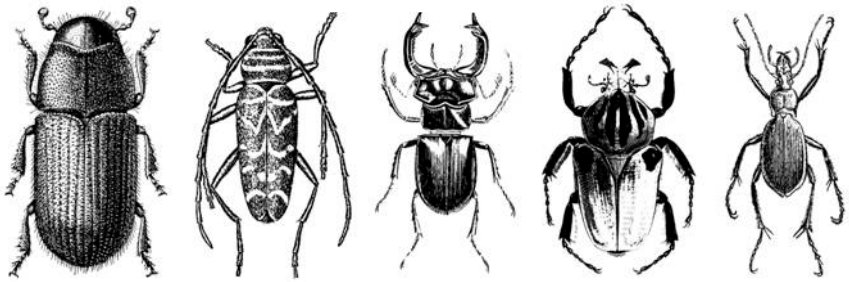


Figure 8.

Shannon Index (H) = $-\sum_{i=1}^{s} p_i \ln p_i$ Simpson Index (D) = $\frac{1}{\sum_{i=1}^{s} p_i^2}$

Sample Area #1:

order	**description**	**number of individuals (n)**	**n/N**	**p_i**	**p_i^2**	**ln p_i**	**p_i ln p_i**
Hymenoptera	yellow and black stripes and a skinny abdomen						

s (number of species) =

N (total number of individuals) =

Σ (sum) of $\mathbf{p_i^2}$ $(n/N)^2$ =

Σ (sum) of $\mathbf{p_i \ln p_i}$ =

Shannon Index =

Simpson Index =

Shannon Index (H) = $-\sum_{i=1}^{s} p_i \ln p_i$ Simpson Index (D) = $\frac{1}{\sum_{i=1}^{s} p_i^2}$

Sample Area #2:

order	**description**	**number of individuals (n)**	**n/N**	**p_i**	**p_i^2**	**ln p_i**	**p_i ln p_i**
Hymenoptera	yellow and black stripes and a skinny abdomen						

s (number of species) =

N (total number of individuals) =

Σ (sum) of $\mathbf{p_i^2}$ $(n/N)^2$ =

Σ (sum) of $\mathbf{p_i \ln p_i}$ =

Shannon Index =

Simpson Index =

Calculating Community Similarity

$$\text{Sorenson's Coefficient (CC)} = \frac{2C}{S1 + S2}$$

Where C is the number of species the two communities have in common, S1 is the total number of species found in community 1, and S2 is the total number of species found in community 2.

Species in Area 1	Species in Area 2

Total number of species found in Area 1:

Total number of species found in Area 2:

Total number of species they have in common:

Sorenson's Coefficient:

Questions to answer:

1) How does the biodiversity of the two areas compare?

2) Was this what you expected? Why or why not?

3) Are there similarities in biodiversity between the two types of ecosystems?

4) Was this what you expected? Why or why not?

5) How similar are the communities that you sampled?