G105 Invertebrate Species Diversity, Richness, and Evenness Indicate Delayed Colonization of Remains

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After attending this presentation, attendees will be able to comprehend the utilization of multivariate statistical approaches for analyzing adult insect data associated with decomposing carrion in order to predict a delay in colonization (i.e. pre-colonization interval); specifically, adult insect species richness associated with decomposing human remains can be used to determine the pre-colonization and post-colonization interval and thus provide a more accurate minimum postmortem interval (mPMI).

This presentation will impact the forensic science community by showing how insects are commonly used to estimate the period of insect activity (PIA), which may correspond to minimum postmortem interval. However, forensic entomologists currently are not able to offer a quantified pre-colonization interval estimate. Consequently, estimates based on succession or development more accurately represent the mPMI which could be much shorter than the actual postmortem interval.

Adult primary colonizers, specifically blowflies (Diptera: Calliphoridae), are rarely used by forensic entomologists to predict PIA because of a high level of variation and unpredictable nature of utilizing a resource. The adults are most commonly used to confirm species identifications of larval specimens. Blowfly larval length and weight are almost exclusively used to estimate the age of a larva which can be used to predict the amount of time since eggs were laid on a body. The PIA consists of two intervals: the pre-colonization and the post-colonization intervals. During the pre-colonization interval remains are made available in the environment, insects will detect and subsequently accept the remains. An oviposition event occurs which indicates the beginning of the post-colonization interval. Insect activity including insect succession during the post-colonization time interval has long been the cornerstone of forensic entomology. Current research focusing on the pre-colonization interval will better understand species interactions and mechanism controlling colonization of remains.

This study used passive insect-trapping methods to assess primary colonizer species diversity, richness, and evenness on three swine carcasses that initially had access to insects (ACC) and three swine carcasses that were excluded from insect access (EXC) for five days using insect exclusion cages. After five days, EXC carcasses were exposed to insects via removal of the exclusion cages. Insects were collected every 12 hours for both treatments of carcasses and then identified to the lowest taxonomic level. Ecological parameters including Simpsons index, Shannon-Weaver index, species richness and species evenness were analyzed with univariate and multivariate statistical approaches. Succession patterns of forensically important insect species were similar for ACC and EXC carcasses with *Phormia regina* being the initial and most abundant blowfly species followed by *Lucilia coerulivirdis* and *Cochliomyia macellaria*. Coleopterans from the families Staphylinidae, Trogidae, Histeridae and Dermestidae were the next wave of insects utilizing the carcasses. Despite similarities between succession patterns with each treatment, Student's t-tests indicated that ACC carcasses had significantly fewer insect taxa than EXC carcasses exposed on each day insects. A multivariate approach was taken to determine any insect community differences between the ACC and EXC carcasses. Nonparametric multidimensional scaling analysis coupled with multiple response permutation procedure indicated a significant difference between ACC and EXC carcasses ($p<0.0001$).

These data are important because of their implications in forensic entomology. Mainly, if a body is excluded from insect activity for five days and insect collections are made using standard entomological evidence collection protocols there is a possibility that the PIA will be underestimated by up to five days. However, the the limitations of these data as only a single time frame was used to exclude insect was understood. More studies are ongoing to determine if these results would be consistent for multiple days of insect exclusion, but at this time collections of adult insect communities present at a body are promising as an indication of whether or not there has been a delay in insect colonization of a body.

Decomposition Ecology, Entomology, Delayed Colonization

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