# Comparison of Longevity in Male and Female *Cochliomyia macellaria* (Fabricius) (Diptera: Calliphoridae)

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**Abstract:** *Cochliomyia macellaria* (Fabricius) (Diptera: Calliphoridae), the secondary screwworm, is a medically and forensically relevant insect due to its infestation of necrotic tissue on cadavers and living organisms. Many insects exhibit sexual dimorphism in various traits, such as longevity, and these differences may be useful in making more accurate estimations of post-mortem interval (PMI). Male and female screwworms were reared from captured adults and their longevity was charted to determine differences between the sexes. However, it was determined that male and female *C. macellaria* exhibit no significant differences with regards to longevity and are similar to other carrion-feeding Diptera that are commonly found in cases of myiasis or cadaver infestation. This new data on longevity may be used in future research on the role *C. macellaria* plays in medical and forensic entomology.

Keywords: *Cochliomyia macellaria*, myiasis, longevity, forensic entomology

*Cochliomyia macellaria* (Fabricius), also known as the secondary screwworm, is a blow fly with significance in the fields of medical and forensic entomology (Mendonca et al 2014). Adults are attracted to and lay eggs on necrotic tissue such as animal carcasses, and the larvae feed on their oviposition medium until adulthood. Blow flies are most attracted to dead mammals in the active decay phase, and therefore it is not uncommon to find blow fly eggs or larvae on recently deceased animals (Alves et al 2014). In some cases, blow flies can cause secondary myiasis by laying eggs in the necrotic tissue of living animals and there are many cases of infestation documented in humans. The biology of *C. macellaria* is understood well enough that they can be reared in laboratory conditions with an artificial diet of bovine liver or blood (Chaudhury, Skoda 2013). In forensic entomology, carrion insects such as *C. macellaria* have been used to estimate a post-mortem interval (PMI) indicating time of death based on colonization of the

decedent's body by insect larvae (Perez et al 2014).

Many creatures, including insects, display sexual dimorphism, which are morphological or physiological differences between male and female members of the species. In some insects, longevity shows an inverse relationship with reproductiveness, a notable sex-specific feature (Zajitschek et al 2009). Males and females of *Megaselia scalaris* (Loew) (Diptera: Phoridae), also carrion feeders, show a difference in developmental period and size such that male pupae are larger and have a related increase in feeding (Zuha, Omar 2014). Sexual dimorphism can be a key aspect of a creature's physiology when it involves feeding, development, size, behavior, or reproductiveness.

Investigation of the life cycles and development of *C. macellaria* would improve understanding of the insect with regards to its medical and forensic uses. The key element of this study is the longevity of *C. macellaria* males and females, where differences in life cycles of each could inform treatment of blow fly infestations or improve the analysis of conditions of death in forensic cases.

**Materials and Methods**

Wild *C. macellaria* larvae were collected off of carrion from the side of Farm to Market Road 2818 in College Station, Texas. The larvae were raised on food-grade bovine liver (Foster Farms, Galveston, TX) and reared to adulthood. Adults were placed in a 12" x 12" x 12" cage (Bioquip, Rancho Dominguez, CA) and fed with sugar (Kroger Co., Cincinnati, OH) and water *ad libitum*. At three days old, the adults were fed cow liver for a protein meal, and at five days old more cow liver was provided as an oviposition medium.

When the new *C. macellaria* eggs eclosed into larvae, they were left to grow on the liver sample. The liver was then cut up and each slice placed on a bed of sand in a 16-oz Mason jar (Walmart, Bentonville, AR). Extra liver was provided as the larvae consumed their supply. When pupated, each pupa was weighed and placed in a 2-oz Diamond (Jarden Brands, Daleville, IN) multi-purpose cup with a lid. The cups were left at room temperature until the adults emerged from the pupae, which were then sexed.

Sugar was mixed with reverse osmosis-purified water to produce a 10% sugar water, and the adults were fed 0.05 mL of this every day until death. The longevity of each adult was recorded. The longevity data was analyzed with a T-test in IBM's SPSS (SPSS 2007, v16.0) analysis software.

**Results**

A total of 31 female *C. macellaria* were sampled, which survived between 1 and 40 days. The mode value for longevity was 27 days, with 6 blow flies surviving that long, and 3 days with 3 blow flies surviving that long.

A total of 29 male *C. macellaria* were sampled, which survived between 1 and 42 days. The mode values for longevity were 32 days, with 7 blow flies surviving that

long, and 29 days, with 3 blow flies surviving that long.

The female flies survived for a mean of 26.52 days ($M$ = 26.52; $SD$ = 9.28) while the males survived for a mean of 27.79 days ($M$ = 27.79; $SD$ = 10.96) (Fig. 1). The T-test found no significant difference in longevity between female and male *C. macellaria* ($p$ = 0.63).

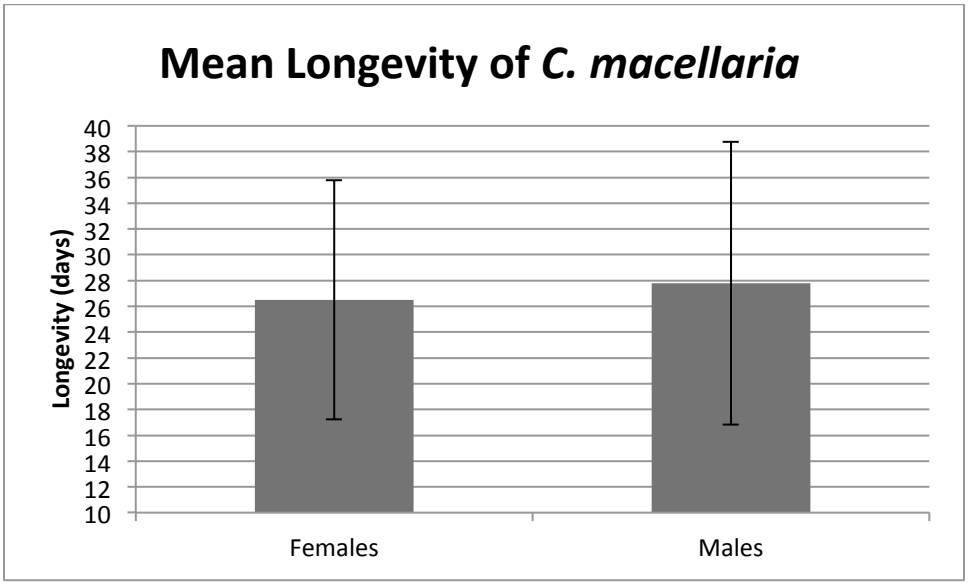


**Fig. 1.** Comparison of longevity of female and male *C. macellaria* with error bars representing standard deviation.

**Discussion**

There was no significant difference between male and female *C. macellaria* in regards to longevity, which suggests that sexual dimorphism does not extend to longevity (Fig. 1). These data are similar to a different longevity study where a closely related species of screwworm, *Cochliomyia hominivorax* (Coquerel) (Diptera: Calliphoridae), also did not show differences between the sexes when reared in bisexual populations (Crystal 1967).

The results of this study show that males and females develop in a similar way, though fertilization and gravidity of females as a potential modifier of longevity was not taken into account. In some insects, factors such as mating frequency can increase both fecundity and longevity, suggesting a correlation between the two, but the isolation of each experimental insect prevented mating which could test for such a factor (Lee et al 2014).

While longevity between males and females was suggested to be similar, the experiment did not address other potential life cycle differences such as the length of each instar or each stage of development. Under the same breeding conditions, for instance, individual flies could be monitored to determine length of the egg, larval, pupal, and adult phases before death. Differences in each phase might indicate sexual dimorphism in development outside of longevity, particularly considering that a

major disruptor of life, gravidity, would be controlled by the isolation of each specimen.

The results suggested that *C. macellaria* that infest cadavers or necrotic tissue in living organisms cannot be sexed based on their longevity. Potentially gravid females, likewise, cannot be identified based on survival past a particular interval of infestation. Moreover, the lack of difference in longevity between males and females contributed to a greater understanding of *C. macellaria*, allowing for the removal of such a consideration in further research endeavors.

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