G65 A New Framework for Guiding Research in Forensic Entomology: Improving the Science Relevant to PMI Estimates

M. Eric Benbow, PhD, University of Dayton, Department of Biology, 300 College Park, Dayton, OH 45469-2320; and Jeffery K. Tomberlin, PhD, and Rachel Mohr, MS, Department of Entomology, Texas A&M University, 2475 TAMU, College Station, TX 77843*

After attending this presentation, attendees will increase awareness of specific basic research needs essential for refining estimates of the period of insect activity (PIA) on human remains. Furthermore, attendees will be introduced to a needed differentiation of semantics intended to improve communication among forensic entomologists, other professionals of the forensic science community, members of the judicial process, and the general public.

This presentation will impact the forensic science community by presenting a new framework for describing the aspects of entomological activity associated with human remains. After attending this presentation, the attendees will understand the need for additional research examining neglected study foci related to the PIA, specifically the interval of activity prior to physical colonization. This presentation will raise attendee awareness to specific basic research needs essential for refining estimates of the PIA on human remains.

A major component of the nature and practice of forensic entomology is assisting investigators in determining the postmortem interval (PMI). To date, the initial time of colonization that begins the defined post-colonization interval (post-CI), and includes arthropod occupation and use of the remains, has been the most relevant information for entomologically-based PMI estimates, which is concisely defined as the PIA; however, the time between death but before initial insect colonization is also a portion of the PIA and is important for cases that require accurate estimates within hours after death. For this presentation, this portion of the PIA is defined as the pre- colonization interval (pre-CI).

The pre-CI encompasses the portion of the PIA from time of death until initial physical colonization and use by insects for consumption or oviposition. Most studies that address the pre-CI have focused on nocturnal oviposition, but few have addressed other processes that influence initial insect contact and early colonizer oviposition; most notably measurable behavioral characteristics that are influenced by both biotic and abiotic factors in the environment. In addition, there is tremendous variation in the length of time and faunal succession characteristics of insect activity on a body. The interface of the pre-CI and the post-CI is defined by the time when arthropods physically colonize and begin using the human remains as a resource; as an oviposition site, habitat for finding prey or primary consumption of tissues. This interface is preceded by an acceptance phase defined by behavioral patterns of body detection and evaluation for full colonization. The acceptance phase of the pre-CI has been all but unstudied to date, but can affect estimates of the PIA. In the current state of knowledge regarding the PIA, limited scientific information can lead to interpretative differences among forensic entomologists.

The pre-CI in general, and the acceptance phase in particular, are broad areas of forensic entomology research that have been neglected, and require more rigorous and repeatable experimental design necessary to improve the entomological information relevant to total PIA, and consequently further refinement of PMI estimates. However, a common language and framework among forensic entomologists is necessary to facilitate and guide this research. To this end, a new conceptual framework is introduced to identify areas of needed forensic entomological research and propose standard terms when discussing entomological data used in investigations involving PMI estimates. This framework divides the PMI into logical components from death to body discovery including but not limited to the following: death to initial insect detection of the decomposing body (pre-CI exposure phase); the time from detection to location of the body (pre-CI detection phase); the time from body location to first oviposition (pre-CI acceptance phase); and, the time from insect colonization of the body to discovery of the remains (post-CI).

This framework identifies specific areas of research within each of these entomological phases that involve the behavioral and physical stages of insect activity on a body, and suggests which abiotic and biotic factors influence these entomological processes that can be of focused and applied studies. It is the intention of the authors to facilitate a common language and conceptual structure to improve the science of forensic entomology, an important consideration for aiding criminal investigations involving estimates of the PMI. Accordingly, this platform is used as a method for developing a common path leading from basic to applied research in the field of forensic entomology.

Forensic Entomology, Arthropod, Insects

 ** Presenting Author*