H77 Inter- and Intra-Element Variation in Carnivore and Rodent Scavenging Patterns in Northern California

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After attending this presentation, attendees will gain a more complete understanding of postmortem artifacts from human remains created by animal scavengers, and their distribution in forensic cases from northern California. The goals of this research include: 1) an assessment of inter and intra-element patterning of postmortem modifications on human remains caused by animal scavengers; 2) a metric analysis of canine impact damage in relation to carnivore tooth dimensions; and 3) an evaluation of taphonomic models for predicting disarticulation sequences and time-since-death estimates in the western United States.

This presentation will impact the forensic community by providing a critical evaluation of the various taphonomic signatures caused by animal scavengers and their relationship to understanding sequences of disarticulation.

Taphonomy has become an integral area of research within forensic anthropology since the late 1980s. Previous studies have generally focused on field or laboratory-based experiments, retrospective case reviews, or individual case reports. However, little recent attention has been devoted to more detailed study of postmortem damage created by animal scavengers in larger forensic collections. Throughout rural northern California, decomposed and skeletonized human remains recovered from outdoor contexts commonly show evidence of carnivore and rodent tooth impact damage. Although their distribution varies by region, key mammalian scavengers include black bears, coyotes, raccoons, opossums, squirrels, and various rodents. A previous survey of scavenged forensic cases from northern California indicated that medium-to-large bodied carnivores (canids and black bears) are responsible for the majority of the postmortem damage to skeletal remains (Bartelink and Bright 2009).

This study examines twenty two forensic cases involving animal scavenging submitted for analysis to the California State University, Chico Human Identification Laboratory (CSUC-HIL). Sixteen of the cases are curated at the CSUC-HIL, with the remainder (n=6) documented from previous case reports. The cases derive from 13 counties in northern California, and were originally submitted between 1986 and 2009. With one exception, all cases derive from outdoor contexts. For each case, a complete inventory was conducted and the pattern of scavenging documented. Diagrams were used to record the completeness of all scavenged elements, and the distribution of tooth impact damage (e.g., furrows, pits, punctures, striations) and spiral fractures within each element. The percentage of bone missing due to scavenging was recorded for all appendicular elements using an ordinal scale as a measure of scavenging intensity. A second component of this research attempted to identify involvement of specific scavenger species associated with the tooth impact damage. Digital calipers were used to measure the maximum diameter of shallow pits as well as deeper puncture marks associated with carnivore scavenging. In addition, dental measurements were recorded for the canine teeth of several scavenger species from the CSUC zooarchaeology comparative collection (e.g., black bear, coyote, grey fox, mountain lion, and raccoon). The maximum diameter of the distal canine tip, maximum labio-lingual crown diameter, and maximum mesio-distal crown diameter was recorded with digital dental calipers for each specimen. Bivariate plots were used to compare distal canine diameters with shallow pits and maximum crown measurements with puncture marks.

The results indicate that the most intensively scavenged appendicular segments are the pubis and ischium, followed by the proximal ulna, tibia, humerus, and radius. In general, distal and especially midshaft segments were less intensively scavenged. The pattern of more intensive carnivore involvement in proximal segments likely reflects differences in the amount of soft tissue available and the extent of decomposition and disarticulation at the time of discovery. Approximately 50% of all elements examined showed evidence of animal scavenging, with 98% of elements affected by carnivores and 7.5% by rodents. Carnivore tooth impact marks were most common on the hand, ribs, and lower limb elements, and rarely observed in vertebrae, sterna, and in the skull. Rodent gnawing damage most commonly occurred on the skull, and along muscle attachment sites of the femora and innominates. Spiral fractures likely caused by scavengers were observed only in six cases, and most commonly affected humeri and ulnae. Preliminary analysis of pit and puncture diameters also appears promising for differentiating tooth impact marks caused by black bears versus medium-sized carnivores (coyote, grey fox, and raccoon). The implications of these findings for understanding disarticulation sequences and limitations of time-since-death estimates are discussed.

Scavenging, Taphonomy, Postmortem Interval

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