



Analyzing Data on Tuskless Elephants

OVERVIEW

This data-driven activity accompanies the BioInteractive Scientists at Work video [Selection for Tuskless Elephants](#). By watching segments of this video, students will follow the analyses and discoveries of Joyce Poole, a scientist who has studied elephants for many years. Students will then analyze data to investigate the impact of human activity, namely poaching, on elephant populations.

Additional information related to pedagogy and implementation can be found on [this resource's webpage](#), including suggested audience, estimated time, and curriculum connections.

KEY CONCEPTS

- Human activities influence the abundance and distribution of living organisms, as well the selective pressures on these organisms.
- Selection can shift the distribution of traits in a population. This is because organisms with an inherited trait that is advantageous in a particular environment tend to increase in proportion relative to organisms lacking this trait.
- Thorough scientific research requires the analysis of relevant variables and the careful, thoughtful interpretation of results.
- Proposing a claim to answer a scientific research question requires the systematic analysis of relevant data.

STUDENT LEARNING TARGETS

- Analyze quantitative data in order to make predictions based on evidence.
- Use evidence-based predictions to explain how a population changes over time due to human impacts.
- Explain how the selective pressures on a population may impact the frequencies of phenotypes.
- Propose a claim supported by scientific evidence to answer a research question.
- Determine whether scientific results confirm or contradict a hypothesis.
- Provide evidence-based reasoning that uses available data to support a scientific claim.

PRIOR KNOWLEDGE

Students should be:

- familiar with the concepts of adaptation, populations, ecosystems, and selection
- comfortable using data tables to organize and analyze information
- able to use calculators for simple calculations, including percentages (optional)

MATERIALS

- copies of the “Student Handout”
- [Selection for Tuskless Elephants](#) video
- calculator (optional)

TEACHING TIPS

- For each video segment, students should make their predictions individually. Afterward, have students form pairs or groups to share their predictions and discuss their ideas before continuing the activity.

- It is recommended that students watch the video segments in class and not as assigned homework. This will ensure that students are not watching more of the video than they should at each interval.
- It is recommended to print and distribute Parts 1 and 2 separately from Part 3, so that students do not read ahead.
- The extension at the end of the “Student Handout” may be assigned as homework.

ANSWER KEY

PART 1: Examining Data

1. How did the total number of elephants that were illegally killed change from 2007 to 2013?
It increased from 4 to 43.
2. In general, did most of the elephants that were illegally killed have tusks, or were they naturally tuskless?
Most had tusks.
3. Calculate the total number of elephants that appear to have been illegally killed between 2007 and 2013 for:
 - a. only their meat **19**
 - b. only their tusks **75**
 - c. both their meat and tusks **27**
4. Calculate the percentages of the illegally killed elephants between 2007 and 2013 represented by each group of elephants in Question 3. Show your work.
 - a. percentage of elephants killed **only** for their meat
 $19/129 = 14.7\%$
 - b. percentage of elephants killed **only** for their tusks
 $75/129 = 58.1\%$
 - c. percentage of elephants killed for **both** their tusks and meat
 $27/129 = 20.9\%$
5. Use the evidence above to make a claim about the **main reason elephants were illegally killed** in this region.
The highest percentage of killed elephants were killed only for their tusks. So the main reason that these elephants were illegally killed was probably so that people could take their tusks (for ivory).
6. Suggest some ways to reduce the number of elephants that are illegally killed each year.
Answers may vary.

PART 2: Video Activity

7. Watch the [Selection for Tuskless Elephants](#) video until time 1:46 and answer the following questions.
 - a. What did Joyce Poole observe about the elephant population in Gorongosa National Park in Mozambique?
Some of the elephants in Gorongosa National Park were tuskless.
 - b. What happened in Mozambique from 1977 to 1992?
There was a civil war.
 - c. How were the elephants in Gorongosa National Park affected by this event?
Poaching increased because soldiers hunted elephants for their tusks (ivory).
8. Resume watching the video until time 4:03 and answer the following questions:

- a. Select all the descriptions that apply to the trait of “tusklessness.”
- occurs naturally in elephant populations
 - does not occur in nature
 - is common among most elephants
 - is more prevalent in males than females
 - is more prevalent in females than males
 - is inherited
- b. Poole says that there is strong selective pressure for male elephants to have tusks. Explain what that means.
- Males need tusks to fight other males for females (intrasexual competition). Without tusks, males are less likely to survive these fights and reproduce. So there is stronger selective pressure for males to have tusks than for females to have tusks.***
9. Resume watching the video until time 4:29, right after you reach the graph below.
- a. Describe what the bar on the left is showing.
- The bar on the left is showing the percentage of tuskless females of all ages in populations with less poaching.***
- b. Describe what the bar on the right is showing.
- The bar on the right is showing the percentage of tuskless females that are at least 20 years of age in Gorongosa National Park, a population with heavy poaching.***
- c. Explain why the bar on the right is much higher than the bar on the left.
- The population shown on the right suffered a higher level of poaching. Poachers killed many of the elephants with tusks and thus selected for tuskless elephants.***
10. The civil war in Mozambique ended in 1992. Based on the data above, predict whether the percentage of tuskless females born after the civil war was:
- a. more or less than the percentage of tuskless females that were civil war survivors (bar on the right)
- Students may predict that this percentage decreased, increased, or stayed the same.***
- b. more or less than the percentage of tuskless females in populations with less poaching (bar on the left)
- Students may predict that this percentage decreased, increased, or stayed the same.***
11. Explain your reasoning for the answers above:
- a. ***Student responses will vary according to their predictions above. Strong responses should cite appropriate evidence that supports their claims and is based on the data provided.***
- b. ***Student responses will vary according to their predictions above. Strong responses should cite appropriate evidence that supports their claims and is based on the data provided.***

PART 3: Continued Analysis

12. Continue watching the video until time 4:56, soon after you reach the graph below.
- a. You made a prediction in Question 10 about tuskless female elephants born after the civil war ended. These elephants would be 10–20 years of age when Poole collected her data. Does the data in the graph above support your prediction? Explain why or why not.
- Student responses will vary according to their previous predictions. Strong responses should cite appropriate evidence that supports their claims and is based on the data provided.***
- b. Why might tusklessness be less common in 10- to 20-year-old elephants than in elephants over 20 years of age?
- Student responses should include the concept of the selective pressure (poaching) being reduced after***

the civil war. Therefore, tusked females were not being selectively removed from the population as they were during the war.

13. Poole noticed a high proportion of tuskless female elephants in Gorongosa. What was the selective pressure that increased the proportion of tuskless females?

Poaching was the selective pressure that reduced the proportion of tusked females, which increased the proportion of tuskless females. Tusklessness is an inherited trait. So the surviving tuskless females produced offspring that were more likely to be tuskless too.

14. No tuskless males have been found in Gorongosa. Why would there be a difference between male and female elephants when it comes to having tusks?

Student responses may be similar to those for Question 8b. They should include the idea that there is strong selection for males that have tusks through competition for mates.

EXTENSION: Claim-Evidence-Reasoning Activity

Complete the "Claim-Evidence-Reasoning" chart below. Cite evidence based on the data above or in the [Selection for Tuskless Elephants](#) video.

Claim: In general, the prevalence of female tuskless elephants is highest in areas with heavy poaching.
Evidence: Answers may vary but should include evidence from data provided. Students may point out that the data mostly support their claim, but there are some inconsistencies (for example, the data in Moremi, Etosha, South Kafue, and North Kafue).
Reasoning: Answers may vary but should include rationale for how the evidence above supports the claim.

You may ask your students to hypothesize why some data (for example, the data from Moremi, Etosha, South Kafue, and North Kafue) do not fit the pattern of other populations. This is a good opportunity to point out that real data is often messy and may be affected by other factors.

REFERENCES

- Nyirenda, Vincent R., Peter A. Lindsey, Edward Phiri, Ian Stevenson, Chansa Chomba, Ngawo Namukonde, Willem J. Myburgh, and Brian K. Reilly. "Trends in illegal killing of African elephants (*Loxodonta africana*) in the Luangwa and Zambezi ecosystems of Zambia." *Environment and Natural Resources Research* 5, 2 (2015): 24–36. <http://dx.doi.org/10.5539/enrr.v5n2p24>.
- Steenkamp, Gerhard, Sam M. Ferreira, and Marthán N. Bester. "Tusklessness and tusk fractures in free-ranging African savanna elephants (*Loxodonta africana*)." *Journal of the South African Veterinary Association* 78, 2 (2007): 75–80. <http://dx.doi.org/10.4102/jsava.v78i2.294>.

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