D5 Case Study: The Uncertainty of Establishing a Postmortem (PMI) Interval Based on Entomological Evidence Incorporating the Influence of Elevation on Ambient Temperature Reconstruction

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The presentation will discuss a particular case study that accounts for the influence of elevation on temperature when estimating a postmortem (PMI) interval based on entomological evidence. The authors intend to demonstrate how this environmental effect can influence a PMI estimate if not considered in the evaluation of temperature data. The attendee will learn how to incorporate elevational effects on ambient temperatures and subsequent PMI estimates based on degree day calculations with this modification to ambient temperatures.

This presentation will demonstrate that within general ecological and meteorological literature, elevation or altitudinal effects on temperature are well documented. However, little or no discussion among forensic entomologists has addressed this environmental influence on the calculation of a PMI. This particular case illustrates how failure to incorporate elevation modifications to ambient temperature can significantly underestimate a postmortem interval using insect evidence. The authors hope that forensic entomologists will recognize how elevation not only influences the established ecotone of a death scene but also impacts temperature reconstruction that is vital to reducing uncertainty on PMI estimations from insect evidence. Further, the authors hope that this case report will foster increased interactions between forensic entomologists and meteorologists.

Forensic entomologists define postmortem interval (PMI) as the period between oviposition (*i.e.*, egg laying) and the discovery of a corpse followed by preservation of recovered insect larvae. This approach rests on the fundamental relationship between insect development and the number of degree-days or thermal units accumulated over time. The comparison of average ambient temperatures with a base developmental temperature is recognized as a powerful method for estimating PMI. Several factors can influence specific insect development including individual species characteristics, weather and climate, presence or absence of maggot mass, drugs and toxins, as well as geographic domain.

A tendency exists for entomologists to act as their own meteorologist without taking into account various environmental influences which may increase the uncertainty associated with a specific PMI estimate. For example, adjustments to the temperature record are often required to account for local differences in elevation, vegetation, sun exposure, ground cover and soil type, wind, and recent weather including precipitation amount and intensity; even the rate of temperature increase or decrease may be considered important. In addition, micro-meteorological studies suggest small-scale climate forcing may produce pronounced temperature variations that are seldom captured by an observational network. These environmental influences often complicate the reconstruction of the most appropriate ambient temperature regime associated with an actual death scene.

The authors will present a case study in which the body of a young adult male was discovered near a ridgeline in steeply sloping terrain in southeastern Pennsylvania. The body was located in a heavily wooded location at an approximate elevation of 270 meters above mean sea level (MSL). The closest National Weather Service maintained weather observation station was located 14 km from the death scene at an elevation of 121 meters MSL on the property of a regional airport. Approximately 12 arthropod taxa were collected from the remains with 33 % of the identified flies of forensic importance. Post-feeding *Calliphora vicina* maggots were collected and represented the oldest identifiable insect taxon used to estimate the PMI. The final PMI was modified to include the primary influence of elevation on temperature, and secondarily, the exposure of the death scene to direct sun, angle of incidence, and slope.

Elevation, Postmortem Interval, Temperature

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