



## Pathology/Biology Section - 2016

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### H118 Heat Signatures Produced by Maggot Masses: Using Forward Looking Infrared Radar (FLIR) Mounted on a Helicopter to Locate Human Remains

*Ian Dadour, PhD\*, Boston University, Program in Forensic Anthropology, Dept of Anatomy & Neurobiology, Boston, MA 02118; and Michael Lee, PhD, Western Australian Police, Forensic Division, 2 Clayton Road, Midland 6056, AUSTRALIA*

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After attending this presentation, attendees will better understand how maggot masses as part of the decomposition process can be detected using FLIR mounted on a helicopter.

This presentation will impact the forensic science community by providing results from a series of controlled experiments in an area of limited research. This presentation will demonstrate how FLIR is a useful tool for the detection of decomposed remains in scenarios ranging from deceased missing persons to homicides.

FLIR is an established search and rescue method for locating people by using their heat signature. Maggot masses are known to generate significant heat and this study set out to establish whether FLIR could be utilized to locate surficial human remains via the heat signature generated by the maggot masses. If the FLIR could detect the maggot masses, over what time period were they visible?

Hand-held thermal imaging cameras at close range have been used to record larval aggregation temperatures. In 2014, a study using hand-held thermal imaging cameras were used to detect the heat signature of larval aggregations of pig cadavers. This research found that the larval aggregations were visible to the thermal imaging camera over a certain period of time and over a relatively short distance (maximum distance described as ~35m). Even more recently in 2015, a helicopter-mounted FLIR was used to locate two cadavers in a field in Duisburg, Germany, during the summer months. The results of this study showed that the larval aggregations were visible via FLIR for a period of up to 20 days.

The current experiment was carried out in a research facility south of Perth, Western Australia, under early autumn and winter conditions. Pig cadavers were utilized as human analogues. During the autumn, the weather was particularly hot and dry with daytime temperatures ranging from 30°C to 40°C. The nighttime temperatures remained fairly high, ranging from 9°C to 19°C and throughout the experiment it did not rain at any time. The site was visited to conduct measurements on 23 separate occasions, mostly between 7:00 p.m. to 10:00 p.m. and the helicopter visited on six different occasions. During the winter period, the trial site experienced maximum daytime temperatures ranging between 15°C and 24°C (with an average temperature of ~19°C). Nighttime temperatures were much cooler, ranging between 2°C and 15°C (with an average temperature of just ~5°C). On several occasions, the area was subject to significant rain and storms.

During the winter experiment, the site was visited to conduct measurements on 42 separate occasions, between 7:00 p.m. and 11:00 p.m. The helicopter visited the trial site on 22 occasions during the winter trial, 5 times during daylight hours and the remaining times during the evening.

Ground measurements included temperature data, insect activity, and the ambient soil temperature recorded from the cadavers.

The results of this study showed that the heat generated by maggot masses in surficial remains was visible to the FLIR. During the autumn, the results show that between day 3 and day 6, the heat signature generated by the larval aggregations were highly visible. By day 7, the cadavers were slightly less visible to the FLIR operator, but nonetheless still identifiable. Between day 14 and day 20, the cadavers remained only weakly visible. In contrast, during the winter trial, the larval aggregations did not develop until between day 9 and day 13; however, once the larval aggregations established themselves, they were present for a period of 14 days on average.

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#### FLIR, Maggot Masses, Decomposition