Adult Longevity for Both Sexes in *Chrysomya rufifacies* (Macquart) (Diptera: Calliphoridae)

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Abstract: The hairy maggot blow fly, *Chrysomya rufifacies* (Diptera: Calliphoridae), is a forensically important fly often encountered on human and other vertebrate remains. The longevity of *Chrysomya rufifacies* was observed from adulthood until death to determine whether females or males lived longer. Several *Ch. rufifacies* maggots were collected and fed cow liver for development. These maggots were reared in a laboratory setting until they pupated. A total of 90 maggots, 43 female and 47 male were gathered. Additional sugar and water was fed to them daily until they all died. The data gathered was analyzed using a T-test in SPSS where $P>0.05$ shows significance where males lived longer than females, and $P<0.05$ shows insignificance where females lived longer than males. The results showed that the P value was equal to 1.620, which shows a substantial significant value. This established a basis that sometimes females die sooner than males. The figures and tables below demonstrate the comparisons with both sexes and the longevity of each.

Key Words: Longevity, Female, Male, Diptera, Chrysomya rufifacies

The life expectancy of *Chrysomya rufifacies* (Macquart, 1842) is sometimes unpredictable. It is just as variable as human life expectancy. The scarcity of food, shelter, mating, genetics, and environmental factors impact how long an insect from this Diptera order lives (Zumpt1965). *Ch. rufifacies*, also known as the hairy maggot blow fly (Flores *et al.*, 2014), is notoriously known for infesting cattle and causing terrible cases of necrotic tissue in live mammals (myiasis) (Zumpt 1965). This is important in the agriculture business in that meat industries are often times highly impacted in their beef sales. Because of this huge impact on the agriculture industry, it is important to understand how long these insects live to determine an effective method to steer them away.

In contrast, *Ch. rufifacies* can also have a positive impact on medical health as well as in forensic studies. New therapies have been discovered where myiasis can actually help in treating patients with acute to severe necrotic tissues (Verma, 2013). This method, also known as maggot debridement therapy, is used to treat those patients that have difficulties with other treatments and have no other resort. The way this method is used is by gathering sterile *Ch. rufifacies*

maggots, or any maggot that is well known for playing a role in myiasis, and leaving them at the site of infection. Every other day, depending on how the treatment is being used, the maggots are cleaned from the wound and replaced with new ones. In forensics, and also in scientific-criminal investigations, the post mortem interval is important to determine the length of time a person has been dead and, in some cases, it may help investigators determine how that person died. (Zumpt, 1965, Verma, 2013). One important contribution is that females, are the sex known to multiply the brood. Knowing how long a female maggot lives may help in predicting oviposition and contribute to further knowledge in the medical entomology and agricultural fields.

The objective of this study was to determine how long a female maggot lives compared to that of a male. This was observed by rearing *Ch. rufifacies* in a controlled laboratory setting. .

Materials and Methods

Several *Chrysomya rufifacies* maggots were collected from carrion on the side of the road in College Station, TX. These maggots were reared in a laboratory and raised on food-grade cow liver until pupation occurred (Cargill Beef, Friona, TX, USA). Once pupae emerged, they were then transferred to adult fly cages and maintained in colonies in a 12”x12”x12” cage (BioQuip, Rancho Dominguez, CA, USA). For the first three days after birth, the *Ch. rufifacies* maggots were fed sugar (Great Value, Omaha, Nebraska, USA) and deionized water. After the third day, the maggots were fed cow liver (Cargill Beef, Friona, TX, USA) as a protein meal. Once maturation had been reached, they were given more cow liver in which to oviposit.

The eggs that were laid on the cow liver were left there to finish development. After development was complete, the liver and the eggs were placed on beds of sand in one-pint mason jars (Ball, Daleville, IN, USA). Extra liver to feed the hairy blow fly maggots, was given *ad libitum*. When the *Ch. rufifacies* maggots pupated, the pupae were gathered and weighed one at a time. They were then individually placed in 2oz. multi-purpose cups with lids (Diamond, Yu Hang District, CHINA) and set at room temperature of 21°C (70°F) to let them emerge. After eclosion had been reached , the newly emerged adults were determined to be either female or male. The adult blow flies were fed 0.05mL of 10% sugar water (made by mixing sugar with reverse osmosis water) every day until the last adult died. The amount of days each fly lived was recorded for each individual (female and male). The data was analyzed by using a T-test with the Statistical Package for the Social Sciences (SPSS).

Results

In this study, a total of 90 *Ch. Rufifacies* were gathered. Females lived an average of 15 days (Figure 2) while males were shown to live an average of 13 days (Figure 1). It was noted that the first to die was a female on the first day at the beginning of the experiment. Shortly

following, a male died on the fourth day (Figure 3). The life expectancy was determined from the point of eclosion, when the pupae became an adult fly to the time of death. This ranged from 1-47 days, ending at the death of the last male. Female flies experienced the most fatalities on day 12 while male flies demonstrated this on day 15. The results were analyzed by a T-test in SPSS; it was calculated that on average, females died on the 24th day. For the males the average was significantly higher with an average of 36 days of life. The T-Test P value was highly significant at a value of 1.620. This value was significantly greater than the preferred value of P>0.05 to determine if it is significant or insignificant.

	Female	Male
Mean Days Lived	23.83870968	36
Standard Deviation	9.018857186	6.250333324
Standard Error	1.619834569	1.16065776
T-Test P value	1.68429E-05	

Table 1. This table depicts information using results analyzed by T-testing in SPSS. It compares each sex individually by: mean days lived, standard deviation, standard error, T-Test P value.

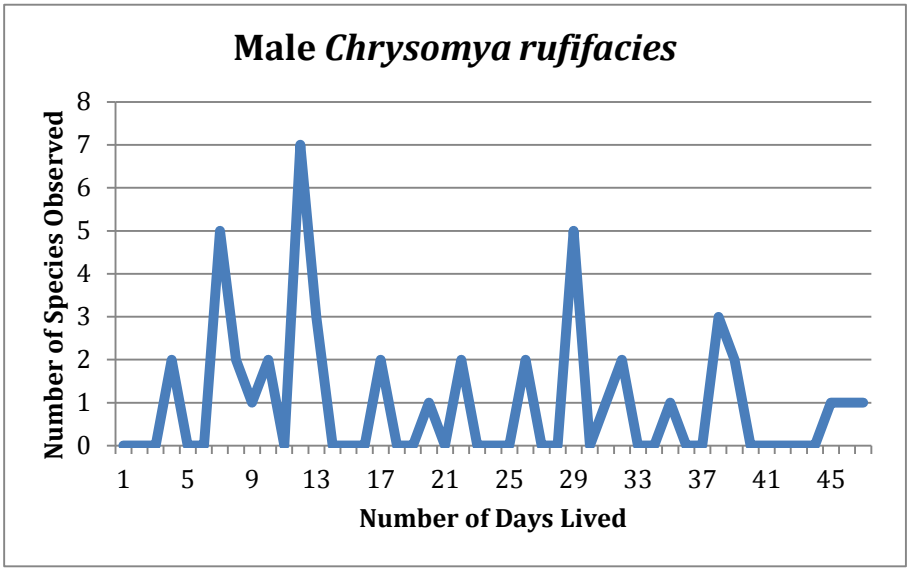

Figure 1 Number of days observed for each individual male *Ch. rufifacies.*

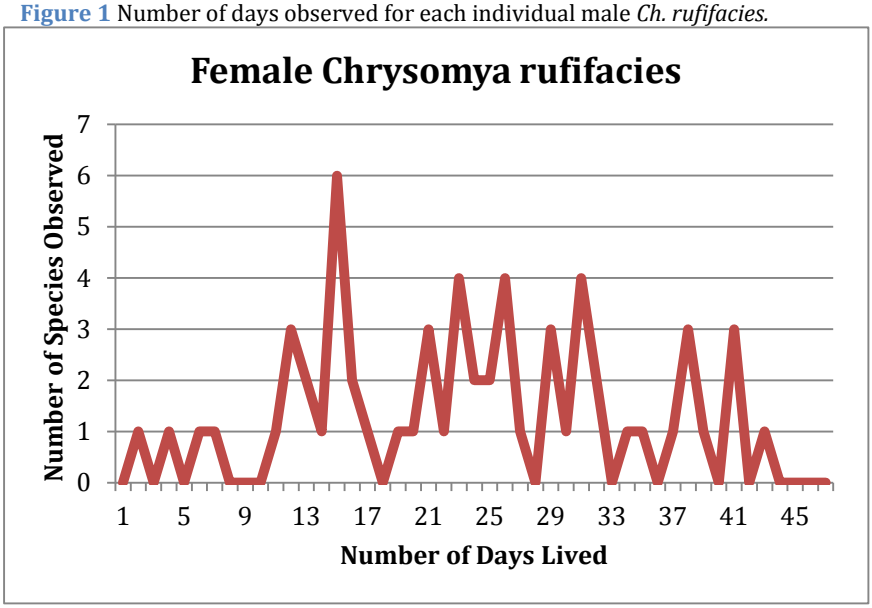

Figure 2 Number of days observed for each individual female *Ch. rufifacies.* Inconsistency is shown throughout all 43 days lived.

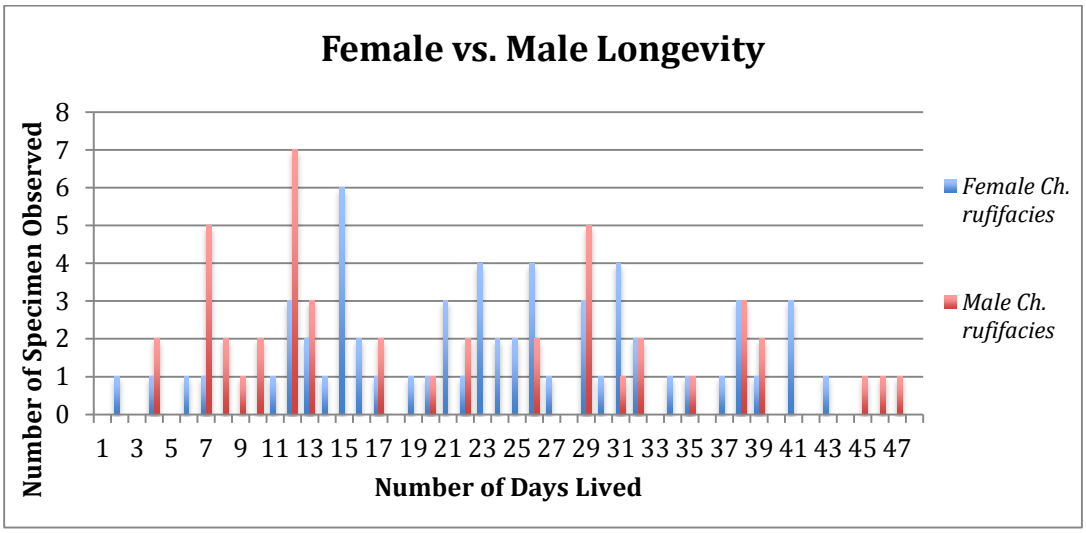

Figure 3 Longevity Distinction Comparison of male and female side by side in the order in which they were dying.

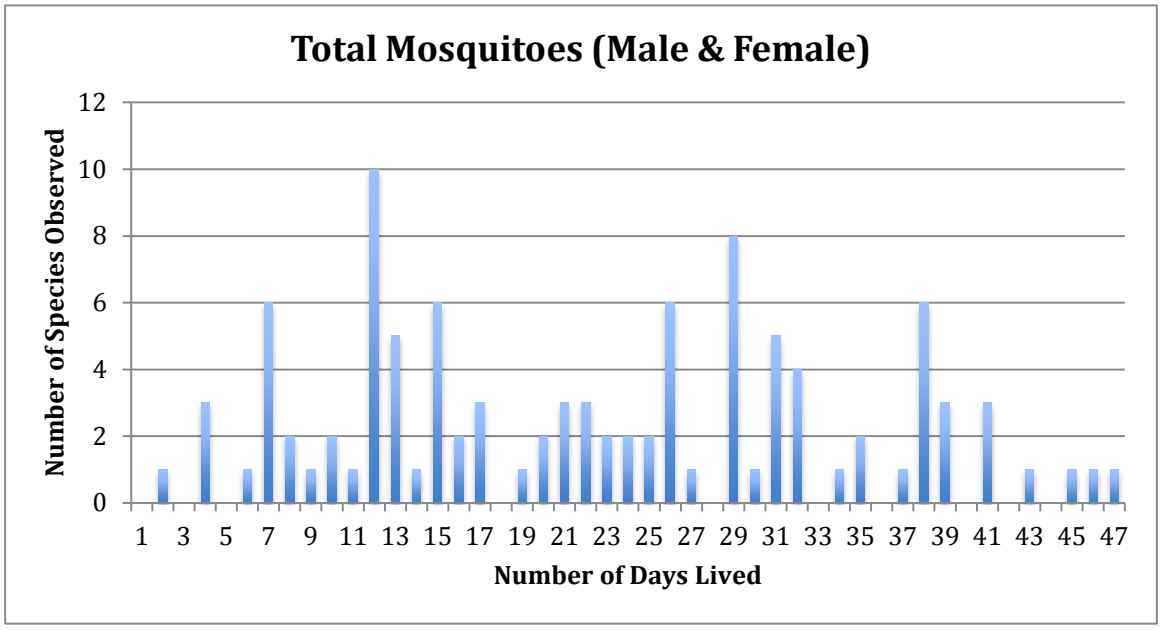

Figure 4 Total number of mosquitoes depicts the number of species observed that died each day, both male and female together.

Discussion

The purpose of this experiment was to determine which sex lived longer. Longevity in females and males depends on many factors. In this experiment, life expectancy was determined to be higher in males, but according to (Gabre 2004), there is no significant way to determine whether one sex outlives the other. Significantly greater P values indicate that on average, males lived 36 days and females lived approximately, 24 days. The numbers were calculated based on the amount of males and females identified. Since there was a greater amount of males, and the outliers ranged from very low (4 d) to very high (47 d), the average amount turned out higher. Comparing these results to the females, showed that the lowest range was at day one, and the longest day lived was at day 43; the results averaged less.

A possible means to improve this study would be including a control variable in which both sexes would be tested in a laboratory setting. The results will vary from that of *Ch. rufifacies* that live in rural or urban areas and other factors (i.e. climate, genetics, and food/shelter sources). The developmental time leads to the prediction that females take longer to develop than

males and adults experience a longer oviposition range than pupae.

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