

SCIENTISTS IN THE FIELD

Where Science
Meets Adventure

DISCUSSION AND ACTIVITY GUIDE

The Hyena Scientist

BY SY MONTGOMERY, PHOTOGRAPHS BY NIC BISHOP

About the Series



The Hyena Scientist is part of the award-winning Scientists in the Field series, which began in 1999. This distinguished and innovative series examines the work of real-life scientists doing actual research. Young readers discover what it is like to be a working scientist, investigate an intriguing research project in action, and gain a wealth of knowledge about fascinating scientific topics. Outstanding writing and stellar photography are features of every book in the series. Reading levels vary, but the books will interest a wide range of readers.



The Hyena Scientist
by Sy Montgomery
Photographs by Nic Bishop
9780544635111

About the Book

The hyena is, perhaps, the most misunderstood animal on the planet, rivaling even snakes, bats, and spiders. However, its slinking, opportunistic reputation does not match the actual facts. Hyenas are essential for the equilibrium of their ecosystem—without them scientists have documented “ecological disaster.” Like any predator, an easy meal scavenging will not be shunned by a hyena. Dr. Kay Holekamp, who has been researching the spotted hyena for more than thirty years, discovered that hyenas are keystone predators who hunt and kill between 60 to 95 percent of their food. She describes them as “unexpectedly brave, smart, and extremely social.” Readers of this book will discover that they have an incredible and amazing social structure as well!

About the Author

While researching some of her many books, Sy Montgomery has been bitten by a vampire bat, hugged by an octopus, hunted by a tiger, and she has crawled into a pit with eighteen thousand snakes! She has written more than twenty books for adults and children and has won many honors, including the Orbis Pictus Award, a Robert F. Sibert Medal, the Henry Bergh Award, and was a National Book Award finalist in nonfiction. Besides writing books, she is a popular speaker, and works with many organizations to preserve and protect nature. Montgomery lives on a farm in New Hampshire with her husband.

About the Photographer

Nic Bishop is the photographer for *The Hyena Scientist* and the author of more than sixty books. Nic holds a PhD in biology from Canterbury University. Nic’s parents were biologists too, and because of their jobs, he grew up in Bangladesh, the Sudan, and Papua New Guinea. He started taking pictures as a child with his sister’s Brownie camera, and he has been photographing animals and the wild, remote places they live ever since. Nic and his wife moved to the United States in 1994.

Houghton Mifflin Harcourt Books for Young Readers

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Pre-reading Activities

Brainstorm with your students ways in which predators (of any sort) are beneficial to our world. Guide the discussion toward making their benefits personal. See if students are able to create cause and effect chains that, say, lower prices, reduce disease, or increase public safety, etc.

Review scientific nomenclature related to animal classification.

Since much of the focus in this book involves changing perceptions, have a discussion on what we risk or what we lose when we only consider first impressions and public perceptions based on gossip. Make a list of words and phrases that people use to stereotype people or animals based on their supposed value as a species. Discuss how this happens.

Have students write down predictions about hyenas. What species are they? What do they eat? Where do they live? Have them add predictions about behaviors, social structure, movement/migration. Update them throughout the reading as you learn new information.

Create a list of different animal social organizations and research them. Is there a single leader? Is there a hierarchy of control? Herds, packs, or solitary individuals? Is there a territory? What happens when there is a threat? In other words, how do decisions seem to be made within this species? Look at all types of animals, including in-sects and other arthropods.

Gender roles in the United States are interpreted in numerous ways throughout our country. However, if we travel to other nations, we find different ways that people are treated based on gender. First brainstorm the range of ways we see gender in this country and then look at nations that have a different cultural customs regarding gender. This pre-reading activity may seem totally unrelated to a book on hyenas until we understand that sometimes our conditioned responses to viewing behavior may interfere with our ability to correctly interpret animal behavior.

Discuss the concept of an outlier. What do outliers teach us about words like “normal” or “predictions”?

Create an annotated list of organisms (plants or animals) with a bad reputation. Include the nature of the reputation and the predicted percentage of the truth of that reputation in the annotations.

If you have a local zoo, have kids visit and choose an animal to make an ethogram (behavior inventory) of.

Discussion Questions

What is the role of science in confronting folklore? Is there a place for the government to intervene when local tradition defies science? Would an environmental plan, for example, that called for the introduction of an animal like a hyena into an area whose population considered them to be dangerous be worth considering? If so, what factors would lead to proposing such a plan? If not, why?

How do we approach people about considering the ecological value of animals like hyenas, bats, wolves, spiders, crows, etc.? If we cannot talk someone out of believing that an organism is a pest, are other incremental goals possible? What would be a worthwhile goal with such a person?

Have you ever panicked in the presence of an animal that you considered to be a threat? What steps did you (or others) take to calm down? Why did you react the way you did? Is there something you/others could have done to keep from panicking?

What do we need to do as a country to make sure that the average citizen has a better understanding of what is involved in an ongoing research project on an animal? What steps would you take to explain to non-science-oriented people of why we would spend so much time researching hyenas?

Applying and Extending Our Knowledge

The book begins with the information that hyenas are more closely related to cats than dogs and even more closely related to the mongoose than to the cat. Teachers should understand that many of the significant

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ways hyenas differ from other animals are related to the female reproductive tract and plan accordingly.

- Prepare an infographic or online presentation that explains to a young student why the classification is true. Then prepare an infographic that shows the student exactly what a mongoose is and why it is not a dog or a hyena.
- Some students may confuse hyenas with jackals or with the wild dogs of Africa. Prepare an explanation detailing why hyenas, especially spotted hyenas, are not jackals. Prepare a presentation that shows young students the differences between spotted hyenas and wild dogs.
- Create a Venn diagram (or similar) to show the ways hyenas, cats, dogs, and mongooses compare and contrast.
- We learn that Hyenidae includes only four species. How do the other three species compare and contrast to the spotted hyena of this book?
- Speculate on how the aardwolf, which only eats termites, really fits in this family. Write a story, song, or poem from the point of view of an aardwolf that wants out of or one that wants membership in Hyenidae. Writing from the perspective of the aardwolf, make an argument for leaving or joining this scientific family. Perhaps prepare a court debate with a judge, jury, and a vote on which side was more convincing.
- Prepare range maps for each of the four Hyenidae species and one that consolidates the information.
- Montgomery gives information on the ways that the scientific team study spotted hyenas, as well as information on basic biology. However, there is much more that cannot be included. Use the Internet to research more information on spotted hyenas. With the help of your librarian or teacher, evaluate the reliability of the sites. Does the information conflict with that provided by Montgomery? How can we determine methods for evaluating which sources are more trustworthy?
- In this book, as in many of the Scientists in the Field books, much of the work consists of watching, dating, collecting, recording, and interpreting. Find an area that students can observe regularly.

Prepare either a class or individual field journal to record information. The American Museum of Natural History has good information about field journals here: www.amnh.org/explore/curriculum-collections/biodiversity-counts/what-is-biodiversity/doing-science-researchers-and-exhibition-staff-talk-about-their-work.-keeping-a-field-journal-1. Make sure students add questions to the end of each entry about something they observe. Generate predictions about what they expect to observe each day and over time.

Common Core Connections

CCSS.ELA-Literacy.RH.6-8.7 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

CCSS.ELA-Literacy.SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

CCSS.ELA-Literacy.W.7.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CCSS.ELA-LITERACY.W.6.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

CCSS.ELA-LITERACY.W.6.1(a-d) Write arguments to support claims with clear reasons and relevant evidence.

CCSS.ELA-Literacy.RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

CCSS.ELA-Literacy.RI Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

On page 2 we read, “hyenas, whose strong jaws can crush bones and whose tough guts can digest them, ate the skeletons of our ancestors. Bad PR goes back a long time in our relationship. ‘Hyenas inspire horror in people,’ wrote Hans Kruuk. ‘Hyenas are inexorably linked with garbage cans, corpses, feces, bad smells, and hideous cackles.’”

- You have been hired by the “Spotted Hyena Bureau” to prepare a campaign attempting to reverse the negative perception of these animals. Your first marketing piece is a pamphlet for the SHB to hand out. Provide an outline of steps that should be taken to reverse the associations with garbage, death, etc.
- Find a copy of Jack Prelutsky’s *Mean Old Mean*

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Hyena. Analyze this book from the perspective of its science. Is there anything correct about the biology, the habitat, the behavior of the hyena (or other animals)? Does the spotted hyena have grounds for a libel suit? Could you prove that the spotted hyena has been damaged?

- Write a story, song, skit, poem, or other work to share with students that presents the truth of spotted hyena culture. If you write a skit or a play, who are the leads? Who directs this play?
- Your own neighborhood probably has at least one sort of despised pest. What pest is found where you live? How is the pest in your neighborhood like the hyena? How is it different?

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CCSS.ELA-Literacy.SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use eye contact, adequate volume, and clear pronunciation.

CCSS.ELA-LITERACY.W.6.1(a-d) Write arguments to support claims with clear reasons and relevant evidence.

CCSS.ELA-Literacy.RI Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.

CCSS.ELA-Literacy.RI Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.

On page 4 we read, “Spotted hyenas are keystone predators who control the health of the ecosystem. ‘Take hyenas out of the picture and all kinds of things would go out of control,’ says Kay. That once happened in South Africa, when farmers decimated hyenas and their fellow predators. The result? Ecological disaster.”

- Montgomery lists herbivore explosions decimating grasslands and turning them to deserts and soil erosion ruining roads and changing river flow. Explain how this process works with graphics, animated videos, or other graphics.
- How does the spotted hyena help maintain the ecosystem? What happens when there is a healthy spotted hyena population and when the population

goes out of control. Are there other factors not mentioned that contribute to either ecological disaster or a balanced ecosystem?

- In your own area, what predators are the keystone predators? Does your region have a balanced predator/prey relationship? Justify your answer.

Common Core Connections

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CCSS.ELA-LITERACY.W.6.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

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This book is filled with the personal stories of the many people who are assisting Dr. Kay Holekamp research the spotted hyena, beginning with Kay’s story on page eight. Altogether ten different people are mentioned in headlines, some with much longer stories than others.

- What are the three most common characteristics for the people mentioned in this book? If you were going to advise people looking to work with Kay on spotted hyena research, what advice would you give? Does luck play any part in this work? Justify your answer with evidence from the text. What is the most significant qualification and consideration for working on this team?
- Students could be a member of a scientific team. Look at your own story and find the link that places you in some future Scientists in the Field book. Then write a letter to the leader explaining why you should be part of this team.
- If you see yourself as a scientist on a team, what happened in your education that made this vision possible? Please reread page 15–17 and explain how you would deal with these sorts of details. If you do not see yourself as a member of a scientific team, what would schools need to change to make

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that career decision more likely? Considering the fact that many more men than women enter science careers, what do schools need to do to better encourage women to view science as a likely career choice? Extra points for writing that considers the very different nature of spotted hyena society in crafting your response.

Common Core Connections

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Ciara and all the other scientists record the GPS coordinates of the spotted hyenas, their dens, kill locations, etc (p. 21–22). Longitude and latitude are what GPS uses to locate any spot on the planet.

- Find the longitude and latitude of your school to the nearest degree.
- Using Google Maps, zoom in to the location of your school. Print out maps for students and have them insert and label a grid showing precise locations where your classroom is located.
- Share the exact GPS location (which can be found online through a longitude and latitude search: www.findlatitudeandlongitude.com). Discuss why it is important to have a standard reference. Discuss why a simpler system might be easier for showing how to find the school. Discuss why and when you might need an exact GPS location, including just how precise your location needs to be.
- Data entry, and using data, requires that scientists be skilled at recognizing when there are errors. Have students research several different ways that data can be corrupted, misleading, in error, or misinterpreted. Have students research the ways any science organization protects itself from data entry errors and misinterpretation of data.

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Kenya is located on the continent of Africa, on the east coast.

- With the help of your teacher, prepare a report on Kenya, showing how it compares with your neighborhood. If possible, have different groups report on different categories, such as geographical features, climate, politics, natural resources, history, language, etc.
- Create Venn diagrams to compare and contrast Kenya with your state or area. Annotate your argument with pictures, videos, links, and written justifications for the reasons for thinking the areas are similar or different. Make sure to give credit to your sources, which your school librarian can help you do correctly.
- Throughout the book there are photos and descriptions of other animals that Montgomery and Bishop find in Kenya. Create a visual glossary, with annotations, of these animals and other animals not depicted that are seen in Kenya.

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CCSS.ELA-Literacy.RH.6-8.7 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

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CCSS.ELA-LITERACY.W.6.1(a-d) Write arguments to support claims with clear reasons and relevant evidence.

Page 24 contains a glossary of spotted hyena behavior. It includes abbreviations such as OMA, which means, “Open-mouth appease. One animal puts his

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or her open mouth up to another's. It's a gesture meant to dispel any aggression before it actually happens."

- Make a glossary of your own gestures, including an annotation for what your gestures mean.
- If you feel comfortable, share just the acronym, written out in full, but not the annotation. Have folks who know you write out the annotation for what they think your behavior means.
- Spend an amount of time observing and cataloguing the gestures and body language of people your age in various settings. Does the same body language convey different meanings depending on the group of people? Look again at the glossary of hyena behaviors. Speculate on whether or not animal behavior ever varies in meaning. Are there some gestures that always mean the same thing? Is this true with people as well? If you were a scientist, how would you test to insure exactly what the body language implies? Design a method for testing your position.
- Page 25 depicts a spotted hyena in OMA pose. Take pictures of another animal, perhaps a dog or other familiar animal, displaying typical behaviors, such as this OMA pose. Show your pictures to your class or group and let them come to a consensus, without your input, of what these pictures reveal about the animal behavior shown. Compare the group consensus with your own assessment. Did the group share all of your ideas? How would you determine the difference between an OMA pose and a yawn? Make sure your descriptions show the differences between similar behaviors.
- Document different behaviors of local animals, such as squirrels, hummingbirds, or blue jays, etc. Try to document these behaviors with a camera or with a sketch. If possible, devote time observing, photographing, sketching, and describing the behaviors. Incorporate these photos and drawings into your field journals.

On page 27 we read about the three cubs chasing off an adult male eight to ten times their size. We also read, "all females outrank all males." These cubs are said to "outrank" this male, which allowed them to chase him off.

- Biology and evolution suggest that successful species adapt to a changing world. Kay says that these hyenas seem to break the typical rules for mammals. Montgomery provides no answer for this atypical behavior other than the fact that these animals are just weird. Yet there should be some rationale for why female hyenas are dominant. Brainstorm theories and then prioritize them. Try to determine the most likely reasons.
- Choreograph a dance for young students in which you play music and they act out this interaction between the three cubs and this adult male.
- Kay says, "Studying the oddballs can teach you about the basics" (p. 7). How does this work? How does the oddball give us insight into the actual rules, as Kay also states? What does the outlier in any grouping teach us about the object of our study? Most of us have examples to share of animals displaying atypical behaviors. Collect some of these stories and work in groups attempting to list possible explanations for these unusual behaviors.

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CCSS.ELA-Literacy.RI Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

Throughout this book there are descriptions of frustrations that render scientific research difficult. Each of us may respond to these frustrations in very different fashions. What seriously bothers one person, may be a very minor issue to another.

- List the issues specific to studying spotted hyenas. Explain which one would bother you the most and, if different, which one would be most likely to compromise the research.
- In research ventures in the United States and most other countries, we deal with the critical issue

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of funding. With the help of your teacher, figure out how much it is likely to cost to spend three months in Kenya. Prepare a budget that includes transportation, lodging, food, personal supplies, research equipment, research supplies, data costs, communication costs, and other expenses one might have. Indicate a range of expenses that factor in best- and worst-case scenarios.

- Kay has had hundreds of students and researchers travel to Kenya to research spotted hyenas. Explain the appeal of working in this part of Kenya as if Kay had created a travel brochure designed to entice potential researchers into spending money to travel to Kenya. Compare this to the actual fact of research internships. Research just exactly how one is able to join a team like Kay's for any given period of time. How long does the actual intern stay? How much does it cost? Who pays? How is Kay's research station funded?
- Kay has listed several reasons that studying spotted hyenas is beneficial to society as a whole. Create an argument both in support and against continuing to fund spotted hyena research. Listen to the arguments of others in your class about this debate and decide which argument seems most persuasive. Explain why. If possible, send your argument to the people running the spotted hyena blog for their feedback.

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Other Websites to Explore

The San Diego Zoo displays spotted hyenas and has a webpage devoted to them. animals.sandiegozoo.org/animals/spotted-hyena.

National Geographic has various resources devoted to spotted hyenas: www.nationalgeographic.com/animals/mammals/s/spotted-hyena

Kay published her reflections on spotted hyenas with the *New York Times*. This journal of field notes deals with mating and other observations. They include many pictures of hyenas feeding on dead and bloody animals. Many of these entries would be very interesting to students, but some may not be helpful. You may wish to share these only after viewing yourself. scientistatwork.blogs.nytimes.com/author/kay-e-holekamp

In April 2018, Sy Montgomery and Dr. Kay Holekamp spoke about this book on Facebook. This link should allow viewers to see this video even after its debut. www.facebook.com/MaraHyenas

The *Smithsonian Magazine* has a feature story about spotted hyenas. www.smithsonianmag.com/science-nature/whos-laughing-now-38529396

Further Reading

In addition to the books listed in the bibliography on page 69:

Kruuk, Hans. *The Spotted Hyena: A Study of Predation and Social Behavior*. Brattleboro, VT: Echo Point Books and Media, 2014.

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