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Using micro-focus X-ray scans to document inner ear morphology in different species of horseshoe bats, Rhinolophus (Mammalia: Rhinolophidae), occurring in Southern Africa

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Horseshoe bats use an adapted auditory and echolocation system to navigate and hunt fluttering prey while flying in the dark amongst vegetation. To overcome the challenge of distinguishing prey from echoes produced by the vegetation, horseshoe bats have developed an intricate coupling of the auditory and vocalizing systems. They combine a long, constant frequency (CF) signal, that has short frequency modulated (FM) regions sweeping up and down at either end of the pure tone, together with Doppler-shift compensation, and an acoustic fovea in the cochlea. The latter being modifications associated with the cochlea, the coiled structure in the inner ear that usually detects a range of frequencies along its length, which focus instead on the specific frequency emitted in the constant frequency call particular to the species. Investigation of the inner ear structure of horseshoe bats has been limited, and has not included species from Southern Africa. The bat diversity in Southern Africa is relatively rich, with new species still being identified. In order to accommodate some geographic variation, as well as anticipated classification changes, micro-focus X-ray tomography scans were made at Necsa of cleaned skulls of 49 individuals, of what were ten different horseshoe bat species occurring in Southern Africa. Various linear and two-dimensional area measurements from a midsection of the horizontal view across the cochlea, showed some differences between species, albeit, these are less distinct between species of similar size. VGStudioMAX analytical software was used to create cochlea volumes from internal voids in the inner ear region of the reconstructed three-dimensional X-ray scans. More extensive analyses of these reconstructed volumes is still underway, however, overall area measures of these volumes also showed some distinctions between species, and, besides a few exceptions, cochlea area generally scaled negatively with skull length, zygomatic width and echolocation frequency.

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Maybe

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