Species Diversity Lab

The diversity of species present in an ecosystem can be used as one gauge of the health of an ecosystem. Species richness is a measure of the number of different species present in an ecosystem, while species evenness measures the relative abundance of the various populations present in an ecosystem. In an ecological survey designed to measure species diversity, a wildlife biologist might determine the number of individuals of each species present in an area, then calculate a "diversity index" for the area. Comparison of the diversity index with that of other areas provides insights into the species diversity and the health of the ecosystem.

In this activity your "ecosystem" will be the school parking lot, and the "species" will be the different car models and colors. As a class, we will be comparing the species diversity of the student and staff parking lots. The diversity index we will use is the Shannon Diversity Index. After determining the number of each species (car), in each parking lot, the Shannon Diversity Index will be calculated separately for the student lot and the staff lot. A rich ecosystem with high species diversity has a large value for the Shannon Diversity Index (H'), while an ecosystem with little diversity has a low H'.

$$p_i = \frac{n_i}{N} \qquad \text{(equation 1)}$$

$$H' = -\sum_{i=1}^{S} p_i (\ln (p_i)) \qquad \text{(equation 2)}$$

n_i = number of individuals of species "i"
N = total number of individuals of all species
p_i = relative abundance of species "i" (see equation 1)
S = total number of species
H' = The Shannon Diversity Index (see equation 2)

Materials

- ☐ 2 parking lots full of cars

Procedure

1. Prepare a data table. There must be enough space for 20 "species".
2. Visit the school's parking lot and collect data as directed in class.

Sample Data Table

- Use an entire page in your lab notebook for your data table. There must be enough space for 20 species
- Leave space to write in either <car model or color> and <student or staff>. This will be determined on the day the lab is performed.

Sample **Table 1: Data collected for <car model or color> in the <student or staff> parking lot**

Species	i	n_i	p_i	$\ln (p_i)$	$p_i (\ln (p_i))$
	1				
	2				
	3				
	4				
	5				
	•				
	•				
	•				
	•				
	•				
	•				
	•				
	•				
totals	—				

Your data table may be longer than this sample. Use an entire page of your lab notebook for each data table.

Prelab Questions—Write out and answer the following questions

1. Use two data tables similar to those that will be used for the lab to record and calculate the Shannon Diversity Index for each of the two diagrams in Figure 7.4 of the textbook (page 123).
2. Identify which parking lot you expect to be the most diverse, and defend your choice.

Data Analysis

1. Make sure you get the data table from the other people in your group so that you have a data table for the student lot AND the teacher lot in your lab notebook. Make sure it is clear which lot YOU took data on.
2. Determine the value for the Shannon Diversity Index for the data collected by your group. Show all of your work.
3. Tabulate the values calculated by each group for the Shannon Diversity Index.
4. Compare the values for the Shannon Diversity Index.

Postlab Questions—Write out and answer the following questions

1. Identify the parking lot that was the most diverse. Based on your observations during the lab, explain why your prediction in question #1 of the prelab was supported or not supported.
2. List the single most abundant species in each set of data, and write a plausible explanation to explain why these are the most abundant species.
3. Determine the maximum and minimum values for the Shannon Diversity Index in the parking lot you surveyed.
4. If you conducted this lab in a shopping mall parking lot, predict whether the Shannon Diversity Index would be high or low, and how it would compare to the school parking lots.
5. If you conducted this lab at a new car dealership, predict whether the Shannon Diversity Index would be high or low, and how it would compare to the school parking lots.

Suggestions for Further Investigation:

What changes would you make to this lab to advance your studies on this subject matter?

Sample Species Diversity Lab Grade Sheet

_____/10 Table of contents updated

_____/20 Data Table for each lot

_____/10 Materials & Procedures Included

_____/10 Diversity Index tabulated

_____/60 Prelab Questions

_____/50 Postlab Questions

_____/30 Data tabulated/calculated

_____/10 Suggestions

_____/200 Total

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