



Homology of an Ossified Metacarpal V in Extant Birds and Mesozoic Theropod Dinosaurs



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Meeting Abstract

P2-46 Sunday, Jan. 5 **Homology of an Ossified Metacarpal V in Extant Birds and Mesozoic Theropod Dinosaurs** **STIEGLER, J***; **MOORE, AJ**; **WANG, S**; **LEITE, JV**; **SCANNELLA, J**; **XU, X**; **CLARK, J**; *The George Washington University; Stony Brook University; Keck School of Medicine, University of Southern California; Natural History Museum, London; Museum of the Rockies, Montana State University; Institute of Vertebrate Paleontology and Paleoanthropology; The George Washington University* stiegler@email.gwu.edu

Early dinosaur hands had three primary digits (I-III) and two vestigial digits (IV and V) in positions 1-5. However, embryological studies have concluded that avian manual digits with digit I-III phenotypes are derived from digit positions 2-4, while positions 1 and 5 retain only un-ossified vestiges. Hypotheses to resolve these conflicting digit reduction patterns include complete or partial homeoses of digits, among others, however there is uncertainty regarding the duration, phylogenetic position, and contributing mechanisms of this transformation. Here we show that a vestigial digit V is ossified in a phylogenetically disparate sample of extant and Mesozoic birds, having been overlooked by morphologists and all modern treatments of avian evolutionary development. Metacarpal V

ossifies postnatally before fusing with metacarpal IV, and the homologues of muscles specific to digit V insert at the location of fusion. We use these data to constrain the phylogenetic location of digit I loss within Theropoda and hypothesize that following digit I loss, the remaining digits with phalanges (II-IV) are each homologous in part to multiple ancestral digits, the result of partial and gradual homeoses. The persistence of a small, lateroventrally positioned metacarpal V without phalanges from Triassic non-avian theropods through extant birds suggests that its range of phenotypes has not changed substantially for more than 220 Ma, and that only digit I has been permanently lost.



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