



How do animals behave during a solar eclipse?

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Abstract

When was the last time you were at the zoo? You probably saw lots of animals doing lots of different things there. We wanted to know what zoo animals do when a solar eclipse happens. People have observed animals during solar eclipses before. But these were mostly just casual observations.

We designed a study to observe 17 different types of animals at the zoo. First, we observed their normal behaviors. Then

we recorded what happened during a solar eclipse. We saw that a lot of animals did something that wasn't normal. Most of them started behaving like it was nighttime – in the middle of the day! Some of them even seemed anxious – like the eclipse stressed them out. This helps us understand how complex animal behavior can be.

Introduction

Have you ever seen a **total solar eclipse**? It's what happens when **the moon passes in front of the sun and completely blocks it**. It makes everything dark for a little while (Figure 1). Chances are you haven't seen one. They happen in different places every few years. But they only occur in the same place on the Earth about once every 375 years.

Scientists really like solar eclipses. They give them a chance to see what animals do during a **novel** event. This helps them better understand how complex animal behavior is.

In the past, there have been some **observations** of animal behavior during solar eclipses. **Animals sometimes show evening behaviors**. They go to their nests or dens when it gets dark. **Other animals seem anxious**. They do things like pace or huddle in groups. Sometimes animals don't react at all. Or they do unexpected things like look at the sky. Unfortunately, many of these observations have just been one person noting what happened with one animal. That doesn't give us a scientific understanding of how animals react to eclipses.

That's why **we wanted to study animal behavior scientifically during a total solar eclipse**. This will help us understand how animals respond to events they have never experienced before.

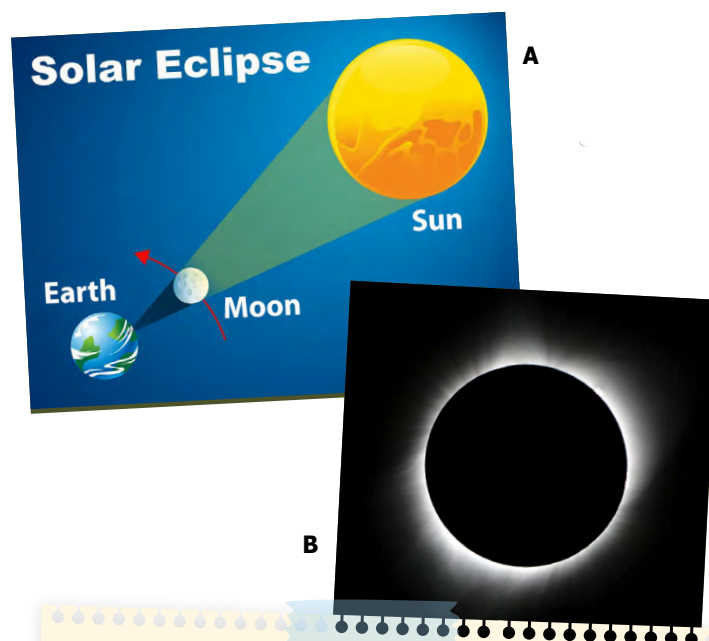


Figure 1. Solar eclipse **A**) A total solar eclipse occurs when the moon passes between the Earth and the sun, blocking out all the sun's light. **B**) Photograph of the total solar eclipse on August 21, 2017, taken in Wyoming, USA. It captures the moment of totality - when the moon completely blocks out the sun. (**Images:** A. NASA. B. Kimon Berlin.)

Methods

We looked at animal behavior at the Riverbanks Zoo and Garden in Columbia, South Carolina. There was a **total solar eclipse** there on August 21, 2017. We did several things to make sure our study was well designed:

1. We trained people to make observations. We made sure they knew the animals and their habitats. We also made sure they watched to see what normal animal behaviors looked like. Each team had researchers, zoo staff, and volunteers making observations.
2. Each team observed one type of animal. We looked at 17 different types of mammals, birds, and reptiles.

3. We made observations in the two days before the eclipse. That's when we recorded what normal behavior looked like. This was our **control** data.

4. Then we made observations during the eclipse. All our observations were **qualitative**. They were based on the behaviors teams saw. We put behaviors into four categories: normal, evening, possible anxiety, and novel.

5. We also made **quantitative** observations of siamangs, a type of gibbon, making **calls**. We recorded them and measured how long the calls were. Then we used statistics to see if they were different during the eclipse.

Results

We found that 13 out of the 17 types of animals acted differently during the eclipse (Figure 2). Most of the animals showed evening behaviors. Some showed possible anxiety. We saw two animals doing novel behaviors.

We also found that siamangs made shorter calls during the eclipse.

What was the most common type of behavior that zoo animals exhibited? The least common?

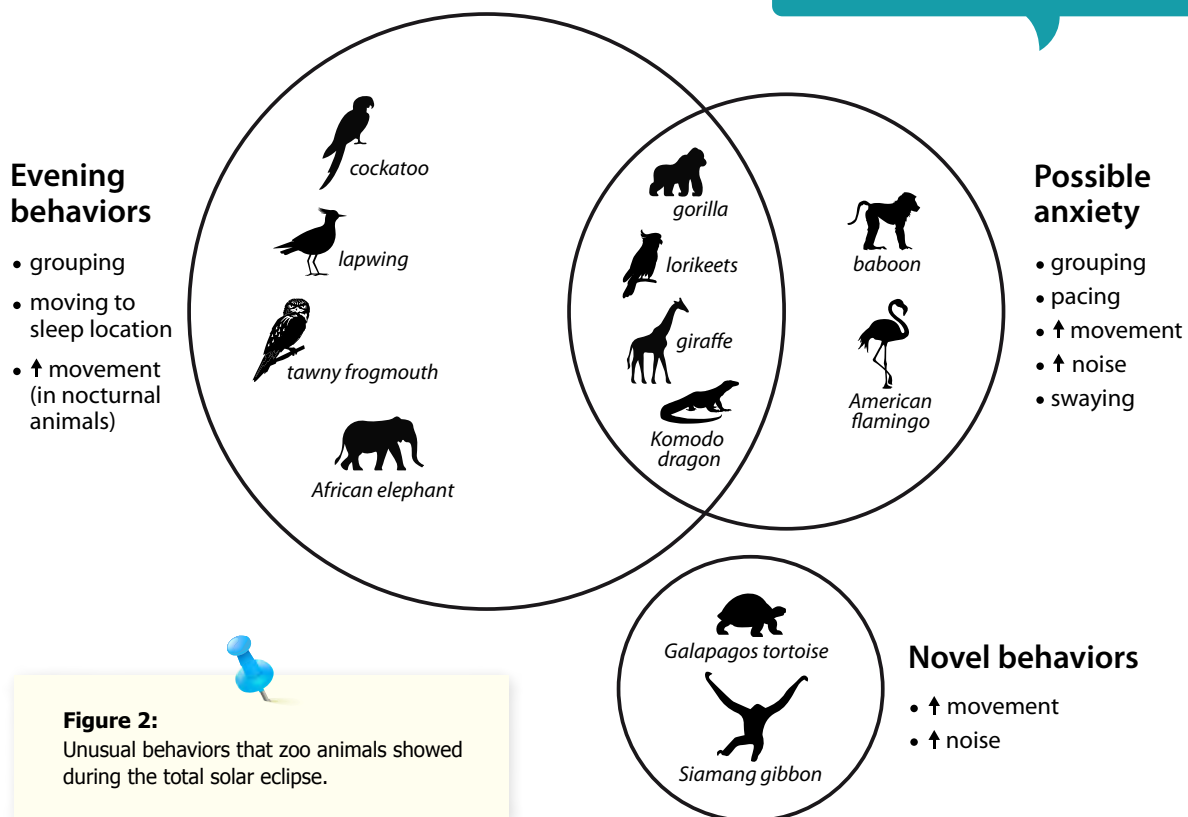


Figure 2: Unusual behaviors that zoo animals showed during the total solar eclipse.

Discussion

Our results match other observations. Many of the zoo animals showed unusual behaviors during the eclipse. Most were related to evening routines. Changes in light can cause evening behaviors. This can disrupt the circadian rhythm of animals, especially when light changes in the middle of the day.

Some animals also acted anxious. For example, Komodo dragons are normally very still and slow. During the eclipse, the Komodo dragon ran to where it sleeps at night.

Zoo animals and wild animals can behave differently. We need to consider these differences when we look at our data.

- Learned behavior: Zoo animals learn that when it gets dark, it is time to go to bed. Evening behaviors might be

learned behavior. Would wild animals do the same?

- Stress: Animals in zoos can get anxious if there are lots of loud people around. The zoo was crowded during the eclipse. To balance that out, we made our control observations on the busiest weekend of the year.

In the future, we would like to study wild and domestic animal behavior. Is it the same as zoo animals? Wild animals see more novel things in life than zoo animals. Domestic animals like dogs and cats might also respond to the eclipse. Or their behavior might be related to their owners' reactions. We want to know if wild or domestic animals respond differently.

Conclusion

Solar eclipses are really cool. If you ever observe one, make sure you **never ever** look straight into the sun with unprotected eyes. They can get really hurt.

Instead, you could look at animals. You can join a citizen science project. Check out all the different projects online

and the links below. You could even collect data during the next solar eclipse for a study like this. Even if you are somewhere where you can only see a partial eclipse. Find out how on [SolarEclipseSafari.org](https://www.solareclipse-safari.org).

Glossary of Key Terms

Calls - the sounds that animals make on purpose. Animals use calls to talk to other animals. Calls can help them attract mates, alert others to danger, or communicate a variety of other things.

Circadian rhythm - the physical, mental, and behavioral changes an animal goes through over a 24-hour cycle. Changes in light, stress, activity, temperature, and eating food can all affect circadian rhythms. For example, people generally feel sleepy if they have to get up in the morning before the sun is out.

Citizen science - research that uses regular people (not scientists) to help collect and analyze data or even perform experiments. Recently the term "participatory science" has been used as well. Anyone can contribute to helping answer science questions!

Control - the "normal" situation that you use to compare to what you're testing in an experiment. It helps you see if your test really makes a difference or if something else might be causing the change. For example, in this experiment, the control was observing animals when there was no eclipse. This was compared to observations during the eclipse.

Novel - new, or something that has never been seen before. Total solar eclipses are novel to animals because they don't happen very often in the same place. The researchers observed novel behaviors from the animals during the eclipse.

Observation - noting information using a person's senses or output from instruments.

Qualitative - a type of observation that relies on description using a person's senses. Qualitative observations include things like color, shape, and descriptions of movement. For example: "The flamingos in the flock are pink."

Quantitative - a type of observation where something is measured and/or counted. Numerical data must be gathered. For example: "There are 7 flamingos in the flock."

Total solar eclipse - a condition when the moon moves in front of the sun and completely blocks all sunlight for a short time. Total solar eclipses happen every few years, but it could be hundreds of years before a total solar eclipse happens in the same place on Earth.

Check your understanding

- 1 Many animals showed multiple types of behaviors during the eclipse. Look at Figure 2. Which animals showed both evening and anxiety behaviors?
- 2 Nocturnal animals sleep during the day and are more active at night. What do you think normal behavior looks like during the day for these animals? What did these animals do during the eclipse?
- 3 Why do you think some animals showed possible anxiety behaviors? (Hint: think about how often they see eclipses)
- 4 What is a control? Why was it so important that we observed animal behavior on days before the eclipse?
- 5 Do some research. When is the next solar eclipse? Where will it happen? Pick an animal that might live in the path of the eclipse. What kinds of behaviors do you think it will show during the eclipse?

REFERENCES

Adam Hartstone-Rose, Edwin Dickinson, Lisa M. Paciulli, Ashley R. Deutsch, Leon Tran, Grace Jones, and Kaitlyn C. Leonard (2020) *Total eclipse of the zoo: animal behavior during a total solar eclipse*. Animals.

<https://ncbi.nlm.nih.gov/pmc/articles/PMC7222787/>

Citizen Science Platforms

<https://www.solareclipsesafari.org/>

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