G67 A Standardized Field Protocol for Experimentally Investigating Variability in Entomology-Based Postmortem Intervals Over Multiple Sites and Years: A Proposal

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After attending this presentation, attendees will gain understanding of the key factors that influence variability of entomology-based PMI estimates and the need for forensic entomologists to devise standardized field experiments at multiple sites over several years. Such a protocol will disentangle the combined and interactive effects of these key factors on carcass decay rates and carrion-arthropod colonization, development and succession.

This presentation will impact the forensic community and/or humanity by through the introduction of this collaborative framework and call for a standardized field protocol, the authors will provide the forensic science community several scientific examples, gleaned from the entomological literature, of the need to better understand spatio-temporal variability of entomology-based PMI estimates through the establishment of a small network of field sites.

A multi-site field protocol, modeled after the U.S. Long-Term Ecological Research Network, is proposed for investigating the major biotic and abiotic factors that influence entomology-based postmortem intervals (PMI), i.e., the time period between insect colonization and body discovery. The study proposes that this goal can only be achieved by a multi-investigator group studying forensically-important (FI) arthropods year-round over several years. Investigators and sites will be chosen from a subset of active and willing researchers (with established track records) whose institutions bracket more latitudes than longitudes in order to reflect the widest range of climates and vegetation types.

The central features of this protocol, which the authors have embraced in their own research and training programs, include the use of pig carcasses as surrogate corpses, fixed sampling stations as mock crime scenes, comparative tests of different field methods, and the integration of photographic, climatic, and arthropod records. The domestic pig (*Sus scrofa* Linnaeus) (of roughly 23-27 kg starting weight) closely resembles a human in its fat distribution, chest cavity, lack of heavy fur, and omnivorous diet. Advantages to using pigs include ease of procurement, reasonable cost, and a low propensity to incite public objection. The pig- as-surrogate claim was recently validated in field trials conducted inside the Forensic Anthropology Center (formerly ARF) at the University of Tennessee, Knoxville, TN, using simultaneously placed human and porcine subjects studied over a 35-day summer period. In that study, exceptionally high overlap in arthropod abundances (>99%) was reported from three subjects (one human, two pigs), indicating that only a few very rare FI taxa were associated with one subject or the other.

Within each site, the initial study design will feature replicated pig carcasses representing the "background" condition (i.e., surface-exposed, unclothed, and vertebrate unscavenged) against which other replicated treatments could be compared in the future (e.g., buried, burned, submerged, clothed, and/or vertebrate scavenged remains). Recent research has shown that when different sampling methods are used to inventory the carrion-arthropod fauna (i.e., aerial nets, hand collections, pitfall traps, sticky traps), results are often species-selective leading to catches of variable species composition which have the potential for affecting PMI estimates. Many other studies have established that carrion- arthropod succession and carcass decay rates are affected by season, temperature, elevation, exposure mode (e.g., buried, burned, submersed, wrapped), presence/absence of predators, and other factors.

Through this protocol, it is hoped to achieve a better understanding of variability and uncertainty in PMI estimates by holding constant both investigator error and exposure conditions. To further this goal this study will work to disentangle the combined and interactive effects of climate, season, and geography on carcass decay rates and arthropod colonization, development, succession, and species composition. To further reduce inter-investigator error, the study will require that each researcher channel his/her voucher specimens to the same taxonomic specialists to insure uniformity and accuracy of identifications across sites. Statistical analysis will focus on testing whether the order and timing of different species of colonizing insects used in both development and succession-based PMI estimates are comparable (i.e., repeatable) across different sites, seasons, and years. Given the critical need to separate pattern from "noise" in forensic entomology and to accurately and precisely estimate time-of- death, which the Law

requires to be ascertained, the need for a standardized field protocol that can function at multiple sites for several years becomes clear.

Through the introduction of this collaborative framework and call for a standardized field protocol, the authors will provide the forensic science community several scientific examples, gleaned from the entomological literature, for the need to better understand spatio-temporal variability of entomology-based PMI estimates through the establishment of a small network of field sites.

Forensic Entomology, Postmortem Interval, Field Protocols

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