



Physical Anthropology Section – 2011

H101 Potential Impact of Regional Ecologies on the Estimation of Postmortem Interval: Case Comparisons From Northern New England

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After attending this presentation, attendees will better understand the potential effects of microenvironment on differential decomposition, and how regional differences can influence taphonomic condition and estimation of postmortem interval (PMI).

This presentation will impact the forensic science community by illustrating how regional ecological variation can affect accurate estimation of PMI in a medicolegal context.

Estimation of postmortem interval is among the most important—and among the most complex—tasks performed by forensic anthropologists. An accurate PMI can help the medical examiner to determine a timeline for events surrounding a death and can inform the direction of medicolegal investigation. However, PMI estimation is complicated by numerous factors, many of which vary geographically, including temperature, precipitation, elevation, terrain, and soil characteristics. These combined factors all contribute to the ecology of plant, insect and animal communities that impact the condition of a corpse. A multi-year research initiative to develop regional taphonomic standards for northern New England has selected comparative case examples where time of death and ecological context is known to illustrate representative patterns.

This presentation examines the effects of regional ecosystem variables using a Maine case involving the body of a young woman found partially submerged in a shallow stream in a area of light-growth, mixed deciduous-evergreen woods. Data from a weather station six miles away was used to calculate the accumulated degree days (ADD). Investigation of daily temperatures showed a cold October, with below-freezing temperatures, but a warmer-than-average November. With a late September death, a 65-day PMI, and an ADD total of 536, the body demonstrated four distinct taphonomic zones, ranging from fleshed with intact internal organs to skeletonization of the head and arms. Large scavengers, primarily coyote, had removed flesh from the arms, back, and buttocks. The head was skeletonized but showed no evidence of carnivore activity, suggesting that this area may have been defleshed by insects or putrefaction prior to canid involvement. However, evidence of insect involvement was absent.

Microenvironmental factors help to explain differences between this case and selected comparison cases from the same geographic area and/or the same timeframe. This case is compared with two other cases found in the woods in the same local area. One is from roughly the same autumn timeframe, with a shorter PMI (about 30 days) and no evidence of mammalian scavengers. Decomposition is at the decay stage, and larvae are present but not abundant. The other comparison case is from the same area, and has a similar amount of decomposition on average, but was exposed in the summer and for a shorter time frame (15 days). Mammalian scavengers were minimally involved, and fly larvae were abundant on the body.

The importance of scavenger involvement and the cold, often freezing temperatures are critical variables in interpreting cases in the northeast. Many actualistic taphonomic studies used to calibrate the PMI estimation have been conducted at the scavenger-protected University of Tennessee Anthropological Research Facility, yet natural experiments in the arid regions of the southwest United States (Galloway 1997; Rhine and Dawson 1998), the southeast (Manhein 1997) and the northeast (Sorg et al., 1998) amply demonstrate tremendous regional variations in the taphonomic factors that influence the rate and characteristics of decomposition. Temperature has been demonstrated to alter the speed of decomposition, and Micozzi (1997) has shown that freezing temperatures can cause cellular breakdown and reverse the order in which decomposition occurs within a body, so that more external and peripheral parts decompose earlier. Comparative rates of thawing of anatomical parts may also reverse scavenging order, and colder temperatures and resulting food scarcity can enhance the intensity of scavenger activity (Klepinger 2006; Bass 1997).

In sum, regional variation in ecological and climatological factors necessitates a more fine-grained examination of case context in order to estimate PMI. Results of actualistic studies, particularly those conducted in other regions, need local testing and adjustments before they can be applied.

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Taphonomy, Postmortem Interval, Regional Ecology