

Pig Tales: Forensic Taphonomy in Cozine Creek

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Introduction

The medicolegal community relies heavily upon determining the postmortem interval (PMI), the knowledge of how much time has elapsed since the person has died. Forensic taphonomy is the study of postmortem changes caused by outdoor environmental conditions that play a crucial role in decomposition rates. These include local temperatures, humidity, soil, plants, insect and other scavenger activity. The purpose of this pilot study is to analyze the rate of decomposition in the microclimate of McMinnville, Oregon. By knowing the rate at which decomposition occurs, as well as common insects associated with decomposition, a more accurate estimate of time of death can be made. Minimal research exists surrounding the rate of surface decomposition in the Pacific Northwest thus prompting this study to help identify key factors affecting decomposition rate.

Materials & Methods

A deceased juvenile pig (*Sus scrofa*) was placed in a secure cage in Cozine Creek on February 17, 2019 approximately two hours after death. The cause of death was a gun shot wound (.22 caliber rifle) to the head behind the right ear. The pig weight (8.7kg) was obtained prior to placement in Cozine creek. Crown-rump length and waist circumference were measured upon placement of the pig in the cage. The dimensions of the cage were obtained as well as the dimensions of the grid pattern within the cage for use as a scale. The datum point was identified as the northeast corner of Newby Hall on the Linfield College McMinnville campus (57.1m , 202°SW). The pig was observed daily and data collection included time of day, maximum temperature (°C, °F), minimum temperature (°C, °F), temperature at time of collection (°C, °F), barometric pressure (mmHg), percent humidity, as well as weather conditions. Decay notes were taken which consisted of observation of the state of decomposition along with any insect activity and each stage was recorded (1-4) to match those of decomposition. Insects were collected periodically for entomological assessment. Once mummified, the remaining skin was removed and the skeletal remains were left for an additional seven days before being collected and cleaned.

Mass of pig	8.7kg
Crown-rump length	56.39cm
Circumference	54.3cm
Cage Length	79.2cm
Cage Height	35.1cm
Cage Width	46cm
Length of grid pattern	2.5cm
Width of grid pattern	1cm
Datum point degrees	202°SW
Datum point distance	57.1m

Stages of Decomposition

Fresh: This generally occurs within the first 24 hours following death. It is characterized by the formation of egg masses and/or other initial insect activity. Algor, rigor, and livor mortis occur and slight discoloration of the skin may be seen due to putrefaction.

Early Decomposition/Bloat: Body tissues bloat and a significant increase in size is observed. Skin slippage begins and marbling of the vascular system becomes very pronounced. Body fluids purge from the mouth, nose, and eyes which often kills nearby vegetation and stains the soil a dark color.

Advanced Decomposition: Facial bones become skeletonized and the body is no longer bloated. Soft tissue continues to break down and the formation of adipocere may be seen in wet environments.

Mummified or Skeletonization: Soft tissues become completely desiccated and dry or absent. Disarticulation of the skeleton may be observed due to animal or bird scavenging. With prolonged exposure, cortical bone may crack or erode. Staining of the bones may also occur due to sun bleaching, decaying vegetation, or soil.

Results

Stage 1: First 24 hours



Stage 2: Days 2-47



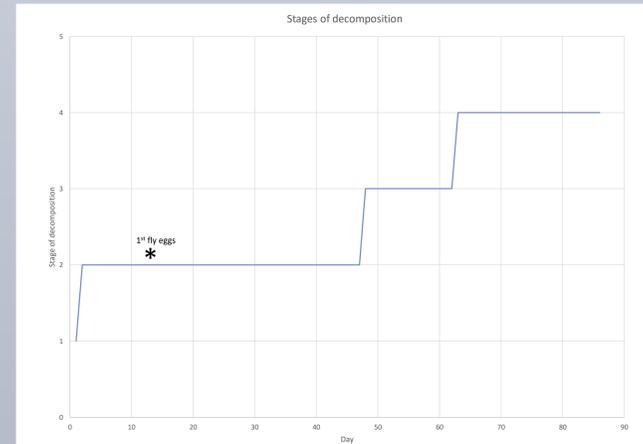
Stage 3: Days 48-62



Stage 4: Days 63-86



Graphs



Discussion

- The bloating process (Stage 2) was inhibited due to cold temperatures and weather conditions, including snow and freezing rain.
- Blowfly eggs first noted on March 13th (day 25) in the inguinal region (groin). The number of fly eggs increased exponentially in subsequent days.
- First fly was caught March 17th (day 27). Over 20 blowflies were seen on March 18th with additional flies and dermestid beetles collected on that day. First maggot masses were seen in one of the nostrils.
- The rate of decomposition increased dramatically upon initial insect activity and consistent temperatures above 13°C.
- Skin slippage began on March 26th (day 38) in the inguinal region.
- Centipedes were collected on April 1st, and three generations of blowfly maggots were collected on April 8th.
- The third stage of decomposition was short (April 5th-April 20th) and less pronounced than other stages which is likely due to a significant increase in precipitation.
- Stage 4 began April 20th when mummification of the skin was first observed. This skin was later removed on May 6th to allow for further skeletonization. The bones were left for seven days without the skin before being collected and cleaned.

Conclusion

All four stages of decomposition were observed over an 86-day time period. Each stage correlates with temperature, weather conditions, and insect activity. Stage One lasted approximately 24 hours which is consistent with research conducted nationwide. Stage Two bloating was minimal due to cold temperatures observed in February. Decreased temperatures slowed the rate of decomposition dramatically. However, this rate significantly increased following consistent temperatures above 13°C as this allowed for blowfly as well as other insect activity to occur. Once maggot masses formed and skin slippage began, decomposition progressed rapidly. Stage Three lasted 15 days due to increased precipitation as water is destructive to tissues. Maximum smell radius (100ft) was noted during on April 7th. Stage Four began with the observation of mummified skin on April 20th. Maggot and dermestid beetle activity continued on remaining wet tissue underneath the mummified skin until May 1st. This pilot study measured the rate of decomposition in the Yamhill County area and is the first published study of its kind. While the results of this study provide a basic timeframe for decomposition in McMinnville, more research needs to be conducted. Future research should include repeating this study during summer, fall, and winter seasons as well as expanding locations statewide.

References

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