

Comparative Adult Longevity of (Macquart) *Chrysomya rufifacies* (Diptera: Calliphoridae) and *Cochliomyia macellaria* (Fabricius) (Diptera: Calliphoridae)

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Abstract: Many forensically important Calliphorids reap their importance from use of their relatively known development time. Both *Chrysomya rufifacies* and *Cochliomyia macellaria* are in the family Calliphoridae, and have been found to invade carcasses. This allows a postmortem interval (PMI) to be established, and this levies them forensic significance. If more points of comparison pertaining to elements of development or time lived of *Ch. rufifacies* and *C. macellaria* could be correctly utilized, then a more accurate PMI could be produced. In this study *C. macellaria* and *Ch. rufifacies* adults (F₁) were reared from maggots obtained on a highway (P₁) in order to record the length of time each individual F₁ adult lived. The mean longevity of *C. macellaria* was found to be about four days longer than the longevity of *Ch. rufifacies* and showed no apparent positive correlation between observed general body size and the length of time an adult lived.

Keywords: Calliphoridae, *Chrysomya rufifacies*, *Cochliomyia macellaria*, longevity

Both *Ch. rufifacies* and *C. macellaria* are of the family Calliphoridae and have been found to invade human corpses, allowing a postmortem interval (PMI) to be established (Byrd and Butler 1996; Barreto et al. 2002). This attributes to their forensic importance, and the fact that *Ch. rufifacies* and *C. macellaria* can act as pathogen carriers in humans give them medical relevance (Thyssen 2004). The natural diets used to rear Calliphoridae in the lab include beef, horse meat, and other foods with high protein values. (Greenberg and Szyska 1984). This can be considered a staple in the diets of both

Ch. rufifacies and *C. macellaria*. The quantity and quality of food consumed in the larval stage may affect growth and development (Barreto et al. 2002). It was observed that *Ch. rufifacies* appeared to be larger than *C. macellaria*. This begged the question if there was a difference in the adult longevity, or how many days an adult lived, between the two Calliphorids. Lack of sufficient research pertaining to the aspect of body size in relation to longevity, prompted investigation of this hypothesis. It was the observation of the relative size between these Calliphorids which proposed the concept of a

possible positive correlation between body size and length of adult life.

Materials and Methods

Wild *Ch. rufifacies* and *C. macellaria* maggots were collected from carrion on the side of highway 2818 in College Station, TX. The maggots were raised on food-grade cow liver and then the adult flies were placed in a 12 x 12 x 12 cage from Bioquip (Rancho Dominguez, CA). The specimens were fed water and sugar (ADM Sugar Nashville, TN) *ad libitum*. Once the adults were three days old they were given cow liver for a protein meal. When the adults were five days old, cow liver was provided as a substrate for oviposition. Eggs were left on the liver and the maggots were allowed to grow. The liver was placed on beds of sand in one pint mason jars (Maryland Glass Corporation Baltimore, MD). Extra liver was given *ad libitum* to the maggots. Once the maggots pupated, the pupae were gathered and weighed one at a time. They were then placed in individual portion cups (Makers Mark Piscataway, NJ) at room temperature to allow them to emerge. When the adults emerged they were promptly sexed. The newly emerged adults were fed 0.05 cc of 10% sugar water – sugar mixed proportionally with RO water – every day until they died. The amount of days the adults lived were recorded. The recorded data was analyzed by use of a T-test in SPSS.

Results

59 *C. macellaria* and 60 *Ch. rufifacies* were reared to adults, and the amount of days each individual lived were recorded. The median and mode for the *C. macellaria* cohort were 29 and 32 days, respectfully. The median and

mode for the *Ch. rufifacies* cohort were 23 and 15 days, respectfully (Figure 2). *C. macellaria* adults were found to live significantly longer than *Ch. rufifacies* adults (T-Test P value of 0.0467). The mean amount of days lived by *C. macellaria* cohort was 27.13. The mean amount of days lived by the

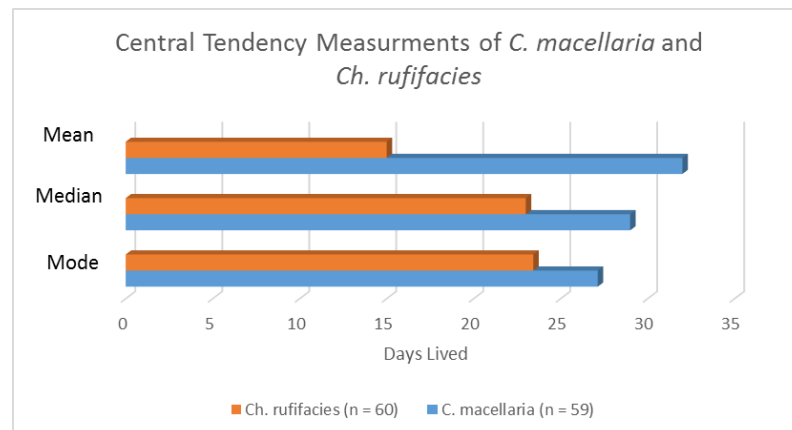


Figure 1. These data are the mean, median, and mode of the amount of days adult *C. macellaria* and *Ch. rufifacies* lived.

Ch. rufifacies cohort was 23.43 (Figure 1). The *C. macellaria* cohort lived an average of 3.709 days longer than the *Ch. rufifacies* cohort.

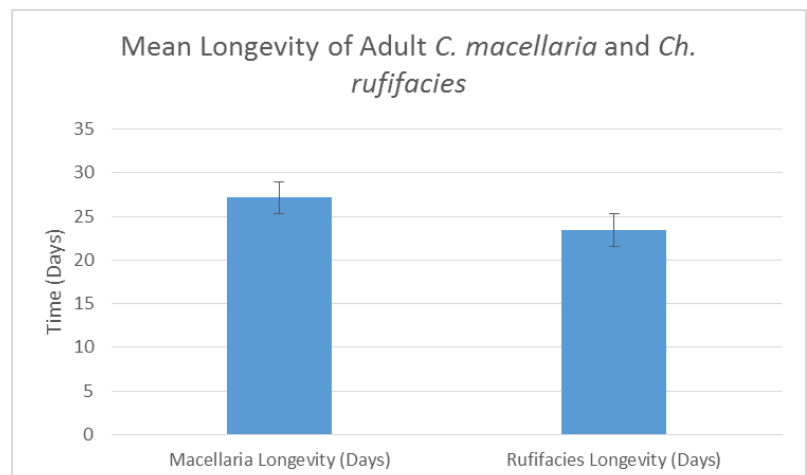


Figure 2. Average amount of days adult *C. macellaria* and *Ch. rufifacies* lived. (*) Is significantly different.

Discussion

Both *C. macellaria* and *Ch. rufifacies* develop at different rates compared to one another. The adults were found to live significantly different lengths of time with the *C. macellaria* cohort living an average of 3.709 days longer (Figure 2). To control as many variables as possible, an F₁ generation of adults was reared from the parent sample of maggots from highway 2818 in College Station, Texas. Both species were reared in identical and sufficient living conditions. The natural diets used to rear Calliphoridae in the lab include beef, horse meat, and other foods with high protein values (Greenberg and Szyska 1984).

The initial observation of *Ch. rufifacies* being larger than *C. macellaria* begged the question if there was a difference between the two species of Calliphorids in terms of their adult longevity. Not only did the *C. macellaria* cohort averagely live longer, but the median longevity value was seven days longer than the *Ch. rufifacies* cohort and the mode was more than twice that of *Ch. Rufifacies* (Figure 1). Therefore, the proposed hypothesis of a larger body size correlating with a higher longevity was not supported. The data does not show any indication which would argue for the affirmation of the proposed hypothesis. In fact, the data argues for the opposite, but lacks components of experimental design to provide sufficient support for the inverse. Multiple details would have to be addressed and controlled due to variables such as ecoregions being able to affect the development time and size of *C. macellaria* (Owings et al. 2014). If a

correlation was able to be demonstrated then that correlation could become another point of evaluation in determining a PMI. A more accurate PMI would be beneficial in a multitude of instances. Regardless, for a more definite conclusion, more research would need to be conducted in a manner which could account for both the aforementioned and non-mentioned variables.

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