# Early Observational Data on Arthropods Associated with Winter Decomposition in the Pacific Northwest

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## Introduction

Forensic entomology is the use of arthropods in a medicolegal, or forensic, investigation. Commonly, forensic entomologists use arthropods discovered on human remains to establish time since death, or post-mortem interval (PMI) [1,2,4]. A PMI is estimated based on the developmental rate and succession of the arthropods present on the remains[3]. Making the calculation can be difficult sometimes because larval stages are unknown in most species of arthropods and many larvae can be misidentified using identification keys[5].

Figure 2. Black fly found in box with one of the heads. It most likely belongs to either Muscidae of Calliporidae.

Figure 3. First colonizers of the heads, part of the Collembola family. Most likely *Sminthurinus atrapallidus*

Figure 4. Maggots falling out of H1's head. Weather for that day was approximately 3°C.

## Materials and Methods

Photos taken from Bushnell Essential E2 Trophy Cam HD model number 119836C trail cameras, an Apple iPhone 7, an Apple iPad mini model A1550, and a Samsung Galaxy Note 9 were analyzed for arthropods. The closest taxonomic level was identified from the photos. Taxonomic identification was limited due to the photos not being taken for the purpose of entomological identification.

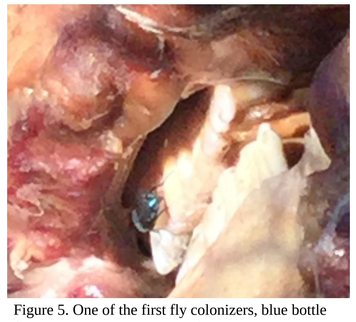

Figure 5. One of the first fly colonizers, blue bottle fly, most likely belonging to *Cynomya* spp., *Chrysomya* spp., or *Phormia regina.*

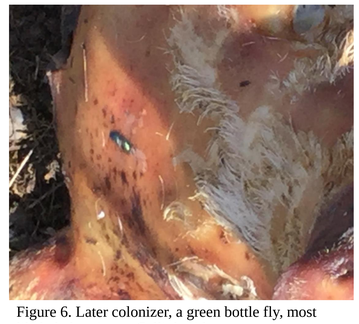

Figure 6. Later colonizer, a green bottle fly, most likely belonging to Calliphoridae

Figure 7. Diptera eggs lain along the interior of the mandible.

## Background

Geographic Variation—Within a sequential colonization of remains, times of arrival vary from region to region. Even when species are present in many different regions, there may be within-species difference. Hence, data from one region should not be used to determine PMI in another region. Each biogeoclimatic zone should have its own data base[2].

Temperature Effects and Growth and Development—Arthropods are poikilothermic ectotherms, meaning they do not regulate their body temperature through internal heat production. Arthropod internal environments vary with changing ambient temperatures. Their zone of tolerance defines aspects of growth and development. Arthropods display several adaptations to cold[4].

Succession Patterns—Arthropod succession has five phases that follow loosely with the stages of human decomposition[4]. Necrophagous arthropods generally follow these five phases, but variation exists due to various conditions (e.g. temperature and geographic variation)[2,4]. The overall general succession pattern has been: necrophagous flies, followed by necrophagous beetles, and finally predatory arthropods[3].

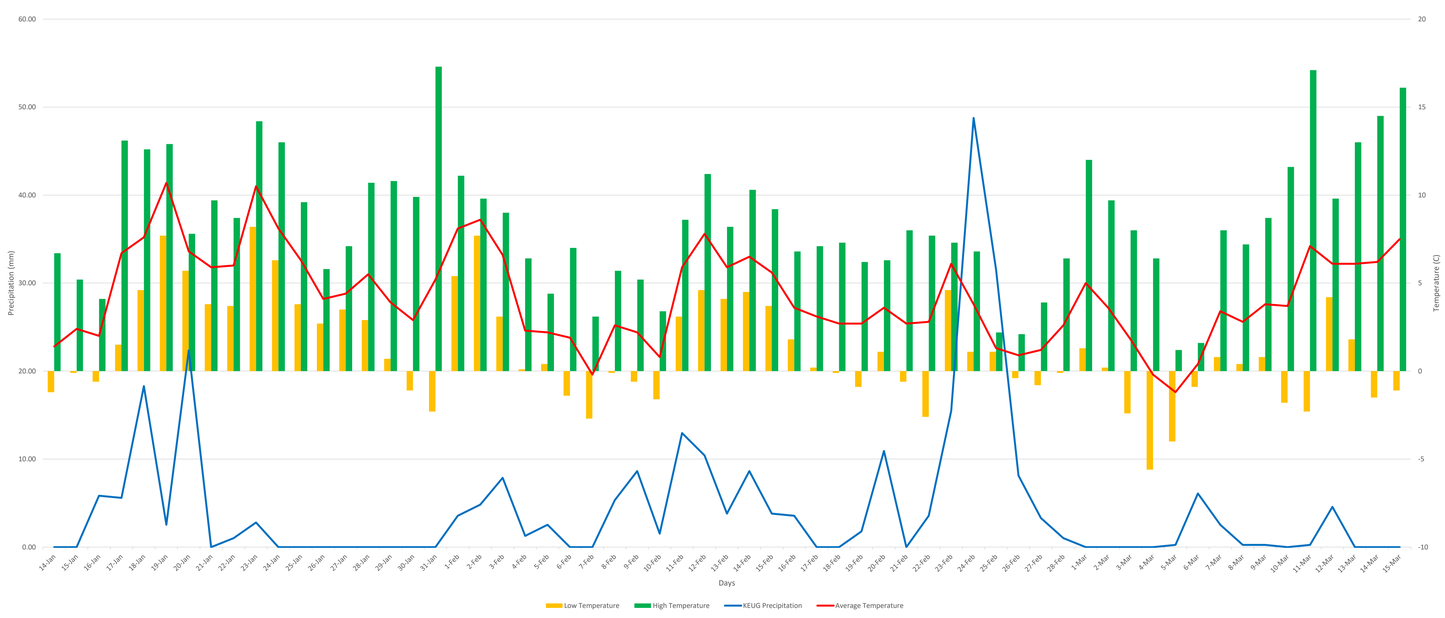


Figure 1. High, low, and average temperatures were recorded for the duration of the project from an onsite weather station. Precipitation was measured from the nearest airport (approximately 15 miles away).

## Results/Conclusion

A black fly (belonging to Muscidae or Calliphoridae) was found in the box one head was delivered in, which could skew succession patterns. The first colonizers were most likely arachnids, not flies. Maggots were unusually active in cold weather. In warmer weather, flies appeared belonging to Calliphoridae.

The methods used in the study were less than ideal for entomological taxonomic identification. Further study is required to establish entomological succession patterns within the southern Willamette Valley.

## Acknowledgements

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## References

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