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CASE REPORT

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Three Species of Insects Collected from an Adult Human Corpse Above 3300 m in Elevation: A Review of a Case from Colorado

ABSTRACT: We report on the colonization of an adult human corpse by three insect species at 3350 m (11,000 ft) in elevation. The adult silphid *Thanatophilus coloradensis* (Wickham), adults of the blow fly *Calliphora coloradensis* (Hough), and larvae and adults of *Lucilia silvarum* (Meigen) were all collected from the victim's body which had been wrapped in plastic. The victim was found in late June in the Rocky Mountains of Colorado. This paper provides additional confirmation of the taxa utilizing a human corpse at high elevations in Colorado.

KEYWORDS: forensic science, forensic entomology, death investigation, *Thanatophilus coloradensis*, *Lucilia silvarum*, *Calliphora coloradensis*, high elevation

Human corpses found at high mountainous elevations in Colorado may be colonized by a variety of saprophagous and necrophagous insects under various environmental conditions (1–4). Generally, habitats above tree line experience harsh and dynamic environmental conditions, much like the arctic, during much of the year limiting the opportunities for insect colonization when compared with lower elevations (5). For example, Peck and Anderson (5) report that the biology of the carrion beetle, *Thanatophilus coloradensis* (Wickham) is closely associated with low temperature regimes. Insect population dynamics of high cold elevations are affected by both low temperatures of the summer and winter and short activity periods. Further, extensive collections by these authors indicate that no other species of carrion beetles regularly occur above tree line. Wickham (4) first reported *T. coloradensis* from a specimen collected above 3648 m (12,000 ft) in elevation on Argentine Pass near Georgetown, (Clear Creek County) Colorado. Bjorkman and Hatch (2) reported collections of *T. coloradensis* from Independence Pass (Lake County) at 3688 m (12,100 ft) and Spring Creek Pass (Hinsdale County) at 3352 m (11,000 ft) in Colorado. The authors reported that in both collections *T. coloradensis* was collected with the Holarctic *T. lapponicus* (Herbst).

Case History

On June 25, 2005, a clothed adult male corpse was found in an advanced stage of decomposition near the summit of Berthoud Pass, Colorado. The elevation of this site is just over 3350 m. The location is just below tree line and is comprised of scattered sub-alpine fir (*Abes lasiocarpa* Hook) trees and small boulders on a steep slope. The victim had substantial perimortem head trauma. The corpse was completely wrapped in plastic but there was a small tear in the plastic near the head area giving access to insects. Evidence from the body and scene indicated that the victim had been deposited the previous winter when deep snow was present. Live adult specimens of *T. coloradensis* and the blow fly *Calliphora coloradensis* (Hough) were collected from the victim and adjacent ground. Live adult specimens and third instar larvae of *Lucilia silvarum* (Meigen) were collected on scene and at autopsy. No eclosed puparia were observed. A limited number of pupae were photographed by investigators but were unavailable to the authors. However, the light to dark color range of the pupae indicates that they are likely *L. silvarum* as no larvae from other species were present. Daily weather records were obtained from the Colorado Avalanche Center weather station located at the summit of Berthoud Pass. Weather records for the previous year indicated that oviposition would have occurred, at a minimum, 5–8 days earlier. This estimate was based only on the *L. silvarum* larvae recovered from the body. Based on the advanced stage of decomposition, death had obviously occurred much earlier.

L. silvarum has primarily been reported as both an obligate and facultative parasite causing myiasis in toads (6,7). This species is rarely reported in forensic cases, and has not been previously reported at high altitudes. Several authors have reported collecting this species from carrion and decaying meats and organs (6,8–11). Fischer (11) reported nearly twice the number of females to males collected from sweepings and pit traps. In this case it was unexpected to find *L. silvarum* as the exclusive calliphorid larvae on the body, however, evidence found at the crime scene is highly suggestive that colonization occurred at the reported location and that no subsequent transportation from a lower elevation occurred.

C. coloradensis is a commonly collected species from human and non-human corpses found in the Rocky Mountains of Colorado (personal observation of both authors). This species has been

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previously collected by the authors on corpses in Colorado even at high elevations. A single adult specimen of *C. coloradensis* was collected from the victim at the crime scene. No larvae were preserved or reared from the corpse. De Jong and Chadwick (3) report several collections of *C. coloradensis* on rabbit carcasses from Colorado elevations as high as 4191 m during the summer months. Hall (6) reports this species to be abundantly occurring in Colorado and New Mexico.

T. coloradensis (Wickham) was first described from specimens collected at over 3648 m (12,000 ft) elevation from Argentine Pass near Georgetown, Colorado (Wickham (4)). Bjorkman and Hatch (2) report collections of *T. coloradensis* from elevations above 3350 m (11,000 ft) from both Independence Pass and Spring Creek Pass in Colorado in July 1938. Specimens from Spring Creek Pass were collected from the carcasses of sheep. On both occasions the authors reported the association of *T. coloradensis* with *T. lapponicus* (Herbst). Anderson and Peck (12) report numerous adult collections from carrion baited pitfall traps at 3962 m (12,998 ft) in rocky alpine tundra. Peck and Anderson (5) report that *T. coloradensis* probably feeds and reproduces in the carcasses of common alpine rodents such as marmots, pikas, pocket gophers, and ground squirrels. Anderson and Peck (12) report the range of *T. coloradensis* to be from central Alaska south along the Rocky Mountains to Northern New Mexico. The authors report that *T. coloradensis* seems to be most abundant above tree line, but may occasionally be found at lower elevations.

Discussion

This is the first report of *L. silvarum* and *T. coloradensis* collected from a human corpse in Colorado. Little is known of these species associated with human corpses or carrion in general, especially at high elevations. While *T. coloradensis* is predominantly collected above 3350 m the true elevation range is unknown in Colorado. The presence of *L. silvarum* and virtual absence of more commonly encountered members of the carrion community was unexpected in this case. Typically, bodies recovered from high elevations in Colorado are primarily colonized by *C. coloradensis*, *Phormia regina* (Meigen), and *Protophormia terraenovae* (Robineau-Desvoidy) (personal observation of both authors). The presence of *L. silvarum* may indicate that this species will ovipositon carrion when little other competition exists. *L. silvarum* may also represent a member of the alpine-tundra carrion community in Colorado. Additional collections of these species at high elevations should be reported to broaden our knowledge of their biology and behavior in forensic cases.

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