H2 Bugs Bunny? No Bugs Bunny

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After attending this presentation, attendees will gain an understanding of the impact of insects on the decomposition process in relation to accumulated degree days (ADD) regardless of the environment in which the carcass is deposited.

This presentation will impact the forensic community by influencing the way in which postmortem interval (PMI) estimates are constructed. The data presented show that, when time/temperature is standardized as ADD, it is the presence of insects alone that accelerates decomposition. This holds true for both surface-deposited remains and for buried remains. Burial is a factor in decomposition solely because it normally excludes (or reduces, depending on the duration of the exposure interval between death and burial) oviposition by Diptera species. ADD can be used to estimate the PMI in burials (using an insect exclusion model) in the same manner as it is in surface depositions.

When temperature/time is standardized as Accumulated Degree Days (ADD), insect access is the most influential factor affecting decomposition rate. Carcass size is of secondary importance, with smaller carcasses decomposing faster than larger ones, mainly due to insect clutch size, which affects larval numbers and the amount of heat generated by the larval mass, which in turn accelerates insect developmental trajectory. Carcass disturbance is also a factor affecting decomposition, particularly when measured via percent weight lost, as movement of a carcass disrupts the insect feeding activity and delays skeletalization.

This paper explores the effect of insect exclusion on decomposition rate in a direct comparison of insect accessed and insect excluded carcasses of the same size class, using a wild rabbit (*Oryctolagus cuniculus*) model. All rabbits were killed as part of the annual cull and their use was approved by university animal research ethics committees and official veterinarians of the United Kingdom Meat Hygiene Service. The studies were conducted primarily in the Northwest of England during the months May to July of 2008. Comparative data from Adlam and Simmons (2007) was used for insect exposed surface decomposition.

Insect accessed surface (N=24) and buried (N=30) carcasses as well as insect excluded surface (N=30) and buried (N=30) carcasses form the study set (total N=114). Insect excluded rabbits were placed in plastic bags immediately following culling, thus precluding oviposition. Buried rabbits were placed into graves immediately following weight recording and thermocouples were placed under the trunk of each rabbit to record changes in carcass temperature during underground decomposition. Two thermocouples were used to record ground temperature external to the graves. The burial depth for all rabbits was 30-35 cm, thus mimicking a shallow, clandestine grave. Similar protocols were followed with regard to the surface insect excluded rabbits, which were placed into raised cages screened with 1mm aluminum mesh and thermocouples were inserted subcutaneously in the abdomens of 7 randomly distributed carcasses. A thermocouple and data logger were also used to continuously record ambient temperature at the site. Carcasses becoming visibly infested with larvae were discarded from the experiment with no further data collected and appropriate control measures were taken to prevent further spread. For the buried, insect exposed carcasses, carcasses were left on the ground surface near the graves and exposed to normal insect activity for approximately five hours prior to burial. Insect exposed surface rabbits were laid on the surface under chicken wire fencing to prevent scavenging for the duration of the experiment.

The data collection protocol for both the buried and surface rabbits was carried out approximately every 50 ADD. This included weighing the rabbits, assigning a Total Body Score (TBS); and, for all groups except insect excluded surface depositions, taking soil samples for pH measurement.

The results indicate that oviposition occurred successfully on both insect exposed groups and was prevented (or delayed substantially) in the insect excluded groups. The rate of decomposition as measured by TBS in insect exposed carcasses exceeded that of insect excluded carcasses throughout the decomposition process with no overlap between the two groups. Furthermore, any difference in rate of decomposition between insect excluded groups (buried and surface) was not significant; the slopes of the regression lines (Figure 1) are not significantly different ($p<0.485$). Buried insect-access carcasses displayed an intermediate rate of decomposition. This can be explained by the single episode of oviposition on the remains prior to burial, without subsequent insect infestation that would have further accelerated the decomposition process.

 ** Presenting Author*

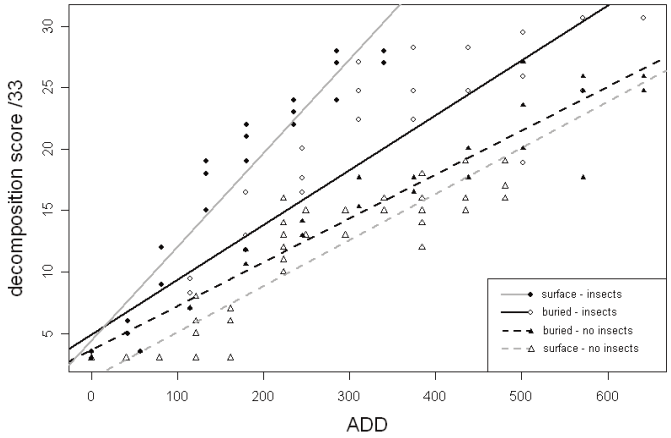

Figure 1: TBS vs. ADD for insect access and insect excluded rabbits

Accumulated Degree Days, Burial, Insects

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