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"The Effects of Cranial Asymmetry on Bite Force in the Green Anole (*Anolis carolinensis*)"

Anole lizards are a model group for understanding evolutionary change and adaptive radiation due to their morphological plasticity and repeated instances of morphological and ecological convergence as they invade new habitats. The green anole lizard (*Anolis carolinensis*) is a native species to the southeastern part of the United States. Among anoles, the green anole has been suggested to be a model organism as it has been widely studied for the past 100 years granting an in-depth understanding of its natural history, it is readily kept and studied in the lab, and it has a diversity of behaviors relevant to a variety of evolutionary mechanisms. Green anoles are commonly found around New Orleans and are generally successful in urban environments. Fluctuating asymmetry in bilaterally symmetric organisms is random right-left asymmetry and arises from genetic and environmental forces during development. Although the root causes of fluctuating asymmetry are broadly understood, its effect on functional performance is not yet clear. Previous studies have demonstrated decreased asymmetry in functionally important structures relative to less functionally important structures (e.g., more symmetric shells in aquatic turtles than in terrestrial turtles). We utilized a large sample of green anole crania to determine the relationship between performance (specifically, bite force) and magnitudes of fluctuating asymmetry. We used micro-computed tomography (micro-CT) to generate high resolution surface models of green anole crania. Prior to death, these anoles had a variety of performance variables measured including bite force, as part of a separate study. We hypothesized that the more asymmetric features the anole crania had, the weaker the bite force the anole would have been capable of generating. Given the small size of lizard crania and the thinness of the cranial bone, we used three separate thresholding values per skull when segmenting CT scans to determine whether the processes used to generate skull surface models impacted our study. These three separate masks of the skulls were used to distinguish between the skull and the cartilage and skin. The cranium micro-CT scans were segmented and landmarked using geometric morphometric techniques to create a dataset of points that were then analyzed in the R statistical software. We found substantial sexual size and shape dimorphism in our data with males and females having distinct cranial shapes. Additionally, contra our hypothesis, our findings suggested that the anoles with stronger bite forces had increased cranial asymmetry. We additionally found that the thresholding value used to generate the cranium models did not have a strong impact on shape. We hypothesize that the thin cranial bone in anoles may deform following repeated biting events and thus that high bite forces may actually lead to increased asymmetry. This asymmetry appears to not lead to a substantial decrease in functionality. Therefore, these anoles represent a case where morphological asymmetry and functionality may be decoupled.