H120 Regional and Micro-Environmental Taphonomic Variation and Decomposition in Northern New England

Marcella H. Sorg, PhD, Univ of Maine, Margaret Chase Smith Center, Orono, ME 04469; Jamie A. Wren, BA, Univ of Maine, Dept of Anthropology, 5773 S Stevens Hall, Orono, ME 04469; and William D. Parker, BA, Univ of Maine, Margaret Chase Smith Center, Orono, ME 04469-5784*

After attending this presentation, attendees will better understand the potential impact that regional and site-specific microenvironmental factors, particularly temperature, can have on the timing of postmortem processes, and the estimation of the Postmortem Interval (PMI).

This presentation will impact the forensic science community by demonstrating the importance of addressing regional and microenvironmental variation in outdoor forensic cases that do not involve animal scavenging.

Published models for the estimation of PMI generally present a sequential decomposition process that includes insect involvement and no scavenger modification. These models are all based on regionally-specific datasets, which may not be applicable to other geographic locations, or even to different microenvironments within that region.

Important regional taphonomic factors for Northern New England include a colder, seasonal climate, a densely forested landscape, and a high level of scavenger access. Using an experimental pig cadaver outdoor case series that excludes mammalian and avian scavengers, the authors have found that both regional factors (such as seasonal temperature fluctuation) and microenvironmental site differences (such as the amount of a forest canopy and the level of moisture retention) impact the rate and character of decomposition. This research utilizes decomposition phase, Accumulated Degree Days (ADD), Accumulated Humidity days (AH), Total Body Scores (TBS), and percent decomposition to track postmortem change including contextual information about forest canopy and ground vegetation.[1]

Two pig cadavers were placed in cages measuring 1.8x2.4m, which allowed insect access, but excluded most mammalian or avian scavengers. The pig cadavers were placed on the same day in late fall, on the day of death. Wildlife cameras were set up within the cages to capture photographs of the cadavers in 15 min intervals. A weather station recording hourly temperature and humidity data was also placed next to the cages. The cages were placed approximately 30m apart. Each pig was placed in a unique microenvironment, one in an open, grassy meadow (designated “Field Pig”), and the other under an evergreen canopy with a pine-needle forest floor (designated “Woods Pig”). These are typical sites for forensic cases in northern New England. This paper focuses on the time period from placement on November 3, with a subsequent snowy winter, extending to June 30. Complete skeletonization occurred during this time frame.

Observations of these two microenvironments showed that year-round forest canopy significantly impacted the rate of decomposition. The Woods Pig progressed through stages of decomposition at a faster rate than the Field Pig, particularly bloat and the early decomposition phases. The Woods Pig had a higher TBS at all 100-ADD benchmarks, despite lower temperatures and a slower build-up of ADD in the woods. The Woods Pig reached full skeletonization earlier, on June 24 (TBS 29), at 1,151 ADD, and an AH of 18,919. By this date, the Field Pig was not completely skeletal (ADD 1,365 and AH 18,827). The Field Pig reached full skeletonization (TBS 29) four days later, on June 28, at 1,440 ADD and 19,145 AH.

Analysis of ADD and AH showed that the insulating effect of the evergreen canopy not only slowed the progression of ADD, but allowed for greater retention of moisture at ADD benchmarks and sped decomposition. By comparing the trends of ADD and AH for each pig, we found that the Woods Pig had similar AH on the same dates, but consistently higher AH than the Field Pig at the same ADD. Vass presents a formula for an aboveground, universal estimation of PMI that includes percent humidity.[2] The documented results during this study also suggest that factoring in humidity during the estimation of PMI can be helpful in explaining microenvironmental differences seen within various geographic regions.

This project is supported by Award No. 2008-DN-BX-K177 through the National Institute of Justice, Office of Justice Programs, and the U.S. Department of Justice. The opinions, findings, and conclusions or recommendations expressed in this presentation are those of the authors and do not necessarily reflect those of the Department of Justice.

References:

1. Megyesi MS, Nawrocki SP, Haskell NH. Using accumulated degree-days to estimate the postmortem interval from decomposed human remains. *J Forensic Sci* 2005;50(3):1-9.
2. Vass AA. The elusive universal post-mortem interval formula. Forensic Sci Int 2011;204(1-3):34-40.

Taphonomy, Decomposition, Regional Variation

 ** Presenting Author*