Why bigger animals aren't always faster (w/ Video)

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New research in the journal *Physiological and Biochemical Zoology* shows why bigger isn't always better when it comes to sprinting speed.

"Typically, bigger animals tend to run faster than smaller animals, because they have longer legs," said Christofer J. Clemente of Harvard University, who led the research. "But this only works up to a point. The fastest land animal is neither the biggest nor the smallest, but something in between. Think about the size of an elephant, a mouse and a cheetah."

Clemente and his team studied monitor lizards to show that that the same principle applies within species as well as across species, and to identify why this is the case. Because adult monitor lizards vary substantially in size, they are an ideal species for testing how size affects speed. The researchers timed and photographed monitors ranging from two to 12 pounds, as sprinted across a 45-foot track.

The researchers found that the midsize lizards were fastest–and they discovered why.

Using high-speed cameras and markers placed at key spots on the lizards' bodies, the researchers created computer models comparing characteristics of the lizards' running strides.

"We then looked at how the mechanics of the stride changed with body size, and we found that the changes in the stride were consistent with the changes in speed," Clemente said. "Above a certain size, lizards were

changing the way they ran, perhaps due to a decreased ability of the bones and muscles to support a larger body mass."

Testing this phenomenon within a single species helps clear up questions about why the biggest animals aren't the fastest. Large animals tend to be closely related evolutionarily. So it's hard to tell whether slower speeds are due to biomechanical issues stemming from size, or from any number of other factors stemming from a shared evolutionary history.

Looking at individuals within a species rather than making cross-species comparisons helps to eliminate this phylogenetic bias. The results bolster the hypothesis that large size creates biomechanical constraints.

"Larger lizards' legs can no longer support their body weight, and they have to change their style of running, making them slower," Clemente said.

More information: *Physiological and Biochemical Zoology* 85:3. (May/June 2012).

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