

Species Composition of Forensically-Important Flies Associated with Human Decomposition at The Body Farm

Omar Ali¹, Yangseung Jeong²
¹Biochemistry, ²Forensic Science Program

INTRODUCTION

Insects are one of the primary factors that affect the pattern and rate of human decomposition. Particularly, blow flies (Diptera: Calliphoridae) are one of the first insects that access dead bodies and lay eggs, of which maggots consume soft tissues. The Anthropological Research Facility (ARF, so-called the 'Body Farm') of the University of Tennessee has been used for human decomposition research for 40 years. However, it has not been fully investigated what species of flies are present and affect human decomposition at the ARF. **The purpose of this study is to investigate the seasonal and regional composition of flies at the ARF.**

MATERIALS AND METHODS

Sample collection and storage

- Flies were collected from 27 traps (open for 24 hours) at the ARF twice a month between March 2018 – April 2019.
- Flies were frozen at Dr. Jeong's lab and pinned with their ID numbers.

Morphological identification

- Morphological identification has been performed by Omar Ali, Simon Pergande, Dr. Jeong, and three forensic entomologists (Dr. Weidner [Arizona State Univ.], Dr. Gemmellaro [Kean Univ.], Dr. Yusseff-Venegas [San Diego Natural History Museum]).
- Reference: Jones N, Whitworth T, Marshall SA. 2019. Blowflies of North America: Keys to the subfamilies and genera of Calliphoridae, and to the species of the subfamilies Calliphorinae, Luciliinae and Chrysomyinae. Canadian Journal of Arthropod Identification 39: 10.3752/cjai.2019.39.

Weather information

- Weather data (e.g., temperature, humidity, and rainfall) have also been collected from the weather station set up at the ARF.

RESULTS & DISCUSSION

A total of 3,355 flies were collected, approximately 95% of which (3,188 out of 3,355) were blowflies (Diptera: Calliphoridae). The greatest number of flies were caught in May and June 2018 (1,016 and 1,068, respectively), and no flies were collected between December 2018 – March 2019. The number of flies caught by month is presented in [Table 1](#).

Month	MAR '18	APR '18	MAY '18	JUN '18	JUL '18	AUG '18	SEP '18	OCT '18	NOV '18	APR '19	Total
# flies	6	367	1,016	1,068	250	122	104	268	68	86	3,355

Table 1. Number of flies caught by month

Nearly 91% of the blowfly specimens consist of three species: *P. regina* (65.1%), *L. coeruleiviridis* (20.3%), and *L. illustris* (5.3%) (Table 2). *P. regina* was the most dominant species most of the time except for September through November when *L. coeruleiviridis* was most dominant (Fig 1).

Omar Ali, who has less than one year of fly identification experience, showed approximately 70% of correct identification ratio (204 out of 294 specimens). Most of the non-matches comprise *Lucilia coeruleiviridis*, *Phormia regina*, and Non-Calliphoridae group.

RESULTS & DISCUSSION (continued)

ID	Mar '18	Apr '18	May '18	Jun '18	Jul '18	Aug '18	Sep '18	Oct '18	Nov '18	Apr '19	Total
Non-Calliphoridae	2	24	9	26	23	9	19	37	6	12	167
Calliphoridae											
<i>Calliphora latifrons</i>			1								1
<i>Chrysomya ruffifacies</i>								2			2
<i>Lucilia silvarum</i>			2								2
<i>Lucilia cuprina</i>						1		2			3
<i>Cynomya cadaverina</i>		1	2						1		4
<i>Pollenia rudis</i>			1	2	1	2	1	1			8
Undetermined		4	1	1	5						11
<i>Calliphora livida</i>		7	4	1					1	1	14
<i>Lucilia spp</i>			1	6	4	3		1		1	16
<i>Cochliomyia macellaria</i>			3	14	2	2					21
<i>Chrysomya megacephala</i>				1				10	12		23
<i>Lucilia sericata</i>			1	3	8	4	2	4	1		23
<i>Calliphora vomitoria</i>		10	3	1					16	1	31
<i>Calliphora vicina</i>		5	24	14	2	2	3	2	2	9	63
<i>Protophormia terraenovae</i>		9	11	42	7		2	1		3	75
<i>Lucilia illustris</i>		7	63	84	6	6			1	1	168
<i>Lucilia coeruleiviridis</i>		10	119	165	95	29	39	158	26	6	647
<i>Phormia regina</i>	4	290	771	708	97	65	37	50	2	52	2076
Total	6	367	1016	1068	250	122	104	268	68	86	3355

Table 2. Species composition of flies at the ARF by month

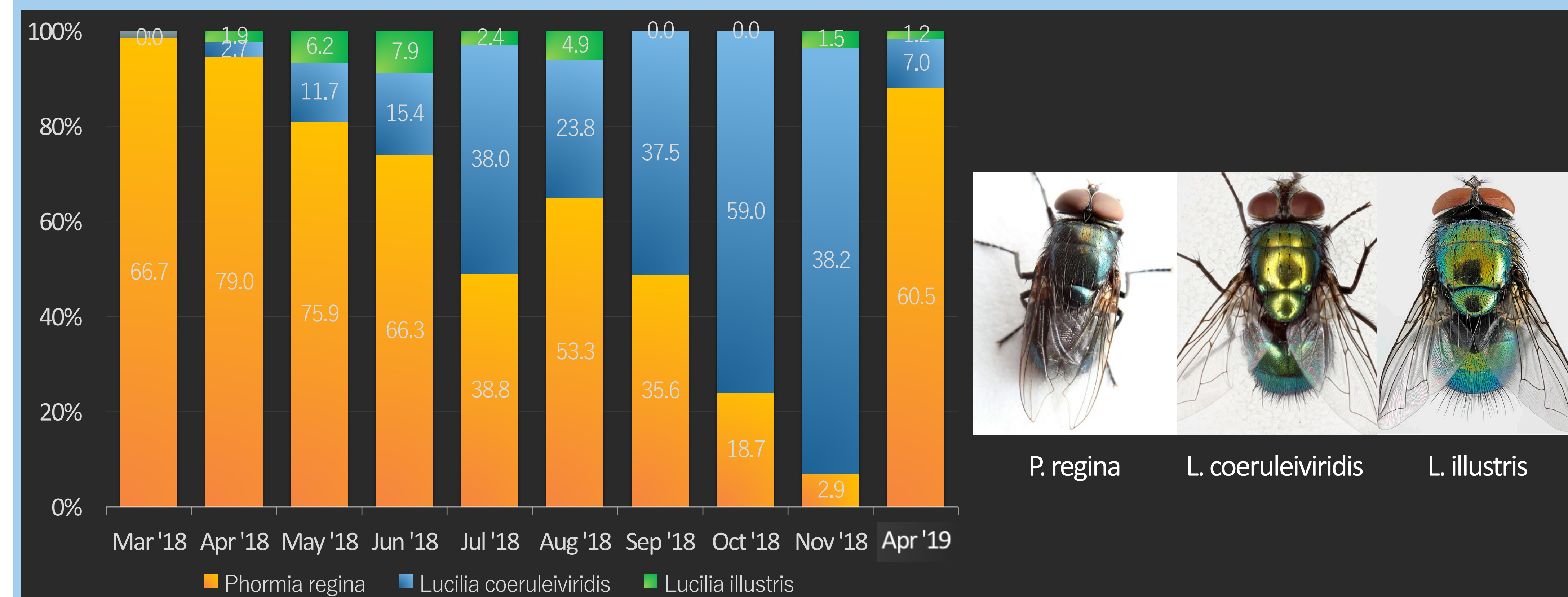


Fig 1. Seasonal dominance of most popular blowflies at the ARF

Heat maps were generated to exhibit the change of regional distributions of flies at the ARF by month. (Only the heat maps from March to October 2018 are presented here). As of March 2020, identification of possible factors that influence their regional distribution (e.g., temperature, decomposition states of nearby bodies, and fly species) is currently under analysis in collaboration with the Forensic Anthropology Center of the University of Tennessee.

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