H100 Taphonomic Signatures of Animal Scavengers in Northern California

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After attending this presentation, attendees will gain a greater understanding of animal scavenging patterns on human remains from the Western U.S. The goals of this research are to: (1) document taphonomic signatures on human remains due to carnivore and rodent scavenging in northern California, and (2) address challenges in time- since-death estimates using taphonomic indicators.

This presentation will impact the forensic community by highlighting important considerations for assessing taphonomic signatures on human remains due to animal scavenging, as well as implications for time-since-death estimations.

Although taphonomic research involving animal scavenging has had a long history in paleontology and archaeology, only a handful of studies have focused on the scavenging of human remains from forensic contexts. Many of the forensic cases submitted to the Human Identification Laboratory at California State University, Chico (CSUC- HIL) derive from outdoor contexts and show extensive evidence of scavenging by carnivores and rodents. Northern California's extensive forests and rural landscape are home to a number of key scavengers, including black bears, coyotes, squirrels, opossums, raccoons, and rats. The especially high frequency of carnivore gnawing marks on bone indicates that bears and canids (coyotes and dogs) are among the most active scavengers of human remains in the area. However, rodents also play a significant role in the scavenging of human remains.

This study examines 21 forensic cases involving animal scavenging submitted to CSUC from 1986 to 2008. The majority of cases (n=16) are curated at the CSUC-HIL, with the remaining (n=5) examined through previous case reports. Each case was inventoried in detail, and all skeletal elements were examined for the presence of tooth impact marks. Elements that showed clear evidence of pits, punctures, and furrows were scored as carnivore gnawing damage. Similarly, linear, parallel striations were scored as evidence of rodent gnawing damage. To facilitate analysis, crania, ribs, hands, and feet are treated as single units rather than as separate elements. The frequency of each element represented was compared with the frequency affected by scavenging to evaluate the relationship between element survivorship and scavenging frequency. General patterns of involvement for carnivores and rodents are documented.

Because the recovery of remains was primarily conducted by law enforcement, the representation of elements may be more informative of the recognizability and size of skeletal elements than actual element survivorship. For example, 95.2% of crania, 88.1% of femora, and 83.3% of innominates were recovered, all which represent large elements easily recognizable as human. In contrast, small elements of the feet, hands, and the patella are the least represented (52.3%, 33.3%, and 28.6%, respectively). When elements were ranked by their representation and compared by scavenging frequency, no correlation was found (rho = 0.162, p = 0.535).

Overall, 31.2% (n=205) of the 658 total elements show evidence of animal gnawing, with carnivore damage accounting for 27.5% and rodent gnawing for 3.6%. Of the elements with evidence of scavenging, the majority are associated with carnivore damage (carnivore = 88.3% vs. rodent = 11.7%). For carnivore scavenged remains, the highest prevalence is found for elements of the lower limb. Although smaller elements are more likely to be consumed during scavenging activity, all element types are well-represented in the dataset. Of particular note is that rodent scavenging is primarily found on the skull and large appendicular elements. For example, rodent gnawing was not observed on ribs, scapulae, clavicles, patellae, or the vertebral column.

Within-element patterns of carnivore scavenging are consistent with that reported in the literature—chewing activity is focused on nutrient- rich cancellous portions of proximal and distal segments of long bones, the pectoral girdle, and the pelvic girdle. For rodents, chewing behavior is guided by both the need to sharpen continuously growing incisors and also the need for minerals (e.g., calcium). Due to functional constraints of the rodent jaw, gnawing is often directed toward portions of elements that have sharp crests, ridges, or borders. The data indicate that rodent gnawing damage is mainly associated with regions of the skull such as the superior borders of the eye orbit, nuchal lines, mastoid processes, mandibular rami, and crests and muscle attachments of large appendicular elements.

The present study highlights the need to examine large samples of scavenged remains from different environments. The preliminary results of this study suggest that large carnivores (bears and canids) are the primary agents that modify human remains in outdoor contexts in northern California. Although rodents play a smaller role, nearly 12% of elements had significant damage due to rodent activity. Variation in the distribution of animal scavengers should be taken into account in time- since-death estimates.

Taphonomy, Animal Scavenging, Time-Since-Death

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