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HOW THE ZEBRA GOT ITS STRIPES

Bold black and white stripes might help zebras evade disease-carrying flies but that's not the only benefit.



By Emily Sohn
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A zebra's bold pattern of black and white stripes reflects light in a way that helps the animals evade disease-infested flies. Click to enlarge this image.
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THE GIST

- Zebras may have developed stripes to evade the bites of annoying, disease-carrying flies.
- Zebras might help inspire strategies for defending animals and people from insects that are attracted to polarized light.
- Explaining why animals look the way they do is a great way to get people excited about science and the natural world.

For more than a century, Rudyard Kipling's "Just So" stories have delighted children (and adults) with imaginary explanations of how animals came to look the way they do.

But while Kipling addressed the leopard's spots and the camel's hump, he never explained the zebra's stripes. A new study helps fill in the void, this time with actual data.

NEWS: Why The Leopard Got Its Spots

Casting aside a long list of possible explanations, the new research proposes that a zebra's bold pattern of black and white stripes reflects light in a way that helps the animals evade disease-infested flies.

Hungry flies might not be the only force that pushed zebras to develop stripes. But the findings might offer new strategies for defending animals, and even people, against some insects.

"We have been breeding animals based on meat or milk production, and we haven't paid much attention to their coat colorations or patterns," said Susanne Åkesson, an evolutionary ecologist at Lund University in Sweden. "Maybe it's something we need to consider. Maybe there's some trick we can learn from the zebra that could help."

Scientists have been speculating about the purpose of the zebra's stripes since the 1870s, when Charles Darwin criticized Alfred Russel Wallace's theory that the stripes provided camouflage in tall grass. Zebras prefer open savannahs, Darwin argued, where the grass is too short to make stripes useful hiding tools.

Since then, theories have invoked zebra-to-zebra recognition, defense against lions who can't pick out an individual zebra from amongst a mass of stripes, and thermoregulation -- as the patterns of dark and light fur might cause air turbulence, helping cool the animals off.

Åkesson and colleagues wondered if horseflies, which belong to a group called tabanids, might have something to do with the story. These flies are major pests for zebras, cows, horses and related animals. Their bites can be irritating enough to reduce grazing. And they can carry deadly diseases.

In previous work, Åkesson and her team had found that horseflies are more attracted to dark animals than to white ones, likely because of the way that light reflects off of different surfaces. Direct sunlight is full of rays that shine in all directions. But when sunlight bounces off of water -- or off of a dark brown horse or cow -- its reflections align horizontally.

Tabanid flies are attracted to this kind of linearly polarized light: it often leads them to water, where they can lay their eggs and mate. Just as often, though, their polarized light sense leads them to large animals, which they bite and annoy to no end.

Since zebras are both dark and light, the researchers wondered if these striking animals might have an intermediate-level of attractiveness to flies. To find out, they conducted a series of experiments with oil-filled trays, odorless insect tape-covered panels and zebra-like plastic models that were black or brown, white or striped.

Every day for a few weeks during the summer on a Hungarian horse farm, flies flew to their preferred color patterns and got trapped, allowing the researchers to collect the insects, count them and gauge their preferences.

As expected, very few flies landed on the white surfaces, the researchers report today in the *Journal of Experimental Biology*, while hundreds went for the black objects in some cases. Surprisingly, the striped objects attracted just as few -- and sometimes fewer -- flies than the white surfaces did. More flies landed on black stripes than on white stripes.

When the researchers made the black stripes wider than a typical zebra's pattern, objects attracted more flies. Measurements confirmed that the most polarized surfaces attracted the most insects.

NEWS: History of the 'Wild Child'

Given the major advantage that zebras would get by avoiding fly bites that could kill them before they reproduced, Åkesson said, the paper offers a strong argument that stripes developed to protect the animals against insects and their diseases.

As solid as the new data is, though, the story is far from over, said Tim Caro, a behavioral ecologist at the University of California, Davis, who is writing a book about the evolution of the zebra's looks.

If stripes are so helpful, for example, why aren't all Eurasian horses striped? Meanwhile, studies have yet to carefully examine most of the other theories about zebra evolution. There might be many reasons why they are black and white.

Animal coloration has a long history of inspiring applications in military and other situations, Caro said, pointing to the black-and-white geometric patterns that decorated navy ships with "dazzle camouflage" during World War I. Still, studies like the new one may have their biggest impact on young minds, sparking excitement about science and the natural world.

"I think there's a real hidden and indirect conservation benefit to this kind of research," Caro said. "As we become increasingly urbanized and computer-focused rather than taking walks in the woods on Sunday afternoons, I think these handles whereby you can capture children's imaginations are going to be increasingly important."

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