

# Study shows snakes use more force than necessary when climbing trees

August 20 2014, by Bob Yirka

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Credit: Western Pacific Tropical Research Center

(Phys.org) —A pair of researchers, one with Siena College in New York, the other with the University of Cincinnati in Ohio, has found that climbing snakes tend to use much more force to hold onto trees than is needed to keep them from sliding back down. In their paper published in the journal *Biology Letters*, Greg Byrnes and Bruce Jayne describe how they tested snakes climbing in their lab and what they learned as a result.

Climbing [trees](#) is no easy feat for those that lack claws or other means of attachment—it generally means using brute force which requires some degree of strength. Humans for example, though well muscled in some respects are not well adapted for [climbing](#) trees when there are few or no tree limbs to use for assistance—it requires wrapping arms and legs and feet tightly around a trunk and inching upwards. Snakes use very much the same technique, wrapping their bodies around a tree trunk in a coil, then inching their way up by releasing, moving various parts at the appropriate time and then re-gripping. In this new effort, the researchers sought to learn more about how much effort the snakes put into tree climbing.

To find out how tightly snakes must grip to climb, the researchers affixed pressure sensors to a pole, which they then covered with tennis racket tape—the combination provided enough friction for adherence by the snakes. They then coaxed five different snakes into climbing the pole, monitoring their progress as they went—four of the snakes were of the boid (boas) species the other a colubrid (a python).

In examining their results, the researchers found that all five snakes clung much tighter to the pole than was necessary to prevent slipping or falling—they suggest this is because the snakes placed more importance on clinging to the tree than they did on conserving energy. What's interesting is that the snakes had a choice—prior research has shown that climbing [snakes](#) have very fine control over the amount of squeezing they exert—and thus they are choosing to squeeze harder than they know they need to—and are doing so despite the fact that a fall from a tree in their native habitat would not likely cause injury. This suggests the added pressure is to ensure they don't fall when predators are around or because they don't want to have to climb the tree again.

**More information:** Gripping during climbing of arboreal snakes may be safe but not economical, *Biol. Lett.* August 2014 vol. 10 no. 8

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## **Abstract**

On the steep surfaces that are common in arboreal environments, many types of animals without claws or adhesive structures must use muscular force to generate sufficient normal force to prevent slipping and climb successfully. Unlike many limbed arboreal animals that have discrete gripping regions on the feet, the elongate bodies of snakes allow for considerable modulation of both the size and orientation of the gripping region. We quantified the gripping forces of snakes climbing a vertical cylinder to determine the extent to which their force production favoured economy or safety. Our sample included four booid species and one colubrid. Nearly all of the gripping forces that we observed for each snake exceeded our estimate of the minimum required, and snakes commonly produced more than three times the normal force required to support their body weight. This suggests that a large safety factor to avoid slipping and falling is more important than locomotor economy.

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