H81 A Comparison of Site-Specific Versus National Weather Service Temperature Data and its Applicability to Estimation of Postmortem Interval Using Accumulated Degree Days

Gretchen R. Dabbs, PhD, Southern Illinois University, Department of Anthropology, 1000 Faner Drive, MC 4502, Carbondale, IL 62901*

After attending this presentation, attendees will gain knowledge on how retroactively collected National Weather Service (NWS) temperature data from the closest NWS weather station to a recovery site are not necessarily directly applicable to the temperatures occurring at a recovery site, regardless of the proximity of the two.

This presentation will impact the forensic science community by correcting the previous assumption that the closest NWS station to a recovery site provides acceptably accurate temperature data for estimation of the postmortem interval using accumulated degree days. It should serve as an impetus for future research into the correlation of the rate and pattern of decomposition with site-specific Accumulated Degree Day (ADD) data, improving our ability to estimate the postmortem interval accurately.

Following the "best practices" guidelines of the Scientific Working Group for Forensic Anthropology, an increasing number of anthropological studies of human decomposition are utilizing accumulated degree days (ADD) to quantify the postmortem interval (PMI) at given decomposition stages and to estimate the number of ADD required for certain events, such as tooth exfoliation, to occur. This study addresses the utility of applying retroactively collected temperature data from the National Weather Service (NWS) station closest to the recovery site to these calculations, as prescribed in the past. Using iButton Link thermochrons (model DS1921G), hourly temperature readings were collected at 15 sites throughout the eastern half of the United States (Arkansas-one site; Connecticut-one site; Illinois-six sites; Kansas-three sites; Louisiana-one site; New York-one site; Mississippi-one site; Vermont-one site). With the exception of one, all research sites represent private property owned by an individual who volunteered to participate in this study upon the request of the author. There is no intentional bias in the selection of sites, the patterning merely reflecting the extent of the author's social network. The non-private research site is located at the Complex for Forensic Anthropology Research (CFAR) at Southern Illinois University. Each thermochron was placed 25 cm above the ground surface on the north side of a support made of natural fiber, most being attached to trees or wooden fence posts. The thermochron was placed at least 3m from any permanent structure (house, shed, driveway, etc.). This placement protocol was designed to ameliorate the possibility that reflected and radiant heat from synthetic materials may increase the recorded temperatures at research sites. The preliminary analysis reported here is based on data collection periods ranging from 135 to 169 days (mid-December 2010 through May 2011). Data collection is ongoing and the total data set will increase to at least 365 days per site by February 2012. The average daily temperature was calculated by averaging the daily maximum and minimum hourly temperature readings for each site, as prescribed by the NWS. In order to maintain consistency with the average daily temperature as reported by the National Weather Service a day was considered to be the 24-hour period from 0000-2400 XST or 0100-0059 XDT. In 2011, Daylight Saving Time began on March 9th. National Weather Service temperature data (F6 data) for the weather station closest to each of the fifteen research sites were retrieved from an official reporting website for the NWS (www.wunderground.com). The direct linear distance between each research site and the closest NWS weather station averaged 7.0km. The NWS stations ranged between 0.5km and 15.3km from the individual research sites. The site-specific and NWS data were matched by date, and a paired-samples t-test (SPSS 17.0) was used to identify statistically significant differences between the temperature data recorded at the research sites and those recorded by the National Weather Service. The difference in average daily temperature between NWS data and site-specific data ranged between 0.05^{o}C and 3.03^{o}C. All 15 sites presented high correlations between NWS and site-specific data ($0.809 \leq r \leq 0.989$). The observed differences were statistically significant for 11 of the 15 research sites (73.3%) (*p-value* ≤ 0.021). Four sites exhibited no statistically significant differences between the temperature data recorded by the NWS and the site-specific data (*p-value* ≥ 0.094). These four sites are suburban and rural, far from the NWS station and close, both west and east of the Mississippi River, coastal and mountainous—in short, there is no clear, observable difference in environmental conditions that may cause these sites to be more consistent with the NWS data than other sites. The results of this study demonstrate that utilizing retroactively collected temperature data from the nearest NWS station to a site without investigation into the correlation between the microclimates of the site and the NWS facility is unwise at best and unacceptable at worst, particularly if the intended purpose is the development of methods of estimating PMI.

This project is partially funded by a Lucas Grant from the Forensic Sciences Foundation.

Forensic Anthropology, Postmortem Interval, Accumulated Degree-Day

Copyright 2012 by the AAFS. Unless stated otherwise, noncommercial *photocopying* of editorial published in this periodical is permitted by AAFS. Permission to reprint, publish, or otherwise reproduce such material in any form other than photocopying must be obtained by AAFS. ** Presenting Author*