

A95 Widespread and Common Blow Fly Species in the Northeastern United States: How Useful Are They in the Forensic Inference About the Movement of a Corpse

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Learning Overview: After attending this presentation, attendees will be familiar with past surveys conducted to examine seasonal and habitat preference of blow flies and the results of the current blow fly survey conducted in the northeastern United States. Attendees will also be exposed to the method used to obtain this data and the feasibility of forensic inference from blow fly distribution data and corpse relocation.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by raising questions regarding the limits of distribution studies and ways to improve forensic inference in this area.

Forensic entomology is primarily used to aid in the estimation of time since death but is also used to assess if a corpse has been moved from a primary crime scene. For a relocation argument to be valid, individual blow fly species must show specific habitat and or seasonal preference. Past surveys have shown that species composition can vary across trap sites, and this has resulted in the categorization of individual species as a warm or cold weather species and as urban or rural. Past surveys have also shown, however, that many blow fly species are not clearly associated with a particular ecoregion, with habitat preference varying by region and very few species being found exclusively in a habitat category, such as urban or rural, or exclusively in a season. Native and non-native species differ in their flexibility to survive in a specific habitat or a cold winter, and most forensically important blow flies in the United States are considered non-native and widespread. Non-native species are more likely to behave as generalists, are opportunistic in terms of feeding and habitat, and are often highly synanthropic.

To determine if past categorizations of blow fly species can be applied to the local region, a survey of blow fly species was conducted in Connecticut. Connecticut is a northeastern state of the United States with little-to-no forensically relevant entomological survey data. Five traps were set over a two-year period to determine which blow fly species dominate the region and whether individual species show habitat or seasonal preference. Trap locations were selected near Hartford, a city with a high murder rate, and within secluded areas ideal for the disposal of a corpse. Geographic Information Systems (GIS) mapping was used to categorize a 1km radius around each site in terms of land use and degree of urbanization. Trap sites were shown to be heavily fragmented in terms of land use, and sites differed significantly in terms of the percent of developed land and degree of urbanization. Despite trap locations differing significantly in terms of the degree of urbanization and percent of developed land, an Analysis of Variance (ANOVA) ($P < 0.05$) showed that the species of blow flies trapped at each site did not differ. No relationship was also found between the number of flies caught, location, and season.

A significant correlation was only found between the recorded temperature and the number of flies caught. Trapped specimens represented three genera and eight species, with 96% of trapped specimens represented by three species: *Phormia regina* (67%), *Lucilia coeruleviridis* (22%), and *Lucilia sericata* (7%). *Phormia regina* is the dominant carrion fly for most of the United States and is found throughout most of the northern continents of the world. It is considered a cold weather species with hemisynanthropic and exophilous synanthropy, and while primarily rural, is also found in urban areas and during hot summers. *Lucilia coeruleviridis* is likewise common in the United States and has a Nearctic distribution. The species lacks the recognition of other dominant species but is considered a predominant species in the spring and fall. *Lucilia sericata* is one of the most common and widespread species of *Lucilia* in the continental United States, is thought to be endemic to the Palaearctic and Nearctic regions, is cosmopolitan, and has been for some time. *Lucilia sericata* shows a preference for urban habitats, less tolerance for cold weather, and demonstrates eusynanthropic and endophilic synanthropy, however, this changes according to region and more specifically latitude.

Results from this current survey suggest that individual blow fly species in this region are flexible in terms of habitat and seasonal preference, with no clear preference for a particular ecoregion or season. Results also suggest that the degree of urbanization has no influence on habitat selection. Temperature was the only factor contributing to abundance, which is not surprising given that blow flies are ectotherms and temperature is the largest physiological constraint limiting their geographical distribution. This survey provides forensically relevant trap data that will be of use for future forensic entomology cases in this region. The results of this survey do not, however, categorize individual species in terms of habitat and seasonal preference. Blow flies have demonstrated their success and ability to adapt to changing environments, and their ubiquitous nature makes them an excellent resource for helping solve crimes. However, their flexibility and lack of a strict habitat and seasonal preference presents a challenge when trying to use their presence on a corpse to demonstrate the previous location of that corpse. Such results should also prompt investigators to be judicious when using past categorizations of blow fly species to argue movement of a corpse.

Blow Fly, Forensic Entomology, Corpse Relocation