and body mechanics in *A. vulsa* from 40mm to 162mm. Juveniles are less stiff, and therefore more flexible than adults, despite having similar numbers of armored plates. Instead, greater flexibility in juveniles stems from the lower mineral density of their armor. Since juveniles are more flexible, they have a higher tail beat frequency (12-19 Hz) and swim slower (0.4-0.6 BL/s) than adult fish (7-11 Hz, 0.6-1 BL/s). This suggests a tradeoff between flexibility and defense as fish grow.

Can Geometric Morphometric Analyses of Limb Shape Reveal Ecomorphological Patterns Across the Evolutionary History of Synapsida?

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Extant Mammalia are the only living representatives of the larger clade known as Synapsida, which has a continuous fossil record from around 320 million years ago to today. Despite the fact that much of the ecological diversity of mammals has been considered in light of limb morphology, the deep time origin of synapsid limb diversity and its influence on ecological diversity has received less attention. Here, we present shape analyses focusing on the forelimbs of the two earliest synapsid radiations ("pelycosaurs", and pre-mammaliaforme Therapsida) in comparison to a broad sample of extant Mammalia. Using an expansive geometric morphometric data set, comprised of 384 fossil specimens and 148 extant mammalian specimens, we sought evidence for ecomorphological signals that could provide insight on the ecology of the earliest synapsids. Collecting shape data of humeral and ulnar elements from an extant sample representing multiple known ecomorphologies provided the framework for a comparative exploration of extinct ecomorphologies, associated specifically with locomotion. Our results show that distal humeral shape is not informative of broad locomotor ecomorphologies in early fossil Synapsida. In contrast, proximal humeral shape shows a more complex pattern that suggests shape similarity between basal synapsids and members of extant Perissodactyla, and certain highly derived fully fossorial mammals, as just two examples. Overall, however, our findings suggest general shape analyses may have limited utility when analyzing for ecological-signal across deep time. Considering skeletal morphology in a holistic framework that considers unique combinations of shapes, as well as the use of biomechanically focused indices (such are functional proportions), may help to elucidate the more nuanced ways that locomotor ecology influenced limb shape in some of the earliest amniote radiations.

Relative Brain Volume of North American Carnivorans Does not Support the Cognitive Buffer Hypothesis

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The Cognitive Buffer Hypothesis proposes that a proportionally larger brain confers greater socioecological flexibility, allowing an organism to occupy novel or fluctuating environments. Previous research supports a relationship between environment, diet, and brain size in primates, an order occupying a wide range of habitats and with diverse ecological behaviors. Like primates, carnivorans have proportionally large brains to their body size, are successful across a wide environmental gradient, and perform a plethora of hunting behaviors. Following the Cognitive Buffer Hypothesis, we predict a positive correlation between relative brain size and variability of the environments occupied by carnivorans. We tested for a correlation between relative endocranial volume (PGLS residual from species mean body mass) and environmental variables in 31 species of North American carnivorans. Variables included annual temperature, annual precipitation, ecoregions inhabited, length of dry season, and vegetation index collected from the recorded geographic range of each species. This data was sourced from GIS maps provided by WorldClim, North American Data Atlas, and NASA/GSFC. Brain and body measurements were sourced from the literature. PGLS analysis found no significant relationship ($p<0.05$) between relative brain volume and the tested environmental variables. This indicates that while there is variation in relative brain size across Carnivora, this variation does not appear to be an adaptation to selective pressures imposed by environment. Instead, it is possible that the large brains seen in Carnivora reflect the dietary specializations of this clade. Most carnivorans are carnivorous, omnivorous, or insectivorous and, therefore, predominantly consume high quality food items. Future analyses testing for correlations between brain size and dietary niche may aid in determining the selective pressures acting on brain evolution within Carnivora.

Orbital Angle in the Australian Dingo

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Wild and domestic canids differ in relation to their field of vision. Wolves (*Canis lupus*) have narrow binocular vision that favors the detection of prey over wide distances, whereas domestic dogs (*Canis familiaris*) have a wider binocular vision as a consequence of decreased predation behavior. Correlated with binocular vision is the orbital angle, which is a morphological ratio based on width and height of specific skull landmarks on the frontal and zygomatic bones. Wolves have acute orbital angles (42° ± 5.3 SD). Little is known about the orbital angle of other wild canids, such as the Australian dingo (*Canis dingo*), that have markedly different lifestyles and prey compared to the grey wolf. This study compares the orbital angles of dingoes (n=45, sourced from South Australian Museum) and greyhounds (n=52, sourced from University of Adelaide). Skulls were photographed in the dorsoventral position from the rostral view. ImageJ software was used to calculate orbital angle measurements. Orbital angles in dingoes and the greyhound were found to be symmetrical ($p= 0.2$); thus only the right-side orbital angles were analyzed. The mean orbital angle of dingoes and greyhounds (49° and 53° respectively) were statistically different, with overlapping ranges of 46.3° - 54.6° ($t(95)=7.9$, $p<0.01$). These findings are comparable to binocular field ranges with wild canids like dingoes and the wolf having narrower binocular fields of vision (70°) than