Up in Arms: Early primate proximal ulnae show affinities with non-quadrupedal, non-primate mammalian taxa

KRISTEN R. RAMIREZ1,2. 1PhD Program in Anthropology, The Graduate Center, CUNY, 2NYCEP, New York Consortium in Evolutionary Primatology

Hypotheses concerning the historical scenario for the origin of primates can be divided into two camps: selection for arboreal acrobatic locomotion or selection for predatory grasping of food items. These hypotheses are predicated on reconstructions of substrate preference, locomotor mode, and degree of manual manipulation for early fossil taxa. I sampled diversity in these variables across six mammalian orders (24 extant genera) to identify relationships between morphology and behavior. I analyzed 3D coordinate data using geometric morphometrics and used these data to calculate the angle between the radial notch and the long axis of the ulna. I tested the hypothesis that primates exhibit unique elbow morphology including a more laterally-oriented radial notch, reflecting the early evolution of increased supination and manipulative abilities in the order. Results support the relationship between radial notch orientation and supination in non-primate clades. Within primates, diversity in this trait was related to locomotor mode, but not substrate choice. Early fossil primates (*Plesiadapis*, *Cantius*, *Notharctus*, *Megaladapis*, *Palaeopropithecus*, and *Archaeolemur*) are intermediate among extant primates in radial notch angle. However, a linear discriminant function analysis of the 3D data indicates that early primate proximal ulnae are more similar to those of taxa that reduced the use of the upper limb in locomotion (e.g. macropods) than to those of extant primates. This result supports previous work emphasizing the importance of non-locomotive upper limb use in primates, though it also suggests extant primates may not be the most appropriate comparisons for the interpretation of early primate functional morphology.