INTRODUCTION

The succession of insect species on carrion during decomposition is studied to aid forensic scientists in determining the PMI, or Post-Mortem Interval (approximate time since death) of corpses in death investigations. For example: the Calliphoridae family (“fly” arrivals) are usually the earliest arrivers. However, the composition and order of succession can vary between geographic areas, due to a number of biotic and abiotic factors. (9) The presence of different larval stages of early arrivers is also used to more accurately estimate PMI, and these also vary between species. Hence, baseline studies in specific areas are necessary to determine accurate PMI. Few insect-succession studies have taken place in the Pacific Northwest (5); and as far as this project could determine, none have been published in the South Puget Sound area.

OBJECTIVE: This project serves as a small-scale pilot study into insect-succession in the South Puget Sound area, by using baited bottle traps - which multiple studies have concluded to be indicative of early Dipteran (“fly”) arrivals on full bodied corpses (4, 7, 8). This project also looked to make a distinction between seasonal populations of Diptera, with collections spanning Autumn, Winter, and early Spring of 2020-2021. A focus was placed on identifying the larger (calypterate) flies collected - of the Muscidae (“house flies”) and Calliphoridae families.

METHODS AND MATERIALS

Calliphora vicina
Calliphora latifrons
Cynomya cadaverina
Lucilia sericata

Fig 1. Reference photographs of the four different Calliphoridae species collected in this study (Source: Jones, Whitworth, and Marshall 2019)

RESULTS

Figure 3. Traps: Left: a deployed bottle trap, on stilts about 3 ½ feet above the ground. Right: a diagram of this study’s bottle trap, made from 2-liter soda bottles, and consisting of a lower compartment, an upper compartment, and a lid. Specimens were collected by placing upper compartment in a freezer, after which small specimens were placed in 70% ethanol, and large specimens were pinned.

Figure 5. (Above) Bar graphs of total weekly fly collections, co-plotted with the average daily high temperature and daily precipitation for each week, for traps A and B. Dotted black lines mark when new bait was placed, and red arrows mark when mold covered the top surface of the bait.

MORPHOLOGICAL IDENTIFICATIONS

Acalypterate files identified to family w/ reference 2
Calypterate files identified to family w/ reference 1
Calliphoridae identified to species w/ reference 3

Genetic identifications

Muscidae

Acalypterate files identified to family w/ reference 2
Calypterate files identified to family w/ reference 1
Calliphoridae identified to species w/ reference 3

RESULTS

MORPHOLOGICAL IDENTIFICATIONS

Isolated DNA w/ QIAGEN’s DNeasy Blood & Tissue Kit
PCR of CO2 gene with Promega’s GoTaq DNA pol.

daily high temperature from: <worldweatheronline.com/lacey-weather-history/washington/us.aspx>
daily precipitation from: <ncdc.noaa.gov> station LACEY 1.9 ENE, WA US

CONCLUSION/CONSIDERATIONS

• Calliphora vicina adults were present during Fall and Winter, but unknown if they will lay eggs (bottle-trap prevents them from associating with bait); but if they don’t lay eggs, their no larval-stage observations - which contribute to accuracy of PMI.
• What appeared to be sun-bathing blow-flies aggregated in yard during cold-weather but couldn’t always navigate into traps.
• baited bottle-traps are no replacement for a full-bodied carcass: lacking contributions that other insects, scavengers, and features of a carcass itself make to progress decomposition; only accurately attract early Dipteran arrivals.
• weather data was not site-specific; geographic range of study was limited; proximity of traps could have interfered with results

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REFERENCES


Figure 6. (Below) A photograph of the South side of the house, taken on 12/12/2020, during a period of no collections. Lethargic blowflies aggregated on sunny side of houses adjacent to yard with traps.