

USING PELVIC DIMENSIONS TO RESTORE THE AEROBIC CAPACITY OF
EXTINCT TETRAPODS

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Skeletal muscle/body mass ratios are twice as high in birds and mammals as in reptiles because the latter's small hyperanaerobic muscles produce twice as much burst power per unit mass as tachaerobic muscles, and because the high pressure circulatory systems needed to oxygenate large tachaerobic muscles produce high metabolic rates (MRs) even at rest. Ilium size/body mass ratios are skeletal markers of relative leg muscle volumes. Iliia are much larger and more plate-like in birds and mammals than in reptiles.

Large ilia imply that pareiasaur MRs were atypically reptilian. In diapsids an initial elevation of MRs above reptilian levels is suggested by modest expansion of the ilium independently in rhynchosaur and basal archosaurs. Further expansion of tachaerobic muscles occurred in bigger hipped crurotarsal archosaurs. In crocodylians an early expansion of the ilium followed by a reduction indicates a corresponding rise and fall of MRs related to terrestrial versus aquatic habits. Large, plate-like ilia suggest pososaurs and pterosaurs had high aerobic MRs. An unusual mix of reptile-like ilia and erect legs in basal dinosaurs suggest their MRs were above reptilian levels, but still rather low. Large ilial plates in ornithischians, sauropods, therizinosaur, theropods and basal birds indicate muscle volume and aerobic MRs were at avian levels. In synapsids ilial and metabolic expansion started in basal therapsids, and reached the mammalian condition in cynodonts.