HOMELESSNESS AND TAPHONOMY: A MULTIDISCIPLINARY STUDY

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ABSTRACT

HOMELESSNESS AND TAPHONOMY: A MULTIDISCIPLINARY STUDY

by Chloë Angst

In this thesis, I present multidisciplinary research applicable to deceased unhoused individuals in urban San José, California. I present the problem of homelessness through a "hybrid collectif," a conceptual framework that encompasses the factors that drive homelessness in life and death. I use taphonomic methodology to examine the problem of homelessness in this urban region by experimentation with porcine carcasses in simulated death scenarios. I utilize total body score (TBS), accumulated degree days (ADD), and predictive entomological species identification to examine decomposition trends. I also introduce "human survival scavenging" as an agent of decomposition, provide an account of ecological succession in this environment, and present a taphonomic index compatible in real-world death investigation of unhoused decedents. Through this report, I encourage researchers to consider the representation of impoverished communities in dense urban geographies and to recognize the value in doing so when conducting multidisciplinary decomposition studies.

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INTRODUCTION AND LITERATURE REVIEW

Problem Statement

In this study, I examine homelessness and the contexts and conditions of homeless deaths using methods of forensic taphonomy. I define taphonomy as the study of decomposition patterns among deceased remains. I use this methodology to study the lifeworlds (Desjarlais and Throop 2011) of homeless populations, with attention to the experiences and surroundings of unhoused individuals and the cumulative effects that intermingle and eventually lead to death. To understand how the environment maps itself onto bodies of the marginalized, and to preserve human dignity and justice, I uncover taphonomic circumstances surrounding death in an outdoor urban environment using model porcine carcasses.

The United States Department of Housing and Urban Development (2020) defines a homeless individual as one who "lacks permanent nighttime residence." This broad definition fails to recognize the socially constructed performance of homelessness and the ambiguity of homeless identity (Marcus 2006, 1-19). Fitting the governmental definition of homelessness does not account for the dynamics of unstable living situations and the fact that an individual may not necessarily consider themselves homeless. Contrary to the stereotypical imagery of criminality, mental illness, and deviant behavior (Kusmer 2002, 386), individuals within the homeless population include people of all ages, genders, ethnicities, abilities, histories, and so on (Wolch and Dear 1993). They may or may not possess co-morbidities or partake in criminal behavior. They may be housed or unhoused, employed or unemployed, chronically homeless or sporadically in and out of street life. They also may receive social support or perhaps live in social isolation. The diverse demographics of this population demonstrates the complexity of the crisis of homelessness and complicates the potential for a solution to the problem. Without the ability to clearly pin down specific characteristics of homelessness, fulfilling the needs of people experiencing homelessness (PEH) becomes elusive because different demographics require different forms of assistance (Glasser and Bridgman 1999, 15-43). Although this particular study refers to PEH by the governmental definition above, one should not dismiss the falsified stereotypes and multifaceted characteristics that they exhibit.

San José, California and surrounding regions face a housing crisis rooted in complex socioeconomic and political issues. Due to persistent insecurities associated with lack of housing (Kusmer 2002), producing accurate numbers of homeless individuals presents particular challenges and public statistics easily underestimate the count. Regardless, the published estimations of PEH are still staggering. A diverse population of 161,548 PEH resides within the state of California (United States Interagency Council on Homelessness 2020), the most of any state (Brown and Edwards 2021, 952). Specifically, a recorded 6,097 individuals within San José alone experienced homelessness in 2019 (Brown and Edwards 2021, 955; City of San José 2019).

The rate of homelessness has accelerated gentrification and skyrocketing costs of living, with rent scoring as the most critical factor preventing PEH from accessing housing (City of San José 2019). Furthermore, the interweaving of stressors, co-morbidities, and lack of access to health care and other fundamental resources elevates physical and/or mental deterioration for many PEH (Hawkins and Abrams 2007). Co-morbidities may include substance abuse, chronic diseases, mental disabilities, and combinations of domestic and social violence. Since early 2020, the Covid-19 pandemic has added yet another troubling obstacle for poor communities (González and Marlovits 2020), increasing both homelessness and PEH mortality rates (Brown and Edwards 2021). On top of these health risks, hostile architecture such as intentional spikes, bars on park benches, and excessive security cameras push PEH out of urban public spaces (Rosenberger 2020). Furthermore, the negative stigma associated with PEH obstructs the development of local solutions such as transitional and affordable housing. In addition to these social factors, an accumulation of physical and environmental elements works collectively to drive PEH out of the common places in which others live and die, manufacturing a unique experience in both living and dying among PEH.

The vast anti-homeless landscape and the cumulative effects that catalyze and exacerbate homelessness heighten the risks of premature mortality for PEH (López 2020). An estimated 46,500 PEH die each year in the United States (National Health Care for the Homeless Council 2021). In 2020, approximately 164 of these individuals resided in Santa Clara County (Burbank 2020). Not surprisingly among these statistics, many PEH deaths still go unacknowledged (National Health Care for the Homeless Council 2021). Highly complex risks of mortality for PEH vary among individual PEH and the social groups they belong to. However, as PEH often die unidentified in outdoor public settings and by homicide (Kimmerle et al. 2009, 182), many conclusions regarding the death event may be ambiguous and may require further investigation using taphonomic methods.

In my study, I focus on recreating the context of homeless deaths with porcine carcasses in lieu of human cadavers (Beck et al. 2015, 12; Shirley et al. 2011, 376) on the urban San

José State University campus. I devote special attention to estimates of post-mortem interval (PMI), the temporal period between death and discovery, in which I index a range of variables: temperature, humidity, and invertebrate species. When compiled, my results create a guide for death investigators and forensic anthropologists by establishing a region-specific decomposition process in the urban region of San José, California. I ask: What variables affect patterns of decomposition of porcine models in an outdoor urban environment? By exploring this question through forensic and anthropological methodologies, I examine the crisis of homelessness by attempting to understand how death and the processes following occur in this environment.

In this report, I present the findings of this research and discuss PEH populations in the urban region of San José, California by exploring how they experience death in a unique way in their environment. I begin by explaining the intellectual merit and broader impacts by discussing the advantage of applying taphonomic methodology to such a study. Next, I consider the anthropological and theoretical issues that relate to a study of homelessness and discuss patterns of death for those who are powerless. In this section, I discern structural violence as the underlying basis of homelessness. Second, I extrapolate the many processes that drive mortality among PEH, both nationally and locally in San José. This leads me to introduce the "hybrid collectif," a conceptual framework serving to organize these processes of PEH lifeworlds and deathworlds. Finally, I branch from my framework to magnify the concept of necropolitics in PEH deathworlds. The second chapter stands alone as a journal article in which I examine homeless deaths by presenting a baseline taphonomic methodology in the rarely attempted urban environment and connect my study to theoretical concepts that drive homeless mortality. In the third chapter, I conclude by explaining the limitations of my study, suggesting future related studies, and deducing how anthropology and forensics can help us better understand death and dying among PEH.

Intellectual Merit and Broader Impacts

Analyzing the passive, active, and unintentional forces that pilot decomposition among homeless populations (Boyd and Boyd 2011) help to establish solutions that reduce the factors that lead to mortality. In this case, "passive" and "active" refer to indirect and direct human interactions while "unintentional" refers to inevitable nonhuman physical decomposition processes such as autolysis and putrefaction. Although these forces are not mutually exclusive, my literature review highlights passive and active forces while the experimentation portion of my thesis magnifies unintentional forces. Determining how critical variables affect decomposition contributes to forensic methodological knowledge, helps interpret facets of homeless mortality in a region of the San Francisco Bay Area, and softens the effects of questionable death upon the social networks of PEH.

Many bystanders discover deceased PEH alone outdoors, in which law enforcement grants a status of "unidentified" (Kimmerle et al. 2009, 182). Though cause and manner of death varies substantially among deceased PEH, the information and context available to easily determine these factors may be limited. In the event of such equivocal deaths, medico-legal offices perform forensic death investigations to attempt to clarify the circumstances (Bell 2019, 67). Particularly with unskeletonized remains, investigators may utilize methods of forensic taphonomy. Ultimately, the information generated through temporal context derived from taphonomic methods can play a key role in legal decisions. The outcome of legal decisions in turn re-establishes dignity and justice for the deceased.

My study with porcine cadavers contributes to region-specific taphonomic knowledge in the outdoor urban environment of San José. Furthermore, as the experiment takes place in a neighborhood densely populated with unhoused PEH, it generates information that holds value for investigators working on similar cases. I also use public data obtained from the ME-C Data Dashboard, a database of the Santa Clara County Medical Examiner-Coroner that contains information pertaining to deaths of the unhoused, to relate my findings to real-life death scenarios on the streets of San José. In an effort to contribute to death investigation methods and reduce negligent public operations due to socioeconomic stigma against PEH, I have provided a taphonomic guide to appropriately account for potential circumstances surrounding their deaths in San José.

Homelessness and Anthropological Framework

Unsheltered individuals have widely varying experiences in their histories and in their day-to-day lives. Regardless of the realms of these experiences, studies have shown that the general experience of homelessness severely increases the likelihood of premature death, often accompanied by mental and physical suffering (Singh et al. 2015). Although the physical factors that contribute to homeless mortality vary immensely, they share similar conceptual patterns and processes.

Structural Violence

Homelessness can be regarded as a product of structural violence, a concept rooted in social inequalities that have developed over time. Paul Farmer interprets structural violence as a systematic, indirect way of exerting harmful effects onto marginalized individuals, limiting their potential to thrive (Farmer 2004). The long-term evolution of structural violence mutes the direct visibility of the many factors that strain the lifeworlds of homelessness. Nevertheless, structural violence ominously plays a role in present socioeconomic marginalization, limiting potential possibilities in PEH lifeworlds.

The anthropological perception of structural violence marries social construction and biology; one cannot exist without the other (Farmer 2004, 315). In terms of homelessness, the effects of structural violence merge the biological and the cultural, as extreme environmental conditions act as stressors which biologically influence health status and lifetime longevity (Thomas 1998). These stressors include socioeconomic and political surroundings, daily life, and biotic and physical conditions (Goad 2020, 54; Thomas 1998, 55). Therefore, at a macroscopic level, structural violence fuels a reduction of agency (Farmer 2004, 315) in the form of social and physical resources for PEH, afflicting physical and mental health. A lack of necessary resources triggered by sociopolitical institutions therefore places PEH bodies in harm's way, escalating mortality risk (Burtle 2013; Pfister and Encinosa 2021; Thomas 1998).

Infinite spiraling processes develop with structural violence and its effects, many resulting in little possibility of an exit from homelessness (Lee et al. 2003), or perhaps death itself. Take, for example, the prevalence of mental and physical health problems among PEH. These problems require degrees of care. Without adequate care, such problems often intensify the degree of homelessness and simultaneously elevate the risk of mortality. The process exacerbates when considering the reluctance of PEH to seek assistance. Without service utilization, co-morbidities linked strongly to health and the lack of care (López 2020,

753) further heighten the risk of death on the streets.

When combined with effects of structural violence, four broad arenas catalyze entrance to homelessness (Wolch and Dear 1993, 1-43), evident in the San Francisco Bay Area and surrounding regions in California: (1) *Economic marginalization.* A polarizing wage gap plagues Santa Clara County. This region ranks substantially as one of the worst in the country, with 45 percent of households at an income level of greater than $100,000 and 14 percent of households at less than $25,000 (Bymaster et al. 2017, 591); (2) *The crisis of affordable housing.* Although many PEH are employed, numerous obstacles in this region contribute to the difficulty of finding permanent housing. These obstacles may include high rents, low incomes, lack of available housing, and limited moving funds (City of San José 2019); (3*) The need for assistance and lack of response to this need.* Although 66 percent of PEH utilize San José's public assistance programs and/or federal assistance, many hesitate to use them (City of San José 2019), possibly stemming from the unsanitary living conditions and the criminal activity that exist in sheltered living (Wolch and Dear 1993, 39), the frustrating failure of services to offer what PEH truly need (Koegel 1992, 8), and/or the bureaucratic stumbling blocks that inhibit follow-through with welfare applications (Wolch and Dear 1993, 38-41). The complexity of welfare assistance often acts as a deterrent, designed in a manner that prevents PEH from seeking it (Wolch and Rowe 1991, 135); and (4) *Personal circumstances*. Though highly individualized, personal circumstances may refer to a large variety of vulnerabilities (i.e., co-morbidities). Experiences within these four arenas intermingle and overburden PEH lifeworlds in the processes that follow.

In addition to the arenas explained above, social networks of PEH influence chances of survival, lessening or worsening the existing effects of structural violence. Hawkins and Abrams (2007) utilize the term "social capital" to reference networks of social support among PEH. They claim that social capital determines the degree of vulnerability of unhoused individuals with co-morbidities. Although social networks and social support typically ameliorate the severity of co-occurring mental disorders, in this context, social capital can generate either positive or negative outcomes. Positive social capital may provide an individual with financial support and resource assistance while negative social capital may prevent an individual from seeking proper care, enable substance abuse and other criminal behaviors, and/or make an individual more susceptible to committing violent acts or becoming victim to violence (Hawkins and Abrams 2007). Definitively, social support acts as the key to coping (Wolch and Dear 1993, 39) and avoiding social isolation (Koegel 1992, 15). A supportive network may offer resources and temporary housing to those who may need it while the lack thereof may result in few places to go when enduring desperate situations.

Processes of Homelessness and the Hybrid Collectif

The unique life and death experiences of PEH evolve from an entanglement of human projects and processes originating from the effects of structural violence. The hardships that PEH endure emerge from mechanisms that work together to chip away at existence in urban space. A combination of biocultural and physical processes contributes to PEH invisibility in these spaces, assisted by contextual conditions of street life (Snow et al. 1994). This bundle of historical forces motivates mortality, especially among the most marginalized and/or vulnerable populations (Goad 2020). In other words, diverse actors implement policies that drive PEH to margins of urban spaces, contributing to socioeconomic and political inequality (De León 2015; Rosenberger 2020).

Alarmingly, PEH stand at four to nine times higher risk of premature mortality than the housed population (City of San José 2019), driven by the cumulative aftermath of housing instability (Goad 2020), a social violation of human rights. I conceptualize the experience of homelessness with its risk of premature death as a cluster of human and nonhuman efforts that perpetually erode existence. I theorize this approach with a "hybrid collectif" (Callon and Law 1997), a penetration of many social and environmental agents that accumulate, facilitating death and the experiences thereafter (De León 2015, 39). Jason De León utilizes this concept as he exposes the inconceivable socioeconomic and political hardships implemented by the Prevention Through Deterrence initiative. In doing so, he exemplifies the often lethal forces that overwhelm migrants attempting to cross the U.S.-Mexico border. The hybrid collectif facilitates a landscape that displaces already marginalized individuals from sociocultural and biophysical normality, diminishing their chances of survival. In my study, I apply De León's use of the hybrid collectif to life and death among PEH. Whereas migrants may endure the hybrid collectif in the form of desert conditions and smugglers, PEH may endure another realm of agents such as prolonged outdoor exposure and comorbidities. Using the hybrid collectif as a framework, I bring attention to the many human and nonhuman projects and processes that funnel the poor into life and death on the streets, transmitting De León's conceptual interpretation of migrant lifeworlds and deathworlds onto those of PEH. I adopt taphonomy as an analogy while simultaneously employing taphonomic methodology as an experimental case to bear on the problem of homelessness.

In terms of PEH visibility, governments have weaponized many urban spaces, persuading against the invitation of homeless social groups. Due to pro-aesthetic anti-homeless laws and regulations, PEH face spatial discrimination in public areas, restricting basic tasks necessary for every-day living (Borchard 2010, 464; Mitchell 1997), while theoretically, city management creates these spaces for use by anyone. While designated to reduce crime in areas populated densely with PEH (a generalization of PEH criminality), this form of spatial weaponization affects unhoused communities more than others. Furthermore, hostile architecture or defensive urban design annihilates public space, working against marginalized social groups to funnel them out of their living environments (Chellew 2019; Rosenberger 2020). Hostile architecture may involve the addition, removal, or modification of public structures (Chellew 2019, 22-23). Common examples of this spatial control tactic include spikes placed on surfaces and armrests on benches. These structures target PEH and push to drive them out of public spaces, as if they have more desirable and accessible living options available. Another feature of hostile architecture involves excessive surveillance or perception of surveillance (Chellew 2019; Rosenberger 2020, 886). To perpetuate self-policing in public spaces, many businesses and housed residents install unnecessary security cameras. This deliberate weaponization heightens discomfort, furthers the PEH social position as outsiders, and contributes to stigmatization of homeless populations. Therefore, hostile architecture in urban public spaces victimizes unhoused PEH and contributes to the aesthetic ideal to keep them out of sight (Kusmer 2002, 387).

Exposure to environmental elements in urban space also proposes difficulty for unhoused PEH. Gaillard et al. (2019) examine how disasters affect the lifeworlds of PEH in regions that fail to consider their well-being in the wake of a disaster. According to their study, among many types of disasters, wet weather appears as one of the most threatening for unhoused PEH (Gaillard et al. 2019, 337). In addition to soaking belongings and clothing, rain and its associated temperatures threaten PEH health. Cold temperatures can intensify illnesses such as pneumonia and bronchitis and can result in death when not treated. Gaillard et al. also state that PEH face more risk in day-to-day hazards (such as rainy days) than in "natural" hazards, due to the constant precarity of financial uncertainty in their lifeworlds (Gaillard et al. 2019). When social and/or physical conditions limit an individual's resources and that individual cannot avoid exposure to environmental elements, disasters become personalized, commonplace, and never-ending events.

Socioeconomic and political power stand behind the cumulative effects of PEH exposure to hostile architecture and hazardous weather events. This dominant force of power and the lack of PEH agency drives homeless vulnerability into homeless mortality. The marginalized status of PEH and any existing co-morbidities exacerbate this process. At the federal, state, and local levels, the more affluent individuals directly or indirectly decide the fate of the economically disadvantaged. A solution to the problem of death and dying among the homeless therefore must arrive from top-down sociopolitical operations (Gaillard et al. 2019, 339).

Necropolitics

Marginalized status, such as that of PEH, coincides with a reduced value of individuals in death. Just as power determines the fate of PEH in their lifeworlds, Achilles Mbembe's concept of necropolitics (Mbembe 2003) applies to the fate of PEH in their deathworlds.

While a lifeworld consists of social and environmental surroundings in life, a deathworld consists of those surroundings after death. For the purposes of my study, a deathworld includes the inevitable processes of the physical remains as well as public and private social responses to individual deaths. Mbembe formulates the concept of necropolitics to explain how performance of power assigns degrees of value in deaths, dependent upon an individual's social status in life. Necropolitics determines how the dead possess agency and how power holds "the capacity to dictate who may live and who must die" (De León 2015, 67; Mbembe 2003, 11). Furthermore, necropolitics encompasses the tendency to popularize some deaths through media, and to ignore others, simultaneously establishing a hegemony in both life and death. Marginalized populations such as PEH likely receive the short end of the stick in mortality, suppressing these individuals' memorialization and illuminating those of the privileged.

De León utilizes necropolitics as a subdivision of the hybrid collectif to exemplify the deathworlds of border crossers. He states that the power of Prevention Through Deterrence justifies violence among border crossing populations as if they deserve death, being more "killable in the eyes of the state" (De León 2015, 68). Similarly, sociopolitical negligence and the failure to act justify violence and death among PEH. Governmental and social entities victimize PEH through a necropolitics that branches from the power of social institutions. For example, Andrea López investigates care experiences of women PEH who endure unstable housing situations and co-morbidities (López 2020). She demonstrates that the poor consistently encounter violent and life-threatening circumstances before the option to seek help even comes within reach. Entities of power construct a compassionate façade yet implement policies with the ulterior motive to drive death and dying among the socioeconomically disadvantaged.

Necropolitics manipulates how media outlets depict and report death and dying. Among immigrants and transients, Erin Kimmerle et al. (2009) state that many decedents that have been found and identified through context meet qualifications for homeless status. Surprisingly, the act of homicide accounts for the majority of these manners of death. I question the anti-newsworthy-ness of this form of violent death. Although we cannot know the true number of deaths among the homeless, we know that premature death among PEH requires more attention than it currently receives. For multiple reasons motivated by necropolitics and the surrounding nodes of PEH marginalization, authorities severely underreport PEH deaths (National Heath Care for the Homeless Council 2021). First, many PEH may fear interactions with law enforcement due to stigmatized targeting (Allison and Klein 2021, 6862), and attempt to avoid contact. Second, a physically isolated homeless decedent may sit dormant for a long period of time before discovery (Archer et al. 2005), and thus delay report of the death to authorities. Third, institutionalized racism and lack of social kin likely reduces news-worthy appeal (White 2021). All these reasons stem from structurally violent social injustices, circling back to the catalysts that put individuals out on the streets in the first place.

So, what options do the homeless have, really? Where do they go? As their lifeworlds lead prematurely to deathworlds, does an ulterior motive exist in order to erase the vulnerable? Does the hybrid collectif of homelessness work to displace PEH?

Numerous historical forces contribute to the processes of death and dying. These forces (passive, active, and unintentional) perform to implement deterioration upon a body within a lifeworld and/or a deathworld. Cultural and biophysical cumulative effects act upon such a body to promote interconnected patterns of decomposition through space and time. These effects create an experience in death and dying for PEH that differs substantially from that of less socioeconomically and politically marginalized populations. The processes involved follow highly individualized and complex routes. Among combinations of structural violence, the arenas that catalyze homelessness, and the existence or non-existence of social support, many individuals and families simply cannot cope with the obstacles of homelessness that impede basic human rights.

Many PEH reside unhoused in urban environments, where daily life becomes an obstacle of its own. Within such environments, hindrances of hostile architecture and devastating weather patterns contribute to PEH victimization and often trigger a higher risk of premature death. These obstacles contribute to the hybrid collectif of homelessness, as PEH visibility becomes proscribed when public urban space becomes weaponized. The hybrid collectif deters exits from homelessness; exiting would mean finding the resources needed to achieve permanent housing and self-sufficiency. Hegemonic power places homeless populations among the bottom rungs of the socioeconomic ladder and dictates a decreased value in their mortalities. While the hybrid collectif diminishes PEH lifeworld experiences, the aftermath of those experiences and necropolitics diminish value in PEH deathworlds.

The staggering numbers of PEH in San José advocates a need for research in homeless lifeworlds and deathworlds. Region-specific taphonomic death investigation methods with an anthropological approach have not yet been attempted in San José. Experimentation using these methods acts as a good place to start examining the problem of death and dying among the homeless. My thesis examines processes that act upon bodies, using proxy porcine cadavers. I use methods of taphonomy to frame the methodological scope of this study and examine phenomena that contribute to death and dying among the homeless. Through taphonomic methods, my research helps to distinguish the unique contexts and conditions of death and dying among PEH in the region of San José.

Examining the Problem of Homelessness with Taphonomic Methods

In this study, I explore homeless mortality through the vessel of taphonomic methods. The term "taphonomy" comes from the Greek *taphos* (burial) and *nomos* (law) (Bristow et al. 2011, 279; Schotsmans et al. 2017, 1). While its initial researchers with expertise in paleontology described taphonomy as a mode of transitioning remains from the biosphere to the lithosphere (Efremov 1940), taphonomy has evolved to envelop all post-mortem processes including the antemortem events that potentially trigger such processes (Bristow et al. 2011, 280). Dirkmaat et al. (2008, 34) regard forensic taphonomy as one of forensic anthropology's major milestones between the years of 1988 and 2008.

Researchers frequently utilize models of taphonomy today in forensic anthropology fieldwork and death investigation in practice to interpret post-mortem changes and establish possible contexts (Dirkmaat and Adovasio 2006). Taphonomists measure these contexts using methodology that derives estimated post-mortem interval (PMI), the period of time between death and discovery. PMI can assist in narrowing down the identities of found remains (Megyesi et al. 2005, 1; Simmons 2017, 134), confirming or refuting suspects in homicide cases (Indra and Lösch 2021, 12; Megyesi et al. 2005, 1), and pointing investigative resources in appropriate directions (Maile et al. 2017). Ultimately, the information generated through PMI plays a key role in legal decisions. To find estimates of PMI, forensic scientists consider several cumulative intrinsic and extrinsic variables which may include temperature, access by insects, burial/depth, scavenging, trauma, humidity/aridity, rainfall, body size/weight, clothing, (Mann et al. 1990; Rodriguez and Bass 1985; Steadman 2009), seasonality (Giles et al. 2020), and many others. Fitzgerald and Oxenham (2009) state that an individual's overall health at the time of death also plays a role in decomposition rates. These many variables work concurrently with or against each other (Adlam and Simmons 2007).

A viable taphonomic method, forensic entomology has been regarded as one of the most reliable and precise (Baz et al. 2014; Singh et al. 2022; Wallman and Archer 2020, 57). Taphonomists utilize forensic entomology because the chemical odors of decomposition attract a diverse insect population eager to feed and reproduce (Dawson et al. 2022; Michaud et al. 2010, 64). These entomofaunal species conveniently inhabit carrion in predictable sequences, allowing death investigators to estimate PMI based on the insects present on a cadaver at a given time. As a cadaver changes physically and chemically throughout the decomposition process, so do the particular insect species that find the cadaver suitable for inhabitation and/or digestion (Dawson et al. 2022). The location of death and season of death immensely affects which taxa decide to colonize a given cadaver, and in what order of ecological succession (Michaud and Moreau 2009, 78).

Following a call for standardization within the forensic sphere, the effects of the 1993 ruling of *Daubert v. Merrell Dow Pharmaceuticals* altered the framework of forensic anthropology (Dirkmaat 2008, 36), including its taphonomic realm. This case questioned a lack of solid, empirical, quantifiable findings permissible in the courtroom and stipulated that scientifically valid reasoning must lend support to expert testimony. To help increase the level of taphonomic credibility in court, Henssge and Madea (2007, 183) have attempted standardization of PMI estimation protocols in response to *Daubert* by proposing (1) quantitative measurement of study variables; (2) mathematical description of the method; (3) considering influencing factors quantitatively; and (4) declaring the precision and proof of precision on independent materials. Although taphonomic research methods still possess flaws, taphonomists gradually improve their experimentation practices to comply with *Daubert* as taphonomic baseline data and case studies accumulate.

Medico-legal personnel often use past experiences in the forensic field as analogies to compare to death scenes under investigation (Haglund and Sorg 2006, 15). However, in order to formally produce and analyze the taphonomic data necessary for progress in the field, researchers often conduct studies at decomposition research facilities. These facilities provide semi-controlled settings for testing and observation, giving researchers designated spaces to study the variables that influence post-mortem processes by simulating death scenarios (Shirley et al. 2011). Twelve prominent human decomposition facilities exist internationally (Pesci et al. 2020, 288). See Appendix 2 for information on how these facilities vary in climate and discipline.

The environmental specificity of taphonomic variables (Wilson et al. 2007, 6-7) restrict researchers from simply applying taphonomic data from decomposition facilities to any other region (Steadman 2009, 159), or from one region to another (Wilson et al. 2007). The rates of decomposition differ substantially according to a location's temperature, humidity, and endemic species, impacting the most prominent agents that break down deceased remains (Mann et al. 1990, 104; Simmons 2017, 135; Steadman 2009, 157). Therefore, region-specific taphonomic data help to fill in the gaps regarding post-mortem decomposition processes in diversified locations (Dabbs and Martin 2013; Jaggers and Rogers 2009). Unfortunately, similar climates exist in more than half of the existing facilities (Wescott 2018, 329). Researchers have not widely represented many regions taphonomically, including the San Francisco Bay Area. All of the decomposition research facilities in the United States extend east of Colorado (Figure 1).

Figure 1 Map of decomposition research facilities in the United States.

Although taphonomic research benefits by data collection in an array of environments, the vast majority have been conducted in rural and desolate spaces as at decomposition research facilities. However, the biogeographies of urban environments play a unique role in the decomposition process that researchers must acknowledge. Kim (1992) assigns a hotter climate to urbanized spaces than to more rural areas, due to lower heat reflectance and the inability of buildings to allow anthropogenic heat to escape. Other factors responsible for this differential climate may include less solar radiation, higher air temperatures, light winds, lower relative humidity, greater cloud cover, greater precipitation, anthropogenic population density, increased pollution, and decreased natural terrain (Hwang and Turner 2009, 218). Consequently, metropolitan climates influence entomofaunal behavior (Hwang and Turner 2009, 219), thus affecting insect colonization and altering cumulative mechanisms of decay. Furthermore, buildings and infrastructural development in cities form physical barriers and get in the way of insects and may act to prevent odor dispersal of decomposing remains (Pohjoismähki et al. 2010, 39).

Eighty percent of the United States population resides in urban areas (Alig et al. 2004, 223). Many unhoused PEH and victims of structural and/or physical violence residing in outdoor makeshift living areas (Santa Clara County Medical Examiner-Coroner 2016) comprise a portion of the urban population. Out of the over 10,000 PEH of urban Santa Clara County alone (County of Santa Clara 2022), 1,110 have died since January 2018 (Santa Clara County Medical Examiner-Coroner 2022). Taphonomists have simply not represented urban centers in the taphonomic literature (Grassberger and Frank 2004), leaving immense gaps in the data available for application in death investigation, especially for the PEH who dwell in these outdoor spaces. In my study, I taphonomically represent the urban environment of San José, California to better understand mortality among PEH in the region.

Conclusion

In this chapter, I introduced the topic of my research. I established an anthropological framework through which to explore homelessness and death. I also provided a literature review that discusses forensic science and death investigation devices that will be utilized in my study to better understand the problem of homeless mortality. I present the next chapter as a stand-alone journal article in which I present my baseline taphonomic study in the rarely attempted urban environment and connect my study to concepts that drive homeless mortality.

CHAPTER II
JOURNAL ARTICLE

Examining Homelessness in an Urban California Environment through Taphonomy

Chloë Angst, M.A.

Abstract

In this study on homeless mortality, I produce multidisciplinary decomposition research data applicable to deceased unhoused individuals in urban San José, California by using taphonomic methodology. I use a forensic approach to investigate the broad sociocultural problem of mortality among homeless bodies. The study showcases potential events that may occur during death investigation of urban homeless encampments, introduces "human survival scavenging" as an agent of decomposition, and presents baseline data usable for PMI estimation of unhoused victims through total body score (TBS), accumulated degree days (ADD), and predictive entomological species identification. I encourage researchers to consider the representation of impoverished communities in dense urban geographies when conducting multidisciplinary studies in forensic science and anthropology.

Keywords

homelessness, taphonomy, scavenging, forensic entomology, post-mortem interval, accumulated degree days, total body score

Highlights

- I use taphonomy as an analogy to present the experience of homelessness in life and death.
- I observe a four porcine carcass sample over 102 days in urban San José, California.
- I gather TBS and ADD data to compose a taphonomic index of estimated PMI.

- I interpret ecological succession of necrophagous insects.
- I identify human survival scavenging as a taphonomic agent.

Introduction

Nearly 6,100 people experiencing homelessness (PEH) reside in the dense city of San José, California (City of San José 2019). Alarmingly, these individuals stand at four to nine times higher risk of premature mortality than the housed population (City of San José 2019), often due to an accumulation of direct and indirect forces: co-morbidities (López 2020), limited access to health care (López 2020,), frequent exposure to environmental elements (Gaillard et al. 2019), and the weaponization of public areas such as hostile architecture (Chellew 2019; Rosenberger 2020). In this study, I conceptualize life and death among PEH as an accumulation of agents that diminish chances of survival and use a forensic methodology to examine how these agents act upon this population: one that exhibits a considerable proportion of premature deaths.

I define taphonomy as a mode of transitioning remains from the biosphere to the lithosphere (Efremov 1940) which includes all post-mortem processes including the ante-mortem and peri-mortem events that potentially trigger them (Bristow et al. 2011, 280). While many researchers perform experimental taphonomic studies in secluded non-urban settings or established anthropological facilities, a need for more studies in metropolitan areas exists, as many variables of decomposition differ profusely in these spaces. Due to the lack of formal taphonomic research in urban and indoor spaces, researchers and investigators can only acquire much of these data from forensic case reports (Martín-Vega et al. 2017). This dearth of taphonomic research (Haglund and Sorg 2006, 6) in urban spaces neglects the forensic integrity of 80 percent of the United States population (Alig et al. 2004, 223), especially disadvantaging the PEH victims in these spaces who face premature death on the streets. My study addresses this dearth by utilizing urban space for taphonomic experimentation with special consideration to the PEH who live and die there.

Although my methodology employs taphonomy as an experimental case to bear on the problem of homelessness, I also introduce taphonomy as an analogy. I develop the experience of homelessness with its risk of premature death as a cluster of human and nonhuman efforts that perpetually erode existence, or a "hybrid collectif" (Callon and Law 1997, 95-117). This concept embodies a penetration of many social and environmental agents that accumulate, facilitating death and the experiences thereafter (De León 2015, 39). The hybrid collectif acts upon PEH health and visibility, both socioculturally and biophysically. For PEH, the hybrid collectif might come in the direct or indirect forms of weaponized environments (Borchard 2010; Chellew 2019; Gaillard et al. 2019; Rosenberger 2020) and/or processes underpinned by structural violence (Farmer 2004) that contribute to the lack of potential to thrive. In both life and death, the hybrid collectif results in dehumanization of the less privileged, as the performance of power assigns degrees of value in death, depending on an individual's social status in life (Mbembe 2003).

In this article, I present a baseline taphonomic study in the rarely attempted urban environment with attention to the analogy presented above to better understand the many factors that drive homeless mortality in these spaces. Although I recognize the socially constructed experience of homelessness and the ambiguity of homeless identity (Marcus 2006, 1-19), I use the broad governmental definition of "homeless individual" to characterize

PEH. The United States Department of Housing and Urban Development (2020) defines a homeless individual as one who "lacks permanent nighttime residence."

Materials and Methods

Deployment

As a representative proxy used regularly in lieu of human donors in forensic decomposition research (Beck et al. 2015; Matuszewski et al. 2020; Shirley et al. 2011), four porcine carcasses (*Sus scrofa domesticus*) comprised the sample for the experiment. I chose to use only four carcasses in order to provide the largest sample possible within the available research space while still placing carcasses at a minimal distance of thirty-two meters to limit entomofaunal cross-contamination. Each carcass weighed an average of twenty-three kilograms, an appropriate weight for carrion ecology field study (Michaud and Moreau 2013; Schoenly et al. 2006). All the porcine carcasses in the sample were female, pink in color, and aged at approximately twelve weeks.

I purchased the carcasses whole as a food source from Terra Linda Farms in Riverdale, California. Each carcass passed the necessary food safety inspections (U.S. Department of Agriculture 2016) prior to purchase, as the supplier selected them as a food source safe for human consumption. The supplier slaughtered the pigs via a captive bolt to the head. I coordinated acquisition of the carcasses on a scheduled slaughter day to assure that the carcass tissue remained as fresh as possible following death. Following purchase, I immediately and securely transported the carcasses to the forensic site in packaging and doubled plastic bags. Upon arrival at the site, I dressed each carcass snugly in identical clothing: 100 percent cotton white T-shirts and sturdy child size denim shorts. I placed each carcass in its controlled or experimental setting.

I deployed the sample within a secure, gated forensic plot located on the south campus of San José State University in urban San José, California at the coordinates 37° 19’19” N 121° 52’00” W. Wedged between a baseball field and a busy city street, the space contained two modular buildings and a storage container. A conglomerate of asphalt, gravel, dirt, and grass comprised the terrain within the space. The nearest residence stood over a football field's distance away (111 meters). I covered chain-link fences surrounding the site with heavy duty opaque tarp material to eliminate visibility from passers-by. To reduce attempted tampering with the sample, I posted biohazard symbols and signs that read “Research in Progress” around the forensic research facility. I laid the carcasses out in their specified locations as far apart from each other as possible within the confines of the available space to limit cross-contamination. Figure 2 depicts an aerial view of the forensic site. The structures labeled “A” and “B” overlay modular buildings on the site, and “C” overlays a storage container. I constructed a sturdy, opaque barrier to limit public visibility of the carcass at the west corner of the site.

Figure 2 Aerial view of forensic site at San José State University with structures and approximate distances between carcasses.

To eliminate the variable of large vertebrate scavenging, I contained each carcass within its own large folding dog crate, secured with a latch mechanism and padlock, as illustrated in Figure 3. The crates were constructed of thick coated steel and allowed air, heat, small scavengers, and entomofauna to pass through freely. I situated the carcasses within their crates in several outdoor death scenarios as experienced by unhoused individuals in urban environments, as illustrated in Figure 3: (1) a control in open air; (2) inside a sleeping bag; (3) inside an open tent; and (4) inside a closed tent. Each crate experienced partial shade and sun throughout the day. I controlled for carcass movement and manipulation, a task required of me in order to observe and collect specimens from the other three carcasses. Specimen collection did not occur from the control carcass. I placed Elitech™ RC-51H digital data

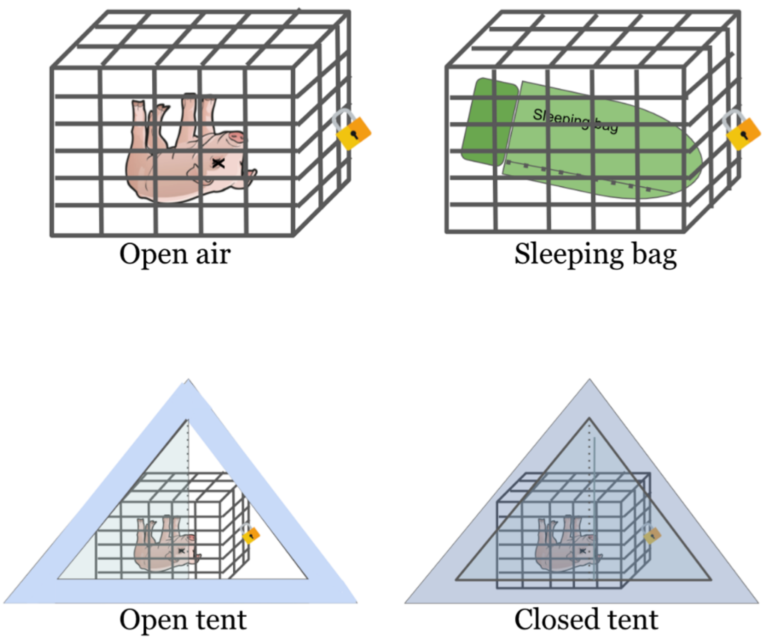

Figure 3 Death scenarios replicated by porcine carcasses at the San José State University forensic site. The upper left graphic shows the control carcass. The upper right graphic shows the sleeping bag carcass. The lower left graphic shows the open tent carcass, with the door unzipped for uninterrupted entry. The lower right graphic shows the closed tent carcass, with the door zipped closed.

loggers inside each crate to record ambient temperature and relative humidity at the direct site of deployment. I also placed Ktktudy^{TM} LCD digital meat thermometers into the abdomen of each carcass post-mortem to record internal temperature and to create a secondary wound that may entice insects. I inserted a plastic tray in the bottom of the control carcass's crate to mimic the synthetic material on the ground surface of the tents and sleeping bag.

Data Collection

Data collection took place over a duration of 102 days. See Appendix 3 for the paperwork utilized on each observation day. I made observations daily for the first 25 days and then less frequently from days 26 to 102 (biweekly and then weekly as decomposition slowed). To observe and visually document the decomposition process in regard to the passage of time, I photographed each carcass at each visit when I observed any change. I also recorded a temporal account of macroscopic post-mortem changes and quantified these changes using the Megyesi et al. total body score (TBS) (2005) during initial decomposition stages through visual observation.

I observed and noted a variety of eight externally visible post-mortem changes (DiMaio and DiMaio 2002; Goff 2009; Hamilton and Green, 2017): (1) tissue color; (2) odor; (3) lividity, any concentrated area on the skin that appeared darker red than the surrounding area; (4) desquamation, any thin layers of epidermal tissue detached from the underlying dermis; (5) purge, any fluid or substance expelled from any bodily orifice; (6) skeletal disarticulation, the separation of bone from bone with some flesh perhaps still intact; (7) loss of tissue due to coleopteran consumption, desiccated tissue that appeared to have been gnawed away by beetles with sawdust-like remnants underneath; and (8) desiccation, any dehydrated tissue that felt hard to the touch with a jerky-like malleability.

On each observation day, I took note of the general environmental conditions of the site by way of weather station data. I used the nearest weather station, Naglee Park KCASANJO872, located at the coordinates 37.34 °N 121.87 °W at an elevation of ninety-five feet. I recorded ambient temperature, relative humidity, and wind speed as well as visual observations of cloud coverage, precipitation, and anything out of the ordinary. I included these measurements to document discrepancies in ADD calculation using weather station data versus individual data logging instruments in their specific microenvironments. See Appendix 4 for each variable's unit of measurement and specific instrumentation.

I collected the internal temperatures at each site visit with Ktktudy™ LCD digital meat thermometers situated in the abdominal cavity of each carcass. I also took temperatures of the surrounding terrain and the floor of each crate with a Papogo™ handheld infrared thermometer gun. With Elitech™ data logging devices, I recorded atmospheric temperature and humidity for each carcass microenvironment hourly and uploaded the information digitally during each site visit.

To observe the closed tent carcass, I entered the closed tent carefully and strategically to restrict insects from flying inside (Malainey and Anderson 2020). I covered the entire tent with a large tarp and pulled it down over myself before unzipping the door to enter the tent. After entry, I immediately zipped the tent door closed. It remained closed for each duration spent inside the tent for observations. I executed a reverse strategy to exit the tent.

Due to the lack of standardization in decomposition measurement methods (Haglund and Sorg 2006, 6; Miles et al. 2020; Wescott et al. 2018) and for purposes of comparison to as many publications as possible, I recorded data using multiple methods. I predominately used the TBS scale published in Keough (2017) because it is specific to porcine proxies in decomposition study. However, I also evaluated stages of decay using the Megyesi et al. (2005) scale, a modification of the scale originally developed by Galloway et al. (1989). Because Keough's scale only differs from the Megyesi et al. scale up to the early decomposition stage, I switched fully to the Megyesi et al. scale after each carcass reached a point that had exceeded early decomposition. Although the Megyesi et al. scale specifies use in human cadaver application, other researchers have used human-designated TBS scales for porcine proxy studies (Dautartas et al. 2018, 1680). I used the TBS values in ADD calculation. Taphonomic literature accepts ADD as a more reliable method than TBS alone (Keough 2016), as it represents time and temperature concurrently (Myburgh et al. 2013). I calculated the original ADD measure with formulas (Schotsmans et al. 2020, 94) derived from prominent taphonomic publications. First, I used the Megyesi et al. (2005) formula:

$$ADD = 10^{(0.002 \text{ x } TBS \text{ x } TBS + 1.81)} \pm 761. \quad (1)$$

Then, I plugged the same data into the Moffatt et al. (2016) improved formula:

$$TBS_{surf} = (125 \text{ x } \log_{10}ADD - 212)^{0.625}. \quad (2)$$

I collected entomological specimens found on the carcasses to determine approximately when certain orders and species first appeared on each carcass. Manual collection into urinalysis vials required movement and manipulation of the carcasses within the crates. The control carcass, however, remained untouched; I collected no insects from this carcass. As days since death increased and TBS became less reliable (Haglund and Sorg 2002), I collected fewer specimens. I preserved many specimens in 92 percent solution ethanol and kept some Dipteran larvae alive. I reared the larvae on beef liver and preserved them in ethanol following adult emergence. Due to the unreliability of morphological identification at immature stages (Meng et al. 2017, 1193), I omitted many specimens preserved at immature stages from inclusion in the study. I identified and recorded the taxonomies of each of the reared and preserved specimens using morphological keys (Jones et al. 2019; Weidner and Powell 2019; Whitworth 2006) and compiled data to determine ecological succession, identifying Calliphorids to the species level and other Dipterans, Coleopterans, and miscellaneous entomofauna to the family level.

Results

Decomposition

I explored the differential rates of decomposition of the carcasses in their respective microenvironments through TBS/ADD comparisons and statistics. The elusive and ambiguous nature of total body scoring by visual observation prompted me to score halfway between integers when necessary. That is, if a score appeared too ambiguous for a certain carcass on a given day of observation, I added a value of 0.5 as a middle ground between scores.

I illustrated the most obvious results in a line graph concerning temporal change versus change in TBS (Figure 4). The open tent carcass progressed the quickest. While insects were allowed relatively easy access to the open tent carcass, they had full access to the control carcass, yet the open tent carcass progressed considerably quicker than the latter. The sleeping bag carcass followed the path of the control carcass closely until day 10, in which TBS spiked rapidly above the open tent carcass. The control carcass experienced a visible lull of change between days 8 and 15 post-mortem. The control carcass likely underwent post-mortem changes during this week-long period, but they could not be observed in detail without sacrificing the integrity of the control, designated to remain untouched. The closed tent carcass produced the most interesting progression. Body scoring values remained very low and slow-changing until the carcass became exposed to the environment outside of the tent. Due to strategic movement into and out of the tent, very few insects were present on

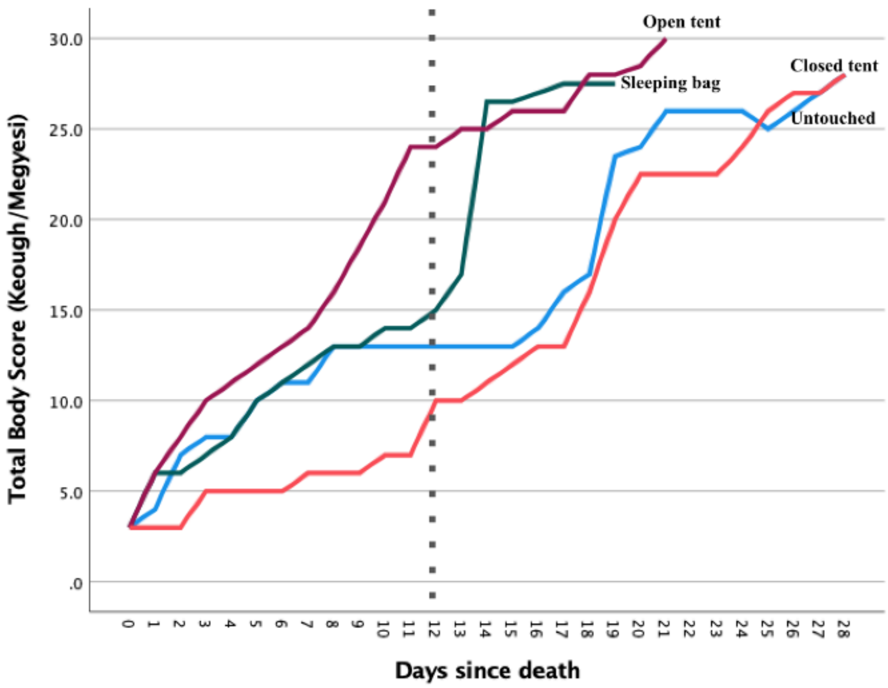

Figure 4 Temporal account of total body score for four porcine carcasses in varying death scenarios. The dotted line represents an event of human tampering on the closed tent carcass.

the closed tent carcass until an individual trespassed onto the forensic site on day 12 and removed the protective tent from its designated position, exposing the remains (Figure 5). After this event, the progression of decomposition immediately became similar to those of the other carcasses on their initial day of deployment and continued on that course.

Figure 5 Photographic documentation of four porcine carcasses on post-mortem days 11 and 14 with an event of human tampering of a closed tent carcass on day 12.

By examining the progress of the closed tent carcass in greater detail, I found evidence that a discrepancy exists between the two systems of measurement. Figure 6 presents the closed tent carcass's progression using both systems. I observed similar differentiations in all carcasses of the sample. Megyesi's TBS illustrates more rapid decomposition progress while Keough's TBS increases more slowly along the timeline. Both systems of measurement meet on day 20 post-mortem at the point when the carcass surpassed the stage of early decomposition and reached advanced decomposition.

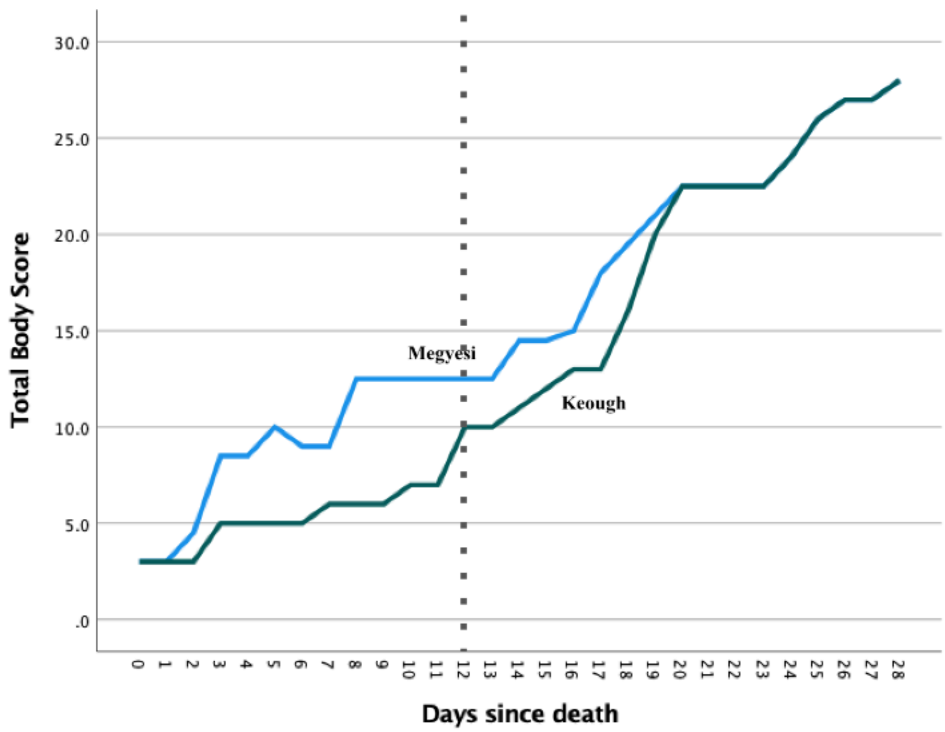

Figure 6 Contrast of a porcine carcass in a closed tent total body scores in an urban environment using different scales. The lines represent TBS values using Megyesi et al. 2005 and Keough 2016. The dotted line represents an event of human tampering on day 12 post-mortem.

I also plotted temporal measures of ADD per carcass. ADD produces the same general lined pattern, as illustrated in Figure 7. However, since ADD requires additional time for heat to accumulate and stimulate growth in value, the ADD trajectory lags behind the TBS trajectory plotted in Figure 6.

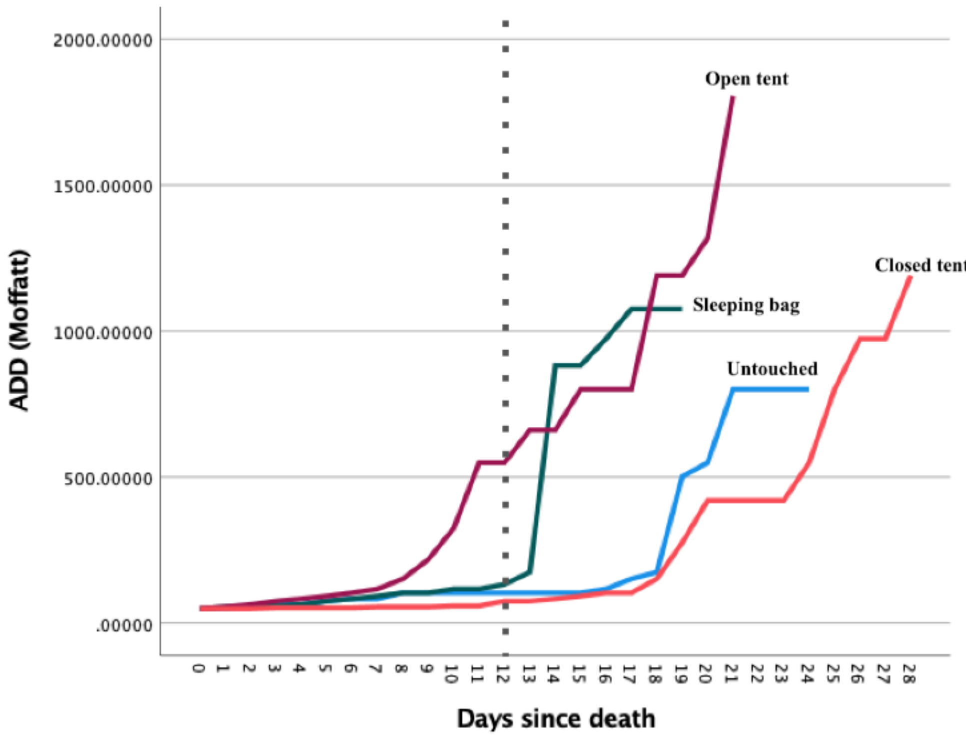

Figure 7 Temporal account of accumulated degree days for four porcine carcasses in an urban environment. Lines represent the untouched control carcass, the sleeping bag carcass, the open tent carcass, and the closed tent carcass. The dotted line represents the event of tampering on the closed tent carcass.

Figure 8 represents the differential temperatures collected in each carcass microenvironment. A malfunction with the sleeping bag carcass data logger occurred between days 16 and 17 post-mortem due to maggot infestation. I replaced the data logger on day 18 and wrapped it within a nylon stocking for protection. Although this measure worked, it likely affected the record of the true temperature inside the sleeping bag after day 18, inflating the results.

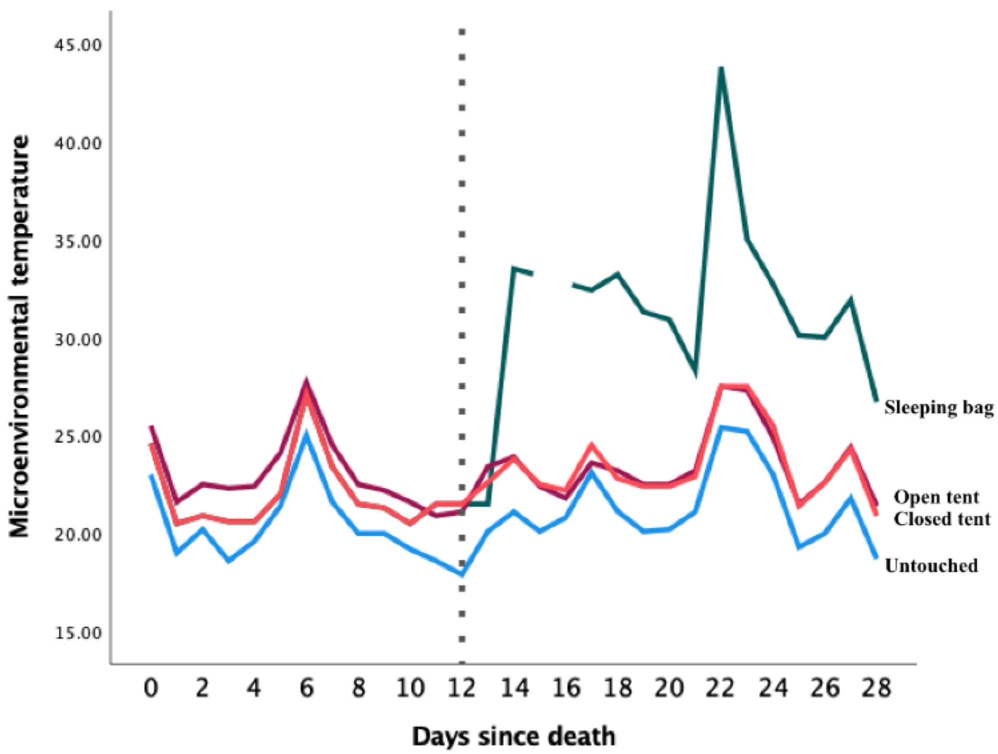

Figure 8 Temporal account of microenvironmental Temperatures of four porcine carcasses situated in varying death scenarios. The dotted line represents an event of tampering on the closed tent carcass.

I compared the TBS and ADD values for all the carcasses over the first nineteen days post-mortem using Spearman's rho. The values were statistically different on most days of observation such as the comparison on day 12 ($p>0.05$, $rho=0.95$, $n=4$); these data show that decomposition follows a general positive curvature when plotted (see statistics output in

Appendix 5). This overrides the assumption that the divergence of microenvironmental temperature and humidity in each death scenario would produce immensely dissimilar results. In this case, values that yielded statistically insignificant p-values were of the most interest, because they strayed from the general pattern that decomposition produces. Particularly, the insignificant p-values produced by statistical analyses on days 4, 5, 6, 8, 9, 12, and 18 post-mortem suggest that something unusual in TBS occurred due to chance. Although this phenomenon is consistent with the event of human tampering that occurred on day 12 and the spike in temperature that occurred on day 6 unanimously, too many factors exist to make the determination that the p-values interpret anything particularly unusual over the duration of decomposition.

Based on all TBS and ADD data acquired from the sample porcine carcasses, I created a very simple, generalized index of decomposition stages, a model that can potentially guide investigators in the right direction for estimated post-mortem interval (PMI) when coming across unhoused deaths in the region of study (Table 1). PMI is a crucial piece of information for death investigators to acquire because it informs temporal context by narrowing down the potential identities of found remains (Megyesi et al. 2005, 1; Simmons 2017, 134) and confirms or refutes suspects in homicide cases (Indra and Lösch 2021, 12; Megyesi et al. 2005, 1). The information generated through this measurement of temporal context plays a key role in legal decisions. The data in my study produced non-linear ranges due to the overlapping decomposition speeds of the head, trunk, and limbs. I represented these ranges in the model. If an investigator were to determine an estimated TBS that fits in more than one range, then they must still consider more than one estimated PMI.

Table 1 Taphonomic Model and Summary of Estimated Post-Mortem Interval Days, Megyesi and Colleagues' Total Body Score, and Moffatt and Colleagues' Accumulated Degree Days for Unhoused Decedents of San José, California

Stage (Megyesi et al. 2005)	Untouched Decedent			Sleeping Bag Decedent			Open Tent Decedent			Disturbed Closed Tent Decedent		
	Est. PMI	Est. TBS	Est. ADD	Est. PMI.	Est. TBS	Est. ADD	Est. PMI	Est. TBS	Est. ADD	Est. PMI	Est. TBS	Est. ADD
Fresh	0-3	3-8.5	50-66	0-2	3-7	50-59	0-1	3-5	50-53	0-2	3-4.5	50-51
Early decomposition	1-13	4-18	9-24	2-10	7-16.5	59-163	1-6	5-15.5	53-142	2-17	4.5-18	51-202
Advanced decomposition	9-24	13.5-26	163-801	8-13	13.5-24	124-662	6-17	15.5-26	142-801	17-29	18-24	202-549
Skeletonization	≥22	≥26	≥801	≥12	≥24	≥549	≥13	≥25	≥662	≥24	≥24	≥549

Ecological Succession

As expected in an urban location (Baz et al. 2014; Brundage 2011), the study lacked major insect diversity. I collected seven species of the forensically significant Calliphoridae (blow flies) over the course of the study on the experimental carcasses: *Phormia regina* (Meigen), *Lucilia sericata* (Meigen), *Lucilia cuprina* (Weidemann), *Lucilia mexicana* Macquart, *Calliphora vomitoria* (Linnaeus), *Calliphora livida* Hall, and *Compsomyiops callipes* (Bigot). Families Sarcophagidae (flesh flies) and Muscidae (house flies), as well as species *Piophila casei* (Linnaeus) (cheese flies) comprised the remainder of other Dipterans (flies) collected. Consistent with typical succession, Coleopterans (beetles) appeared following the Calliphoridae. Coleopteran specimens collected belonged to the families Dermestidae (hide beetles), Cleridae (checkered beetles), Staphylinidae (rove beetles), Tenebrionidae (darkling beetles), and Histeridae (clown beetles). Additional entomofauna collected that did not hold as much relevance to the study included those from the families

Anisolabididae (earwigs), Formicidae (ants), Aranaeae (spiders), and Bibionidae (march flies).

Tables 2 and 3 show the ecological succession for the insects collected up to day 20 post-mortem for the sleeping bag carcass and the open tent carcass. The ecological succession of the closed tent carcass in Table 4 is displayed from days 7 to 27, as no insects were present on the carcass prior to day 7. I represented the stages of Dipteran specimens in Table 2, Table 3, and Table 4 by E (eggs), L (larvae), P (pupae), and A (mature adult). I collected the early oviposited eggs laid on the sleeping bag carcass and the open tent carcass during the fresh stage to raise on beef liver in the forensic entomology laboratory. However, they failed to survive into adulthood for morphological identification.

Table 2 Ecological Succession for the Diptera and Coleoptera Collected on a Porcine Carcass within a Sleeping Bag for the First Twenty Days Post-Mortem in Urban San José, California

Sleeping Bag Carcass			DAYS POSTMORTEM																				
ORDER	FAMILY	SPECIES	Fresh			Early							Advanced				Skeletonization						
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Diptera																							
	Calliphoridae																						
		Phormia regina								A	L	L	L		L	L			L				A
		Lucilia sericata						L		L	L	L											
		Lucilia cuprina													L								
		Lucilia mexicana																					
		Calliphora vomitoria						A				L		L									
		Calliphora livida												L									
		Compsomyiops callipes					A			E,A		L	L	L	L	L			L				
	Piophilidae																						
		Piophila casei				A														A			
	Sarcophagidae					A		A	L,A		A		L	L,A	A		A						A
	Muscidae											L	L										
Coleoptera																							
	Dermestidae																						
	Cleridae																						
	Staphylinidae																						
	Tenebrionidae																						
	Histeridae																						

Table 3 Ecological Succession for the Diptera and Coleoptera Collected on a Porcine Carcass within an Open Tent for the First Twenty Days Post-Mortem in Urban San José, California

Open Tent Carcass			DAYS POSTMORTEM																				
ORDER	FAMILY	SPECIES	Fresh		Early					Advanced											Skel.		
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Diptera																							
	Calliphoridae																						
		Phormia regina						L		L	A	L	L		L,P					A	A		A
		Lucilia sericata			A		L	A,L			L	L			P								
		Lucilia cuprina					L		L	L			L										
		Lucilia mexicana							L	L	A												
		Calliphora vomitoria											L										
		Calliphora livida																					
		Compsomyiops callipes					A		L	L,A	L	L	L		L,P				L				A
	Piophilidae																						
		Piophila casei														A							
	Sarcophagidae			A	A	A			L,A	A	L					A	A						
	Muscidae																			A			A
Coleoptera																							
	Dermestidae																						
	Cleridae																						
	Staphylinidae																						
	Tenebrionidae																						
	Histeridae																						

Table 4 Ecological Succession for Days 7 to 27 Post-Mortem in Urban San José, California for the Diptera and Coleoptera Collected on a Porcine Carcass within a Closed Tent and Later Exposed Following Disturbance on Day 12

Closed Tent Carcass			DAYS POSTMORTEM																				
ORDER	FAMILY	SPECIES	Early											Advanced							Skel.		
			7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Diptera																							
	Calliphoridae																						
		Phormia regina								A			L	A,L								L	
		Lucilia sericata						L	A,L	L			L	L								L	
		Lucilia cuprina																					
		Lucilia mexicana																					
		Calliphora vomitoria																					
		Calliphora livida																					
		Compsomyiops callipes											L	L		A							
	Piophilidae																						
		Piophila casei	A	L					A	A			A	A	A		A						
	Sarcophagidae									L,A				A		A		A		A		L	
	Muscidae															A							
Coleoptera																							
	Dermestidae																						
	Cleridae																						
	Staphylinidae																						
	Tenebrionidae																						
	Histeridae																						

Discussion

Decomposition and Ecological Succession

In this study, larval activity played a critical role in carcass decay. First, it is likely that, although the open tent carcass had substantial partial tent coverage, insects may prefer a protected area as blow fly larvae possess negative phototrophy (Gross 2015, 7). Although the open tent carcass had substantial partial tent coverage out of direct sunlight, the insects became trapped inside the tent and preferred this protected oviposition location as it guaranteed their offspring a better chance of survival. This likely led to continued and increased oviposition and feeding, speeding the process in comparison to the other carcasses. Second, the spike in the TBS of the sleeping bag carcass on day 10 post-mortem likely occurred due to a gradual buildup of maggot mass activity at this time, affecting an increase in internal temperature (Adlam and Simmons 2007; Barton et al. 2021) and trapping heat inside the insulated sleeping bag (Guo et al. 2023).

Not surprisingly, mature Calliphorids first became available for collection on the open tent carcass on day 1 post-mortem, as the open door allowed for uninterrupted insect access. The sleeping bag carcass had partially limited access due to the insulated cover, delaying colonization. Therefore, I did not collect the first specimens until day 3 post-mortem. The first insects did not appear for collection on the closed tent carcass until day 7 post-mortem, as the closed tent severely limited insect access. Even so, I identified these first specimens as *Piophila casei,* which as adults only measure up to about three to five millimeters long (Byrd and Castner 2001). Larger flies likely could not fit through any miniscule openings that existed in the tent. I did not observe and collect the first blowfly on the closed tent carcass until day 12 post-mortem; this occurred after the tampering event, in which a trespasser removed the carcass from the closed tent, fully exposing it to the external environment.

According to Thümmel et al. (2023), concealment by a closed tent influences decomposition through the factors of microclimate, species abundance, colonization, and oviposition. The closed tent carcass in this study adheres to their claim and exhibits the most unique ecological succession when compared to those of the other two carcasses. The closed tent's restricted access and the full exposure to the environment that followed human tampering likely played a role in its divergences. First, unlike the others, I did not collect Sarcophagidae (flesh flies) from the closed tent carcass until after I had already collected Calliphorids. Second, I initially collected Dermestidae on the closed tent carcass on the same day as the first Calliphorid specimens, while a considerable interval existed between the collection of the first Calliphoridae and the first Dermestidae on the two other carcasses: four days for the sleeping bag carcass and six days for the open tent carcass. Third, even after the tampering event, I found only three species of Calliphorids on the exposed closed tent carcass, while I found six different species on each of the other two carcasses. Furthermore, the Calliphorid species collected from the closed tent carcass comprised the most commonly collected entomofauna of the study: *Phormia regina, Compsomyiops callipes,* and *Lucilia sericata.*

Some insects only colonized on specific pigs and appeared nonexistent on others. I only collected *Lucilia mexicana* from the open tent carcass, *Calliphora livida* from the sleeping bag carcass, and Tenebrionidae from the sleeping bag carcass. Interestingly, although Cleridae: *Necrobia rufipes* (De Geer) (red-legged ham beetle) existed on all carcasses, only the open tent carcass exhibited the species *Necrobia ruficollis* (Fabricius) (red shouldered ham beetle). These discrepancies likely resulted from a combination of reasons: (1) the degree of access to the carcasses; (2) the general abundance of necrophagous species endemic to the San José region; and (3) the diverse terrain at the forensic site. In urban areas, the terrain changes quite readily, possibly factoring into species ecological differences.

Human Survival Scavenging and Taphonomy

Over the duration of the experiment, several people who appeared to scavenge for the resources used in the staging of the experiment disturbed the sample of carcasses on multiple occasions. This required adaptations to the methodology midway through the study, as these individuals made changes to the control carcass. I use the term *human survival scavenging* to label these events in which a living individual likely experiencing desperation altered the settings surrounding a deceased individual in order to increase their own chances of survival. While this phenomenon disturbed the data collection and limited the ability to use certain metrics, it nevertheless reveals certain features associated with life and death among PEH. Reflecting on this outcome with an anthropological approach serves forensic value, as these events demonstrate a realistic contribution to sites where death among PEH has occurred. The *human survival scavenging* that took place actually provided more of a realistic simulation of urban homeless mortality due to the high-traffic activity of impoverished individuals at the site and at other locations where PEH reside. Researchers might consider *human survival scavenging* as a taphonomic agent specific to the urban context; and therefore, evaluate it as a potential variable when conducting taphonomic research in such environments.

Human survival scavenging began on day 12 post-mortem, in which I found the crate containing the closed tent carcass on the outside of a collapsed tent, thus exposing the previously unexposed experimental subject fully to the external environment. I left the closed tent carcass fully exposed after this event, since the *human survival scavenging* left the carcass fully exposed to the climate; insects had already begun colonization and the scavenger had destroyed the tent. On day 53 post-mortem, I discovered the control carcass's crate displaced from its designated microenvironment and tipped on its side, flipping the carcass underside-up. I immediately returned the crate with the carcass to its original upright position and location. Although authorities acknowledged that activity had occurred on the site around this time, they withheld the specific details of this event from me. I found that campus facilities staff had moved the crate approximately ten feet to the east on day 62 post-mortem, altering the proportion of sunlight and shade that the control carcass had experienced each day prior in its original position. The experiment continued until day 102 post-mortem. The sleeping bag carcass remained undisturbed by *human survival scavenging* over the entire duration of the experiment. With so many events of *human survival scavenging*, the early days of experimentation produced the most reliable data. However, since most post-mortem changes occur early in the decomposition process, later taphonomic data tends to hold far less analytical value (Haglund and Sorg 2002). An analysis for this study proceeded to day 28 post-mortem and not further, when TBS evaluation for all pigs became too elusive to determine, due to *human survival scavenging* and natural decomposition processes.

Relevance in the Real World

In addition to studying the taphonomic processes of proxy carcasses, I also investigated the real-life homeless death patterns that the sample represents. To compare existing data to this baseline study's results in the same geographical vicinity, I accessed the Santa Clara County Medical Examiner Data Dashboard: an excellent public resource available to browse real-life homeless death data. The database helped me to identify more specific characteristics of death events and emphasized the sheer weight of the homeless crisis in terms of human suffering and premature death compared to the housed population. It also assigned value to taphonomic research of this kind, because it showed transparent numbers of people who have met their demises in identical or similar situations to those simulated in the taphonomic study. I looked at data specific to the 95112 zip code region in San Jose, the area of the forensic site and coincidentally a location where 7 percent of PEH deaths since 2018 have occurred in Santa Clara County (Santa Clara County Medical Examiner-Coroner 2022). I display the types of spaces that PEH deaths have occurred in this region as a pie chart in Figure 9. See Appendix 6 for the codebook created to compile these data. Based on data of 1,015 total PEH deaths in Santa Clara County from January 2018 to November 2022, most deaths occurred in outdoor spaces, as represented by the control carcass and the sleeping bag carcass. Another large portion of deaths occurred in homeless encampments, as represented by the open tent carcass and the closed tent carcass.

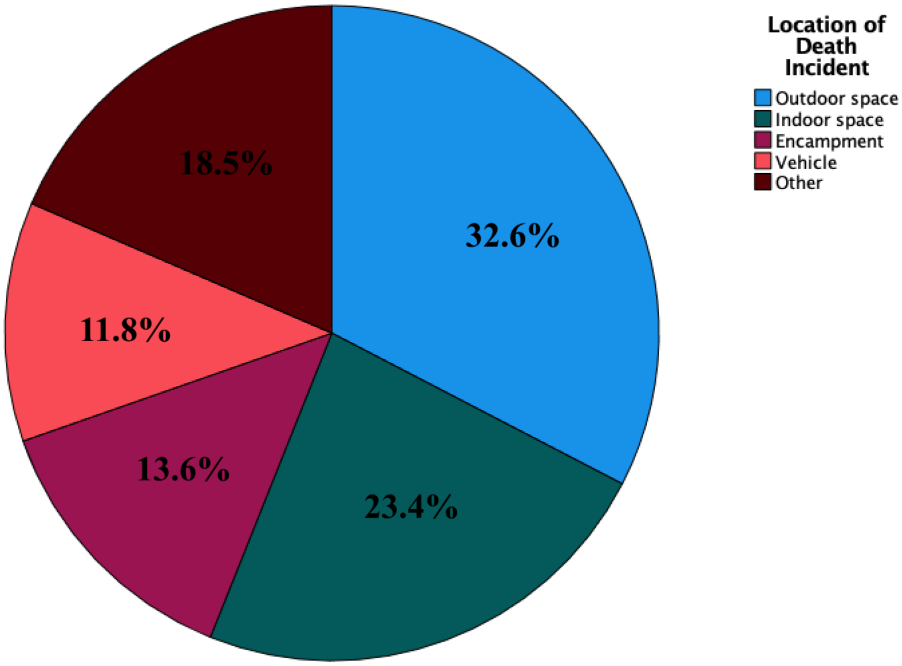

Figure 9 Frequencies of n=1,015 PEH death incident locations in Santa Clara County (Santa Clara County Medical Examiner-Coroner 2022).

With the sheer number of homeless mortalities on the charts and their deaths occurring often in unfathomable squalor and inhumane conditions, it seems that medico-legal agencies and educational facilities would push for research that would provide the tools required to piece together the details. However, urban taphonomic research is rare, and even more rare in California, leaving impoverished regions unrecognized and PEH death events overlooked and deprioritized. The lack of investigative urgency augments the landscape of the hybrid collectif of homelessness, as it signifies a push for the erasure of PEH and presents a societal apathy for a powerless population.

Conclusion

I have used a taphonomic methodology to better understand aspects of the problem of homeless mortality. As an outcome of my analysis, I propose that unhoused circumstances or conditions of homelessness play some role in the decomposition process, potentially impacting estimated PMI for victims in an outdoor urban environment and/or skewing the interpretation of urban unhoused death events when evaluated taphonomically. Although my experiment only simulated death events among PEH, its outcomes have the potential of occurring in the real world.

Taphonomic research has not been perfected and remains a major work in progress. Although much of the data and analysis produced should be interpreted skeptically due to the abundance of variables at work during decomposition, I have developed a strong beginning. I have determined that *human survival scavenging* and/or various microenvironmental settings may severely alter death scenes in outdoor urban environments under investigation. I therefore urge investigators to evaluate scenes in such environments with unique variables specific to the urban context in mind. I also encourage researchers in general to examine homelessness in more contexts and environments than they currently do. I used forensic science to look at a sociocultural problem in this study, initiating a new perspective and prompting real-world solutions. We must be willing to try new approaches to solve old problems in order to tackle inequities in life and death.

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CHAPTER III
CONCLUSION

In this chapter, I first discuss limitations to taphonomic research in general as well as those encountered in my research specifically. I then suggest opportunities to expand on this study and advocate for the potential of future taphonomic studies. Finally, I close by echoing the applied value and broader impact of my research.

Limitations to Research

Although this research serves a critical purpose and holds broader value, several limitations exist in conducting fieldwork and in analysis. Initially, one must understand that taphonomic research has not been perfected and continues to develop as data and methods become available. Due to the abundance of variables at work during decomposition, one should interpret this data and analysis skeptically. My findings comparing methods support this.

The narrow and unstandardized methods of taphonomic research prompted me to create a data bank in all formats available instead of using just one solid method. Even with all available methods represented, I found adaptation during data collection inevitable due to methodological uncertainties and unexpected events. The subjective nature of observing post-mortem changes visually made the quantification of the total body score point system sometimes ambiguous and difficult to comprehend. More than one onlooker during data collection in my study would have been beneficial to prevent visual bias.

Ideally in this kind of research, a much larger carcass sample size per scenario would have been more sufficient to compare levels of decomposition with other carcasses undergoing identical conditions. Schoenly et al. (2015) recommend a sample size that will produce at least 80 percent statistical power, requiring a minimum of forty-three carcasses (134). However, I could not possibly maximize our sample of four carcasses, as the confined parameters at the urban site limited the space I had available. While rural space generally exceeds the compact nature of urban space, minimal sample sizes likely serve as a major limitation to urban forensic taphonomy.

Obviously, the events of *human survival scavenging* upon the site inconveniently skewed the data following their dates of occurrence. Although I still kept detailed records, these events restricted me from doing any in-depth analysis following their occurrences. However, they did indicate real-life variables of scavenging within the setting, suggesting that researchers must consider human survival scavenging as an agent of decomposition.

Some Calliphoridae specimens collected from the carcasses appeared teneral when examined under the microscope. That is, they lacked identifying features when I preserved them. The collection of teneral flies which had recently emerged from pupal casings resulted because they were easier to catch than fully developed adult flies. Additionally, debris from the carcass tissue had saturated some specimens and therefore appeared of poor examination quality. Unfortunately, these factors made morphological identification of some blowflies more difficult and even impossible. A more consistent device used to capture specimens might have been more suitable and effective. Perhaps the addition of baited bottle traps (Hwang and Turner 2005, 380) placed beside each carcass would have randomized our specimen collection more efficiently.

Future Studies

The fields of anthropology and forensic science require more studies in general on homelessness: a silent, underrepresented population in various avenues. Regarding forensic taphonomy specifically, the field can only evolve with an abundance of studies in diverse settings. Increased urban studies, more variables tested, and the standardization of the variables themselves will always benefit the field of taphonomy and its development. However, with the skeptical assumptions made of taphonomic studies, an increased interest in broad methodological research might impact the field more beneficially. After establishing the limitations of my own research, I would be most interested in finding out how total body score results differ when collected simultaneously by multiple researchers at the same site, because of its subjective nature.

A follow-up study at the San José urban forensic site would enhance the data and provide additional outcomes. To enrich my research, I might consider conducting a study during the winter season to understand how the change in weather at the same location affects the sample. With colder temperatures and events of precipitation, the winter season would likely produce different results in entomofaunal diversity and general speed of decay.

I could experiment further in the same location to replicate the study, but I could also explore multiple pathways with the already existing data and/or through an anthropological lens. Some research questions of interest might include:

- How does the internal temperature, ground temperature and surface temperature affect the decomposition rate in comparison to TBS?
- How does total body score correspond with changes in temperature and humidity?

- How might myiasis (a parasitic condition in which insects colonize a living body) play a role in the taphonomy of homeless bodies?
- How do events of human survival scavenging coincide with other events of crime in the vicinity of the forensic site?
- How do the locations of homeless deaths in Santa Clara County compare with those in other urban hubs in California? Can this be explored taphonomically?
- How do unhoused individuals experience mortality in their communities first-hand?

Closing Remarks

My study contributes to the region-specific forensic taphonomic knowledge in the outdoor urban environment of San José, applicable to the death experiences of unhoused homeless individuals. Through forensic taphonomic experimentation, I have provided a taphonomic guide serving to appropriately account for the circumstances surrounding deaths among PEH of San José. Through analysis and anthropological insight, I have examined how unhoused PEH experience death and decomposition through the hybrid collectif of homelessness. Finally, I have promoted the urgency of refined forensic taphonomic research, especially in urban settings. It is our duty as researchers to examine evidence, conduct experiments, and ask questions behind the scenes to help those who have fallen victim to the inequities of society. We must use the tools we have to push for justice for these individuals in life and death. It is irresponsible and inhumane to accept the lack of urgency on homelessness issues. It is my hope that this thesis will leave a mark on the importance of multidisciplinary research on homelessness in both the fields of anthropology and forensic science.

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Appendix 1

Institutional Animal Care and Use Committee Approval

San Jose State University
Institutional Animal Care and Use Committee

LETTER OF OFFICIAL PROTOCOL REVIEW

Date: March 11, 2022

Dear Jodie,

The animal care and use portion of your research proposal indicated below was reviewed by the Institutional Animal Care and Use Committee (IACUC). The status of your proposal is as follows:

Principal Investigator(s): Jodie Warren
Co-Investigator(s): Chloe Angst
Protocol #: 2022-A
Title: The taphonomy of homelessness in an outdoor urban environment.

The application was approved without modification by the IACUC.

Approval date: April 15, 2022 * Expiration Date: April 14, 2025

The IACUC must be informed in writing of any proposed changes to the approved protocol outline and approval must be granted in writing by the IACUC before any change is instituted. If you wish to continue the project beyond the protocol expiration date, it is recommended that you submit a renewal application for the use of non-living animal tissue in ample time for IACUC review in March, 2025.

The IACUC protocol number 2022-A may only be used by the principal investigator and participants included on the approved protocol. The protocol number will be required on grant or contract proposals to fund the project. If you have any questions, please contact me at 408-924-4929.

Larry Young

Larry Young, RVT, CPIA
IACUC Coordinator

This protocol has been approved as a Health Risk Category One level project (RC-1).

Please refer to the attached risk category description page for relevant personnel safety information pertaining to this study.

Personnel Health Risk Category Description

Applicability:

Federal regulations require IACUC to review animal-related activities with due consideration to risk assessment and occupational health and safety concerns for personnel associated with the project. Each SJSU animal care and use protocol is assigned a "Risk Category" by the IACUC as described below at the time it is approved. This process is meant to facilitate a safer work environment through education (e.g., relevant zoonosis information), medical assessment and surveillance (e.g., occupational health services), and training.

Risk Category Descriptions:

IACUC criteria for protocol risk category assignment are based on the potential hazards posed by the animals and materials used; exposure intensity, duration, and frequency; susceptibility of personnel and on the history of occupational illness and injury in the particular workplace. The extent of personnel participation in the Laboratory Animal Occupational Health Program (LAOHP) is dependent upon individual risk of exposure and IACUC assignment to Health Risk Category 1 (RC-1), Category 2 (RC-2) or Category 3 (RC-3), listed from lowest to highest risk respectively.

Health Risk Category 1

- **RC-1** covers all approved animal activities posing minimal risk of exposure to personnel having minimal contact with purpose-bred animals or their tissues, or inherent risks associated with field studies. Through general training in laboratory animal use and protocol review, personnel shall be informed of the inherent risks associated with fieldwork. Investigators and their staff will be informed of the LAOHP services available to them and are encouraged to complete and submit an LAOHP questionnaire at any time during the study as requested. Individuals interested in participating in the LAOHP must first contact the University Animal Care office for assistance.

Health risks identified by the IACUC in this protocol include (but certainly are not limited to) trained personnel handling decaying and putrefied tissues from conventional, purpose-bred porcine carcasses. Tissues should be safely handled and managed using the appropriate personal protective gear, and mechanical and engineering controls in the laboratory. Tissue waste shall be disposed of in manageable quantities in coordination with the Animal Care Facility staff. The IACUC requires that the Principal Investigator and all personnel associated with this approved protocol be familiar with the risks, precautions, and emergency response procedures with respect to the approved protocol activities.

BY NO MEANS SHOULD THESE RECOMMENDATIONS BE VIEWED AS SUFFICIENT FOR THE PREVENTION OF ALL POSSIBLE OR CONCEIVABLE ANIMAL-RELATED INJURIES OR ILLNESSES, NOR SHOULD THE RECOMMENDATIONS HEREIN BE USED TO REFUTE OR SUBSTITUTE FOR THE ADVICE OF TRAINED MEDICAL PROFESSIONALS.

Appendix 2

Human Decomposition Facilities Currently in Operation

Facility	Year est.	Location	School	Department	Environment
Anthropology Research Facility (ARF)	1981	Knoxville, Tennessee, USA	University of Tennessee	Anthropology	Temperate, without dry season and hot summers
Forensic Osteology Research Station (FOREST)	2007	Cullowhee, North Carolina, USA	Western Carolina University	Anthropology	Temperate, without dry season and hot summers
Forensic Anthropology Research Facility (FARF)	2008	San Marcos, Texas, USA	Texas State University	Anthropology	Temperate, without dry season and hot summers
Applied Anatomical Research Center of Southwest Texas	2008	Huntsville, Texas, USA	Sam Houston State University	Criminal Justice	Temperate, without dry season and hot summers
Complex for Forensic Anthropology Research (CFAR)	2010	Carbondale, Illinois, USA	Southern Illinois University	Anthropology	Temperate, without dry season and hot summers
Forensic Investigation Research Station (FIRS)	2012	Whitewater, Colorado, USA	Colorado Mesa University	Criminal Justice	Arid, steppe and cold
Australian Facility for Taphonomic Experimental Anthropologist Research (AFTER)	2016	Sydney, New South Wales, Australia	University of Technology Sydney	Centre for Forensic Sciences	Temperate, without dry season and hot summers
Amsterdam Research Initiative for Sub-surface Taphonomy and Anthropology (ARISTA)	2018	Amsterdam, Netherlands	Amsterdam Medical Center	Medicine	Temperate, without dry season and hot summers

Forensic Research Outdoor Station (FROST)	2018	Marquette, Michigan, USA	Northern Michigan University	Anthropology	Cold, dry winter, very cold winter
Buckingham Environmental Forensics Facility	2018	Fort Myers, Florida, USA	Florida Gulf Coast University	Justice Studies	Temperate, without dry season and hot summers
Recherche en Sciences Thanatologiques [Expérimentales et Sociales] (REST[ES])	2020	Trois-Rivières, Québec, Canada	Université du Québec à Trois-Rivières	Anatomy	Temperate/continental climate
Florida Forensic Institute for Research, Security, and Tactics (F1RST)	2020	Land O' Lakes, Florida	Pasco Sheriff's Office and Florida Gulf Coast University (FGCU)	Justice Studies	Temperate, without dry season and hot summers

Appendix 3

Daily Data Collection Forms

<u>Environmental Observations (Nearest Weather Station)</u>

Observation Day:

Date/time:

Ambient Temperature (C):

Relative Humidity:

Wind Speed:

Weather Observations:

Pig Observations (Include photos)

Pig (circle one): Control [1] Sleeping bag [2] Tent open [3] Tent closed [4]

Observation day:

Date/time:

Internal temperature (C): Ground temperature (C):

Visual/olfactory observations:

Data Logger (Include full data report)

Average temperature:

Average humidity:

ADD:

Arthropods Present

Pig (circle one): Sleeping bag [2] Tent open [3] Tent closed [4]

Observation Day:

Date/time:

Vial #					
Total collected					
Location on carcass					
Stage					
Preserved (Y/N)					
Kept alive (Y/N)					
Scientific name					
Common name					
Taxonomic source					
Notes					

Appendix 4

Extrinsic and Intrinsic Events Observed in the Field and their Means of Measurement

	Observation	**Units**	**Instrument**
Extrinsic	Ambient temperature	Degrees Celsius	Naglee Park Weather Station
	Relative humidity	Water vapor in air/ maximum vapor capacity at given temperature (%)	Naglee Park Weather Station
	Microenvironmental temperature	Degrees Celsius	Elitech™ RC-51H Digital Data Logger
	Microenvironmental relative humidity	Water vapor in air/ maximum vapor capacity at given temperature (%)	Elitech™ RC-51H Digital Data Logger
	Wind speed	Miles per hour	Naglee Park Weather Station
	Cloud cover	Presence or absence, cardinal direction	Visual inspection
	General observation	Miscellaneous description	Sensory inspection
	Immediate ground surface temperature	Degrees Celsius	Papogo™ Digital Laser Infrared Thermometer Gun
	Surface temperature	Degrees Celsius	Papogo™ Digital Laser Infrared Thermometer Gun
	Observation	**Units**	**Instrument**
Intrinsic	Internal temperature	Degrees Celsius	Ktkudy™ LCD Meat Thermometer

	Tissue color	Miscellaneous description	Visual inspection, photography
	Lividity	Presence or absence, anatomical location	Visual inspection, photography
	Desquamation	Presence or absence, anatomical location	Visual inspection, photography
	Odor	Qualitative severity	Olfactory inspection
	Purge	Presence or absence, anatomical location	Visual inspection, photography
	Disarticulation	Presence or absence, anatomical location	Visual inspection, photography
	Tissue desiccation	Presence or absence, anatomical location	Visual inspection, photography
	Loss of tissue via coleopteran consumption	Presence or absence, anatomical location	Visual inspection, photography
	Overall degree of decomposition	Total body score (Megyesi et al. 2005)	Visual inspection

Appendix 5

Statistical Output of Each Carcass for Days 0-19 Post-Mortem

Days since death	Untouched ADD	TBS (Megyesi) Head	TBS (Megyesi) Trunk	TBS (Megyesi) Limbs	Sleeping bag ADD	TBS (Megyesi) Head	TBS (Megyesi) Trunk	TBS (Megyesi) Limbs	Open tent ADD	TBS (Megyesi) Head	TBS (Megyesi) Trunk	TBS (Megyesi) Limbs	Closed tent ADD	TBS (Megyesi) Head	TBS (Megyesi) Trunk	TBS (Megyesi) Limbs	Spearman`s rho	p-value
0	49.65923215	1	1	1	49.65923	1	1	1	49.65923	1	1	1	49.65923	1	1	1		
1	50.5824662	2	1	1	49.65923	1	1	1	52.51114	2	2	1	49.65923	1	1	1	1	0
2	55.25815357	2	3	1	58.81887	3	3	1	68.6511	3	4	2	51.44049	2	1.5	1	1	0
3	65.82163777	4.5	3	1	63.25008	3	3	2	92.27369	5	4	3	65.82164	2.5	4	2	1	0
4	78.88533511	4.5	4	2	71.757	3	4	2.5	103.3917	5.5	4	3.5	65.82164	2.5	4	2	0.94868	0.05132
5	92.27368887	4.5	4	3.5	103.3917	5	4.5	3.5	116.6682	5.5	4.5	4	75.16045	4.5	2.5	3	0.94868	0.05132
6	103.3917143	4.5	4.5	4	109.7348	5.5	4.5	3.5	141.6254	5.5	5.5	4.5	68.6511	4.5	2.5	2	0.94868	0.05132
7	109.7347741	5	4.5	4	109.7348	5.5	4.5	3.5	254.4971	8	6	5.5	68.6511	4.5	2.5	2	1	0
8	109.7347741	5	4.5	4	124.25	6.5	4.5	3.5	254.4971	8	6	5.5	97.58693	4.5	4.5	3.5	0.94868	0.05132
9	162.4735938	4.5	5.5	4.5	162.4736	6.5	5	5	275.6787	8.5	6.5	5.5	97.58693	4.5	4.5	3.5	0.94868	0.05132
10	162.4735938	6.5	5.5	4.5	324.8565	8	7	6	324.8565	9	6	6	97.58693	4.5	4.5	3.5	1	0
11	162.4735938	6.5	5.5	4.5	458.6361	9	8	6	549.3595	9	8	7	97.58693	4.5	4.5	3.5	1	0
12	201.9792555	7	6	5	549.3595	9.5	8.5	6	549.3595	9	8	7	97.58693	4.5	4.5	3.5	0.94868	0.05132
13	201.9792555	7	6	5	661.4814	9.5	8.5	7	661.4814	9.5	8.5	7	97.58693	4.5	4.5	4.5	1	0
14	419.8944166	9	7	6.5	882.428	10.5	8.5	7.5	661.4814	9.5	8.5	7	124.25	5.5	4.5	4.5	1	0
15	419.8944166	9	7	6.5	882.428	10.5	8.5	7.5	800.5885	9.5	9.5	7	124.25	5.5	4.5	4.5	1	0
16	501.6209031	9	8	6.5	973.8506	11	8.5	7.5	800.5885	9.5	9.5	7	132.545	5.5	5	4.5	1	0
17	501.6209031	9	8	6.5	1076.078	11	9	7.5	800.5885	9.5	9.5	7	201.9793	5.5	6.5	6	1	0
18	501.6209031	9	8	6.5	1076.078	11	9	7.5	1190.501	10.5	10	7.5	254.4971	7	6.5	6	0.8	0.2
19	501.6209031	9	8	6.5	1076.078	11	9	7.5	1190.501	10.5	10	7.5	324.8565	8	7	6	1	0
20	549.3595025	9	8	7					1318.698	11	10	7.5	419.8944	9	7	6.5		
21	800.5884534	11	8	7					1805.218	11	10	9	419.8944	9	7	6.5		
22	800.5884534	11	8	7									419.8944	9	7	6.5		
23	800.5884534	11	8	7									419.8944	9	7	6.5		
24	800.5884534	11	8	7									549.3595	9.5	7	7.5		
25													800.5885	9.5	8.5	7.5		
26													973.8506	11	8.5	7.5		
27													973.8506	11	8.5	7.5		
28													1190.501	11	8.5	8.5		

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Appendix 6

Figure 9 Codebook

1. **Outdoor space** Includes the following: embankment, under bridge, parking lot (does not indicate in vehicle), public sidewalk, behind or side of business, street, park, highway, railroad/train tracks, trail, yard, bus stop/drop off area, overpass, alley, ditch, creek/river/pond, wooded area, field, bushes, top of train, public bench, empty lot, underneath vehicle, front steps. Does not include encampment.
2. **Indoor space** Includes the following: motel/hotel, hospital, residence, trailer, homeless shelter, recovery center, jail/correctional facility, public restroom, supermarket, church, housing, restaurant, BART train.
3. **Encampment** As specified.
4. **Vehicle** As specified. May indicate recreational vehicle or vehicle parked in a certain space.
5. **Other** Includes spaces that did not provide specific enough information to fit into one of the designated categories: parking structure, business, fire station, walkway, other, shed, storage unit, recycling plant, vacant building, rail platform, BART station, workplace, apartment complex, carport, stairwell, ground. Also includes nondescript spaces listed as unknown or N/A in the database.

Appendix 7

Daily Data Collected on the Untouched Control Carcass

Control Carcass Microenvironmental Observations

Day #	Date	Days since death	Temperatures (C) Average ambient temp	Internal temp	Surface temp	Immediate ground temp	Average humidity	Visual/olfactory observations
1	5/18	0	23.0	38.6	26.8	27	51.8	fresh, minor lividity, blood expelling from snout
2	5/19	1	19.0	26.4	24.2	22.7	45.2	bloated neck, lividity on chin/top of head/back of neck, left ear/upper limbs
3	5/20	2	20.2	24.7	25.4	24.7	40.7	odor only detectable from inches away, no visible flies, purge expelling from mouth, discoloration in trunk
4	5/21	3	18.6	26.3	28.3	29.5	51.0	marbling on ears, flies collecting on chin, bloated eyes
5	5/22	4	19.6	25.9	23.9	23.9	52.5	marbling on ears, desiccation on edges of ears, bloated eyes, insect activity in mouth and eyes
6	5/23	5	21.4	27.2	25.3	25.1	53.1	increased distension in abdominal cavity, gray/green discoloration on head, increased gray color on underside of head, elevated desiccation and marbling on ears and snout, eggs on underside of head, insect activity in mouth and chin wound
7	5/24	6	25.0	31.6	33.8	33.3	36.4	green/gray coloring on head and trunk, desiccated toes and nailbeds, blistering on underside and limbs, marbling on ears
8	5/25	7	21.6	32.3	29.8	31.9	55.5	foamy yellow fluid under head, small maggots squirming under head, eggs on left shoulder of shirt, dry lower limbs, bloated upper limbs, some purge on left arm, blistering on underside of abdomen, fluid expelling from wound caused by internal thermometer

9	5/26	8	20.0	26.8	23.4	25.5	60.9	large egg mass 4' in diameter at lumbar vertebrae region, visible beetles on chin, torso bloating beginning to decrease
10	5/27	9	20.0	21.2	21.6	30.6	63.0	fluid collected at foot end of cage and head, faint odor, foamy fluid puddle at mouth, desiccated tongue, hair loss, caving torso and chin
11	5/28	10	19.2	25.9	22.9	37.7	58.4	escape of gases from thermometer wound, teeth exposed, maggots present under blister on left arm
12	5/29	11	18.6	27.1	25.9	25.2	67.4	desquamation on midriff region, large maggot mass on
13	5/30	12	17.9	17	12	10.3	53.4	small maggots on shirt in thoracic region, flesh on dorsal side still intact, mandible and maxilla partially exposed, data logger box soaked with fluid
14	5/31	13	20.1	17.5	12.7	12.7	49.0	foamy sludge underneath torso and head, maggots on shirt, green/gray coloration on head, crepey/crispy epidermis on torso, intestines likely protruding from abdomen (not visible under shirt)
15	6/1	14	21.1	21.6	29.1	28	45.8	swarm of flies, increased foamy/sludgy substance under head, foam on ventral region of shirt, mummification initiating on lower quadrants of abdomen, visible beetles, left arm desiccated, bone tissue exposed on underside of head
16	6/2	15	20.1	23.4	17.4	19	57.6	maggots have repositioned pants, gray coloration, visible beetles
17	6/3	16	20.8	34.3	21.6	23.6	54.4	birds and bird feces on barrier near pig, maggots in blister pockets on visible region of torso, maggots visible in eye, accumulation of cheese flies, leathery and dry facial features, mummified patches on all visible regions
18	6/4	17	23.1	29.5	28	28.5	50.8	increased gray coloration, right ear appearing very leathery, hair

								loss and desquamation severe on left arm, visible mummification on right thigh, increased avian activity surrounding cage
19	6/5	18	21.13	31.9	26.2	24.8	60.8	increased mummification on torso/eyes/mouth/visible limbs, severe maggot activity, continued avian activity surrounding cage
20	6/6	19	20.1	25.5	16.4	16.6	53.6	moist ground, blackening of mummified flesh, continued avian activity
21	6/7	20	20.2	35.9	23.7	24.9	45.1	about 30 birds surrounding cage, torso significantly caved in, crepey flesh on neck and right buttock, whitening of teeth
22	6/8	21	21.1	41.1	24	24.9	56.7	tooth loss, severe mummification on left side of head, several holes on left side of head, hair still intact on head, maggot seen on carcass (maggot activity occurring internally), beetle activity
23	6/9	22	25.4	27.1	17	16.2	44.7	about 10 birds present surrounding cage
24	6/10	23	25.2	31.3	20.5	19.6	51.4	no noticeable change
25	6/11	24	23.0	35.8	30.1	26.8	62.8	all regions of head appear mummified
26	6/12	25	19.3	31.7	24	26	57.9	no flies seen, crepey tissue on right buttock and dorsal region of neck
	6/13	26	20.0				50.1	
	6/14	27	21.8				47.0	
27	6/15	28	18.7	29.9	23.6	25.9	50.0	desiccated tendons visible on left ulna
	6/16	29	18.1				48.8	
	6/17	30	17.8				52.2	
28	6/18	31	18.5	18.2	17	16.5	49.9	no noticeable change
	6/19	32	23.6				48.2	
	6/20	33	26.8				40.1	
29	6/21	34	27.3	39.2	36	34.4	31.1	no noticeable change
	6/22	35	24.8				47.5	
	6/23	36	26.0				45.3	

30	6/24	37	23.0	41.8	34.2	39.3	51.0	no noticeable change
	6/25	38	22.5				55.0	
	6/26	39	22.2				58.0	
	6/27	40	22.2				54.0	
31	6/28	41	20.6	25.0	27.3	27.6	52.8	
	6/29	42	19.9				56.1	hollow head, skeletonization of upper right arm, insect activity underneath
	6/30	43	19.4				57.0	
	7/1	44	19.6				55.8	
32	7/2	45	21.0	21.8	19.3	19.6	53.0	"sawdust" under head, visible gnats
	7/3	46	21.4				55.4	
	7/4	47	24.6				54.8	
	7/5	48	24.9				52.7	
33	7/6	49	21.2	28.6	26.1	27.3	57.6	"munching" evidence on snout and mouth, underside of head has been eaten away by coleopterans
	7/7	50	21.1				53.3	
	7/8	51	20.8				56.4	
	7/9	52	24.2				50.1	
34	7/10	53	25.8	27.3	26.0	22.7	45.1	tampering, cage discovered tipped on its die, debris ("sawdust", pupal casings, dry flesh, tooth) littered on underside of cage, visible cheese fly activity
	7/11	54	23.3				55.5	
	7/12	55	22.7				56.1	
	7/13	56	22				58.9	
35	7/14	57	20.8	28.6	28.6	29.5	56.1	dark and pasty grayish black coloration, white coloration on left ear, "munching" evidence on head, increase in crepey tissue development
	7/15	58	22.4				56.8	
	7/16	59	24.1				53.0	
	7/17	60	24.9				49.0	
	7/18	61	22.7				54.7	

36	7/19	62	21.6	30.2	28.1	30.1	57.0	tampering, cage moved approximately 10 feet East (sun and shade distribution is altered), severe crepey tissue at midriff, left limbs still intact but desiccated, no visible insect activity, avian activity near cage
	7/20	63	21.5				56.4	
	7/21	64	21.4				54.5	
	7/22	65	21.3				52.7	
	7/23	66	20.7				55.4	
37	7/24	67	20.8	38.4	30.4	38.3	55.9	increased "munching" activity on snout, slightly darker coloration on tissue on head and torso, no insect activity on exterior
	7/25	68	21.3				56.7	
	7/26	69	21.8				56.6	
	7/27	70	21.3				58.3	
	7/28	71	21.6				59.1	
	7/29	72	21.5				59.9	
38	7/30	73	21.9	25.5	27.6	28.9	61.7	significant deterioration of desiccated tissue on head due to coleopteran consumption, yellow coloration of flesh on torso, darkening of tissue on left arm, "munching" activity on ventral neck, moist appearance due to rainfall
	7/31	74	22.3				62.4	
	8/1	75	24.6				51.5	
	8/2	76	23.2				52.9	
	8/3	77	24.6				53.3	
	8/4	78	23.4				52.8	
	8/5	79	22.5				57.0	
39	8/6	80	20.8	24.8	26.8	26.5	59.5	no noticeable change
	8/7	81	20.6				60.4	
	8/8	82	21.1				59.4	
	8/9	83	20.9				60.0	
	8/10	84	21.1				61.1	
	8/11	85	19.9				61.7	

	8/12	86	20.1				57.6	
	8/13	87	20.8				57.0	
40	8/14	88	22.1	23.5	27.7	26.4	55.8	visible D. maculatus, darkening of mummified tissue on torso/ears/neck/eye/left arm, "munching" progress on ventral head/torso/snout
	8/15	89	24.3				48.0	
	8/16	90	26.4				42.0	
	8/17	91	23.2				56.8	
	8/18	92	21.6				61.6	
	8/19	93	21.9				58.3	
41	8/20	94	22.4	25.5	29.8	27.4	55.5	visible D. maculatus, increased "munching" on head
	8/21	95	21.9				57.5	
	8/22	96	22.4				63.9	
	8/23	97	21.8				61.5	
	8/24	98	20.7				62.4	
	8/25	99	21.2				62.5	
	8/26	100	20.8				62.2	
	8/27	101	20.1				62.1	
42	8/28	102	25.6	27.7	27.8	28.5	44.0	increased "munching" progress on dorsal region of head

Note: The rows highlighted in yellow represent events of human survival scavenging.

Control Carcass TBS and ADD Using Megyesi et al. 2005 Scale

Days since death	Head	Trunk	Limbs	TBS	ADD min (Megyesi)	ADD max (Megyesi)	TBS_{surf}	ADD (Moffatt)
0	1	1	1	3	-693.7023344	828.2976656	0	49.65923215
1	2	1	1	4	-691.4975682	830.5024318	1	50.5824662
2	2	3	1	6	-684.792099	837.207901	3	55.25815357
3	4.5	3	1	8.5	-670.9466237	851.0533763	5.5	65.82163777
4	4.5	4	2	10.5	-653.7246352	868.2753648	7.5	78.88533511
5	4.5	4	3.5	12	-635.6858825	886.3141175	9	92.27368887
6	4.5	4.5	4	13	-620.3952476	901.6047524	10	103.3917143
7	5	4.5	4	13.5	-611.5485958	910.4514042	10.5	109.7347741
8	5	4.5	4	13.5	-611.5485958	910.4514042	10.5	109.7347741
9	4.5	5.5	4.5	16.5	-534.796146	987.203854	13.5	162.4735938
10	6.5	5.5	4.5	16.5	-534.796146	987.203854	13.5	162.4735938
11	6.5	5.5	4.5	16.5	-534.796146	987.203854	13.5	162.4735938
12	7	6	5	18	-473.9219418	1048.078058	15	201.9792555
13	7	6	5	18	-473.9219418	1048.078058	15	201.9792555
14	9	7	6.5	22.5	-96.49232709	1425.507673	19.5	419.8944166
15	9	7	6.5	22.5	-96.49232709	1425.507673	19.5	419.8944166
16	9	8	6.5	23.5	60.29655283	1582.296553	20.5	501.6209031
17	9	8	6.5	23.5	60.29655283	1582.296553	20.5	501.6209031
18	9	8	6.5	23.5	60.29655283	1582.296553	20.5	501.6209031
19	9	8	6.5	23.5	60.29655283	1582.296553	20.5	501.6209031
20	9	8	7	24	155.2204901	1677.22049	21	549.3595025
21	11	8	7	26	691.1116176	2213.111618	23	800.5884534
22	11	8	7	26	691.1116176	2213.111618	23	800.5884534
23	11	8	7	26	691.1116176	2213.111618	23	800.5884534
24	11	8	7	26	691.1116176	2213.111618	23	800.5884534

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Control Carcass TBS and ADD Using Keough 2017 Scale

Days since death	Head	Trunk	Limbs	TBS	ADD min (Megyesi)	ADD max (Megyesi)	TBS_{surf}	ADD (Moffatt)
0	1	1	1	3	-693.7023344	828.2976656	0	49.6592321
1	2	1	1	4	-691.4975682	830.5024318	1	50.5824662
2	2	3	2	7	-680.0904101	841.9095899	4	58.8188724
3	3	3	2	8	-674.3038124	847.6961876	5	63.2500848
4	3	3	2	8	-674.3038124	847.6961876	5	63.2500848
5	4	3	3	10	-658.6707008	863.3292992	7	75.1604493
6	5	3	3	11	-648.2802544	873.7197456	8	82.9585102
7	5	4	4	11	-648.2802544	873.7197456	8	82.9585102
8	5	4	4	13	-620.3952476	901.6047524	10	103.391714
9	5	4	4	13	-620.3952476	901.6047524	10	103.391714
10	5	4	4	13	-620.3952476	901.6047524	10	103.391714
11	5	4	4	13	-620.3952476	901.6047524	10	103.391714
12	5	4	4	13	-620.3952476	901.6047524	10	103.391714
13	5	4	4	13	-620.3952476	901.6047524	10	103.391714
14	5	4	4	13	-620.3952476	901.6047524	10	103.391714
15	5	4	4	13	-620.3952476	901.6047524	10	103.391714
16	5	4	5	14	-601.7791273	920.2208727	11	116.668196
17	6	5	5	16	-551.1060116	970.8939884	13	151.571583
18	7	5	5	17	-516.6569447	1005.343055	14	174.431828
19	9	8	6.5	23.5	60.29655283	1582.296553	20.5	501.620903
20	9	8	7	24	155.2204901	1677.22049	21	549.359502
21	11	8	7	26	691.1116176	2213.111618	23	800.588453
22	11	8	7	26	691.1116176	2213.111618	23	800.588453
23	11	8	7	26	691.1116176	2213.111618	23	800.588453
24	11	8	7	26	691.1116176	2213.111618	23	800.588453

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Appendix 8

Daily Data Collected on the Sleeping Bag Carcass

Sleeping Bag Carcass Microenvironmental Observations

Day #	Date	Days since death	Temperatures (C) Average ambient temp	Internal temp	Surface temp	Immediate ground temp	Average humidity	Visual/olfactory observations
1	5/18	0	24.6	37.7	26.7	26.8	49.4	purge expelling from snout, lividity present on chin
2	5/19	1	20.5	27.2	22.3	23.7	44.0	frothy purge expelling from snout (crust developing at edges), lividity on chin, abdominal bloating present
3	5/20	2	20.9	23.4	23.5	26.6	40.8	faint odor, impressions on right side of torso due to sleeping bag, increased odor underneath pig, no noticeable insect, flies landed on body minutes after opening
4	5/21	3	20.6	24.2	29.2	27.9	49.4	increased liquid purge, 1" diameter blisters on lower right quadrant, anal distension, discoloration on limbs, damp and cold on pig underside
5	5/22	4	20.6	24.8	17.7	21.1	53.4	detectable odor 1' away from cage
6	5/23	5	22.0	24.9	24.8	27.0	54.5	marbling present, green discoloration on limbs, blistering present on lower limbs, bloating of tongue, fly activity, increased skin slip/fluid release/marbling on left ear
7	5/24	6	27.1	27.6	29.3	31.0	38.2	marbling present, greenish gray discoloration on whole body, desiccation at edges of snout and ears, severe bloating of eyes/torso/ umbilicus, blistering and desquamation of abdomen, tissue gas present on ear bases, anal purge, severe hair loss
8	5/25	7	23.4	28.9	29.6	30.2	53.1	desquamation on torso, large mass of eggs on right ear 3" in diameter, left arm exhibiting large mass of eggs/severe gray discoloration/desquamation/tissue

								gas, bloating of torso has caused laceration of umbilicus, decompositional fluids have saturated sleeping bag, no insect activity at lower limbs/pelvis, eggs present in right eye
9	5/26	8	21.5	28.0	24.4	28.6	58.4	odor detectable from 6' away, puddle of fluid at foot end underneath sleeping bag, desquamation and green discoloration of torso, anal purge and distension, maggot mass at chest and head, caving of chin
10	5/27	9	21.3	38.8	29.9	43.2	61.1	odor detectable from 12' away, teeth/mandible/maxilla slightly exposed
11	5/28	10	20.5	31.1	28.3	35.1	55.4	head and upper limbs leathery and moist, anus and eyes have disintegrated, left humerus and left ribs exposed
12	5/29	11	21.5	30	26.9	29.6	46.4	maggot mass at temperature of 30.4, strong odor, maggot mass underneath sleeping bag, teeth fully exposed, marbling on pelvic region, pig deflated
13	5/30	12	21.5	24.3	35.4	38.8	46.5	wet decomposition, bone tissue of mandible/cranium/upper limbs partially exposed
14	5/31	13	21.5	26.8	20.9	17.1	46.5	strong mothball scent, mandible detached, wet/moist tissue, holes in flesh from maggot locomotion
15	6/1	14	33.5	32.8	29.3	46.1	84.9	strong mothball scent, wet decay, bones partially exposed in all regions of body, maggot of multiple sizes and peach/pink/orange coloration, desiccation present in all regions of body, no flies collecting on cadaver
16	6/2	15		28.3	18.2	17.7		wet cadaver, bones of thorax and abdomen exposed anteriorly, foul odor, sleeping bag saturated with fluid
17	6/3	16		34.2	21.3	28.7		odor not detected from farther than 6 feet, greasy ribs/mandible/maxilla, many maggots still wandering, large pink

								maggots, disarticulation of some hoof hard tissue
18	6/4	17	32.4	35.6	21.2	30.6	85.8	mummification on pig underside, maggots stuck inside sleeping bag lining
19	6/5	18	33.2	36.4	26.9	26.1	91.3	increased skeletonization of limbs, mild mothball odor
20	6/6	19	31.3	32.4	17.2	19.5	89.6	fewer maggots
21	6/7	20	30.9	34.3	21.5	25.1	91	flies trapped inside sleeping bag lining, underside of pig mummified with hair still attached, increased desiccation
22	6/8	21	28.3	35.5	24.8	28.3	84.4	odor detectable from 3'
23	6/9	22	43.8	30.1	18.1	18.1	91.4	no change
24	6/10	23	35.0	33.2	21.1	20.7	94.6	posterior spine visible
25	6/11	24	32.7	37.5	57.0	42.1	95.7	left ribs fully exposed, left and right humeri fully exposed
26	6/12	25	30.1	36.4	20.9	26.1	95.1	flesh on cranium feels tough but still malleable, dark coloration on cranium, mostly skeletonized from thorax to cranium (not including limbs), disarticulation of scapulae
	6/13	26	30.0				91.4	
	6/14	27	31.9				91.1	
27	6/15	28	26.7	35.1	22.7	26.8	94.0	limbs becoming more skeletonized (upper limbs are further than lower limbs), desiccated tendons/ligaments visible on right arm, black discoloration, flesh exhibits jerky texture, hair on underside of pig still attached, whitening of flesh on left foot, wet decomposition in thoracic cavity, increased desiccation of limbs and head
	6/16	29	24.3				93.4	
	6/17	30	24.8				88.6	
28	6/18	31	24.8	22.9	28.9	31.8	85.1	no change
	6/19	32	27.1				82.7	
	6/20	33	29.3				79.2	
29	6/21	34	30.5	30.1	31.9	33.3	77.4	bleaching of flesh on cranium/right arm/lumbar, slightly damp backside with hair still attached, slightly wet thoracic cavity

	6/22	35	30.2				80.3	
	6/23	36	30.3				77.6	
30	6/24	37	28.8	33.9	34.1	33.9	75.9	slightly damp/stretchy thoracic cavity tissue, continued bleaching of lumbar/head/lower limbs, increased lower limb skeletonization
	6/25	38	28.9				74.7	
	6/26	39	28.8				73.7	
	6/27	40	28.3				69.4	
31	6/28	41	27.4	26.4	28.1	28.6	67.5	continued bleaching of flash on lumbar and head, conglomerate patterning on whitened flesh (black and brown specks), partial skeletonization of all limbs, feet are further in skeletonization than at thighs
	6/29	42	26.6				68.0	
	6/30	43	26.1				67.5	
	7/1	44	25.5				66.5	
32	7/2	45	23.9	23.4	47.5	37.5	68.1	"munching" of lower limbs, mummified abdominal region (not skeletonized)
	7/3	46	24.5				70.4	
	7/4	47	27.1				73.2	
	7/5	48	27.5				71.7	
33	7/6	49	26.8	29.3	25.0	25.9	72.7	increased skeletonization, "munching" activity, dry/flexible flesh, upper limbs disarticulated
	7/7	50	26.9				71.9	
	7/8	51	27.5				71.5	
	7/9	52	29.3				66.7	
34	7/10	53	30.7	26.2	46.4	38.2	61.2	no change
	7/11	54	29.4				63.6	
	7/12	55	28.7				64.0	
	7/13	56	28.2				64.8	
35	7/14	57	26.5	29.8	26.9	29.2	63.1	continued "munching" and bleaching, increased skeletonization
	7/15	58	27.4				63.4	
	7/16	59	28.5				62.2	

	7/17	60	28.9				61.1	
	7/18	61	28.0				61.2	
36	7/19	62	25.0	28.5	27.0	28.6	67.1	slowed "munching" progress
	7/20	63	24.7				67.2	
	7/21	64	24.5				66.5	
	7/22	65	24.4				65.0	
	7/23	66	23.8				66.2	
37	7/24	67	25.0		28.7	27.9	63.9	increased "munching" in limbs
	7/25	68	25.4				64.8	
	7/26	69	25.7				65.3	
	7/27	70	25.4				66.2	
	7/28	71	25.5				67.2	
	7/29	72	24.8				68.8	
38	7/30	73	24.5		27.5	30.0	70.7	increased moisture on bones, darkening of bone at articulations
	7/31	74	25.4				72.4	
	8/1	75	26.8				69.6	
	8/2	76	26.7				65.4	
	8/3	77	27.5				66.3	
	8/4	78	26.9				65.4	
	8/5	79	26.3				67.3	
39	8/6	80	24.8		29.8	30.5	68.7	adipocere between ribs on backside
	8/7	81	24.4				68.5	
	8/8	82	24.5				68.6	
	8/9	83	24.1				69.2	
	8/10	84	24.4				69.8	
	8/11	85	23.3				70.4	
	8/12	86	23.1				69.5	
	8/13	87	23.4				68.2	
40	8/14	88	23.8		42.8	31.2	68.4	increased odor, adipocere formation on lower limbs, increased darkening at joints and head, munching progress on underside of cervical vertebrae
	8/15	89	25.1				65.6	
	8/16	90	27.0				61.4	
	8/17	91	25.1				69.0	

	8/18	92	23.6				72.1	
	8/19	93	23.6				71.2	
41	8/20	94	24.5		31.3	31.1	67.3	no change
	8/21	95	24.1				69.2	
	8/22	96	24.6				73.1	
	8/23	97	23.9				72.1	
	8/24	98	23.1				72.5	
	8/25	99	23.3				73.2	
	8/26	100	22.9				73.4	
	8/27	101	22.1				73.1	
42	8/28	102	25.5		23.8	23.9	62.0	no change

Note: A new data logger placed inside a nylon sock to limit maggot infestation on day 17 post-mortem.

Sleeping Bag Carcass TBS and ADD Using Megyesi et al. 2005 Scale

Days since death	Head	Trunk	Limbs	TBS	ADD min (Megyesi)	ADD max (Megyesi)	TBS_{surf}	ADD (Moffatt)
0	1	1	1	3	-693.702	828.2977	0	49.65923
1	1	1	1	3	-693.702	828.2977	0	49.65923
2	3	3	1	7	-680.09	841.9096	4	58.81887
3	3	3	2	8	-674.304	847.6962	5	63.25008
4	3	4	2.5	9.5	-663.164	858.8363	6.5	71.757
5	5	4.5	3.5	13	-620.395	901.6048	10	103.3917
6	5.5	4.5	3.5	13.5	-611.549	910.4514	10.5	109.7348
7	5.5	4.5	3.5	13.5	-611.549	910.4514	10.5	109.7348
8	6.5	4.5	3.5	14.5	-590.98	931.02	11.5	124.25
9	6.5	5	5	16.5	-534.796	987.2039	13.5	162.4736
10	8	7	6	21	-268.96	1253.04	18	324.8565
11	9	8	6	23	-23.0958	1498.904	20	458.6361
12	9.5	8.5	6	24	155.2205	1677.22	21	549.3595
13	9.5	8.5	7	25	387.1536	1909.154	22	661.4814
14	10.5	8.5	7.5	26.5	877.7021	2399.702	23.5	882.428
15	10.5	8.5	7.5	26.5	877.7021	2399.702	23.5	882.428
16	11	8.5	7.5	27	1092.532	2614.532	24	973.8506
17	11	9	7.5	27.5	1340.358	2862.358	24.5	1076.078
18	11	9	7.5	27.5	1340.358	2862.358	24.5	1076.078
19	11	9	7.5	27.5	1340.358	2862.358	24.5	1076.078

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Sleeping Bag Carcass TBS and ADD Using Keough 2017 Scale

Days since death	Head	Trunk	Limbs	TBS	ADD min (Megyesi)	ADD max (Megyesi)	TBS_{surf}	ADD (Moffatt)
0	1	1	1	3	-693.702	828.2977	0	49.65923
1	2	2	2	6	-684.792	837.2079	3	55.25815
2	2	2	2	6	-684.792	837.2079	3	55.25815
3	2	3	2	7	-680.09	841.9096	4	58.81887
4	3	3	2	8	-674.304	847.6962	5	63.25008
5	4	3	3	10	-658.671	863.3293	7	75.16045
6	4	3	4	11	-648.28	873.7197	8	82.95851
7	5	3	4	12	-635.686	886.3141	9	92.27369
8	5	4	4	13	-620.395	901.6048	10	103.3917
9	5	4	4	13	-620.395	901.6048	10	103.3917
10	5	5	4	14	-601.779	920.2209	11	116.6682
11	5	5	4	14	-601.779	920.2209	11	116.6682
12	5	5	5	15	-579.03	942.9701	12	132.545
13	6	6	5	17	-516.657	1005.343	14	174.4318
14	10.5	8.5	7.5	26.5	877.7021	2399.702	23.5	882.428
15	10.5	8.5	7.5	26.5	877.7021	2399.702	23.5	882.428
16	11	8.5	7.5	27	1092.532	2614.532	24	973.8506
17	11	9	7.5	27.5	1340.358	2862.358	24.5	1076.078
18	11	9	7.5	27.5	1340.358	2862.358	24.5	1076.078
19	11	9	7.5	27.5	1340.358	2862.358	24.5	1076.078

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Appendix 9

Daily Data Collected on the Open Tent Carcass

Open Tent Carcass Microenvironmental Observations

Day #	Date	Days since death	Temps (C) Average ambient temp	Internal temp	Surface temp	Immediate ground temp	Average humidity	Visual/olfactory observations
1	5/18	0	25.5	38.1	33.9	33.5	42.5	slight odor, foamy purge from snout, T-shirt is wicked with urine
2	5/19	1	21.6	30.3	26.4	31.7	37.6	increased odor, old lividity on face, heavy bloating from abdomen, dark green discoloration at lower quadrants, desquamation, slight lividity on underside of limbs
3	5/20	2	22.5	29.3	37.1	35.4	32.7	odor detectable from inside tent, fluid expelling from torso, green discoloration, anal prolapse, blister 4" in diameter at lower quadrants
4	5/21	3	22.3	29.4	34.0	44.9	42.6	fluid-filled blisters on groin and lower quadrants, collection of maggots under right arm, increased putrefactive activity, eggs at kill wound, mouth, and snout, marbling on all limbs, postmortem staining on underside, desiccation of right ear
5	5/22	4	22.4	28.2	24.9	31.7	45.0	green/gray discoloration, hair loss under chin, blackening at cecum, brown fluid-filled blisters at lower left quadrant
6	5/23	5	24.1	29.6	26.7	34.9	46.2	intestines have erupted through abdominal dermis (crepey/dry texture), increased blackening at cecum, increased blistering at lower quadrants and underside of limbs, severe desiccation of snout and tongue, severe hair loss, severe bloating, gray discoloration of limbs, desiccation of toes, foamy purge
7	5/24	6	27.7	33.6	30.9	42.4	34.6	exposed viscera has shriveled up, decreasing abdominal and chin bloat pressure, pants have moved in position on body, large maggot

								mass 5" diameter at mouth and underside of head, crepey flesh at left arm and hand, severe desquamation on underside of cadaver, strong putrefactive odor
8	5/25	7	24.5	32.1	29.8	39.0	48.1	caving of left side of thorax, maxilla partially exposed, desiccation of tissue at thighs/arms/back/side of face, puddle of anal purge, maggot mass 10" diameter very hot to the touch, some teeth exposed, blackening of mouth, green/black/gray discoloration at all regions, severely pungent odor
9	5/26	8	22.5	28.6	27.6	33.3	52.6	decreased odor severity, increased caving of trunk and chin, teeth and maxilla exposed, leathery texture to flesh on chin and chest
10	5/27	9	22.2	26.9	31.2	46.9	54.0	severe caving, deterioration of flesh at chest/mouth/torso, blackening of flesh at head/limbs/abdomen, maxilla and mandible fully exposed, facial features are unrecognizable
11	5/28	10	21.6	31.1	35.6	49.1	50.3	desiccation of chin/face/lower quadrants, skeletonization of left upper limb
12	5/29	11	20.9	29.4	36.0	50.6	46.7	deflation, maggot mass 10" diameter on torso underneath T-shirt, desiccation of lower limbs/feet/lower quadrants, hair loss on skull and limbs, blackening of limbs and skull, cranium exposed, strong odor
13	5/30	12	21.1	34.9	48.4	29.3	47.2	maggots have congregated mostly underneath pig, increased quantity of pupae on tent floor
14	5/31	13	23.4	27.3	17.6	15.9	41.8	increased maggot activity
15	6/1	14	23.9	37.0	31.2	49.6	42.5	increased desiccation, skeletonization of left ribs, partial skeletonization of all regions, mummified right thigh
16	6/2	15	22.4	26.5	20.8	20.6	55.3	desiccation of all regions
17	6/3	16	21.8	34.7	26.5	33.2	53.6	increased quantity of pupae on tent floor
18	6/4	17	23.6	31.8	34.6	35.2	51.8	increased dipteran activity

19	6/5	18	23.2	30.5	26.3	28.4	58.4	avian activity surrounding tent, beginning of disarticulation (metacarpal and tooth on floor)
20	6/6	19	22.5	28.3	19.3	18.3	51.0	no change
21	6/7	20	22.5		25.7	31.0	43.6	increased avian activity, chaotic dipteran activity inside tent, severe desiccation of head
22	6/8	21	23.2		30.1	32.4	54.2	continued flattening of pig
23	6/9	22	27.5	24.5	19.7	18.3	43.3	orange discoloration of face and increased desiccation, lightening coloration of dry flesh on right thigh/shoulder/cheek
24	6/10	23	27.3	26.3	21.3	21.2	50.4	no change
25	6/11	24	24.9	32.7	37.2	54.4	62.3	increased softening and cooling of underside flesh, mummification in all regions
26	6/12	25	21.5	26.7	27.8	35.1	54.7	hard/crispy flesh, right thigh fully mummified, decrease in weight of entire pig, greater surface area of mummified flesh over skeletonized
	6/13	26	22.6				49.1	
	6/14	27	24.4				45.9	
27	6/15	28	21.4	28.0	27.0	33.4	48.8	avian activity inside tent, no flies, whitening of right arm, and head, dried tendons visible on limbs, slight mist on pig from nearby sprinkler
	6/16	29	20.3				46.1	
	6/17	30	20.5				48.3	
28	6/18	31	21.2	25.0	65.8	43.1	46.4	all flesh is dry, very firm tissue, whitening of desiccated skin at limbs and torso
	6/19	32	23.7				46.9	
	6/20	33	27.0				38.6	
29	6/21	34	29.6	33.5	38.3	44.4	29.6	no change
	6/22	35	27.6				44.9	
	6/23	36	28.2				42.1	
30	6/24	37	26.3	35.6	40.3	57.1	47.2	avian activity, "munching" on thin flesh on torso, increased orange coloring of head and thighs
	6/25	38	25.5				51.7	
	6/26	39	25.1				54.0	

	6/27	40	25.1				49.8	
31	6/28	41	23.5	28.5	31.5	42.5	49.6	"munching" in all regions
	6/29	42	22.4				53.2	
	6/30	43	22.3				52.9	
	7/1	44	21.5				53.8	
32	7/2	45	20.7	27.7	35.3	46.6	53.4	increased "munching", deterioration of snout
	7/3	46	22.5				53.2	
	7/4	47	25.3				56.2	
	7/5	48	24.3				54.3	
33	7/6	49	23.4	28.8	28.1	35.4	54.3	hollowed cavities, disarticulation of limbs underneath mummified flesh, some flesh still malleable, deterioration of face, shriveled/stringy viscera
	7/7	50	23.8				51.7	
	7/8	51	23.8				54.1	
	7/9	52	25.4				51.4	
34	7/10	53	28.4	33.2	36.5	52.8	42.3	increased "munching", disarticulation of phalanges/carpals/tarsals/mandible
	7/11	54	26.1				51.1	
	7/12	55	25.3				52.1	
	7/13	56	24.9				54.0	
35	7/14	57	23.9		30.8	40.5	50.3	increased "munching", increased disarticulation of tarsals and carpals, lumbar spine visible through mummified flesh
	7/15	58	25.0				52.3	
	7/16	59	26.7				48.8	
	7/17	60	27.5				45.3	
	7/18	61	25.8				49.5	
36	7/19	62	24.3		31.0	40.7	53.0	back door of tent found zipped open, tissues that have been munched by coleopterans has become spongey at right leg/back/face
	7/20	63	23.9				53.7	
	7/21	64	24.1				51.0	
	7/22	65	23.9				49.6	

	7/23	66	23.1				52.5	
37	7/24	67	23.0		36.7	52.3	53.8	complete disarticulation of feet from all limbs except lower left
	7/25	68	23.7				54.2	
	7/26	69	23.9				55.2	
	7/27	70	23.6				56.1	
	7/28	71	23.3				58.8	
	7/29	72	23.4				59.5	
38	7/30	73	22.8		34.4	44.2	63.2	continued softening of mummified tissue due to coleopteran activity, darkening of bone at right knee, bleaching of sun-exposed tissue
	7/31	74	24.1				60.3	
	8/1	75	27.0				50.4	
	8/2	76	25.9				50.2	
	8/3	77	27.2				51.6	
	8/4	78	26.0				50.1	
	8/5	79	24.8				55.4	
39	8/6	80	23.6		37.7	52.9	56.2	no change
	8/7	81	23.6				56.0	
	8/8	82	23.9				56.2	
	8/9	83	24.2				55.6	
	8/10	84	24.0				57.4	
	8/11	85	23.1				57.7	
	8/12	86	23.7				53.2	
	8/13	87	24.6				51.8	
40	8/14	88	25.6		40.2	54.9	51.8	no change
	8/15	89	27.7				44.2	
	8/16	90	28.2				38.9	
	8/17	91	26.1				54.2	
	8/18	92	24.7				57.8	
	8/19	93	25.5				53.5	
41	8/20	94	25.6		44.1	54.5	54.2	spiderweb on cage, darkening of lower right patella, fragility of flesh
	8/21	95	25.7				55.5	
	8/22	96	26.6				60.0	
	8/23	97	25.8				57.9	

	8/24	98	24.7			60.0	
	8/25	99	25.5			58.3	
	8/26	100	24.9			58.9	
	8/27	101	24.1			59.0	
42	8/28	102	25.6		42.5	42.9	tent stolen, crate collapsed with pig inside tossed to side, darkening of underside tissue, complete absence of Necrobia ruficollis

Open Tent Carcass TBS and ADD Using Megyesi et al. 2005 Scale

Days since death	Head	Trunk	Limbs	TBS	ADD min (Megyesi)	ADD max (Megyesi)	TBS_{surf}	ADD (Moffatt)
0	1	1	1	3	-693.702	828.2977	0	49.65923
1	2	2	1	5	-688.556	833.4436	2	52.51114
2	3	4	2	9	-667.244	854.7562	6	68.6511
3	5	4	3	12	-635.686	886.3141	9	92.27369
4	5.5	4	3.5	13	-620.395	901.6048	10	103.3917
5	5.5	4.5	4	14	-601.779	920.2209	11	116.6682
6	5.5	5.5	4.5	15.5	-565.791	956.2091	12.5	141.6254
7	8	6	5.5	19.5	-389.037	1132.963	16.5	254.4971
8	8	6	5.5	19.5	-389.037	1132.963	16.5	254.4971
9	8.5	6.5	5.5	20	-353.62	1168.38	17	275.6787
10	9	6	6	21	-268.96	1253.04	18	324.8565
11	9	8	7	24	155.2205	1677.22	21	549.3595
12	9	8	7	24	155.2205	1677.22	21	549.3595
13	9.5	8.5	7	25	387.1536	1909.154	22	661.4814
14	9.5	8.5	7	25	387.1536	1909.154	22	661.4814
15	9.5	9.5	7	26	691.1116	2213.112	23	800.5885
16	9.5	9.5	7	26	691.1116	2213.112	23	800.5885
17	9.5	9.5	7	26	691.1116	2213.112	23	800.5885
18	10.5	10	7.5	28	1626.811	3148.811	25	1190.501
19	10.5	10	7.5	28	1626.811	3148.811	25	1190.501
20	11	10	7.5	28.5	1958.568	3480.568	25.5	1318.698
21	11	10	9	30	3312.803	4834.803	27	1805.218

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Open Tent Carcass TBS and ADD Using Keough 2017 Scale

Days since death	Head	Trunk	Limbs	TBS	ADD min (Megyesi)	ADD max (Megyesi)	TBS_{surf}	ADD (Moffatt)
0	1	1	1	3	-693.702	828.2977	0	49.65923
1	2	2	2	6	-684.792	837.2079	3	55.25815
2	3	3	2	8	-674.304	847.6962	5	63.25008
3	4	3	3	10	-658.671	863.3293	7	75.16045
4	5	3	3	11	-648.28	873.7197	8	82.95851
5	5	3	4	12	-635.686	886.3141	9	92.27369
6	5	4	4	13	-620.395	901.6048	10	103.3917
7	6	4	4	14	-601.779	920.2209	11	116.6682
8	8	4	4	16	-551.106	970.894	13	151.5716
9	8.5	5	5	18.5	-448.752	1073.248	15.5	217.8345
10	9	6	6	21	-268.96	1253.04	18	324.8565
11	9	8	7	24	155.2205	1677.22	21	549.3595
12	9	8	7	24	155.2205	1677.22	21	549.3595
13	9.5	8.5	7	25	387.1536	1909.154	22	661.4814
14	9.5	8.5	7	25	387.1536	1909.154	22	661.4814
15	9.5	9.5	7	26	691.1116	2213.112	23	800.5885
16	9.5	9.5	7	26	691.1116	2213.112	23	800.5885
17	9.5	9.5	7	26	691.1116	2213.112	23	800.5885
18	10.5	10	7.5	28	1626.811	3148.811	25	1190.501
19	10.5	10	7.5	28	1626.811	3148.811	25	1190.501
20	11	10	7.5	28.5	1958.568	3480.568	25.5	1318.698
21	11	10	9	30	3312.803	4834.803	27	1805.218

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Appendix 10

Daily Data Collected on the Closed Tent Carcass

Closed Tent Carcass Microenvironmental Observations

			Temp (C)					
Day #	**Date**	**Days since death**	Average ambient temp	Internal temp	Surface temp	Immediate ground temp	Average humidity	Visual/olfactory observations
1	5/18	0	24.6	37.4		29.2	49.4	minor lividity on left arm, no insect activity, small amount of blood on snout
2	5/19	1	20.5	27.4	22.9	24.5	44.0	very slight odor, no discoloration, liquid purge from snout, slight bloating, no insect activity
3	5/20	2	20.9	25.6	24.0	24.0	40.8	slight odor, bloating of abdomen, release of putrefactive gas from wound in abdomen, no insect activity, extravasation on pig underside
4	5/21	3	20.6	25.8	27.1	30.6	49.4	slight odor, foamy purge release from mouth, slight discoloration on underside of pig, majority of flesh still fresh, no insect activity, desquamation at lower left quadrant
5	5/22	4	20.6	26.4	22.2	25.4	53.4	slight odor, no insect activity, no change
6	5/23	5	22.0	26.6	24.9	28.5	54.5	slight green discoloration of upper torso, tissue gas present in upper torso, desiccation present on toes/rim of ears/snout, continued desquamation at lower left quadrant, bloating of eyes, increased purge from snout, no insects noticed
7	5/24	6	27.1	29.5	27.8	31.2	38.2	slight gray tint to entire cadaver, continued

								desiccation of toes, small insect noticed,
8	5/25	7	23.4	31.4	28.1	31.2	53.1	small insect noticed, no change in appearance or odor
9	5/26	8	21.5	27.6	26.0	27.9	58.4	increased odor inside tent, no odor outside tent, small insects noticed, very small maggots found underneath head, continued desiccation of toes and rims of ears, little change in appearance
10	5/27	9	21.3	23.6	27.2	45.8	61.1	increased desiccation of snout increased release of putrefactive gas, continued bloat
11	5/28	10	20.5	24.1	29.5		55.4	no change
12	5/29	11	21.5	23.6	29.9	43.3	46.4	continued desiccation of ears
13	5/30	12	21.5	27.3		39.7	46.5	tampering with tent (pig now exposed to external environment), increased bloat and release of gas
14	5/31	13	22.6	18.2		18.3	42.8	caving of abdominal cavity, mouth fresh and wet on outside but desiccated on outside
15	6/1	14	23.8	29.5		54.1	43.5	green/gray tint to entire torso, continued gas escape, increased desiccation of snout and ears, some fresh flesh still exists in each region, maggots in left armpit and underside of head, air-filled blisters on sun-exposed areas
16	6/2	15	22.5	22.5		19.5	55.7	continued caving, increased green/gray discoloration, continued gas escape, puddle of putrefactive fluid underneath pig
17	6/3	16	22.2	31.0		27.7	54.9	sternum partially exposed, maggots

								consuming chest from chin wound to armpits
18	6/4	17	24.5	24.8		29.5	58.2	maggot-filled blisters on abdominal tissue, large 10" maggot mass underneath head and T-shirt has developed hole behind right ear and left leg, right leg is drier than left leg, flies collecting in pelvic region, desiccation of chin
19	6/5	18	22.8	25.3		37.4	61.6	diverse insect activity, foamy sludge underneath head
20	6/6	19	22.4	24.2		17.7	54.2	severe mothball odor, moist decomposition, deterioration of chin tissue, partial skeletonization of left foot
21	6/7	20	22.4	34.1		24.5	51.1	fully deflated abdomen, partial skeletonization of ribs/vertebrae/left leg/right arm, desiccation of head, peach-colored maggots, slight intermittent mist from nearby sprinklers
22	6/8	21	22.9	33.9		25.8	57.0	increased drying of cadaver, left side of head moist/right side of head desiccated, right leg flesh still intact
23	6/9	22	27.5	22.6		18.5	45.1	decrease in odor
24	6/10	23	27.5	25.2		20.2	51.3	underside of pig exhibits green/blue discoloration, continued desiccation in all regions
25	6/11	24	25.5	32.5		49.8	62.3	desiccation of torso tissue, skeletonization of all ribs, humeri skeletonized while distal upper limbs hold soft tissue, left leg fully mummified

26	6/12	25	21.4	32.3		27.7	55.5	some viscera still moist, blackening of left side of head
	6/13	26	22.6				49.7	
	6/14	27	24.3				46.4	
27	6/15	28	20.9	34.3		28.9	51.2	adipocere formation under glutes/in thoracic cavity, slight mist from nearby sprinkler, desiccated tissue has become severely firm
	6/16	29	19.7				48.8	
	6/17	30	20.0				51.1	
28	6/18	31	20.8	23.8		35.8	48.3	severe cheesy odor, adipocere formation at lumbar vertebrae
	6/19	32	23.7				48.1	
	6/20	33	27.1				39.6	
29	6/21	34	29.5	39.3		37.4	30.9	very moist underside, very large maggots colonizing wet areas, dry thoracic region, abundance of cheese flies, majority of activity occurring underneath pig
	6/22	35	27.2				47.4	
	6/23	36	27.6				44.7	
30	6/24	37	26.5	36.5		52.5	48.9	"munching" progress and breakage of thin mummified tissues at left torso
	6/25	38	26.0				52.2	
	6/26	39	25.4				54.8	
	6/27	40	24.9				51.7	
31	6/28	41	23.1	28.9		42.7	51.9	continued "munching", pink coloration of wet (caseous) areas
	6/29	42	22.4				54.7	
	6/30	43	22.1				54.8	
	7/1	44	21.9				54.5	
32	7/2	45	21.2	25.6		35.6	54.2	pink and yellow coloration of caseous areas, continued

								"munching", overall wet abdomen and dry thoracic
	7/3	46	22.9				54.7	
	7/4	47	26.1				56.4	
	7/5	48	24.5				55.5	
33	7/6	49	23.3	30.4		29.2	56.5	fragility of soft tissue that is deteriorating due to Coleopteran consumption, mummified tissue surrounding hollow interior with disarticulated bones, slight pinking of caseous area, disarticulation of vertebrae
	7/7	50	23.5				54.5	
	7/8	51	23.3				57.4	
	7/9	52	25.2				54.4	
34	7/10	53	28.0	32.6		45.4	45.2	increased deterioration of thin mummified tissue due to coleopteran consumption, left tibia and fibula fully exposed and dry, browning of caseous area
	7/11	54	25.6				54.8	
	7/12	55	24.8				56.2	
	7/13	56	24.3				58.7	
35	7/14	57	22.5	33.8		31.0	56.5	further darkening of caseous area
	7/15	58	24.0				57.4	
	7/16	59	25.7				53.5	
	7/17	60	26.9				49.1	
	7/18	61	25.0				53.5	
36	7/19	62	23.0			30.6	59.7	halted caseous activity, disarticulation of pelvis, increased fragility of mummified tissue, decreased "munching" progress, fully mummified distal limbs and proximal left leg, fully skeletonized

							proximal upper limbs and right leg
	7/20	63	22.9			59.8	
	7/21	64	22.7			58.0	
	7/22	65	22.8			55.7	
	7/23	66	22.1			58.7	
37	7/24	67	22.4		37.6	58.8	blackening of forehead, further disarticulation of limb bones within mummified limb tissue
	7/25	68	23.0			59.3	
	7/26	69	23.5			59.0	
	7/27	70	23.0			60.2	
	7/28	71	23.2			61.2	
	7/29	72	23.3			61.9	
38	7/30	73	23.2		35.2	64.6	increased moisture, darkening of some tissues possibly due to rainfall, bleaching of some sun-exposed bones
	7/31	74	24.1			63.5	
	8/1	75	26.6			53.7	
	8/2	76	25.2			54.7	
	8/3	77	26.6			55.5	
	8/4	78	25.5			54.4	
	8/5	79	24.5			59.6	
39	8/6	80	22.9		50.6	61.1	whitening of left leg, full disarticulation of all bones in thoracic and abdominal cavities
	8/7	81	22.6			61.9	
	8/8	82	23.0			61.4	
	8/9	83	22.9			62.1	
	8/10	84	23.0			63.4	
	8/11	85	21.8			64.2	
	8/12	86	22.2			59.8	
	8/13	87	22.9			59.0	

40	8/14	88	23.9		52.9	58.6	continued bleaching of sun-exposed bones continued darkening of left side of head, pig held together only by minimal stringy tissue
	8/15	89	26.2			50.3	
	8/16	90	27.6			42.9	
	8/17	91	24.8			59.9	
	8/18	92	23.1			64.5	
	8/19	93	23.7			60.7	
41	8/20	94	24.1		50.8	57.0	no change
	8/21	95	23.7			59.8	
	8/22	96	24.1			65.8	
	8/23	97	23.6			63.1	
	8/24	98	22.6			63.7	
	8/25	99	23.1			63.4	
	8/26	100	22.6			64.3	
	8/27	101	21.8			63.7	
42	8/28	102	25.6		27.8	46.1	darkening at disarticulated joints, deterioration of left side of head due to coleopteran consumption,

Note: The row highlighted in yellow represents an event of human survival scavenging.

Closed Tent Carcass TBS and ADD Using Megyesi et al. 2005 Scale

Days since death	Head	Trunk	Limbs	TBS	ADD min (Megyesi)	ADD max (Megyesi)	TBS_{surf}	ADD (Moffatt)
0	1	1	1	3	-693.702	828.2977	0	49.65923
1	1	1	1	3	-693.702	828.2977	0	49.65923
2	2	1.5	1	4.5	-690.124	831.8761	1.5	51.44049
3	2.5	4	2	8.5	-670.947	851.0534	5.5	65.82164
4	2.5	4	2	8.5	-670.947	851.0534	5.5	65.82164
5	4.5	2.5	3	10	-658.671	863.3293	7	75.16045
6	4.5	2.5	2	9	-667.244	854.7562	6	68.6511
7	4.5	2.5	2	9	-667.244	854.7562	6	68.6511
8	4.5	4.5	3.5	12.5	-628.413	893.5867	9.5	97.58693
9	4.5	4.5	3.5	12.5	-628.413	893.5867	9.5	97.58693
10	4.5	4.5	3.5	12.5	-628.413	893.5867	9.5	97.58693
11	4.5	4.5	3.5	12.5	-628.413	893.5867	9.5	97.58693
12	4.5	4.5	3.5	12.5	-628.413	893.5867	9.5	97.58693
13	4.5	4.5	4.5	12.5	-628.413	893.5867	9.5	97.58693
14	5.5	4.5	4.5	14.5	-590.98	931.02	11.5	124.25
15	5.5	4.5	4.5	14.5	-590.98	931.02	11.5	124.25
16	5.5	5	4.5	15	-579.03	942.9701	12	132.545
17	5.5	6.5	6	18	-473.922	1048.078	15	201.9793
18	7	6.5	6	19.5	-389.037	1132.963	16.5	254.4971
19	8	7	6	21	-268.96	1253.04	18	324.8565
20	9	7	6.5	22.5	-96.4923	1425.508	19.5	419.8944
21	9	7	6.5	22.5	-96.4923	1425.508	19.5	419.8944
22	9	7	6.5	22.5	-96.4923	1425.508	19.5	419.8944
23	9	7	6.5	22.5	-96.4923	1425.508	19.5	419.8944
24	9.5	7	7.5	24	155.2205	1677.22	21	549.3595
25	9.5	8.5	7.5	26	691.1116	2213.112	23	800.5885
26	11	8.5	7.5	27	1092.532	2614.532	24	973.8506
27	11	8.5	7.5	27	1092.532	2614.532	24	973.8506
28	11	8.5	8.5	28	1626.811	3148.811	25	1190.501

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Note: The row highlighted in yellow represents an event of human survival scavenging.

Closed Tent Carcass TBS and ADD Using Keough 2017 Scale

Days since death	Head	Trunk	Limbs	TBS	ADD min (Megyesi)	ADD max (Megyesi)	TBS_{surf}	ADD (Moffatt)
0	1	1	1	3	-693.702	828.2977	0	49.65923
1	1	1	1	3	-693.702	828.2977	0	49.65923
2	1	1	1	3	-693.702	828.2977	0	49.65923
3	1	2	2	5	-688.556	833.4436	2	52.51114
4	1	2	2	5	-688.556	833.4436	2	52.51114
5	1	2	2	5	-688.556	833.4436	2	52.51114
6	1	2	2	5	-688.556	833.4436	2	52.51114
7	2	2	2	6	-684.792	837.2079	3	55.25815
8	2	2	2	6	-684.792	837.2079	3	55.25815
9	2	2	2	6	-684.792	837.2079	3	55.25815
10	3	2	2	7	-680.09	841.9096	4	58.81887
11	3	2	2	7	-680.09	841.9096	4	58.81887
12	4	2	2	10	-658.671	863.3293	7	75.16045
13	4	3	3	10	-658.671	863.3293	7	75.16045
14	4	3	4	11	-648.28	873.7197	8	82.95851
15	5	3	4	12	-635.686	886.3141	9	92.27369
16	5	4	4	13	-620.395	901.6048	10	103.3917
17	5	4	4	13	-620.395	901.6048	10	103.3917
18	7	5	4	16	-551.106	970.894	13	151.5716
19	8	7	5	20	-353.62	1168.38	17	275.6787
20	9	7	6.5	22.5	-96.4923	1425.508	19.5	419.8944
21	9	7	6.5	22.5	-96.4923	1425.508	19.5	419.8944
22	9	7	6.5	22.5	-96.4923	1425.508	19.5	419.8944
23	9	7	6.5	22.5	-96.4923	1425.508	19.5	419.8944
24	9.5	8.5	7.5	24	155.2205	1677.22	21	549.3595
25	9.5	8.5	7.5	26	691.1116	2213.112	23	800.5885
26	11	8.5	7.5	27	1092.532	2614.532	24	973.8506
27	11	8.5	7.5	27	1092.532	2614.532	24	973.8506
28	11	8.5	8.5	28	1626.811	3148.811	25	1190.501

Blue = Fresh
Purple = Early Decomposition
Pink = Advanced Decomposition
Orange = Skeletonization

Note: The row highlighted in yellow represents an event of human survival scavenging.

Appendix 11

Daily General Environmental Data

Day #	Date	Days since death	Time	Ambient temp (Celsius)	Relative humidity (%)	Wind speed (mph)	Other Observations
1	5/18	0	6:08pm	27.8	31	4.1	sunny, slight breeze, no clouds
2	5/19	1	5:40pm	22.5	32	5	wispy clouds, slight breeze, sunny
3	5/20	2	5:10pm	11.6	18	1.1	sunny, hot, no clouds, slight breeze
4	5/21	3	4:34pm	28.3	20	6.3	partly cloudy, few clouds, hot, sunny, moderate breeze
5	5/22	4	5:31pm	21.8	34	8.5	sunny, wispy clouds East, breeze
6	5/23	5	5:46pm	26.1	30	3	sunny, more humid, some clouds, slight breeze
7	5/24	6	5:08pm	33.5	18	2.6	partly cloudy, very hot, wispy clouds South and East
8	5/25	7	5:32pm	28.9	37	3.7	very humid, moderate breeze, many wispy clouds, very hot
9	5/26	8	5:06pm	22.8	54	2.1	mostly cloudy, cooler, slight breeze, slight chill, darker clouds in North
10	5/27	9	12:40pm	22.2	48	2	hot, sunny, partly cloudy
11	5/28	10	1:34pm	23.3	45	9	cloudy, darker clouds in Northeast, windy
12	5/29	11	2:20pm	22.8	35	7	clear sky, slight breeze, muggy
13	5/30	12	12:04pm	21	36	5	hot, clear sky, slight breeze
14	5/31	13	6:05am	8.9	77	0	chilly, sun still rising, no clouds, brisk

15	6/1	14	12:23pm	27.8	30	2	hot, muggy, clouds in far West, sunny
16	6/2	15	6:27am	13.9	72	0	cloudy, sun rising, clouds darker in West, brisk
17	6/3	16	5:10pm	21.1	64	14	most cloudy, some gray clouds, warm wind
18	6/4	17	11:59am	22.2	42	2	mostly cloudy, hot, overcast, muggy, rain impending
19	6/5	18	9:47am	21.1	77	1	mostly cloudy, puddles at gate entrance, some gray clouds, muggy
20	6/6	19	6:05am	15	76	1	partly cloudy, chilly, hear crickets, sun rising
21	6/7	20	6:06pm	22.2	43	7	partly cloudy, sunny, cool breeze, wispy clouds, half moon
22	6/8	21	6:01pm	22.2	56	10	windy, sunny, partly cloudy, bright
23	6/9	22	6:19am	12.2	84	0	partly cloudy, thin clouds across all of sky, cool
24	6/10	23	6:18am	15.6	75	0	no clouds, sunny, clear blue sky
25	6/11	24	11:30am	32.2	28	1	sunny, dry heat, slight hot breeze, clear blue sky
26	6/13	26	5:09pm	21.1	34	4	sunny, clear blue sky, small wind gusts, dry heat
27	6/15	28	5:41pm	23.3	32	7	sunny, windy, birds chirping, hot, clear blue sky
28	6/18	31	11:05am	20	43	3	sunny, humid, cloudy in East/South/West, weak breeze
29	6/21	34	5:26pm	37.8	11	3	very hot, sunny, hot wind, clear blue sky
30	6/24	37	4:08pm	32.8	31	4	sunny, clear blue sky, hot breeze, beaming heat
31	6/28	41	10:11am	22.8	50	1	sunny, clear blue sky

32	7/2	45	11:49am	20.6	57	2	partly cloudy, gray clouds in Northwest
33	7/6	49	5:13pm	23.9	55	4	sunny, no clouds, breezy
34	7/10	53	11:47am	26.7	45	1	sunny, humid, no clouds, no wind felt
35	7/14	57	6:42pm	22	51	3	sunny, hot
36	7/19	62	5:34pm	25	47	3	sunny, no clouds
37	7/24	67	4:28pm	27.2	45	5	sunny, hot, no clouds, hot breeze
38	7/30	73	11:40am	22.8	53	0	partly cloudy, clear in East, muggy
39	8/6	80	1:43pm	26.7	47	5	sunny, clear blue sky, hot, slight breeze
40	8/14	88	1:00pm	30	33	5	sunny, hot, no clouds
41	8/20	94	1:39pm	32.2	32	5	sunny, hot, no clouds, unbearable heat, hot breeze
42	8/28	102	4:52pm	26.7	45	1	sunny, some clouds in West, brown tint to sky, light breeze

Appendix 12

Daily Photography per Carcass

0 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

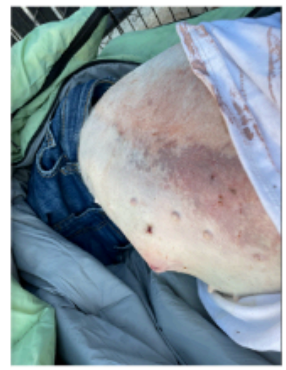
Pig 3 (Open tent)

Pig 4(Closed tent)

1 Day Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)



Pig 3 (Open tent)

Pig 4(Closed tent)

No visible change

2 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

No visible change

3 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

4 Days Postmortem

Pig 1 (Control)

No visible
change

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

No visible
change

5 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

6 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

7 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

8 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

9 Days Postmortem

Pig 1 (Control)

No visible change

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

No visible change

Pig 4(Closed tent)

10 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

11 Days Postmortem

Pig 1 (Control)

No visible change

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

No visible change

Pig 4(Closed tent)

12 Days Postmortem

Pig 1 (Control)

No visible
change

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

13 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

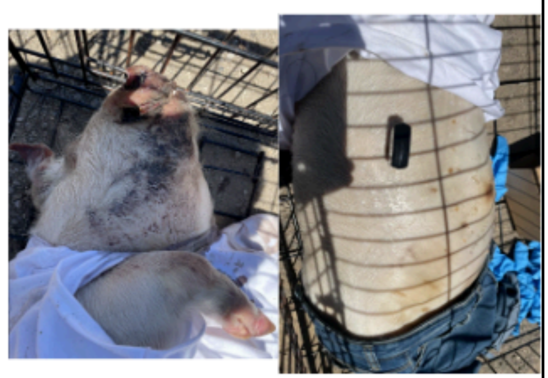
14 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)



15 Days Postmortem

Pig 1 (Control)

No visible change

Pig 2 (Sleeping bag)

No visible change

Pig 3 (Open tent)

Pig 4(Closed tent)

16 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

17 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

18 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Pig 3 (Open tent)

Pig 4(Closed tent)

19 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

No visible change

Pig 3 (Open tent)

No visible change

Pig 4(Closed tent)

20 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

No visible change

Subject has surpassed reliable TBS quantification

Pig 3 (Open tent)

Pig 4(Closed tent)

21 Days Postmortem

Pig 1 (Control)

Pig 2 (Sleeping bag)

Subject has surpassed reliable TBS quantification

Pig 3 (Open tent)

Pig 4(Closed tent)

22 Days Postmortem

Pig 1 (Control)

No visible change

Pig 2 (Sleeping bag)

Subject has surpassed reliable TBS quantification

Pig 3 (Open tent)

Subject has surpassed reliable TBS quantification

Pig 4(Closed tent)

23 Days Postmortem

Pig 1 (Control)

No visible change

Pig 2 (Sleeping bag)

Subject has surpassed reliable TBS quantification

Pig 3 (Open tent)

Subject has surpassed reliable TBS quantification

Pig 4(Closed tent)

24 Days Postmortem

Pig 1 (Control)

No visible change

Pig 2 (Sleeping bag)

Subject has surpassed reliable TBS quantification

Pig 3 (Open tent)

Subject has surpassed reliable TBS quantification

Pig 4(Closed tent)

25 Days Postmortem

Pig 1 (Control)

Subject has surpassed reliable TBS quantification

Pig 2 (Sleeping bag)

Subject has surpassed reliable TBS quantification

Pig 3 (Open tent)

Subject has surpassed reliable TBS quantification

Pig 4(Closed tent)

26 Days Postmortem

Pig 1 (Control)

Subject has surpassed reliable TBS quantification

Pig 2 (Sleeping bag)

Subject has surpassed reliable TBS quantification

Pig 3 (Open tent)

Subject has surpassed reliable TBS quantification

Pig 4(Closed tent)

27 Days Postmortem

Pig 1 (Control)

Subject has surpassed reliable TBS quantification

Pig 2 (Sleeping bag)

Subject has surpassed reliable TBS quantification

Pig 3 (Open tent)

Subject has surpassed reliable TBS quantification

Pig 4(Closed tent)

Appendix 13

Log of Entomological Specimens Collected

Sleeping Bag										
Date	Days since death	Vial #	Total collected	Location on carcass	Stage	Preserved or reared	Scientific name (family or genus/species)	Common name	Taxonomic source
5/21	3	7-2	1	external right ear	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		8-2	1	chin	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
5/22	4	14-2	1	head	adult	preserved	Compsomyiops callipes	blow fly	Jones et al. 2019
5/23	5	18-2	8	left side of head	larvae	reared	Lucilia sericata	blow fly	Jones et al. 2019
		19-2	2	mouth	larvae	reared	Lucilia sericata	blow fly	Jones et al. 2019
		22-2	1	right eye	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		23-2	1	left eye	adult	preserved	Calliphora vomitoria	blow fly	Jones et al. 2019
5/24	6	30-2	1	chin	adult	preserved	Tenebrionidae: Tenebrio molitor	yellow mealworm beetle	Weidner & Powell 2019
		32-2	~50	mouth	larvae	reared	Sarcophagidae	flesh fly	Milne 1980
		33-2	2	bag exterior	adult	preserved	Sarcophagidae	flesh fly	Milne 1980

5/25	7	39-2	>100	left arm	larvae	reared ~90, preserved ~10	Lucilia sericata	blow fly	Jones et al. 2019
		40-2	1	chin	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
		41-2	3	left arm	eggs, adult	preserved	Compsomyiops callipes/Sarcophagidae	blow fly/flesh fly	Jones et al. 2019/Milne 1980
5/26	8	51-2	~40	chin	larvae	reared	Phormia regina	blow fly	Jones et al. 2019
		53-2	~40	left breast, armpit	larvae	reared	Lucilia sericata/Phormia regina	blow fly	Jones et al. 2019
		54-2	1	back	adult	preserved	Staphylinidae: Creophilus maxillosus villosus (Gravenhorst)	hairy rove beetle	Weidner & Powell 2019; Evans 2021
		55-2	2	behind right ear	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		56-2	1	bag floor	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Byrd & Castner 2001; Weidner & Powell 2019
5/27	9	64-2	1	bag exterior	adult	preserved	Staphylinidae: Creophilus maxillosus villosus (Gravenhorst)	hairy rove beetle	Weidner & Powell 2019; Evans 2021
		65-2	~200	lower right abdominal quadrant	larvae	reared	Lucilia sericata/Compsomyiops callipes/Phormia regina/Calliphora	blow fly/house fly	Jones et al. 2019/Milne 1980

							vomitoria/Muscidae		
5/28	10	72-2	~20	umbilicus, intestine	larvae	reared ~10, preserved ~10	Compsomyiops callipes/Muscidae	blow fly/house fly	Jones et al. 2019/Milne 1980
		73-2	~20	right ear	larvae	reared	Compsomyiops callipes/Phormia regina	blow fly	Jones et al. 2019
		74-2	~20	bag exterior	larvae	reared	Compsomyiops callipes/Phormia regina/Sarcophagidae	blow fly/flesh fly	Jones et al. 2019/Milne 1980
5/29	11	78-2	1, 5	under bag	adult, larvae	preserved	Histeridae: Hister furtivus	clown beetle	Díaz-Aranda et al. 2018; Weidner & Powell 2019; Evans 2021; Byrd & Castner 2001
		79-2	~100	under bag	larvae	reared	Compsomyiops callipes/Calliphora livida/ Calliphora vomitoria/Sarcophagidae	blow fly/flesh fly	Jones et al. 2019/Milne 1980
		80-2	~100	under bag	larvae	preserved	Compsomyiops callipes/Calliphora livida/ Calliphora vomitoria/Sarcophagidae	blow fly/flesh fly	Jones et al. 2019/Milne 1980
		81-2	1	central torso	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		82-2	1	cage gate	adult	preserved	Anisolabididae: Euborellia	earwig	Langston & Powell 1975

							cincticollis (Gerstaecker)		
5/30	12	88-2	~50	shirt	larvae	reared	Compsomyiops callipes/Phormia regina/Lucilia cuprina	blow fly	Jones et al. 2019
		89-2	1	bag exterior	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		90-2	1	right thigh	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
5/31	13	94-2	~30	under head	larvae	reared	Compsomyiops callipes/Phormia regina	blow fly	Jones et al. 2019
6/1	14	102-2	2	bag exterior	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Byrd & Castner 2001; Weidner & Powell 2019
		103-2	1	shirt	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
6/2	15	114-2	1	right leg	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
6/3	16	117-2	2	bag exterior	adult, larvae	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		118-2	1	bag exterior	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Byrd & Castner 2001; Weidner & Powell 2019
		119-2	~100	lower torso	larvae	reared	Compsomyiops callipes/Phormia regina	blow fly	Jones et al. 2019

		120-2	~50	upper torso, head	larvae	reared	Compsomyiops callipes/Phormia regina	blow fly	Jones et al. 2019
6/4	17	127-2	1	bag floor	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		128-2	1	bag floor	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
6/5	18	137-2	1	under bag	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
6/6	19	149-2	1	pelvis	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
6/7	20	156-2	1	shirt	adult	preserved	Formicidae	ant	Milne 1980
		157-2	1	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		158-2	1	bag floor	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		159-2	1	bag floor	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
6/9	22	176-2	2	bag floor	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		177-2	1	bag floor	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
6/10	23	182-2	1	bag floor	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd &

									Castner 2001
		183-2	1	bag floor	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		184-2	1	shirt	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
6/11	24	190-2	1	bag exterior	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		191-2	1	lower limbs	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		192-2	1	right thigh	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
6/12	25	199-2	~20	under torso	larvae	reared	Compsomyiops callipes/Phormia regina	blow fly	Jones et al. 2019
		200-2	1	bag exterior	adult	preserved	Formicidae	ant	Milne 1980
		201-2	1	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		202-2	1	bag floor	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		203-2	1	bag floor	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		204-2	2	head	adult	preserved	Phormia regina	blow fly	Jones et al. 2019

6/15	28	209-2	1	right shoulder	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		210-2	2	bag floor	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		211-2	2	head	adult	preserved	Compsomyiops callipes	blow fly	Jones et al. 2019
		212-2	1	pelvis	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
6/18	31	220-2	1	bag floor	adult	preserved	Compsomyiops callipes	blow fly	Jones et al. 2019
		221-2	1	chest	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		222-2	1	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		223-2	1	pelvis	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		227-2	12	underside	larvae, pupae	reared	Compsomyiops callipes	blow fly	Jones et al. 2019
6/21	34	230-2	1	ribcage	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
6/24	37	240-2	1	lower limbs	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd &

									Castner 2001
		241-2	2	bag exterior	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		242-2	1	thoracic area	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		243-2	2	damp thoracic tissue	larvae	preserved	Dermestidae: Dermestes maculatus/Cleridae: Necrobia rufipes (De Geer)	hide beetle/red legged ham beetle	Díaz-Aranda et al. 2018/Byrd & Castner 2001
6/28	41	250-2	1	shirt	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		251-2	1	shirt	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		252-2	1	head	adult	preserved	Aranaeae	spider	Milne 1980
		253-2	1	bag floor	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		254-2	1	right thigh	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		255-2	1	chest	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
7/2	45	261-2	1	underside	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019;

									Evans 2021
		262-2	1	under side	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		263-2	1	right thigh	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
7/6	49	272-2	1	abdominal area	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		273-2	1	abdominal area	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
7/14	57	289-2	1	under side	larvae	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Díaz-Aranda et al. 2018
7/19	62	293-2	1	head	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		294-2	3	bag floor	adult	preserved	Formicidae	ant	Milne 1980
7/24	67	297-2	5	bag floor	adult	preserved	Formicidae	ant	Milne 1980
7/30	73	300-2	1	bag floor	larvae	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
8/20	94	303-2	1	bag floor	adult	preserved	Aranaeae	spider	Milne 1980

8/28	102	304-2	1	bag floor	adult	preserved	Aranaeae	spider	Milne 1980
Open Tent									
Date	Days since death	Vial #	Total collected	Location on carcass	Stage	Preserved or reared	Scientific name (family or genus/species)	Common name	Taxonomic source
5/19	1	1-3	1	tent wall	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		2-3	1	neck	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
5/20	2	3-3	2	right arm	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		4-3	1	lower torso	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		5-3	1	chin	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		6-3	2	right exter nal ear	adult	preserved	Lucilia sericata	blow fly	Jones et al. 2019
5/21	3	9-3	1	torso	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		10-3	2	right face	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		13-3	1	lower right quadr ant	adult	preserved	Anisolabididae: Euborellia cincticollis (Gerstaecker)	earwig	Langston & Powell 1975
5/22	4	14-3	1	torso	adult	preserved	Compsomyiops callipes	blow fly	Jones et al. 2019
		16-3	5	chin woun d	larvae	reared	Lucilia cuprina	blow fly	Jones et al. 2019
		17-3	~20	left arm	larvae	reared	Lucilia sericata	blow fly	Jones et al. 2019

5/23	5	24-3	2	upper torso	adult	preserved	Lucilia sericata	blow fly	Jones et al. 2019
		25-3	~50	under side of head	larvae	reared	Phormia regina	blow fly	Jones et al. 2019
		26-3	~30	mouth	larvae	reared	Lucilia sericata	blowfly	Jones et al. 2019
		27-3	~20	under side of torso	larvae	reared	Lucilia sericata	blowfly	Jones et al. 2019
		28-3	1	tent floor	adult	preserved	Histeridae: Hister furtivus (J.E. LeConte)	clown beetle	Weidner & Powell 2019; Evans 2021
		29-3	1	tent floor	adult	preserved	Staphylinidae: Anotylus rugosus (Fabricius)	rove beetle	Weidner & Powell 2019; Evans 2021
5/24	6	34-3	~100	under side of head	larvae	reared	Lucilia mexicana/Sarcophagidae	blow fly/flesh fly	Jones et al. 2019/Milne 1980
		35-3	~100	left arm	larvae	preserved ~10, reared ~90	Compsomyiops callipes/Lucilia cuprina	blow fly	Jones et al. 2019
		36-3	~20	mouth, throat	larvae	reared	Compsomyiops callipes/Lucilia cuprina	blow fly	Jones et al. 2019
		37-3	1	intestine	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		38-3	4	chin	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
5/25	7	43-3	~100	right thigh	larvae	reared	Phormia regina/Lucilia mexicana	blow fly	Jones et al. 2019

		44-3	~10	left thigh	larvae	reared	Compsomyiops callipes/Lucilia cuprina	blow fly	Jones et al. 2019
		46-3	8	left side of head	larvae	reared	Compsomyiops callipes	blow fly	Jones et al. 2019
		47-3	~10	anus	larvae	reared	Lucilia cuprina	blow fly	Jones et al. 2019
		48-3	6	blister on right torso	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		49-3	1	chest	adult	preserved	Compsomyiops callipes	blow fly	Jones et al. 2019
		50-3	1	pubis	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
5/26	8	63-3	~100	chin	larvae	reared	Lucilinae (teneral)*	blow fly	Jones et al. 2019
		60-3	~200	pubis	larvae	reared	Compsomyiops callipes	blow fly	Jones et al. 2019
		61-3	~10	intestine	larvae	reared	Compsomyiops callipes/Lucilia sericata/Sarcophagidae	blow fly/ flesh fly	Jones et al. 2019/Milne 1980
		59-3	1	right shoulder	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		62-3	~30	mouth	larvae	reared	Compsomyiops callipes	blow fly	Jones et al. 2019
		58-3	2	tent interior	adult	preserved	Phormia regina/Lucilia mexicana	blow fly	Jones et al. 2019
5/27	9	67-3	~10	eye, mouth	larvae	reared	Compsomyiops callipes/Lucilia sericata	blow fly	Jones et al. 2019

		68-3	~200	right arm	larvae	reared	Compsomyiops callipes	blow fly	Jones et al. 2019
		69-3	~50	anus	larvae	reared	Compsomyiops callipes/Lucilia sericata/Phormia regina	blow fly	Jones et al. 2019
		70-3	intes tine	~50	larvae	reared	Compsomyiops callipes/Phormia regina	blow fly	Jones et al. 2019
		71-3	~50	thora cic under side	larvae	reared	Compsomyiops callipes/Lucilia sericata	blow fly	Jones et al. 2019
5/28	10	76-3	~50	chest	larvae	reared	Calliphora vomitoria/Phormi a regina	blow fly	Jones et al. 2019
		77-3	~50	under head	larvae	reared	Compsomyiops callipes/Lucilia cuprina/Phormia regina	blow fly	Jones et al. 2019
5/29	11	85-3	6	under right leg	pupa e	preserved			
		86-3	1	tent interi or	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		87-3	1	distal right leg	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
5/30	12	91-3	1	torso	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021

		92-3	~100	thoracic underside	larvae, pupae	reared	Compsomyiops callipes/Phormia regina	blow fly	Jones et al. 2019
		93-3	~20	tent interior	pupae	reared	Phormia regina/Lucilia sericata	blow fly	Jones et al. 2019
5/31	13	98-3	1	tent interior	adult	preserved	Anisolabididae: Euborellia cincticollis (Gerstaecker)	earwig	Langston & Powell 1975
		99-3	1	tent interior	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		100-3	1	tent interior	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		101-3	1	tent interior	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
6/1	14	104-3	1	intestine	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		105-3	1	skull	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		106-3	1	intestine	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
6/3	16	121-3	2	right thigh	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		122-3	~200	under abdo	larvae	reared	Compsomyiops callipes	blow fly	Jones et al. 2019

				minal area					
		124-3	5	shirt	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		125-3	1	adult	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
6/4	17	133-3	1	intestine	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
		134-3	3	thoracic area	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		135-3	8	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		136-3	1	pubis	adult	preserved	Muscidae	house fly	Milne 1980
6/5	18	144-3	2	tent interior	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
		145-3	2	right thigh	adult	preserved	Lucilinae (teneral)*	blow fly	Jones et al. 2019
		146-3	1	right thigh	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
		147-3	1	thoracic area	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd &

									Castner 2001
		148-3	2	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
6/6	19	153-3	1	thoracic area	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		154-3	1	intestine	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		155-3	1	intestine	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
6/7	20	165-3	1	thoracic area	adult	preserved	Muscidae	house fly	Milne 1980
		166-3	8	various locations on carcass	adult	preserved	Compsomyiops callipes/ Phormia regina	blow fly	Jones et al. 2019
6/8	21	172-3	~20	under abdominal area	larvae	reared	Compsomyiops callipes/ Phormia regina	blow fly	Jones et al. 2019
		173-3	1	head	adult	preserved	Cleridae: Necrobia ruficollis (Fabricius)	red-shouldered ham beetle	Weidner & Powell 2019; bugguide
		174-3	1	shirt	adult	preserved	Phormia regina	blow fly	Jones et al. 2019

		175-3	~20	under head	larvae	reared	Compsomyiops callipes/ Phormia regina	blow fly	Jones et al. 2019
6/9	22	181-3	2	frontal	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
6/10	23	188-3	1	tent floor	adult	preserved	Formicidae	ant	Milne 1980
		189-3	5	shirt	adult	preserved	Compsomyiops callipes/ Phormia regina	blow fly	Jones et al. 2019
6/11	24	197-3	11	tent interior	adult	preserved	Compsomyiops callipes	blow fly	Jones et al. 2019
		198-3	1	jeans	larvae	reared	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
6/13	26	208-3	3	head, under thoracic area	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
6/15	28	218-3	1	sternum	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		219-3	1	head, under thoracic area	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
6/18	31	228-3	1	xiphoid	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		229-3	1	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
6/21	34	238-3	1	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001

		239-3	1	thoracic area	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
6/24	37	248-3	1	thoracic area	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		249-3	1	tent floor	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
6/28	41	259-3	1	under side	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		260-3	1	right thigh	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
7/2	45	271-3	1	abdominal area	adult	preserved	Cleridae: Necrobia ruficollis (Fabricius)	red-shouldered ham beetle	Weidner & Powell 2019; bugguide
7/6	49	280-3	1	intestine	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		281-3	1	pubis	adult	preserved	Cleridae: Necrobia ruficollis (Fabricius)	red-shouldered ham beetle	Weidner & Powell 2019; bugguide
		282-3	1	head, under thoracic area	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
7/10	53	287-3	1	intestine	adult	preserved	Cleridae: Necrobia ruficollis (Fabricius)	red-shouldered ham beetle	Weidner & Powell 2019; bugguide
		288-3	1	jeans	adult	preserved	Sarcophagidae	flesh fly	Milne 1980

7/14	57	293-3	1	shirt	adult	preserved	Cleridae: Necrobia ruficollis (Fabricius)	red-shouldered ham beetle	Weidner & Powell 2019; bugguide
7/19	62	296-3	1	tent floor	adult	preserved	Formidae	ant	Milne 1980
		299-3	1	head	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
7/30	73	302-3	1	under side	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
Closed tent									
Date	Days since death	Vial #	Total collected	Location on carcass	Stage	Preserved or reared	Scientific name (family or genus/species)	Common name	Taxonomic source
5/25	7	42-4	1	left chest	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
5/26	8	57-4	5	under side of head	larvae	reared	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
5/30	12	94-4	1	back	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		95-4	~10	lower neck	larvae	reared	Lucilia sericata	blow fly	Jones et al. 2019
5/31	13	95-4b	1	left arm	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001

		96-4	5	left ear	larvae	reared	Lucilia sericata	blow fly	Jones et al. 2019
		97-4	1	right thigh	adult	preserved	Lucilia sericata	blow fly	Jones et al. 2019
6/1	14	107-4	~100	chin wound	larvae	reared	Lucilia sericata/Sarcophagidae	blow fly/flesh fly	Jones et al. 2019/Milne 1980
		108-4	~10	right ear	larvae	reared	Sarcophagidae	flesh fly	Milne 1980
		109-4	1	right ear	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		110-4	1	right shoulder	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
		111-4	1	left arm	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		113-4	1	chin	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
6/2	15	115-4	1	under side of head	adult	preserved	Staphylinidae: Creophilus maxillosus villosus (Gravenhorst)	hairy rove beetle	Weidner & Powell 2019; Evans 2021
		116-4	1	under side of head	adult	preserved	Calliphoridae (teneral)*/Sarcophagidae (teneral)*	blow fly/flesh fly	Jones et al. 2019/Milne 1980
6/3	16	126-4	1	abdominal underside	adult	preserved	Histeridae: Hister furtivus (J.E. LeConte)	clown beetle	Weidner & Powell 2019/Evans 2021
6/4	17	129-4	1	right shoulder	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		131-4	~100	ground next to	larvae	reared	Phormia regina/Lucilia sericata	blow fly	Jones et al. 2019

				carcass					
		132-4	~100	trachea	larvae	reared	Phormia regina/Lucilia sericata/Compsomyiops callipes	blow fly	Jones et al. 2019
6/5	18	138-4	1	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		139-4	1	right shoulder	adult	preserved	Sarcophagidae	flesh fly	Milne 1980
		140-4	2	jeans	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
		141-4	1	jeans	adult	preserved	Anisolabididae: Euborellia cincticollis (Gerstaecker)	earwig	Langston & Powell 1975
		142-4	~20	left leg	larvae	reared	Lucilia sericata	blow fly	Jones et al. 2019
		143-4	~100	underside of head	larvae	reared	Compsomyiops callipes/Phormia regina	blow fly	Jones et al. 2019
6/6	19	150-4	1	chest	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		151-4	1	pubis	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		152-4	1	pubis	adult	preserved	Staphylinidae	hairy rove beetle	Weidner & Powell 2019; Evans 2021
6/7	20	160-4	1	pubis	adult	preserved	Compsomyiops callipes	blow fly	Jones et al. 2019

		161-4	2	abdominal area	adult	preserved	Histeridae: Hister furtivus (J.E. LeConte)	clown beetle	Weidner & Powell 2019; Evans 2021
		162-4	1	abdominal area	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		163-4	1	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		164-4	1	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		167-4	1	shirt	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		165-4	1	head	adult	preserved	Muscidae	house fly	Milne 1980
6/8	21	168-4	1	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		169-4	1	underside of torso	adult	preserved	Histeridae: Hister furtivus (J.E. LeConte)	clown beetle	Weidner & Powell 2019; Evans 2021
		170-4	1	lower left quadrant	adult	preserved	Staphylinidae: Ontholestes cingulatus	gold and brown rove beetle	Weidner & Powell 2019; Evans 2021
		171-4	1	pubis	adult	preserved	Staphylinidae: Creophilus maxillosus villosus (Gravenhorst)	hairy rove beetle	Weidner & Powell 2019; Evans 2021

6/9	22	178-4	1	medial right thigh	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		179-4	1	shirt	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		180-4	2	pubis	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
6/10	23	185-4	1	shirt	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		186-4	1	abdominal area	adult	preserved	Staphylinidae: Creophilus maxillosus villosus (Gravenhorst)	hairy rove beetle	Weidner & Powell 2019; Evans 2021
		187-4	2	abdominal area	adult	preserved	Dermestidae: Dermestes maculatus/Histeridae: Hister furtivus (J.E. LeConte)	hide beetle/clown beetle	Weidner & Powell 2019; Byrd & Castner 2001/Weidner & Powell 2019; Evans 2021
6/11	24	193-4	1	underside of lower torso	adult	preserved	Anisolabididae: Euborellia cincticollis (Gerstaecker)	earwig	Langston & Powell 1975
		194-4	1	right thigh	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001

		195-4	1	abdominal area	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		196-4	1	thoracic area	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
6/13	26	205-4	~10	ribcage tissue	larvae	reared	Lucilia sericata/Phormia regina	blow fly	Jones et al. 2019
		206-4	~10	pubis, right thigh	larvae	reared	Lucilia sericata/Sarcophagidae	blow fly/flesh fly	Jones et al. 2019/Milne 1980
6/15	28	213-4	1	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		214-4	1	chin	adult	preserved	Phormia regina	blow fly	Jones et al. 2019
		215-4	1	underside of carcass	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		216-4	4	jeans	pupae	reared	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		217-4	1	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
6/18	31	224-4	1	cage bars	adult	preserved	Bibionidae	march fly	Milne 1980
		225-4	1	head	adult	preserved	Compsomyiops callipes	blow fly	Jones et al. 2019
		226-4	5	lumbar area	larvae	reared	Sarcophagidae	flesh fly	Milne 1980

6/21	34	231-4	5	under side of carcass	larvae	preserved 2, reared 3	Sarcophagidae	flesh fly	Milne 1980
		232-4	1	thoracic area	adult	preserved	Staphylinidae: Creophilus maxillosus villosus (Gravenhorst)	hairy rove beetle	Weidner & Powell 2019; Evans 2021
		233-4	1	abdominal area	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		234-4	1	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		235-4	1	thoracic area	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		236-4	1	chin	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		237-4	3	abdominal area	larvae	reared	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
6/24	37	244-4	2	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		245-4	1	abdominal area	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		246-4	7	abdominal area	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001

		247-4	4	abdominal area	pupae	reared	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
6/28	41	256-4	1	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		257-4	1	right arm	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
		258-4	~20	lumbar area	larvae	reared	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
7/2	45	263-4	1	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		264-4	~100	abdominal area	eggs, larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		265-4	8	abdominal area (caseous)	larvae	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		266-4	1	neck	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		267-4	1	neck	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		269-4	1	shirt	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd &

									Castner 2001
7/6	49	274-4	2	shirt	adult	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		275-4	1	abdominal area	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		276-4	1	abdominal area	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		277-4	~10	underside of carcass	larvae	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		278-4	1	right leg	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
		279-4	1	on observer	adult	preserved	Lucilinae (teneral)*	blow fly	Jones et al. 2019
7/10	53	284-4	1	underside of carcass	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		285-4	~20	abdominal area (caseous)	larvae	preserved	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001

		286-4	~10	abdominal area (caseous)	larvae	reared	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
7/14	57	290-4	1	underside of carcass	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
		291-4	~15	abdominal area (caseous)	larvae	reared	Piophilidae: Piophila casei	cheese fly	Byrd & Castner 2001
		292-4	1	under head	adult	preserved	Dermestidae: Dermestes maculatus	hide beetle	Weidner & Powell 2019; Byrd & Castner 2001
7/19	62	295-4	1	underside of carcass	larvae	preserved	Dermestidae: Dermestes maculatus	hide beetle	Díaz-Aranda et al. 2018
7/24	67	298-4	1	abdominal area	adult	preserved	Cleridae: Necrobia rufipes (De Geer)	red-legged ham beetle	Weidner & Powell 2019; Evans 2021
7/30	73	301-4	4	abdominal area (caseous)	adult	preserved	Formicidae	ant	Milne 1980

*Teneral specimens of order Calliphoridae could not be reliably identified down to the species level.

Note: Many specimens preserved at egg, pupal, and larval stages have been omitted from the study.