



Learning Set 4

Investigating Local Biodiversity

Overview

The terms richness, abundance, and biodiversity are first introduced using animal photos and a student worksheet. Students then use their schoolyard data to further explore these terms and determine which zones in their schoolyard have the greatest biodiversity.

Lessons

Lesson 1: How Can We Measure Animal Biodiversity?

This lesson introduces students to the terms: animal abundance, animal richness, and biodiversity. First students examine a diagram showing the difference between animal abundance and animal richness. Following this, they examine three photos that depict different levels of animal abundance and animal richness. They are asked to rank these photos and finally have a team discussion regarding how abundance and richness can be combined to determine biodiversity.

Lesson 2: Which Schoolyard Zone has the Greatest Biodiversity?

Using the Schoolyard Habitat Map and CyberTracker Zone Summary Table, students will examine why different parts of their schoolyard have higher/lower amounts of animal richness/abundance and ultimately determine which zone is the most biodiverse.



Learning Set 4

Investigating Local Biodiversity



Before You Begin Learning Set 4

Lesson 1

- ☐ Read the *To The Teacher* section for Lesson 1 and reference section 7 entitled *Animal Biodiversity*.
- ☐ In the teacher packet, find the richness/abundance animal photos. You will need one photo sheet per team.

Lesson 2

- ☐ Read the *To The Teacher* section for Lesson 2.
- ☐ Prepare one copy of your schoolyard data in the form of a CyberTracker Zone Summary for each team. This table is computer generated after you sync the palms and upload the data, but is different from the CyberTracker Habitat Summary Table.
- ☐ Make sure students have a copy of the Schoolyard Habitat Map for reference.



Lesson 1: How Can We Measure Animal Biodiversity?

To the teacher:

Lesson 1 Overview:

Students first learn about the concepts of richness and abundance using pictures of trees on the worksheet. Animal photos provided by BioKIDS are then used to further practice these concepts and discuss how richness and abundance can be combined to measure the biodiversity of an area. Reference section number seven, entitled *Animal Biodiversity*, provides additional information for the teacher on these concepts.

1. Richness and Abundance

In this lesson students will first examine abundance and richness concepts separately, using pictures of trees on the worksheets. Help students to distinguish these two aspects of biodiversity. The first two “trees” show high and low abundance of ants. The second two “trees” depict two levels of richness.

2. Biodiversity

After students become familiar with the two concepts, have them examine three pictures provided by BioKIDS (all three photos are on one sheet). First, have them rank the pictures in terms of abundance and richness separately. The worksheet (*Abundance and Richness Photo Comparison*) asks students why they rank the pictures in a particular order. Students will then decide which picture shows the highest biodiversity. Discuss with the students why taken by itself each aspect (abundance and richness) gives us an incomplete notion of biodiversity, but together they are very informative.

Driving Question

How can we measure animal biodiversity?

Learning Goals

Content

- Students learn about the concepts of richness, abundance, and biodiversity.

Inquiry

- Students use appropriate tools and techniques to analyze and interpret data.
- Students formulate explanations from evidence.

Time

1 class period

Materials

- One set of richness and abundance photos per team, found in the teacher supply tote bag.



Lesson 1:

How Can We Measure Animal Biodiversity?

Name: _____ Team Name: _____

Measuring animal abundance and animal richness allows scientists to compare the biodiversity of different areas.

Animal Abundance The total number of animals in an area.

For example: If you have 3 blue jays and 10 worms in your yard (13 animals total), and 2 blue jays and 2 worms in your neighbor's yard (4 animals total), your yard has a higher abundance of animals.

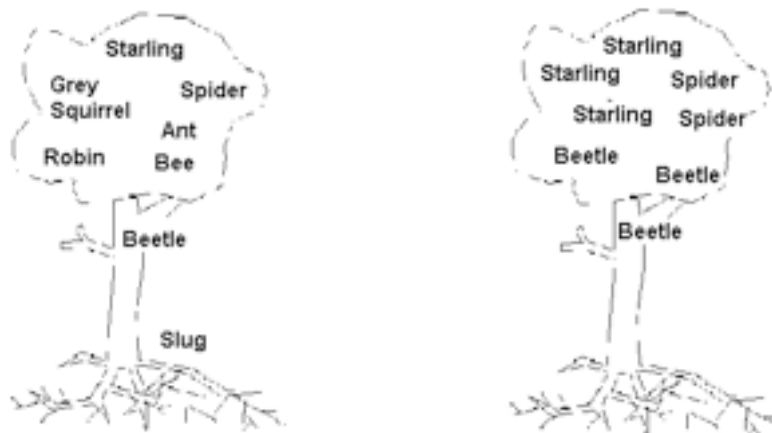
Circle the drawing that has the higher animal abundance.



Animal Richness The number of kinds of animals in an area.

For example: If you have 3 rabbits, 1 butterfly, and 1 sparrow in your yard (3 different kinds of animals), and 1 rabbit and 100 ants in your neighbor's yard (2 different kinds of animals), your yard has a higher richness of animals.

Circle the drawing that has the higher animal richness.





Abundance and Richness Photo Comparison 1

Name: _____ Team Name: _____

1. Photos A, B, and C each show a community of animals. Examine the **abundance** of animals in each photo and complete the sentences below:

I think that photo _____ *C* _____ has the **highest abundance** because ...

There are more animals in this photos than in the other two.

I think that photo _____ *B* _____ has the **lowest abundance** because ...

Photo B only has three animals, and the other photos have more.

2. Examine the **richness** of animals in each photo and complete the sentences below:

I think that photo _____ *A* _____ has the **highest richness** because ...

It has at least three different species, and the other photos have less.

I think that photo _____ *C* _____ has the **lowest richness** because ...

It only has one species.



Abundance and Richness Photo Comparison 2

Name: _____ Team Name: _____

Biologists use abundance and richness as two measures of the biodiversity of a region.

Biodiversity: An area is considered biodiverse if it has BOTH a high abundance of animals AND a high richness of animals.

Examine three photos labeled A, B or C.

Scientific question: Which photo shows the highest biodiversity? *What is the main science concept covered in this question? Sample: Biodiversity – an area is considered biodiverse if it has both a high abundance and a high richness of animals.*

Scientific Explanation:

Claim: There is only one correct claim to this question.

Sample:

Photo A has the most biodiversity.

Hint:

A claim is a complete sentence that answers the question.

Evidence: Since biodiversity is a measure of both abundance AND richness, students should use the abundance and richness of each photo as evidence. ALSO, since the question is asking students to compare between photos, students must show that photo A is high in both, compared to the other photos.

Sample:

#1 – Photo A has 4 different kinds of animals, photo B has 3, and photo C only has 1 kind of animal.

#2 – Photo A has more animals than photo B and photo C has the most animals.

Hint:

Evidence is observations, data, or information that support the claim. Explanations need two or more pieces of evidence.

Reasoning: Here students need to explain that since biodiversity is a measure of richness AND abundance, you must look at both to determine which photo is the most biodiverse compared to the other photos.

Sample:

Photo A has both high richness and high abundance.

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence: Therefore,

Here, students should reassert their claim.

Sample:

Therefore, photo A has the most biodiversity.

Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!

Photo A has the most biodiversity. An area is considered biodiverse if it has BOTH a high abundance of animals and a high richness of animals. Photo A has 4 different kinds of animals, photo B has 3, and photo C only has 1. Photo A has dozens of animals and photo C has the most. Photo A has both high richness and high abundance. Therefore, photo A has the most biodiversity.



Lesson 2:

Which Schoolyard Zone has the Greatest Biodiversity?

To the teacher:

Lesson 2 Overview:

This lesson looks at the schoolyard data with respect to richness, abundance, and biodiversity of animals. Students will make bar graphs of the zone richness and abundance data. Using the graphs, students will determine which areas of the schoolyard possess high richness, abundance, and ultimately biodiversity, and justify their answers.

1. Richness and Abundance

During this lesson students will apply their knowledge about abundance and richness to the animal data the class has collected and think about what features in each zone support animals living there. Students first make bar graphs of their data followed by using this data to support their claims.

2. Biodiversity

Have the students determine which zone has the highest biodiversity. Determining which zone has the highest biodiversity is subjective, and two zones may have similar abundance and richness values making it a “tie.” Students will think about their conclusions and make suggestions for future investigations.

Driving Question

Which schoolyard zone has the greatest biodiversity?

Learning Goals

Content

- Students use their observations and data to describe the abundance and richness of different kinds of animals in their schoolyard.
- Students examine the concept of biodiversity in the schoolyard using the data they have collected.

Inquiry

- Students use appropriate tools and techniques to analyze and interpret data.
- Students formulate explanations from evidence.

Technology

- Students use technological tools to organize and transform data for analysis.

Time

2 class periods

Materials

- One copy of the CyberTracker Zone Summary Table per team.

Lesson 2:

Which Schoolyard Zone has the Greatest Biodiversity?

Sample CyberTracker Zone Summary Table

Biologists often determine the biodiversity of an area by measuring the animal richness and abundance. You will now analyze the schoolyard data that you collected to determine which schoolyard zone has the highest biodiversity.

A summary table is a chart that organizes the data so that it is easy to make calculations and see patterns in the data. Your team will get a copy of the CyberTracker Zone Summary Table with data from the whole class. A sample summary table is shown below.

CyberTracker Zone Summary		Zone A	Zone C	Zone E	Micro Habitat	Total
Animal Name						
	Earthworms	2	0	2	- In dirt	4
	Ants	2	229	75	- On something hard - On grass	306
	Other insects	0	0	2	- On grass - Other microhabitat	2
	Unknown beetle	0	3	0	- On plant	3
	Unknown insect	0	2	0	- On dirt	2
	Other leggy inverteb	1	0	0	- In dirt	1
	American robin	6	1	3	- On tree - In the sky	10
	Black tern	200	0	0	- On plant - On something hard	200
	House sparrow	0	0	1	- On tree	1
	Mourning dove	3	0	0	- On tree	3
	Unknown bird	7	5	2	- On tree - In the sky	14
	other birds	0	1	2	- In water - On grass	3
	E. fox squirrel	1	1	0	- On something hard	2
	Human	10	21	1	- On grass - On something hard - Other microhabitat	32
	Other mammal	3	0	16	- Other microhabitat - On something hard	19
	Red squirrel	2	0	0	- On tree	2
Number of Animals (Abundance)		237	263	104		604
Number of Kinds of Animals (Richness)		11	8	9		16



Biodiversity Data Sheet 1

Name: _____ Team Name: _____

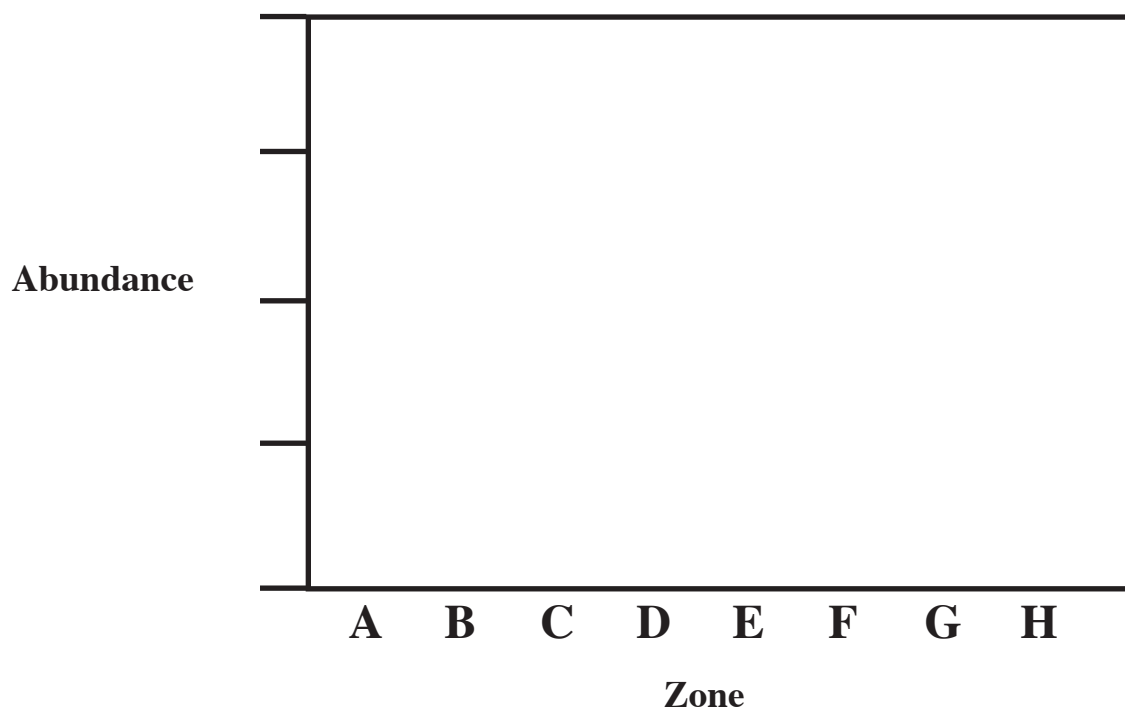
After biologists have collected data, they look at it closely to make sure they don't have any obvious errors. These are called “outliers.” **An outlier is a questionable data point, one that is bigger or smaller than would be expected.**

1. Look at the CyberTracker Zone Summary Table. Circle any possible outliers on the summary table. Discuss as a whole class to determine whether they are errors or not.
2. As a team, fill in the abundance and richness data for each zone below (your class may not have this many zones):

	Abundance	Richness
Zone A	237	11
Zone B		
Zone C	263	8
Zone D		
Zone E	104	9
Zone F		
Zone G		

Biodiversity Data Sheet 2

3. As a team, make a bar graph of the abundance data below.



Result: According to the graph above, zone C has the highest abundance.

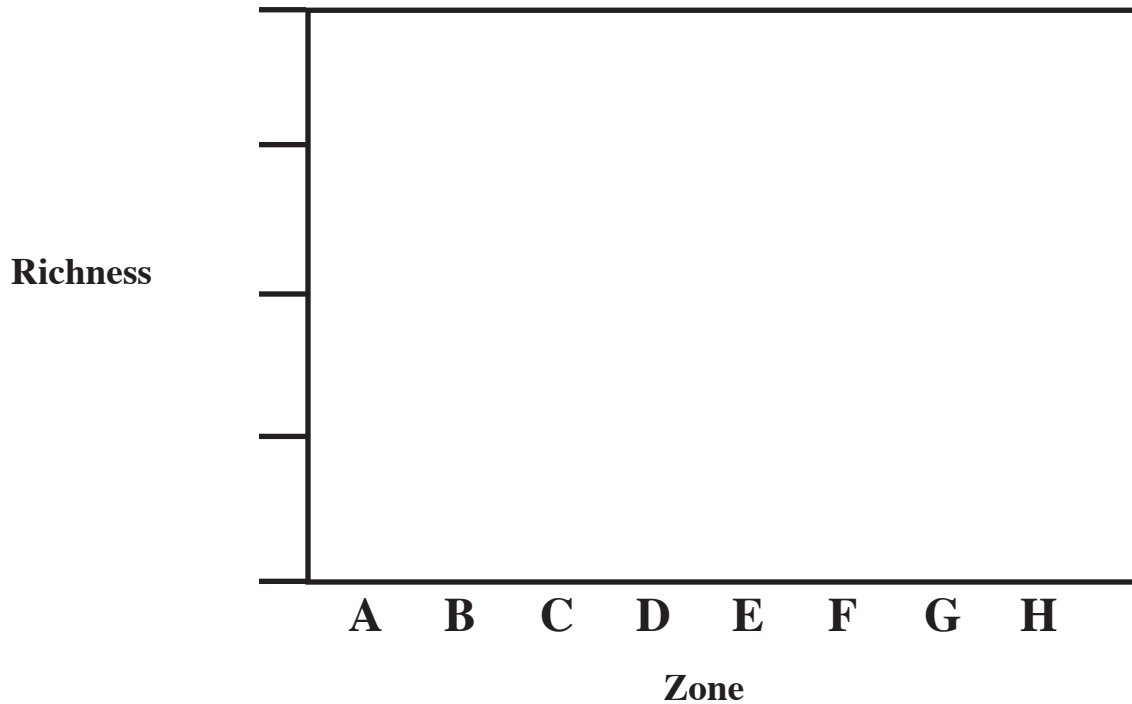
Name two characteristics of the zone that attracted the large number of animals.

(1) *Zone C has a lot of dirt with no plants on top that the ants like.*

(2) *Zone C has the most trees.*

Biodiversity Data Sheet 3

4. As a team, make a bar graph of the richness data below.



Result: According to the graph above, zone A has the highest richness.

Name two characteristics of the zone that attracted a large number of different kinds of animals.

(1) *Zone A has many different ground covers. Each type of animals then has a place to live.*

(2) *Zone A has a lot of hiding places for invertebrates.*



Biodiversity Data Sheet 4

Name: _____ Team Name: _____

5. Looking at the two results you obtained from the data analysis, discuss as a class which zone in your schoolyard has the highest biodiversity.

Example scientific question:

Which zone in the schoolyard has the highest biodiversity?

← **What is the main science concept covered in this question?** *Sample: Biodiversity – an area is considered biodiverse if it has both a high abundance and a high richness of animals.*

Scientific Explanation:

Claim: The correct claim will depend on your class data. Whichever zone has both high abundance AND high richness should be considered the highest in biodiversity.

Sample:

Zone B has the highest biodiversity.

Hint:

A claim is a complete sentence that answers the question.

Evidence: Here students should the richness and abundance values of the zones as evidence. Since it is a comparison between zones, students should probably provide numbers for all relevant zones.

Sample:

#1 – Zone B has the highest richness (9), zone A and C richness are 4 and 3.

#2 – Zone B has a high abundance (56) even though zone A abundance is 62, and zone C abundance is 20.

Hint:

*Evidence is observations, data, or information that support the claim. Explanations need **two** or more pieces of evidence.*

Reasoning: Here students need to explain that since biodiversity is a measure of richness AND abundance, you must look at both to determine which photo is the most biodiverse compared to the other zones.

Sample:

Compared to the other zones, zone B has both high richness and high abundance.

Hint:

Reasoning tells why your particular evidence supports your claim.

Concluding Sentence: Therefore,

Here, students should reassert their claim.

Sample:

Therefore, zone B has the highest biodiversity.

Hint:

Restate your claim in the Concluding Sentence.

Put it all together in a paragraph!

Zone B has the highest biodiversity. An area with both high abundance and high richness is considered biodiverse if it has both high abundance and high richness of animals. Zone B has the highest richness (9), zone A and C richness are 4 and 3. Zone B has a high abundance (56) even though zone A abundance is 62, and zone C abundance is 20. Compared to the other zones, zone B has both high richness and high abundance. Therefore, Zone B would be considered the zone with the highest biodiversity.

Biodiversity Data Sheet 5

7. Using your knowledge about animal needs, your schoolyard habitat and schoolyard animal biodiversity, give three suggestions for changes to your schoolyard to improve the animal biodiversity.

(1)

(2)

(3)
