



## Physical Anthropology Section - 2013

### H19 Adipose Distribution as a Predictive Model for Scavenging Sequencing and Intensity

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The goals of this presentation are to: (1) provide an assessment of current scavenging models; (2) provide an evaluation of actualistic experimental data; and, (3) provide a discussion of the role of adipose in scavenging sequencing and intensity. Attendees will be provided with examples of scavenging patterns from actualistic experiments using pig and deer carcasses and from forensic case report documentation of curated human remains housed at the California State University, Chico Human Identification Lab (CSUC-HIL).

This presentation will impact the forensic science community by providing a critical evaluation of current scavenging models and discussing the role of adipose in scavenging behavior.

Current anthropological scavenging theory states that elements disarticulated the earliest should show the greatest amount of damage. Much of the literature also states that the ventral thorax should be one of the first areas of the body to be scavenged. This study, however, shows that sometimes the internal organs are the last portions scavenged.

The actualistic study associated with this presentation was conducted in October 2009 and November through December of 2011 at the Big Chico Creek Ecological Reserve (BCCER) in Butte County, California. A single adult mule deer and five 100-pound pig carcasses were placed at six different locations within the BCCER. Digital game cameras were positioned at each of the sites in order to monitor scavenger activity. Two pictures were taken each time the motion-sensitive laser was triggered, with a delay of one minute between each image. Sites were monitored daily and the camera was repositioned if the carcass had been moved out of the camera's field of view. The carcasses were placed on the surface, and to prevent immediate removal from the site location, each carcass was tied down to rebar stakes with lengths of wire wrapped around the forelimbs and hind limbs. Documented scavengers included: black bear, gray fox, turkey vulture, red-tailed hawk, golden eagle, and the common raven. From the camera documentation, the sequence of tissue consumption and disarticulation were recorded and analyzed. The scavenging damage was then compared to 21 forensic cases curated at the CSUC-HIL. The deer, pig, and human skeleton element representation, and inter- and intra-element scavenging patterns, were documented in detail.

Results indicate that the carcasses were consumed in a predictable sequence from areas of high body-fat content to areas with low fat content. In the deer carcass, scavenging damage occurred first to the thorax and anal region, with all internal organs removed and consumed in the first 24 hours. The deer was completely skeletonized, disarticulated, and scattered by the second day. Total body fat of an adult female mule deer ranges from 3.7 to 10.9 percent (Torbit et al. 1988).<sup>1</sup> Conversely, in the case of the pigs, the skin and subcutaneous tissue were consumed first, followed by the forequarter, hindquarter, and lastly, the internal organs. In modern, commercially produced pigs, total carcass fat is kept at approximately 20 percent; this percentage is similar to the average American adult (Kouba and Sellier 2011, MedlinePlus 2011).<sup>2,3</sup>

The pattern documented in the pig carcasses, with regards to scavenging intensity and adipose amounts, was mirrored in the human skeletal sample. The most heavily scavenged portions of the human skeletons were the innominate, proximal ulna, proximal tibia, and proximal humerus; these areas are all surrounded by rich fat deposits. The higher rates of damage in high-adipose areas may occur because of the higher caloric, and thus energetic, return of fat-rich areas compared to protein- or carbohydrate-rich areas. Thus, areas that are richer in fat should have a higher degree of scavenging intensity than areas lower in fat.

#### References:

- <sup>1</sup> Torbit S, Carpenter L, Bartmann R, Alldredge AW, White G. Calibration of carcass fat indices in wintering mule deer. *J Wildlife Mgmt* 1988;582-88.
- <sup>2</sup> Kouba M, Sellier P. A review of the factors influencing the development of intermuscular adipose tissue in the growing pig. *Meat Sci* 2011;88(2):213-20.
- <sup>3</sup> MedlinePlus Weight Management: MedlinePlus Medical Encyclopedia. 2011.

#### Taphonomy, Scavenging, Adipose