Habitat Preference Drives Brain Shape in Crocodylomorphs

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Explicating the larger rules that dictate biological evolution requires the study of a subject that exemplifies not only the immense variety that occurs from the diversification of species, but that also represents the continuities and convergences that can occur across a large passage of time. Such spans journey through mass extinction events, drastic environmental change, and unavoidable shifts in habitat. In this study, the virtual endocasts (internal molds of the braincase) of 12 extant and extinct crocodylomorphs, were created through the segmentation of high resolution µCT scans of each species. To mathematically capture the shape of the endocasts, digital coordinate points were placed on major physiological regions of the neuroanatomy. A custom code using the R programming language was modified to place these points within a space where the distance between them could be measured. The measurement of the most variant properties of shape, thickness and length enabled effective comparisons among phylogenetic relation, size, and habitat preference to be made. The use of Landmark Editor in crocodylomorphs enabled collection and processing of valuable morphometric data. Habitat preference was the largest influencing factor in brain shape, even when accounting for phylogenetic relatedness. The second highest contributor towards variation in brain shape was the size of the animal, which was related to the species' ecological niche. Taken together, these findings suggest an important role of habitat in driving brain shape in crocodylomorphs.

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