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Morphological Diversification under high Integration in a Hyper diverse Mammal Clade

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ABSTRACT

The demands of flight select for small body size in flying animals, including bats. Sensory systems therefore occupy finite cranial space and thus there are potential trade-offs in size among sensory structures that might evolve in highly integrated fashion within the skull. At the same time, low integration has been linked to increased morphological diversity and speciation rates. Phyllostomid bats occupy the widest range of dietary niches among mammals. If bat skulls are highly integrated, then why are phyllostomids so morphologically diverse? We assessed disparity in the shapes of skulls and integration between the facial skeleton and cranium, and how these parameters may have facilitated dietary diversity and increased speciation within phyllostomids relative to their outgroups, which both have fewer species and are all insectivorous. We analyzed 3D images of micro-CT scanned skulls from 141 bats across 65 species from the families Phyllostomidae, Noctilionidae, Mormoopidae, Mystacinidae, Furipteridae, and Thyropteridae. Phyllostomid skulls were more integrated and less disparate in shape when compared to all outgroups combined. Shape diversity followed the diet-predicted adaptive peaks confirming the well-established link between diet and the diversification of phyllostomids. The changes in skull shape and feeding style within phyllostomids are driven by relatively simple changes in the length and width of the rostrum. The tight link between rostrum shape and diet allows their highly integrated skulls to exhibit such functional diversity. This finding provides one of the best empirical examples of how even highly integrated structures can allow unique morphologies and spur adaptive radiations.

BIO:

Gregory Mutumi is a Post-doc in the Evolutionary Morphology Lab of the school of Natural Sciences. Under the supervision of Elizabeth Dumont, Gregory seeks to understand the role of sensory adaptations in the diversification of new-world leaf-nosed bats (Phyllostomidae). He comes from a background in forestry in Zimbabwe and received his MSc in Zoology from the University of Cape Town. His PhD (in Biological Sciences) His pursuit of a PhD was spurred on by his interest in the evolutionary processes responsible for the enormous diversity of life. For his thesis, he teased apart the relative roles of natural selection and random genetic drift in shaping the diversity of two species of horseshoe bats (Rhinolophidae). Gregory hopes to further his enquiries of diversification processes in bats and other mammals using a combination of information derived from morphology, genetics and developmental processes