**Great Smoky Mountains National Park - The Five Star Restaurant for Ants**

**(Let's Explore the Ant Diversity in Your Schoolyard!)**

by Kitty Esco Office of Academic Special Programs University of Georgia

Ant communities are one of the most prevalent insect communities in the United States and in the world. There are more than 4,500 described species that are found in temperate and tropical areas around the world. In the Amazon there are more ants in the total of the biomass in its rain forest than all other vertebrates combined. Ants are members of the family of social insects (Formicidae order Hymenoptera) which live in organized colonies. These colonies consist of wingless, infertile females who are workers, soldiers, foragers and brood-tenders. The fertilized winged female becomes the queen of the colony (the reproductive "mother"). The males are the breeders of the colony and die after mating.

Ant colonies live in nests in various habitats. Mounds and underground nests, under stones, on the ground, on tree twigs and trunks, and in dead trees are different places where ants are found (also on picnic tables!). The food sources for ants vary for the habitat they are found and in the environment which they have adapted. Grass seeds; nectar, pollen, berries and seeds of herbs, shrubs and vines; termites; liquid from aphids; other small insects; and body parts of large insects are examples of the food sources for ants. The habitats where the food sources are obtained may become altered due to environmental disturbances. Disturbance can occur in various natural and nonnatural (human induced) ways. Natural disturbances can be caused by flooding, tornados, wind storms and hurricanes. Examples of human disturbance are from invasive/nonnative species like kudzu, privet, fire ants, zebra mussels, gypsy moths, and Japanese beetles.

**ANT DIVERSITY LAB**

**Lesson 1:**

In this lab, we are going to take a look at the diversity of ant communities in your schoolyard and observe why and how these ants are surviving in this area. Was there human or natural disturbance which caused the ants to survive there and/or are they natural insects native to that location? The more questions that are asked, the more fun you will have being scientists and obselving the ant colonies to come up with the answers. **Step 1** - Preparing the students (and yourself!) for the lab: 1. Get the students to count off into small groups. Before they do the experiment, ask them to come up with predictions on what they think will happen: -There will be more ants in the shade than in the sun. (vice versa) -There will be a variety of ants or there will be only one species of an ant.

2. Define a hypothesis to go along with their predictions: Ex: If there is more sun in the grassy area, then there will be more ants in the grassy area than in the forest. Discuss different sampling techniques - random sampling, using quadrants etc. Talk afterwards as to what may have been problems with the experiment - what would affect the results differently - what could be done next time to make the experiment better.

3. Define a Hypothesis to go along with their predictions: Ex: If there is more sun in the grassy area, then there will be more ants in the grassy area than in the forest.

4. Discuss different sampling techniques- random sampling, using quadrants etc.

5. Talk afterwards as to what may have been problems with the experiment- what would affect the results differently? What could have been done next time to make the experiment better?

6. Give the students "research scientist" assignments: -Data recorder (records all the information: where the experiment is being done, what time, who is doing it, and then the actual data - how many ants are collected at each site) -Experimental setup team (fill plastic vials with sugar solution, dig holes and place plastic vials flush to ground surfaces, place small pieces of vienna sausages in vials, soak cotton balls with sugar solution) -Cotton ball sampler (watch the cotton ball for ants for 30 minutes; use the tweezers to gather the ants as they cross the cotton ball and place in the collection jar filled with 70% alcohol.

7. Send the students to their designated collection site (sun or shade) and place each sample in random spots within the site. Perform the experiment for 30 minutes and gather data and collect materials to take back to the classroom.

8. Analyze the data and discuss the results and conclusions as a classroom group. Possibly draw a chart on the chalkboard with example entries as the following, and allow the team data recorder to fill in the blanks with the number of ants found for their Team at that specific site:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Student Groups** | **Forested Area (shade sausage)(** | **Forested Area (shade sugar solution)** | **Grassy Area (sunny sausage)** | **Hilly Area (sausage)** | **Hilly Area (sugar)** | **Flat Area (sausage)** | **Flat Area (sugar)** |
| **team #1** |  |  |  |  |  |  |  |
| **team #2** |  |  |  |  |  |  |  |
| **team #3** |  |  |  |  |  |  |  |
| **team #4** |  |  |  |  |  |  |  |
| **team #5** |  |  |  |  |  |  |  |
| **team #6** |  |  |  |  |  |  |  |
| **Total Ants Found:** |  |  |  |  |  |  |  |

9. Observe specimens under microscopes. Allow the students to ask further questions about the ants structure and anatomy. Have insect reference books and keys available in the classroom or take a trip to the library and have the students do library research on their questions about ants and have them to key out the species of ants found in their schoolyard.

**Step 2** - Time to get dirty! (Performing the lab): Ouestion 1: - How many species of ants can you find? Four techniques can be used to assess the number of species found in your schoolyard: 1. Pitfall Traps

 Materials needed:

-vials(size: number: ) -vienna sausages (or tuna fish) -sugar/water solution (50% sugar/50% water; you want a saturated sugar solution) -forceps -white cap plastic vials -isopropyl alcohol -labels -data sheet (log ID) -bar codes

 Methods used:

-fill half the vials with sugar solution and half the vials with chopped vienna sausages -fill the sealable plastic vials with isopropyl alcohol -dig small holes (the size of the vials) in the ground in the chosen comparable areas (forest, grass, hill, flat) and drop the vials in the holes so the lip of the vial is flush to the surface of the ground -allow the student teams to observe each of the testing sights and instruct the data recorder to chart the number of ants seen entering the baited vials -the students then should collect the counted ants and place them in the sealable vials filled with isopropyl alcohol

2. Baited Traps

 Matelials needed:

-cotton swabs -sugar/water solution ( % sugar; % water) -paper plates (or large index cards) -jam/jelly (or honey) -forceps -white cap plastic vials -isopropyl alcohol -labels -data sheet (log ID) -bar codes

 Methods used:

-soak the cotton swabs in the sugar solution and place the samples in the chosen comparable areas (forest, grass, hill, flat) -spread the jam/jelly/honey on the paper plates/large index cards and place the samples in the chosen comparable areas (forest, grass, hill, flat) -allow the student teams to observe each of the testing sights and instruct the data recorder to chart the number of ants seen on the cotton swabs and the number of ants that cross the paper plate/large index card baited areas -the students then should collect the counted ants and place them in the sealable vials filled with isopropyl alcohol

3. Search and Peck

 Materials needed:

-forceps -sealable containers -isopropyl alcohol

 Methods used:

-walk through the schoolyard and search for ants on the ground, trees, garbage bins, etc. and collect them with forceps and place in the sealable containers

4. Moving sticks, acorns, dead logs, rocks - Be careful with this method. It can be disruptive to the environment.

 Materials needed:

-forceps -sealable containers -isopropyl alcohol

 Methods used: -walk through the schoolyard and search for ants by moving sticks, dead logs, rocks, looking on acorns, etc. and placing the objects back in the place where they were moved from. This activity can be disruptive to the surrounding habitat and small ecosystems that exist in that obselved area, so tell the kids to be careful ! (and watch out for other critters they may f1nd too)

**Lesson 2:**

**Step 3** - Designing a web page of your schoolyard adventures: Now it's time to share your findings from your schoolyard with other teachers and students around the world !

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