Insect Succession on Pig Carcasses to Determine Post-Mortem Interval in Eastern North Carolina

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Abstract

The relationship between insect succession and carcass decomposition is a factor in determining the post-mortem interval (PMI), the period of time after death. Aspects of decomposition are used in forensic investigations to determine time of death and whether the carcass was relocated. Patterns in species occurrence and abundance can be found during the PMI. It is important to obtain data from different geographic regions and habitats as this information can be used in forensic studies and criminal investigations. Region-specific documentation of insects of forensic importance can facilitate estimation of the PMI. The current study evaluates seasonal (summer, fall, winter, spring) effects on the PMI in relation to insect succession. The summer and fall observation periods have been completed. The winter and spring components of this experiment are in progress. Data on species composition and abundance with regard to the PMI are presented from the summer experiment.

Goals

- Document insect species involved in decomposition in eastern North Carolina.
- Determine insects of forensic importance and role in post-mortem interval.
- Recognize influence of environmental factors on species occurrence and abundance.

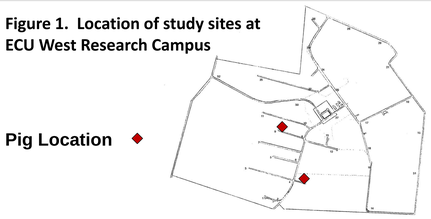

Figure 1. Location of study sites at ECU West Research Campus

Materials and Methods

- Daily insect collections from two pig carcasses placed at the West Research Campus (Figures 1 and 2)for three weeks (June 7-28, 2012)
- Pigs placed in cages that allowed access to insects but not scavengers.
- Soft bodied insects preserved in 70% ethanol (Figure 6); other insects pinned.
- All specimens identified to species (> 600 insects collected during summer/fall experiments.
- Methods of collection included: Sweep net, mechanical aspirator, malaise trap, pitfall trap, and hand collection using forceps.
- Daily temperature and humidity readings were also taken in half hour intervals.
- Daily measurements of rainfall with rain gauge.

Results

Figure 2. Personnel from the Department of Comparative Medicine placing pigs in cages.

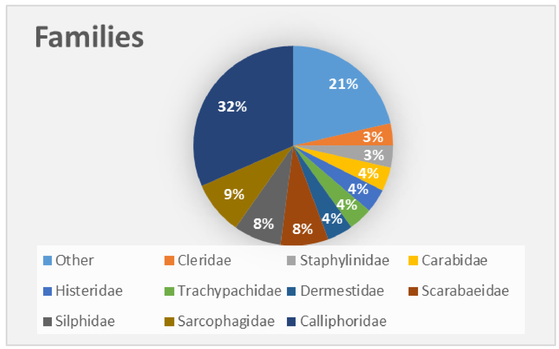

Figure 3. Insect families collected.

- During the summer session, a variety of 59 different species from 33 families were collected and identified out of a total of 337 insects (Figure 3). Blowflies and bottle flies (Family Calliphoridae) were most commonly collected.
- Insect activity varied during each stage of decomposition (fresh, bloated, active, advanced decay, dry/remains) (Figures 4 and 5).
- Fresh stage (June 7) of decomposition showed the lowest insect activity.
- Active decay stage (June 11 –15) included > 50% of the total identified (Figure 7).
- Advanced decay stage (June 16-24) showed the most insect diversity.

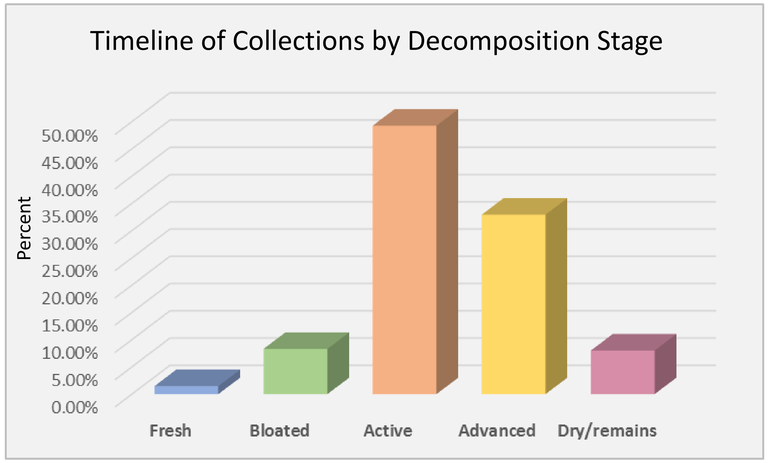

Figure 4. Timeline of Collections by Decomposition Stage

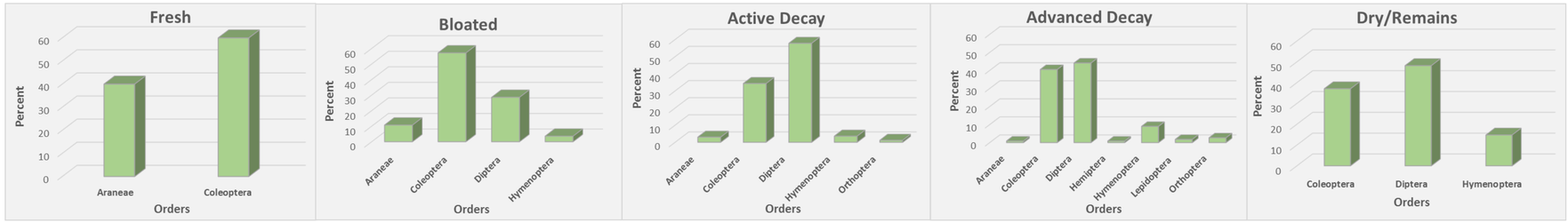

Figure 5. Orders Collected by Decomposition Stage

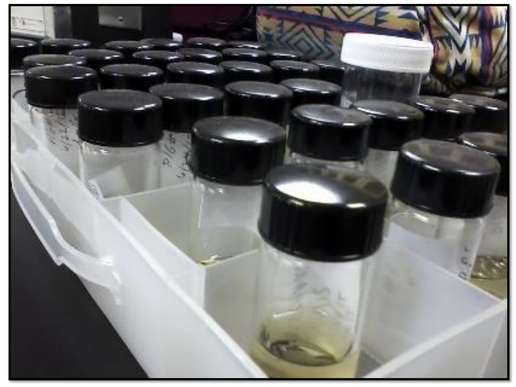

Figure 6. Soft bodies were preserved in vials containing 70% ethanol.

Conclusions

- Species diversity increased as the PMI progressed (i.e. bloated, active decay, advanced decay, dry/remains stages).
- Highest insect activity during the 4-18 days post-placement .
- Order Diptera most abundant 4-11 days post-placement.
- Insect diversity increased by the advanced decay stage, especially in Order Coleoptera.
- Temperature and relative humidity are related to insect activity.
- Patterns of insect succession will be analyzed within and between seasons.

Figure 7. On Day 6 post-placement (active decay stage), several fly maggots were observed and a high diversity of insects in Orders Diptera (flies) and Coleoptera (beetles). Insects laid eggs in exposed orifices and these were the initial body regions to decompose.