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Size Scaling in the Skull of North American Felids as Adaptations for Prey Acquisition

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Abstract

The purpose of this comparative study is to explore the correlation between skull morphology and prey acquisition among felids, mustelids (weasels, badgers, wolverines), and canids (wolves, foxes); with a focus on North American felids (house cat, lynx, puma). Previous studies have focused on the evolution of carnivores, which include the species to be examined in this study. Using the measurement methods laid out by Radinsky (1981a; 1984), the size of skull components are compared to overall body size to determine the rate of scaling of skull features with body size with statistical evaluations of skull measurements within and between the three selected North American carnivore groups. Additionally, these skull features will be correlated with the body size of possible prey to determine if there are limitations on prey size with ranges of skull parameters which may be indicative of bite strength.

Introduction

Previous studies on carnivore skull shape and function parameters (Radinsky, 1981a; 1984) focused on between group differences and did not tie the shape to prey acquisition. While others consider the functional aspects such as bite strength at the canines or at carnassial teeth to see how they correlate to capabilities to capture prey.

Here the cranial and mandibular parameters to be analyzed will be correlated with aspects of prey size to see if as carnivore body size increases do cranial parameters increase linearly or in a step-wise fashion and how does all of this compare to prey size.

Material and Methods

Using the skulls of various NA felids (house cat, lynx, puma), mustelids (weasels, badgers, wolverines), and canids (wolves, foxes) we can compare different aspects of skull dimensions. Looking at Radinsky 1984 Appendix 1, there is a list of skull dimensions that will be used, in part, as a basis of comparison. Using 3-5 specimens per species, 9 different measurements will be collected for comparison. Once this data has been collected, statistical comparisons between species can be made. Taking this data, it can then be compared to known prey species from the literature to determine what size prey can be successfully acquired. Data analysis will highlight if the difference in skull size and parameters such as bite strength is linearly related to prey size acquisition.

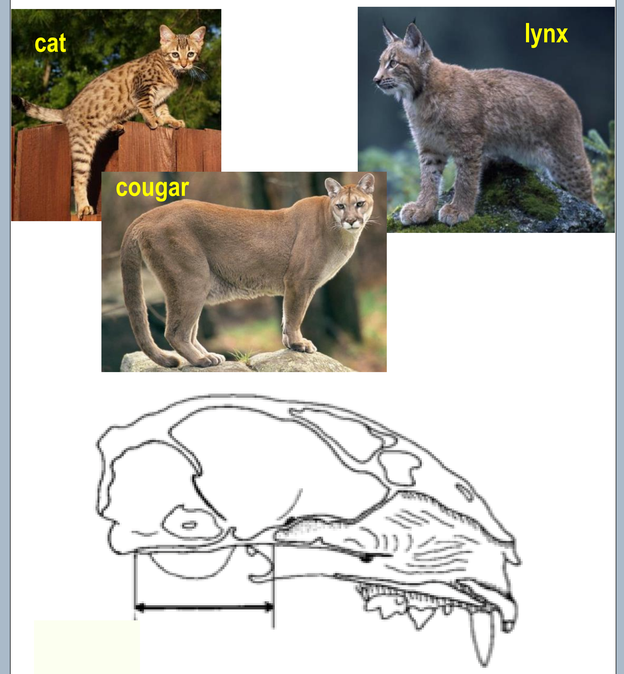
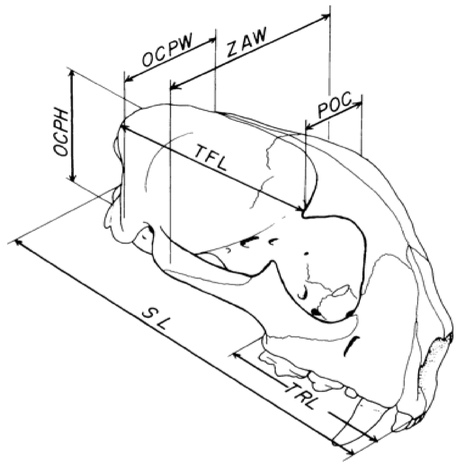


Figure 1 – Basicranial length (double arrow) as measure in this study (from Radinsky, 1984)

Measurements

BCAL	Basicranial Axis Length	Measured from medventral border of foramen magnum to basisphenoid-presphenoid suture
BWT	Body Weight	From literature
CD	Canine Diameter	Diameter of upper canines
JL	Jaw Length	Measured from back of condyle to front of median incisor alveolus
SL	Skull Length	Measured from back of occipital condyles to anterior tip of premaxilla
TFL	Temporal Fossa Length	Measured from the most posterior point of the lambdoidal crest to back of supraorbital process
TFW	Temporal Fossa Width	Calculated by subtracting width at the postorbital constriction from width across zygomatic arches
TRL	Tooth Row Length	Measured parallel to palatal midline, from a point level with back of the last tooth to the front of median incisor alveolus
ZAW	Zygomatic Arch Width	Measured across the widest portion of zygomatic arches



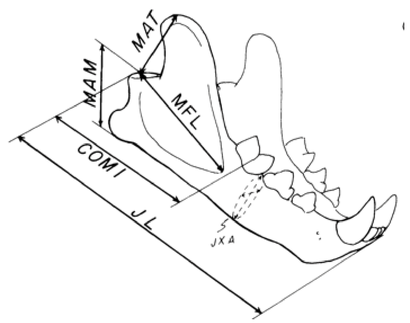


Figure 2 – Cat cranial and mandibular measurements (double arrows) as used in this study (from Radinsky, 1981a, 1982) .

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