UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 18, 2018 Mary Gates Hall

Online Proceedings

Poster Session 1

MGH 241, Easel 141

11:00 AM to 1:00 PM

Variation in Hind Limb Morphology in Relation to Hunting Behavior in Carnivora

Aleina Catherine Cudnofskey, Senior, Biology (Physiology)
Dustin Kramer, Senior, Biology (Physiology)
Mentor: Sharlene Santana, Biology

Functional morphologists examine the anatomy of organisms to elucidate how they are adapted to various habitats and behaviors. These type of studies have also led to intense research and speculation about the specific behaviors associated with the morphologies of now extinct species. Can we predict the hunting behavior of a predator from its skeletal morphology? In this study, we examined both femur morphology and the calcaneus to femur length ratios in extant members of Carnivora, with the goal of finding a link between these traits and a species' hunting strategy. We categorized hunting strategies from videos and previous accounts by taking note of the presence and timing of each species' attacks of live prey. To quantify hind limb bone morphology across species with different hunting strategies, we measured the length of the calcaneus and femur, and the minimum bone diameter of the femur. Our sample included 12 extant species from several hunting strategies. We expect to find femurs with a greater minimum diameter in species that have strategies that require greater muscle force during the prey capture period. This type of anatomy would provide the support necessary for attachments of larger running muscles. For femur to calcaneus ratio, we expect to find a lower value in species with longer chase periods in their hunting strategy. This would be due to a greater need for longer strides and contact time to reach the speeds necessary to catch their prey. This study will allow scientists to more accurately predict the hunting behaviors of extinct animals based on measurements that can be easily obtained from an intact fossil.

Session 1D

Marine Ecology and Food Webs

Session Moderator: Bonnie Becker, Academic Affairs (Tacoma)

MGH 228

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Predicting Diet through Quantification of Biomechanical Differences in Cranial Morphology in Odontoceti

Grace X. Sun, Senior, Biology (General)
Austin Fletcher Sears, Senior, Biology (Physiology)
Mentor: Sharlene Santana, Biology

Among the most robust determinants of fitness within the animal kingdom are successful feeding techniques that enable adequate energy acquisition. The need to maintain a steady food supply is especially crucial in mammals who have high metabolic demands in order to maintain a homeostatic internal body temperature. Within the Class Mammalia, the Order Cetacea consists of whales, dolphins, and porpoises, and includes some of the most derived and specialized aquatic carnivores. Of the three Cetacean suborders, Odontoceti retains the ancestral condition of having teeth rather than baleen for filter-feeding as in Mysticeti whales. This allows odontocetes to consume many prey types, ranging from cephalopods to large vertebrates. The aim of this study is to investigate if interspecific differences in bite force and gape size evolved in tandem with the consumption of specific prey types in odontocetes. To achieve this goal, we used skull specimens from the Burke Mammalogy Collection at the University of Washington to take a variety of linear measurements of the cranium and mandible. We used these measurements to estimate gape size and bite force by applying mathematical equations, and then contrasted these values across species that differ in diet. We expect to find that odontocetes evolved cranial adaptations to 1) increase bite force as a means to consume harder prey and 2) increase gape size as a means to consume larger prey. Developing a better understanding of how species maximize energy gain is imperative to determining the factors that drive evolution and species adaptation. This knowledge can also help inform future conservation efforts, improve the general understanding of Odontoceti evolution, and serve as a reference for future studies of mammalian cranial morphol-

ogy and biomechanics.