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Allometry of the Pterosaur Wing Skeleton

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Differences in relative lengths of skeletal elements are known to influence flight mechanics and aerodynamic performance in extant vertebrates. To explore the possibility of similar patterns in Pterosauria, I examined allometric scaling of the lengths of pterosaur wing elements across their entire phylogenetic range and through ontogenetic growth in three taxa. Using a phylogenetically-informed regression analysis to examine scaling patterns between different wing elements, I found that metacarpal IV and the femur were significantly longer in pterodactyloids than basal pterosaurs and the second phalanx scaled with positive allometry relative to the other bones, but all other relationships were isometric for all pterosaurs. A test for shifts in rates of evolution supported a significant change in the relative length of metacarpal IV at the root of Pterodactyloidea, but not the femur. The ontogenetic analysis focused on one basal pterosaur (*Rhamphorhynchus muensteri*) and two pterodactyloids (*Pterodaustro guinazui* and *Pterodactylus kochi*). In *Rhamphorhynchus* a significant change in scaling patterns was found between the older and younger age groups, which may correspond to a significant life history event, such as sexual maturity. Additionally, the distal wing bones of *Rhamphorhynchus* generally scaled positively relative to the proximal bones. However, in both pterodactyloids the central wing elements scaled with positive allometry relative to the proximal and distal bones. This result may indicate that the difference in skeletal proportions between pterodactyloids and basal pterosaurs was the result of a change in growth strategies.

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