Testing the origins of primate anterior orbital convergence as a function of evasive leap landing and reduced posterior predation.

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Terrestrial predation on much of the planet's two-dimensional surface can be exemplified by larger predators pursuing smaller prey who use peripheral vision along with numerous, sudden directional changes during potentially prolonged pursuit. These dynamics were dimensionally altered when primates evolved anatomy specialized for arboreal avoidance. Appendages that embrace (rather than claw into) substrate enable refuge from larger terrestrial specialists because a high body to branch size ratio can render predation infeasible in a fractally slendering terminal branch topology. An extinct family of non-burrowing, legless, large-gaped, constricting reptiles (madtsoiids) could have overcome this size ratio barrier in the late Cretaceous when grasping Euprimateformes were first emerging. Frequent leaping has been suggested as serving as an anti-predation locomotor strategy in prosimians. I extend this idea by hypothesizing that leaping specializations in primates first evolved as a snake predation avoidance mechanism. Absent substantial (terrestrial) predation from their posterior, (strictly arboreal) primates may have instead evolved anteriorly convergent vision for landing leaps as part of expeditious evasion from this new serpentine threat to its terminal branch refuge. I test this theory using phylogenetic generalized linear modeling on quantitative leaping data for 61 species collected from locomotor studies, and data from a study that recently tested Isbell's snake detection theory (Wheeler 2011). Leaping frequency and body mass had significant and positive associations with orbital convergence, while the controls (e.g. anatomy, frugivory, and nocturnality) did not. Better measures for various predation risks on primates are needed to help understand the conflicting selection pressures on orbital orientation and to resolve the evolutionary chronology of detection, evasion, and avoidance.