H5 Insect Colonization of Child-Sized Remains: Behavioral Analysis of Pig Carcasses via 24 Hour, High Resolution Video Surveillance

Abigail Gremillian, BA, 17862 East General Forrest, Baton Rouge, LA 70817; and Robert J. Morton, MS, and Wayne D. Lord, PhD, FBI NCAVC, FBI Academy, Quantico, VA 22135*

The goal of this presentation is to document the behavioral patterns and activities of arthropods colonizing child-sized remains as observed via 24-hour high-resolution video surveillance.

This presentation will impact the forensic community and/or humanity by reinforcing the need for careful review of all factors when considering postmortem interval estimations.

The purpose of this research was to test the relationship between delays in arthropod colonization of child-sized remains and climatic conditions. The effects of weather conditions, particularly temperature, on insect colonization are well documented in the research literature. Most studies relied upon on-site observations, conducted several times a day. The traditional sampling methodology provides a limited view of arthropod colonization by framing the number of field observations in snippets of time. The restrictions of limited observations fail to account for unobserved arthropod species and activity, as well as the affect of the micro-climate.

The FBI's National Center for the Analysis of Violent Crime (NCAVC) is routinely consulted by federal, state, and local authorities in a variety of cases of bizarre and repetitive violent crimes, including child homicides. The NCAVC has previously conducted research on the taphonomy of child-sized remains. This study provided observations on a 24-hour basis, via high-resolution video camera, and collected weather data from the microenvironment at the disposal sites, as well as macroenvironment data from a national weather collection site located nearby.

During the time period March 2004 through June 2004, the remains of two child-sized pigs (approximately 25 pounds) were deposited in an isolated wooded area in a suburban area of Virginia. The sites were secluded, approximately 250 feet from any dwellings. The pigs were placed on the surface, one was clothed, the other nude. Wire cages were placed over the two specimens to prevent larger scavengers from consuming the corpses. Pig carcasses were initially placed at study sites on days characterized by inclement weather conditions to assess the effects of such climatic conditions on arthropod colonization and succession. Two highresolution video cameras were set up utilizing an infrared light source for night viewing. The cameras were set up to record on a 24-hour basis. Taping was conducted every day throughout the period. Remains were also physically monitored twice a day, arthropods collected, observations noted and temperature and humidity readings taken with a psychrometer. Data for the microenvironment was collected from the U.S. Marine Corps Meteorology and Oceanographic Division, which provided hourly data on wind speed and direction, temperature, humidity, sky cover, and weather observations. Two replicates of the study were conducted. Tapes were reviewed to document the number of arthropods visiting the sites, as well as genus and activity. Inter-rater reliability was performed to ensure genus documentation was accurate.

The results of this study demonstrate the relationship between weather and delays in arthropod colonization. For both replicates, rainy, overcast weather conditions delayed colonization even though temperatures were above established thresholds for activity. During initial spring replicate, such conditions contributed to a 17-day delay in carcass colonization by carrion frequenting insects. Similarly, a 3-day delay was observed in the late spring replicate. This study also showed the effect of seasonality on the succession of various arthropods and reinforced arthropod temporal predilections. Calliphorid activity was largely diurnal, beginning during midmorning and peaking in afternoon. Carrion beetle activity, however, was characterized by both diurnal and nocturnal activity patterns. Carrion beetle activity was not as dependent on temperature as fly activity. The study further highlighted the interspecific and intraspecific competition among insects for viable food sources and demonstrated exclusion and succession. Vertebrate scavenging was also a factor for decomposition, even though study carcasses were secured in wire mesh cages. The scavenging activities of small mammals and vultures clearly illustrated competitive interactions inherent between vertebrates and invertebrates competing for patchy carrion resources. Results of this study reinforce the need for careful review of all factors when considering postmortem interval estimations.

Postmortem Interval, Arthropod Colonization, Child-Sized Remains

 ** Presenting Author*