

Blizzard Bag Lesson #3: Conserving Biodiversity

(Biology – Grade 10)

Objective: Evaluate the impact of low genetic diversity on an endangered species and conservation measures to address the impact



Overview: We have learned about the relationship between low genetic diversity and a species ability to adapt in a changing environment. One of the best known cases of this is in cheetah populations in Africa that experienced a genetic bottleneck as the result of a rebound from very low population numbers.

Directions

- 1.) **Read** the included article and **answer the critical thinking** questions at the end.
- 2.) Visit **either or both** of the following and **write a paragraph summarizing** what you feel are the best methods of conservations to help the cheetah populations recover.

Explore this Website: <http://cheetah.org/about-the-cheetah/genetic-diversity/>

Video: <https://www.youtube.com/watch?v=JEvS07wpD9Q>

How to turn in this assignment:

- 1.) Turn in the answers to the required questions, either typed or neatly written, to your teacher by the due date.
- 2.) If you do not have the ability to print your document from home, you may do so when you return to school and/or you may email the assignment to your teacher.

No Internet Alternative:

If you do not have Internet access at home, see your teacher to arrange a time during your study hall or before or after school to access the materials and complete your response.

Conserving Biodiversity Enrich

Skills: Applying concepts, making predictions

Conservation Conundrum

In the past 20 years, biodiversity preservation has moved to the forefront of conservation efforts. Many people now realize that biodiversity is one of Earth's most valuable natural resources. As a result, conservation biologists all over the world are working to find ways of preventing the extinction of plants and animals. One animal that scientists are trying to save from extinction is the cheetah.

Cheetahs are large cats related to lions, tigers, and leopards. Cheetahs inhabit the open plains of south, central, and eastern Africa and parts of India. Reaching a top speed of 95 kilometers per hour or more when chasing prey, the cheetah is the fastest land animal on Earth. Unfortunately, cheetahs were once hunted for their beautiful fur. The effects of overhunting combined to drive cheetahs to the point of extinction. Fortunately, cheetah hunting was banned and the small cheetah populations that survived have increased in size during the last few decades. Nonetheless, these animals remain an endangered species.

Conservation biologists are concerned that cheetah populations may have lost much of their genetic diversity when cheetah populations reached very low levels. Genetic diversity, the variety of genetic information within a population, is a crucial part of biodiversity. As conservation biologists look for ways to ensure the survival of the cheetah, many of them have begun to believe that preserving genetic diversity may be just as important as preserving habitat.

There are two problems that can result from low genetic diversity among cheetahs or any small population of plants or animals. First, in a small population, the individuals breeding with each other tend to be related. Because there is little genetic variety between related individuals,

the population gene pool is never replenished with different genes. Suppose that one of the genes in the gene pool causes a rare disease. The disease actually becomes less and less rare because there are fewer and fewer different genes in the gene pool. Eventually, the disease becomes very common in the small population.

The second problem caused by low genetic diversity is related to adaptation, which is the ability to respond to change. A population cannot respond well to change when its gene pool becomes less varied. To use a simple example, consider a cornfield that consists of genetically identical corn plants. What happens if the corn is suddenly attacked by a new insect pest?

Because all the plants are identical, none will have genetic resistance to the pest and the entire field will be wiped out. In 1970, farmers learned the importance of genetic diversity when corn leaf blight destroyed entire crops of corn. Biologists worry that something similar could happen to the genetically similar cheetah populations.

A survey of a small cheetah population in southern Africa showed that the cheetahs were virtually genetically identical. In other words, the cheetah population was like a large family of brothers and sisters! Scientists became especially concerned when almost half of a population of captive cheetahs died after an outbreak of a viral disease. The dangers of low genetic diversity seemed obvious.

So is low genetic diversity the greatest threat to the survival of the cheetah? Not necessarily. Some biologists believe that major threats to captive populations may not be as serious in wild populations. For example, a study of wild cheetahs found that only five percent of cubs born during a certain period lived to see their first birthday. However, of the cubs that died

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Conservation Conundrum (continued)

within their first year, only a tiny percentage died as a result of genetic defects. In fact, over 70 percent of the cubs were killed by predators, primarily lions.

As for the inability of populations with low genetic diversity to adapt to changes such as deadly viral diseases, the lethal affects of low genetic diversity were clear in the populations of captive cheetahs. But captive cheetahs live in much closer contact with one another than wild cheetahs. Some scientists suspect that this close contact allows disease to spread much faster among captive animals than among wild animals. In addition, captive cheetahs have no predators. These scientists feel that although low genetic diversity is theoretically harmful, actual wildlife populations of cheetahs are much more affected

by outside factors such as predation. To determine the true effects of low genetic diversity on wild populations, more studies are needed.

CRITICAL THINKING

1. How is genetic diversity important to the long-term health of a population?
(*Applying concepts*)
2. As a cheetah conservation biologist, you must determine which is the greater threat to the survival of the cheetah, low genetic diversity or lion predation. On a separate sheet of paper, design and describe a study to answer this question. (*Making predictions*)