Forensic Canine Soil Test for Nikumaroro

Dawn Johnson, August 14, 2015

Introduction

On August 2, 2015, Dawn Johnson, a team archaeologist for The International Group for Historic Aircraft Recovery (TIGHAR) and six teams from the Institute of Canine Forensics (ICF) conducted a test on soil samples that were collected during a recent trip to the island of Nikumaroro, where it is believed Amelia Earhart made an emergency landing during her World Flight in 1937 and subsequently perished.

Background

In 1940, a partial human skeleton was found on remote Nikumaroro Island, when it was being colonized by the British during the Phoenix Island Settlement Scheme. The colonial officer-in-charge, Gerald Gallagher, reported to his senior officers that he believed the remains could be those of "Amelia Earhardt" [sic]. The thirteen bones were sent to Fiji and have remained missing since WWII. Repeated searches by TIGHAR teams in the area where the remains of the "castaway" were found has only located one phalange, which has not been confirmed as human.

After observing an ICF canine at work searching for pre-European burials at a site in Northern California, the author wondered if the canines could be used to locate more human remains on Nikumaroro.

The Institute for Canine Forensics is a non-profit organization in Northern California which trains canines specifically for forensic and human remains detection. Since the ratio of chemicals present during human decomposition is fundamentally distinct from that present during the decomposition of other mammals, the dogs are able to be trained to alert only on human remains.

The soil and climate on Nikumaroro present several difficult challenges for the ICF teams. First and foremost is the difficulty of getting the dogs to Niku, which would require a 12-hr flight and a four-day, 1000-mile voyage across the Pacific. Once there, the usual daytime heat on the island would be problematic, as the dogs have difficulty picking up the scent in warmer temperatures and can only work for a shorter period of time. Finally, and perhaps most challenging, is the fact that the soil on Niku is almost entirely coral rubble, which may or may not hold the scent of human decomposition.

Because of the challenge of bringing the dogs to the island, the decision was made to bring the island to the dogs.

Study Methods

During a June 2015 visit to Nikumaroro, Dawn Johnson collected thirteen samples of soil from various locations on the island. Each soil sample was collected by scraping off the top layer of coral with a new trowel and scooping up 8-12 ounces of coral and duff from 3-6 cm below the surface. The sample was placed into a sterile polypropylene specimen bag and tightly sealed. It was then labeled, rolled up, and sealed into a second sterile specimen bag. Six samples were collected from six marked graves which date from Nikumaroro's 1940-62 colonial period. Four additional samples were collected from the west and south side of a fallen ren tree at the Seven Site, believed to be the same tree where the "castaway" remains were discovered, and where the phalange was found. Three more samples were collected as control samples from areas that could have not been used for burials due to their proximity to the water.

To further avoid the possibility of cross contamination, sample bags were then sealed into one of three specimen bags, according to their sample type.

On August 2, 2015, a test was conducted in the cafeteria of a closed summer camp in the Santa Cruz Mountains outside of Saratoga, California. Four certified ICF teams and two currently noncertified ICF teams took part in the test. Present were team members Adela Morris with canine Jasper, Lynne Angeloro with Berkeley, John Grebenkemper PhD with Kayle, Lynne Engelbert with Piper, Barbara Pence with Bailey, and Kim Ward with Gustav. ICF teams undergo frequent tests for certification and Kayle and Gustav are currently awaiting re-certification. In order to preserve the validity of the test, only the alerts by the certified canines will be included in the test results. Also present as an observer was Lorna Pierce PhD, a forensic anthropologist who teaches at San Jose State University and Santa Clara University and consults with the coroner's office in Santa Clara County.

While all canines and handlers waited outside, Dawn Johnson poured 4-ounce soil samples in random order around the inside perimeter of the large building. Samples were placed at least 10 ft. apart and given an alphabetical label. She began with the control samples, then the ren tree samples, and finally the grave samples to prevent cross contamination. Two human ribs were then placed in the center of the room as a control, to ensure that each dog was capable of picking up on the scent of human remains. Dawn then left the area, in order to avoid giving any visual clues to the dogs or their handlers while they worked. John Grebenkemper was acting coordinator and recorder. Each team was then brought in one at a time and spent from five to fifteen minutes to "work" the room. The test results were not revealed until all six teams had completed their search.

Results

Source code	Sample #	Sample Origin	Certified Alerts
A	1	Graves S28.9"/W18.9"	-
B	2	Graves S28.9"/W18.9"	-
C	3	Control: Crab City	-
D	4	4 Grave Site S52.3"/W33.3"	-
E	5	Control: Cosmetic Site	-
F	6	4 Grave Site S52.3"/W33.3"	-
G	7	4 Grave Site S52.3"/W33.3"	-
H	8	Ren Tree NNW	-
J	9	Ren Tree W	LA/Berkeley
K	10	Ren Tree NW	Am/Jasper
M	11	Ren Tree South	-
N	12	Control: Club Ed	-
P	13	Bottle Grave	LE/Piper
R	14	Control: Alder Creek	-
S	15	Control: Garden Soil	-

No dogs alerted on the samples that were known not to contain the scent of human remains. No two certified dogs alerted on the same sample. The only soil from a marked grave that the dogs alerted on was the sample from the grave known as the Bottle Grave. It should be noted that both Piper and Gustav alerted on this sample. One dog alerted on the samples collected from the west side of the ren tree, and another alerted on the northwest side, but no dogs alerted on the samples collected from the NNW side next to the tree's fallen trunk, or the south side.

If all six of the burials included in the samples did indeed contain bodies, the probability of detection was less than 10%. This implies that the source of the scent is quite weak and not easily detected by the dogs in this experiment.

Conclusions

The soil from Nikumaroro evidently did not present much scent for the dogs to alert on. Apparently, from a canine viewpoint, the scent of human remains in the coral that constitutes Nikumaroro's soil is weak or non-existent.

The only soil from a marked grave that the dogs did alert on was the sample from the grave known as the Bottle Grave, so named because its perimeter is outlined by inverted beverage bottles. This grave is close to the shoreline and is showing signs of erosion. It may be possible that the moisture from the encroaching sea water is causing the scent to be stronger than the samples taken from graves that were located further away from the sea.

The test area proved to be a challenge for scent detection. Air currents will carry scent from a target into other parts of an enclosed room. The behavior of the dogs indicated that scent was carried into several corners that contained collection of objects that trapped the scent. The dogs kept wanting to return to these areas even though there were no samples located there. In particular, the corner next to test samples E and F attracted interest, the corner next to samples J and K attracted even more interest, and the several support posts near test sample P were of interest.

The dogs are mostly trained to search outdoors to locate human burials. When they do train indoors, the scent targets are well hidden and they have to work hard to find the hiding spot. They are almost never asked to test specific objects for the scent of human remains. In this case, they went hunting for objects that were hidden, as in their normal training protocol, and were not as interested in looking at obvious targets in plain sight on the floor.

Both handlers and observers agreed that the canines seemed more interested in trying to find human remains in the hiding spots that are usually used during training sessions. The dogs were observed hunting "up", looking for objects that might have been placed on the decorative ledges in the room. However, it was noted that when they did search "up", it was often in the vicinity of sources that were suspected to be positive for burials. It is believed that the scent they were searching for did not come from the two bones in the middle of the room.

All parties involved felt that the results of this test were somewhat inconclusive. However, it may have been the design of the test, rather than the inability of the dogs to detect the scent in Nikumaroro's soil. Both the unusual conditions of test samples in plain sight and the pooling of scent in the confined space of the building made the experiment more difficult than intended.

The decision has been made to conduct a second test in a few months using the soil remaining in each of the sample bags. The handlers feel that this will give them time to get the dogs accustomed to working with soil samples again and get them to focus on the soil, rather than searching "up" or searching for something with a stronger scent. It was also decided to conduct the test out of doors in a covered parking structure. This will eliminate the possibility that any scent from the soil samples on the floor might "pool" into corners of the room. A covered structure will also ensure that moisture or heat from the sun will not influence the dogs' ability to work, and the samples could be placed further apart. There will also be one or two video cameras filming each canine team to enable a full review following the test.

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