FEMALE BLOW FLY (DIPTERA: CALLIPHORIDAE) ARRIVAL PATTERNS AND CONSEQUENCES FOR LARVAL DEVELOPMENT ON EPHEMERAL RESOURCES

A Dissertation

by

RACHEL MARGARET MOHR

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2012

Major Subject: Entomology

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Approved by:

Chair of Committee,	Jeffery K. Tomberlin
Committee Members,	Spencer T. Behmer
	Micky D. Eubanks
	William E. Grant
Head of Department,	David Ragsdale

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ABSTRACT

Female Blow Fly (Diptera: Calliphoridae) Arrival Patterns and Consequences for Larval Development on Ephemeral Resources. (May 2012)

Rachel Margaret Mohr, B.S., Texas A&M University;

M.S., University of California, Riverside

Chair of Advisory Committee: Dr. Jeffery K. Tomberlin

This investigation explored the environmental and physiological factors affecting adult blow fly (Diptera: Calliphoridae) arrival and attendance at pig (*Sus scrofa domesticus* L.) carcasses in Brazos Co, TX in the summer and winter, and validated a new technique for estimating the pre-colonization interval. It also examined how the offspring of said blow flies compensate for adverse developmental conditions such as starvation or the presence of older competitors by determining the function of minimum viable weight, critical weight, and the terminal growth period in *Cochliomyia macellaria* (F.) (Diptera: Calliphoridae).

Adult blow fly carcass attendance is poorly explained by temperature, wind speed, ambient light intensity, or body size for either winter or summer-active species. Time of day explained approximately 10% in carcass size variation for all four of the most common species. For summer flies, the degree of ovarian development changed significantly from 96%/98% fully developed on day 1 postmortem to 7%/2% fully developed on day 2 postmortem for *C. macellaria* and *Chrysomya rufifacies* (Macquart)

respectively. Using the binomial distribution, the minimum postmortem interval was correctly estimated for 4/6 validation tests.

Minimum viable weight for *C. macellaria* was found to be ~ 0.02 g, and was stable under conditions of starvation and simulated competition. Under starvation conditions, time to pupariation was not altered, whereas under simulated competition, growth rate was increased and terminal growth period shortened. Starved flies under simulated competition entered the pupal state ~12 h faster than starved flies without competition, but required ~12 longer to complete development. These effects should be considered when estimating post-colonization intervals.

DEDICATION

To my family, who always said I could fly.

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I would like to thank my boss, mentor, collaborator and all-around Benevolent Overlord, Dr. Jeffery Tomberlin for all the effort and time he has spent pushing me down the path to scientist-dom. He has been generous with support and praise, and saved the boot for those occasions I've genuinely needed it. Dr. Tomberlin helped take a simple idea, borne out of linguistic frustration, and turn it into a new way of looking at a cadaver, a couple of publications, and a really nifty infographic. He has gone above and beyond the role of advisor, introducing me to his own collaborators and friends, letting me do actual casework, and giving me opportunities to teach and present as an intellectual equal. Perhaps the most significant thing that he's helped me with is being socially engaged with other scientists, something with which I've long struggled.

I'd also like to thank my advisory committee for all their support and guidance over the past few years: Dr. Micky Eubanks, Dr. William Grant, and Dr. Spence Behmer. The unique perspectives and strengths each brings to the table have made my own work much better than it would have been otherwise. I would be remiss in excluding Dr. Aaron Tarone, who helped as much as any formal committee member with the design of my experiments and interpretation of my data.

Very little of my research would be complete without the kind assistance of the various coworkers who have shared the FLIES building over the past four years. Those of particular note start with Adrienne Brundage, who oh-so-casually asked the question that started all these experiments, and who shared the products of her fly colonies

without hesitation. Then there is Micah Flores, who has helped me lift more cages, carry more boxes, and loaned the use of his truck more times than anyone could ask. Jennifer Pechal has always asked the kind of painfully insightful questions that challenge my assumptions and my interpretation of data, and who provided invaluable help in collecting validation test samples. Without the assistance of Charity Owings and her mass fly production, I would never have finished my final experimental trials. I also thank Christine Picard for helping me collect the first of the blind samples I used for validation.

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Last, but certainly not least, I need to thank my long-suffering partner Aaron Johnson. He's borne my odd hours and even more unusual odors with good humor. He's celebrated my successes, bemoaned my failures, and generally been my rock and my best friend.

NOMENCLATURE

20-E	20-hydroxyecdysone
ADD	Accumulated Degree Days
ADH	Accumulated Degree Hours
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
PMI	Post Mortem Interval
Pre-CI	Pre-Colonization Interval
Post-CI	Post-Colonization Interval
CW	Critical Weight
DILP	*Drosophila* Insulin-Like Peptide
E/S	Excretions/Secretions
IIS	Insulin/Insulin-Like Signaling
JH	Juvenile Hormone
KW	Kruskall-Wallis test statistic
L3	Third larval instar of Calliphoridae
MVW	Minimum Viable Weight
NAS/NRC	National Academy of Science/National Research Council
PIA	Period of Insect Activity
PTTH	Prothoracicotropic Hormone
TGP	Terminal Growth Period

TOR	Target of Rapamyacin
Tukey's HSD	Tukey's Honestly Significant Difference

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1. INTRODUCTION AND SIGNIFICANCE

Forensic entomology has grown immensely as a discipline in the past thirty years, both in terms of the number of practitioners, the number of papers being published, and the degree of public awareness of the field. It also seems to be in the midst of moving from what Kuhn (1996) would characterize as "pre-paradigm" to "normal science". Textbooks and manuals are being published, of which two are already into their second edition (Haskell and Williams 2008, Byrd and Castner 2010). Efforts are being made to articulate the basic rules and assumptions under which the field operates, e.g. Catts and Goff (1992), Amendt et al. (2007), or Tomberlin et al. (2011b). Much of that movement is toward a science rooted in basic research into decomposition ecology, while at the same time meeting the requirements of the legal community.

When a forensic entomologist presents evidence in a court case, they are acting as an expert witness. They are permitted to offer testimony, generally under Federal Rule of Evidence #702. This rule states:

> "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and

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This dissertation follows the style of Journal of Medical Entomology.

methods, and (3) the witness has applied the principles and methods reliably to the facts of the case." (FRE 2009)

The task of determining if a potential expert witness has met these criteria falls to the judge, and one determined to be lacking credentials may be barred from testimony (Hall 2010). Placing the judge in the role of gatekeeper forces them to analyze not just individuals, but the validity of entire fields of science as well, which they do using the criteria of the jurisdictionally-appropriate standard. For many years, the federal standard was that elucidated by *Frye v. United States* (1923) which merely required "experimental testimony [be] deduced from a well-recognized scientific principle or discovery, [and] the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs." While the *Frye* test is still used by some US states, in federal courts, it has been superseded by the *Daubert* standard (Calhoun 2008), which came from a synthesis of three cases where the scientific validity of expert testimony was called into question: *Daubert v. Merrell Dow Pharmaceuticals, General Electric Co. v. Joiner,* and *Kumho Tire Co. v. Carmichael* (1993, 1997, 1999). Among other criteria, the *Daubert* standard posits the following requirements for an admissible scientific methodology:

1.) The theory or technique must be subject to empirical testing under the Popper (1962) model of falsifiability/refutability/testability

2.) It should be subject to the scrutiny of the scientific community in the form of peer review and/or publication;

3.) The known or projected rate of error for a methodology;

4.) The degree to which the technique or methodology is consistent with professional standards (if any exist);

5.) It should have widespread support within the relevant community or discipline

However, the seven concurring justices in *Daubert* also took pains to point out that these points were not a checklist, and that Rule 702 was "flexible" in the determination of scientific validity (1993). As a result, the role of gatekeeper of scientific validity can become problematic for judges who are unfamiliar with scientific techniques and operating as the sole arbiters of admissibility (NAS/NRC 2009).

One of the most significant aspects of the acceptance of the *Daubert* standard is that many "forensic" sciences failed to meet all of the various criteria. Although individuals had been calling for forensic science reform for many years (Saks and Koehler 2005), it was not until 2009 the National Research Council/National Academy of Science published a report roundly criticizing the forensic sciences. The report raised issues such as lack of training, inconsistent laboratory practice, worker biases, lack of empirical research, and need for quality control (NAS/NRC 2009). In response to this report, my co-authors and I wrote "A Roadmap for Bridging Basic and Applied Research in Forensic Entomology" (Tomberlin et al. 2011b), in which we discussed the

ways that forensic entomology as a discipline needed to change in order to meet the recommendations of the NAS/NRC report, and in turn, the requirements of the *Daubert* standard. Among other things, we discussed the need for a paradigm shift from a purely applied science to one that was based on the understanding of decomposition ecology in the carrion system. My primary contribution to this paradigm shift was a re-conceptualization of the postmortem interval (PMI) from a legalistic question of "How long has this been dead?" to an ecological question of how arthropods, microbial communities, the environment amongst other things interact with a human or animal cadaver.

Under normal circumstances, after an animal, such as a human, dies, it becomes a resource patch for various necrophilous organisms. As the patch ages, it passes through a continuum of decay from fresh to dried bony remains (Haglund and Sorg 1996). In turn, various seres of arthropods colonize the corpse (Mohr 1943). The order of these seres, and their relationship to the state of decomposition have been studied in depth in a variety of long-term ecological studies in systems including humans (Motter 1898, Rodriguez and Bass 1983), dogs (Reed 1958), and swine (Payne 1965). While most of these seres, such as the larvae of blow flies (Diptera: Calliphoridae), will consume the tissue; others, such as beetles are predacious on the tissue-consumers (Payne 1965).

In order to locate and exploit a carrion resource, arthropods must go through a series of fairly discrete phases. These phases are well described in parasitoids (reviewed by Vinson (1976)) and herbivores (reviewed by Dethier (1954)). Both versions borrow from the terminology first proposed by Salt (1935). For carrion-associating insects, the

following sequence is proposed. An insect must 1.) *detect* and be activated by the presence of a resource, 2.) *locate* that resource, 3.) *colonize* the resource, in the sense of using it as either a reproduction or feeding site, and 4) *disperse* from the resource when it is no longer useful (Tomberlin et al. 2011b). These physiologically-based interactions between arthropod and cadaver can then be used to subdivide the entirety of the PMI. Prior to detection, the body is in the *exposure phase*: it may be producing cues, but insects are not yet capable of detecting them. Between detection and location lies the *location phase*, which includes both the activation of the insect by sensory stimuli (Visser 1986) and the physical act of searching for the patch (Mittelstaedt 1962), which can be two discrete events. Between location and colonization lies the *acceptance* phase, where arthropods evaluate the quality and suitability of the patch (particularly for oviposition). Finally, between colonization and dispersal lies the *colonization phase*. This phase generally constitutes the greatest percentage of the total PMI, as it encompasses the entirety of tissue consumption and corpse breakdown. Given its importance in calculating time-estimations of insect presence, the PMI can also be divided into the pre- and post-colonization intervals (pre-CI and post-CI, respectively).

Fully half of this new framework involves the process of neurosensory detection and behavioral activation, followed by searching and location of the carcass prior to colonization. This is somewhat out of proportion with the actual activity on a corpse. Blow flies have been reported to arrive on a carcass very shortly following death/exposure: 30 s (Gruner et al. 2007), 40 s (DeJong 1994), “minutes” (Watson and Carlton 2003), 10-60 min on pigs (Payne 1965), and 184-295 min on rats (Grunbaum

2002). Therefore, there is apparently some physiological mechanism that allows them to detect and respond to death very quickly, most likely some form of odor cue. Unlike the extensive electroantennagram work done with hematophagous dipteran species, not much has been done on the specific odor cues that activate carrion seeking-Diptera. Some authors working with *Lucilia sericata* (Meigen) (Diptera: Calliphoridae) have shown that neurons respond powerfully to 1-octen-3-ol, dimethyldisulfide, and 2-phenylethanol (Park and Cork 1999). Other researchers have also noted that odor was a significant component of attraction for this myiasis-causing fly (Cragg 1950, Cragg and Thurston 1950, Ashworth and Wall 1994). Significantly, odors produced by the bacteria *Pseudomonas* and *Bacillus* have been found to be strongly attractive (Emmens and Murray 1982, Wall and Warnes 1994). On a corpse, apneumone production from cell lysis and bacterial proliferation begins almost immediately after death (LeBlanc et al. 2009). Vass et al. (2008) found at least 478 volatile chemicals associated with decaying human cadavers, with volatile odor profile change substantially over the course of decomposition (Archer and Elgar 2003).

While blow flies can arrive at a corpse quickly, they have also been reported to take days to find and colonize a corpse, either due to wrapping (Goff 1992) or low temperature (Watson and Carlton 2005). Also, blow flies do not normally seek out carrion at night, though there have been at least two reports of nocturnal oviposition under artificial illumination (Greenberg 1990, Baldridge et al. 2006). Ergo, there is some form of mechanism that can delay activation in the dark, even if a carrion cue is detectable by the antennae. And much like mosquitoes (Diptera: Culicidae) attacking

some individuals at much higher rates than others (Qiu et al. 2006), it is possible that blow flies show a variation in response to individual carcasses.

Even though adult fly activity during the pre-CI "starts the clock" with larval colonization of a corpse, the pre-CI has been widely ignored by forensic entomology researchers, even in the major studies of succession (Motter 1898, Reed 1958, Payne 1965). In many cases, the species makeup of behavior, population size, and other basic parameters of the adult blow fly population are not known. One of the most basic pieces of information necessary to understand the pre-CI was simply to observe and document when and under what conditions adult blow flies appeared at a carcass.

The purpose of this study, therefore, was to examine the role of season, species, and selected environmental and physiological factors on the initiation and variation in population size at a carcass for locally dominant species of Calliphoridae. Such factors play into the critical switch between the pre-CI and the post-CI: acceptance of the carrion by the adult female flies and oviposition upon it. Independently of the production of larvae, understanding of the overall ecology of blow fly species, improves the ability to estimate the pre-CI (Tomberlin et al. 2011a). Specifically, in the case of this study, I explored the environmental and physiological mechanisms governing their interactions with the carcass. Circadian rhythms can also play an important role in regulating insect activity levels (Saunders 1997, 2009). Environmental effects such as temperature, time of day, and wind level are known to affect blow fly activity levels, to the point that activity can be mathematically modeled with some degree of success (Nicholson 1934, Digby 1958, Crystal 1964, Vogt et al. 1983, Vogt 1988, Wall et al. 1993a). With that

goal in mind, the intent of this study was to characterize the species, sex, size, time of first arrival, and population size with respect to parameters such as PMI, temperature, time of day, and season.

Based on the findings that there was a strong age structure to fly populations, the next logical step was to investigate the selection pressures supporting that structure. This portion of the investigation involved fitness and development effects on the larvae produced following colonization – effects which could alter the duration of the post-CI.

From an applied perspective, the post-CI is probably the more important of the two. Unlike the other intervals, the length of the post-CI can be estimated, making it the most common piece of evidence offered as expert testimony. Generally, the length of the post-CI is estimated based on the known developmental rates of various necrophilous species for the temperatures thought to have been experienced by the corpse, using the Accumulated Degree Day and Accumulated Degree Hour concepts of insect growth (Higley and Haskell 2010, Wells and LaMotte 2010). The exact mathematical methods for estimating post-CI (functionally equivalent to "minimum postmortem interval" (Amendt et al. 2007)) can be quite complex, ranging from simple summation to nonlinear general additive models encompassing length, weight, developmental stage, and strain/population membership (Tarone and Foran 2008). However, estimations can also be affected by succession pattern (Schoenly 1992), seasonality (Moretti et al. 2011), antemortem chemical consumption (Introna et al. 2001), presence of predators (Wells and Greenberg 1994), species makeup (Shiao and Yeh 2008), and habitat (Tomberlin and Adler 1998). There is increasing evidence for the role of genetic variation and

genetic/environmental effects on development rates, (Picard and Wells 2009, Tarone et al. 2011). Therefore, it is critical to understand many of the underlying physiological mechanisms of insect growth and development.

Development curves and datasets are available for a number of forensically important blow fly species (Diptera: Calliphoridae), including the locally significant *Cochliomyia macellaria* (F.) (Byrd and Butler 1996, Boatright and Tomberlin 2010), *Chrysomya rufifacies* (Macquart) (Byrd and Butler 1997), *Phormia regina* Meigen (Byrd and Allen 2001), *Calliphora vicina* Robineau-Desvoidy (Donovan et al. 2006), and *L. sericata* (Grassberger and Reiter 2001, Tarone et al. 2011). While the adult body size and a typical developmental trajectory are known, and are important to know, *how* these insects determine their size and development time is not known. In fact these mechanisms are known only for a few model species (Nijhout et al. 2010). Generally, body size for a given species is positively correlated with fitness, so insects might be expected to grow as large as possible given local food resources (Grassberger and Reiter 2001, Wells and King 2001, Chown and Gaston 2010). However, a large body size usually comes at the price of an extended development time (Roff 1992) This developmental extension carries increased risks of predation, parasitism, and likelihood of resource exhaustion (Nijhout et al. 2010). Therefore, body size and development time are under conflicting evolutionary pressures, which they mitigate through a trade-off between body size and development time (Davidowitz et al. 2005).

In order to survive the process of metamorphosis to adulthood, an insect must accumulate a certain degree of nutritional reserves, usually conceived in terms of body

mass. Formally expressed, minimum viable weight (MVW) represents the weight at which an insect has a 50% likelihood of surviving to the next developmental stage (Nijhout 1975, Mirth et al. 2005). How long a larva requires to reach its next stage of development is a complex function of the nutrient density, quality, and makeup of the larval food resource, coupled to physiological aspects such as feeding rate and metabolic efficiency and environmental effects thereupon (Mirth and Riddiford 2007, Chown and Gaston 2010). MVW may show some variation when diet quality is altered, with larvae needing a larger MVW if the nutritional quality is poor (Ribeiro and Von Zuben 2010).

A related, but distinct concept from MVW is critical weight (CW). CW differs from MVW in that CW is intimately connected to the pattern of hormone release and degradation during the latter part of the last larval stadium (Davidowitz et al. 2003). During the last larval instar development is regulated by a complex interplay of juvenile hormone (JH), juvenile hormone-esterase, and ecdysteroids. Prior to reaching CW, the insect larvae have high titers of juvenile hormone (JH) in their hemolymph, which prevents molting to adulthood and inhibits the secretion of prothoracicotropic hormone (PTTH) and ecdysteroids involved in every molt (Riddiford 2008). Once CW is reached, PTTH is released. This release commits the larva to pupation, regardless of body size, overall nutrition, or starvation (Nijhout and Williams 1974b, Davidowitz et al. 2005, Mirth and Riddiford 2007). However, under normal circumstances, the period between attaining CW and pupariating – called the terminal growth period (Shingleton et al. 2007) or interval to the cessation of growth (Davidowitz and Nijhout 2004) - can account for half or more of the normal peak larval mass (Ames et al. 2006).

CW splits the terminal instar into nutrition-dependent and nutritionally-independent periods, making it a possible source of the observed plasticity within the normal bounds of growth (Shingleton et al. 2007). It also connects environmentally-variable traits to genetically programmed traits, encouraging overall variation through a *genotype x environment interaction* (Davidowitz et al. 2004). CW is best understood in *Manduca sexta* (L) (Lepidoptera: Sphingidae) and *Drosophila melanogaster* Meigen (Diptera: Drosophilidae). In *M. sexta*, once PTTH has been released, the time course to pupariation is set and no further environmental variation affects it (Nijhout and Williams 1974b, Davidowitz et al. 2003). However, CW itself can exhibit change over as little as 230 generations (D'Amico et al. 2001). In *M. sexta,* CW can also be plastic by up to 30% in response to nutrition quality changes (Davidowitz et al. 2004). In the *D. melanogaster* system, it is not CW that is plastic, but the terminal growth period. Both starvation and diet quality challenges induce *D.* melanogaster to shorten this period, which accelerates pupariation and reduces adult body size (Layalle et al. 2008, Stieper et al. 2008).

As body size and development time are critical parameters for the estimation of the post-CI, characterizing plasticity in CW and terminal growth period could be very important to explaining some of the variation seen between development studies. This experiment could also serve a more ecological purpose. To determine CW, larvae are starved partway through their final larval instar (Nijhout and Williams 1974b, Stieper et al. 2008). This approach would also effectively simulate the consequences for larvae

developing on an exhausted carrion patch. Deleterious fitness effects on such larvae could explain some of age-structure found in adult populations.

Starvation is not the only potential stressor that larvae face on a carrion patch. Blow flies such as *L. sericata* often lay large clutches of eggs, exposing offspring to sibling competition (Salt 1930, Heard and Remer 1997). Many females will also lay eggs together in large aggregations, well beyond what the patch can support, incurring increased mortality and fitness costs for those surviving (Smith and Wall 1997a). Inter- and intraspecific competition on a carrion patch can be very high, particularly as many species of carrion-breeding flies have very similar niches, in apparent contravention of Gause's axiom (Denno and Cothran 1975, 1976).

For the larvae, developing en masse can be beneficial. The collective heat produced by hundreds, if not thousands, of simultaneously feeding larvae can raise the temperature by more than 30ºC over the local ambient (Campobasso et al. 2001). Increased heat speeds development (Greenberg 1991) and improves nutrient assimilation (Hanski 1976, 1977). It may also improve and ease feeding, as the salivary output and churning larval movements break down tissue into a nutrient-laden soup (Greenberg and Kunich 2002). Furthermore, the presence of many larvae may reduce the likelihood of individual parasitism or predation (Rohlfs and Hoffmeister 2004).

On the other hand, high densities of developing larvae can be highly detrimental. For most species for which intra-specific competition has been tested, increases in larval density result in reduced adult body size, longevity, and/or fecundity (Prinkkila and Hanski 1995, Smith and Wall 1997a, Wall and Smith 1997, dos Reis et al. 1999, Green

et al. 2003, Shiao and Yeh 2008). Secondary colonizers, therefore, suffer more severe intraspecific competition simply because there is less resource available for consumption (Ullyett 1950). Unless they are capable of some form of resource partitioning (e.g. temporal or spatial), their risk of mortality is dramatically greater (Hartley and Shorrocks 2002). Adult flies can enable some degree of temporal resource partitioning for their offspring by being selective about the size and location of their egg clutches, aggregating them on unoccupied carrion patches (Jaenike 1978, Scheirs and De Bruyn 2002). Simulation models show that this aggregation behavior helps support stable coexistence in a guild with very similar niches (Shorrocks and Sevenster 1995, Chesson 2000, Abos et al. 2006).

If adults do not aggregate or partition their offspring, dipteran larvae have a variety of mechanisms for coping with competition. One of the main strategies is to reduce body weight and shorten development time, even when food is not limiting (Krijger et al. 2001). Presumably, the mechanism is implemented via induced plasticity in either CW or terminal growth period, much as it might for simple starvation.

One facet of the interaction between primary and secondary colonizers is nonconsumptive effects, mediated by chemical cues. The semiochemicals and other physical cues produced in the normal course of development can potentially serve as important sources of information to secondary colonizers regarding the state of the patch, and could induce physiological and developmental shifts. During feeding, calliphorid larvae secrete digestive enzymes and other materials from their salivary glands onto their development substrate. These materials include a mixture of trypsin

and chymotrypsin-like proteases, collagenic enzymes, amylase and lipases (Price 1975, Bowles 1988, Young et al. 1996, Chambers et al. 2003). The excretions, secretions, defecation and associated microbiota could have a negative effect on subsequent cohorts. Given that carrion may only support a single generation of larvae, secreted materials of a previous generation(s) could indicate that food will be in short supply. In turn, larvae would invoke their species-appropriate mechanism for coping with food shortage. If food was not limited – as in the case of a large carrion source – the primary cohort would have pushed the secondary into a non-optimal development strategy, much as a predator might (Orrock et al. 2008). Preliminary studies have shown that such an effect can be induced between species, with a simple aqueous extract of excretions and secretions from one species dramatically affecting the second, without any food shortage effects (Tomberlin et al. 2010).

To further investigate the effects of sub-optimal oviposition by adult blow flies, I exposed larvae to chemical cues of an older cohort, and then either fed them or starved them partway through their final larval instar. The experiment tested the plasticity of development under more severe conditions than under simple starvation. It is also be a novel demonstration of intergenerational information transfer, non-predatory nonconsumptive effects, and mechanisms of compensation for adverse conditions in a forensically important blow fly species.

One of the most complex questions in a biological science is “Why?” Tinbergen expresses four perspectives from which to answer any such question: function, phylogeny, causation, and development (1963). In other words, what is the adaptive

value? What were the evolutionary pressures that shaped it? What are the physiological mechanisms involved? How has it developed in the organism in question? None of these perspectives is any more or any less valid than any of the others, but a complete understanding of any behavior requires an understanding of each. In the case of my dissertation, the effort has been to answer deceptively simple questions: What are the adult flies doing on the carcass, and why are they doing it that way? In this sense, the ultimate explanations of function and phylogeny seemed the appropriate perspective to take in these investigations, with the intent of linking deep causes with applied usefulness.

2. ENVIRONMENTAL AND PHYSIOLOGICAL FACTORS AFFECTING EARLY CARCASS ATTENDANCE IN FOUR SPECIES OF TEXAS BLOW FLIES, AND A NEW TECHNIQUE FOR ESTIMATING THE PRE-COLONIZATION INTERVAL

2.1 INTRODUCTION

Carrion breakdown is a critical ecosystem service, adding biomass and mineral content to soil and returning concentrated nitrogen to the bottom of the food web (Carter et al. 2007). The mechanism of carrion breakdown and removal is performed predominantly by arthropods (Payne 1965). Once an animal has died, arthropods begin to arrive in predictable waves, or microseres (Mohr 1943). These microseres, and their relationship to the decomposition process, have been studied in depth in a variety of long-term ecological studies in systems including humans (Motter 1898, Rodriguez and Bass 1983), dogs (Reed 1958), and swine (Payne 1965). Most of these aforementioned studies have been placed in the framework of distinct decomposition stages. There have been several different nomenclatures for the various phases, indicating the difficulty of separating a continuous process into discrete labels (Schoenly et al. 1991). In general, these studies recognize that a corpse moves through a fresh period, followed by bloating, active insect feeding, and a reduction to dried remains (Haglund and Sorg 1996). The microseres of insects that arrive at each corpse are typically described based on which phase they arrive and the overall order of phases. Historically, most of the emphasis on characterizing insect interactions with a carcass focused on the fly larvae, as opposed to

adults (Motter 1898, Payne 1965). This one-sided focus has occurred largely because estimations of the "postmortem interval" (PMI) have been based on the thermally-dependent development of larvae (Greenberg 1991). In contrast to that perspective, Tomberlin et al. (2011b) described the insect activity on a carcass as a series of physiological and behavioral responses of the insect itself to volatile allelochemicals and other cues provided by the carcass and its associated microbial flora. Fully half the phases of this framework involves the process of neurosensory detection and behavioral activation, followed by searching and location of the carcass prior to colonization. This pre-colonization portion (Pre-CI) of the adult insect relationship with carrion has been largely neglected, though some authors working with *Lucilia sericata* (Meigen) (Diptera: Calliphoridae) noted that understanding the odor-response behavior was important in preventing and controlling this myiasis-causing fly (Cragg and Ramage 1945, Cragg 1956, Emmens and Murray 1982, Ashworth and Wall 1994, Wall and Warnes 1994).

Fundamental information necessary to understand the pre-CI is documenting when and under what conditions adult blow flies (Diptera: Calliphoridae) appear at a carcass. The purpose of this study, therefore, was to examine the role of season and selected environmental and physiological factors on the arrival pattern and population size variation of the locally dominant species of blow flies. There are approximately ten species of Calliphoridae known to inhabit carrion in Texas with variable seasonal occurrence (Tenorio et al. 2003). Two of the most important summer species are *Cochliomyia macellaria* (F.) (Diptera: Calliphoridae), the secondary screwworm, and *Chrysomya rufifacies* Macquart (Diptera: Calliphoridae), the hairy maggot blow fly. *C.*

macellaria is a native species, active above about 10ºC (Deonier 1940, Tenorio et al. 2003). Although it is nearly an obligate carrion breeder, it has caused at least one case of aural myiasis in Texas (Harrison and Pearson 1968). Until the 20th century, it shared much of the desert Southwest, Texas, and Oklahoma with the congener *Cochliomyia hominivorax* (Coquerel) (Diptera: Calliphoridae), which was primarily a myiasis-causing fly rather than a carrion-breeder. A massive eradication program drove *C. hominivorax* out of the United States by 1980 (Wyss 2000).

In 1983, *Ch. rufifacies* was reported in Texas for the first time (Richard and Ahrens). Originally endemic to Australasia, *Ch. rufifacies* was introduced to South America in 1978 and since migrated north (Baumgartner 1993). *Ch. rufifacies* has now been reported as far north as Ontario, Canada (Rosati and VanLaerhoven 2007). This species is facultatively predacious and cannibalistic as third instar larvae and been known to cause myiasis (Baumgartner 1993). Unusually, female *Ch. rufifacies* produce egg clutches that are all one sex (Roy and Siddons 1939).

Two common and forensically important winter blow flies are *Calliphora vicina* Robineau-Desvoidy (Diptera: Calliphoridae) and *Phormia regina* Meigen (Diptera: Calliphoridae). *Ca. vicina* is the most cold-hardy of the local flies (Deonier 1940), with a higher metabolic rate at a given temperature than other species (Faucherre et al. 1999). It seems to be a specialist on mammal carrion (Kneidel 1984), and it has also been the subject of substantial circadian rhythm research (Saunders et al.). *P. regina* is one of the more generalist blow flies, accepting much older carrion as a colonization site than other species (Deonier 1940, Hall and Doisy 1993, Gruner et al. 2007).

After documenting the basic character of adult blow fly interaction with the carcass during early decay, some properties of adult insects might be useful in allowing the development of an analytical technique by which the pre-CI can be estimated. Aside from being a powerful technique in its own right, accurate estimations of the pre-CI are important to properly estimating the entire period of insect activity (PIA), which stretches from detection of the corpse by arthropods until either discovery of the corpse or dispersal of insects from it (Tomberlin et al. 2011b).

2.2 METHODS AND MATERIALS

Field Site

For each trial, three white commercial swine (*Sus scrofa domesticus* L.) were obtained from a commercial abattoir. The swine were mixed-sex, with individuals weighing 60-80 kg (Catts and Goff 1992). Each pig was killed by cranial trauma to avoid any tranquilizer effects (Patrican and Vaidyanathan 1995) and to better mimic traumatic human death (Schoenly et al. 2007). The Texas A&M University Institutional Animal Care and Use Committee required no animal use protocol, as the swine were deceased at the time of acquisition.

Within one hour of death, the swine were placed in rural, fallow pasture near Snook, TX (30º26’14”N/96º25’12”W). For the summer trials, pigs were killed at 07:45 and placed in the field at 08:45. In winter trials, pigs were killed at 09:45 and 08:30, and placed in the field at 10:45 and 9:45, respectively. Each pig was placed in full sun along a north/south line approximately 40 m apart at sites labeled A, B, and C. For consistency, pigs were placed on their left side with abdomens facing west. Site A was

approximately 20 m from a fence line and low-traffic county road. Site B was approximately 15 m from a large, solitary oak tree (*Quercus* spp.), and Site C was approximately 25 m from a disused shed. To prevent nocturnal vertebrate scavenging, each carcass was placed beneath a wire cage each evening.

Each carcass was observed at hourly intervals following placement in the field, between sunrise and sunset as defined by the US Naval Observatory (2011). An observation consisted of a standardized collection of ten directed sweeps of a 21cm aerial net made over each carcass within 30 s. The flies so collected were preserved immediately in labeled 4 dram vials containing ~80% ethanol. Following collections, the time, and ambient air temperature was recorded to 0.1ºC. Wind speed was assessed on a 5 point scale using a plastic portable anemometer (Dwyer Instruments, Michigan City, IN): 0 was calm, 1 was <2.25 m/s, 2 was 2.25-4.5 m/s, 3 was 4.5-9m/s, and 4 was >9m/s. Ambient light intensity was qualitatively assessed on a 3 point scale with 0 equating to deep twilight, 1 for 50-70% cloud cover, and 2 for normal daylight. Observations were made until third instar dipteran larvae were observed on the carcass.

Trials were run on 7-9 August 2008, 5-7 September 2008, 7-13 January 2009, and 24 Feb. -7 March 2010. Each trial period was selected for seasonally typical temperatures and predicted clear weather. After each trial was completed, the remains were removed to avoid as much site contamination and alteration as possible. Sites were re-used to maintain consistent microhabitat effects between trials, the likelihood of faunal enrichment effects considered negligible (Shahid et al. 2003, Schoenly et al. 2005).

Laboratory Analysis

In the laboratory, flies were removed from the ethanol and surface moisture was removed with a Kimwipe (Kimberly-Clark, Roswell, GA). Flies were identified to species and sex using Whitworth's key (2006), and those belonging to family Calliphoridae were weighed to 0.1mg on an Adventurer Pro scale (Ohaus, Parsippany, NJ). To assess ovarian physiological development, the ovaries of female flies were dissected under a standard 7x-45x dissecting microscope, following the method of Anderson (1964). Anderson's technique was chosen over Spradbery (1976) or Adams and Mulla (1967) as it did not require any subjective judgment of relative developmental stage, merely a length measurement. Ovaries were also checked for the presence of yellow bodies, follicular relics, and tracheoloar expansions to indicate prior oogenesis or oviposition (Tyndale-Biscoe 1984). The length of one random ovariole of the polytrophic panoistic ovary was measured under a dissecting microscope using a steel miniscale with 0.1mm intervals. A single ovariole was chosen instead of the entire ovary to avoid an interaction with overall body size, as smaller flies typically have fewer ovarioles (Bennettova and Fraenkel 1981).

Statistical Analysis

Only species with a total collection of more than two individuals were used for statistical analysis using SPSS 15.0 (SPSS Inc, Chicago, IL.). One-way ANOVA was used to compare temperatures, wind speed, and light intensity between trials for each season. Summer observations were paired based on the number of hours postmortem to have passed when collection was made. Winter observations could not be paired due to

the difference in length of trials. Full factorial ANOVA was run to compare number of flies collected and time of first arrival by trial, species, and position for each season of collection. As there was a difference in the total number of flies captured between trials, but not position, capture numbers were transformed to proportionate catch per observation.

Crepuscular time, amount elapsed since sunrise or time remaining until sunset was calculated for each observation (Mohr et al. 2011). Species-appropriate accumulated degree hour (ADH) values were also calculated for each observation, using a lower threshold of 10ºC for *C. macellaria* (Byrd and Butler 1996) and *Ch. rufifacies* (Byrd and Butler 1997), 8ºC for *P. regina* (Nabity et al. 2006) and 1ºC for *Ca. vicina* (Donovan et al. 2006). ANCOVA was used to regress proportionate capture data for each season, trial, species, and sex against objective time of day, wind speed, and light intensity. ADH, PMI, temperature and crepuscular time, and tested as covariates. Lowest mean square error was used to refine the regression equation. As part of this ANCOVA, Tukey's HSD post-hoc test was used to compare capture between factor levels, generally time of day. Since the observations generally did not meet the assumptions of normality or of equality of variances, the nonparametric Kruskall-Wallis (KW) test was used with Dunn's post-test co compare on-carcass population size across times of day, for species and sexes using GraphPad Instat 3.0 (GraphPad Software, La Jolla, CA). Size zero collections prior to the first capture of a fly type were omitted to avoid artificially inflating the test statistic.

ANOVA and ANCOVA were used to compare body mass between species, sexes, PMI, and postmortem day of collection. Custom hypothesis testing using the Lmatrix function was used to compare coefficients at different factor levels. ANOVA was used to compare ovariole length between species, trials, positions, and postmortem day of collection. Tukey's HSD post-hoc was used to separate levels of significant factors.

Validation Tests

Seven blind validation tests were performed to verify the findings from the standardized trials, using domestic pigs (*Sus scrofa domesticus* L.), feral pig (*Sus scrofa scrofa* L.) and a human cadaver (*Homo sapiens sapiens* L.). The use of human cadaver was approved by cooperative agreement with the Texas State University Forensic Anthropology Center. Specifics of type, size, location, cause of death, and timing of death, exposure, and sampling are summarized in Table 2.1. In tests 1-6, a trained volunteer collected adult flies with an aerial net from each validation carcass and preserved them immediately in ~80% ethanol. In test 7, flies were sampled using sticky traps placed on the cadaver for 12 h and afterwards frozen. The preserved flies and the date and time of their collection were then provided to the original experimenter (R.M.M.), who identified and dissected female ovaries as above. In the case of the flies from test 7, they were rehydrated by soaking for 48 h in ~80% ethanol before dissection. A cumulative Bernoulli experiment using a population derived from the field collections for *C. macellaria* and *Ch. rufifacies* was used to calculate the likelihood of having fewer than *n* and more than *n* "developed" ovarioles from each validation trial. For species

with an unknown ovarian population profile, the profile of *C. macellaria* was used. Based on these likelihoods, a period of insect activity estimate was generated and compared to the known carcass age.

2.3 RESULTS

Over the course of this study, 2925 calliphorid flies were collected (Table 2.2). Both summer trials were dominated by *C. macellaria* and *Ch. rufifacies* while winter trials were dominated by *Ca. vicina* and *P. regina*. In terms of total collections, for summer trials, significantly more flies were captured in trial 2 than in trial 1 ($F = 35.451$, df = 1, $P = 0.027$). There were no differences in capture between species ($F = 0.009$, df = 1, $P = 0.993$) or position ($F = 2.455$, df = 2, $P = 0.289$); nor were there significant interactions between species, trial, or position ($F < 1.152$, df = 4, $P > 0.05$). For winter trials, significantly more flies were caught in trial 3 than in trial 4 ($F = 27.712$, df = 1, $P = 0.034$). There were no significant differences in capture between positions ($F = 1.552$, df = 2, $P = 0.392$), but there was a significant interaction between trial and species. In trial 3, significantly more *P. regina* were captured than *Ca. vicina*; however, there was no significant difference in capture in trial 4 ($F = 30.577$, df = 2, $P = 0.031$).

In the case of both summer studies, the first flies observed arriving at the carcasses were captured. In the first winter trials, some probable *Ca. vicina* were observed two hours before the first flies were successfully captured. In the second winter trials, some calliphorid-type flies were observed at a PMI of 75 h. This was 26 h before any flies were captured (Table 2.3). Flies in trial 2 arrived a mean of 2.67 h before those

Table 2.1 Validation Test Subjects. Descriptions of the specimens used in the validation trials. Specimen 1 was obtained as surplus from a feral hog ectoparasite survey. Specimens 2-6 were obtained from commercial meat suppliers. Specimen 7 was used through cooperation with the Texas State Forensic Anthropology Center, San Marcos, Texas. Subjects 1-6 were sampled by aerial net, Subject 7 by sticky trap.

Variables	Specimen Number						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Site	Snook, TX	Snook, TX	CLL Airport	CLL Airport	Dayton, OH	Dayton, OH	San Marcos, TX
Species	Feral Pig	Domestic Pig	Domestic Pig	Domestic Pig	Domestic Pig	Domestic Pig	Human
Manner of Death	Cranial Trauma	Cranial Trauma	Cranial Trauma	Cranial Trauma	Cranial Trauma	Cranial Trauma	Natural
Mass	10-20 kg	20-30kg	20-30kg	20-30kg	6.8 kg	6.4 kg	47.6 kg
Time of Death	Not Known Apr 2011	15 Sept 2011, 08:25	15 Sept 2011, 08:25	15 Sept 2011, 08:25	26 July 2011 17:45	26 July 2011 17:45	25 Oct 2011 11:52
Storage, Duration	Frozen until 12 June 2011	N/A	N/A	N/A	N/A	N/A	Chilled <5 ºC
Time of Exposure	13 June 2011 15:30	15 Sept 2011 09:53	15 Sept 2011 09:19	15 Sept 2011 09:21	26 July 2011 18:27	26 July 2011 18:27	2 Nov 2011 15:00
Time of Sampling	15 June 2011 13:00	16 Sept 2011 13:00	16 Sept 2011 10:00	16 Sept 2011 10:30	27 July 2011 20:17	28 July 2011 18:43	5 Nov 2011 07:00-15:00
Avg Site Temp	30.9ºC	29.2ºC	29.2ºC	29.2ºC	25.1°C	25.5ºC	11.0 ºC

Table 2.2 Fly Capture Numbers. Numeric capture of all collected Calliphoridae adults for each species, sex, trial, and season for three pig carcasses during each of four trials in field near Snook. Texas.

	Species	Sex	Position A	B	C	Total
Trial 1	*C. macellaria*	F	118	104	92	314
	C. macellaria	M	18	10	11	39
	Ch. rufifacies	F	121	208	105	434
	Ch. rufifacies	M	2	4	5	11
Trial 2	*C. macellaria*	F	209	381	324	914
	C. macellaria	M	28	44	31	103
	Ch. rufifacies	F	247	325	267	839
	Ch. rufifacies	M	15	18	35	68
	Ch. megacephala	F	0	2	0	2
	Summer Total		758	1096	870	2724
Trial 3	*C. macellaria*	F	1	0	0	1
	Ca. vicina	F	5	8	10	23
	P. regina	F	39	28	59	126
	P. regina	M	2	5	3	10
Trial 4	*Ca. vicina*	F	12	7	7	26
	P. regina	F	1	3	2	6
	P. regina	M	4	1	3	8
	L. sericata	F	0	1	0	1
	Winter Total		64	53	84	201

Table 2.3 Time of Initial Arrival. PMI, in hours, for the initial arrival of females for each position in each trial, by species from three pig carcasses during each of four trials in field near Snook. Texas. Species with fewer than 2 collected individuals are excluded.

		Position		
Trial	Species	A	B	C
1	*C. macellaria*	10	9	9
	Ch. rufifacies	10	11	11
2	*C. macellaria*	4	12	5
	Ch. rufifacies	5	11	7
3	*Ca. vicina*	26	26	27
	P. regina	31	26	28
4	*Ca. vicina*	101	171	176
	P. regina	171	147	174

in trial 1, though this was only barely significant ($F = 19.692$, df = 1, $P = 0.047$). There was no significant difference in mean time of first arrival between species ($F = 2.769$, df = 1, $P = 0.238$) or between positions ($F = 12.538$, df = 1, $P = 0.074$), nor were there any interactions between trial, position, and species ($F < 0.692$, df = 4, $P > 0.05$). In winter, flies in trial 3 arrived a mean of 116 h before those in trial 4 ($F = 43.827$, df = 1, $P = 0.022$). There were no differences between mean time of first arrival between species or position, nor were there any significant interactions between species, position, or trial ($F < 2.615$, df < 4, $P > 0.05$).

Environmental Conditions

The summer trials were characterized by high heat, up to 38.2ºC (Fig 2.1). Trial 1 was an average of 4.2°C warmer than trial 2 ($F = 23.558$, df = 1, P < 0.01). Temperatures for both trials were consistent with the normal temperature for the area for the time of year (NESDIS 2011). Winds were generally light (Fig 2.2), and there was little cloud cover (Fig 2.3). In the first three days of the winter trials, trial 3 averaged 10.2ºC warmer than trial 4 ($F = 92.483$, df = 1, $P < 0.01$), and very close to the area's record high of 27.8ºC. On ensuing days, trial 3 was about 3.3ºC colder than trial 4 ($F = 16.6$, df = 1, $P < 0.01$), and slightly colder than the normal low of 5.0ºC for mid-January. trial 4's temperatures were generally consistent with the local area normal of 9º-20ºC for late February – early March (NESDIS 2011). Wind speed was variable in the winter trials, though trial 4 often had the strongest wind during mid-afternoon. The winter trials also exhibited at least one day each with heavy cloud cover. Trial 4 had two

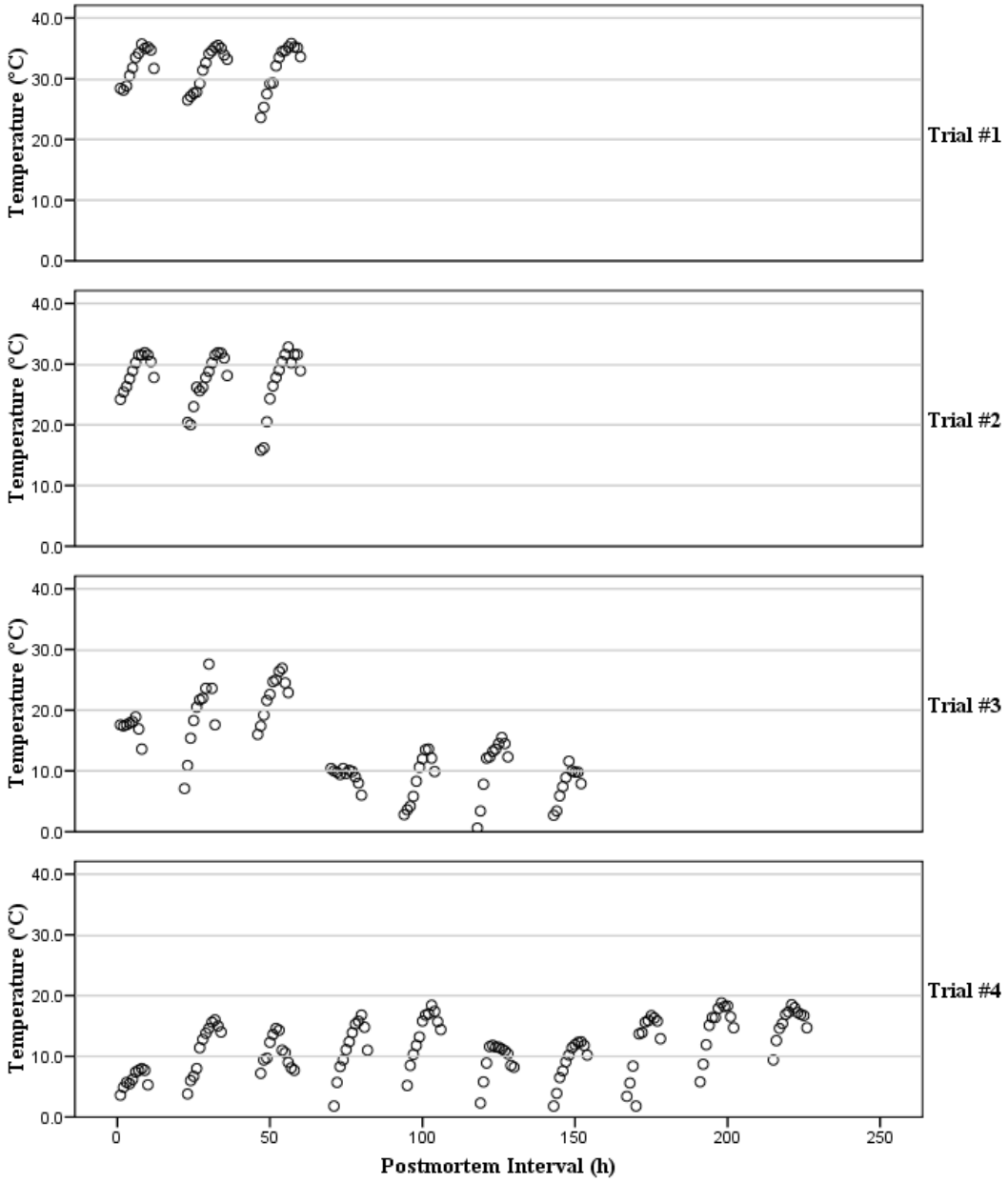

Figure 2.1 Temperature. Ambient dry-bulb air temperatures for the four swine carrion observation trials in Snook, TX. Trial 1 was run on 7-9 August 2008, Trial 2 on 5-7 September 2008, Trial 3 on 7-13 January 2009, and Trial 4 on 24 Feb. -7 March 2010. Temperature was recorded 1 m above ground to 0.1ºC immediately after fly collections.

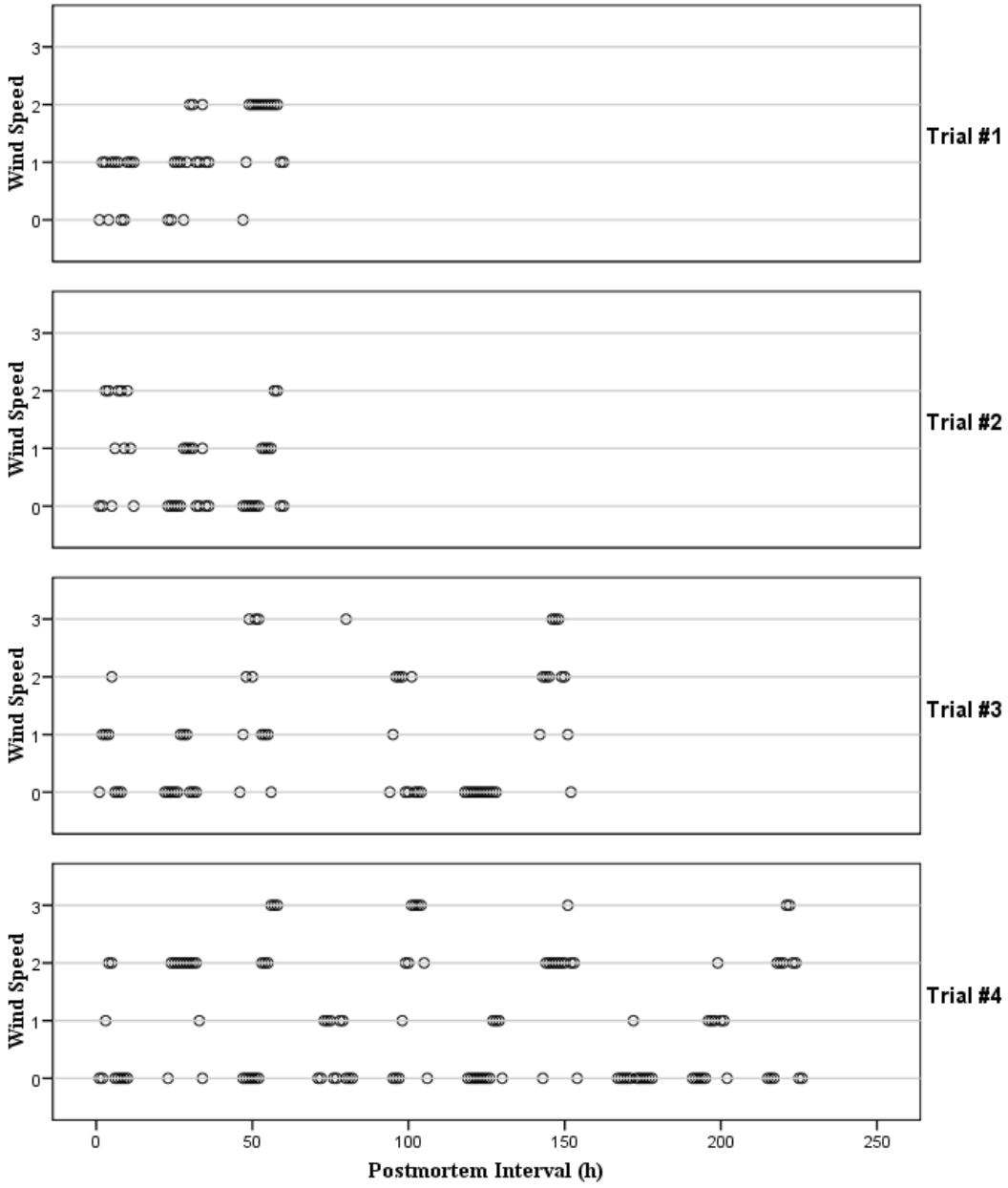

Figure 2.2 Wind Speed. Categorical wind speeds across the four pig carrion observation trials in Snook, TX. Trial 1 was run on 7-9 August 2008, Trial 2 on 5-7 September 2008, Trial 3 on 7-13 January 2009, and Trial 4 on 24 Feb. -7 March 2010. Wind speeds were determined with a portable anemometer, using the maximum gust speed in a 1 minute measurement period.

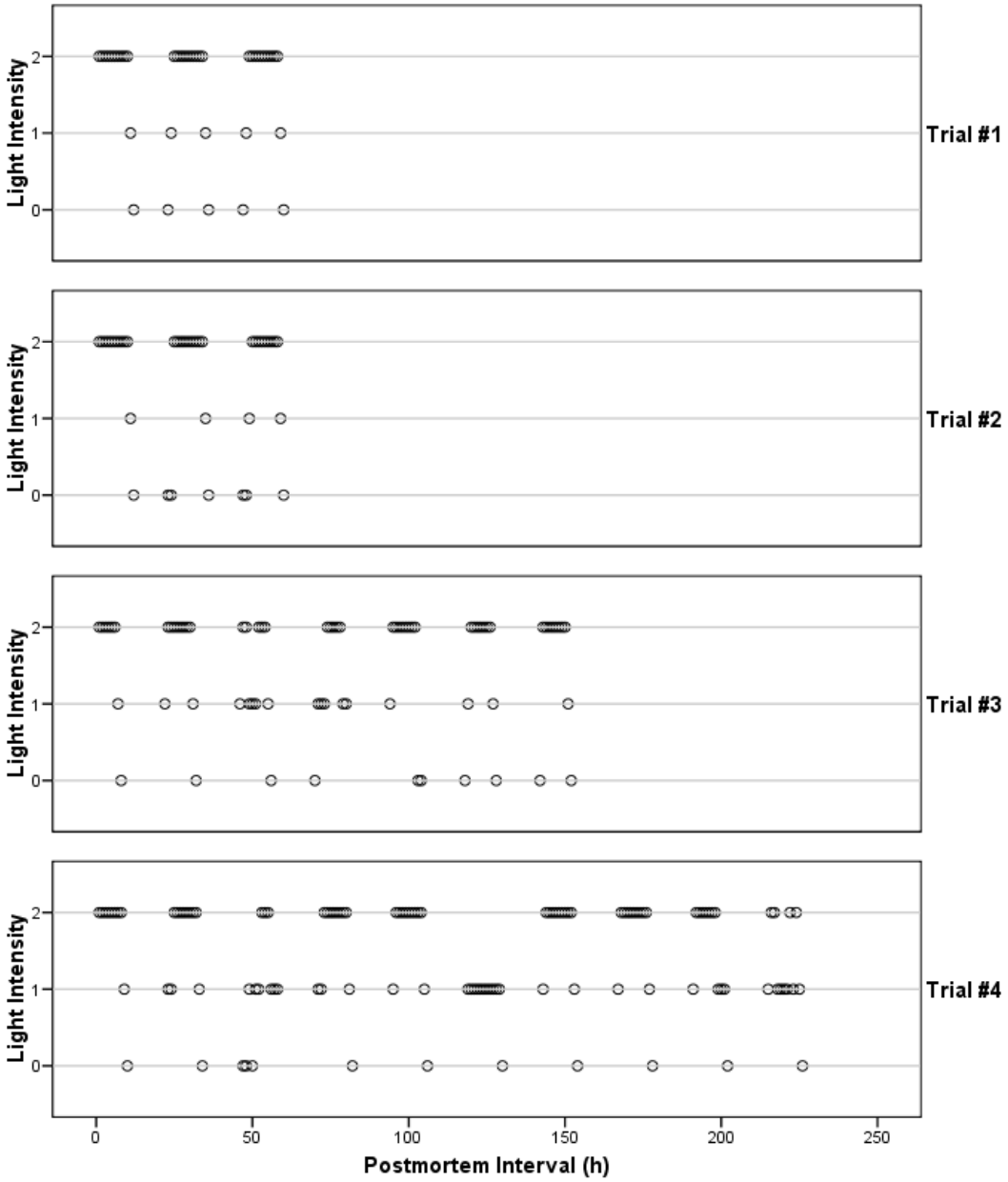

Figure 2.3 Light Intensity. Categorical illumination levels trends across the four pig carrion observation trials in Snook, TX. Trial 1 was run on 7-9 August 2008, Trial 2 on 5-7 September 2008, Trial 3 on 7-13 January 2009, and Trial 4 on 24 Feb. -7 March 2010. Illumination level was visually assessed based on degree of shadow.

rain events : a short shower at 08:30 on 26 February, and sustained light rain from 08:30-11:30 on 1 March 2010.

Environmental Effects on Carcass Attendance

For both male and female *C. macellaria*, time of day was the only significant explanatory variable, with an adjusted R^2 of 0.146 for the males and 0.179 for the females ($F > 2.038$, df = 1, $P < 0.031$). For female, the relationship between time of day and population size was borne out by the nonparametric test, with population sizes between 18:45-19:45 hours significantly higher than 06:45-08:45 (KW = 31.502, df = 13, $P = 0.0028$) (Fig 2.4). For males, no significant variation in the medians was found (KW = 20.315, df = 13, $P = 0.0876$) (Fig 2.4). Similar to the female *C. macellaria*, time of day was the only significant explanatory variable for female *Ch. rufifacies*, with an adjusted R^2 of 0.173 ($F = 2.269$, df = 13, $P = 0.3098$). They also had a significantly higher population size at 18:45 vs. 06:45 (KW = 27.198, df = 13, $P = 0.0117$).

Male *Ch. rufifacies* had a slightly more complex ANCOVA result, with PMI being the most important explanatory variable, but including a significant interaction between postmortem interval and time of day, with an adjusted R^2 of 0.300 ($F > 2.516$, df = 13, $P < 0.007$). This interaction may help explain the high standard error of the mean for *Ch. rufifacies* males in Fig 2.4.

Populations of *Ca. vicina* were explained by a complex interaction of time of day, light level, and wind level, with an adjusted R^2 of 0.178 ($F = 1.565$, df = 14, $P = 0.015$). The presence of high wind and/or heavy cloud cover significantly reduced capture during their active time of day ($F = 4.232$, df = 2, $P < 0.001$). For *P. regina*,

post mortem interval strongly interacted with time of day ($F = 2.907$, df = 10, $P = 0.002$), with later PMI seeing higher population. Males of this species, however, were explained by the interaction of ambient temperature and time of day ($F = (2.319$, df = 10, $P = 0.011$). For winter flies of both sexes, the KW test statistics showed a strong likelihood of median differences between times of day (KW > 18.275, df = 10, $P < 0.032$). Despite this low P value, the Dunnett's post-hoc test found no significant differences in capture, probably due to the large number of zero-value collections and ties.

Body Mass

Among summer flies, there was no difference in mean body mass between species, position, or between trials ($F < 0.039$, df < 4, $P > 0.843$). At 0.029 g, males weighed an average of 0.016 g less than 0.049 g females ($F = 11.508$, df = 1, $P = 0.001$). Female flies collected on the first day postmortem weighed an average of approximately 0.006 g more than on day 2 and or day 3 after death ($F = 9.591$, df = 2, $P < 0.001$). There is a significant difference between both the intercepts and the slopes for the regression lines of PMI as a function of mass ($F = 26.697$, df = 5, $P < 0.001$): PMI = 9.091 + 26.267* Mass on day 1, PMI = 32.301- 2.536*Mass on day 2, and PMI = 56.969-75.183*Mass on day 3. Similarly, there was no difference in mean body mass (0.055 g) between species, positions, or between trials for female winter flies ($F < 0.567$, df = 4, $P > 0.467$). Male *P. regina* weighed 0.014 g less than females (F = 8.245, df = 1, $P < 0.001$. No male *Ca. vicina* were collected, so there was no inter-species comparison for the male flies. For winter flies, there are significant differences in the intercepts for

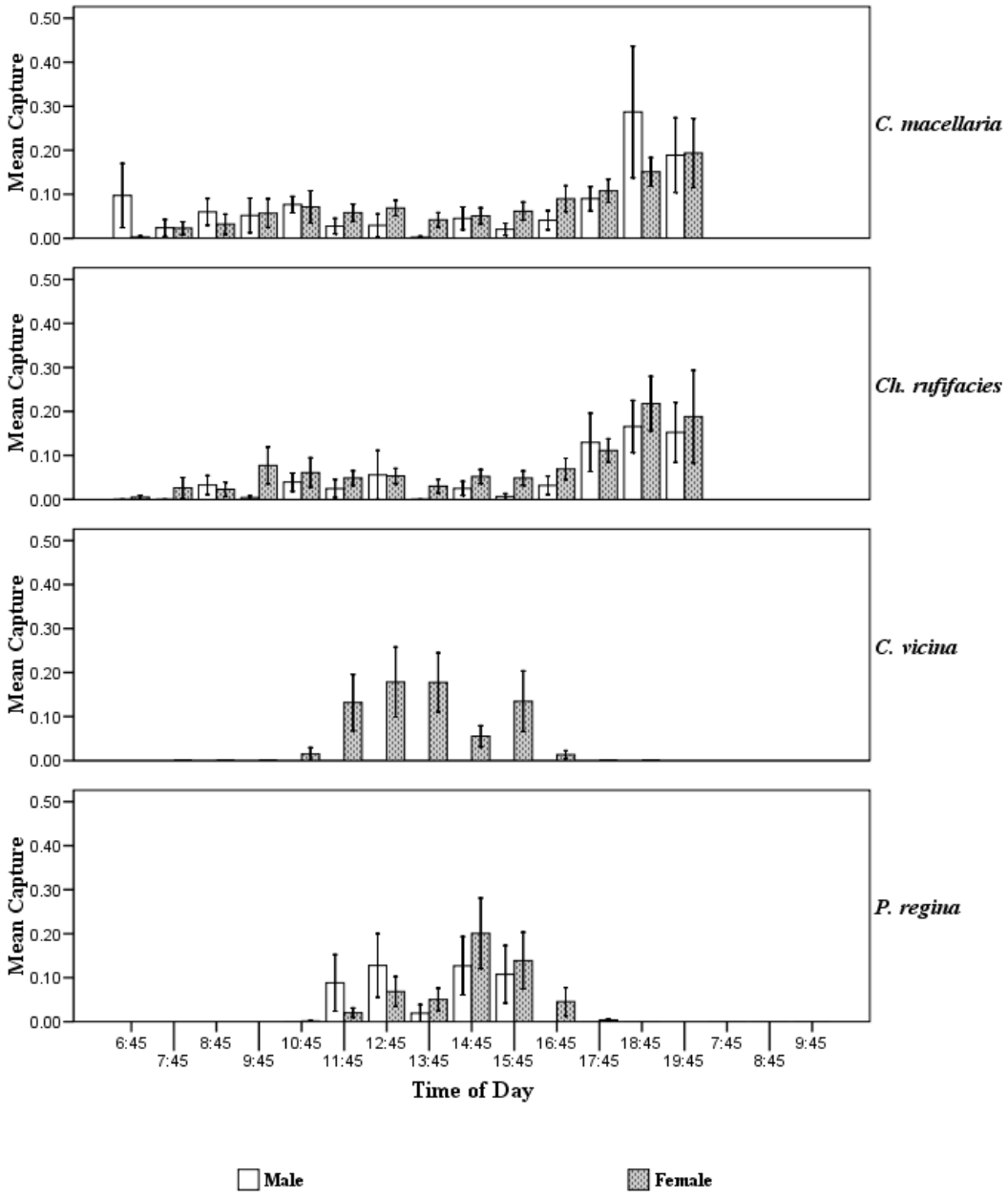

Figure 2.4 Time of Day. Mean ± 1 SEM of the percentage capture of each sex and species of fly collected from the carcasses for each time of day. Trials 1 and 2 are pooled, as are trials 3 and 4. For the summer trials, $n = 6$ for each time of day between 6:45 and 19:45. For the winter trials, $n = 51$ for each time of day.

both day of collection and species ($F > 24311.141$, df = 11, $P < 0.001$), but mass was not a significant explanatory variable (F = 1.231, df = 1, $P = 0.186$) of time of collection.

Ovarian Status

Of the 2682 female flies dissected, 2189 had measurable ovarioles. The remaining 18.4% could not be measured due to either gut perforation leading to internal degradation or severe abdominal crushing during capture and preservation. Ovarioles varied from very small (<1 mm) to fully gravid (>1.5 mm) (Fig 2.5). In the summer trials, neither trial ($F < 0.175$, df = 1, $P > 0.676$) nor position ($F < 0.272$, df = 2, $P > 0.762$) had any significant effect on ovariole length, nor did it interact significantly with species, postmortem day of collection, or with each other, allowing these data to be pooled. Species also had no significant effect on ovariole length ($F = 0.175$, df = 1, $P = 0.241$). Day of postmortem collection was the sole significant predictor of ovariole length ($F = 655.372$, df = 2, $P < 0.001$), with day 1 having a mean length of 1.428mm, day 2 a mean length of 1.009, and day 3 a mean length of 0.313 mm. Each day was significantly different from the others. For *Ca. vicina* and *P. regina*, none of the tested variables – trial, position, species, or day of collection - significantly explained ovariole length ($F < 7.047$, df < 4, $P > 0.053$).

The pronounced bimodal distribution of the ovarioles, and the strong relationship between ovariole size and postmortem day of collection lent themselves to treatment as a binomial categorical variable against which to validate and test sample populations (Fig 2.6). The cut-off for "developed" was set at ≥1.2 mm for both *C. macellaria* and *Ch.*

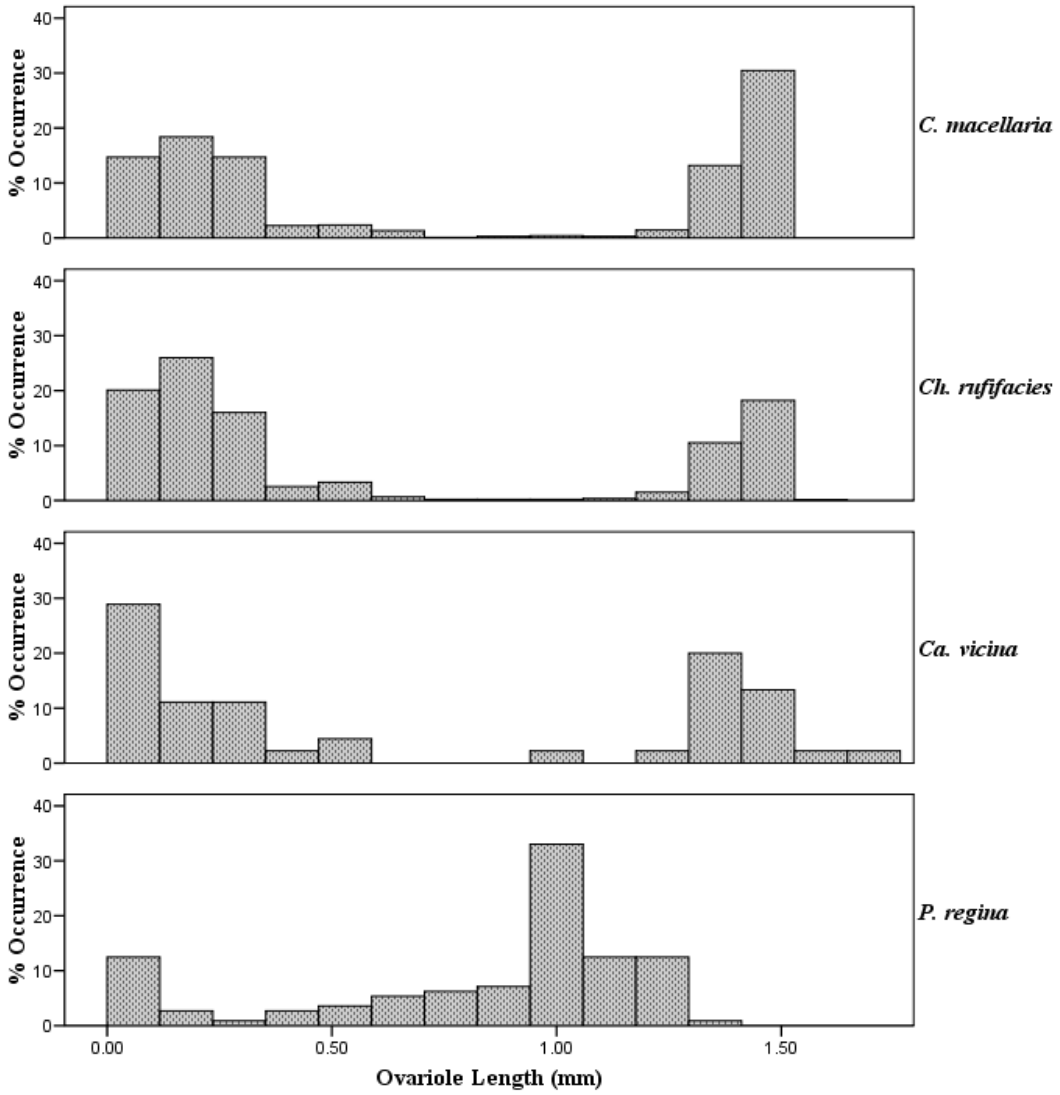

Figure 2.5 Ovariole Lengths. Frequency distribution of measured ovariole lengths for the four different tested species of blowfly collected from swine carcasses in Snook, TX over the first three days postmortem.

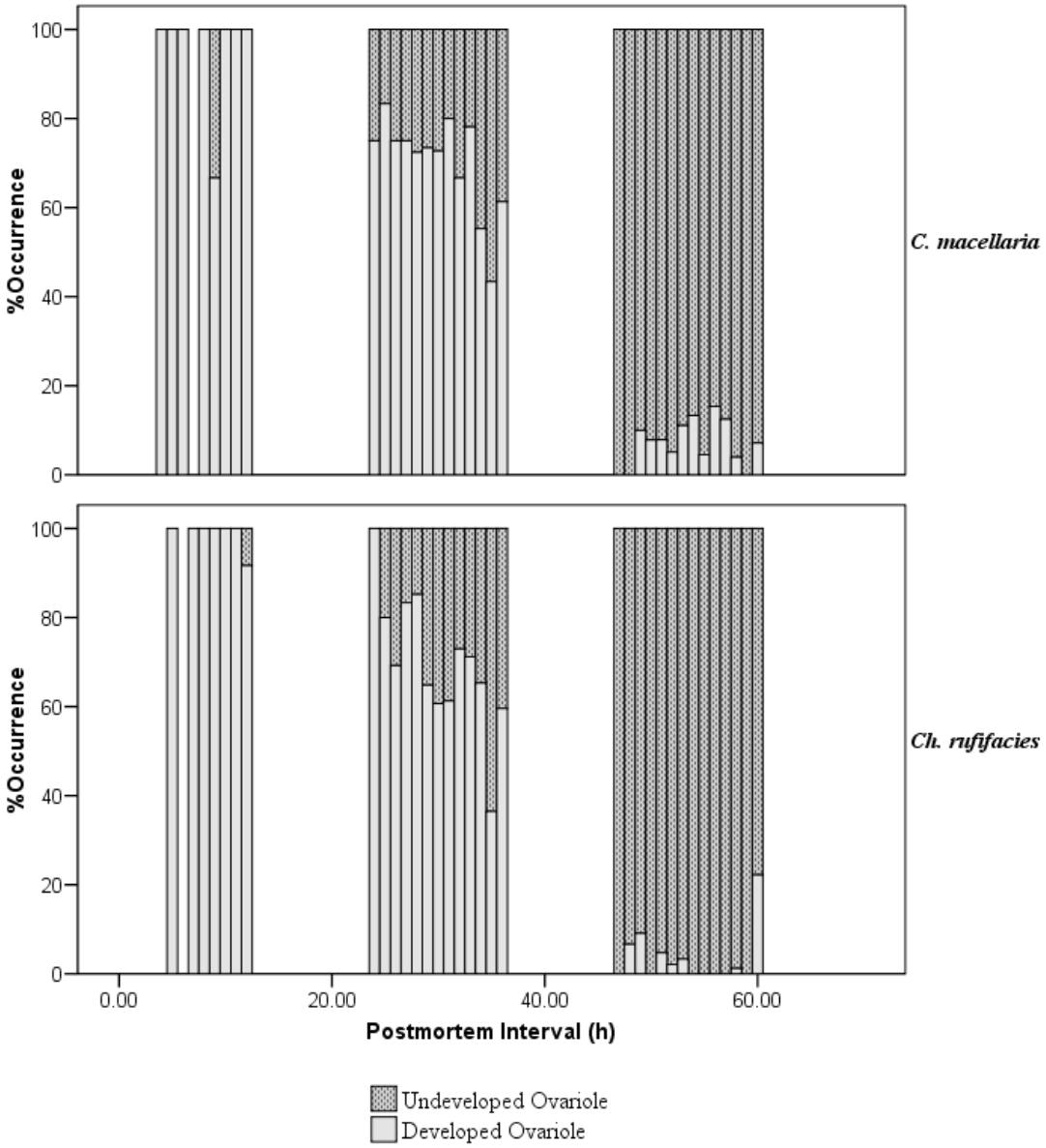

Figure 2.6 Developed/Nondeveloped Ovarioles. Daily binomial distribution of ovariole type for summer-occurring fly species, with "developed" being defined as ovariole length 1.2mm or larger. The proportion of developed flies is significantly different between each day.

Table 2.4 Binomial Probabilities. Binomial distribution parameters for the population percentage of developed ovarioles (1.2mm or larger) for the first three postmortem days for summer species.

Species	Postmortem Day	Mean	95% CI	SEM
C. macellaria	1	0.9643	0.8910-1.0376	0.0357
	2	0.6684	0.6298-0.7070	0.0196
	3	0.0775	0.0503-0.1048	0.0139
Ch. rufifacies	1	0.9756	0.9263-1.0249	0.0244
	2	0.6351	0.5890-0.6812	0.0235
	3	0.0203	0.0089-0.0317	0.0058

Table 2.5 Validation Test Results. Validation test results, using the binomial likelihood. Estimates were selected based on the number of developed ovarioles (n >1.2mm) falling within the 95% CI, then by daily probabilities using the species-appropriate binomial probabilities given in Table 2.4. For species without a known probability, *C. macellaria* was used Bracketed values are the likelihoods of finding fewer [x>n] or more [x<n] developed ovarioles than were observed.* indicates a correct estimate.

						Day 1		Day 2		Day 3			
Test	Site	Species	Sample Size	n >1.2 mm	CI Match	[x<n]	[x>n]	[x<n]	[x>n]	[x<n]	[x>n]	Estimate	Actual
1	Snook, TX	*C. macellaria*	13	8	No	<0.001	>0.999	0.237	0.557	>0.999	<0.001	24-48 h*	46.5 h
2	Snook, TX	*Ch. rufifacies*	4	3	No	0.004	0.906	0.463	0.163	>0.999	<0.001	24-48 h*	31 h
		C. macellaria	21	9	No	<0.001	>0.999	0.007	0.980	>0.999	<0.001	24-48 h*	31 h
3	CLL Airport	*Ch. rufifacies*	3	2	Yes	0.002	0.929	0.302	>0.999	0.999	<0.001	24-48 h*	26 h
		C. macellaria	4	3	No	0.007	0.865	<0.001	>0.999	>0.999	<0.001	0-24 h	26 h
4	CLL Airport	*Ch. rufifacies*	3	2	Yes	0.002	0.929	0.302	0.635	0.999	<0.001	24-48 h*	26.5 h
		C. macellaria	13	3	No	<0.001	0.999	<0.001	0.998	0.926	0.015	48-73 h	26.5 h
5	Dayton, OH	*L. sericata*	5	4	Yes	0.013	0.834	0.536	0.133	>0.999	<0.001	0-24 h	26 h
6	Dayton, OH	*L. sericata*	1	0	Yes	<0.001	>0.999	<0.001	0.668	<0.001	0.078	48-73 h*	48.5 h
		P. regina	1	0	Yes	<0.001	>0.999	<0.001	0.668	<0.001	0.078	48-73 h*	48.5 h
7	San Marcos, TX	*C. macellaria*	1	1	Yes	0.036	0	0.332	0	0.923	0	0-24 h	60-72 h
		P. regina	6	5	Yes	0.017	0.804	0.645	0.089	>0.999	<0.001	0-24 h	60-72 h
		Cy. cadaverina	12	10	No	0.008	0.934	0.816	0.055	>0.999	<0.001	0-24 h	60-72 h

rufifacies, while and "undeveloped" ovariole was <1.2 mm long. 95% confidence intervals of the mean proportion of "developed" flies in each daily population were calculated (Table 2.4).

Validation Tests

In five of the seven validations, the correct time of collection was selected, based on either a consensus of species or by selecting the longer exposure choice (Table 2.5). In one of the incorrect estimation, the estimation was generated from five or fewer individuals of untested species of flies. In the other, time of year, sampling method, and species were different than the experimental design.

2.4 DISCUSSION

Environmental Factors on Population Size

Mixed effects of wind speed on dipteran flight activity have been reported. For *Fannia conspicua* (Malloch) (Diptera: Muscidae), wind has no effect, but in *Culicoides* spp., (Diptera: Ceratopogonidae) host-seeking is generally depressed by wind (Blackwell 1997, Mohr et al. 2011). Two studies found wind to have no effect on *Ch. rufifacies*, though there was no indication of the range of speeds tested (Vogt and Starick 1985, Vogt et al. 1985*)*. In this study, the summer flies never experienced wind speeds more than 4.5 m/s (Fig 2.2), which may be below the threshold for a significant wind impact on their behaviors, although the blow fly *Lucilia cuprina* (Weidemann) (Diptera: Calliphoridae) has been reported to be flight-inhibited at speeds above 2.5 m/s (Vogt et al. 1985). However, *Ca. vicina* is capable of coordinated flight between 4.5- 8.0 m/s (Digby 1958). Wind speeds above 9.0 m/s second were observed during the winter,

which may explain why wind speed was a significant component of the regression equation for female *Ca. vicina* in this experiment.

Temperature has often been found to be a significant predictor of activity level for a variety of species, explaining 97.7% of variation in tabanid host-seeking (Cilek and Schreiber 1996) and up to 67% of variation in *L. sericata* trap counts (Wall et al. 1993b). Unlike this study, Vogt et al. (1988) found that temperature explained 74.3% of within-day variation in catch rates. That study, however, did not attempt to separate the effect of time of day from temperature, which are closely related. The significant relationship between time of day and population size at the carcass for all examined species seems to indicate that carcass attendance may have a circadian rhythm component. Solar-activated circadian control might also explain the diel behavioral patterns (Saunders 2009). For female summer flies, adult fly activity begins after dawn (Baldridge et al. 2006), and stays at a relatively constant level until significantly increasing in the two hours or so prior to sunset (Fig 2.4). Nocturnal/crepuscular activity is not uncommon in Diptera, typically in hematophagous species (Barrozo et al. 2004). However, there is an abrupt drop-off of blow fly activity after sunset (Payne 1965) and lack of nocturnal oviposition (Baldridge et al. 2006, Amendt et al. 2008). Only in cases of artificial illumination have there been documented findings of nocturnal activity of blow flies (Greenberg 1990), probably because light is an exogenous activity stimulant, particularly in the presence of an odor cue (Wooldridge et al. 2007).

For the winter species, *Ca. vicina* were only active on the carcass at midday, regardless of morning temperatures (Fig 2.4), consistent with the findings of Deonier

(1940). Heavy cloud cover was a deterrent to activity, as also documented by Payne (1965) and Deonier (1940). Heliotaxis cannot be assumed in this species, however, as Isiche et al. (1992) found them to strongly prefer shady to sunlit conditions. For *P. regina*, activity during the middle of the day is unsurprising, as this species is less cold tolerant than *Ca. vicina* –it is considered a summer active species in South Carolina, not far north of the study site (Tomberlin and Adler 1998).

Male blow flies do not require a protein meal to produce sperm (Mackerras 1933), so they are probably attracted to carcasses for mating opportunities (Archer and Elgar 2003). It is therefore unsurprising that in males, the on-carcass populations generally tracked with the relative size of female populations across the day. Syncing their activity to females increases males' likelihood of mating (Zeil 1986) and avoids substantial wasted energy (Hocking 1953). Males have a relatively narrow window of mating opportunity. After one mating, females of *L. cuprina* will be refractory to further mating attempts for up to 7 d, although the duration of their post-mating inactivation decreases dramatically if the male partner has had more than four prior matings (Smith et al. 1990). In lab colonies of *C. macellaria* congener *Cochliomyia hominivorax*, peak mating occurs at 3-4 d-old (Crystal 1964). *Chrysomya rufifacies* mate two or more days after emergence (Baumgartner 1993).

Time of First Arrival

The lack of differences among trial carcasses in terms of fly population or time of first arrival was fortuitous, though not unique (Archer and Elgar 2003). Individuals often vary in significantly in their attractiveness to host-seeking Diptera (Qiu et al.

2006), and in an intensely competitive system like carrion, aggregative colonization might be expected to facilitate coexistence (Denno and Cothran 1975, Hanski 1987). Colonization patterns can often vary immensely among different microhabitats in a relatively small area, even if the overall pattern of succession is the same (Isiche et al. 1992, Tomberlin and Adler 1998).

In summer studies, *C. macellaria* and *Ch. rufifacies* initially arrived within 1 h of one another: 9-10 h (first trial) or 4-5 h (second trial) postmortem (Table 2.3). There are a broad range of reported intervals between carcass exposure and initial adult blow fly contact in the literature, ranging upwards from 40 s (DeJong 1994) to 2 d (Tabor et al. 2004) for exposed, unwrapped carcasses. The time of initial arrival for *C. macellaria* and *Ch. rufifacies* seems to vary somewhat with season. In Louisiana, they appear on day three postmortem in the fall, but on day one and two of winter/spring (Watson and Carlton 2003, 2005). Across its range, *C. macellaria* arrives fairly regularly as a primary colonizer. They have documented arrived at carcasses quite quickly: 184-295 m after exposure to rats, 10 m-1 h of exposure to pigs, and 48-96 h of exposure to chickens (Payne 1965, Hall and Doisy 1993, Grisbaum et al. 1995). *Ch. rufifacies* is broadly considered a secondary colonizer in the United States (Baumgartner 1993), though in this study and others, it has been reported as a primary (O'Flynn and Moorhouse 1979, Eberhardt and Elliot 2008). It may simply be that *Ch. rufifacies* is an asynchronous colonizer, acting as primary or secondary with equanimity (Nelder et al. 2009).

In the winter species, the significant difference in initial arrival times is probably due to the unseasonably warm weather in the first three days of trial 3. The 20-30ºC

temperatures and low wind speeds were nearly optimal for bacterial growth, acceleration of decomposition, and volatile odor production (Campobasso et al. 2001). In this study, *Ca. vicina* and *P. regina* always arrived within 48 h of one another. This pattern is broadly similar to one Louisiana study, where both *Ca. vicina* and *P. regina* were collected on day two postmortem (Watson and Carlton 2005). However, in other literature, *P. regina* is described as a secondary colonizer, less cold hardy and preferring carcasses later in decay (Deonier 1940, Hall and Doisy 1993, Gruner et al. 2007). The difference is most likely due to climatic differences among studies, as winter in central Texas is milder than Arizona or Missouri.

Body Size

In general, body size has a large impact on insect fitness (Davidowitz et al. 2003), and strongly influences flight and locomotor ability (Hocking 1953). In female blow flies, size directly affects reproductive output, with small fly ovaries having up to 80% fewer ovarioles than those of average size flies (Bennettova and Fraenkel 1981). These smaller ovaries produce fewer eggs and lower overall lifetime reproduction (Wall 1993). Under cases of egg-limitation, they should be very selective about larval substrate, per the optimal-oviposition theory (Ward 1987). For male flies, small size carries mating penalties. Small males are less successful at inseminating larger females (Stoffolano et al. 2000). They can also mate fewer times before they stop the post-mating de-activation of females (Smith et al. 1990, Cook 1992). They might be expected to spend their time at a carcass only when the maximum number of available females is present.

In this study, body size did not affect the flies' response to the carcass, for either sex or species, indicating that small size was not a hindrance to carcass location and attendance. The mathematically significance in intercepts of the regression line for each day are expected, due to the fact that each day postmortem is a discrete set of the total PMI. For the summer flies, the significant differences in slope for the female flies are probably due to the difference in ovarian development, as fully gravid flies have more mass than non-gravid, and there is a very strong relationship between day of collection and ovarian status. The total lack of structure in terms of body size in winter flies is likely a similar result of the lack of structure in the ovarian development profile.

Ovarian Status

Female blow flies require a protein meal in order to complete oogenesis (Mackerras 1933, Roy and Siddons 1939). They also need a carrion patch or carcass upon which to deposit their eggs. Gravid flies should therefore be under strong selection to also arrive at a carcass quickly, evaluate it, and either accept or reject it (Jaenike 1978). Given the often rare, fleeting nature of carrion (Carter et al. 2007) it would seem logical that non-gravid flies should also seek a carcass rapidly to take a protein meal, complete oogenesis, and lay eggs while the carcass is still suitable for larval development, albeit at a competitive disadvantage to earlier cohorts (Kneidel 1983). In this study, there was a very strong bias for gravid flies to arrive first, but for the maturity profile to shift dramatically over the next two days to a non-gravid dominance. This partitioning may be a strategy for balancing optimal foraging for the non-gravid fly and

optimal oviposition for the gravid, maximizing fitness for both (Scheirs and De Bruyn 2002).

The primary dipteran activation and location cue from carrion are odors, with allelochemical and apneumone production begun by cell lysis and bacterial proliferation almost immediately after death (LeBlanc et al. 2009). As decomposition progresses, volatile odor profile change substantially (Archer and Elgar 2003). Vass et al. found at least 478 volatile chemicals associated with decaying human cadavers (2008). Many of these chemicals are bacterially produced - a mere four species of fluorescent *Pseudomonas* can produce 28 distinctive volatile chemicals (Pittard et al. 1982). One of the compounds produced by both human cadaver and isolated bacteria in great volume was hydrogen sulfide, which has been shown to be very attractive to *L. sericata* (Ashworth and Wall 1994). Further work with *L. sericata* electroantennography has shown that neurons respond powerfully to 1-octen-3-ol, dimethyldisulfide, and 2-phenylethanol (Park and Cork 1999). Mosquitoes (Diptera: Culicidae) and other hematophagous flies are also attracted to 1-octen-3-ol, so it may be a general animal location cue among Diptera, while the sulfide compound is probably more specifically carrion-based (Cook et al. 2011). Another compound, ammonium carbonate has been shown to serve as an activation cue, while other sulfide and indole-based putrefactive cues are probably close-range location and acceptance cues (Ashworth and Wall 1994). A last possibility for the source of attractive volatiles is bacteria proliferating on the surface of intra- and interspecific eggs (Lam et al. 2007, Brundage 2011). Obviously,

these volatiles would not be produced until after the first batch of eggs is laid, so they could not be activators or attractants to the primary colonizers.

Insect sensitivity to these compounds changes with physiological state. In mosquitoes, there is a strong inhibition to host-seek up to 72 h post blood-feeding while oogeny is completed (Takken et al. 2001). Similarly, 3-d-old, liver-fed, mid-oogeny *L. sericata* did not respond to a liver odor plume, while fully gravid and protein starved 3-d-old *L. sericata* showed a strong attractive response (Wall and Warnes 1994). If that response pattern holds for other blow fly species, it might explain why so many studies, including this one, have failed to collect many mid-oogenic flies. In one experiment using raw liver exposed for one day, 25 of the collected *Ch. rufifacies* were in Spradbery stage II-IV of ovarian development (equivalent to about 0.1-0.4 mm in ovariole length), and 92 were in X or gravid (equivalent to 1.3-1.5mm ovariole length) (Spradbery 1979). Using untreated liver-based traps over a period of 18 d, Mackerras (1933) found the vast majority of flies caught had <50% vitellogen deposition. The longer duration of that study suggests that after the first cohort of females oviposits, gravid flies are no longer attracted to a carcass in large numbers, and the ovarian status profile on subsequent days might look like that of day 3 in this study. In a counterexample, using sheep's liver treated with sodium sulfide, Hayes et al. (1999) collected a marked overabundance of young, non-gravid flies over a single day. Though the liver in this experiment was fresh, the addition of sodium sulfide might have effectively mimicked a later stated of decomposition, attracting young instead of mature flies.

Protein is not the only necessity for blow flies to fully develop eggs. For *L. sericata*, mating is usually necessary to complete the process, and they mate 2-3 d before ovipositing (Mackerras 1933). Likewise, female houseflies, *Musca domestica* L., (Diptera: Muscidae) prefer to mate when their ovaries are at developmental stage 6 of 10 (Adams and Hintz 1969). Accordingly, many of the female flies collected on the second day, and nearly all of the flies collected on the third should have been if not receptive, recently mated. This idea was borne out by observed mating was on the carcass. The availability of receptive females further explains the presence of males, and why males of *Ch. rufifacies* were more abundant later into the PMI.

Validation Tests

For *Ch. rufifacies*, if the sample proportion fell within fell within the 95% confidence interval for one of the three postmortem days (Tests 3 and 4), the day after death was correctly estimated (Table 2.5). In fact, every estimate based on *Ch. rufifacies* was correct, while those based on *C. macellaria* were only correct 2 of 5 times. However, for test 3, the actual PMI was 26 h, while the *C. macellaria* data predicted an interval of 0-24 h, which is not far off. In the other incorrect estimation, test 4, the true PMI was underestimated by 48-72 h. The pig for test 4 was placed less than 50 m from the pig used in test 3, exposed only 2 min after it, and sampled 30 minutes after it. The two tests should have had similar sample makeup; however, the pig in test 4 was deeper into the woods, which may have delayed initial attraction. If initial attraction and oviposition were delayed, gravid females may have been preferentially attracted to the test 3 pig by the odor of conspecific eggs. Such an attraction could have left the test 4

pig with an abnormally large number of non-developed flies on the second chronological day postmortem. The other possibility is that in different habitat (forested vs. open pasture), there is a different relationship between ovarian physiology and carcass age.

For the Snook site, where the original populations were collected, the estimations were always correct, as was one of the airport sites, less than 20 km away. None of the estimations for Ohio were correct. However, for both tests 5 & 6, the pigs were exposed very late in the evening. Given the low incidence of nocturnal blow fly activity and oviposition (Baldridge et al. 2006), the second chronological day postmortem would have served as the first daylight period postmortem, shifting the ovarian status profile by approximately one day and causing a 24 h underestimation of minimum PMI. In the case of test #6, minimum PMI was overestimated by one day, though with only one fly collected per species, it would be mathematically impossible to differentiate between a day 2 and a day 3 estimation: both would round to an expected one developed fly. Small sample sizes would be a drawback to widespread application of this technique. One alternative approaches to analysis with very small populations would be to incorporate Bayesian analysis, which would make *a posteriori* estimates of group membership, but would also require knowledge of the likelihood of sampling from any given day (Stamey et al. 2005). However, Bayesian analysis using 1/3 as the likelihood of sampling still assigned the highest probability to day 3 for test #6. Another small sample-size technique would be to use a correction factor such as the Wilson or Adjusted Wald to generate confidence intervals for the individual samples, and compare on the basis of overlapping/nonoverlapping intervals (Agresti and Coull 1998, Agresti and Caffo 2000).

Using these techniques, test #6 could not have been assigned to any particular day postmortem; the confidence intervals all overlapped.

Test #7 represented a special challenge, as it differed from the experimental setup in terms of species (human instead of pig), geographic location & environment, and temperature. While the generated minimum PMI was not accurate, it does bear out some useful findings. All three of the species of calliphorid collected from the cadaver, including the previously untested *Cynomya cadaverina* Robineau-Desvoidy, had similar patterns of ovarian development, and consistently predicted the same time interval. This result would seem to indicate that physiological age-structuring holds across more species than the four tested in this experiment, and across at least part of the colder part of the year. This cold temperature may have caused the underestimation of the minimum PMI. While the cadaver had been exposed to insects for 60 h when the sticky trap was placed, the average temperature for the previous two days had been cold (a low of 2.0°C) and windy (gusts up to 16.5m/s) (NOAA, 2011). Both of these factors could have delayed blow fly arrival, as discussed above. The sample collector also reported negligible blow fly activity on the cadaver during the first two days of exposure. Therefore, the estimates were correct in the sense that they placed the collections as taken during the first 24 h that the flies were actually on the carcass. As a result, use of this technique under cases of unusual weather conditions could cause a significant under-estimation of the PMI.

2.5 CONCLUSIONS

In this experiment, during both winter and summer, the size of the fly population on the carcass was governed by time of day and extreme weather conditions. Species in each season had a notably similar diel pattern of behavior. These two facts seem to indicate that carcass attendance for these four species of necrophilous flies is governed by an endogenous circadian mechanism (Saunders 2009). Understanding the circadian rhythm of blow flies to a carcass may make it possible to predict how likely adult blow flies are to react to and locate a carcass at a given time of day. When paired with basic ecological information such as relative species abundance, understating the diel pattern of activity would make the estimation of the pre-CI and the PIA much more accurate and reliable, something that has long been a challenge for forensic entomologists (Tomberlin et al. 2011b). Elucidating the complex relationship between daily activity levels, neurophysiological responsiveness to carrion-associated volatiles, and habitat might also help resolve the high level of variation in the reported exposure, activation, and location phases of the postmortem interval.

The extremely structured changes in the ovarian status of blow flies on the carcass present some remarkable opportunities to understand their behavioral ecology. Separation of reproductively developed from non-developed flies suggests that many blow females will use two separate carrion patches in their lifetime. The first time, they exploit it as a consumer. The delayed response of immature flies is consistent with optimal foraging theory, as by the time the carcass has reached active decay, the corpse fluids provide easily accessed protein (Archer and Elgar 2003). Furthermore, even

carcasses in late decay provide appropriate protein for the purposes of oogenesis (Huntington and Higley 2010).

While the immature interaction with carrion may be to find food, it is also an exercise in response to a resource. As most blow fly species are generalists with regard to the type of carrion they will oviposit upon, they typically are less efficient at identifying and locating resource, and because of this inefficiency, they incur greater ecological risk (Bernays 2001). Experience with a first carrion patch when they are not yet mature may improve their ability to detect and evaluate a subsequent patch when they are ready to oviposit, as seen in parasitoids (Wajnberg 2006). Optimum oviposition theory states that flies should "choose" to oviposit on the most suitable resources for larval development, balanced with the probability of encountering better alternatives and the capacity for reproductive output (Jaenike 1978). "Choice" can fall along a continuum, if only partial egg clutches are laid across space or time (Ward 1987). However, if an insect lacks the ability to rank alternatives, or if learning is counterbalanced by heredity or other forces, optimal oviposition theory may not be valid (Mayhew 1997). Furthermore, the forces shaping optimal clutch size for a patch may be working in an opposite direction from those shaping optimal aggregation (Denno and Cothran 1975, Hanski 1987) For blow flies, at least a few of these critiques may be valid. Given the presence of other female flies, even dead ones, *L. sericata* will oviposit without being able to evaluate the substrate (Barton Browne et al. 1969). Female *Drosophila* carrying high egg loads deposit larger clutches on lower quality hosts and, based largely on a heritable genetic component (Minkenberg et al. 1992). However, it is

the integration of these theories that begin to explain how a relatively short-lived fly would make use of two ephemeral resources in its lifetime.

From a forensic perspective, understanding the ecology of the adult blow flies and their interaction with the carcass allows them to serve as predictors of minimum PMI in the absence of corresponding larvae, and an important step forward in estimating the complete PIA (Tomberlin et al. 2011a). Although some have advocated collection of adult flies at scenes (Smith 1986, Haskell and Williams 2008), their use has been largely to validate larval identifications. Too little is known about the various early colonizers to reliably estimate the true period of insect activity or the pre-CI based strictly on adult flies at a scene. Only rough guesses can be made about adult flies' relationship with a carcass based on species, habitat, or time of year. As a result, only the post-CI of the PMI is typically calculated.

Even if it is not yet possible to estimate how long it takes flies to find a given corpse, using their ovarian status, the length of the adult's association can be estimated using the Bernoulli distribution and 95% CI of the mean ovariole length for the first three days after death (Table 2.4). This technique has much potential. The use of objective measurements and numerical probabilities means that it should meet the *Daubert* standard for scientific evidence (1993). Adult blow flies could be particularly useful as indicators in cases where the body is very fresh, as eggs and first instar larvae can be difficult for field investigators to locate (Catts and Haskell 1990). Success of the single trial with more than one *L. sericata* from Dayton, OH, and the partial success in San Marcos, TX also imply that this technique may be applicable for a variety of species

and locales, though further research into species and geographic variation would be required. However, there are some caveats. Although five of the seven validation trials did correctly estimate the PIA, one overestimated by nearly 48 h and one underestimated it by 48 (Table 2.5). The lack of ovarian status data for species other than *C. macellaria* and *Ch. rufifacies* mean that error rates and probabilities are unknown when generating estimates for non-tested species. And the apparent effect of weather in test 7 indicates that environmental factors cannot be ignored completely.

Further population surveys are necessary to understand how the behavior of the adult blow fly relates to carrion, both in terms of proximal and ultimate causes. Further validation, particularly with species that have different seasonality than Texas species is also a necessity before the use of the ovarian-based PIA estimate can be widely adopted. Both aspects of research show potential to improve the field of forensic entomology.

3. ELUCIDATION OF PARAMETERS OF BODY SIZE AND DEVELOPMENTAL PROGRAMMING IN *COCHLIOMYIA MACELLARIA* (F.) (DIPTERA: CALLIPHORIDAE)

3.1 INTRODUCTION

For most insects, the control of development time and body size is of great interest, due to the way these parameters impacts survival, offspring production, dispersal, and resource consumption (Chown and Gaston 2010). Understanding the mechanisms and variation in both is an ongoing exploration (Mirth and Riddiford 2007). Most species have a typical adult body size and developmental trajectory, but the mechanisms and evolutionary pressures shaping these processes are not very well known outside of a few models species (Nijhout et al. 2010). Generally, body size for a given species is positively correlated with fitness (Grassberger and Reiter 2001, Wells and King 2001, Chown and Gaston 2010). In the family Calliphoridae (Diptera), increased body size improves fecundity (Bennettova and Fraenkel 1981), mating success (Stoffolano et al. 2000), and probably improves dispersal ability (Hanski et al. 2000). However, a large body size usually comes at the price of a long development time (Roff 1992). Extended development time carries increased risks of predation, parasitism, and increased likelihood of resource exhaustion (Nijhout et al. 2010). Therefore, body size and development time are under conflicting evolutionary pressures, which they mitigate through a trade-off between body size and development time (Davidowitz et al. 2005). It is thought that both aspects are controlled by only a few factors: initiation size of the final immature stage, growth rate during the immature stage, photoperiodic

gating/circadian rhythms of hormone release, critical weight, and the time delay between reaching critical weight and cessation of feeding (D'Amico et al. 2001). As the link between encouraging further growth and then regulating the time of stopping growth, critical weight is an important part of determining overall plasticity in terms of body size and developmental duration (Davidowitz et al. 2003).

Size and Nutrient Assessment

The mechanisms by which insects gauge their own size are poorly understood (Davidowitz et al. 2003). *Rhodnius prolixus* Stal (Hemiptera: Reduviidae) seems to begin metamorphosis in response to stimulation of abdominal stretch receptors, even if that meal is only saline (Cragg 1950, Faucherre et al. 1999). The system is even simpler for the dung beetle *Onthophagus taurus* Schreiber (Coleoptera: Scarabaeidae), for which the onset of pupation is dictated by the depletion of their larval food-ball (Shafiei et al. 2001). In the model species *Drosophila melanogaster* Meigen (Diptera: Drosophilidae) and *Manduca sexta* (L.) (Lepidoptera: Sphingidae), the systems are somewhat more complex.

Insulin/insulin-like signaling (IIS) is essential for normal insect growth, by serving as an indicator of nutrient intake (Geminard et al. 2006). Much as in mammals, the IIS system induces cells to uptake glucose and produce glycogen, increasing their energy reserves, as well as general cell growth and proliferation (Oldham and Hafen 2003). Production of at least two of seven *Drosophila* insulin-like peptides (DILP) is nutrition-dependent, and if all insulin-neurosecretory cells are ablated, the adult is severely stunted. Conversely, if the DILPs are over-expressed throughout development,

the outcome tends to be significantly increased body size (Smeeton et al. 1984, Mirth and Riddiford 2007).

The IIS system is also closely intertwined with the Target of Rapamyacin (TOR) complex. Where IIS is primarily a carbohydrate nutrient sensor, TOR responds to free amino acids (Oldham and Hafen 2003), and controls the transcription of numerous protein-associated metabolic pathways in eukaryotes (Jaenike 1978). TOR also promotes cell growth by increasing translation and ribosome production, encouraging endocytosis, and by suppressing autophagy (Hennig et al. 2006). The TOR pathway receives information about carbohydrate availability through coupling with the insulin pathway via protein kinase Akt. This enzyme serves a variety of roles, including promoting growth through uptake of glucose and suppressing the Tuberous Sclerosis Complex that deactivates TOR. It also deactivates the transcriptional repressor Forkhead Box, Class O (Taniguchi et al. 2006, Mirth and Riddiford 2007). The TOR complex, plays its most significant role in nutrient sensing in the fat body (Colombani et al. 2003). In response to free amino acid concentrations, the fat body responds by an as-yet unknown factor - possibly a DILP stabilizer, imaginal disc growth factor, or an adenosine deaminate related growth factor – which upregulates DILP production (Faria et al. 2004). Together, the TOR and insulin-signaling pathways in the cells of the fat body allow for both growth and nutrient sensing in the entire body.

Somewhat separate from the nutrient-sensing pathways, there is some evidence in *Drosophila* that ecdysteroid hormones may be an important signaling molecule in determining body size. In mutants with inhibited ecdysteroid synthesis, larvae grow

unnaturally large. When treated with exogenous ecdysteroid, these large larvae pupate on a normal schedule (Colombani et al. 2005). Mirth et al. (2005) suggest that as the corpora allata grows (which is nutritionally based), it secretes a small amount of ecdysteroid independently of other hormones. The antagonist effects of IIS and ecdysone, therefore in the early part of each larval stadium is probably the mechanism that prevents premature metamorphosis (Colombani et al. 2005, Chown and Gaston 2010).

Minimum Viable Weight

In order to successfully survive the metamorphic process, insect larvae require a certain level of stored nutrients, particularly the lipids that are so heavily metabolized during the pupal stage (Merkey et al. 2011). Minimum viable weight (MVW) represents the weight at which an insect has a 50% likelihood of surviving to the next developmental stage (Nijhout 1975, Mirth et al. 2005). At its heart, MVW represents the necessary nutrient accumulation to survive metamorphosis, a "period of indispensable nutrition" (Nijhout 1975). Therefore, the length of time to reach MVW will be a function of the nutrient density, quality, and makeup of the larval food resource, coupled to physiological aspects such as feeding rate and metabolic efficiency and environmental effects thereupon (Mirth and Riddiford 2007, Chown and Gaston 2010). In *M. sexta*, MVW is 3-4 g. Larvae that are starved before reaching that weight either die without pupating, produce a supernumerary larvae, or form nonviable larval-pupal intermediates (Nijhout 1975). Similarly, for *D. melanogaster,* 3rd instar larvae (L3) starved before a MVW of 0.68 mg die without pupating (Stieper et al. 2008). Unlike other events in the

control of body size, attainment of MVW is not typically associated with any particular hormonal control event. However, it may be related to nutrient makeup; if a particular nutrient is present in unusually low proportion in a larvae's diet, it may shift MVW upward (Ribeiro and Von Zuben 2010). This result is consistent with the nutritional rail concept for herbivorous insects – larvae with no diet choice are forced to consume more food total to gain sufficient amounts of a limiting nutrient (Behmer 2009).

Critical Weight

Critical weight (CW) is distinct from MVW in that CW is intimately connected to the pattern of hormone release and degradation during the latter part of the last larval stadium (Davidowitz et al. 2003). It is also typically larger than MVW, though they may occur very close together (Mirth et al. 2005). Prior to reaching CW, the insect hemolymph is dominated by juvenile hormone (JH), which maintains morphostasis and inhibits secretion of prothoracicotropic hormone (PTTH) and ecdysteroids (Riddiford 2008). JH titer then drops as the last larval instar progresses. At CW, two distinct hormonal events occur. The corpora allata stops secreting JH, and there is a subsequent release of JH-esterase to clear the hemolymph of remaining JH (Stoffolano et al. 2000, Davidowitz et al. 2003, Chen et al. 2004). The initial decline of JH also allows for the first is release of PTTH from the brain. Upon the release of PTTH at CW, the larvae begin a hormonal cascade that commits them to pupation, regardless of further nutrition or starvation (Nijhout and Williams 1974b, Davidowitz et al. 2005, Mirth and Riddiford 2007). However, PTTH release is not strictly required for successful pupation. PTTH-ablated *Drosophila* larvae grow more slowly and larger than normal larvae, but are

capable of initiating and surviving pupation (McBrayer et al. 2007). In normal larvae, PTTH's major function is as a timer, controlling proper progression and duration of growth, activates the prothoracic glands (in Diptera, the ring gland) via a cAMP/protein kinase pathway (Nijhout and Williams 1974a, Smith and Gilbert 1989, Disney 2005). In *M. sexta*, PTTH release is regulated by a light-biased photoperiodic gate. If CW occurs when the gate is closed, nutritionally-based growth continues until the next day cycle (Truman and Riddiford 1974). This does not appear to be the case in *D. melanogaster*, which do not seem to exhibit any photoperiodic gating, though PTTH production does show an ~8 h periodicity (Edgar 2006, McBrayer et al. 2007).

Once PTTH has been released, the prothoracic glands/ring gland begin to release a small amount of ecdysone, which is metabolized to the active form 20-hydroxyecdysone (20E) (Mirth et al. 2005, Warren et al. 2006). When CW is reached, juvenile hormone esterase (JHE) production also spikes, largely clearing JH from the hemolymph (deKort and Granger 1996, Browder et al. 2001). In the absence of JH, 20E causes the larvae to eventually stop feeding, purge its gut content, and seek out a pupation site (Chown and Gaston 2010). For many insects, the period between attaining CW and the cessation of feeding is an important part of reaching their normal adult weight. This terminal growth period (Shingleton et al. 2007) or interval to the cessation of growth (Davidowitz and Nijhout 2004) can account for half or more of the normal peak larval mass (Ames et al. 2006). Shortly after wandering, there is a large pulse of JH production, as a prelude to physical pupation/pupariation. This pulse is seen in both *D. melanogaster* and *M. sexta (*Baker et al. 1987, Sliter 1987), where is followed by a

large release of PTTH (McBrayer et al. 2007), inducing a very large peak of 20E as physical metamorphosis begins (Warren et al. 2006). This second JH pulse is cleared within 12 h of puparium formation by a very large pulse of JHE (Campbell et al. 1992). Clearance of JH during the pupal stage is critical, as the simultaneous presence of JH and 20E causes the molting insect to simultaneously express a mixture of immature and adult traits (Wigglesworth 1940, Nijhout 1983).

Developmental Plasticity

CW splits the terminal instar into nutrition-dependent and nutritionally-independent periods, making it a possible source of the observed plasticity within the normal bounds of growth (Shingleton et al. 2007). It also connects environmentally-variable traits to genetically programmed traits, encouraging overall variation through a genotype x environment interaction (Davidowitz et al. 2004). Growth rate in particular is highly affected by environmental factors such as nutrition, temperature, and crowding (Edgar 2006). Variation in growth rate has different effects based on whether it occurs before or after CW. Slow growing, nutrient deprived larvae take a long time to reach the CW, which extends developmental time and reduces body size (Layalle et al. 2008). Conversely, an overexpression of growth rate means CW is reached sooner, decreasing developmental duration and increasing body size. After CW is reached, however, changes in growth rate (such as those induced by temperature) do not effect development time, but vary final body size (Davidowitz et al. 2005). Variation in the TGP seems to be a mixture of genetic and environmental control. In *M. sexta*, the time course to pupariation is set once PTTH has been released, no further environmental variation

affects it (Nijhout and Williams 1974b, Davidowitz et al. 2003). In *Drosophila,* however, the length of the TGP is highly influenced by starvation, with complete starvation shortening the TGP, but low nutrition extending it to allow flies to reach near-normal size (Stieper et al. 2008). Photoperiodic gating is probably largely genetically controlled, though it is obviously environmentally activated (Saunders 2009).

In *D. melanogaster*, altered diet quality does not lead to changes in CW (Layalle et al. 2008), though temperature and genetic strain can influence it (De Moed et al. 1999). However, in *M. sexta,* Davidowitz et al. (2003, 2004) showed that individual CWs in a single generation may range from 6-8 g. Between siblings fed on different quality diets, CW varied significantly based on diet quality, but there are no CW changes in response to temperature. However, when all three conditions were considered together, changes in individual CW did not explain body size plasticity to selection pressure. Further mathematical modeling with *Manduca* shows that with other factors held constant, a substantial range of CW has little effect on the final body size, but substantial effects on development time (Nijhout et al. 2010). There is also evidence that CW can also change in response to evolutionary pressure. Over 30 y, the CW for *M. se*xta in a lab strain has increased from 5 g to 6 g (D'Amico et al. 2001). However, change in the CW alone should be unlikely, as changes in the CW and TGP should be synergistically selected (Davidowitz et al. 2005). General phenotype stability is likely stabilized by conflicting pressures on body size and development time, preventing runaway selection for small bodies or fast growth (Nijhout et al. 2010).

Forensic Relevance

The most common task for a forensic entomologist is estimation of post-colonization intervals based on immature larvae in the family Calliphoridae (Diptera) (Catts and Goff 1992). Estimations are typically made based on the stage of development, possibly coupled with size information (Byrd and Castner 2010), so understanding the control mechanisms underlying immature growth is critical to explaining and estimating size and development plasticity and variation. It is known that temperature is the major driver of growth, particularly the concept of accumulated degree hours/accumulated degree days (Catts and Goff 1992). Growth curves for many species of forensically significant species have been published, linking temperature, age, and occasionally length or mass (Reviewed in Higley and Haskell (2010). These curves often allow for strikingly accurate estimates of larva age over known temperatures. They also provide two of the five developmental control factors elucidated by D'Amico et al. (2001): initial larval size and growth rates. However, they do not account for other environmental effects on development time such as larval nutrition or crowding, or how body size and development time might be traded off. The presence of such a tradeoff would have significant effects for post-colonization interval estimation. For example, if normal development time is traded for body size, variably-sized pupae could not be estimated as the same age as smaller. Conversely, if normal body size is traded for development time, pupae of the same size could be variably aged. This investigation, therefore, documents the normal development in terms of time and body size for a forensically important blow fly species, *Cochliomyia macellaria* (F.). Temperature-

driven growth rate and tissue type effects have already been documented in this species (Byrd and Allen 2001, Boatright and Tomberlin 2010). By providing estimates of CW and TGP, I then describe four of the five general development control factors, and begin to document any trade-offs that might impact forensic age estimation.

3.2 METHODS AND MATERIALS

Fly Stocks

All flies used in this experiment resulted wild-type *C. macellaria* collected as larvae from decomposing feral pig (*Sus scrofa* L) carcasses located within 20 km of Texas A&M University. Developing larvae were kept in 28.0 cm L x 15.5 cm H x 30.0 cm plastic containers filled with approximately 500 mL sand and provided beef liver *ad libitum*. After all larvae had pupariated, pupae were sifted from the sand medium and placed in 250ml plastic cups, which were placed into 30 cm^3 cages covered in fine mesh screen. Adult flies were fed *ad libitum* sucrose, powdered buttermilk, and water. Beginning approximately 6 d post-emergence, adults were provided 10-20 g pieces of raw beef liver in a small plastic bowl to use as a protein source and oviposition site. Egg-laden liver was then placed atop a folded paper towel in a fresh larval rearing box. All larvae used in this experiment were the F_2-F_8 generation to avoid excessive drift from the wild genotype (Mason et al. 1987). In the laboratory, all stocks were maintained at 27°C and a 12:12 L:D cycle in a walk-in growth chamber.

Measurement of Critical Weight

This experiment was modeled on methods by Nijhout and Williams (1974b) and Steiper et al. (2008), with slight modifications to accommodate the biology of the test

species. Multiple cages of female *C. macellaria* were provided approximately 200 g of raw beef liver each and allowed two-hour interval for oviposition. As soon as sufficient oviposition for the number of trials was confirmed, all of the frozen human food-grade beef liver to be used as larval diet was defrosted, and all of the individual rearing cups prepared so that when the larvae were transferred later in the experiment, they would be placed on food of the same age and thermal history. For each repetition, 180 individual 30 mL plastic cups were filled with 2.5 mL autoclaved play sand and 0.25 mL of deionized water. Half of these cups were also provided an approximately 1 g pellet of beef liver, more than sufficient for larval development (Rosa et al. 2004). The cups were closed with a cardboard cap and stored in a Percival I-36LLVL (Percival Scientific, Perry, IA) stand-up incubator at 27ºC, 12:12 L:D, and 60%RH until use.

Eggs for all experiments were collected between 17:00 and 20:00 hours. Eggs were removed from the liver, separated with a moistened paintbrush, and intermixed to maximize genetic diversity in each trial. Approximately 0.05 (± .005 g) of eggs were weighed on an Ohaus Adventurer Pro scale (Parsippany, NJ), then transferred to a 28.0 cm x 15.5 cm x 30.0 cm plastic "master box" holding 500 mL of autoclaved sand, and 250 g of beef liver resting on a folded white paper towel. The master box and all of the individual cups were then placed in a stand-up incubator at 27ºC, 12:12 L:D, and 60% RH. Every 24 h throughout the experiment, 7 mL of deionized water was added to the master box, and 0.25 mL was added to each of the individual cups.

To synchronize observations with the onset of the L3, beginning at 64 h after oviposition and every two hours thereafter, ten larvae were removed from the master box

and checked for stadium. When at least 80% of this sample had reached the L3, starvation observations were initiated. At each observation, ten larvae were randomly selected from the master box. Each individual larva was weighed to 0.0001 g on the Ohaus scale, and assigned to either a cup with a food pellet (fed condition) or a cup without additional food (starved condition). Observations were made every 2 h for the first 24 h of the L3. After the first 24 h, observations were made every 6 h. Observations at 6 h intervals were identical to 2 h intervals, save that the individual larvae in their cups were checked for pupariation, death, or escape. The first 5 pupa from the master box were placed into individual cups containing only 2.5 mL play sand (mass-reared condition). The individuals in this collection were used to check for differences between mass-reared and individually-reared pupae. All pupae were weighed to 0.0001 g on the Ohaus scale, approximately 12 h post-pupariation and placed in 2.5 mL of autoclaved sand. Observations were made every 6 g until the last individual had either pupariated, died, or escaped. The pupae were then checked every 12 h for eclosion. For each individual, the following data were recorded: date and time of removal from the master box, weight at removal, time of pupariation, pupal weight, time of eclosion, sex, and treatment.

Six repetitions were run in three different incubators, each monitored with a HOBO data logger (Onset Applications, Pocasset, MA). Different incubators were used to avoid pseudoreplication.

Statistical Analysis

Statistical analyses were performed with SPSS 15.0 (SPSS Inc, Chicago, IL). Initial and final instar weights were assessed as the mean weight for the first and last larval observations of each trial. MVW for pupariation was determined using binary logistic regression against larval weight and repetition for starved individuals. For MVW to eclosion, binary logistic regression was used with trial number and either larval or pupal weight (Mirth et al. 2005). To test for a nutritional or rearing effect in eclosion success, treatment was included in the model testing the effect of pupal weight. When visually comparing the relationship between time to pupariation and weight at starvation, it was apparent that trial #2 had a dramatically different slope than the other five repositions. Trial #2 had suffered extensive fungal growth on the food pellets over the course of the experiment. Given this aberrance, trial #2 was excluded from further analysis. CW was assessed by creating LOESS curves for fed and nonfed treatments for each repetition and for pooled data. LOESS parameters selected were 30% of points to fit and the Epanechnikov kernel. As the data were largely linear, ANCOVA was also used with treatment, trial and larval weight regressed against time between initial observations and pupariation. Regressions were examined for the break-points, changes in slope, or regression intersections indicative of CW (Stieper et al. 2008). ANCOVA was also used to test the effect of larval weight on the total duration of the 3rd instar, using trial and treatment as factors. Lastly, L3 duration, pupal durations and total development were compared with ANOVA, with treatment, trial, and sex used as factors.

3.3 RESULTS

Over the course of this experiment, 1040 individual larvae were tracked. Of these, 270 males and 275 females emerged. There were a total of 62 escaped larvae (5.96%), 13 from the nonfed treatment and 49 from the fed treatment. Larvae began the third instar at 0.0091 g (95% CI: 0.0085-0.0096 g), and completed it at 0.0463 g (95% CI: 0.0428-0.0499 g). This demonstrates that 80.34% of maximum larval weight was attained during the third instar, though there was some variation in degree and growth rate between trials (Fig 3.1). Pupae of the nonfed treatment weighed an average of 0.022 g (95% CI: 0.021-0.023 g), the fed treatment 0.031 g (95%CI: 0.030-0.32 g), and the mass-reared pupae 0.039 g (95% CI: 0.037-0.042 g). These were significantly different ($P < 0.001$). There was no difference in mass between the sexes ($F = 2.215$, df = 1, $P = 0.137$), but there was a significant difference between trials, with trial #1 having the lowest mean weight and trial #6 having the highest. There was no significant difference between trials 3, 4, or 5.

Larval mortality was clustered around low larval masses for both the fed and nonfed treatments, though overall mortality was much lower in the fed treatment (Fig 3.2). For estimating the MVW for pupariation, trial number was not a significant part of the logistic regression equation (Wald = 8.285, df = 5, $P = 0.141$). The simple logistic model ($\chi^{2} = 395.912$, df = 1, $P < 0.001$) gave 50% likelihood of survival to pupariation

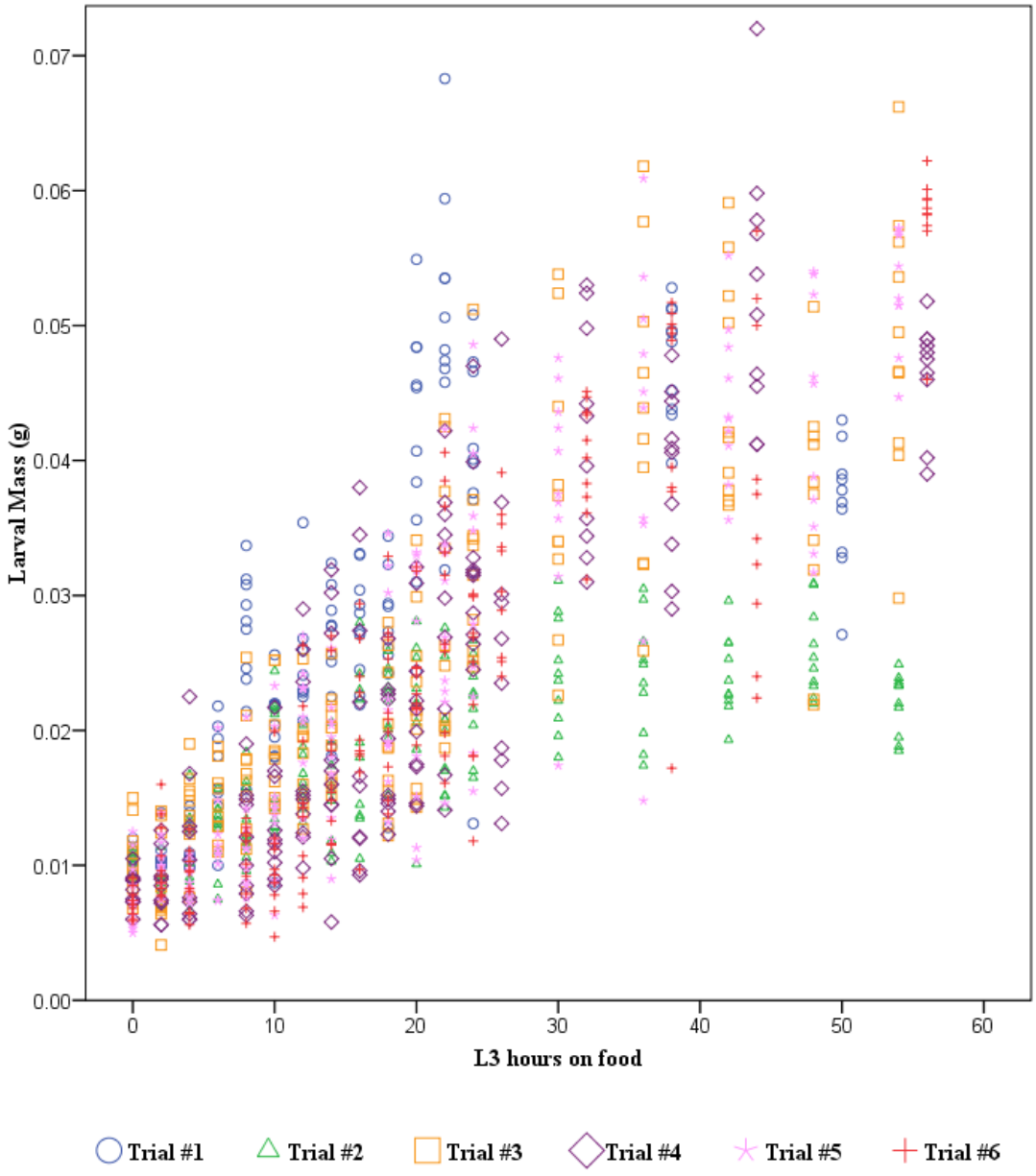

Figure 3.1 Larval Mass. Larval mass of *C. macellaria* reared in the master box, as a function of the duration of feeding during the L3. Each experimental repetition is plotted as a different color and indicator shape.

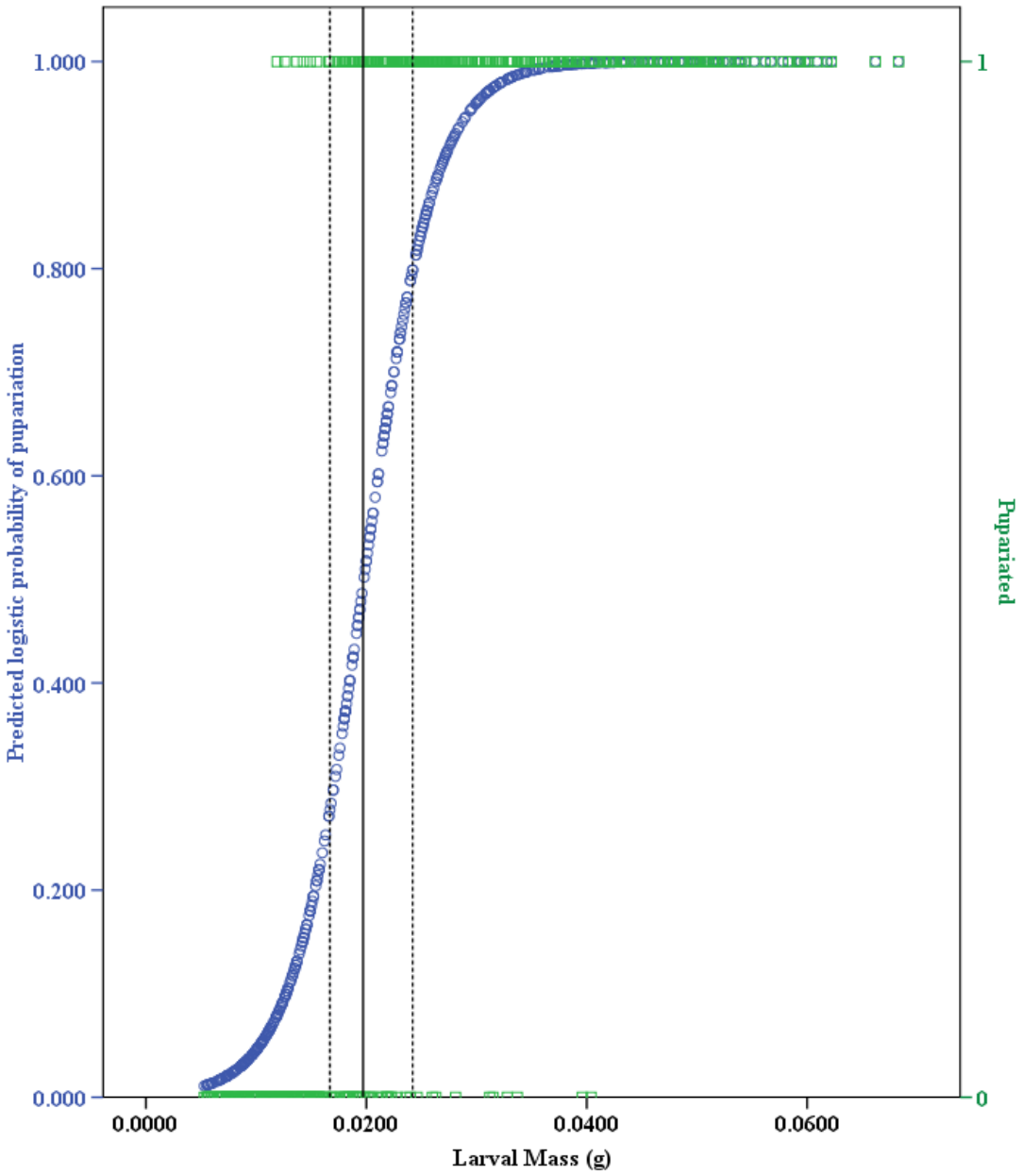

Figure 3.2 Minimum Viable Weight for Pupariation. Failure/Success at pupariation for nonfed *C. macellaria* larvae reared in individual cups (right axis), plotted with the predicted survival for each larval weight from the binary logistic regression equation (left axis). Solid vertical rule marks the 50% likelihood of survival, and dotted lines mark the bounds of the 95% CI.

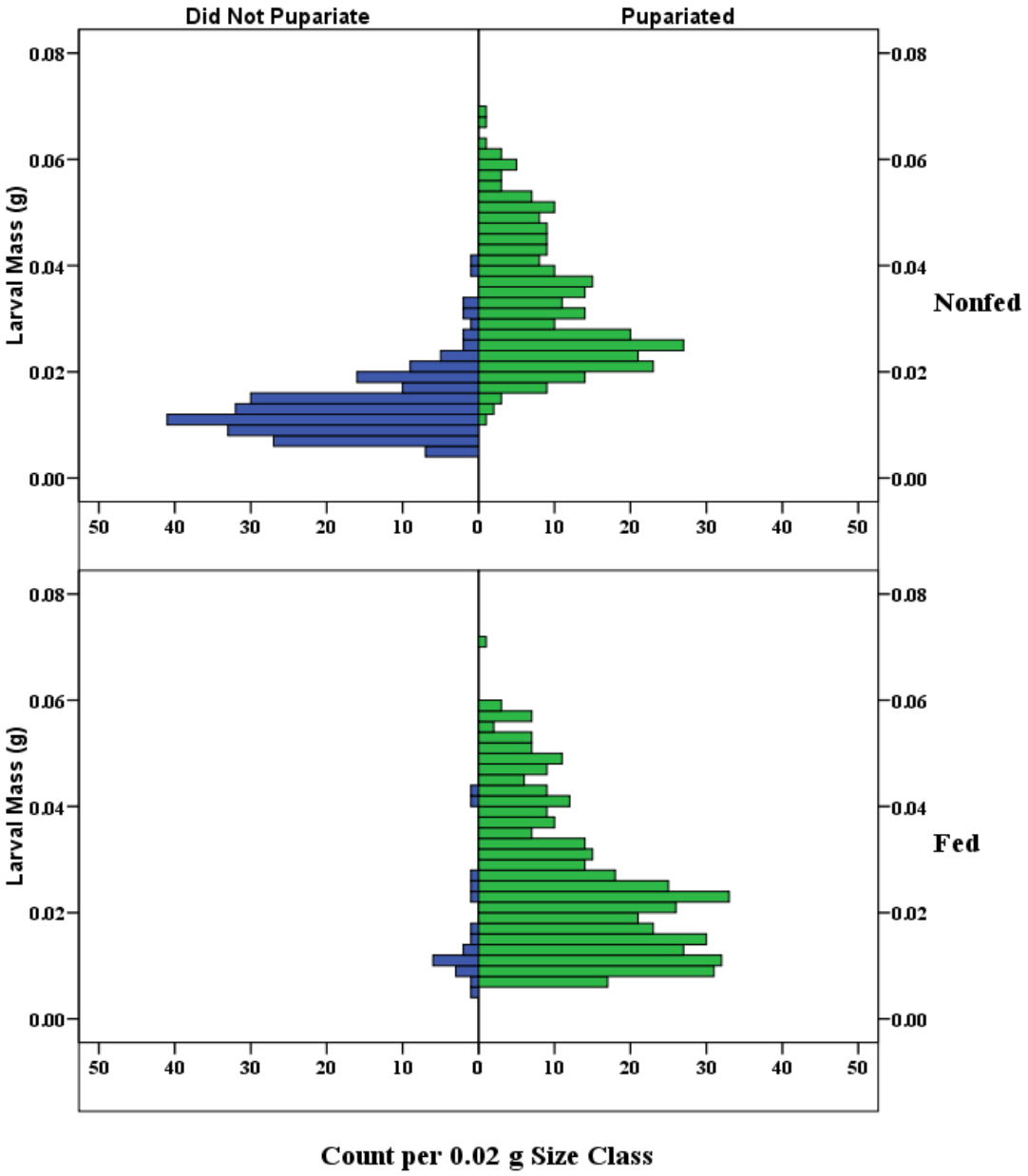

Figure 3.3 Pupariation Success. Observed frequency of failure to pupariate (blue) and successful pupariation (green) for each 0.002 g size class of *C. macellaria* larvae reared in individual cups. Successful pupariation was defined as formation of a sclerotized, smooth puparium with mouth hooks fully retracted.

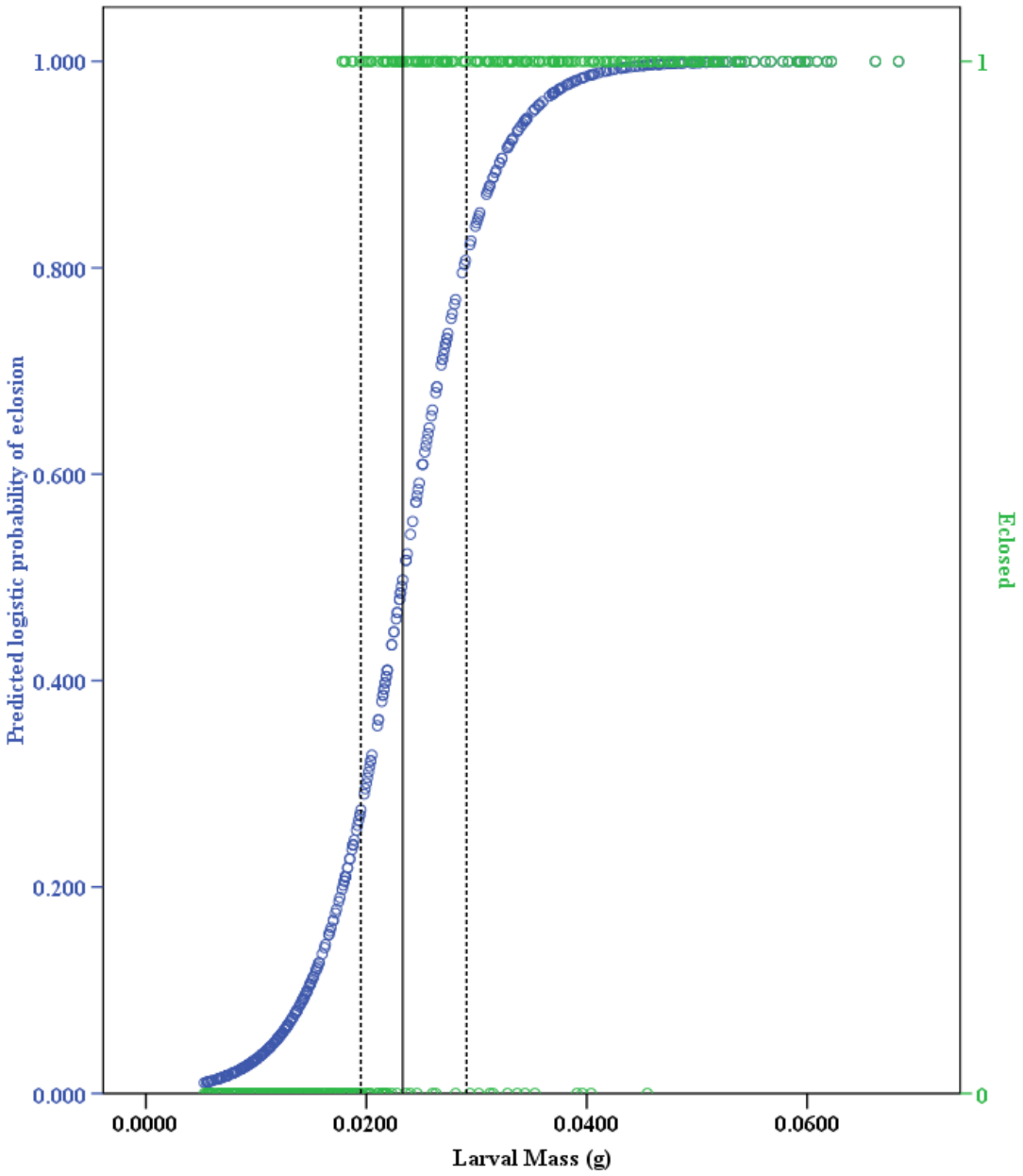

Figure 3.4 Minimum Viable Weight for Eclosion. Failure/Success at eclosion for nonfed *C. macellaria* larvae reared in individual cups (right axis), plotted with the predicted survival for each larval weight from the binary logistic regression equation (left axis). Solid vertical rule marks the 50% likelihood of survival, and dotted lines mark the bounds of the 95% CI. Successful eclosion was defined as complete escape from the puparium, retraction of the ptilinum, and inflation of the wings.

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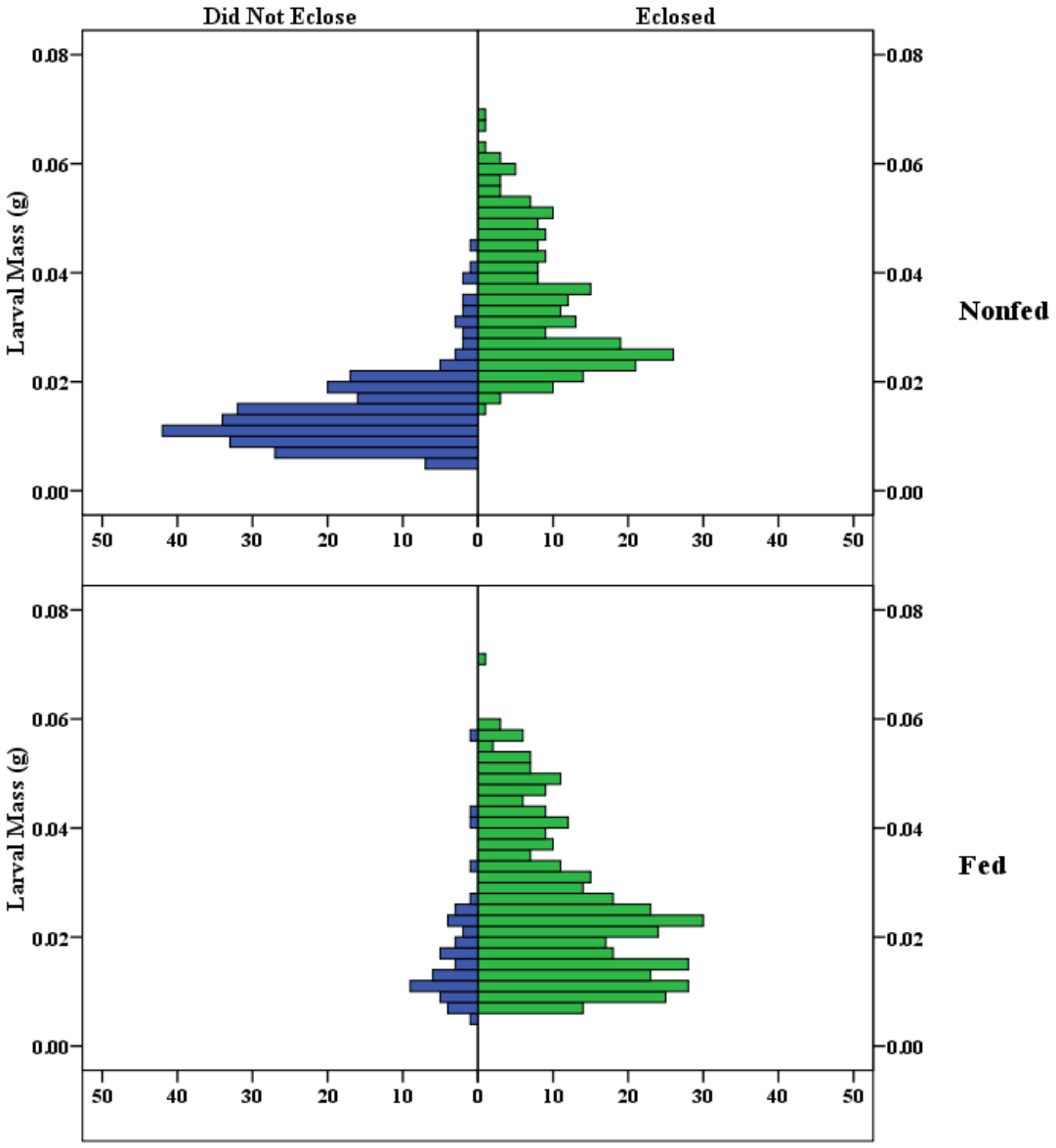

Figure 3.5 Eclosion Success. Observed frequency of failure to eclose (blue) and successful eclosion (green) for each 0.002 g size class of *C. macellaria* larvae reared in individual cups. Successful pupariation was defined as formation of a sclerotized, smooth puparium with mouth hooks fully retracted.

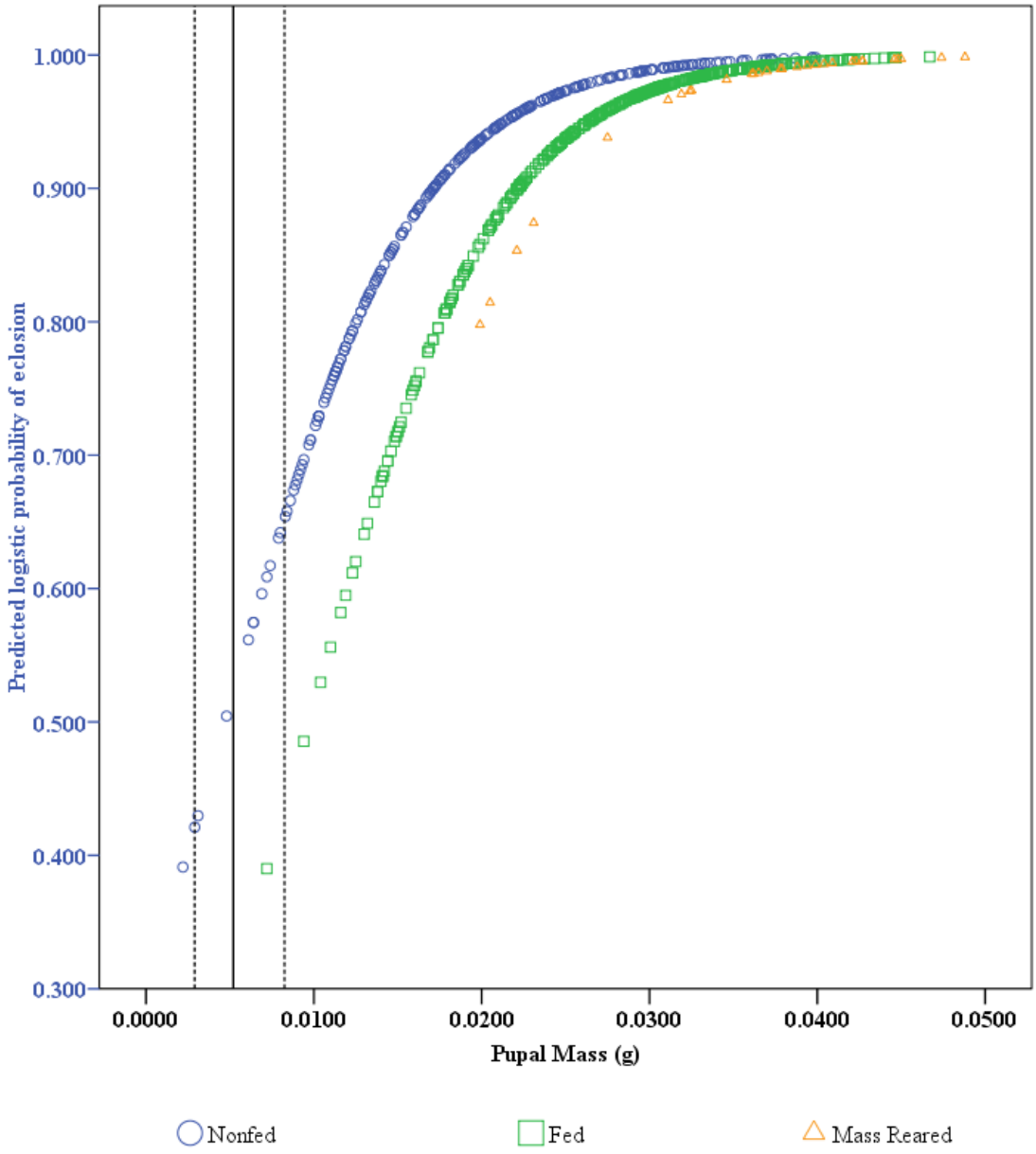

Figure 3.6 MVW for Eclosion, by Pupae. Predicted success of eclosion for *C. macellaria* pupae. Each treatment is marked with a different color and indicator. Solid vertical rule marks the 50% likelihood of survival, and dotted lines mark the bounds of the 95% CI for this non significantly different group.

when larvae were starved at 0.0197 g (95% CI: 0.0167-0.0242 g) (Fig 3.3). As with pupariation, pupal mortality was clustered around low larval masses for both fed and nonfed treatments,. Overall pupal mortality was higher in the nonfed treatment (Fig 3.4). For estimating minimum viable weight of eclosion using larval mass as the explanatory variable, trial number was significant if trial #2 was included in the dataset (Wald = 13.069, df = 5, P = 0.023). If trial #2 was removed, trial ceased to be significant (Wald = 4.823, df = 4, P = 0.306). The logistic model ($\chi^{2 =}$ 331.146, df = 1, $P < 0.001$) estimated a minimum viable weight for eclosion at 0.0233 g (95% CI: 0.0195-0.0291 g) (Fig 3.5), with a Nagelkerke pseudo-R^2 of 0.728. When nonfed treatment pupal weight was used as the independent variable, the 50% survival was at 0.0081 g (95% CI: 0.0058-0.0132 g) ($\chi^{2 =}$ 57.444, df = 1, $P < 0.001$, Nagelkerke pseudo-$R^{2 =}$ 0.442). When all three treatments were tested together, there was no difference between trials (Wald = 7.927, df = 5, P = 0.160), or among treatments (Wald = 7.323, df = 2, P = 0.026,). Minimum viable pupal weight for eclosion for pooled treatments was 0.0052 g (95%CI: 0.0029-0.0052 g) ($\chi^{2 =}$ 57.402, df = 1, $P < 0.001$, Nagelkerke pseudo-$R^{2 =}$ 0.230) (Fig 3.6).

LOWESS curve generation for time from removal from the master box until pupariation for the pooled data seemed to indicate a break point in starved flies at approximately 0.250 g (Fig 3.7). However, when the trials were analyzed separately, the break-point appeared to be an artifact of inter-trial variation. On an individual basis, the relationship became approximately linear (Fig 3.8). ANCOVA analysis revealed that there was no difference in slope between fed and nonfed treatments (F = 2.750, df = 1,

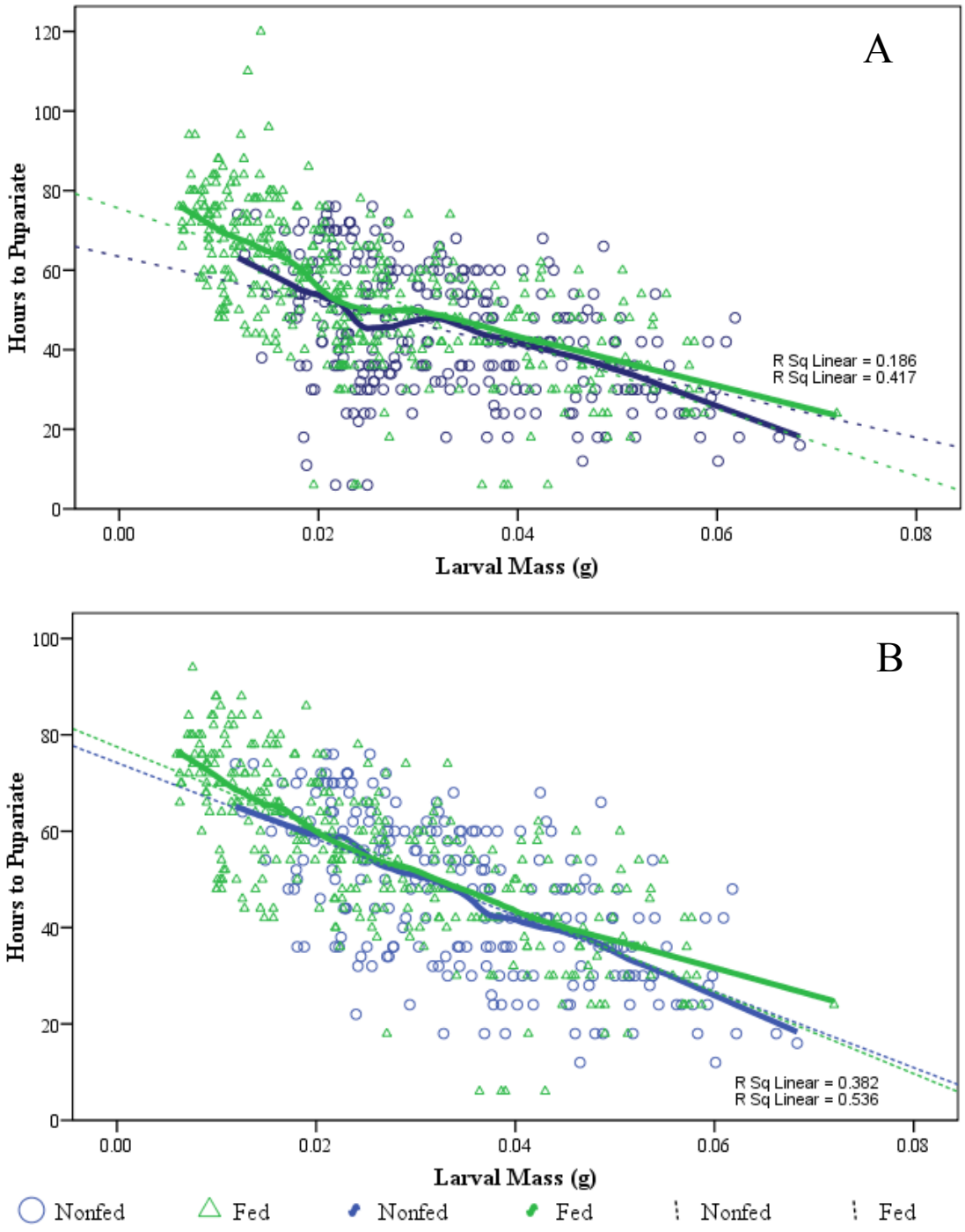

Figure 3.7 Time Delay to Pupariation (Pooled). Relationship of measured *C. macellaria* larval weight to the interval between initial observation and pupariation. LOWESS curves (solid) and linear regression (dotted) lines are given for all pooled trials (A) and excluding trial 2 (B). R^2 values for the linear regressions are also displayed: the upper is for the nonfed treatment and the lower for the fed treatment.

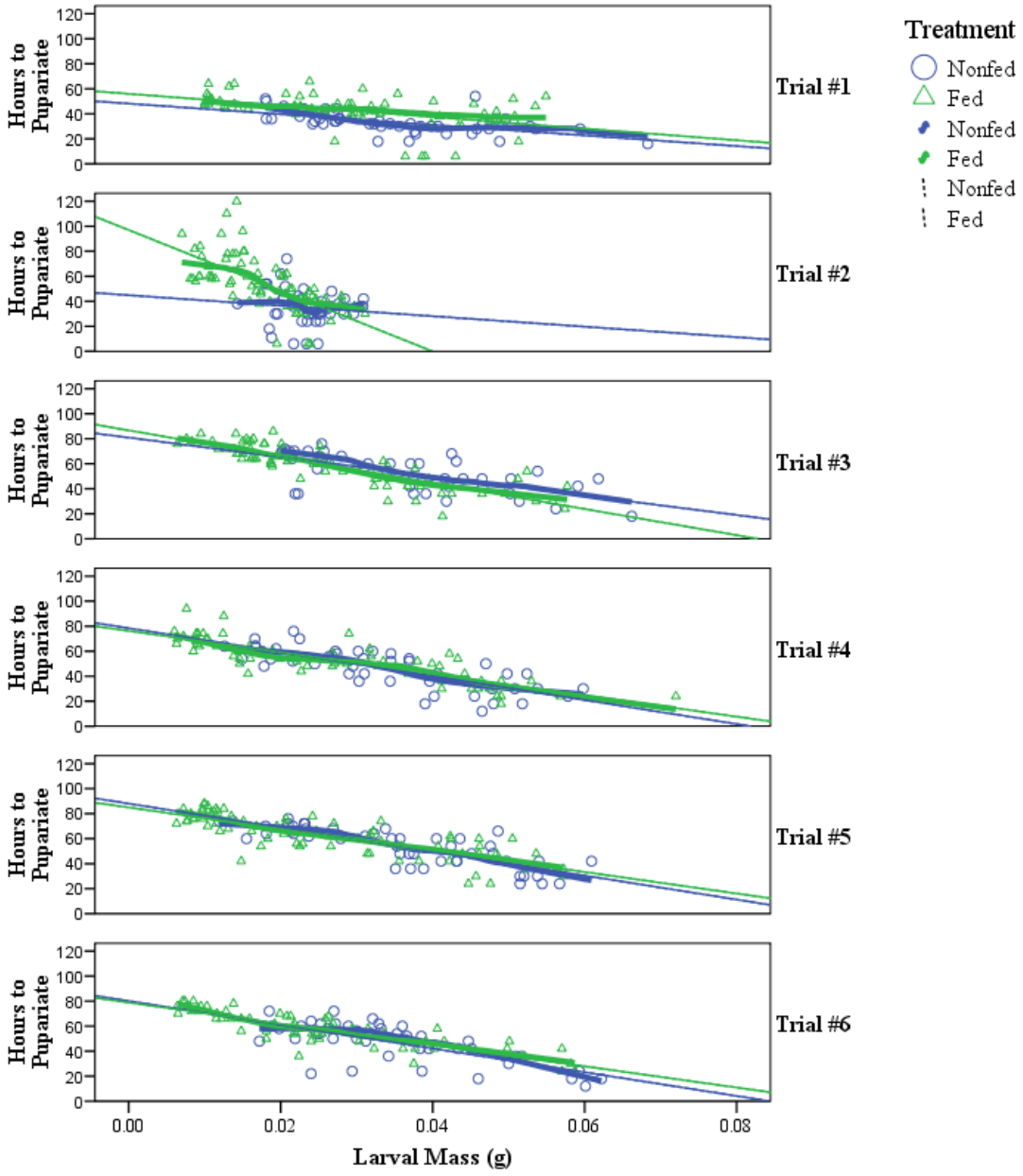

Figure 3.8 Time Delay to Pupariation (Individual). Relationship of measured *C. macellaria* larval weight to the interval between initial observation and pupariation. LOWESS curves (solid) and linear regression (dotted) lines are given for all pooled trials

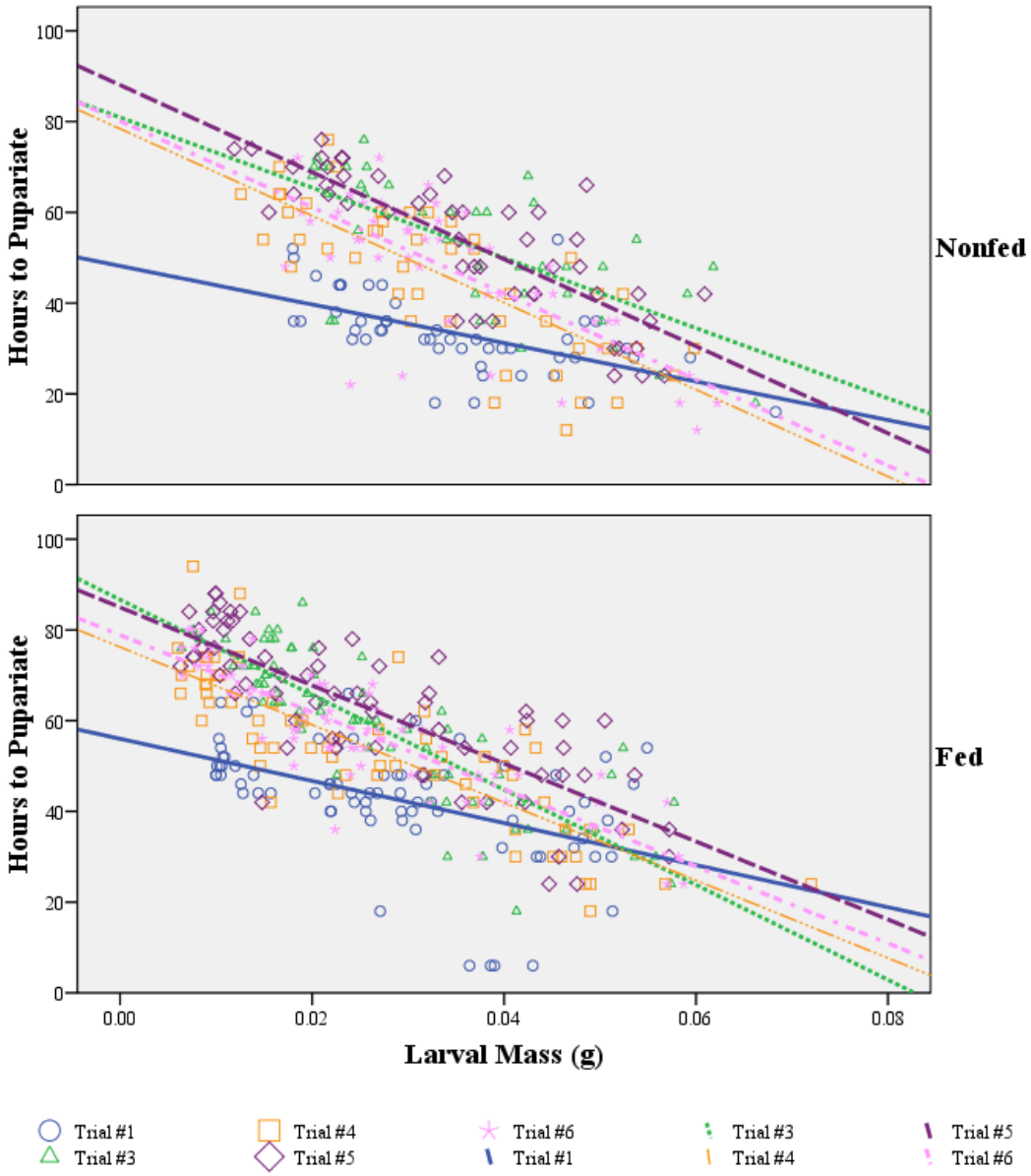

Figure 3.9 Simple Linear Regressions. Simple linear regressions relating measured *C. macellaria* larval mass and time delay until pupariation. Regressions for each trial are given in a different color and line pattern. The overall regression equation for all trials and treatments is Hours to Pupariate = 76.875 - 844.020*Larval Weight. $R^2 = 0.509$.

$P = 0.098$), nor was there an interaction between treatment and trial # ($F = 1.455$, df = 4, $P = 0.215$) (Fig 3.9). Between the trials, there was a significant difference in mean time to pupariation ($F = 30.119$, df = 4, $P < 0.001$). Trial 1 took a mean of 11.38 and 13.88 h shorter to pupariate than trials 4 and 6 respectively, and 17.66 or 19.91 h shorter than trial 3 and trial 5. These three groupings (#1, #4 & #6, and #3 and #5) were supported in both Tukey's HSD and Dunnett's C post-hoc tests. Analysis of the effect of larval weight on the duration of the L3 showed that neither had any effect, to the point that the univariate model itself was not statistically significant ($F = 0.209$, df = 2, $P = 0.811$).

Mean length of the L3 was 75.19 h for nonfed larvae, 75.51 h for fed larvae, and 75.60 h for mass-reared larvae (Fig 3.10), though this was not significantly different ($F = 0.194$, df = 1, $P = 0.823$). There was a significant difference among trials ($F = 74.695$, df = 4, $P < 0.001$), and a there was a significant interaction between the two ($F = 6.960$, df = 8, $P < 0.001$). In trials #1, #4, and #5, there was no difference in mean L3 duration between treatments. However, in trial #3, the larvae allowed to develop in the master box took a significantly shorter time to complete the L3 than the larvae in the individual cups, whether fed or nonfed. In trial #6, it took the larvae in the master box significantly longer than those reared in individual cups ($P < 0.001$). Sex had no effect on L3 duration, nor did it have an interaction with treatment or trial ($F < 0.951$, df < 8, $P > 0.387$).

Pupal duration was significantly different among treatments ($F = 45.871$, df = 2, $P < 0.001$) with a mean duration of 93.43 h, 100.88 h, and 114.00 h for the nonfed, fed,

and mass-reared treatments respectively. There was also a significant difference among trials (F = 10.344, df = 4, P < 0.001), and there was a significant interaction between the trial and treatment. In trials 3, 5, and 6, the pupal duration for individuals reared en masse in the master box were longer than for those reared in individual cups. In trial #1, there was no significant difference between the three treatments, and in trial #4, only the nonfed individuals had a shorter pupal development time than the fed and master box treatments. Sex had no effect on pupal duration, nor did it interact with treatment or trial (F < 1.604, df < 8, P > 0.202).

Total development time was significantly affected by trial (F = 376.892, df = 4, P < 0.001), treatment (F = 50.668, df = 2, P < 0.001), and by their interaction (F = 4.622, df = 8, P < 0.001). The nonfed treatment was the fastest to develop at 226.77 h, followed by the fed treatment at 234.71 h, then those allowed to rear en masse at 247.80 h. However, in trial #1 and #6, there was no difference between the fed and nonfed treatments; while in trials #3 and #4, there was no difference between the fed treatment and the mass-reared pupae. Only in trial #5 was there complete separation between treatments. Overall, the nonfed treatment averaged a 7.935 h shorter development time than the fed treatment, and 21.028 h shorter development time than those reared en mass. The fed treatment averaged 13.092 h shorter than the pupae.

3.4 DISCUSSION

The rapid rate of growth in the third instar is typical of most insects. During this stage they may gain up to 90% of their final body mass (Nijhout 2008). While the

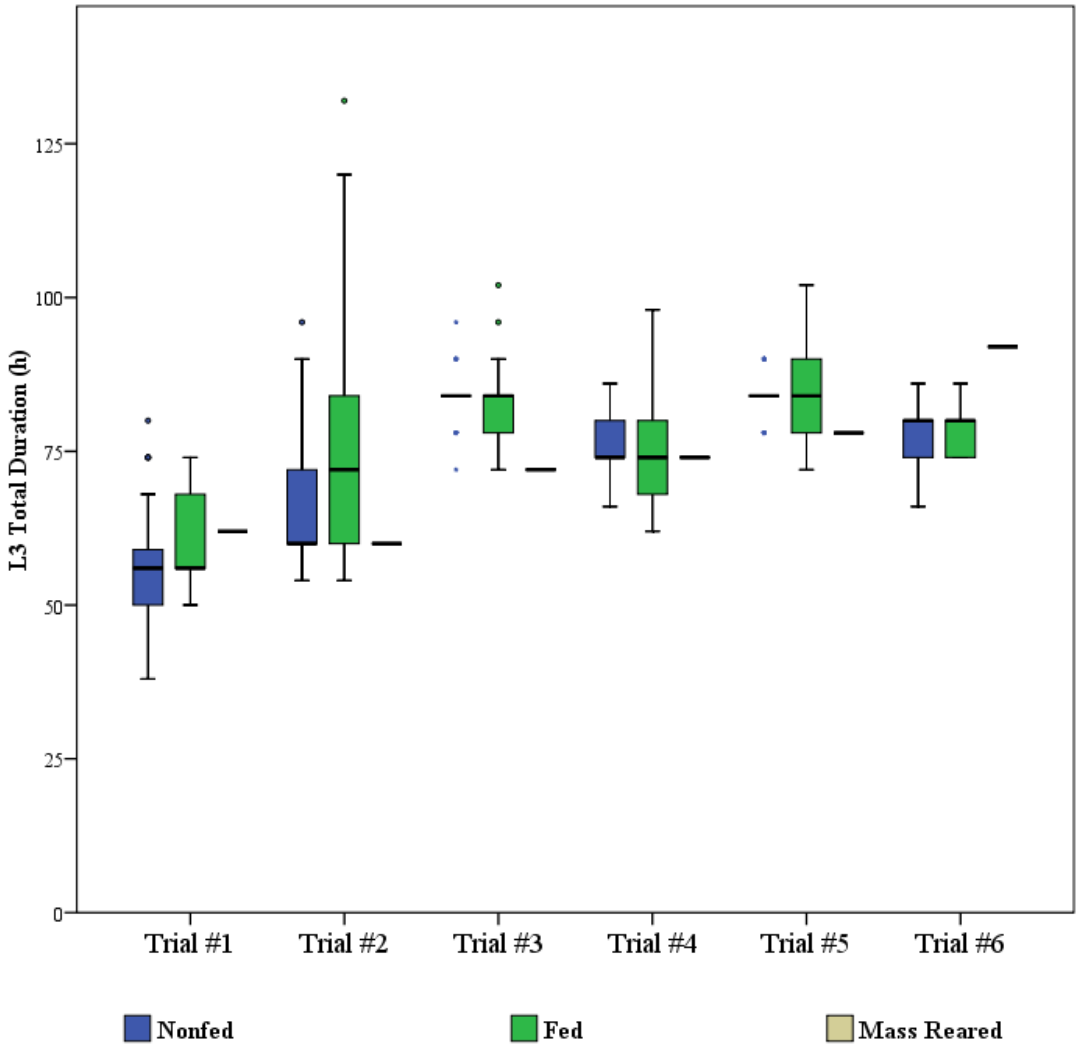

Figure 3.10 L3 Duration. Relative durations of *C. macellaria* L3 for each experimental repetition and each treatment. Blue represents nonfed, green fed, and beige mass-reared. Mean stage duration is given by thick line, with quartiles represented by box and whiskers, and outliers by asterisks.

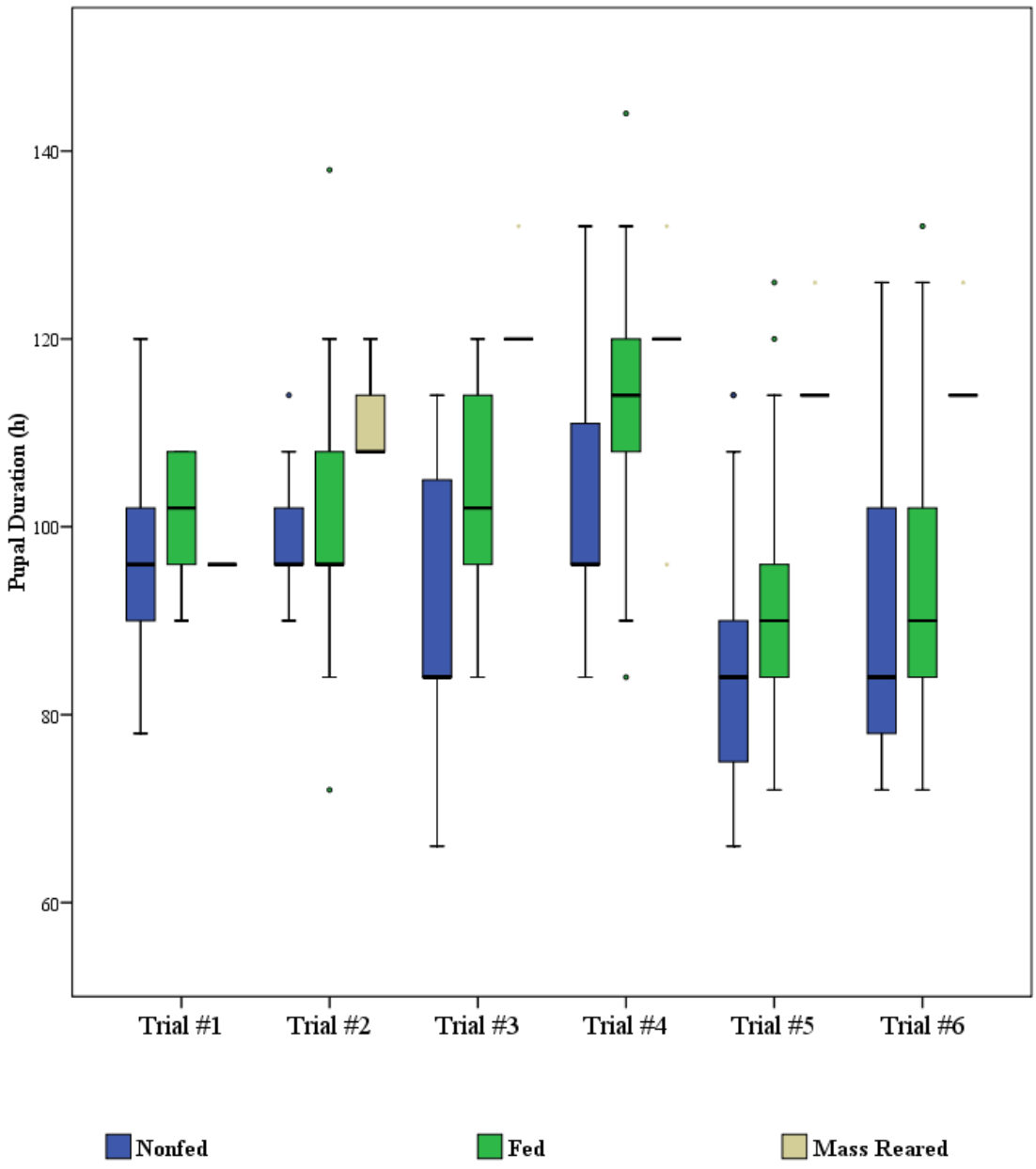

Figure 3.11 Pupal Duration. Relative pupal durations of *C. macellaria* for each experimental repetition and each treatment. Blue represents nonfed, green fed, and beige mass-reared. Mean stage duration is given by thick line, with quartiles represented by box and whiskers, and outliers by asterisks.

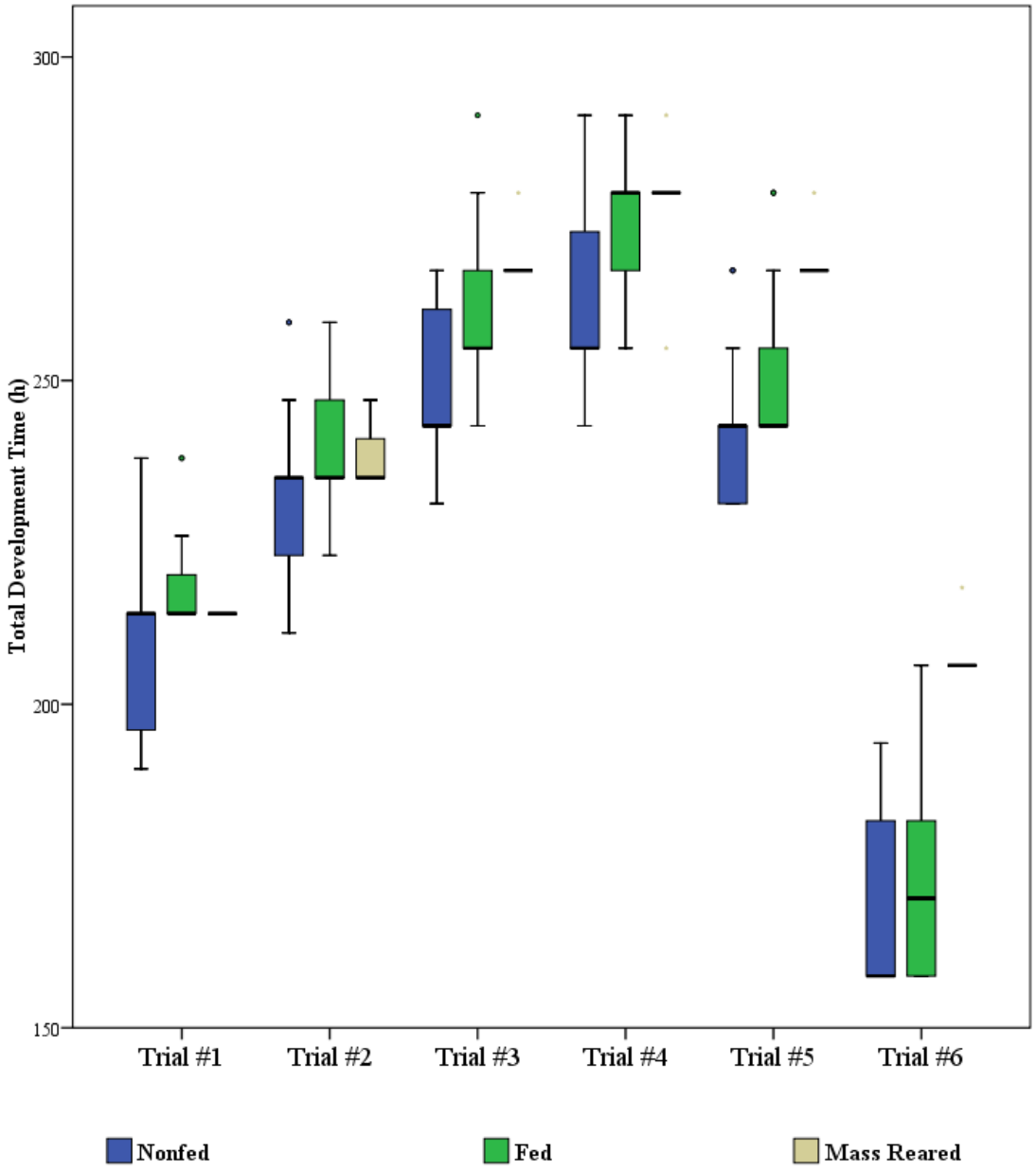

Figure 3.12 Total Development Time. Relative pupal durations of *C. macellaria* for each experimental repetition and each treatment. Blue represents nonfed, green fed, and beige mass-reared. Mean stage duration is given by thick line, with quartiles represented by box and whiskers, and outliers by asterisks.

observed growth rate in this experiment was not quite exponential, it does illustrate how even a small change in the timing of growth cessation can have a large effect on ultimate size (Nijhout et al. 2010). The small number of larval deaths in the fed treatment indicates that most of the individual flies successfully switched from their original development site to the single food pellet (Fig 3.3). Successful switching is also borne out by the larger mean pupal mass of the fed treatment vs. the nonfed. However, the clustering of mortality in the smaller end of the size spectrum for the fed treatment suggests that younger larvae may be less successful at switching their developmental sites. This may be due to difficulty for a single small larva to penetrate a virgin substrate, either due to small mouth hook size or from a lack of collective digestive action (Rivers et al. 2011). Collective feeding also raises local temperature (Slone and Gruner 2007), increasing metabolism (Chapman 1998) and presumably the assimilation of nutrients (Hanski 1976, 1977), which may explain why the mass-reared pupae were larger than the individually reared treatments. The lack of difference in pupal mass between the sexes was surprising, given that for wild collected adults, males were typically smaller than females (Section 2), and adult holometabolous insects do not grow (Mirth and Riddiford 2007).

The substantial inter-trial variation in growth curves and pupal weight may be a mixture of genetic and environmental effects. The founders for the colony used for trial 1 and trial 2 were collected in late autumn of 2009, near the end of *C. macellaria*'s local activity period, whereas the founders of trials 3-6 were collected in February of 2011, at the very beginning of *C. macellaria*'s local activity period. Even in flies collected from

the same basic geographic area, there can be significant variation in genetic diversity, which can lead to developmental variation (Picard and Wells 2009, Tarone et al. 2011). Seasonal developmental rate changes related to diapause have also been observed in Coleoptera and Lepidoptera (Margraf et al. 2003, Plaistow et al. 2005). Furthermore, data recorded on the HOBO data loggers indicated the rearing chamber used for trials #2, #3 and #5 was on average 1.2ºC warmer than the chamber used for trials #1, #4, and #6. Increased temperature has increases the development rate of *C. macellaria* (Byrd and Butler 1996, Boatright and Tomberlin 2010).

The similarity in larval development times between the mass-reared larvae and the individually-reared larvae demonstrates that the larvae were not much detrimentally affected by the experimental technique (Fig 3.7). The pupal stage and total development time for the mass-reared larvae was significantly longer than for the individuals (Figs 3.11 -3.12) though this may be related to a simple difference in mass, as mass-reared pupae, were larger than individually-reared larvae by a factor of 1.3-1.7. That the mass-reared larvae took the longest to complete development is somewhat counterintuitive, as the heat-producing effects of the maggot mass are generally thought to accelerate metabolism and development (Rivers et al. 2011). In general, immature development in this experiment took much longer than other developmental data sets for *C. macellaria.* Byrd and Butler (1996) report the 3rd instar, pupal stage and total development at 26.7º as 56 h, 65 h, and 177 h respectively. Boatright and Tomberlin (2010) report the same stages at 28.2ºC as 60.4 h, 55.3 h, and 172 h. In comparison, this investigation showed the L3 lasting 24-35% longer, the pupal stage lasting 68-105% longer, and total

development time lasting 31-43% longer overall than the other two data sets. The difference from the Boatright and Tomberlin (2010) dataset is particularly interesting, as the fly stocks used in both experiments came from the College Station, TX area. It is possible that lower population density in the master box was the cause of the relative extension of development. This is contraindicated in trial 1, which had a similar rate of development was similar to the published data sets, probably the same phenomena leading to the inter-trial variability in growth curve and pupal mass.

Minimum Viable Weight

In *D. melanogaster,* there seem to be two MVWs: one to successfully pupariate, and one to eclose, though they are only different by about 0.002 g (Stieper et al. 2008). However, in this investigation, the 95%CIs for MVW for pupariation and the MVW for eclosion predicted by the logistic regression equations overlapped. However, the cluster of low-mass pupae that failed to eclose in the nonfed treatment vs. the more even distribution of eclosion failure in the fed treatment (Fig 3.13) suggests that there is a threshold size for proper eclosion that is higher than that merely for pupariation. The interval between MVW to pupariate and MVW to eclose may have been too small to detect with this sample size, or it may represent the close proximity of MVW to CW in this system (discussed below).

Interestingly, the larval mass was a better predictor of eclosion success than the pupal mass itself, based on the Nagelkerke values. This suggests that nutrient intake of the larvae to a certain mass offsets the mass loss involved in pupariation. A possible explanation is the great degree of lipid metabolism by the pupa (Merkey et al. 2011). A

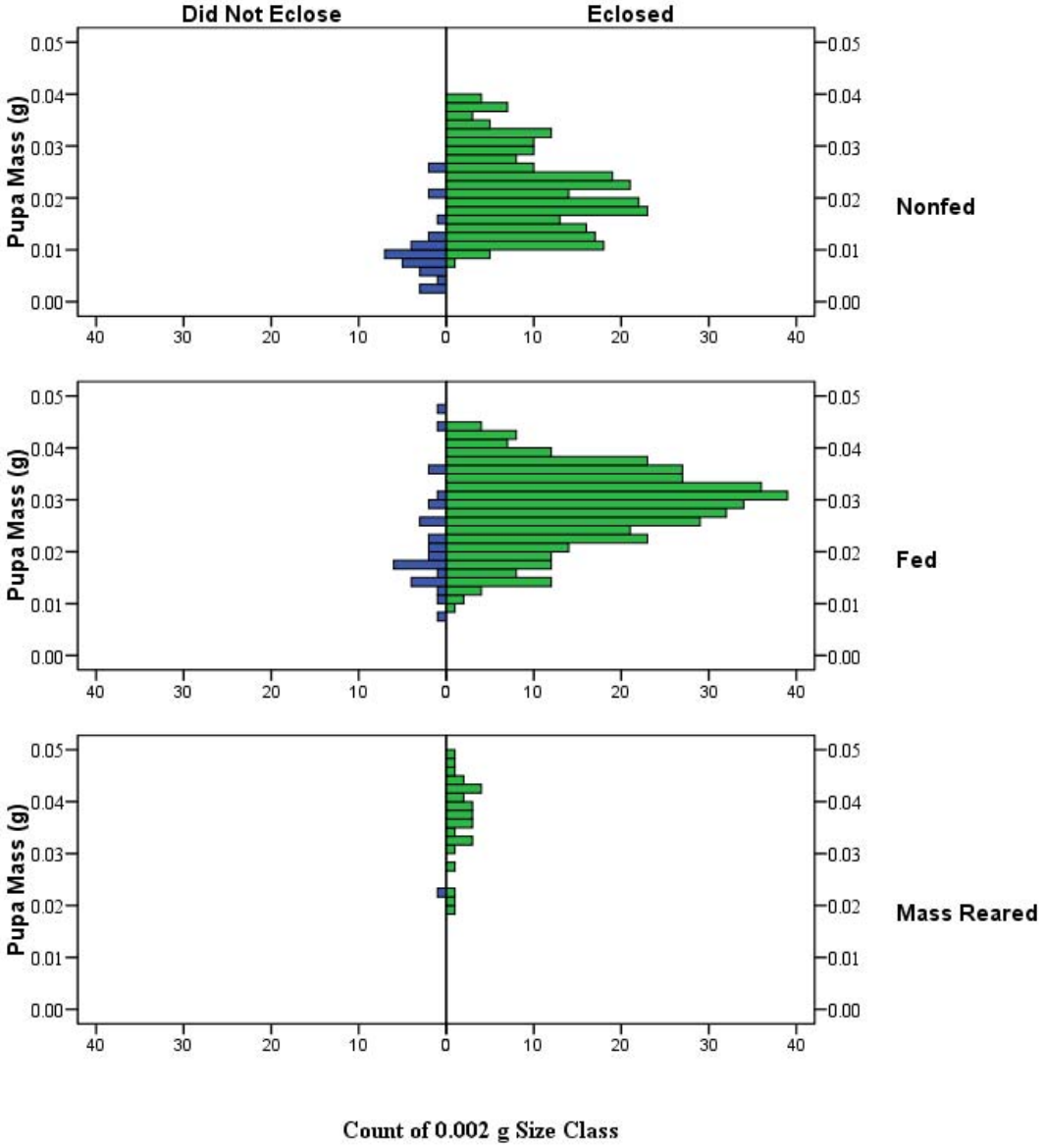

Figure 3.13 Eclosion Success for Pupae. Observed frequency of failure to eclose (blue) and successful eclosion (green) for each 0.002 g size class of *C. macellaria* larvae reared in individual cups. Successful eclosion was defined as complete escape from the puparium, retraction of the ptilinum, and inflation of the wings. Pupae that were damaged during handling have been excluded.

larva sequesters sufficient lipid may be able to complete pupation, regardless of its pupal size. Additionally, in this experiment, there was no way to estimate mass lost in the nonfed treatment or mass gained in the fed treatment prior to pupariation. Variability in these effects might explain why pupa size was not a good predictor.

Critical Weight

The outcomes of this study did not seem to operate within the frameworks of either the *D. melanogaster* model or the *M. sexta* model. If *C. macellaria* operated under the *M. sexta* model, larvae starved prior to CW would have had an extended time to pupariation vs. fed individuals removed from the master box at the same time. At CW and larger, the nonfed and fed treatments would take the same amount of time to pupariate (Nijhout and Williams 1974b, D'Amico et al. 2001). In the *Drosophila* model, there would be a clear break point in the relationship between mass and time to pupariate at CW. Prior to CW, both nonfed and fed treatments would be expected to take an extended time to pupariate vs. after CW. Throughout the L3, the nonfed treatment would be expected to pupariate faster than fed individuals (Stieper et al. 2008). Initial analysis of the LOWESS curves for the data from the pooled trials appeared to show a break point at approximately 0.025 g (Fig 3.5), this was due to the influence of trial #2, which had a very low growth rate (Fig 3.1). The undue influence of this one trial illustrates the variability in developmental schema in *C. macellaria.* The other five repetitions showed much more similar trends between them, although there was a significant difference in the slope of trial #1, and differences in the mean time to pupariation. The truly unexpected result was a linear relationship between larval weight at starvation and time

to pupariation. The *M. sexta* and *D. melanogaster* models exhibit curvilinear if not "broken-stick" relationships (Nijhout and Williams 1974b, D'Amico et al. 2001, Layalle et al. 2008, Stieper et al. 2008). However, there are a few possible explanations for the observed results which are compatible with the critical-weight modulated growth control system.

In very low quality diets, *M. sexta* shows no difference in growth curve is approximately linear and shows no difference between nonfed and fed treatments (Davidowitz et al. 2003). The extreme protein-bias of *C. macellaria* larval development substrate may mimic a carbohydrate-limited "low quality diet" though the IIS. However, the high amino acid availability should cause TOR to signal high nutrient intake from the fat body (Mirth and Riddiford 2007). Nutrient availability also upregulates ecdysone biosynthesis, possibly independently of PTTH (Mirth et al. 2009). This is also borne out by evidence that completely PTTH-ablated *D. melanogaster* larvae grow more slowly and larger than normal larvae, but are capable of initiating and surviving pupation (McBrayer et al. 2007).

CW could occur simultaneously with or even prior to attaining MVW. If this is the case in *C. macellaria,* the growth curve pattern is congruent with the post-CW *M. sexta* model. The close proximity of MVW and CW in *Drosophila* has led several authors to use the terms interchangeably (Mirth and Riddiford 2007). As both *D. melanogaster* and *C. macellaria* are cyclorraphan Diptera, the phenomenon could be phylogenetically based. However, if CW and MVW did occur simultaneously, there still should have been a break point in the fed flies weighed before MVW/CW. Neither the

pooled nor the individual trial data (Figs 3.6-3.7) show any such break point. If CW was attained before MVW, and *C. macellaria* adhered to the *M. sexta* model, both fed and non-fed should complete the L3 at the same time (Nijhout and Williams 1974b). The relationship between larval weight and hours to pupariate after starvation would be dictated by the shape of growth rate in the master box, which is the only element controlling body size variation post-CW (Davidowitz and Nijhout 2004). If larvae committed to pupariation before obtaining the requisite nutrients, there could be the production of larval/pupal intermediates, or small, nonviable pupae in the starved treatment (Mirth et al. 2005). The results from this investigation were consistent with these three ideas. In all of the individual trials, there was no difference in either regression slope or in intercept between treatments, showing that starved and fed flies were following the same trajectory (Figs 3.6-3.8). And although they had different relative mean development times between trials, the duration of the 3rd instar was relatively constant no matter what size larvae were removed from mass rearing (Fig 3.9). The larvae in the master box seemed to grow at a nominally constant rate for each trial (Fig 3.1), one that grossly serves as the negative counterpart to the mass/time to pupariation relationship (Figs 3.6-3.8).

Based on these various lines of evidence, it seems likely that *C. macellaria* commits to pupariation very early in the L3, possibly before it has even begun. Any nutrient sensing must be done in the 1st and 2nd instars. Unlike *D. melanogaster*, they do not seem to modify their TGP in response to low nutrient levels, allowing a larva on a substandard diet the ability to attain normal size at a slower rate (Stieper et al. 2008).

Nor do starved larvae pupariate early, trading the possibility of finding more food for the increased security and desiccation-resistance of the puparium (Chapman 1998). These factors suggest that *C. macellaria* trades the possibility of a larger body size for a specific development time. This kind of biased trade-off suggests that specific developmental timing imparts a significant fitness benefit, and therefore probably under substantial selection pressure (Roff 2000). Since *C. macellaria* adults are known to oviposit collectively on a carrion resource, tightly controlled developmental times would tend to keep a cohort of larvae developing synchronously. This could in turn impart benefits from collective feeding (Rivers et al. 2011), aggregative predator avoidance (Dugatkin 2009), or mate availability post-eclosion.

This type of tradeoff has some important connotations for estimation of post-colonization intervals. If, indeed, *C. macellaria* (and possibly related species as well) always develop in a specific time frame given environmental driving factors like temperature, age estimation based on stage of development is the better technique. Given the wide variation in body size possible through variable growth rate and nutrition effects, it would be very hard to use the objective assessment techniques and error rate considerations required by the *Daubert* standard (Tomberlin et al. 2011b). Further research is necessary, in other forensically important species to establish the reliability of this mode of size control.

3.5 CONCLUSIONS

With the increased use of genomic tools, the deep physiology of nutrient signaling and size determination in *D. melanogaster* has been considerably explored. Similarly, the hormonal pathways which regulate the major metamorphic events in the last larval instar of *M. sexta* have been studied for many years. Between the two organisms, a framework of the mechanisms by which insects balance body size and development speed is emerging (Nijhout 2008), built around initial size, CW, growth rate, and length of the terminal growth period (Davidowitz et al. 2005). For forensic entomologists, understanding these mechanisms in necrophilous arthropods like *C. macellaria* is crucial to accurate estimations of post-CI.

There is considerable variation in *C. macellaria* growth rates, even under controlled laboratory conditions. It does not appear to conform to the *D. melanogaster/M. sexta* paradigm unless CW in *C. macellaria* occurs before MVW is attained. Four pieces of evidence support this unusual mechanism: 1. Regardless of starvation or feeding, variation in body size does not affect the duration of the L3. 2. There are no sharp break points in the size/development time curve, even in the very earliest hours of the L3. 3. There is no difference in the size/development time curve between fed and starved individuals. 4. There was number of very small, nonviable pupae in the starved treatment, consistent with individuals that had committed to pupariation without the necessary body reserves.

By committing to pupariation very early in the 3rd instar, *C. macellaria* trades potential increase in body size for a development interval. This tradeoff validates the use

of stadium-based age assessment over body size-based assessments in the estimation of post-colonization intervals. However, the high levels of variation in growth rate among repetitions need to be resolved and the currently known growth rate information for many species must be integrated before the use of the 4 or 5-factor growth model is feasible for forensic entomology. Furthermore, the pattern of hormone releases in *C. macellaria* larvae should be assayed before positively concluding that critical weight is attained before minimum viable weight. If true, it would likely be a novel means of body size control, with great implications for other species with a similar nutritional ecology.

4. BODY SIZE THRESHOLDS AND DEVELOPMENTAL PARAMETERS UNDER SIMULATED INTRASPECIFIC COMPETITION

4.1 INTRODUCTION

Carrion is perhaps a quintessential ephemeral resource. With a few exceptions, such as annual salmon runs or human garbage dumps, it is patchily distributed in both space and time. Patches vary in size from earthworms to elephants, and can also be extremely fleeting in the environment. Under the right conditions, a patch can pass from fresh to advanced decay in a matter of days (Carter et al. 2007). This patchiness creates an atmosphere of significant inter- and intraspecific competition for the arthropods that exploit carrion, particularly for the larval blow flies that perform much of the actual tissue consumption (Wells and Greenberg 1992). This competition in turn shapes the succeeding generations' population size and fitness (Fuller 1934).

Blow flies such as *Lucilia sericata* (Meigen) (Diptera: Calliphoridae) often lay large clutches of eggs, exposing offspring to sibling competition (Salt 1930, Heard and Remer 1997). Many will lay eggs together in large aggregations, well beyond what the patch can support, incurring increased mortality and fitness costs (Smith and Wall 1997a). This seemingly non-optimal oviposition behavior is explained by the rarity of fresh carrion patches. Spatially rare patches are associated with high travel costs (Heard and Remer 2008), while temporally rare patches increase egg pressure (Minkenberg et al. 1992, Takahashi 2007). As a result, under both the travel cost hypothesis and optimum oviposition theory, a female that encounters an occupied, but otherwise

appropriate carrion patch, should deposit a large egg clutch (Jaenike 1978, Remer and Heard 1998, Scheirs and De Bruyn 2002).

For the resulting larvae, developing en masse can be beneficial. The collective heat produced by hundreds, if not thousands, of simultaneously feeding larvae can raise the temperature by more than 30ºC over the local ambient (Campobasso et al. 2001). These heat increases can push the bounds of the upper temperature tolerance, where it begins to incur thermal stress responses (Richards and Villet 2008, Rivers et al. 2010). For the most part, though, they represent a beneficially adaptive response (Rivers et al. 2011). Increased heat speeds development (Greenberg 1991) and improves nutrient assimilation (Hanski 1976, 1977). It may also improve and ease feeding, as the salivary output and churning larval movements break down tissue into a nutrient-laden soup (Greenberg and Kunich 2002). Furthermore, the presence of many larvae may reduce the likelihood of individual parasitism or predation (Rohlfs and Hoffmeister 2004).

On the other hand, high densities of developing larvae can be highly detrimental. In tests of increasing density many species of blow fly (Diptera: Calliphoridae), suffered increased mortality from increased rearing density: *Lucilia caesar* L.*, illustris* (Meigen)*, silvarum,* and *sericata* Meigen(Prinkkila and Hanski 1995); *Chrysomya megacephala* (F.) and *rufifacies* (Macquart) (Shiao and Yeh 2008)*; Chrysomya putoria* (Wiedemann) and *Cochliomyia macellaria* (F.) (dos Reis et al. 1999); *Phormia regina* (Green et al. 2003), *Calliphora vicina* Robineau-Desvoidy and *L. sericata* (Smith and Wall 1997a), and *L. sericata (*Wall and Smith 1997).There were often complex interactions between rearing density and relative performance, with the "best" performing species shifting

across densities, which probably functions to maintain species diversity in similar niches. In general, larvae initially reduce their body size without reducing the overall population numbers, which reduces adult size, fecundity, and/or longevity (Ullyett 1950, Prinkkila and Hanski 1995). Once there is insufficient food for all larvae, mortality increases in a density-dependent fashion. At the very highest densities, the production is reduced due to the large number of feeders which do not survive (Salt 1930, Ullyett 1950, Smith and Wall 1997b). This can lead to a "hydra effect" when large populations of adults have low effective fecundity because so many offspring die as immatures, but leads to population rebound as the few survivors reproduce abundantly (Nicholson 1950, Abrams and Matsuda 2005).

As a result of these conflicting forces, simulation models typically show maximum survival and/or fitness at intermediate densities for primary colonizers (Rohlfs and Hoffmeister 2003). This is not true for secondary colonizers: either different species, or secondary cohorts of the primary colonizer. Particularly in small carcasses, the first generation of colonizers may completely deplete the tissue, leaving later arrivers to starve (Denno and Cothran 1975, Kneidel 1984, 1985, Prinkkila and Hanski 1995, Moura et al. 2005). Secondary colonizers, therefore, suffer more severe intraspecific competition simply because there is less resource available for consumption (Ullyett 1950). In these kinds of carcasses, where the first sere consumes it all, the form of competition is shifted from scramble to contest competition (Mano and Toquenaga 2011). Indeed, species coexistence under the Aggregation Model is predicated on high degrees of aggregation on small patches coupled with resource partitioning where

possible (Hartley and Shorrocks 2002, Reader et al. 2006). Even so, when resource partitioning is possible between, it is the activity of the primary that controls the population density of the secondary, as Denno and Cothran (1976) demonstrated with the interaction between *L. sericata* and *P. regina* and three species of sarcophagids (Diptera: Sarcophagidae) (1976).

Flies have a variety of mechanisms for coping with competition. Adult flies can avoid competition for their offspring by being selective about the size and location of their egg clutches (Jaenike 1978, Scheirs and De Bruyn 2002), leading to avoidance and resource portioning. In terms of temporal avoidance, primary colonizers would seem to have the greatest chance of avoiding starvation, as the carcass is intact at colonization. It would also allow larvae to avoid intense competition immediately upon hatching. Sufficiently large temporal separation can also serve as a mechanism of avoiding facultatively predacious species, which often serve as secondary colonizers (Brundage 2011). In practice, avoidance requires the ability to assess not only the quality of a given carrion source, but also the presence, absence, or density of potential competitors or predators. Moura et al. (2005) argue that this is beyond the capacity of blow flies, but there are several pieces of evidence to the contrary – in fact, blow fly adults seem to have a relatively sophisticated mechanism for assessing a given carrion patch. Adult flies may also be attracted to bacteria on conspecific eggs (Lam et al. 2007, Brundage 2011) or due to some sort of pheromone-mediated group behavior (Barton Browne et al. 1969), either of which indicates the existing presence of conspecific adults. On the other hand, some species are known to prefer carrion with no other larvae present, and to

avoid the evidence of predatory calliphorid species (Giao and Godoy 2007). Conspecific presence can also be a deterrent, as demonstrated by reduce recruitment of adult *Lucilia coeruleiviridis* Macquart once larvae are present (Ives 1991). While most blow flies are generalists with regard to carcass type, at least a few species, such as *Ca. vicina, Calliphora vomitoria* L., and *Lucilia richardsi* Collin do show distinct carcass preferences (Kneidel 1984, Anderson 2010). More frequently, multiple species of flies partition larger resources spatially (Denno and Cothran 1975, Hanski 1987).

An alternate to partitioning is larval competition tactics. Some species, such as *Chrysomya marginalis* (Wiedemann) enjoy a high upper temperature threshold, and can thrive in carcasses too warm for competing species (Richards et al. 2009). For *D. melanogaster*, shortening development time improves competitive ability (Krijger et al. 2001). Pompanon et al. (2006) also found that in *Chiastocheta* spp. (Diptera: Anthomyiidae), secondary colonizers incurred no competitive disadvantage by feeding more quickly and pupating more quickly than primary colonizers. As discussed in the previous section, one of the mechanisms affecting both body size and development time is critical weight. In *M. sexta*, critical weight is plastic in response to food quality, leading to faster-developing, smaller pupae on low-quality diets (Davidowitz et al. 2004). For *D. melanogaster*, critical weight (CW) does not seem to be plastic in the face of diet quality changes; however, the terminal growth period (TGP) is modulated (De Moed et al. 1999, Layalle et al. 2008). This modulation seems to be based on the nutrient-sensing target of rapamyacin pathway, discussed in the previous section.

It is important not to ignore the nonconsumptive effects of earlier colonizers on secondary colonizers. The semiochemicals and other physical cues produced in the normal course of development can potentially serve as important sources of information to secondary colonizers about the state of the patch, and could induce physiological and developmental shifts. To our knowledge, nonconsumptive effects have not been demonstrated for the carrion system or one like it. In the case of blow flies, these effects could be beneficial, due to tendency of calliphorid larvae to secrete digestive enzymes and other materials during feeding. These materials include a mixture of trypsin and chymotrypsin-like proteases, collagenic enzymes, amylase and lipases (Price 1975, Bowles 1988, Young et al. 1996, Chambers et al. 2003). These enzymes have antimicrobial properties (Kerridge et al. 2005) and biofilm disruptants (van der Plas et al. 2008), which may explain why larvae are not affected by the large microbial population on decaying tissue (BARNES and GENNARD 2010). The excretions of a larger larva would be expected to be much greater than those of a newly-eclosed larvae, and could aid in feeding and growth (Rivers et al. 2011).

By the same token, the excretions, secretions, and associated microbiota could have a negative effect on subsequent cohorts. Given that carrion may only support a single generation of larvae, the excretions, secretions, and associated microbiota of a previous one could indicate that food was in short supply. In turn, larvae would invoke their species-appropriate mechanism for coping with food shortage. If food was not limited – as in the case of a large carrion source – the primary cohort would have pushed the secondary into a non-optimal development strategy, much as a predator might

(Orrock et al. 2008). Although no reports of such an effect appear to have been published in peer-reviewed channels, a pilot project showed that a simple aqueous extract of *Ch. rufifacies* larvae dramatically impacted the developmental path of younger *C. macellaria* (Tomberlin et al. 2010). While that experiment was testing interspecific nonconsumptive effects, it seemed reasonable that there might also be an intraspecific effect. Therefore, in this experiment, I tested the effect of simulating secondary colonization in *C. macellaria,* as conveyed by semiochemical extract. The intent was to document if *C. macellaria* did exhibit a developmental change, how that change was accomplished, and if it varied from the response to starvation. This would be a novel demonstration of intergenerational information transfer, non-predatory nonconsumptive effects, and mechanisms of compensation for adverse conditions in a forensically important blow fly species.

4.2 METHODS AND MATERIALS

Fly Stocks

All flies used in this experiment resulted wild-type *C. macellaria* collected as larvae from decomposing feral pig (*Sus scrofa* L) carcasses located within 20 km of Texas A&M University. Developing larvae were kept in 28.0 cm L x 15.5 cm H x 30.0 cm plastic containers filled with approximately 500 mL sand and provided beef liver *ad libitum*. After all larvae had pupariated, pupae were sifted from the sand medium and placed in 250 ml plastic cups, which were placed into 30 cm^3 cages covered in fine mesh screen. Adult flies were fed *ad libitum* sucrose, powdered buttermilk, and water.

Beginning approximately 6 d post-emergence, adults were provided 10-20 g pieces of raw beef liver in a small plastic bowl to use as a protein source and oviposition site. Egg-laden liver was then placed atop a folded paper towel in a fresh larval rearing box. All larvae used in this experiment were the F_2-F_8 generation to avoid excessive drift from the wild genotype (Mason et al. 1987). In the laboratory, all stocks were maintained at 27°C and a 12:12 L:D cycle in a walk-in growth chamber.

Collection of Excretions & Secretions

C. macellaria larvae were removed from laboratory rearing during the last day of their third larval instar. An aqueous extract of their soluble excretions and secretions (E/S) was prepared following (van der Plas et al. 2007, van der Plas et al. 2008), and modified to accommodate the volume of E/S required for the experiment. 250mL Erlenmyer flasks were triple rinsed with acetone and deionized H_2O, then autoclaved. Into each flask, 100 g of larvae were mixed with 200 mL of dH_2O and capped with paraffin film and autoclaved aluminum foil. Filled flasks were incubated at 35°C for 2 h, which previous trials had shown to cause minimal mortality to the larvae (Tomberlin et al. 2010). Following incubation, larvae and solid detritus were separated from the aqueous component by means of two passes through a powered Büchner funnel lined with #2 filter paper. The liquid phase extraction was then frozen and stored at -20ºC. The extract was removed from the freezer at the outset of each experimental trial, and defrosted prior to use. The E/S used for each replication was kept in the experimental growth chambers alongside the master cohort boxes at 27ºC throughout the experiment.

Measurement of Minimum & Critical Weight

The overall technique of this experiment was identical to that of Section 3, save that the dH_2O used in the previous experiment was replaced with an equivalent volume of E/S. Thus, the previous experimental treatments served as controls for a fed treatment minus competition cues and a nonfed treatment minus completion cues, hereafter referred to as the "non-cued" treatment. Separating the control and E/S treatments in this fashion avoided any potential volatile odor effects from the E/S on the controls, and reduced the number of incubators in use simultaneously.

To generate a uniformly aged cohort, multiple cages of female *C. macellaria* were provided approximately 250 g of raw beef liver each and allowed two-hour interval for oviposition. As soon as sufficient oviposition for the number of trials was confirmed, all of the frozen human food-grade beef liver to be used as larval diet was defrosted and all of the individual rearing cups prepared. This preparation was done so that as larvae were transferred from mass to individual rearing over the course of the experiment, they would be placed on food of the same age and thermal history as their natal resource. For each repetition, 180 individual 30 mL plastic cups were filled with 2.5 mL autoclaved play sand and 0.25 mL of defrosted E/S. Half of these cups were also provided an approximately 1 g pellet of beef liver, more than sufficient for larval development (Rosa et al. 2004). The cups were closed with a cardboard cap and stored a Percival I-36LLVL stand-up incubator (Percival Scientific, Perry, IA) at 27ºC, 12:12 L:D, and 60%RH until use.

Eggs for all experiments were collected between 17:00 and 20:00 hours. Eggs were removed from the liver, separated with a moistened paintbrush, and intermixed to maximize genetic diversity in each trial. Approximately 0.05 (± .005 g) of eggs were weighed on an Ohaus Adventurer Pro scale (Parsippany, NJ), then transferred to a 28.0 cm x 15.5 cm x 30.0 cm plastic "master box" holding 500mL of autoclaved sand, and 250 g of beef liver resting on a folded white paper towel. The master box and all of the individual cups were then placed in a stand-up incubator at 27ºC, 12:12 L:D, and 60% RH. Every 24 h throughout the experiment, 7 mL of E/S was added to the master box, and 0.25 mL of E/S was added to each of the individual cups.

To synchronize observations with the onset of the L3, beginning at 64 h after oviposition and every two hours thereafter, ten larvae were removed from the master box and checked for stadium. When at least 80% of this sample had reached the L3, starvation observations were initiated. At each observation, ten larvae were randomly selected from the master box. Each individual larva was weighed to 0.0001 g on the Ohaus scale, and assigned to either a cup with a food pellet (fed condition) or a cup without additional food (starved condition). Observations were made every 2 h for the first 24 h of the L3. After the first 24 h, observations were made every 6 h. Observations at 6 h intervals were identical to 2 h intervals, save that the individual larvae in their cups were checked for pupariation, death, or escape. The first 5 pupa from the master box were placed into individual cups containing only 2.5 mL play sand (mass-reared condition). The individuals in this collection were used to check for differences between mass-reared and individually-reared pupae. All pupae were weighed to 0.0001 g on the

Ohaus scale, approximately 12 h post-pupariation and placed in 2.5 mL of autoclaved sand. Observations were made every 6 g until the last individual had either pupariated, died, or escaped. The pupae were then checked every 12 h for eclosion. For each individual, the following data were recorded: date and time of removal from the master box, weight at removal, time of pupariation, pupal weight, time of eclosion, sex, and treatment.

Statistical Analysis

Statistical analyses were performed with SPSS 15.0 (SPSS Inc, Chicago, IL.). Initial and final instar weights were assessed as the mean weight for the first and last larval observations of each trial. Minimum viable weight for pupariation was determined using binary logistic regression against larval weight and repetition for starved individuals. For minimum viable weight to eclosion, binary logistic regression was used with trial number and either larval or pupal weight (Mirth et al. 2005). To test for a nutritional or rearing effect in eclosion success, treatment was included in the model testing the effect of pupal weight. CW was assessed by creating LOESS curves for fed and nonfed treatments for each repetition and for pooled data. LOESS parameters selected were 30% of points to fit and the Epanechnikov kernel. As the data was largely linear, ANCOVA was also used with treatment, trial and larval weight regressed against time between initial observations and pupariation. Regressions were examined for the break-points, changes in slope, or regression intersections indicative of critical weight (Stieper et al. 2008). L3 duration, pupal durations and total development were compared with ANOVA, with treatment, trial, and sex used as factors.

Comparison with Non-Cued Data

Several results were compared to those from the non-cued data set described in detail in the previous section. Initial and final larval mass were compared by one-way ANOVA using experiment as the factor. Pupal masses were compared by two-way ANOVA using experiment and treatment as factors. Most standard statistical tests could not be used to compare the MVW between experiments because of the exponential nature of the logistic curve around the inflection point. Per Payton et al., (2003) 84% CIs represent the optimum balance of Type I and Type II error. Therefore, 84% CIs were constructed for the mass at 50% likelihood of survival for each MVW possibility. Pooled and individual LOESS curves of larval mass vs. time to pupariate were visually compared for obvious differences. For linear regression, experiment was added as a factor to ANCOVA analysis. For comparison of the length of the third instar, pupal stage, and total development time, two-way ANOVA was used with experiment and treatment used as factors.

4.3 RESULTS

In the course of this experiment, 875 larvae were measured. The M:F ratio at eclosion was 230:258. There were 183 total escapees (20.9%), 59 from the nonfed treatment and 124 from the fed treatment (Fig 4.1). Mean initial larval mass was 0.0133 g (95%CI: 0.0119-0.146 g), and final mass was 0.0536 g (95% CI: 0.0511-.0560 g), representing a gain of approximately 75% of total mass. There was some inter-trial difference, with trial 3 growing at a faster rate and attaining a larger size than the other four trials (Fig 4.2), and displaying a wide range of body mass at each time point

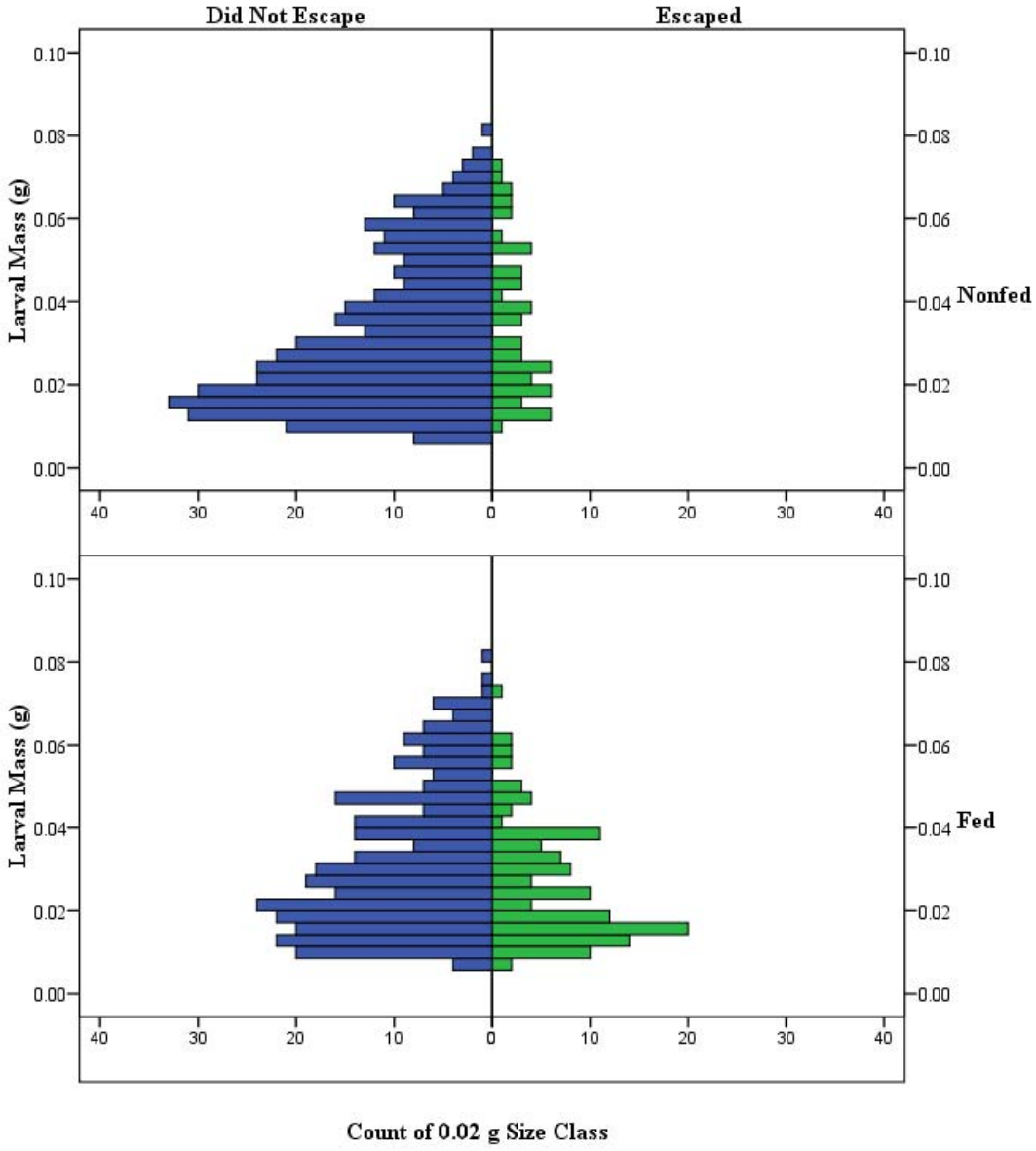

Figure 4.1 Larval Escape. Makeup of *C. macellaria* larval escapees from closed individual cups, and non-escapees for the same as a function of larval mass. Size class bins are 0.002 g wide. Both treatments were treated with E/S from older larvae.

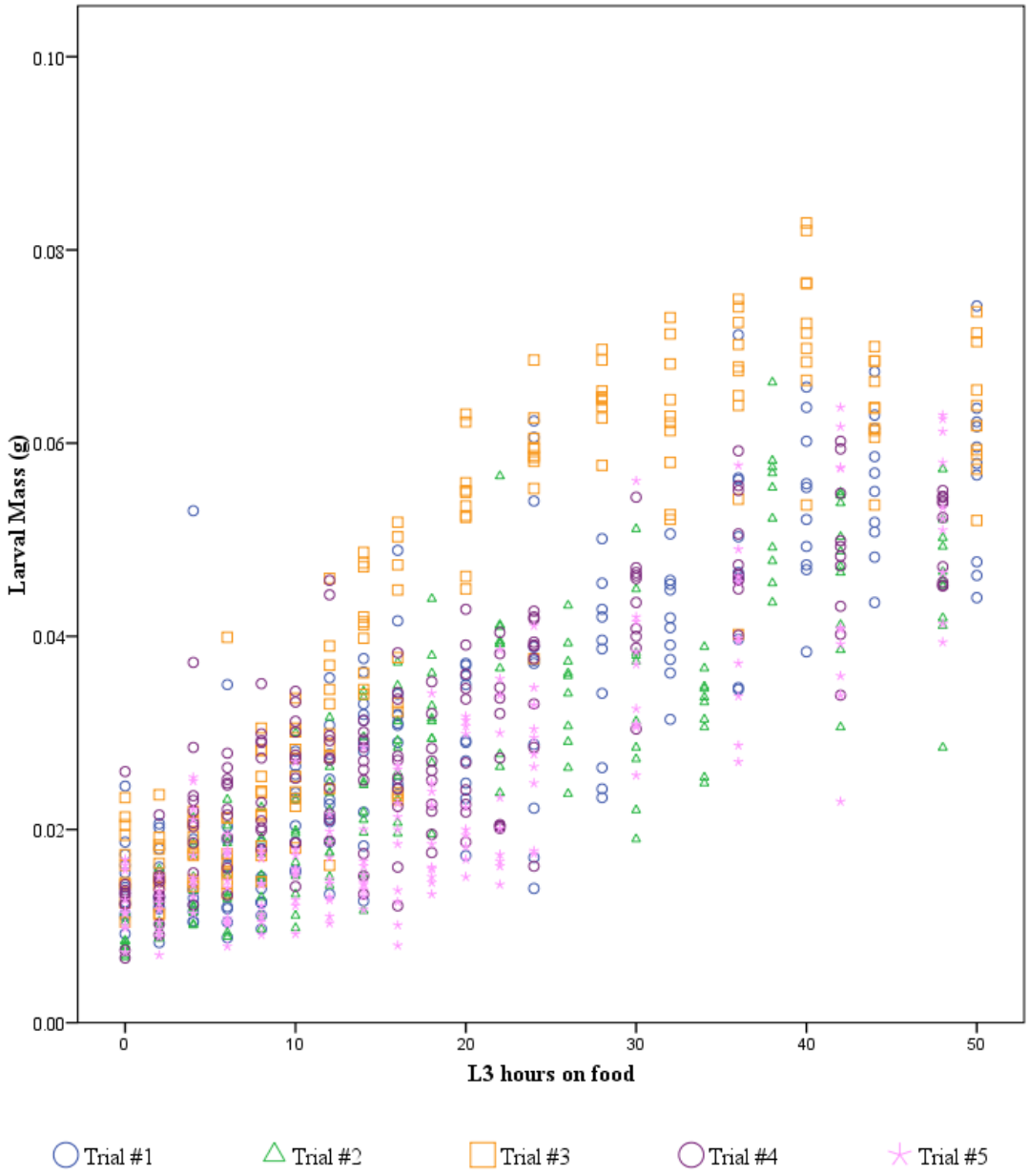

Figure 4.2 Larval Mass. Larval mass of *C. macellaria* treated with competition cues and reared in the master box, as a function of the duration of feeding during the L3. Each experimental repetition is plotted as a different color and indicator shape.

during the third instar. Pupal mass was significantly different among treatments (F = 34.215, df = 2, $P < 0.001$). In the nonfed treatment, pupae had a mean mass of 0.0262 g (95% CI: 0.0246-0.0279 g); in the fed treatment 0.0329 g (95% CI: 0.0316-0.341 g); and in the mass-reared 0.0414 g (95% CI: 0.0382-0.445 g). There was no difference in pupal mass between males and females (F = 0.488, df = 1, P = 0.485). However, there was a significant interaction between pupal mass and trial in the unfed treatment. trials 4 and 5 were significantly smaller than trials 1 and 2, and all four were smaller than trial 3 (F = 39.060, df = 4, $P < 0.001$).

For MVW for pupariation, binary logistic regression was effective ($\chi^{2 =}$ 349.279, df = 5, $P < 0.001$), with a Nagelkerke pseudo-R^2 of 0.834. There was a significant inter-trial difference, with trial 1 having a higher MWV (Wald = 18.690, df = 4, $P < 0.001$). MVW for trials 2, 3, 4, & 5 was 0.0206 g (95% CI: 0.0165-0.0275 g), and for trial 1, 0.0297 g (95% CI: 0.0250-0.0343 g) (Fig 4.3). In terms of eclosion, larval weight was a good predictor of eclosion success ($\chi^{2 =}$ 203.0, df = 5, $P < 0.001$) with a Nagelkerke value of 0.752. Again, there was a significant trial effect (Wald = 12.844, df = 4, P = 0.012). trials 1 & 3 had a 50% likelihood to eclose at .0312 g (95%CI: .0209-.0614 g), while trials 2, 4, and 5 had a 50% likelihood to eclose at .0250 g (95%CI: 0.0194-0.351 g) (Fig 4.4). Pupal mass was a poorer predictor of eclosion success ($\chi^{2 =}$ 39.833, df = 5, $P < 0.001$) with a Naglekerke value of 0.309. There were no significant differences between treatment (Wald = 1.817, df = 2, P = 0.403) or between trial (Wald = 0.046, df = 4 , P = 0.830). The 50% likelihood to eclose for the pooled treatments was 0.0012 g

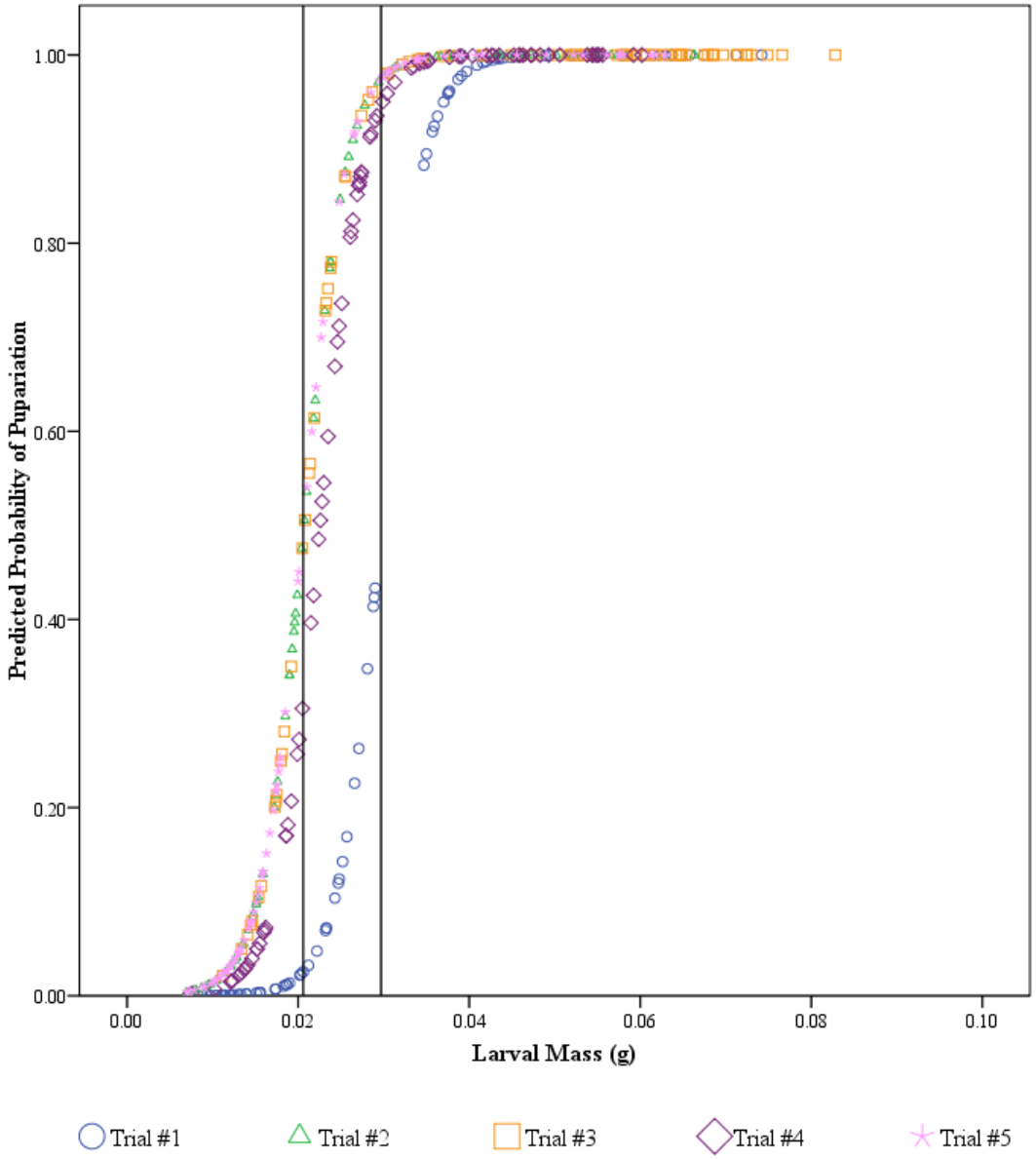

Figure 4.3 Minimum Viable Weight for Pupariation. Predicted probability of *C. macellaria* pupariation for each larval weight from the binary logistic regression equation using trial and larval mass as independent variables. Vertical rules mark the larval mass at 50% likelihood to eclose for each of the two significantly different subsets.

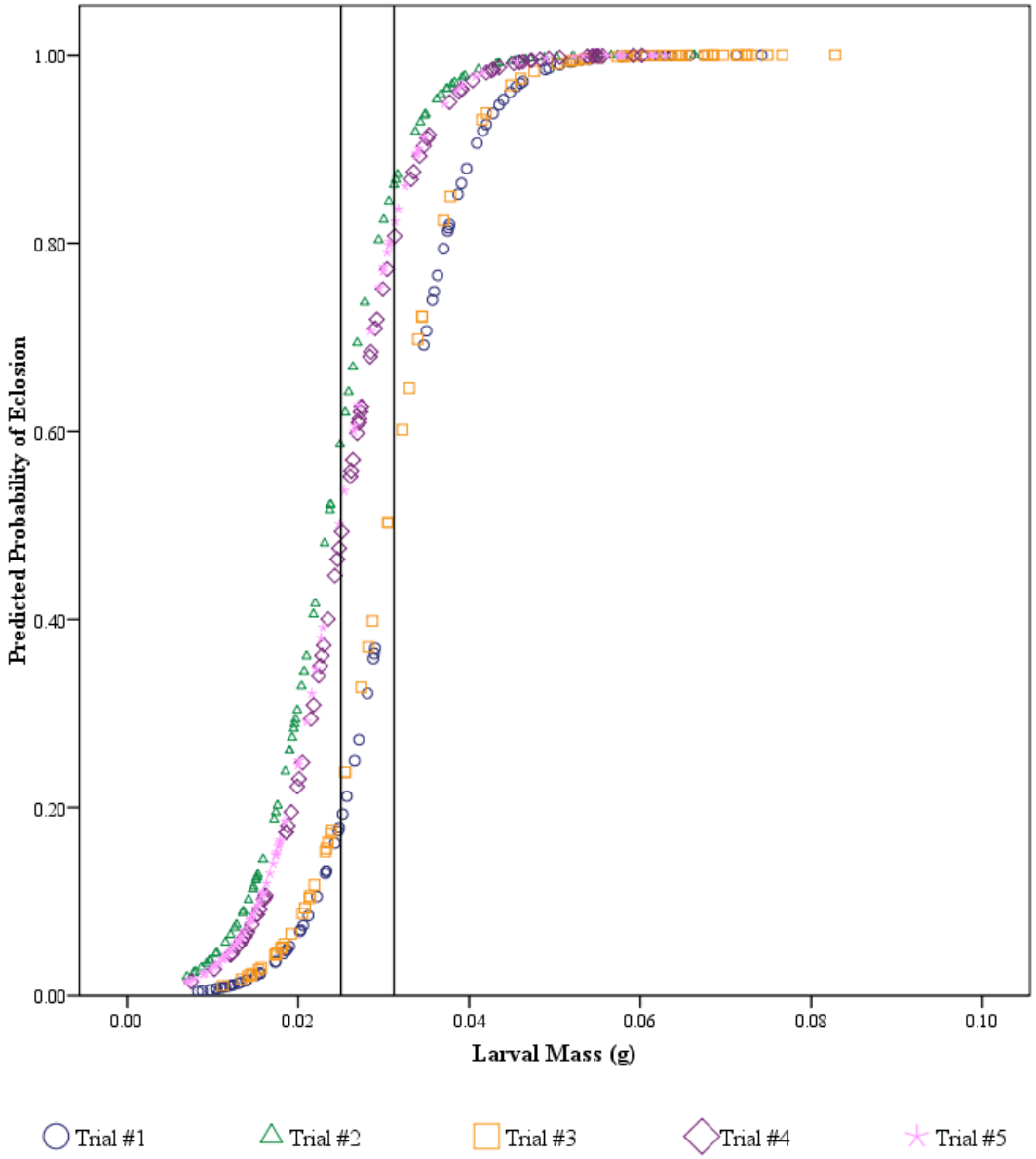

Figure 4.4 Minimum Viable Weight for Eclosion. Predicted probability of *C. macellaria* eclosion for each larval weight from the binary logistic regression equation, using trial and larval mass as independent variables. Vertical rules mark the larval mass at 50% likelihood to eclose for each of the two significantly different subsets.

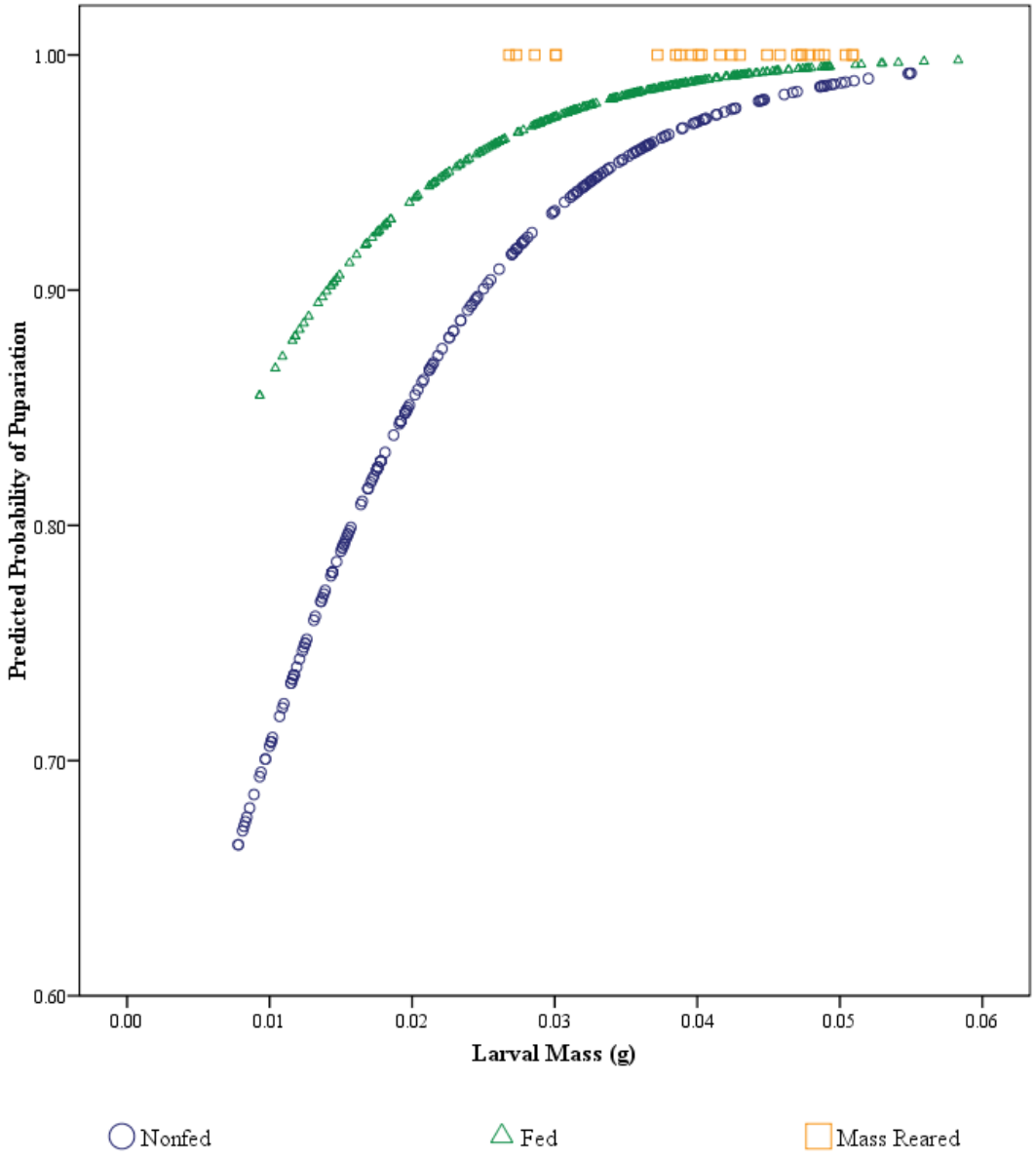

Figure 4.5 Minimum Viable Weight for Eclosion by Pupae. Failure/Success at eclosion, plotted with the predicted survival for each pupal weight from the binary logistic regression equation. Vertical rule marks the pupal mass at 50% likelihood to eclose. There is no significant difference between these three treatments

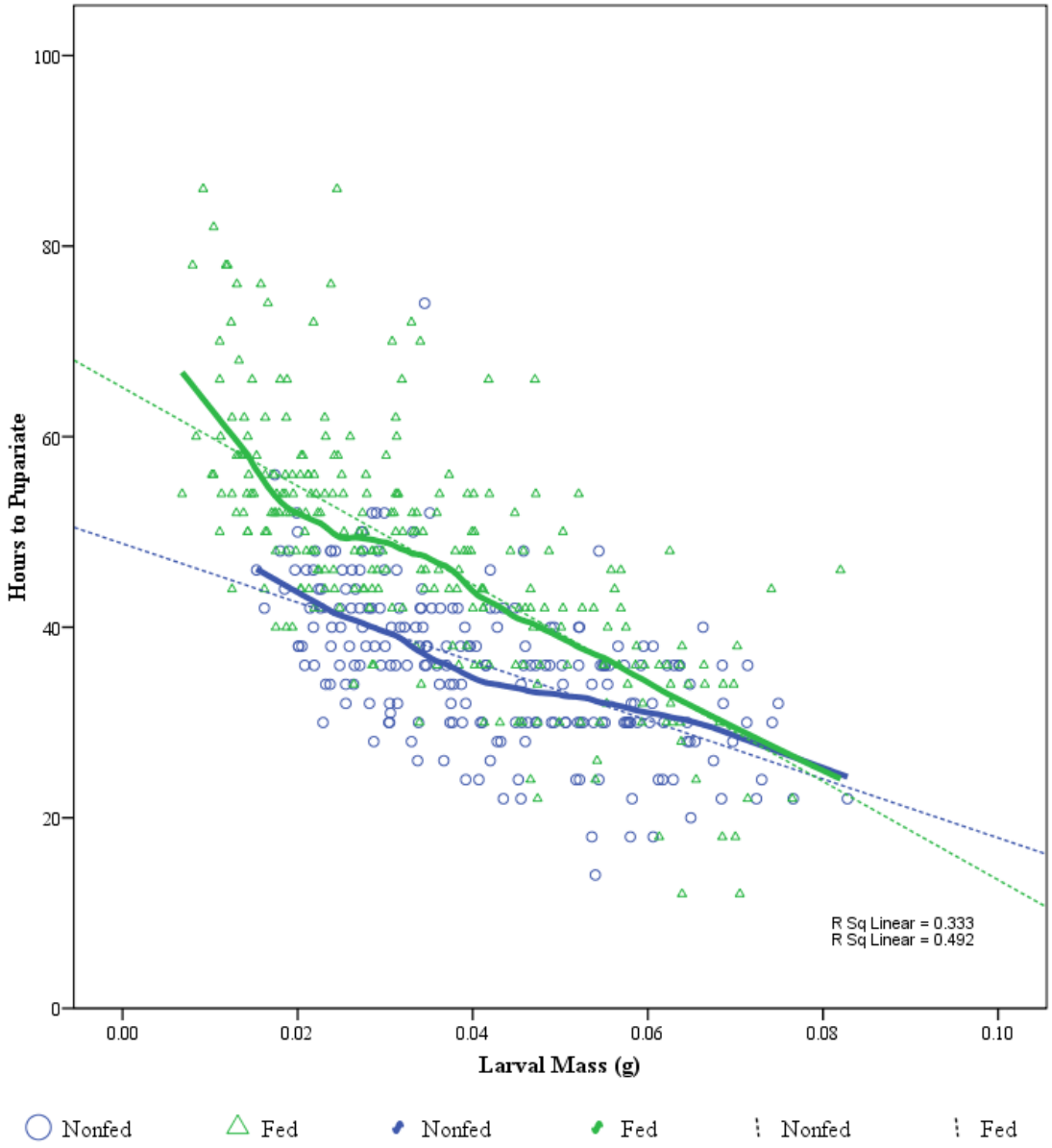

Figure 4.6 Time Delay to Pupariation (Pooled). Relationship of measured *C. macellaria* larval weight to the interval between initial observation and pupariation under conditions of simulated competition. LOWESS curves (solid) and linear regression (dotted) lines are given for all pooled trials. R^2 values for the linear regressions are also displayed: the upper is for the nonfed treatment and the lower for the fed treatment.

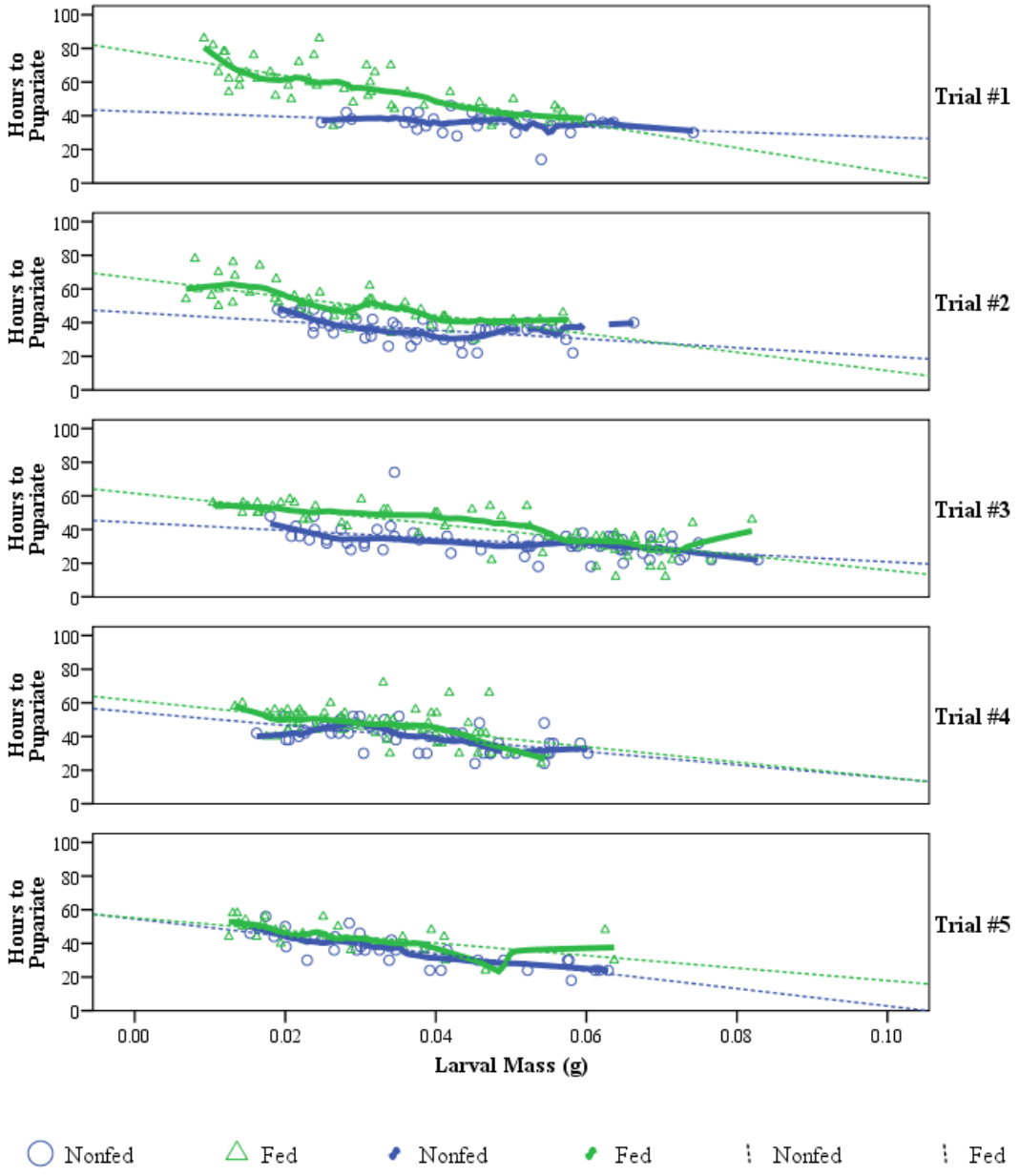

Figure 4.7 Time Delay to Pupariation (Individual). Relationship of measured *C. macellaria* larval weight to the interval between initial observation and pupariation under conditions of simulated competition. LOWESS curves (solid) and linear regression (dotted) lines are shown for all trials. R^2 values for each linear regression are given in Table 3.2

(95%CI: 0.0009-0.0019 g.) (Fig 4.5).

Although there appears to be a break point in the pooled LOESS curve for the fed treatment (Fig 4.6), analysis of the individual curves show this to largely be an artifact of trial #1 (Figure 4.7). With that exception, there did not appear to be any strongly anomalous trials as there had been in the control experiment. Furthermore, the LOESS curves were nominally linear (particularly for the nonfed treatment), allowing for linear regression tests. When the data were analyzed with ANCOVA, slope did not vary between trials ($F = 1.525$, df = 4, $P = 0.194$), but there was a significant trial x treatment effect ($F = 6.747$, df = 4, $P < 0.001$). There was a significant difference in slope between treatments ($F = 60.589$, df = 1, $P < 0.001$). In terms of intercepts, it varied by treatment ($F = 14.256$, df = 1, $P < 0.001$), but not trial ($F = 0.797$, df = 4, $P = 0.527$), though there was a significant treatment x trial interaction ($F = 3.914$, df = 4, $P = 0.004$). In the nonfed treatment, the overall adjusted R^2 values was 0.409, while for the fed treatment, adjusted R^2 was 0.609 ($F > 20.786$, df > 1, $P < 0.01$). Regression equations are summarized in Table 3.1.

There were significant differences between treatments in how long they took to pupariate after being removed from the master box ($F = 152.503$, df = 1, $P < 0.001$). Larvae in the nonfed treatment took 11.69 h fewer than the fed treatment to complete the stage. There were also significant differences among trials and a trial x treatment effect ($F > 6.579$, df = 4, $P < 0.001$). Overall, trial 3 and 5 were the fastest to develop, and trial 1 the longest. However, in the nonfed treatment, trials 3 was faster than the others, while

Table 4.1 Linear Regression Equations. Linear Regression Equations for each treatment by trial. Dependent variable is hours to pupariate, independent variable is C. *macellaria* larval mass. Regression equation: β_1*Larval Mass + β_0. * indicates that larval mass is a nonsignificant explanatory variable ($P > 0.05$). All others df = 1 and $P<0.001$. Subgroups are compared within treatment

	Trial	*F*-value	β_1	Subgroup	β_0	R^2
Nonfed Treatment	1	2.450*	-152.555	A	42.521	0.089
	2	12.344	-260.017	B	45.922	0.219
	3	19.696	-232.776	B	44.124	0.250
	4	28.293	-390.042	B	54.385	0.362
	5	56.999	-517.475	C	54.522	0.633
Fed Treatment	1	76.659	-714.094	C	78.046	0.605
	2	47.361	-548.928	B	66.335	0.497
	3	97.366	-456.541	B	61.505	0.600
	4	23.288	-456.583	B	61.257	0.264
	5	16.978	-371.924	A	55.101	0.377

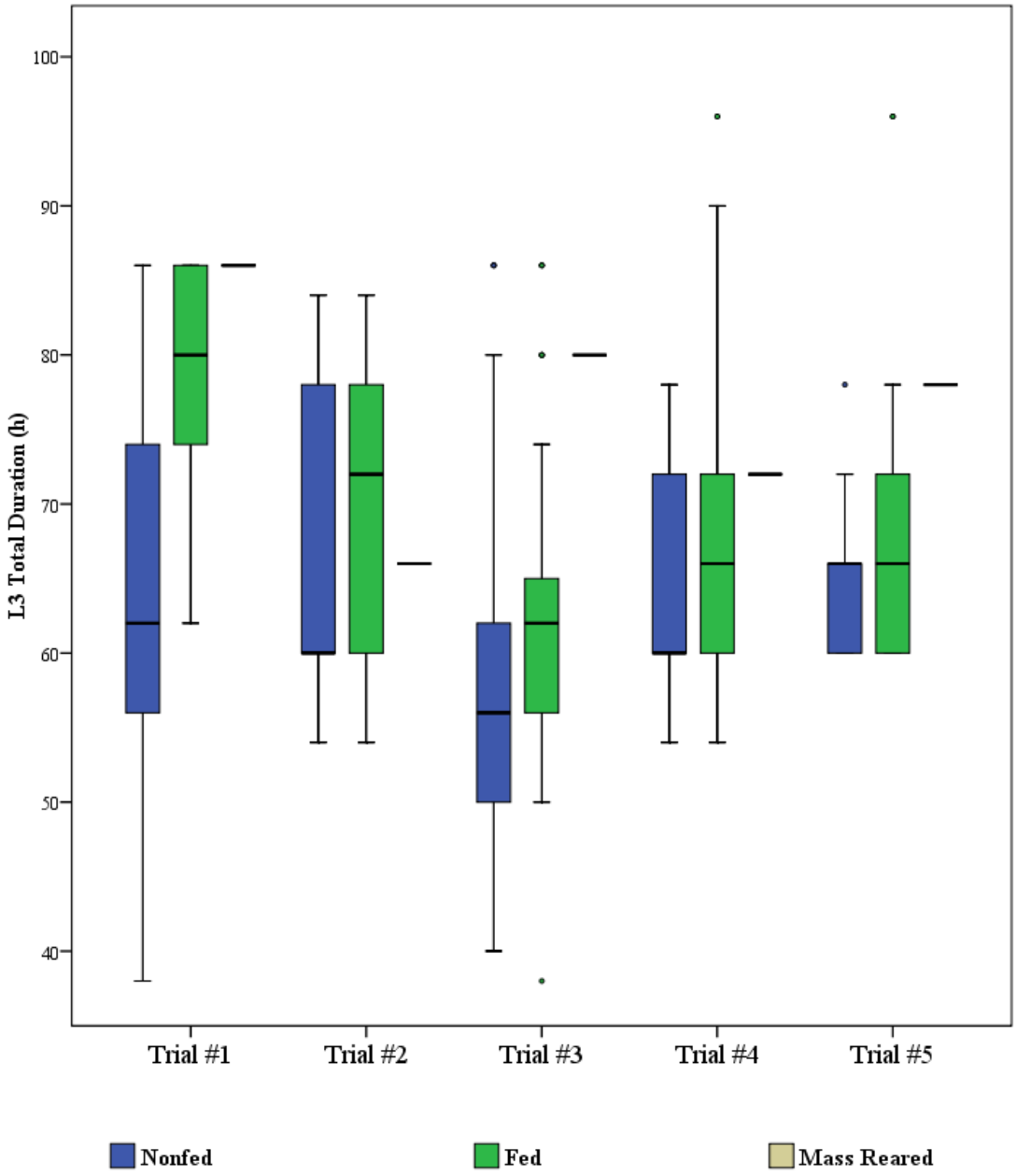

Figure 4.8 L3 Duration. Relative durations of competition-cued *C. macellaria* L3 for each experimental repetition and each treatment. Blue represents nonfed, green fed, and beige mass-reared. Mean stage duration is given by thick line, with quartiles represented by box and whiskers, and outliers by asterisks.

in the fed treatment, there were three overlapping subsets of trial 3 and 5, trial 3, 5, and 2, and trial 1 and 2.

In terms of the length of the third instar, there were significant differences between all three treatments (F = 4.105, df = 2, $P<0.001$). The nonfed treatment took 5.817 h faster than the fed treatment and 13.002 h faster than the mass-reared treatment, and the fed treatment took 7.185 h less than the mass-reared treatment. In the fed treatment, there was significant difference between trials ($F = 6.355$, df = 4, $P<0.001$). trial 3 was the fastest, trials 2, 4, and 5 NSD, and trial 1 was the slowest. However, there was also a trial x treatment effect ($F = 3.617$, df = 8, $P<0.001$). In the nonfed treatment, trial 3 was the fastest, with NSD between trial 1, 2, 4, and 5. In the fed treatment, trial 3 and 4 were similar, trials 2, 4, and 5 had no significant difference, and trial 1 was the slowest. In the mass reared group, trial 2 was the fastest, but without significant difference from trials 3, 4 or 5. trial 3, 4, and 5, were also not significantly different from trial 1, the slowest trial (Fig 4.8).

In the pupal stage, there was no significant difference between the fed and the nonfed treatments, but they were significantly shorter than the mass-reared treatment. There were also significant inter-trial ($F = 18.763$, df = 4, $P < 0.001$) and trial x treatment ($F = 2.906$, df = 8, $P = 0.004$) effects (Fig 4.9). Trials 4 and 5 were the fastest to develop, followed by trial 2 and 5, then trials 1 and 3. This same pattern was seen in the fed treatment. In the nonfed treatment, there was complete separation, with trials 4 and 5 shorter than trial 2, and all shorter than trials 1 and 3. There was no difference in pupal duration among the mass reared treatment (Fig 4.10).

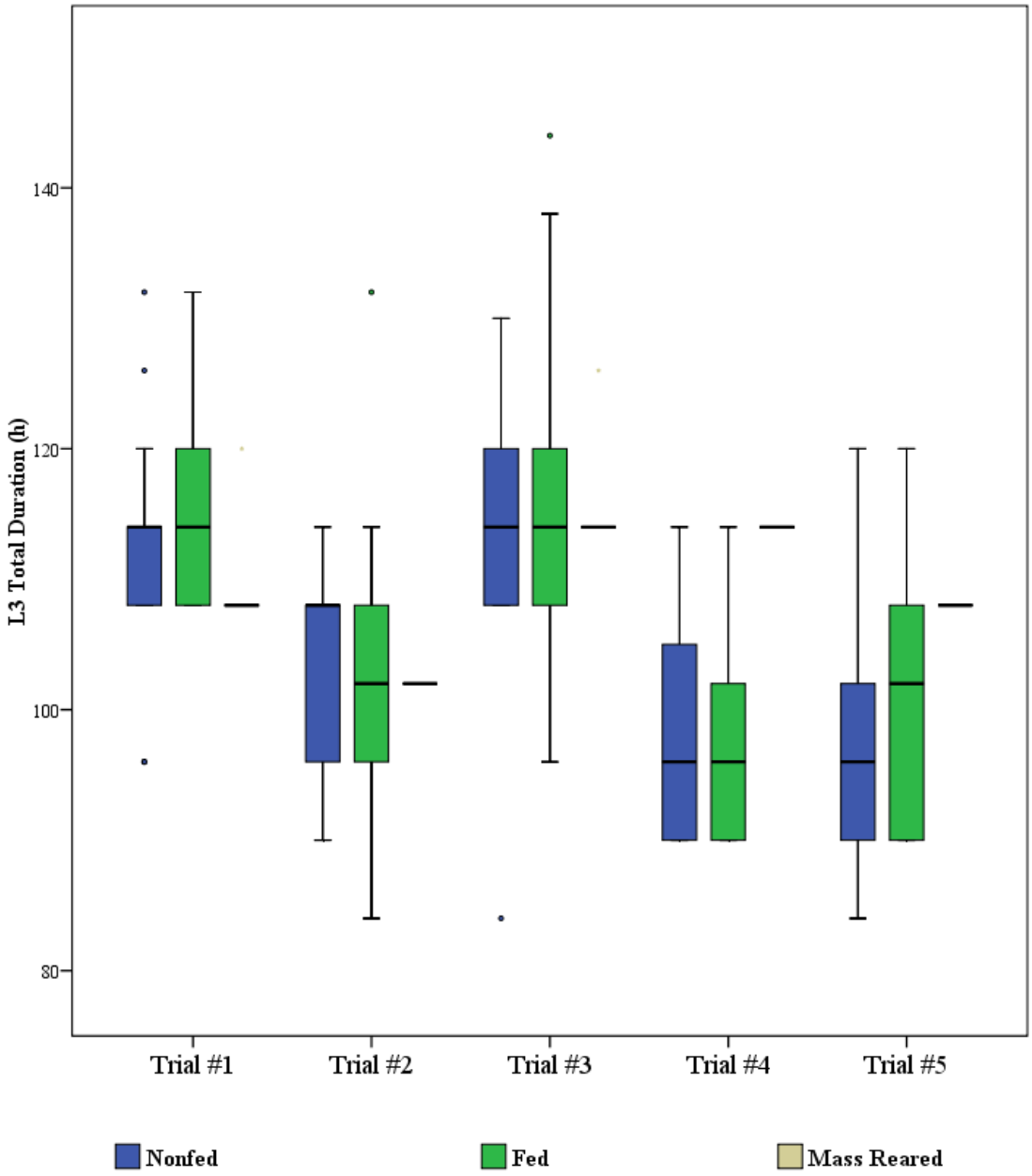

Figure 4.9 Pupal Duration. Relative durations of competition-cued *C. macellaria* pupal stage (pupariation to eclosion) for each experimental repetition and each treatment. Blue represents nonfed, green fed, and beige mass-reared. Mean stage duration is given by thick line, with quartiles represented by box and whiskers, and outliers by asterisks.

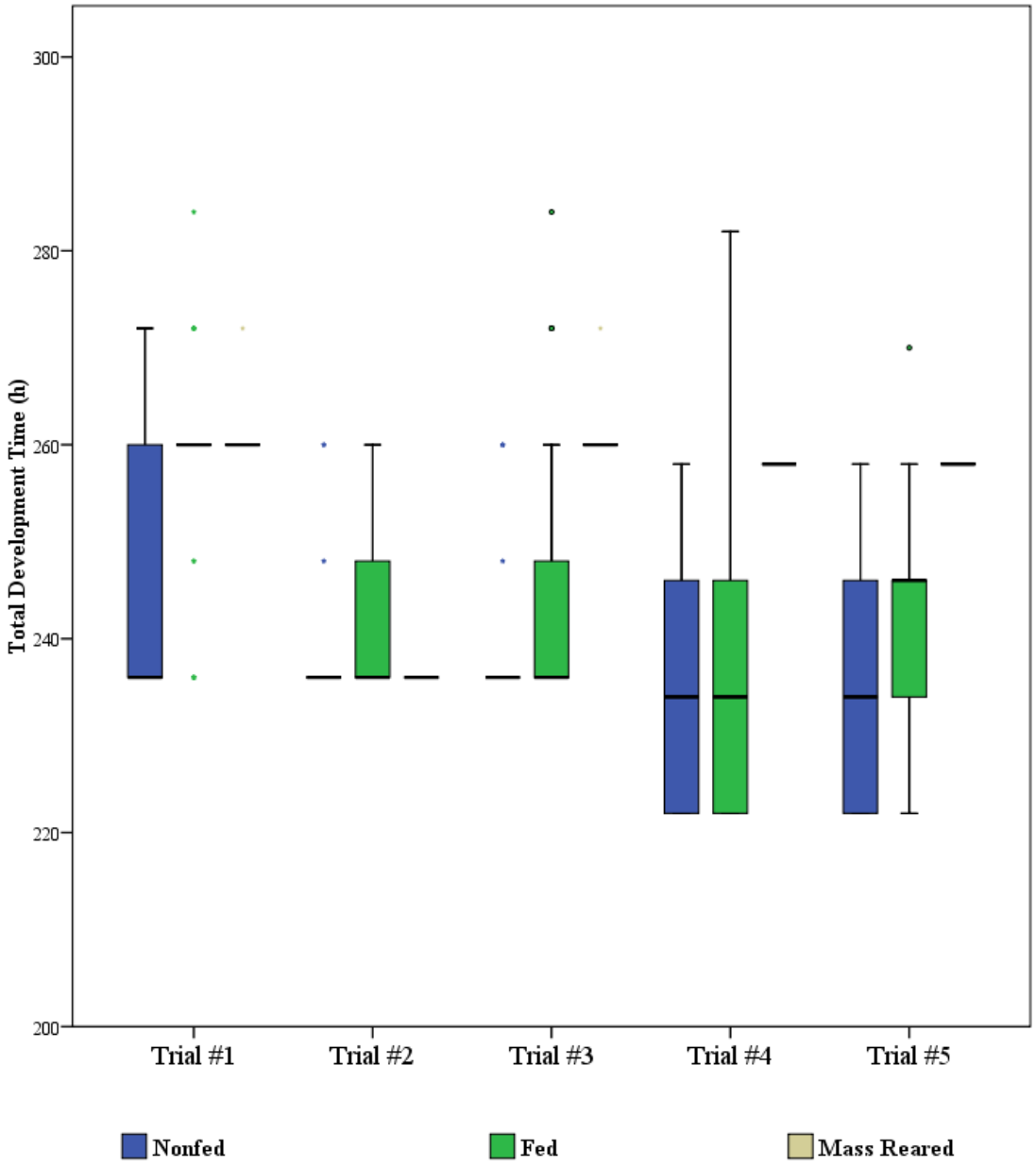

Figure 4.10 Total Development Time. Relative total development periods (oviposition to eclosion) for competition-cued *C. macellaria* for each experimental repetition and each treatment. Blue represents nonfed, green fed, and beige mass-reared. Mean stage duration is given by thick line, with quartiles represented by box and whiskers, and outliers by asterisks.

For total development, there were significant treatment effects ($F = 31.900$, df = 2, $P < 0.001$). The nonfed treatment took 6.181 h shorter than the fed treatment and 17.293 h faster than the mass-reared treatment. The fed treatment developed 11.112 h faster than the mass-reared. Inter-trial differences were significant ($F = 10.465$, df = 4, $P < 0.001$), with trials 2, 4 and 5 the fastest, trials 2,3, and 4 intermediate, and trial 1 the longest. There were also trial x treatment effects ($F = 4.638$, df = 8, $P < 0.001$). For the nonfed treatment, trial 2, 3, 4, and 4 were faster than trial 1, 2, 3, 4. In the fed treatment, trial 2, 4, and 5 were faster than trial 2, 3, and 5, and all were faster than trial 1. For the mass-reared treatment, trial 2 was faster than trial 1, 3, 4, and 5 (Fig 4.10).

Compared to the control experiment, larvae were smaller as they began the third instar, but gained more mass, resulting in larger pupae. They also grew at a greater rate, as the L3 duration was shorter. MVW for larvae to pupariate or eclose, or for pupae to eclose were no different between experiments. Pupal development and overall development time was also extended for the nonfed and fed treatments, but were unchanged for the mass-reared larvae. Regression slopes and intercepts were significantly different between treatments and between experiments. However, there was a strong experiment x treatment effect such that at mean larva size, the nonfed treatment pupariated 8.876 h (95%CI: 6.866-10.886 h) faster than the nonfed treatment ($F > 10.240$, df = 1, $P < 0.001$.). Other specific results are summarized in Table 4.2.

Table 4.2 Cued vs. Noncued Comparison. Comparison of various body size and development time parameters for *C. macellaria* between the noncued control as reported in the previous section and the results of this experiment. For "Overall", all treatments are pooled.

Parameter Tested	Treatment	Difference: Cued – Noncued	95%CI	Statistic, DF, *P*
Initial Larval Mass	Overall	-0.005 g	-0.003-0.007 g	*F* =23.346, 1, <0.001
Final Larval Mass	Overall	+0.004 g	+0.003-0.006 g	*F*=4.542,1, 0.035
Pupal Mass	Fed	+0.005 g	+0.003-0.006 g	*F*=4.214, 2, 0.015
	Nonfed	+0.002 g	+0.001-0.003 g	
	Mass-Reared	+0.002 g	+0.001-0.003 g	
MVW to Pupariate	Larval Mass (Nonfed)	0	(0.077-0.0238) vs (0.0194-0.0270) g	Overlapping 84%CI
MVW to Eclose	Larval Mass (Nonfed)	0	(0.0204-0.0272) vs (0.231-0.313) g	Overlapping 84%CI
MVW to Eclose	Pupal Mass (Nonfed)	0	(0.0063 -0.112) vs (0.0036-0.0072) g	Overlapping 84%CI
L3 Duration	Overall	-6.016 h		*F*=29.362, 1, <0.001
	Nonfed	-12.233 h	-10.179-14.287 h	*F*=13.714,2, <0.001
	Fed	-6.616 h	-4.907-8.325 h	
	Mass-Reared	0		
Pupal Duration	Overall	+5.153 h		*F*=15.609,1, <0.001
	Nonfed	+12.759 h	+10.238-15.279 h	*F* = 13.782,2, <0.001
	Fed	+6.300 h	+4.232-8.368 h	
	Mass-Reared	0		
Total Development Time	Overall	+10.094 h	+4.374-15.813 h	*F*=11.990, 1, <0.001
	Nonfed	+12.828 h	+7.660-17.997 h	*F*=4.56, 2, 0.034
	Fed	+9.652 h	+4.812-14.493 h	
	Mass-Reared	0		

4.4 DISCUSSION

The increased rate of escape in this experiment seems to indicate that the aqueous E/S extract had a repellent effect. Interestingly, escape was more common in the fed treatment, indicating that the repellent qualities of the extract overrode a food signal. This runs contrary to most foraging theory, as the benefit of an available food resource – even under apparent competition – should be higher than the risks of seeking an uncontested carrion source. A more expected strategy would be that of the nonfed treatment, which was more likely to remain in the cups, even in the absence of food. Given the patchy nature of carrion, the trade-off of small adult size to spending resources during fruitless foraging seems to favor sitting still (Houston et al. 2011, Pavlic and Passino 2011). There were also more larval deaths in the fed treatment of this experiment versus the previous one (Fig 3.3, Fig 4.11), indicating that fewer flies successfully switched from their natal food to the individual pellet. While the same physiological factors such as mouth hook size or collective thermal energy may be in play as in the starvation experiment (Slone and Gruner 2007, Rivers et al. 2011), the E/S should have enhanced any extra-oral digestion. The repellency might have come from the mere indication of the presence of older, larger larvae able to out-compete an individual for the food pellet in the cup. Alternatively, the escape may have been an effort at resource partitioning, seeking out a resource not subject to the feeding of older larvae, as resource partitioning generally favors intraguild coexistence (Reader et al. 2006).

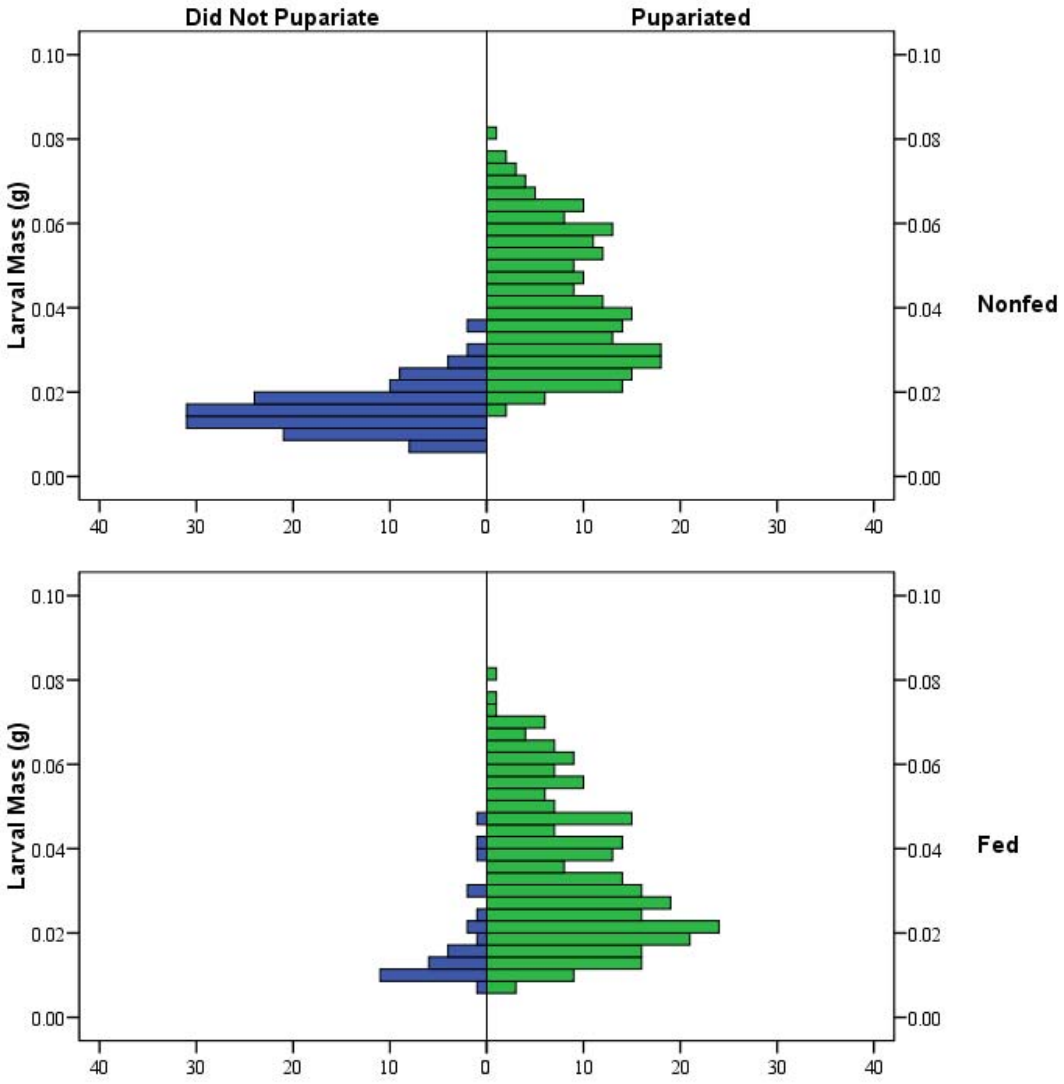

Figure 4.11 Pupariation Success. Observed frequency of failure to pupariate (blue) and successful pupariation (green) for each 0.002 g size class of *C. macellaria* larvae. Successful pupariation was defined as formation of a sclerotized, smooth puparium with mouth hooks fully retracted.

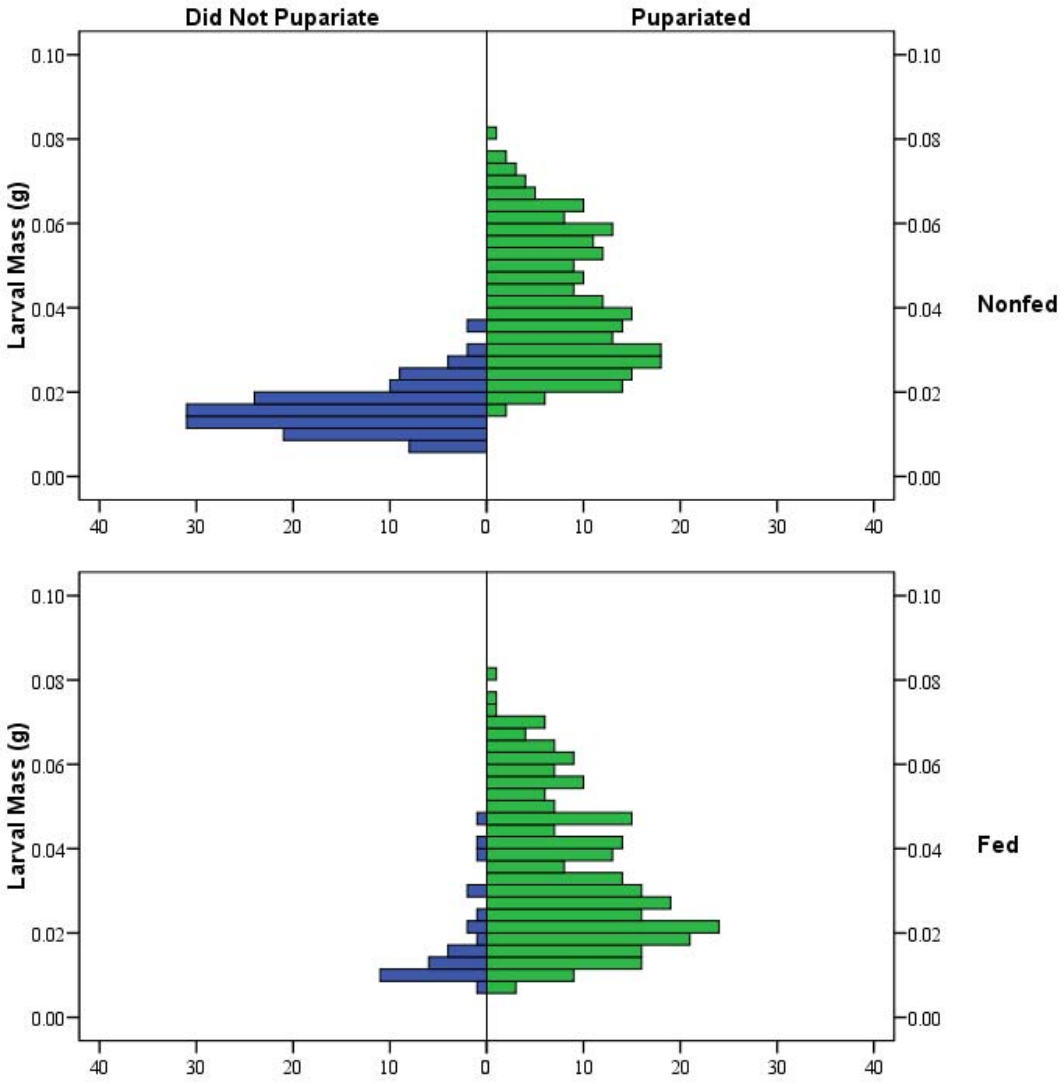

Figure 4.12 Eclosion Success. Observed frequency of failure to eclose (blue) and successful eclosion (green) for each 0.002 g size class of *C. macellaria* larvae. Successful eclosion was defined as full emergence from the puparium, with ptilinum retracted and wings inflated.

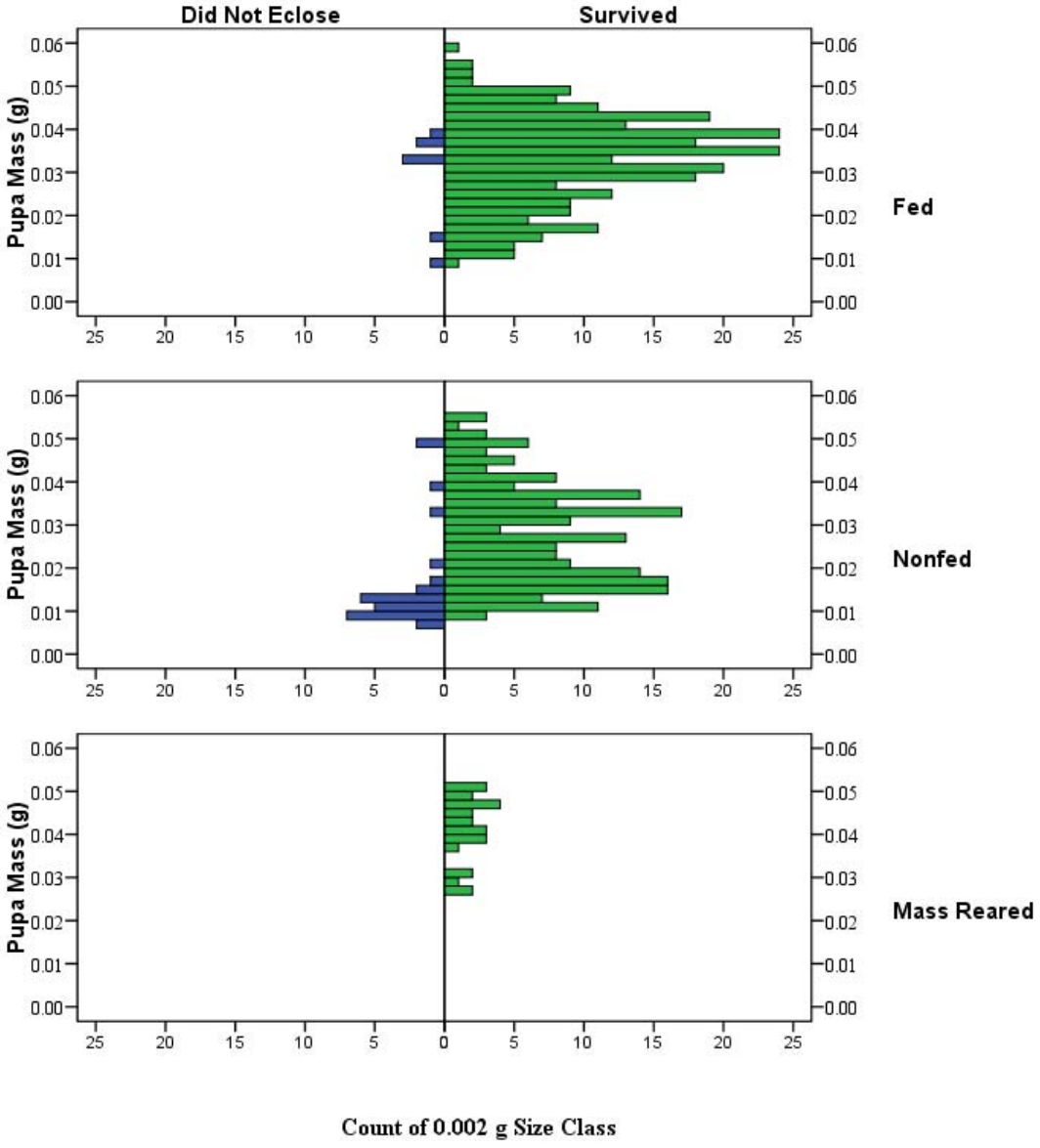

Figure 4.13 Eclosion Success by Pupae. Observed frequency of failure to eclose (blue) and successful eclosion (green) for each 0.002 g size class of *C. macellaria* pupae. Successful eclosion was defined as full emergence from the puparium, with ptilinum retracted and wings inflated.

There is some support for a beneficial effect of extract treatment. Although larvae in this experiment entered the L3 at a lower body mass than in the normal treatment, they finished it at approximately 9% larger mass, in a shorter period of time (Table 4.2). This relative increase in growth rate indicates that the larvae are either ingesting food at a greater rate or are converting it to tissue more efficiently (Davidowitz et al. 2005) – either could get due to the action of digestive enzymes in the extract. Yet despite this increase in growth rate, MVW to pupariate and to eclose were not significantly different from the prior experiment (Table 4.2). This result would seem to indicate that the calculated MVW is true, and stable under starvation and competition at 27ºC. However, there is the isolated case of trial 1 in terms of MVW to pupariate. In trial 1, nearly 25% of the unfed larvae escaped vs. 6-11% in the other unfed trials. Since it is predominantly the smaller larvae that escape (Fig 4.1), the apparent mortality at small body masses may have been reduced, artificially shifting the logistic equation to the right in both the MVW to pupariate and MVW to eclose regressions (Fig 4.3, Fig 4.4). A similar phenomenon may underlie the shift of trial 3 in the MVW to eclose regression. In trial 3, larvae entered the L3 at a higher mass, and grew much larger than the other trials (Fig 4.2). This trial saw comparatively little mortality (Fig 4.12), as the smallest members were generally larger than MVW, causing a shifted curve.

As in the previous experiment, larval mass was a much better explanatory variable for eclosion success than pupal mass. Figure 4.13 illustrates that pupae failing to eclose were distributed across the size range, and accounted for only a small portion of

the total pupae numbers 6. In fact, the mass at predicted 50% likelihood, 0.0012 g (Fig 4.5), was smaller than the smallest larvae measured in this experiment.

Unlike the previous experiment, there are definite differences in the developmental strategies of larvae removed from their cohort, closer to the *D. melanogaster* model (Layalle et al. 2008, Stieper et al. 2008). While the timing of pupariation is still largely determinant rather than a broken-stick for a given larval mass, the relationship is different. In this experiment, the shape of the regression lines is significantly flatter than without competition cues, indicating that changes in larval mass have a lower effect on the timing of pupariation. However, the overall stadium duration of the competition-cued experiment is shortened relative to the "normal" experiment (Table 4.2). As a result, the competition-cued larvae are not pupariating any faster than the noncued larvae, on average. Mere exposure to apparent competition cues does not seem sufficient to induce plasticity in critical weight (Figs 3.7-3.9). However, when starvation and competition cues are presented together, the developmental arc does shift (Figs 4.6-4.7). At a given larval mass, larvae are pupariating about 9 h faster, and averaging nearly 30% lighter as pupae than the fed treatment (Fig 4.9). This is comparable to the *D. melanogaster* response to simple starvation (Stieper et al. 2008); save that the abrupt shift in pupariation timing at CW is still missing. A possible explanation for this absence is found in the nearly flat relationship of larval mass to pupariation time and the lack of significant differences in intercept in the nonfed treatment (Figs 4.6-4.7). If larvae are committing to pupariation at or before MVW, as was discussed in the previous section, the remainder of the L3 is spent in the terminal

growth period (TGP). In *D. melanogaster,* the length of the TGP is nutritionally dependent, with high nutritional value associated with a shortened TGP (Layalle et al. 2008). If this is the case, instead of demonstrating an expected plasticity in CW, *C. macellaria* actually demonstrates plasticity in the TGP, but only in response to severe adverse conditions. A shortened TGP is consistent with the finding that the length of the L3 is shortened versus the noncued experiment (Table 4.2) and with the idea that E/S extracts benefit feeding & digestion. On the other hand, it is also consistent with the idea that some insects will increase developmental rates on poor-quality host (Roder et al. 2008). Both mechanisms could actually be working simultaneously in this experiment: the fed treatment benefiting from the action of the E/S extracts, and the nonfed treatment developing quickly because the absence of food combined with the presence of E/S signals that accepting a smaller adult size is the optimal choice (Houston et al. 2011). The presence of E/S from a previous cohort, coupled with an absence of available food, could therefore serve as an informational transfer about the likelihood of successful foraging, a key part of optimal decision making (Pyke 1984).

Interestingly, these development modifications only seem to apply to larvae reared in the individual cups. Larvae reared in the master box were somewhat larger than those in the non-cued experiment, but there were no changes in development time for L3, pupal development, or total development time (Table 4.2). This suggests that individual development is a stressor in addition to the loss of group benefits such as thermal increases, mass feeding, and predator avoidance (Dugatkin 2009, Rivers et al. 2011). On the whole, larvae reared in the presence of chemo-gustatory competition

cues from an older cohort do not seem to suffer any apparent fitness costs. If anything, they gain a slight size advantage without a concurrent development time penalty (Table 4.2).

4.5 CONCLUSIONS

From a forensic entomological perspective, understanding sources of plasticity in insect development is important, both as a means of understanding the underlying ecology while meeting the requirements of *Daubert* (Tomberlin et al. 2011b). In the case of *C. macellaria* treated with the E/S and associated bacteria of an older cohort, development time is affected if the larvae are separated from the rest of their own cohort and/or are starved. These results could be very significant if bodies are moved. If a body is colonized a second time in a new area, and the larvae are feeding together, development time should not be affected. However, if there is a small secondary colonization of corpse fluids or other material, they could be approximately 12 h younger to 12 h older than estimated, depending upon their stage of discovery.

From an ecological perspective, the demonstration of semiochemical-induced developmental changes indicate that the interactions of different seres or cohorts of necrophilous arthropods could be more important than heretofore thought, particularly in a laboratory setting where generations of species are generally reared in isolation. Depending upon the exact nature of the cue - whether it is a digestive product, results of carrion tissue degradation, or a microbial-produced material – could also shed new light on the role of communication and signaling between groups on a carcass.

In terms of species ecology, these results also show how refractory *C. macellaria* is to altering its developmental arc, and the frequency that this species will trade body size for a standard development time in a cohort. While they do have a mechanism for altering their TGP, as *D. melanogaster* do, they do not seem to employ it except in extreme cases of both starvation and evidence of superior competitors. Further research into the factor regulating synchronous development within a cohort could reveal a very important selection pressure in the life of this species.

5. SUMMARY AND CONCLUSIONS

The purpose of these experiments was to better understand the basic ecology of some locally prevalent blow fly species; to turn that understanding to the betterment of the applied side of forensic entomology; to explain that ecology from an adaptive/evolutionary perspective; and to produce research that was compliant with the requirements of the *Daubert* standard for expert testimony. On these points, the three major experiments were largely successful.

Probably the most important finding was the ovarian-status/physiological age structure in *Chrysomya rufifacies* (Macquart) and *Cochliomyia macellaria* (F.) (Diptera: Calliphoridae). From a forensic perspective, this strong relationship between time and ovary size allows the female flies to serve as predictors of minimum postmortem interval, an important step forward (Tomberlin et al. 2011a). Using their ovarian status, the length of the adult's association can be estimated using the Bernoulli distribution and 95% CI of the mean ovariole length for the first three days postmortem. As far as can be determined, this is a completely new technique for estimating the duration of insect association with a carcass in the absence of larval activity. Using objective measurements and numerical probabilities means that the technique complies with the recommendation of the NAS/NRC report for reducing the effect of worker bias (2009). With a quantified error rate or it should easily meet the *Daubert* standard for scientific evidence, even as a very novel technique (1993). The usefulness of this technique can be seen from the validation trials, where looking solely at adult ovary size correctly

estimated minimum PMI in three out of four tests using *C. macellaria* and *Ch. rufifacies*. It also worked for one of the validation tests using a completely different species, *Lucilia sericata* (Meigen) (Diptera: Calliphoridae), from a completely different portion of the country. Although further research is necessary, this result seems to indicate that similar ovary size-based population structures can be found in other species of warm-weather flies.

Not only is this a new technique for estimating the period of insect activity, it represents an important increase in the usefulness of the adult flies themselves in forensic investigations. Some have advocated collection of adult flies at scenes (Smith 1986, Haskell and Williams 2008), serving largely as validations of larval identifications. Although these results were unable to successfully model adult carcass attendance in terms of environmental factors, some inferences can be made. For both winter- and summer-active species, the size of the fly population on the carcass was governed by time of day and extreme weather conditions. Species in each season had a notably similar diel pattern of behavior, which seems to indicate that carcass attendance is governed by an endogenous circadian mechanism (Saunders 2009). The presence of this diel patterns allows – in a qualitative sense – an assessment of the likelihood that adults will respond to a carcass, and may explain some of the variation in arrival times documented throughout the forensic entomological literature.

Experiments with larvae were of a mixed success. Minimum viable weight (MVW) to pupariate of about 0.02 g and was well supported across ten trials and two experiments. A slightly higher MVW to eclose of 0.023-0.025 g was also supported

across eight trials and two experiments. Although these differences were not significant at 95%, they are certainly suggestive that larvae attempt to pupate before they can actually survive the process – a poor developmental strategy. Whether this MVW is consistent across temperatures or diet qualities is a subject for further research, as not all tissue is alike, and does affect growth trajectories in this species (Boatright and Tomberlin 2010).

Determination of critical weight (CW) was less successful. Under starvation conditions, the larvae did not alter their development time in any meaningful way (Figs 3.7-3.9). This result deviates from all the known models of developmental control, specifically from *Manduca sexta* (L.) (Lepidoptera: Sphingidae) and *Drosophila melanogaster* Meigen (Diptera; Drosophilidae) (Nijhout 2008). If a genuine effect, this would represent a new model of development, a linear relationship between larval mass and time to pupariation. This is supported by a linear regression for both treatments in both experiments. While there were significant differences in the slope and the intercepts of the regression lines was different, the basic nature of the relationship was the same. However, these results also bear out some contraindications. In *C. macellaria,* CW could occur simultaneously with or even prior to attaining MVW. If this arrangement is the case, the growth curve patterns for the nonfed non-cued experiment, the fed non-cued experiment, and the fed competition-cued experiment are all congruent with the post-CW *M. sexta* model, inasmuch as the experimental manipulation has no effect on delay to pupariation (Nijhout and Williams 1974b). Overall, though, between the two larval experiments, there seems to be more evidence for following the *D. melanogaster*

model (Stieper et al. 2008). In *D. melanogaster,* the close proximity of MVW and CW has led several authors to use the terms interchangeably (Mirth and Riddiford 2007), so it is not far-fetched that a similar phenomenon might be seen in a fellow cyclorraphan fly. The predominant evidence comes from the competition cue experiment, where both the cued-fed and the cued -nonfed treatments accelerated pupariation relative to the non-cued treatments, ostensibly by modifying the terminal growth period.

The truly interesting outcome of the larval experiments was how little larval development varied in terms of time. As the competition-cue experiment showed, larvae could accelerate pupariation (Figs 4.6-4.7). Yet in the starvation experiment, they did not. Pupariation provides protection against predation and desiccation (Chapman 1998). Particularly for larvae near MVW, extended time off of a food resource would seem to reduce the ultimate likelihood of surviving to adulthood by metabolizing nutrient stores as a larvae. Only when larvae were presented with cues of the presence of older larvae did they shorten their terminal growth period, and at that, only be a few hours. Taken together, these results suggest that there is some strong cause keeping larvae developing in fairly close synchrony, although further research is required to determine exactly what that cause might be.

From a forensic perspective, this seeming reluctance of larvae to trade body size for increased likelihood of survival an important consequence. Even when larvae are in situations of starvation, their age can be estimated in many of the same ways that non-starved larvae can be estimated (that is, by ADD and developmental stage) (Wells and LaMotte 2010). By the same token, using weight as a predictor could have disastrous

results (Wells and Lamotte 1995), as larvae could be much older than their body size would predict. Small adjustments of 6-12 h might be necessary for secondarily-colonizing larvae that were also starved, though.

From an ecological perspective, the lack of larval response to adverse conditions would seem to explain why adult blow flies arrive at carcasses so quickly, when they colonize them so quickly, and then why they abruptly stop colonizing them. In general, larvae are going to enhance fitness by maximizing their growth for their development time (Chown and Gaston 2010). Prematurely committing to pupariation when there is a chance of finding more food, even given the limited foraging capabilities of a maggot, would seem to be selected against. The competition cue experiment showed that blow fly larvae have relatively limited means of assessing the size and quality of their own food patch, as they shortened development even in the presence of abundant food. Given these two facts, it would seem to fall on the adult female to evaluate and select oviposition sites that present offspring the greatest chance of avoiding starvation – that is, very fresh carcasses – in a manner consistent with optimum oviposition theory (Scheirs and De Bruyn 2002). This would seem to answer the question of "why are flies acting like this" from an evolutionary perspective – because it increases the fitness of their offspring.

Female flies also use carcasses as sources for a protein meal. But the appearance of less-developed flies later in the postmortem interval would seem to indicate that they are under less pressure to find a protein source quickly. By the time they arrive, the first larvae are beginning to break down the carcass collective salivary secretions (Rivers et

al. 2011). With their sponging mouthparts, females probably find feeding much easier on this nutrient soup than on an intact piece of tissue (Chapman 1998). In sum, this staggering of arrival suggests that adult blow flies employ a degree of optimal foraging in their interactions with carrion by avoiding expending unnecessary energy (Pyke 1984). For these younger flies, showing up later is an adaptive benefit to their own fitness - "why" from another of Tinbergen's perspectives (Tinbergen 1963).

Overall, this series of results is an excellent example of how very basic ecological research can improve the practice of forensic entomology (Tomberlin et al. 2011b). Through an exploration of the behavior of adult flies and the development of their offspring, estimates of both the pre-colonization interval and the post-colonization interval are improved. Further research is warranted in several areas, as is the eternal cause of science. In the case of adult blow flies, ovarian-status population profiles for more species than simple *C. macellaria* and *Ch. rufifacies* are needed, as are profiles from different ecozones. While the general trends of developed – mixed – undeveloped may hold across different species, variation in the proportions could have profound effects on the likelihoods and confidences generated by the binomial distribution.

Even working with *C. macellaria* and/or *Ch. rufifacies*, there are certainly more avenues for research. These two species are common across much of the year, and it would be very useful to know if and how much their ovarian-status structure does not change between seasons. Such investigations might also resolve the estimation errors in the validation portion of this study (Table 2.5).

As far as conclusively determining the role of CW, further investigation could do so by performing PTTH or ecdysteroid assays or by using genomic tools to look for specific post-CW gene expression (Layalle et al. 2008). Using such tools to determine the relative importance of CW and TGP plasticity in controlling overall body size could also explain some of the reported nutrient-based variation in blow fly development, e.g. *Calliphora vicina* Robineau-Desvoidy and *L. sericata* (Kaneshrajah and Turner 2004, Clark et al. 2006). Another issue that might be explored through plasticity in CW/TGP is mechanisms by which prey blow flies such as *C. macellaria* coexist with predatory blow flies such as *Ch. rufifacies*. When simultaneously present on a carcass, *Ch. rufifacies* can almost completely prevent *C. macellaria* from developing (Faria et al. 1999, Brundage 2011), however, a sufficiently large temporal separation will rescue them (Brundage 2011). Manipulation of developmental time through the mechanism of CW/TGP could be an important competition tactic and selection locus for coexistence in nature.
For any one of these possible avenues, the results reported in this dissertation would make a good baseline for comparison.

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APPENDIX A

ENVIRONMENTAL CONDITIONS DURING FIELD OBSERVATIONS

Date	Time	Trial	Temperature °C	Wind Speed	Light Intensity
8/7/08	8:45	1	28.4	0	2
8/7/08	9:45	1	28.1	1	2
8/7/08	10:45	1	28.8	1	2
8/7/08	11:45	1	30.5	0	2
8/7/08	12:45	1	31.8	1	2
8/7/08	13:45	1	33.5	1	2
8/7/08	14:45	1	34.2	1	2
8/7/08	15:45	1	35.7	0	2
8/7/08	16:45	1	35.0	0	2
8/7/08	17:45	1	35.2	1	2
8/7/08	18:45	1	34.7	1	1
8/7/08	19:45	1	31.7	1	0
8/8/08	6:45	1	26.5	0	0
8/8/08	7:45	1	27.1	0	1
8/8/08	8:45	1	27.6	1	2
8/8/08	9:45	1	27.8	1	2
8/8/08	10:45	1	29.2	1	2
8/8/08	11:45	1	31.4	0	2
8/8/08	12:45	1	32.6	1	2
8/8/08	13:45	1	34.1	2	2
8/8/08	14:45	1	34.6	2	2
8/8/08	15:45	1	35.2	1	2
8/8/08	16:45	1	35.5	1	2
8/8/08	17:45	1	35.0	2	2
8/8/08	18:45	1	33.9	1	1
8/8/08	19:45	1	33.2	1	0
8/9/08	6:45	1	23.6	0	0
8/9/08	7:45	1	25.3	1	1
8/9/08	8:45	1	27.5	2	2
8/9/08	9:45	1	29.2	2	2
8/9/08	10:45	1	29.3	2	2
8/9/08	11:45	1	32.1	2	2
8/9/08	12:45	1	33.5	2	2
8/9/08	13:45	1	34.5	2	2
8/9/08	14:45	1	34.6	2	2
8/9/08	15:45	1	35.2	2	2
8/9/08	16:45	1	35.8	2	2

Date	Time	Trial	Temperature °C	Wind Speed	Light Intensity
8/9/08	17:45	1	35.2	2	2
8/9/08	18:45	1	35.1	1	1
8/9/08	19:45	1	33.6	1	0
9/5/08	8:45	2	24.2	0	2
9/5/08	9:45	2	25.4	0	2
9/5/08	10:45	2	26.3	2	2
9/5/08	11:45	2	27.6	2	2
9/5/08	12:45	2	28.9	0	2
9/5/08	13:45	2	30.2	1	2
9/5/08	14:45	2	31.5	2	2
9/5/08	15:45	2	31.5	2	2
9/5/08	16:45	2	31.9	1	2
9/5/08	17:45	2	31.5	2	2
9/5/08	18:45	2	30.4	1	1
9/5/08	19:45	2	27.8	0	0
9/6/08	6:45	2	20.4	0	0
9/6/08	7:45	2	20.0	0	0
9/6/08	8:45	2	23.0	0	2
9/6/08	9:45	2	26.2	0	2
9/6/08	10:45	2	25.6	0	2
9/6/08	11:45	2	26.2	1	2
9/6/08	12:45	2	27.8	1	2
9/6/08	13:45	2	28.8	1	2
9/6/08	14:45	2	30.2	1	2
9/6/08	15:45	2	31.5	0	2
9/6/08	16:45	2	31.9	0	2
9/6/08	17:45	2	31.8	1	2
9/6/08	18:45	2	31.0	0	1
9/6/08	19:45	2	28.1	0	0
9/7/08	6:45	2	15.8	0	0
9/7/08	7:45	2	16.2	0	0
9/7/08	8:45	2	20.5	0	1
9/7/08	9:45	2	24.3	0	2
9/7/08	10:45	2	26.4	0	2
9/7/08	11:45	2	27.8	0	2
9/7/08	12:45	2	29.0	1	2
9/7/08	13:45	2	30.4	1	2
9/7/08	14:45	2	31.6	1	2
9/7/08	15:45	2	32.8	1	2
9/7/08	16:45	2	30.2	2	2
9/7/08	17:45	2	31.6	2	2
9/7/08	18:45	2	31.6	0	1

Date	Time	Trial	Temperature °C	Wind Speed	Light Intensity
9/7/08	19:45	2	28.9	0	0
1/7/09	10:45	3	17.6	0	2
1/7/09	11:45	3	17.4	1	2
1/7/09	12:45	3	17.6	1	2
1/7/09	13:45	3	17.9	1	2
1/7/09	14:45	3	18.1	2	2
1/7/09	15:45	3	18.9	0	2
1/7/09	16:45	3	16.9	0	1
1/7/09	17:45	3	13.6	0	0
1/8/09	7:45	3	7.1	0	1
1/8/09	8:45	3	10.9	0	2
1/8/09	9:45	3	15.4	0	2
1/8/09	10:45	3	18.3	0	2
1/8/09	11:45	3	20.5	0	2
1/8/09	12:45	3	21.7	1	2
1/8/09	13:45	3	22.0	1	2
1/8/09	14:45	3	23.6	1	2
1/8/09	15:45	3	27.6	0	2
1/8/09	16:45	3	23.6	0	1
1/8/09	17:45	3	17.6	0	0
1/9/09	7:45	3	16.0	0	1
1/9/09	8:45	3	17.4	1	2
1/9/09	9:45	3	19.2	2	2
1/9/09	10:45	3	21.6	3	1
1/9/09	11:45	3	22.6	2	1
1/9/09	12:45	3	24.7	3	1
1/9/09	13:45	3	25.0	3	2
1/9/09	14:45	3	26.4	1	2
1/9/09	15:45	3	26.9	1	2
1/9/09	16:45	3	24.5	1	1
1/9/09	17:45	3	22.9	0	0
1/10/09	7:45	3	10.4	4	0
1/10/09	8:45	3	10.0	4	1
1/10/09	9:45	3	9.8	4	1
1/10/09	10:45	3	9.4	4	1
1/10/09	11:45	3	10.4	4	2
1/10/09	12:45	3	9.6	4	2
1/10/09	13:45	3	10.1	4	2
1/10/09	14:45	3	9.9	4	2
1/10/09	15:45	3	9.0	4	2
1/10/09	16:45	3	8.0	4	1
1/10/09	17:45	3	6.0	3	1

Date	Time	Trial	Temperature °C	Wind Speed	Light Intensity
1/11/09	7:45	3	2.8	0	1
1/11/09	8:45	3	3.6	1	2
1/11/09	9:45	3	4.2	2	2
1/11/09	10:45	3	5.8	2	2
1/11/09	11:45	3	8.3	2	2
1/11/09	12:45	3	10.6	0	2
1/11/09	13:45	3	12.0	0	2
1/11/09	14:45	3	13.5	2	2
1/11/09	15:45	3	13.6	0	2
1/11/09	16:45	3	12.1	0	0
1/11/09	17:45	3	9.9	0	0
1/12/09	7:45	3	0.6	0	0
1/12/09	8:45	3	3.4	0	1
1/12/09	9:45	3	7.8	0	2
1/12/09	10:45	3	12.1	0	2
1/12/09	11:45	3	12.3	0	2
1/12/09	12:45	3	13.2	0	2
1/12/09	13:45	3	13.6	0	2
1/12/09	14:45	3	14.5	0	2
1/12/09	15:45	3	15.5	0	2
1/12/09	16:45	3	14.5	0	1
1/12/09	17:45	3	12.3	0	0
1/13/09	7:45	3	-0.6	1	0
1/13/09	8:45	3	2.7	2	2
1/13/09	9:45	3	3.4	2	2
1/13/09	10:45	3	5.9	2	2
1/13/09	11:45	3	7.4	3	2
1/13/09	12:45	3	8.9	3	2
1/13/09	13:45	3	11.6	3	2
1/13/09	14:45	3	10.0	2	2
1/13/09	15:45	3	9.8	2	2
1/13/09	16:45	3	9.8	1	1
1/13/09	17:45	3	7.9	0	0
2/24/10	9:45	4	3.6	0	2
2/24/10	10:45	4	4.9	0	2
2/24/10	11:45	4	5.7	1	2
2/24/10	12:45	4	5.5	2	2
2/24/10	13:45	4	6.2	2	2
2/24/10	14:45	4	7.4	0	2
2/24/10	15:45	4	7.7	0	2
2/24/10	16:45	4	8.0	0	2
2/24/10	17:45	4	7.7	0	1

Date	Time	Trial	Temperature °C	Wind Speed	Light Intensity
2/24/10	18:45	4	5.3	0	0
2/25/10	7:45	4	3.8	0	1
2/25/10	8:45	4	6.0	2	1
2/25/10	9:45	4	6.7	2	2
2/25/10	10:45	4	8.0	2	2
2/25/10	11:45	4	11.4	2	2
2/25/10	12:45	4	12.8	2	2
2/25/10	13:45	4	13.8	2	2
2/25/10	14:45	4	14.6	2	2
2/25/10	15:45	4	15.6	2	2
2/25/10	16:45	4	16.0	2	2
2/25/10	17:45	4	15.0	1	1
2/25/10	18:45	4	14.0	0	0
2/26/10	7:45	4	7.2	0	0
2/26/10	8:45	4	9.4	0	0
2/26/10	9:45	4	9.7	0	1
2/26/10	10:45	4	12.3	0	0
2/26/10	11:45	4	13.6	0	1
2/26/10	12:45	4	14.6	0	1
2/26/10	13:45	4	14.3	2	2
2/26/10	14:45	4	11.0	2	2
2/26/10	15:45	4	10.6	2	2
2/26/10	16:45	4	9.0	3	1
2/26/10	17:45	4	8.1	3	1
2/26/10	18:45	4	7.7	3	1
2/27/10	7:45	4	1.8	0	1
2/27/10	8:45	4	5.7	0	1
2/27/10	9:45	4	8.3	1	2
2/27/10	10:45	4	9.4	1	2
2/27/10	11:45	4	11.1	1	2
2/27/10	12:45	4	12.4	0	2
2/27/10	13:45	4	13.9	0	2
2/27/10	14:45	4	15.3	1	2
2/27/10	15:45	4	15.8	1	2
2/27/10	16:45	4	16.8	0	2
2/27/10	17:45	4	14.8	0	1
2/27/10	18:45	4	11.0	0	0
2/28/10	7:45	4	5.2	0	1
2/28/10	8:45	4	8.5	0	2
2/28/10	9:45	4	10.3	0	2
2/28/10	10:45	4	11.8	1	2
2/28/10	11:45	4	13.2	2	2

Date	Time	Trial	Temperature °C	Wind Speed	Light Intensity
2/28/10	12:45	4	15.8	2	2
2/28/10	13:45	4	16.8	3	2
2/28/10	14:45	4	17.0	3	2
2/28/10	15:45	4	18.4	3	2
2/28/10	16:45	4	17.4	3	2
2/28/10	17:45	4	15.7	2	1
2/28/10	18:45	4	14.4	0	0
3/1/10	7:45	4	2.3	0	1
3/1/10	8:45	4	5.8	0	1
3/1/10	9:45	4	8.9	0	1
3/1/10	10:45	4	11.6	0	1
3/1/10	11:45	4	11.8	0	1
3/1/10	12:45	4	11.5	0	1
3/1/10	13:45	4	11.5	0	1
3/1/10	14:45	4	11.2	0	1
3/1/10	15:45	4	10.9	1	1
3/1/10	16:45	4	10.4	1	1
3/1/10	17:45	4	8.5	1	1
3/1/10	18:45	4	8.2	0	0
3/2/10	7:45	4	1.8	0	1
3/2/10	8:45	4	3.9	2	2
3/2/10	9:45	4	6.5	2	2
3/2/10	10:45	4	7.6	2	2
3/2/10	11:45	4	9.1	2	2
3/2/10	12:45	4	10.2	2	2
3/2/10	13:45	4	11.4	2	2
3/2/10	14:45	4	11.9	2	2
3/2/10	15:45	4	12.3	3	2
3/2/10	16:45	4	12.4	2	2
3/2/10	17:45	4	11.8	2	1
3/2/10	18:45	4	10.2	0	0
3/3/10	7:45	4	3.4	0	1
3/3/10	8:45	4	5.6	0	2
3/3/10	9:45	4	8.4	0	2
3/3/10	10:45	4	1.8	0	2
3/3/10	11:45	4	13.7	0	2
3/3/10	12:45	4	13.9	1	2
3/3/10	13:45	4	15.6	0	2
3/3/10	14:45	4	15.9	0	2
3/3/10	15:45	4	16.7	0	2
3/3/10	16:45	4	16.3	0	2
3/3/10	17:45	4	15.8	0	1

Date	Time	Trial	Temperature °C	Wind Speed	Light Intensity
3/3/10	18:45	4	12.9	0	0
3/4/10	7:45	4	5.8	0	1
3/4/10	8:45	4	8.7	0	2
3/4/10	9:45	4	11.9	0	2
3/4/10	10:45	4	15.1	0	2
3/4/10	11:45	4	16.4	0	2
3/4/10	12:45	4	16.4	1	2
3/4/10	13:45	4	17.9	1	2
3/4/10	14:45	4	18.8	1	2
3/4/10	15:45	4	18.2	2	1
3/4/10	16:45	4	18.3	1	1
3/4/10	17:45	4	16.5	1	1
3/4/10	18:45	4	14.7	0	0
3/5/10	7:45	4	9.4	0	1
3/5/10	8:45	4	12.6	0	2
3/5/10	9:45	4	14.6	0	2
3/5/10	10:45	4	15.4	2	1
3/5/10	11:45	4	16.9	2	1
3/5/10	12:45	4	17.3	2	1
3/5/10	13:45	4	18.5	3	1
3/5/10	14:45	4	18.0	3	2
3/5/10	15:45	4	17.2	2	1
3/5/10	16:45	4	16.9	2	2
3/5/10	17:45	4	16.7	0	1
3/5/10	18:45	4	14.7	0	0

APPENDIX B

ADULT FLY COLLECTIONS

Species key: CM = *Cochliomyia macellaria*
CR = *Chrysomya rufifacies*
CV = *Calliphora vicina*
LS = *Lucilia sericata*
MEGA = *Chrysomya megacephala*
PR = *Phormia regina*

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
Summer Trial #1							
A	8/7/2008	18:45	CM	M	0.0369		11.0
A	8/7/2008	18:45	CR	F	0.0601	1.4	11.0
A	8/7/2008	18:45	CR	F	0.0554	1.5	11.0
A	8/7/2008	18:45	CR	F	0.0481	1.4	11.0
A	8/7/2008	18:45	CR	F	0.0441	1.5	11.0
A	8/7/2008	19:45	CM	F		1.5	12.0
A	8/7/2008	19:45	CM	F	0.0752	1.5	12.0
A	8/7/2008	19:45	CM	F	0.0637	1.4	12.0
A	8/7/2008	19:45	CM	F	0.0563	1.5	12.0
A	8/7/2008	19:45	CM	F	0.0556	1.5	12.0
A	8/7/2008	19:45	CR	F	0.0574	1.5	12.0
A	8/7/2008	19:45	CR	F	0.0554	1.4	12.0
A	8/7/2008	19:45	CR	F	0.0320	1.5	12.0
A	8/7/2008	19:45	CR	F	0.0195	1.3	12.0
A	8/8/2008	6:45	CM	M	0.0358		23.0
A	8/8/2008	6:45	CM	M	0.0287		23.0
A	8/8/2008	7:45	CM	M	0.0317		24.0
A	8/8/2008	7:45	CM	F	0.0547	1.3	24.0
A	8/8/2008	7:45	CM	F	0.0376	1.2	24.0
A	8/8/2008	7:45	CM	F	0.0565		24.0
A	8/8/2008	7:45	CR	F	0.0652	1.5	24.0
A	8/8/2008	8:45	CM	M	0.0256		25.0
A	8/8/2008	8:45	CM	M	0.0233		25.0
A	8/8/2008	8:45	CM	M	0.0230		25.0
A	8/8/2008	8:45	CM	M	0.0205		25.0
A	8/8/2008	8:45	CM	M	0.0172		25.0
A	8/8/2008	8:45	CM	F	0.0625	1.2	25.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	8/8/2008	8:45	CM	F	0.0434	1.5	25.0
A	8/8/2008	8:45	CR	F	0.0730	1.5	25.0
A	8/8/2008	9:45	CM	F	0.0611	1.3	26.0
A	8/8/2008	9:45	CM	F	0.0512	1.5	26.0
A	8/8/2008	9:45	CM	F	0.0429	1.4	26.0
A	8/8/2008	9:45	CM	F	0.0360		26.0
A	8/8/2008	9:45	CR	F	0.0663	1.4	26.0
A	8/8/2008	9:45	CR	F	0.0592	1.5	26.0
A	8/8/2008	9:45	CR	F	0.0503	1.4	26.0
A	8/8/2008	9:45	CR	F	0.0501	1.5	26.0
A	8/8/2008	10:45	CM	M	0.0282		27.0
A	8/8/2008	10:45	CM	M	0.0255		27.0
A	8/8/2008	10:45	CM	F	0.0510	1.3	27.0
A	8/8/2008	10:45	CM	F	0.0470	1.5	27.0
A	8/8/2008	10:45	CM	F	0.0378	1.5	27.0
A	8/8/2008	10:45	CR	F	0.0568	0.1	27.0
A	8/8/2008	10:45	CR	F	0.0562	1.4	27.0
A	8/8/2008	10:45	CR	F	0.0425	1.5	27.0
A	8/8/2008	11:45	CM	F	0.0460	1.5	28.0
A	8/8/2008	11:45	CM	F	0.0203	1.5	28.0
A	8/8/2008	11:45	CR	F	0.0598	1.5	28.0
A	8/8/2008	11:45	CR	F	0.0579	1.5	28.0
A	8/8/2008	11:45	CR	F	0.0494	1.4	28.0
A	8/8/2008	11:45	CR	F	0.0592		28.0
A	8/8/2008	12:45	CM	F	0.0491	0.1	29.0
A	8/8/2008	12:45	CM	F	0.0423	0.1	29.0
A	8/8/2008	12:45	CM	F	0.0591	1.5	29.0
A	8/8/2008	12:45	CM	F	0.0487	1.5	29.0
A	8/8/2008	12:45	CM	F	0.0404	1.3	29.0
A	8/8/2008	12:45	CM	F	0.0352	1.4	29.0
A	8/8/2008	12:45	CR	F	0.0502	1.5	29.0
A	8/8/2008	13:45	CM	F	0.0348	0.1	30.0
A	8/8/2008	13:45	CR	F	0.0674	1.5	30.0
A	8/8/2008	13:45	CR	F	0.0480	1.5	30.0
A	8/8/2008	14:45	CM	F	0.0596	1.5	31.0
A	8/8/2008	14:45	CM	F	0.0379	1.5	31.0
A	8/8/2008	14:45	CM	F	0.0471		31.0
A	8/8/2008	14:45	CM	F	0.0374		31.0
A	8/8/2008	14:45	CR	F	0.0529	1.3	31.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	8/8/2008	14:45	CR	F	0.0588		31.0
A	8/8/2008	15:45	CM	F	0.0558	1.4	32.0
A	8/8/2008	15:45	CM	F	0.0398	1.5	32.0
A	8/8/2008	15:45	CM	F	0.0393	1.4	32.0
A	8/8/2008	15:45	CR	F	0.0439	1.1	32.0
A	8/8/2008	15:45	CR	F	0.0270	1.2	32.0
A	8/8/2008	15:45	CR	F	0.0533	1.4	32.0
A	8/8/2008	15:45	CR	F	0.0467	1.3	32.0
A	8/8/2008	15:45	CR	F	0.0372	1.5	32.0
A	8/8/2008	16:45	CM	F	0.0409	0.1	33.0
A	8/8/2008	16:45	CM	F	0.0289	0.1	33.0
A	8/8/2008	16:45	CM	F	0.0670	1.3	33.0
A	8/8/2008	16:45	CM	F	0.0639	1.5	33.0
A	8/8/2008	16:45	CM	F	0.0552	1.3	33.0
A	8/8/2008	16:45	CM	F	0.0538	1.5	33.0
A	8/8/2008	16:45	CM	F	0.0522	1.3	33.0
A	8/8/2008	16:45	CM	F	0.0490	1.5	33.0
A	8/8/2008	16:45	CM	F	0.0477	1.4	33.0
A	8/8/2008	16:45	CM	F	0.0464	1.5	33.0
A	8/8/2008	16:45	CM	F	0.0464	1.4	33.0
A	8/8/2008	16:45	CM	F	0.0457	1.5	33.0
A	8/8/2008	16:45	CM	F	0.0453	1.5	33.0
A	8/8/2008	16:45	CM	F	0.0433	1.3	33.0
A	8/8/2008	16:45	CM	F	0.0381	1.4	33.0
A	8/8/2008	16:45	CM	F	0.0350	1.3	33.0
A	8/8/2008	16:45	CM	F	0.0256	1.5	33.0
A	8/8/2008	16:45	CM	F	0.0525		33.0
A	8/8/2008	16:45	CR	F	0.0389	0.2	33.0
A	8/8/2008	16:45	CR	F	0.0660	1.5	33.0
A	8/8/2008	16:45	CR	F	0.0578	1.6	33.0
A	8/8/2008	16:45	CR	F	0.0457	1.5	33.0
A	8/8/2008	16:45	CR	F	0.0425	1.3	33.0
A	8/8/2008	16:45	CR	F	0.0416	1.4	33.0
A	8/8/2008	16:45	CR	F	0.0354	1.4	33.0
A	8/8/2008	16:45	CR	F	0.0348	1.4	33.0
A	8/8/2008	16:45	CR	F	0.0212	1.3	33.0
A	8/8/2008	17:45	CM	M	0.0275		34.0
A	8/8/2008	17:45	CM	F	0.0489	0.2	34.0
A	8/8/2008	17:45	CM	F	0.0469	0.1	34.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	8/8/2008	17:45	CM	F	0.0398	0.1	34.0
A	8/8/2008	17:45	CM	F	0.0399		34.0
A	8/8/2008	17:45	CM	F			34.0
A	8/8/2008	17:45	CR	F	0.0513	0.1	34.0
A	8/8/2008	17:45	CR	F	0.0420	1.2	34.0
A	8/8/2008	17:45	CR	F	0.0218	1.1	34.0
A	8/8/2008	17:45	CR	F	0.0467		34.0
A	8/8/2008	18:45	CM	M	0.0263		35.0
A	8/8/2008	18:45	CM	F	0.0554	0.1	35.0
A	8/8/2008	18:45	CM	F	0.0427	0.1	35.0
A	8/8/2008	18:45	CM	F	0.0414	0.1	35.0
A	8/8/2008	18:45	CM	F	0.0456	1.0	35.0
A	8/8/2008	18:45	CM	F	0.0488	1.5	35.0
A	8/8/2008	18:45	CM	F	0.0484	1.3	35.0
A	8/8/2008	18:45	CM	F	0.0367	1.5	35.0
A	8/8/2008	18:45	CR	F	0.0330	0.1	35.0
A	8/8/2008	18:45	CR	F	0.0550	1.5	35.0
A	8/8/2008	18:45	CR	F	0.0366	1.5	35.0
A	8/8/2008	19:45	CM	F	0.0434	0.1	36.0
A	8/8/2008	19:45	CM	F	0.0575	1.3	36.0
A	8/8/2008	19:45	CM	F	0.0434	1.2	36.0
A	8/8/2008	19:45	CR	M	0.0385		36.0
A	8/8/2008	19:45	CR	F	0.0516	0.1	36.0
A	8/8/2008	19:45	CR	F	0.0461	0.1	36.0
A	8/8/2008	19:45	CR	F	0.0593	1.2	36.0
A	8/8/2008	19:45	CR	F	0.0565	1.2	36.0
A	8/8/2008	19:45	CR	F	0.0673	1.2	36.0
A	8/8/2008	19:45	CR	F	0.0662	1.3	36.0
A	8/8/2008	19:45	CR	F	0.0362	1.4	36.0
A	8/9/2008	6:45	CM	M	0.0309		47.0
A	8/9/2008	6:45	CM	M	0.0300		47.0
A	8/9/2008	6:45	CM	M	0.0289		47.0
A	8/9/2008	7:45	CM	F	0.0500	0.1	48.0
A	8/9/2008	7:45	CM	F	0.0448	0.1	48.0
A	8/9/2008	7:45	CM	F	0.0712	0.3	48.0
A	8/9/2008	7:45	CM	F	0.0427	0.3	48.0
A	8/9/2008	7:45	CR	F	0.0747	0.1	48.0
A	8/9/2008	7:45	CR	F	0.0683	0.1	48.0
A	8/9/2008	7:45	CR	F	0.0627	0.1	48.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	8/9/2008	7:45	CR	F	0.0539	0.1	48.0
A	8/9/2008	7:45	CR	F	0.0514	0.1	48.0
A	8/9/2008	7:45	CR	F	0.0656	0.3	48.0
A	8/9/2008	7:45	CR	F	0.0657	0.5	48.0
A	8/9/2008	8:45	CM	F	0.0586	0.1	49.0
A	8/9/2008	8:45	CM	F	0.0436	0.1	49.0
A	8/9/2008	8:45	CM	F	0.0428	0.1	49.0
A	8/9/2008	8:45	CM	F	0.0377	0.1	49.0
A	8/9/2008	8:45	CM	F	0.0296	0.1	49.0
A	8/9/2008	8:45	CM	F	0.0511	0.3	49.0
A	8/9/2008	8:45	CM	F	0.0385	0.3	49.0
A	8/9/2008	8:45	CM	F	0.0329	0.3	49.0
A	8/9/2008	8:45	CR	M	0.0233		49.0
A	8/9/2008	8:45	CR	F	0.0578	0.1	49.0
A	8/9/2008	8:45	CR	F	0.0574	0.1	49.0
A	8/9/2008	8:45	CR	F	0.0532	0.1	49.0
A	8/9/2008	8:45	CR	F	0.0496	0.1	49.0
A	8/9/2008	8:45	CR	F	0.0471	0.1	49.0
A	8/9/2008	8:45	CR	F	0.0352	0.1	49.0
A	8/9/2008	8:45	CR	F	0.0212	0.1	49.0
A	8/9/2008	8:45	CR	F	0.0496	0.3	49.0
A	8/9/2008	8:45	CR	F	0.0492	0.3	49.0
A	8/9/2008	8:45	CR	F	0.0251	0.3	49.0
A	8/9/2008	8:45	CR	F	0.0481	0.5	49.0
A	8/9/2008	8:45	CR	F	-	-	49.0
A	8/9/2008	9:45	CM	F	0.0363	0.3	50.0
A	8/9/2008	9:45	CM	F	0.0345		50.0
A	8/9/2008	9:45	CR	F	0.0684	0.3	50.0
A	8/9/2008	9:45	CR	F	0.0635	0.3	50.0
A	8/9/2008	9:45	CR	F	0.0625	0.2	50.0
A	8/9/2008	9:45	CR	F	0.0550	0.2	50.0
A	8/9/2008	9:45	CR	F	0.0538	0.3	50.0
A	8/9/2008	9:45	CR	F	0.0512	0.3	50.0
A	8/9/2008	9:45	CR	F	0.0460	0.3	50.0
A	8/9/2008	9:45	CR	F	0.0440	0.3	50.0
A	8/9/2008	9:45	CR	F	0.0428	0.2	50.0
A	8/9/2008	9:45	CR	F	0.0412	0.3	50.0
A	8/9/2008	9:45	CR	F	0.0366	0.3	50.0
A	8/9/2008	9:45	CR	F	0.0309	0.3	50.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	8/9/2008	9:45	CR	F	0.0546	0.6	50.0
A	8/9/2008	9:45	CR	F	0.0429	0.5	50.0
A	8/9/2008	9:45	CR	F	0.0329	0.5	50.0
A	8/9/2008	9:45	CR	F	0.0591		50.0
A	8/9/2008	9:45	CR	F	0.0427		50.0
A	8/9/2008	10:45	CM	F	0.0496	0.1	51.0
A	8/9/2008	10:45	CM	F	0.0701	0.3	51.0
A	8/9/2008	10:45	CM	F	0.0676	0.2	51.0
A	8/9/2008	10:45	CM	F	0.0535	0.3	51.0
A	8/9/2008	10:45	CM	F	0.0527	0.3	51.0
A	8/9/2008	10:45	CM	F	0.0443	0.3	51.0
A	8/9/2008	10:45	CR	F	0.0652	0.1	51.0
A	8/9/2008	10:45	CR	F	0.0606	0.1	51.0
A	8/9/2008	10:45	CR	F	0.0597	0.1	51.0
A	8/9/2008	10:45	CR	F	0.0543	0.1	51.0
A	8/9/2008	10:45	CR	F	0.0540	0.1	51.0
A	8/9/2008	10:45	CR	F	0.0532	0.1	51.0
A	8/9/2008	10:45	CR	F	0.0422	0.1	51.0
A	8/9/2008	10:45	CR	F	0.0225	0.3	51.0
A	8/9/2008	10:45	CR	F	0.0554	0.6	51.0
A	8/9/2008	11:45	CM	F	0.0465	0.1	52.0
A	8/9/2008	11:45	CM	F	0.0351	0.1	52.0
A	8/9/2008	11:45	CM	F	0.0445	0.2	52.0
A	8/9/2008	11:45	CM	F	0.0431	0.3	52.0
A	8/9/2008	11:45	CM	F	0.0286	0.6	52.0
A	8/9/2008	11:45	CM	F	0.0534	0.9	52.0
A	8/9/2008	11:45	CR	F	0.0605	0.3	52.0
A	8/9/2008	11:45	CR	F	0.0530	0.3	52.0
A	8/9/2008	11:45	CR	F	0.0487	0.3	52.0
A	8/9/2008	12:45	CM	F	0.0556	0.3	53.0
A	8/9/2008	12:45	CM	F	0.0540	0.3	53.0
A	8/9/2008	12:45	CM	F	0.0463	0.3	53.0
A	8/9/2008	12:45	CM	F	0.0397	0.3	53.0
A	8/9/2008	12:45	CM	F	0.0685	0.6	53.0
A	8/9/2008	12:45	CM	F	0.0398	0.7	53.0
A	8/9/2008	12:45	CR	F	0.0559	0.1	53.0
A	8/9/2008	12:45	CR	F	0.0541	0.1	53.0
A	8/9/2008	12:45	CR	F	0.0611	0.3	53.0
A	8/9/2008	13:45	CM	F	0.0620	0.3	54.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	8/9/2008	13:45	CM	F	0.0555	0.2	54.0
A	8/9/2008	13:45	CM	F	0.0382	0.5	54.0
A	8/9/2008	13:45	CR	F	0.0562	0.3	54.0
A	8/9/2008	13:45	CR	F	0.0450	0.2	54.0
A	8/9/2008	13:45	CR	F	0.0480	0.7	54.0
A	8/9/2008	14:45	CM	F	0.0678	0.2	55.0
A	8/9/2008	14:45	CM	F	0.0380	0.6	55.0
A	8/9/2008	14:45	CM	F	0.0378	0.6	55.0
A	8/9/2008	14:45	CM	F	0.0522	0.9	55.0
A	8/9/2008	14:45	CR	F	0.0432	0.1	55.0
A	8/9/2008	14:45	CR	F	0.0415	0.1	55.0
A	8/9/2008	14:45	CR	F	0.0675	0.3	55.0
A	8/9/2008	14:45	CR	F	0.0405	0.3	55.0
A	8/9/2008	15:45	CM	F	0.0434	0.2	56.0
A	8/9/2008	15:45	CM	F	0.0460		56.0
A	8/9/2008	15:45	CR	F	0.0489	0.3	56.0
A	8/9/2008	16:45	CM	F	0.0380	0.5	57.0
A	8/9/2008	16:45	CR	F	0.0637		57.0
A	8/9/2008	17:45	CM	F	0.0384	0.1	58.0
A	8/9/2008	17:45	CR	F	0.0329	0.1	58.0
A	8/9/2008	17:45	CR	F	0.0606	0.3	58.0
A	8/9/2008	17:45	CR	F	0.0457	0.5	58.0
A	8/9/2008	18:45	CM	F	0.0433	0.1	59.0
A	8/9/2008	18:45	CM	F	0.0476	0.3	59.0
A	8/9/2008	18:45	CM	F	0.0405	0.5	59.0
A	8/9/2008	18:45	CM	F	0.0127		59.0
A	8/9/2008	18:45	CM	F	0.0391		59.0
A	8/9/2008	18:45	CM	F	0.0324		59.0
A	8/9/2008	18:45	CR	F	0.0380	0.1	59.0
A	8/9/2008	18:45	CR	F	0.0379	0.3	59.0
A	8/9/2008	18:45	CR	F	0.0645		59.0
A	8/9/2008	19:45	CM	M	0.0331		60.0
A	8/9/2008	19:45	CM	M	0.0125		60.0
A	8/9/2008	19:45	CM	F	0.0409	0.3	60.0
A	8/9/2008	19:45	CM	F	0.0396	0.3	60.0
A	8/9/2008	19:45	CM	F	0.0386		60.0
A	8/9/2008	19:45	CR	F	0.0300	0.3	60.0
B	8/7/2008	17:45	CM	F	0.0665	1.4	10.0
B	8/7/2008	18:45	CM	F	0.0599	1.5	11.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/7/2008	18:45	CM	F	0.0413	1.4	11.0
B	8/7/2008	19:45	CR	F	0.0655	1.3	12.0
B	8/7/2008	19:45	CR	F	0.0649	1.4	12.0
B	8/7/2008	19:45	CR	F	0.0560	1.5	12.0
B	8/7/2008	19:45	CR	F	0.0462	1.5	12.0
B	8/8/2008	7:45	CM	M	0.0275		24.0
B	8/8/2008	7:45	CM	F	0.0596	0.2	24.0
B	8/8/2008	7:45	CR	F	0.0615	1.5	24.0
B	8/8/2008	8:45	CR	F	0.0573	0.1	25.0
B	8/8/2008	8:45	CR	F	0.0544	1.2	25.0
B	8/8/2008	8:45	CR	F	0.0462	1.5	25.0
B	8/8/2008	8:45	CR	F	0.0432	1.4	25.0
B	8/8/2008	9:45	CM	F	0.0397	0.2	26.0
B	8/8/2008	9:45	CR	F		0.2	26.0
B	8/8/2008	9:45	CR	F	0.0689	0.5	26.0
B	8/8/2008	9:45	CR	F	0.0534	1.2	26.0
B	8/8/2008	9:45	CR	F	0.0689	1.5	26.0
B	8/8/2008	9:45	CR	F	0.0557	1.3	26.0
B	8/8/2008	10:45	CM	F	0.0461	1.3	27.0
B	8/8/2008	10:45	CM	F	0.0542	1.3	27.0
B	8/8/2008	10:45	CM	F	0.0635	1.5	27.0
B	8/8/2008	10:45	CM	F	0.0468	1.5	27.0
B	8/8/2008	10:45	CR	F	0.0715	1.5	27.0
B	8/8/2008	10:45	CR	F	0.0638	1.3	27.0
B	8/8/2008	10:45	CR	F	0.0619	1.4	27.0
B	8/8/2008	10:45	CR	F	0.0460	1.5	27.0
B	8/8/2008	10:45	CR	F	0.0322	1.5	27.0
B	8/8/2008	11:45	CM	F	0.0328	0.1	28.0
B	8/8/2008	11:45	CM	F	0.0388	1.5	28.0
B	8/8/2008	11:45	CM	F	0.0511		28.0
B	8/8/2008	11:45	CR	F	0.0326	0.5	28.0
B	8/8/2008	11:45	CR	F	0.0632	1.4	28.0
B	8/8/2008	11:45	CR	F	0.0543	1.4	28.0
B	8/8/2008	11:45	CR	F	0.0523	1.3	28.0
B	8/8/2008	11:45	CR	F	0.0345	1.4	28.0
B	8/8/2008	11:45	CR	F	0.0243		28.0
B	8/8/2008	12:45	CM	F	0.0436	0.1	29.0
B	8/8/2008	12:45	CM	F	0.0423	0.1	29.0
B	8/8/2008	12:45	CM	F	0.0289	0.1	29.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/8/2008	12:45	CM	F	0.0497	1.5	29.0
B	8/8/2008	12:45	CM	F	0.0489	1.4	29.0
B	8/8/2008	12:45	CM	F	0.0553		29.0
B	8/8/2008	12:45	CM	F	0.0495		29.0
B	8/8/2008	12:45	CR	M	0.0141		29.0
B	8/8/2008	12:45	CR	F	0.0607	0.1	29.0
B	8/8/2008	12:45	CR	F	0.0543	0.1	29.0
B	8/8/2008	12:45	CR	F	0.0335	0.1	29.0
B	8/8/2008	12:45	CR	F	0.0179	0.1	29.0
B	8/8/2008	12:45	CR	F	0.0535		29.0
B	8/8/2008	12:45	CR	F	0.0463		29.0
B	8/8/2008	12:45	CR	F	0.0432		29.0
B	8/8/2008	12:45	CR	F	0.0357		29.0
B	8/8/2008	13:45	CM	F	0.0456	0.2	30.0
B	8/8/2008	13:45	CM	F	0.0344	1.4	30.0
B	8/8/2008	13:45	CR	F	0.0511	0.3	30.0
B	8/8/2008	14:45	CM	M	0.0278		31.0
B	8/8/2008	14:45	CM	F	0.0513		31.0
B	8/8/2008	14:45	CM	F	0.0509		31.0
B	8/8/2008	14:45	CM	F	0.0434		31.0
B	8/8/2008	14:45	CM	F	0.0427		31.0
B	8/8/2008	14:45	CM	F	0.0360		31.0
B	8/8/2008	14:45	CR	F	0.0316	0.1	31.0
B	8/8/2008	14:45	CR	F	0.0648		31.0
B	8/8/2008	14:45	CR	F	0.0550		31.0
B	8/8/2008	14:45	CR	F	0.0498		31.0
B	8/8/2008	14:45	CR	F	0.0450		31.0
B	8/8/2008	14:45	CR	F	0.0448		31.0
B	8/8/2008	14:45	CR	F	0.0438		31.0
B	8/8/2008	14:45	CR	F	0.0300		31.0
B	8/8/2008	15:45	CM	F	0.0308	0.1	32.0
B	8/8/2008	15:45	CM	F	0.0441	1.4	32.0
B	8/8/2008	15:45	CM	F	0.0412	1.5	32.0
B	8/8/2008	15:45	CM	F	0.0689		32.0
B	8/8/2008	15:45	CR	F	0.0555	0.2	32.0
B	8/8/2008	15:45	CR	F	0.0584	1.5	32.0
B	8/8/2008	15:45	CR	F	0.0433	1.5	32.0
B	8/8/2008	15:45	CR	F	0.0472		32.0
B	8/8/2008	16:45	CM	M	0.0215		33.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/8/2008	16:45	CM	F	0.0455	0.1	33.0
B	8/8/2008	16:45	CM	F	0.0369	0.1	33.0
B	8/8/2008	16:45	CM	F	0.0500	1.1	33.0
B	8/8/2008	16:45	CM	F	0.0759	1.5	33.0
B	8/8/2008	16:45	CM	F	0.0728	1.4	33.0
B	8/8/2008	16:45	CM	F	0.0590	1.5	33.0
B	8/8/2008	16:45	CM	F	0.0535	1.5	33.0
B	8/8/2008	16:45	CM	F	0.0516	1.5	33.0
B	8/8/2008	16:45	CM	F	0.0487	1.5	33.0
B	8/8/2008	16:45	CM	F	0.0397	1.3	33.0
B	8/8/2008	16:45	CM	F	0.0361	1.4	33.0
B	8/8/2008	16:45	CM	F	0.0507		33.0
B	8/8/2008	16:45	CM	F	0.0439		33.0
B	8/8/2008	16:45	CM	F	0.0423		33.0
B	8/8/2008	16:45	CM	F	0.0358		33.0
B	8/8/2008	16:45	CR	F	0.0502	0.1	33.0
B	8/8/2008	16:45	CR	F	0.0427	0.1	33.0
B	8/8/2008	16:45	CR	F	0.0631	1.3	33.0
B	8/8/2008	16:45	CR	F	0.0623	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0571	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0563	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0527	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0505	1.4	33.0
B	8/8/2008	16:45	CR	F	0.0501	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0498	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0495	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0488	1.3	33.0
B	8/8/2008	16:45	CR	F	0.0483	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0472	1.3	33.0
B	8/8/2008	16:45	CR	F	0.0433	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0403	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0370	1.4	33.0
B	8/8/2008	16:45	CR	F	0.0300	1.3	33.0
B	8/8/2008	16:45	CR	F	0.0263	1.3	33.0
B	8/8/2008	16:45	CR	F	0.0259	1.5	33.0
B	8/8/2008	16:45	CR	F	0.0231	1.4	33.0
B	8/8/2008	16:45	CR	F	0.0168	1.4	33.0
B	8/8/2008	17:45	CM	M	0.0186		34.0
B	8/8/2008	17:45	CM	M	0.0183		34.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/8/2008	17:45	CM	F	0.0602	1.4	34.0
B	8/8/2008	17:45	CM	F	0.0592	1.5	34.0
B	8/8/2008	17:45	CM	F	0.0534	1.5	34.0
B	8/8/2008	17:45	CM	F	0.0425	1.5	34.0
B	8/8/2008	17:45	CM	F	0.0323	1.5	34.0
B	8/8/2008	17:45	CM	F	0.0656		34.0
B	8/8/2008	17:45	CM	F	0.0220		34.0
B	8/8/2008	17:45	CR	F	0.0479	0.1	34.0
B	8/8/2008	17:45	CR	F	0.0403	1.3	34.0
B	8/8/2008	17:45	CR	F	0.0636	1.4	34.0
B	8/8/2008	17:45	CR	F	0.0556	1.3	34.0
B	8/8/2008	17:45	CR	F	0.0544	1.5	34.0
B	8/8/2008	17:45	CR	F	0.0534	1.5	34.0
B	8/8/2008	17:45	CR	F	0.0512	1.4	34.0
B	8/8/2008	17:45	CR	F	0.0511	1.5	34.0
B	8/8/2008	17:45	CR	F	0.0446	1.5	34.0
B	8/8/2008	17:45	CR	F	0.0416	1.5	34.0
B	8/8/2008	17:45	CR	F	0.0397	1.4	34.0
B	8/8/2008	17:45	CR	F	0.0381	1.5	34.0
B	8/8/2008	17:45	CR	F	0.0361	1.4	34.0
B	8/8/2008	17:45	CR	F	0.0316	1.5	34.0
B	8/8/2008	17:45	CR	F	0.0297	1.4	34.0
B	8/8/2008	17:45	CR	F	0.0285	1.4	34.0
B	8/8/2008	17:45	CR	F	0.0474		34.0
B	8/8/2008	17:45	CR	F	0.0451		34.0
B	8/8/2008	17:45	CR	F	0.0430		34.0
B	8/8/2008	17:45	CR	F	0.0352		34.0
B	8/8/2008	18:45	CM	F	0.0545	0.2	35.0
B	8/8/2008	18:45	CM	F	0.0539	0.1	35.0
B	8/8/2008	18:45	CM	F	0.0427	0.1	35.0
B	8/8/2008	18:45	CM	F	0.0256	0.1	35.0
B	8/8/2008	18:45	CM	F	0.0469	0.2	35.0
B	8/8/2008	18:45	CM	F	0.0581	1.5	35.0
B	8/8/2008	18:45	CM	F	0.0454		35.0
B	8/8/2008	18:45	CR	M	0.0206		35.0
B	8/8/2008	18:45	CR	F	0.0539	0.1	35.0
B	8/8/2008	18:45	CR	F	0.0509	0.1	35.0
B	8/8/2008	18:45	CR	F	0.0420	0.1	35.0
B	8/8/2008	18:45	CR	F	0.0376	0.1	35.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/8/2008	18:45	CR	F	0.0124	0.5	35.0
B	8/8/2008	18:45	CR	F	0.0430	0.5	35.0
B	8/8/2008	18:45	CR	F	0.0250	0.5	35.0
B	8/8/2008	18:45	CR	F	0.0439	1.2	35.0
B	8/8/2008	18:45	CR	F	0.0621	1.5	35.0
B	8/8/2008	18:45	CR	F	0.0567	1.3	35.0
B	8/8/2008	18:45	CR	F	0.0484	1.3	35.0
B	8/8/2008	18:45	CR	F	0.0478	1.4	35.0
B	8/8/2008	18:45	CR	F	0.0338		35.0
B	8/8/2008	18:45	CR	F	0.0187		35.0
B	8/8/2008	18:45	CR	F	0.0626		35.0
B	8/8/2008	18:45	CR	F	0.0593		35.0
B	8/8/2008	18:45	CR	F	0.0509		35.0
B	8/8/2008	18:45	CR	F	0.0444		35.0
B	8/8/2008	18:45	CR	F	0.0407		35.0
B	8/8/2008	18:45	CR	F	0.0374		35.0
B	8/8/2008	18:45	CR	F	0.0519		35.0
B	8/8/2008	19:45	CM	M	0.0152		36.0
B	8/8/2008	19:45	CM	F	0.0493	0.1	36.0
B	8/8/2008	19:45	CM	F	0.0492	0.1	36.0
B	8/8/2008	19:45	CM	F	0.0411	0.1	36.0
B	8/8/2008	19:45	CM	F	0.0382	0.1	36.0
B	8/8/2008	19:45	CM	F	0.0316	0.1	36.0
B	8/8/2008	19:45	CM	F	0.0228	0.1	36.0
B	8/8/2008	19:45	CM	F	0.0391	0.3	36.0
B	8/8/2008	19:45	CM	F	0.0390	0.3	36.0
B	8/8/2008	19:45	CM	F	0.0465	0.9	36.0
B	8/8/2008	19:45	CM	F	0.0743	1.3	36.0
B	8/8/2008	19:45	CM	F	0.0462	1.3	36.0
B	8/8/2008	19:45	CM	F	0.0241	1.3	36.0
B	8/8/2008	19:45	CM	F	0.3460	1.4	36.0
B	8/8/2008	19:45	CM	F	0.0773	1.5	36.0
B	8/8/2008	19:45	CM	F	0.0573	1.5	36.0
B	8/8/2008	19:45	CM	F	0.0474	1.5	36.0
B	8/8/2008	19:45	CM	F	0.0397		36.0
B	8/8/2008	19:45	CM	F	0.0433		36.0
B	8/8/2008	19:45	CM	F	0.0424		36.0
B	8/8/2008	19:45	CR	F	0.0697	0.1	36.0
B	8/8/2008	19:45	CR	F	0.0600	0.1	36.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/8/2008	19:45	CR	F	0.0526	0.1	36.0
B	8/8/2008	19:45	CR	F	0.0494	0.1	36.0
B	8/8/2008	19:45	CR	F	0.0332	0.1	36.0
B	8/8/2008	19:45	CR	F	0.0324	0.1	36.0
B	8/8/2008	19:45	CR	F	0.0324	0.1	36.0
B	8/8/2008	19:45	CR	F	0.0299	0.1	36.0
B	8/8/2008	19:45	CR	F	0.0237	0.1	36.0
B	8/8/2008	19:45	CR	F	0.0443	1.1	36.0
B	8/8/2008	19:45	CR	F	0.0224	1.2	36.0
B	8/8/2008	19:45	CR	F	0.0660	1.4	36.0
B	8/8/2008	19:45	CR	F	0.0605	1.5	36.0
B	8/8/2008	19:45	CR	F	0.0592	1.4	36.0
B	8/8/2008	19:45	CR	F	0.0577	1.5	36.0
B	8/8/2008	19:45	CR	F	0.0545	1.5	36.0
B	8/8/2008	19:45	CR	F	0.0459	1.4	36.0
B	8/8/2008	19:45	CR	F	0.0458	1.4	36.0
B	8/8/2008	19:45	CR	F	0.0393	1.5	36.0
B	8/8/2008	19:45	CR	F	0.0355	1.5	36.0
B	8/8/2008	19:45	CR	F	0.0293	1.3	36.0
B	8/8/2008	19:45	CR	F	0.0177	1.5	36.0
B	8/8/2008	19:45	CR	F	0.0488		36.0
B	8/8/2008	19:45	CR	F	0.0475		36.0
B	8/8/2008	19:45	CR	F	0.0643		36.0
B	8/8/2008	19:45	CR	F	0.0614		36.0
B	8/8/2008	19:45	CR	F	0.0567		36.0
B	8/8/2008	19:45	CR	F	0.0445		36.0
B	8/8/2008	19:45	CR	F	0.0381		36.0
B	8/8/2008	19:45	CR	F	0.0364		36.0
B	8/8/2008	19:45	CR	F	0.0306		36.0
B	8/8/2008	19:45	CR	F	0.0262		36.0
B	8/9/2008	6:45	CR	F	0.0535	0.1	47.0
B	8/9/2008	6:45	CR	F	0.0526	0.1	47.0
B	8/9/2008	6:45	CR	F	0.0609	0.3	47.0
B	8/9/2008	7:45	CR	F	0.0586	0.1	48.0
B	8/9/2008	7:45	CR	F	0.0328	0.1	48.0
B	8/9/2008	7:45	CR	F	0.0634	0.3	48.0
B	8/9/2008	7:45	CR	F	0.0568	0.3	48.0
B	8/9/2008	7:45	CR	F	0.0401	0.3	48.0
B	8/9/2008	7:45	CR	F	0.0606	0.5	48.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/9/2008	7:45	CR	F	0.0549	0.6	48.0
B	8/9/2008	7:45	CR	F	0.0562	1.3	48.0
B	8/9/2008	8:45	CM	F	0.0330	0.1	49.0
B	8/9/2008	8:45	CM	F	0.0461	0.3	49.0
B	8/9/2008	8:45	CM	F	0.0468	1.3	49.0
B	8/9/2008	8:45	CR	F	0.0518	0.1	49.0
B	8/9/2008	8:45	CR	F	0.0235	0.1	49.0
B	8/9/2008	8:45	CR	F	0.0485	0.5	49.0
B	8/9/2008	9:45	CM	F	0.0441	0.1	50.0
B	8/9/2008	9:45	CM	F	0.0420	0.1	50.0
B	8/9/2008	9:45	CM	F	0.0400	0.1	50.0
B	8/9/2008	9:45	CM	F	0.0449	0.5	50.0
B	8/9/2008	9:45	CR	F	0.0653	0.1	50.0
B	8/9/2008	9:45	CR	F	0.0600	0.1	50.0
B	8/9/2008	9:45	CR	F	0.0582	0.1	50.0
B	8/9/2008	9:45	CR	F	0.0537	0.1	50.0
B	8/9/2008	9:45	CR	F	0.0485	0.1	50.0
B	8/9/2008	9:45	CR	F	0.0643	0.3	50.0
B	8/9/2008	9:45	CR	F	0.0597	0.3	50.0
B	8/9/2008	9:45	CR	F	0.0593	0.3	50.0
B	8/9/2008	9:45	CR	F	0.0550	0.3	50.0
B	8/9/2008	9:45	CR	F	0.0476	0.2	50.0
B	8/9/2008	9:45	CR	F	0.0440	0.3	50.0
B	8/9/2008	9:45	CR	F	0.0405	0.3	50.0
B	8/9/2008	9:45	CR	F	0.2670	0.5	50.0
B	8/9/2008	9:45	CR	F	0.0448	0.5	50.0
B	8/9/2008	10:45	CM	F	0.5190	0.1	51.0
B	8/9/2008	10:45	CM	F	0.0437	0.1	51.0
B	8/9/2008	10:45	CM	F	0.0425	0.1	51.0
B	8/9/2008	10:45	CM	F	0.0625	0.3	51.0
B	8/9/2008	10:45	CM	F	0.0315	0.2	51.0
B	8/9/2008	10:45	CR	F	0.0638	0.1	51.0
B	8/9/2008	10:45	CR	F	0.0637	0.1	51.0
B	8/9/2008	10:45	CR	F	0.0636	0.1	51.0
B	8/9/2008	10:45	CR	F	0.0600	0.1	51.0
B	8/9/2008	10:45	CR	F	0.0558	0.1	51.0
B	8/9/2008	10:45	CR	F	0.0541	0.1	51.0
B	8/9/2008	10:45	CR	F	0.0483	0.1	51.0
B	8/9/2008	10:45	CR	F	0.0651	0.3	51.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/9/2008	10:45	CR	F	0.0627	0.2	51.0
B	8/9/2008	10:45	CR	F	0.0609	0.3	51.0
B	8/9/2008	10:45	CR	F	0.0536	0.3	51.0
B	8/9/2008	10:45	CR	F	0.0527	0.3	51.0
B	8/9/2008	10:45	CR	F	0.0475	0.3	51.0
B	8/9/2008	10:45	CR	F	0.0460	0.2	51.0
B	8/9/2008	10:45	CR	F	0.0386	0.3	51.0
B	8/9/2008	10:45	CR	F	0.0383	0.3	51.0
B	8/9/2008	10:45	CR	F	0.0289	0.3	51.0
B	8/9/2008	10:45	CR	F	0.0265	0.3	51.0
B	8/9/2008	10:45	CR	F	0.0565	1.0	51.0
B	8/9/2008	11:45	CM	F	0.0488	0.3	52.0
B	8/9/2008	11:45	CM	F	0.0451	0.3	52.0
B	8/9/2008	11:45	CM	F	0.0226	0.3	52.0
B	8/9/2008	11:45	CM	F	0.0340	0.5	52.0
B	8/9/2008	11:45	CR	F	0.0676	0.1	52.0
B	8/9/2008	11:45	CR	F	0.0478	0.1	52.0
B	8/9/2008	11:45	CR	F	0.0583	0.3	52.0
B	8/9/2008	11:45	CR	F	0.0467	0.3	52.0
B	8/9/2008	12:45	CM	F	0.0512	0.3	53.0
B	8/9/2008	12:45	CR	F	0.0552	0.3	53.0
B	8/9/2008	13:45	CR	F	0.0580	0.3	54.0
B	8/9/2008	14:45	CM	F	0.0496	0.5	55.0
B	8/9/2008	14:45	CR	F	0.0421	0.3	55.0
B	8/9/2008	15:45	CM	F	0.0403	1.5	56.0
B	8/9/2008	16:45	CM	M	0.0244		57.0
B	8/9/2008	16:45	CM	F	0.0833	1.4	57.0
B	8/9/2008	16:45	CR	F	0.1254	0.1	57.0
B	8/9/2008	16:45	CR	F	0.0464	0.3	57.0
B	8/9/2008	17:45	CM	M	0.0264		58.0
B	8/9/2008	17:45	CM	F	0.0413	0.2	58.0
B	8/9/2008	17:45	CM	F	0.0325		58.0
B	8/9/2008	17:45	CR	M	0.0545		58.0
B	8/9/2008	17:45	CR	F	0.0394	0.1	58.0
B	8/9/2008	17:45	CR	F	0.0348	0.1	58.0
B	8/9/2008	17:45	CR	F	0.0526	0.3	58.0
B	8/9/2008	17:45	CR	F	0.0520	0.3	58.0
B	8/9/2008	17:45	CR	F	0.0514	0.4	58.0
B	8/9/2008	17:45	CR	F	0.0658	0.5	58.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	8/9/2008	17:45	CR	F	0.0618	0.5	58.0
B	8/9/2008	17:45	CR	F	0.0602	0.7	58.0
B	8/9/2008	17:45	CR	F	0.0526	0.5	58.0
B	8/9/2008	17:45	CR	F	0.0413	0.5	58.0
B	8/9/2008	18:45	CM	F	0.0337	0.1	59.0
B	8/9/2008	18:45	CM	F	0.0320	0.5	59.0
B	8/9/2008	18:45	CM	F	0.0548	0.5	59.0
B	8/9/2008	19:45	CM	M	0.0398		60.0
B	8/9/2008	19:45	CM	M	0.0379		60.0
B	8/9/2008	19:45	CM	F	0.0260	0.5	60.0
B	8/9/2008	19:45	CR	M	0.0453		60.0
B	8/9/2008	19:45	CR	F	0.0575	0.3	60.0
C	8/7/2008	17:45	CM	F	0.0287	1.5	10.0
C	8/7/2008	19:45	CR	F	0.0484	1.5	12.0
C	8/8/2008	7:45	CM	F	0.0561	1.5	24.0
C	8/8/2008	7:45	CM	F	0.0383		24.0
C	8/8/2008	8:45	CM	F	0.0616	1.2	25.0
C	8/8/2008	8:45	CM	F	0.0215	1.2	25.0
C	8/8/2008	8:45	CM	F	0.0420	1.5	25.0
C	8/8/2008	9:45	CM	F	0.0494	0.1	26.0
C	8/8/2008	9:45	CM	F	0.0622	1.5	26.0
C	8/8/2008	9:45	CR	F	0.0226	0.1	26.0
C	8/8/2008	9:45	CR	F	0.0361	1.4	26.0
C	8/8/2008	10:45	CM	M	0.0143		27.0
C	8/8/2008	10:45	CM	F	0.0524	1.2	27.0
C	8/8/2008	10:45	CM	F	0.0467	1.3	27.0
C	8/8/2008	10:45	CM	F	0.0443	1.4	27.0
C	8/8/2008	10:45	CR	F	0.0642	1.4	27.0
C	8/8/2008	10:45	CR	F	0.0516	1.5	27.0
C	8/8/2008	10:45	CR	F	0.0464	1.3	27.0
C	8/8/2008	11:45	CM	M	0.0232		28.0
C	8/8/2008	11:45	CM	M	0.0172		28.0
C	8/8/2008	11:45	CM	F	0.0556	0.1	28.0
C	8/8/2008	11:45	CM	F	0.0483	0.1	28.0
C	8/8/2008	11:45	CM	F	0.0425	0.1	28.0
C	8/8/2008	11:45	CR	F	0.0403	0.5	28.0
C	8/8/2008	11:45	CR	F	0.0571	1.4	28.0
C	8/8/2008	11:45	CR	F	0.0517		28.0
C	8/8/2008	12:45	CM	F	0.0399	0.1	29.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	8/8/2008	12:45	CM	F	0.0311	0.1	29.0
C	8/8/2008	12:45	CM	F	0.0568	1.5	29.0
C	8/8/2008	12:45	CM	F	0.0469	1.5	29.0
C	8/8/2008	12:45	CM	F	0.0448	1.4	29.0
C	8/8/2008	12:45	CM	F	0.0442	1.5	29.0
C	8/8/2008	12:45	CM	F	0.0373	1.5	29.0
C	8/8/2008	12:45	CM	F	0.0285	1.4	29.0
C	8/8/2008	12:45	CM	F	0.0283	1.3	29.0
C	8/8/2008	12:45	CR	F	0.0479	0.2	29.0
C	8/8/2008	12:45	CR	F	0.0459	0.3	29.0
C	8/8/2008	13:45	CM	F	0.0536	1.5	30.0
C	8/8/2008	13:45	CM	F	0.0453		30.0
C	8/8/2008	13:45	CM	F	0.0286		30.0
C	8/8/2008	13:45	CR	F	0.0598	1.5	30.0
C	8/8/2008	14:45	CM	F	0.0391	0.1	31.0
C	8/8/2008	14:45	CM	F	0.0251	0.1	31.0
C	8/8/2008	14:45	CM	F	0.0590	1.5	31.0
C	8/8/2008	14:45	CM	F	0.0586	1.5	31.0
C	8/8/2008	14:45	CM	F	0.0465	1.5	31.0
C	8/8/2008	14:45	CM	F	0.0353	1.5	31.0
C	8/8/2008	14:45	CM	F	0.0326		31.0
C	8/8/2008	14:45	CR	F	0.0486	1.3	31.0
C	8/8/2008	14:45	CR	F	0.0481	1.5	31.0
C	8/8/2008	15:45	CM	F	0.0387	0.1	32.0
C	8/8/2008	15:45	CM	F	0.0175	0.1	32.0
C	8/8/2008	15:45	CM	F	0.0273	0.2	32.0
C	8/8/2008	15:45	CM	F	0.0361	1.5	32.0
C	8/8/2008	15:45	CM	F	0.0347	1.5	32.0
C	8/8/2008	15:45	CM	F	0.0257		32.0
C	8/8/2008	15:45	CR	F	0.0311	0.1	32.0
C	8/8/2008	15:45	CR	F	0.0550	1.5	32.0
C	8/8/2008	15:45	CR	F	0.0488	1.5	32.0
C	8/8/2008	15:45	CR	F	0.0462	1.5	32.0
C	8/8/2008	16:45	CM	F	0.0658	1.5	33.0
C	8/8/2008	16:45	CM	F	0.0409	1.3	33.0
C	8/8/2008	16:45	CM	F	0.0445		33.0
C	8/8/2008	16:45	CM	F	0.0405		33.0
C	8/8/2008	16:45	CR	F	0.0469	0.1	33.0
C	8/8/2008	16:45	CR	F	0.0336	0.1	33.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	8/8/2008	16:45	CR	F	0.0552	0.5	33.0
C	8/8/2008	16:45	CR	F	0.0461	1.2	33.0
C	8/8/2008	16:45	CR	F	0.0439	1.2	33.0
C	8/8/2008	16:45	CR	F	0.0575	1.4	33.0
C	8/8/2008	16:45	CR	F	0.0568	1.5	33.0
C	8/8/2008	16:45	CR	F	0.0441	1.4	33.0
C	8/8/2008	16:45	CR	F	0.0319	1.5	33.0
C	8/8/2008	16:45	CR	F	0.0516		33.0
C	8/8/2008	16:45	CR	F	0.0472		33.0
C	8/8/2008	17:45	CM	M	0.0202		34.0
C	8/8/2008	17:45	CM	M	0.0201		34.0
C	8/8/2008	17:45	CM	F	0.0395	0.1	34.0
C	8/8/2008	17:45	CM	F	0.0358	0.1	34.0
C	8/8/2008	17:45	CM	F	0.0628	1.5	34.0
C	8/8/2008	17:45	CM	F	0.0467	1.5	34.0
C	8/8/2008	17:45	CM	F	0.0398	1.5	34.0
C	8/8/2008	17:45	CM	F	0.0362	1.4	34.0
C	8/8/2008	17:45	CM	F	0.0249		34.0
C	8/8/2008	17:45	CM	F	0.0496		34.0
C	8/8/2008	17:45	CM	F	0.0466		34.0
C	8/8/2008	17:45	CM	F	0.0388		34.0
C	8/8/2008	17:45	CM	F	0.0343		34.0
C	8/8/2008	17:45	CM	F	0.0261		34.0
C	8/8/2008	17:45	CM	F	0.0255		34.0
C	8/8/2008	17:45	CR	F	0.0509	0.1	34.0
C	8/8/2008	17:45	CR	F	0.0409	0.1	34.0
C	8/8/2008	17:45	CR	F	0.0363	0.1	34.0
C	8/8/2008	17:45	CR	F	0.0301	0.1	34.0
C	8/8/2008	17:45	CR	F	0.0568	1.5	34.0
C	8/8/2008	17:45	CR	F	0.0466	1.5	34.0
C	8/8/2008	17:45	CR	F	0.0462	1.5	34.0
C	8/8/2008	17:45	CR	F	0.0225		34.0
C	8/8/2008	17:45	CR	F	0.0139		34.0
C	8/8/2008	17:45	CR	F	0.0529		34.0
C	8/8/2008	17:45	CR	F	0.0508		34.0
C	8/8/2008	17:45	CR	F	0.0501		34.0
C	8/8/2008	17:45	CR	F	0.0467		34.0
C	8/8/2008	17:45	CR	F	0.0427		34.0
C	8/8/2008	17:45	CR	F	0.0353		34.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	8/8/2008	17:45	CR	F	0.0278		34.0
C	8/8/2008	17:45	CR	F	0.0266		34.0
C	8/8/2008	18:45	CM	F	0.0427	0.1	35.0
C	8/8/2008	18:45	CM	F	0.0418	1.1	35.0
C	8/8/2008	18:45	CM	F	0.0528	1.5	35.0
C	8/8/2008	18:45	CM	F	0.0419	1.4	35.0
C	8/8/2008	18:45	CM	F	0.0368	1.5	35.0
C	8/8/2008	18:45	CM	F	0.0312		35.0
C	8/8/2008	18:45	CM	F	0.0387		35.0
C	8/8/2008	18:45	CR	F	0.0427	0.1	35.0
C	8/8/2008	18:45	CR	F	0.0311	0.1	35.0
C	8/8/2008	18:45	CR	F	0.0196	0.1	35.0
C	8/8/2008	18:45	CR	F	0.0153	0.5	35.0
C	8/8/2008	18:45	CR	F	0.0404	0.5	35.0
C	8/8/2008	18:45	CR	F	0.0546	1.2	35.0
C	8/8/2008	18:45	CR	F	0.0476		35.0
C	8/8/2008	18:45	CR	F	0.0361		35.0
C	8/8/2008	18:45	CR	F	0.0192		35.0
C	8/8/2008	18:45	CR	F	0.0600		35.0
C	8/8/2008	18:45	CR	F	0.0589		35.0
C	8/8/2008	18:45	CR	F	0.0581		35.0
C	8/8/2008	18:45	CR	F	0.0580		35.0
C	8/8/2008	18:45	CR	F	0.0526		35.0
C	8/8/2008	18:45	CR	F	0.0493		35.0
C	8/8/2008	18:45	CR	F	0.0448		35.0
C	8/8/2008	18:45	CR	F	0.0286		35.0
C	8/8/2008	19:45	CM	M	0.0273		36.0
C	8/8/2008	19:45	CM	M	0.0246		36.0
C	8/8/2008	19:45	CM	F	0.0529	0.1	36.0
C	8/8/2008	19:45	CM	F	0.0507	0.1	36.0
C	8/8/2008	19:45	CM	F	0.0444	0.1	36.0
C	8/8/2008	19:45	CM	F	0.0438	0.1	36.0
C	8/8/2008	19:45	CM	F	0.0358	0.2	36.0
C	8/8/2008	19:45	CM	F	0.0336	0.2	36.0
C	8/8/2008	19:45	CM	F	0.0328	0.3	36.0
C	8/8/2008	19:45	CM	F	0.0540	1.4	36.0
C	8/8/2008	19:45	CM	F	0.0259	1.4	36.0
C	8/8/2008	19:45	CM	F	0.0542		36.0
C	8/8/2008	19:45	CR	F	0.0647	0.1	36.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	8/8/2008	19:45	CR	F	0.0586	0.1	36.0
C	8/8/2008	19:45	CR	F	0.0474	0.1	36.0
C	8/8/2008	19:45	CR	F	0.0467	0.1	36.0
C	8/8/2008	19:45	CR	F	0.0415	0.1	36.0
C	8/8/2008	19:45	CR	F	0.0302	0.1	36.0
C	8/8/2008	19:45	CR	F	0.0376	0.4	36.0
C	8/8/2008	19:45	CR	F	0.0667	1.3	36.0
C	8/8/2008	19:45	CR	F	0.0618	1.3	36.0
C	8/8/2008	19:45	CR	F	0.0565	1.1	36.0
C	8/8/2008	19:45	CR	F	0.0514	1.3	36.0
C	8/8/2008	19:45	CR	F	0.0470	1.3	36.0
C	8/8/2008	19:45	CR	F	0.0429		36.0
C	8/8/2008	19:45	CR	F	0.0399		36.0
C	8/8/2008	19:45	CR	F	0.0341		36.0
C	8/8/2008	19:45	CR	F	0.0231		36.0
C	8/8/2008	19:45	CR	F	0.0339		36.0
C	8/8/2008	19:45	CR	F	0.0215		36.0
C	8/8/2008	19:45	CR	F	0.0145		36.0
C	8/8/2008	19:45	CR	F	0.0125		36.0
C	8/8/2008	19:45	CR	F			36.0
C	8/9/2008	6:45	CM	M	0.0325		47.0
C	8/9/2008	6:45	CM	F	0.0506	0.1	47.0
C	8/9/2008	7:45	CM	F	0.0234	0.1	48.0
C	8/9/2008	7:45	CM	F	0.0426	0.3	48.0
C	8/9/2008	8:45	CM	M	0.0244		49.0
C	8/9/2008	8:45	CM	F	0.0420	0.1	49.0
C	8/9/2008	8:45	CM	F	0.0439	0.3	49.0
C	8/9/2008	8:45	CM	F	0.0403	1.4	49.0
C	8/9/2008	8:45	CR	F	0.0566	0.1	49.0
C	8/9/2008	9:45	CM	F	0.0610	0.1	50.0
C	8/9/2008	9:45	CM	F	0.0505	0.1	50.0
C	8/9/2008	9:45	CM	F	0.0756	0.7	50.0
C	8/9/2008	9:45	CM	F	0.0401	1.3	50.0
C	8/9/2008	9:45	CR	F	0.0447	0.1	50.0
C	8/9/2008	9:45	CR	F	0.0498	0.6	50.0
C	8/9/2008	10:45	CM	M	0.0328		51.0
C	8/9/2008	10:45	CM	F	0.0354	0.1	51.0
C	8/9/2008	10:45	CR	M	0.0175		51.0
C	8/9/2008	10:45	CR	F	0.0255	0.1	51.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	8/9/2008	10:45	CR	F	0.0602	0.3	51.0
C	8/9/2008	11:45	CM	F	0.0355	0.1	52.0
C	8/9/2008	11:45	CM	F	0.0419	0.6	52.0
C	8/9/2008	11:45	CM	F	0.0324	0.5	52.0
C	8/9/2008	11:45	CR	M	0.0272		52.0
C	8/9/2008	11:45	CR	F	0.0578	0.1	52.0
C	8/9/2008	11:45	CR	F	0.0555	0.1	52.0
C	8/9/2008	11:45	CR	F	0.0554	0.1	52.0
C	8/9/2008	11:45	CR	F	0.0518	0.1	52.0
C	8/9/2008	11:45	CR	F	0.0350	0.1	52.0
C	8/9/2008	11:45	CR	F	0.0523	0.3	52.0
C	8/9/2008	11:45	CR	F	0.0318	0.3	52.0
C	8/9/2008	11:45	CR	F	0.0566	0.9	52.0
C	8/9/2008	12:45	CM	F	0.0562	0.7	53.0
C	8/9/2008	12:45	CM	F	0.0320	0.6	53.0
C	8/9/2008	13:45	CR	F	0.0471	0.2	54.0
C	8/9/2008	14:45	CM	F	0.0247	0.8	55.0
C	8/9/2008	14:45	CR	F	0.0443	0.1	55.0
C	8/9/2008	15:45	CR	F	0.0626	0.5	56.0
C	8/9/2008	16:45	CR	F	0.0271	0.1	57.0
C	8/9/2008	17:45	CM	F	0.0420	0.3	58.0
C	8/9/2008	18:45	CR	M	0.0214		59.0
C	8/9/2008	18:45	CR	F	0.0561	0.3	59.0
C	8/9/2008	19:45	CM	M	0.0266		60.0
C	8/9/2008	19:45	CM	F	0.0469	0.1	60.0
C	8/9/2008	19:45	CR	M	0.0258		60.0
C	8/9/2008	19:45	CR	M	0.0173		60.0
C	8/9/2008	19:45	CR	F	0.0257	0.1	60.0
C	8/9/2008	19:45	CR	F	0.0531	1.5	60.0
C	8/9/2008	19:45	CR	F	0.0681		60.0
Summer Trial #2							
A	9/5/2008	10:45	CM	M	0.0419		3.0
A	9/5/2008	11:45	CM	F	0.0453	1.4	4.0
A	9/5/2008	12:45	CR	F	0.0478	1.5	5.0
A	9/5/2008	12:45	CR	F	0.0340	1.5	5.0
A	9/5/2008	13:45	CM	F	0.0397	1.5	6.0
A	9/5/2008	14:45	CR	F		1.5	7.0
A	9/5/2008	15:45	CR	F	0.0426	1.4	8.0
A	9/5/2008	15:45	CM	F	0.0460	1.5	8.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/5/2008	15:45	CR	F	0.0583	1.5	8.0
A	9/5/2008	16:45	CM	F	0.0371	1.4	9.0
A	9/5/2008	16:45	CM	F	0.0512	1.5	9.0
A	9/5/2008	17:45	CM	F	0.0489	1.4	10.0
A	9/5/2008	17:45	CR	F	0.0496	1.5	10.0
A	9/5/2008	17:45	CR	F	0.0504	1.5	10.0
A	9/5/2008	17:45	CR	F	0.0506	1.5	10.0
A	9/5/2008	18:45	CR	F	0.0612	1.3	11.0
A	9/5/2008	18:45	CR	F	0.0456	1.4	11.0
A	9/5/2008	18:45	CR	F	0.0474	1.4	11.0
A	9/5/2008	18:45	CM	F	0.0603	1.5	11.0
A	9/5/2008	18:45	CR	F	0.0539	1.5	11.0
A	9/5/2008	18:45	CR	F	0.0313	1.5	11.0
A	9/5/2008	18:45	CR	F	0.0372	1.5	11.0
A	9/5/2008	18:45	CR	F	0.0304	1.5	11.0
A	9/5/2008	18:45	CR	F	0.0458	1.5	11.0
A	9/5/2008	18:45	CR	F	0.0513	1.5	11.0
A	9/5/2008	18:45	CM	M	0.0385		11.0
A	9/5/2008	19:45	CR	F	0.0733	0.3	12.0
A	9/5/2008	19:45	CM	F	0.0370	1.5	12.0
A	9/5/2008	19:45	CR	F	0.0615	1.5	12.0
A	9/5/2008	19:45	CM	F	0.0489		12.0
A	9/5/2008	19:45	CM	M	0.0263		12.0
A	9/5/2008	19:45	CM	M	0.0437		12.0
A	9/6/2008	7:45	CM	M	0.0371		24.0
A	9/6/2008	8:45	CM	F	0.0541	0.2	25.0
A	9/6/2008	8:45	CM	M	0.0393		25.0
A	9/6/2008	9:45	CM	F	0.0426		26.0
A	9/6/2008	9:45	CM	M	0.0291		26.0
A	9/6/2008	10:45	CM	F	0.0478	0.2	27.0
A	9/6/2008	10:45	CM	F	0.0535	0.2	27.0
A	9/6/2008	10:45	CR	F	0.0537	0.2	27.0
A	9/6/2008	10:45	CM	F	0.0573	1.0	27.0
A	9/6/2008	10:45	CM	F	0.0435		27.0
A	9/6/2008	10:45	CM	M	0.0248		27.0
A	9/6/2008	10:45	CM	M	0.0411		27.0
A	9/6/2008	10:45	CM	M	0.0216		27.0
A	9/6/2008	11:45	CM	F	0.0395	0.1	28.0
A	9/6/2008	11:45	CR	F	0.0409	1.0	28.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/6/2008	11:45	CM	F	0.0677	1.2	28.0
A	9/6/2008	11:45	CR	F	0.0548	1.3	28.0
A	9/6/2008	11:45	CM	F	0.0526	1.4	28.0
A	9/6/2008	11:45	CM	F	0.0440	1.5	28.0
A	9/6/2008	11:45	CM	F	0.0470	1.5	28.0
A	9/6/2008	11:45	CR	F	0.0592	1.5	28.0
A	9/6/2008	11:45	CR	F	0.0441	1.5	28.0
A	9/6/2008	11:45	CR	F	0.0496	1.5	28.0
A	9/6/2008	11:45	CM	F	0.0329		28.0
A	9/6/2008	11:45	CM	M	0.0349		28.0
A	9/6/2008	11:45	CM	M	0.0243		28.0
A	9/6/2008	12:45	CM	F	0.0412	0.1	29.0
A	9/6/2008	12:45	CR	F	0.0478	0.1	29.0
A	9/6/2008	12:45	CM	F	0.0431	0.1	29.0
A	9/6/2008	12:45	CR	F	0.0415	0.5	29.0
A	9/6/2008	12:45	CR	F	0.0607	1.2	29.0
A	9/6/2008	12:45	CM	F	0.0530	1.3	29.0
A	9/6/2008	12:45	CM	F	0.0292	1.3	29.0
A	9/6/2008	12:45	CR	F	0.0512	1.4	29.0
A	9/6/2008	12:45	CR	F	0.0598	1.4	29.0
A	9/6/2008	12:45	CR	F	0.0507	1.4	29.0
A	9/6/2008	12:45	CM	F	0.0500	1.5	29.0
A	9/6/2008	12:45	CM	F	0.0508	1.5	29.0
A	9/6/2008	12:45	CM	F	0.0441	1.5	29.0
A	9/6/2008	12:45	CM	F	0.0443	1.5	29.0
A	9/6/2008	12:45	CM	F	0.0448	1.5	29.0
A	9/6/2008	12:45	CR	F	0.0431	1.5	29.0
A	9/6/2008	12:45	CR	F	0.0665	1.5	29.0
A	9/6/2008	12:45	CR	F	0.0313	1.5	29.0
A	9/6/2008	12:45	CR	F	0.0536	1.5	29.0
A	9/6/2008	12:45	CM	F	0.0137		29.0
A	9/6/2008	12:45	CR	F	0.0338		29.0
A	9/6/2008	12:45	CR	F	0.0383		29.0
A	9/6/2008	12:45	CM	F	0.0533		29.0
A	9/6/2008	12:45	CM	F	0.0317		29.0
A	9/6/2008	12:45	CM	F	0.0429		29.0
A	9/6/2008	12:45	CM	F	0.0398		29.0
A	9/6/2008	12:45	CM	F	0.0395		29.0
A	9/6/2008	12:45	CM	F	0.0382		29.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/6/2008	12:45	CR	F	0.0421		29.0
A	9/6/2008	13:45	CR	F	0.0361	0.1	30.0
A	9/6/2008	13:45	CR	F	0.0176	0.1	30.0
A	9/6/2008	13:45	CM	F	0.0498	1.3	30.0
A	9/6/2008	13:45	CM	F	0.0350	1.3	30.0
A	9/6/2008	13:45	CM	F	0.0485	1.4	30.0
A	9/6/2008	13:45	CM	F	0.0395	1.4	30.0
A	9/6/2008	13:45	CM	F	0.0399	1.4	30.0
A	9/6/2008	13:45	CR	F	0.0283	1.4	30.0
A	9/6/2008	13:45	CR	F	0.0340	1.4	30.0
A	9/6/2008	13:45	CM	F	0.0430	1.5	30.0
A	9/6/2008	13:45	CM	F	0.0254	1.5	30.0
A	9/6/2008	13:45	CM	F	0.0548	1.5	30.0
A	9/6/2008	13:45	CM	F	0.0562	1.5	30.0
A	9/6/2008	13:45	CM	F	0.0453	1.5	30.0
A	9/6/2008	13:45	CM	F	0.0227	1.5	30.0
A	9/6/2008	13:45	CR	F	0.0597	1.5	30.0
A	9/6/2008	13:45	CR	F	0.0458	1.5	30.0
A	9/6/2008	13:45	CR	F	0.0320	1.5	30.0
A	9/6/2008	13:45	CM	F	0.0410		30.0
A	9/6/2008	13:45	CM	F	0.0415		30.0
A	9/6/2008	13:45	CM	F	0.0229		30.0
A	9/6/2008	13:45	CR	F	0.0605		30.0
A	9/6/2008	13:45	CM	M	0.0255		30.0
A	9/6/2008	14:45	CR	F	0.0237	0.1	31.0
A	9/6/2008	14:45	CR	F	0.0364	0.1	31.0
A	9/6/2008	14:45	CR	F	0.0534	0.1	31.0
A	9/6/2008	14:45	CR	F	0.0406	0.1	31.0
A	9/6/2008	14:45	CR	F	0.0508	1.3	31.0
A	9/6/2008	14:45	CM	F	0.0524	1.4	31.0
A	9/6/2008	14:45	CM	F	0.0437	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0371	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0531	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0330	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0304	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0488	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0387	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0276	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0199	1.5	31.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/6/2008	14:45	CR	F	0.0562	1.5	31.0
A	9/6/2008	14:45	CR	F	0.0552	1.5	31.0
A	9/6/2008	14:45	CM	F	0.0464		31.0
A	9/6/2008	14:45	CM	F	0.0520		31.0
A	9/6/2008	14:45	CM	M	0.0434		31.0
A	9/6/2008	15:45	CR	F	0.0500	0.2	32.0
A	9/6/2008	15:45	CM	F	0.0535	1.4	32.0
A	9/6/2008	15:45	CM	F	0.0570	1.4	32.0
A	9/6/2008	15:45	CM	F	0.0547	1.4	32.0
A	9/6/2008	15:45	CR	F	0.0398	1.4	32.0
A	9/6/2008	15:45	CM	F	0.0441	1.5	32.0
A	9/6/2008	15:45	CM	F	0.0409	1.5	32.0
A	9/6/2008	15:45	CM	F	0.0430	1.5	32.0
A	9/6/2008	15:45	CM	F	0.0516	1.5	32.0
A	9/6/2008	15:45	CM	F	0.0458	1.5	32.0
A	9/6/2008	15:45	CM	F	0.0182	1.5	32.0
A	9/6/2008	15:45	CM	F	0.0354	1.5	32.0
A	9/6/2008	15:45	CM	F	0.0628	1.5	32.0
A	9/6/2008	15:45	CR	F	0.0459	1.5	32.0
A	9/6/2008	15:45	CR	F	0.0477	1.5	32.0
A	9/6/2008	15:45	CR	F	0.0608	1.5	32.0
A	9/6/2008	15:45	CM	F	0.0452		32.0
A	9/6/2008	15:45	CM	F	0.0562		32.0
A	9/6/2008	15:45	CM	F	0.0484		32.0
A	9/6/2008	15:45	CR	F	0.0456		32.0
A	9/6/2008	15:45	CR	F	0.0364		32.0
A	9/6/2008	16:45	CR	F	0.0434	0.1	33.0
A	9/6/2008	16:45	CR	F	0.0381	0.1	33.0
A	9/6/2008	16:45	CM	F	0.0316	0.2	33.0
A	9/6/2008	16:45	CR	F	0.0524	0.2	33.0
A	9/6/2008	16:45	CM	F	0.0374	1.4	33.0
A	9/6/2008	16:45	CM	F	0.0319	1.5	33.0
A	9/6/2008	16:45	CM	F	0.0537	1.5	33.0
A	9/6/2008	16:45	CM	F	0.0542	1.5	33.0
A	9/6/2008	16:45	CM	F	0.0359	1.5	33.0
A	9/6/2008	16:45	CR	F	0.0311	1.5	33.0
A	9/6/2008	16:45	CR	F	0.0302	1.5	33.0
A	9/6/2008	16:45	CR	F	0.0612	1.5	33.0
A	9/6/2008	16:45	CR	F	0.0404	1.5	33.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/6/2008	16:45	CM	F	0.0354		33.0
A	9/6/2008	16:45	CM	F	0.0325		33.0
A	9/6/2008	16:45	CM	F	0.0612		33.0
A	9/6/2008	16:45	CR	F	0.0519		33.0
A	9/6/2008	16:45	CR	M	0.0255		33.0
A	9/6/2008	17:45	CR	F	0.0237	0.1	34.0
A	9/6/2008	17:45	CR	F	0.0245	0.1	34.0
A	9/6/2008	17:45	CM	F	0.0434	0.2	34.0
A	9/6/2008	17:45	CR	F	0.0420	0.2	34.0
A	9/6/2008	17:45	CR	F	0.0437	0.2	34.0
A	9/6/2008	17:45	CR	F	0.0270	1.3	34.0
A	9/6/2008	17:45	CM	F	0.0507	1.5	34.0
A	9/6/2008	17:45	CR	F	0.0342	1.5	34.0
A	9/6/2008	17:45	CR	F	0.0395	1.5	34.0
A	9/6/2008	17:45	CR	F	0.0389	1.5	34.0
A	9/6/2008	17:45	CR	F	0.0343	1.5	34.0
A	9/6/2008	17:45	CM	F	0.0542		34.0
A	9/6/2008	17:45	CM	F	0.0629		34.0
A	9/6/2008	17:45	CM	F	0.0449		34.0
A	9/6/2008	17:45	CM	F	0.0351		34.0
A	9/6/2008	17:45	CR	F	0.0609		34.0
A	9/6/2008	17:45	CR	F	0.0522		34.0
A	9/6/2008	17:45	CR	F	0.0231		34.0
A	9/6/2008	17:45	CR	F	0.0412		34.0
A	9/6/2008	17:45	CM	M	0.0227		34.0
A	9/6/2008	17:45	CR	M	0.0422		34.0
A	9/6/2008	17:45	CR	M	0.0376		34.0
A	9/6/2008	17:45	CR	M	0.0302		34.0
A	9/6/2008	17:45	CR	M	0.0289		34.0
A	9/6/2008	18:45	CM	F	0.0478	0.1	35.0
A	9/6/2008	18:45	CM	F	0.0561	0.1	35.0
A	9/6/2008	18:45	CR	F	0.0297	0.1	35.0
A	9/6/2008	18:45	CR	F	0.0529	0.1	35.0
A	9/6/2008	18:45	CR	F	0.0275	0.1	35.0
A	9/6/2008	18:45	CM	F	0.0510	0.2	35.0
A	9/6/2008	18:45	CM	F	0.0601	0.2	35.0
A	9/6/2008	18:45	CM	F	0.0541	0.2	35.0
A	9/6/2008	18:45	CM	F	0.0552	0.2	35.0
A	9/6/2008	18:45	CR	F	0.0559	0.2	35.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/6/2008	18:45	CR	F	0.0503	0.2	35.0
A	9/6/2008	18:45	CR	F	0.0456	0.2	35.0
A	9/6/2008	18:45	CR	F	0.0423	0.2	35.0
A	9/6/2008	18:45	CR	F	0.0624	0.2	35.0
A	9/6/2008	18:45	CM	F	0.0339	0.3	35.0
A	9/6/2008	18:45	CM	F	0.0280	0.3	35.0
A	9/6/2008	18:45	CR	F	0.0320	0.3	35.0
A	9/6/2008	18:45	CR	F	0.0518	0.3	35.0
A	9/6/2008	18:45	CR	F	0.0390	0.3	35.0
A	9/6/2008	18:45	CM	F	0.0359	1.2	35.0
A	9/6/2008	18:45	CR	F	0.0488	1.3	35.0
A	9/6/2008	18:45	CR	F	0.0352	1.4	35.0
A	9/6/2008	18:45	CR	F	0.0646	1.4	35.0
A	9/6/2008	18:45	CR	F	0.0546	1.4	35.0
A	9/6/2008	18:45	CM	F	0.0601	1.5	35.0
A	9/6/2008	18:45	CM	F	0.0559	1.5	35.0
A	9/6/2008	18:45	CM	F	0.0405	1.5	35.0
A	9/6/2008	18:45	CR	F	0.0562	1.5	35.0
A	9/6/2008	18:45	CR	F	0.0458	1.5	35.0
A	9/6/2008	18:45	CR	F	0.0361	1.5	35.0
A	9/6/2008	18:45	CR	F	0.0627	1.5	35.0
A	9/6/2008	18:45	CR	F	0.0536	1.5	35.0
A	9/6/2008	18:45	CM	F	0.0422		35.0
A	9/6/2008	18:45	CM	F	0.0308		35.0
A	9/6/2008	18:45	CM	F	0.0561		35.0
A	9/6/2008	18:45	CM	F	0.0433		35.0
A	9/6/2008	18:45	CM	F	0.0345		35.0
A	9/6/2008	18:45	CR	F	0.0490		35.0
A	9/6/2008	18:45	CR	F	0.0611		35.0
A	9/6/2008	18:45	CR	F	0.0399		35.0
A	9/6/2008	18:45	CR	F	0.0509		35.0
A	9/6/2008	18:45	CR	F	0.0492		35.0
A	9/6/2008	18:45	CR	F	0.0526		35.0
A	9/6/2008	18:45	CM	M	0.0443		35.0
A	9/6/2008	18:45	CM	M	0.0386		35.0
A	9/6/2008	18:45	CM	M	0.0376		35.0
A	9/6/2008	18:45	CM	M	0.0443		35.0
A	9/6/2008	18:45	CM	M	0.0420		35.0
A	9/6/2008	18:45	CM	M	0.0402		35.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/6/2008	18:45	CR	M	0.0264		35.0
A	9/6/2008	18:45	CR	M	0.0316		35.0
A	9/6/2008	19:45	CR	F	0.0557	1.4	36.0
A	9/6/2008	19:45	CR	F	0.0499	1.4	36.0
A	9/6/2008	19:45	CM	F	0.0438	1.5	36.0
A	9/6/2008	19:45	CM	F	0.0367	1.5	36.0
A	9/6/2008	19:45	CR	F	0.0303	1.5	36.0
A	9/6/2008	19:45	CR	F	0.0505	1.5	36.0
A	9/6/2008	19:45	CR	F	0.0677	1.5	36.0
A	9/6/2008	19:45	CR	F	0.0537	1.5	36.0
A	9/6/2008	19:45	CM	F	0.0406		36.0
A	9/6/2008	19:45	CM	F	0.0485		36.0
A	9/6/2008	19:45	CR	F	0.0483		36.0
A	9/6/2008	19:45	CR	F	0.0396		36.0
A	9/6/2008	19:45	CM	M	0.0308		36.0
A	9/6/2008	19:45	CM	M	0.0343		36.0
A	9/7/2008	8:45	CM	F	0.0438	0.2	49.0
A	9/7/2008	8:45	CR	F	0.0477	0.2	49.0
A	9/7/2008	8:45	CM	F	0.0530	0.3	49.0
A	9/7/2008	8:45	CR	F	0.0504	1.5	49.0
A	9/7/2008	8:45	CR	F	0.0403	1.5	49.0
A	9/7/2008	8:45	CM	F	0.0455		49.0
A	9/7/2008	8:45	CM	M	0.0228		49.0
A	9/7/2008	8:45	CR	M	0.0229		49.0
A	9/7/2008	9:45	CR	F	0.0481	0.1	50.0
A	9/7/2008	9:45	CM	F	0.0404	0.2	50.0
A	9/7/2008	9:45	CM	F	0.0377	0.2	50.0
A	9/7/2008	9:45	CM	F	0.0319	0.2	50.0
A	9/7/2008	9:45	CM	F	0.0446	0.3	50.0
A	9/7/2008	9:45	CR	F	0.0564	0.3	50.0
A	9/7/2008	9:45	CR	F	0.0312	0.3	50.0
A	9/7/2008	9:45	CM	F	0.0480	0.5	50.0
A	9/7/2008	9:45	CM	F	0.0387	0.5	50.0
A	9/7/2008	9:45	CM	F	0.0484	0.7	50.0
A	9/7/2008	9:45	CR	F	0.0381	0.8	50.0
A	9/7/2008	9:45	CM	F	0.0416		50.0
A	9/7/2008	9:45	CM	F	0.0470		50.0
A	9/7/2008	9:45	CR	F	0.0451		50.0
A	9/7/2008	10:45	CM	F	0.0409	0.1	51.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/7/2008	10:45	CR	F	0.0383	0.1	51.0
A	9/7/2008	10:45	CR	F	0.0559	0.2	51.0
A	9/7/2008	10:45	CR	F	0.0351	0.2	51.0
A	9/7/2008	10:45	CR	F	0.0437	0.2	51.0
A	9/7/2008	10:45	CM	F	0.0568	0.3	51.0
A	9/7/2008	10:45	CM	F	0.0566	0.3	51.0
A	9/7/2008	10:45	CR	F	0.0356	0.3	51.0
A	9/7/2008	10:45	CR	F	0.0365	0.3	51.0
A	9/7/2008	10:45	CM	F	0.0411	1.5	51.0
A	9/7/2008	10:45	CR	M	0.0246		51.0
A	9/7/2008	11:45	CR	F	0.0408	0.1	52.0
A	9/7/2008	11:45	CM	F	0.0382	0.2	52.0
A	9/7/2008	11:45	CM	F	0.0422	0.2	52.0
A	9/7/2008	11:45	CR	F	0.0605	0.2	52.0
A	9/7/2008	11:45	CR	F	0.0593	0.2	52.0
A	9/7/2008	11:45	CR	F	0.0332	0.2	52.0
A	9/7/2008	11:45	CM	F	0.0490	0.3	52.0
A	9/7/2008	11:45	CM	F	0.0419	0.3	52.0
A	9/7/2008	11:45	CM	F	0.0601	0.3	52.0
A	9/7/2008	11:45	CM	F	0.0531	0.5	52.0
A	9/7/2008	11:45	CM	F	0.0252		52.0
A	9/7/2008	12:45	CM	F	0.0417	0.2	53.0
A	9/7/2008	12:45	CR	F	0.0497	0.2	53.0
A	9/7/2008	12:45	CR	F	0.0495	0.2	53.0
A	9/7/2008	12:45	CR	F	0.0298	0.2	53.0
A	9/7/2008	12:45	CM	F	0.0516	0.3	53.0
A	9/7/2008	12:45	CM	F	0.0502	0.3	53.0
A	9/7/2008	12:45	CM	F	0.0527	0.3	53.0
A	9/7/2008	12:45	CM	F	0.0484	0.3	53.0
A	9/7/2008	12:45	CM	F	0.0442	0.3	53.0
A	9/7/2008	12:45	CR	F	0.0406	0.3	53.0
A	9/7/2008	12:45	CM	F	0.0485	1.5	53.0
A	9/7/2008	12:45	CM	F	0.0373	1.5	53.0
A	9/7/2008	12:45	CM	F	0.0466	1.5	53.0
A	9/7/2008	12:45	CR	F	0.0407		53.0
A	9/7/2008	13:45	CM	F	0.0389	0.2	54.0
A	9/7/2008	13:45	CR	F	0.0507	0.2	54.0
A	9/7/2008	13:45	CR	F	0.0316	0.2	54.0
A	9/7/2008	13:45	CR	F	0.0461	0.2	54.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/7/2008	13:45	CM	F	0.0373	0.3	54.0
A	9/7/2008	13:45	CM	F	0.0588	0.4	54.0
A	9/7/2008	13:45	CM	F	0.0465	1.5	54.0
A	9/7/2008	14:45	CR	F	0.0359	0.1	55.0
A	9/7/2008	14:45	CR	F	0.0114	0.1	55.0
A	9/7/2008	14:45	CM	F	0.0461	0.2	55.0
A	9/7/2008	14:45	CM	F	0.0431	0.2	55.0
A	9/7/2008	14:45	CM	F	0.0242	0.2	55.0
A	9/7/2008	14:45	CM	F	0.0346	0.2	55.0
A	9/7/2008	14:45	CM	F	0.0418	0.2	55.0
A	9/7/2008	14:45	CM	F	0.0500	0.2	55.0
A	9/7/2008	14:45	CR	F	0.0472	0.2	55.0
A	9/7/2008	14:45	CR	F	0.0545	0.2	55.0
A	9/7/2008	14:45	CM	F	0.0585	0.3	55.0
A	9/7/2008	14:45	CM	F	0.0331	0.3	55.0
A	9/7/2008	14:45	CR	F	0.0463	0.3	55.0
A	9/7/2008	14:45	CM	F	0.0264		55.0
A	9/7/2008	14:45	CM	F	0.0220		55.0
A	9/7/2008	14:45	CM	M	0.0189		55.0
A	9/7/2008	15:45	CM	F	0.0416	0.1	56.0
A	9/7/2008	15:45	CR	F	0.0381	0.1	56.0
A	9/7/2008	15:45	CR	F	0.0447	0.1	56.0
A	9/7/2008	15:45	CR	F	0.0271	0.1	56.0
A	9/7/2008	15:45	CR	F	0.0325	0.1	56.0
A	9/7/2008	15:45	CR	F	0.0209	0.1	56.0
A	9/7/2008	15:45	CM	F	0.0413	0.2	56.0
A	9/7/2008	15:45	CM	F	0.0328	0.2	56.0
A	9/7/2008	15:45	CM	F	0.0394	0.2	56.0
A	9/7/2008	15:45	CR	F	0.0220	0.2	56.0
A	9/7/2008	15:45	CR	F	0.0132	0.2	56.0
A	9/7/2008	15:45	CR	F	0.0352	0.2	56.0
A	9/7/2008	15:45	CR	F	0.0279	0.2	56.0
A	9/7/2008	15:45	CR	F	0.0211	0.2	56.0
A	9/7/2008	15:45	CM	F	0.0400	0.3	56.0
A	9/7/2008	15:45	CR	F	0.0488	0.3	56.0
A	9/7/2008	15:45	CR	F	0.0168	0.3	56.0
A	9/7/2008	15:45	CR	F	0.0516	0.3	56.0
A	9/7/2008	15:45	CR	F	0.0489	0.3	56.0
A	9/7/2008	15:45	CM	F	0.0490	0.4	56.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/7/2008	15:45	CM	M	0.0300		56.0
A	9/7/2008	16:45	CM	F	0.0488	0.1	57.0
A	9/7/2008	16:45	CR	F	0.0229	0.1	57.0
A	9/7/2008	16:45	CR	F	0.0364	0.1	57.0
A	9/7/2008	16:45	CR	F	0.0264	0.1	57.0
A	9/7/2008	16:45	CM	F	0.0582	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0264	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0322	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0315	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0461	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0426	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0427	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0443	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0474	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0535	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0522	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0356	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0424	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0480	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0553	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0503	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0418	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0208	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0230	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0368	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0318	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0529	0.2	57.0
A	9/7/2008	16:45	CR	F	0.0323	0.2	57.0
A	9/7/2008	16:45	CM	F	0.0357	0.3	57.0
A	9/7/2008	16:45	CM	F	0.0329	0.3	57.0
A	9/7/2008	16:45	CR	F	0.0521	0.3	57.0
A	9/7/2008	16:45	CR	F	0.0403	0.3	57.0
A	9/7/2008	16:45	CR	F	0.0596	0.3	57.0
A	9/7/2008	16:45	CR	F	0.0584		57.0
A	9/7/2008	16:45	CR	F	0.0388		57.0
A	9/7/2008	16:45	CR	F	0.0444		57.0
A	9/7/2008	16:45	CR	M	0.0183		57.0
A	9/7/2008	16:45	CR	M	0.0165		57.0
A	9/7/2008	17:45	CM	F	0.0392	0.1	58.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/7/2008	17:45	CR	F	0.0458	0.1	58.0
A	9/7/2008	17:45	CR	F	0.0174	0.1	58.0
A	9/7/2008	17:45	CR	F	0.0286	0.1	58.0
A	9/7/2008	17:45	CM	F	0.0407	0.2	58.0
A	9/7/2008	17:45	CM	F	0.0467	0.2	58.0
A	9/7/2008	17:45	CM	F	0.0341	0.2	58.0
A	9/7/2008	17:45	CM	F	0.0414	0.2	58.0
A	9/7/2008	17:45	CM	F	0.0478	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0527	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0528	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0394	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0309	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0522	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0563	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0482	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0419	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0225	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0448	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0209	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0440	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0448	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0400	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0435	0.2	58.0
A	9/7/2008	17:45	CR	F	0.0248	0.2	58.0
A	9/7/2008	17:45	CM	F	0.0530	0.3	58.0
A	9/7/2008	17:45	CM	F	0.0438	0.3	58.0
A	9/7/2008	17:45	CR	F	0.0550	0.3	58.0
A	9/7/2008	17:45	CR	F	0.0458	0.3	58.0
A	9/7/2008	17:45	CR	F	0.0444	0.3	58.0
A	9/7/2008	17:45	CR	F	0.0305	0.3	58.0
A	9/7/2008	17:45	CR	F	0.0618	0.4	58.0
A	9/7/2008	17:45	CM	F	0.0408	0.5	58.0
A	9/7/2008	17:45	CM	F	0.0355	1.5	58.0
A	9/7/2008	17:45	CM	F	0.0243		58.0
A	9/7/2008	17:45	CR	F	0.0243		58.0
A	9/7/2008	17:45	CR	F	0.0155		58.0
A	9/7/2008	17:45	CM	M	0.0300		58.0
A	9/7/2008	18:45	CM	F	0.0237	0.1	59.0
A	9/7/2008	18:45	CR	F	0.0386	0.1	59.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/7/2008	18:45	CR	F	0.0412	0.1	59.0
A	9/7/2008	18:45	CM	F	0.0385	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0459	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0522	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0287	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0395	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0446	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0368	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0378	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0371	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0460	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0421	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0214	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0371	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0435	0.2	59.0
A	9/7/2008	18:45	CR	F	0.0397	0.2	59.0
A	9/7/2008	18:45	CM	F	0.0420	0.3	59.0
A	9/7/2008	18:45	CR	F	0.0313	0.3	59.0
A	9/7/2008	18:45	CR	F	0.0384	0.3	59.0
A	9/7/2008	18:45	CR	F	0.0433	0.3	59.0
A	9/7/2008	18:45	CR	F	0.0442	0.3	59.0
A	9/7/2008	18:45	CR	F	0.0539	0.3	59.0
A	9/7/2008	18:45	CM	F	0.0570	0.4	59.0
A	9/7/2008	18:45	CR	F	0.0549	0.4	59.0
A	9/7/2008	18:45	CM	F	0.0220		59.0
A	9/7/2008	18:45	CR	F	0.0350		59.0
A	9/7/2008	18:45	CR	F	0.0532		59.0
A	9/7/2008	18:45	CR	F	0.0559		59.0
A	9/7/2008	18:45	CR	F	0.0101		59.0
A	9/7/2008	18:45	CR	F	0.0274		59.0
A	9/7/2008	18:45	CR	F	0.0569		59.0
A	9/7/2008	18:45	CM	M	0.0271		59.0
A	9/7/2008	18:45	CR	M	0.0238		59.0
A	9/7/2008	18:45	CR	M	0.0284		59.0
A	9/7/2008	18:45	CR	M	0.0302		59.0
A	9/7/2008	19:45	CR	F	0.0453	0.1	60.0
A	9/7/2008	19:45	CM	F	0.0493	0.2	60.0
A	9/7/2008	19:45	CM	F	0.0285	0.2	60.0
A	9/7/2008	19:45	CM	F	0.0307	0.2	60.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	9/7/2008	19:45	CR	F	0.0584	0.2	60.0
A	9/7/2008	19:45	CR	F	0.0475	0.2	60.0
A	9/7/2008	19:45	CM	F	0.0480	0.3	60.0
A	9/7/2008	19:45	CM	F	0.0354	0.3	60.0
A	9/7/2008	19:45	CR	F	0.0579	0.3	60.0
A	9/7/2008	19:45	CM	F	0.0486	0.4	60.0
A	9/7/2008	19:45	CM	F	0.0514	0.5	60.0
A	9/7/2008	19:45	CM	F	0.0531	0.5	60.0
A	9/7/2008	19:45	CM	F	0.0412	0.5	60.0
A	9/7/2008	19:45	CR	F	0.0461	1.5	60.0
A	9/7/2008	19:45	CM	F	0.0217		60.0
A	9/7/2008	19:45	CM	F	0.0446		60.0
A	9/7/2008	19:45	CM	F	0.0405		60.0
A	9/7/2008	19:45	CM	F	0.0367		60.0
A	9/7/2008	19:45	CM	F	0.0483		60.0
A	9/7/2008	19:45	CM	F	0.0396		60.0
A	9/7/2008	19:45	CR	F	0.0519		60.0
A	9/7/2008	19:45	CR	F	0.0401		60.0
A	9/7/2008	19:45	CR	F	0.0605		60.0
A	9/7/2008	19:45	CR	F	0.0525		60.0
A	9/7/2008	19:45	CR	F	0.0582		60.0
A	9/7/2008	19:45	CR	F	0.0296		60.0
A	9/7/2008	19:45	CR	M	0.0404		60.0
B	9/5/2008	17:45	CM	M	0.0165		10.0
B	9/5/2008	18:45	CR	F	0.0600	1.5	11.0
B	9/5/2008	19:45	CM	F	0.0430	1.5	12.0
B	9/6/2008	8:45	CM	M	0.0355		25.0
B	9/6/2008	9:45	CR	F	0.0451	0.1	26.0
B	9/6/2008	9:45	CM	F	0.0263	1.5	26.0
B	9/6/2008	9:45	CR	F	0.0508	1.5	26.0
B	9/6/2008	9:45	CM	M	0.0310		26.0
B	9/6/2008	9:45	CM	M	0.0297		26.0
B	9/6/2008	10:45	CM	F	0.0416	1.5	27.0
B	9/6/2008	10:45	CM	F	0.0350	1.5	27.0
B	9/6/2008	10:45	CM	M	0.2730		27.0
B	9/6/2008	11:45	CM	F	0.0449	1.1	28.0
B	9/6/2008	11:45	CR	F	0.0538	1.2	28.0
B	9/6/2008	11:45	CR	F	0.0402	1.3	28.0
B	9/6/2008	11:45	CM	F	0.0368	1.4	28.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	11:45	CM	F	0.0297	1.5	28.0
B	9/6/2008	11:45	CM	F	0.0508	1.5	28.0
B	9/6/2008	11:45	CM	F	0.0458	1.5	28.0
B	9/6/2008	11:45	CR	F	0.0512	1.5	28.0
B	9/6/2008	11:45	CR	F	0.0498	1.5	28.0
B	9/6/2008	11:45	CR	F	0.0591	1.5	28.0
B	9/6/2008	11:45	CR	F	0.0473	1.5	28.0
B	9/6/2008	11:45	CR	F	0.0388		28.0
B	9/6/2008	11:45	CM	F	0.0496		28.0
B	9/6/2008	11:45	CM	F	0.0350		28.0
B	9/6/2008	11:45	CM	F	0.0422		28.0
B	9/6/2008	11:45	CM	F	0.0477		28.0
B	9/6/2008	11:45	CM	F	0.0514		28.0
B	9/6/2008	11:45	CM	F	0.0289		28.0
B	9/6/2008	11:45	CM	F	0.0525		28.0
B	9/6/2008	11:45	CR	F	0.0579		28.0
B	9/6/2008	11:45	CM	M	0.0286		28.0
B	9/6/2008	11:45	CM	M	0.0172		28.0
B	9/6/2008	11:45	CM	M	0.0329		28.0
B	9/6/2008	12:45	CM	F	0.0372	0.1	29.0
B	9/6/2008	12:45	CM	F	0.0409	0.1	29.0
B	9/6/2008	12:45	CM	F	0.0334	0.1	29.0
B	9/6/2008	12:45	CM	F	0.0426	0.1	29.0
B	9/6/2008	12:45	CM	F	0.0174	0.1	29.0
B	9/6/2008	12:45	CR	F	0.0395	0.1	29.0
B	9/6/2008	12:45	CR	F	0.0551	0.1	29.0
B	9/6/2008	12:45	CM	F	0.0368	0.2	29.0
B	9/6/2008	12:45	CM	F	0.0528	1.4	29.0
B	9/6/2008	12:45	CM	F	0.0426	1.4	29.0
B	9/6/2008	12:45	CM	F	0.0332	1.4	29.0
B	9/6/2008	12:45	CR	F	0.0392	1.4	29.0
B	9/6/2008	12:45	CR	F	0.0858	1.4	29.0
B	9/6/2008	12:45	CM	F	0.0388	1.5	29.0
B	9/6/2008	12:45	CM	F	0.0493	1.5	29.0
B	9/6/2008	12:45	CM	F	0.0438	1.5	29.0
B	9/6/2008	12:45	CM	F	0.0581	1.5	29.0
B	9/6/2008	12:45	CM	F	0.0432	1.5	29.0
B	9/6/2008	12:45	CM	F	0.0293	1.5	29.0
B	9/6/2008	12:45	CM	F	0.0400	1.5	29.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	12:45	CM	F	0.0266	1.5	29.0
B	9/6/2008	12:45	CR	F	0.0637	1.5	29.0
B	9/6/2008	12:45	CR	F	0.0507	1.5	29.0
B	9/6/2008	12:45	CR	F	0.0285	1.5	29.0
B	9/6/2008	12:45	CR	F	0.0628	1.5	29.0
B	9/6/2008	12:45	CR	F	0.0411	1.5	29.0
B	9/6/2008	12:45	CR	F	0.0200		29.0
B	9/6/2008	12:45	CM	M	0.0365		29.0
B	9/6/2008	13:45	CR	F	0.0372	0.1	30.0
B	9/6/2008	13:45	CM	F	0.0296	0.1	30.0
B	9/6/2008	13:45	CM	F	0.0325	0.1	30.0
B	9/6/2008	13:45	CM	F	0.0167	0.1	30.0
B	9/6/2008	13:45	CM	F	0.0526	0.1	30.0
B	9/6/2008	13:45	CM	F	0.0392	0.1	30.0
B	9/6/2008	13:45	CM	F	0.0269	0.1	30.0
B	9/6/2008	13:45	CR	F	0.0495	0.1	30.0
B	9/6/2008	13:45	CR	F	0.0395	0.1	30.0
B	9/6/2008	13:45	CR	F	0.0514	0.1	30.0
B	9/6/2008	13:45	CR	F	0.0502	0.1	30.0
B	9/6/2008	13:45	CR	F	0.0504	0.1	30.0
B	9/6/2008	13:45	CM	F	0.0337	0.2	30.0
B	9/6/2008	13:45	CM	F	0.0491	0.2	30.0
B	9/6/2008	13:45	CM	F	0.0448	0.2	30.0
B	9/6/2008	13:45	CM	F	0.0291	0.2	30.0
B	9/6/2008	13:45	CM	F	0.0638	0.2	30.0
B	9/6/2008	13:45	CR	F	0.0612	0.2	30.0
B	9/6/2008	13:45	CR	F	0.0179	0.2	30.0
B	9/6/2008	13:45	CM	F	0.0494	1.3	30.0
B	9/6/2008	13:45	CM	F	0.0340	1.4	30.0
B	9/6/2008	13:45	CM	F	0.0578	1.4	30.0
B	9/6/2008	13:45	CR	F	0.0618	1.4	30.0
B	9/6/2008	13:45	CR	F	0.0553	1.4	30.0
B	9/6/2008	13:45	CM	F	0.0539	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0460	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0532	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0473	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0553	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0212	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0553	1.5	30.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	13:45	CM	F	0.0393	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0629	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0656	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0580	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0557	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0245	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0502	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0558	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0494	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0524	1.5	30.0
B	9/6/2008	13:45	CR	F	0.0547	1.5	30.0
B	9/6/2008	13:45	CR	F	0.0420	1.5	30.0
B	9/6/2008	13:45	CM	F	0.0330		30.0
B	9/6/2008	13:45	CM	F	0.0236		30.0
B	9/6/2008	13:45	CM	F	0.0342		30.0
B	9/6/2008	13:45	CM	F	0.0297		30.0
B	9/6/2008	13:45	CM	F	0.0337		30.0
B	9/6/2008	13:45	CM	F	0.0570		30.0
B	9/6/2008	13:45	CM	F	0.0447		30.0
B	9/6/2008	13:45	CM	F	0.0505		30.0
B	9/6/2008	13:45	CM	F	0.0318		30.0
B	9/6/2008	13:45	CR	F	0.0502		30.0
B	9/6/2008	13:45	CR	F	0.0451		30.0
B	9/6/2008	13:45	CR	F	0.0313		30.0
B	9/6/2008	14:45	CM	F	0.0582	0.1	31.0
B	9/6/2008	14:45	CM	F	0.0368	0.1	31.0
B	9/6/2008	14:45	CM	F	0.0421	0.1	31.0
B	9/6/2008	14:45	CR	F	0.0243	0.1	31.0
B	9/6/2008	14:45	CR	F	0.0277	0.1	31.0
B	9/6/2008	14:45	CM	F	0.0218	0.2	31.0
B	9/6/2008	14:45	CM	F	0.0404	0.2	31.0
B	9/6/2008	14:45	CR	F	0.0543	0.2	31.0
B	9/6/2008	14:45	CM	F	0.0444	0.3	31.0
B	9/6/2008	14:45	CM	F	0.0398	0.3	31.0
B	9/6/2008	14:45	CR	F	0.0452	0.9	31.0
B	9/6/2008	14:45	CM	F	0.0444	1.3	31.0
B	9/6/2008	14:45	CM	F	0.0349	1.4	31.0
B	9/6/2008	14:45	CM	F	0.0533	1.4	31.0
B	9/6/2008	14:45	CM	F	0.0507	1.4	31.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	14:45	CR	F	0.0687	1.4	31.0
B	9/6/2008	14:45	CM	F	0.0468	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0499	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0419	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0649	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0337	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0561	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0426	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0424	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0561	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0419	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0638	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0525	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0386	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0299	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0675	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0447	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0295	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0430	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0433	1.5	31.0
B	9/6/2008	14:45	CR	F	0.0540	1.5	31.0
B	9/6/2008	14:45	CR	F	0.0650	1.5	31.0
B	9/6/2008	14:45	CR	F	0.0703	1.5	31.0
B	9/6/2008	14:45	CR	F	0.0475	1.5	31.0
B	9/6/2008	14:45	CR	F	0.0480	1.5	31.0
B	9/6/2008	14:45	CR	F	0.0431	1.5	31.0
B	9/6/2008	14:45	CR	F	0.0614	1.5	31.0
B	9/6/2008	14:45	CR	F	0.0281	1.5	31.0
B	9/6/2008	14:45	CM	F	0.0262		31.0
B	9/6/2008	14:45	CM	F	0.0358		31.0
B	9/6/2008	14:45	CM	F	0.0550		31.0
B	9/6/2008	14:45	CM	F	0.0430		31.0
B	9/6/2008	14:45	CM	F	0.0459		31.0
B	9/6/2008	14:45	CR	F	0.0240		31.0
B	9/6/2008	14:45	CR	F	0.0491		31.0
B	9/6/2008	14:45	CR	F	0.0409		31.0
B	9/6/2008	14:45	CM	M	0.0297		31.0
B	9/6/2008	14:45	CM	M	0.0435		31.0
B	9/6/2008	14:45	CR	M	0.0301		31.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	15:45	CR	F	0.0494	0.1	32.0
B	9/6/2008	15:45	CR	F	0.0273	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0334	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0485	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0365	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0317	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0272	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0343	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0460	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0344	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0268	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0343	0.1	32.0
B	9/6/2008	15:45	CR	F	0.0446	0.1	32.0
B	9/6/2008	15:45	CR	F	0.0476	0.1	32.0
B	9/6/2008	15:45	CM	F	0.0449	0.2	32.0
B	9/6/2008	15:45	CM	F	0.0336	0.2	32.0
B	9/6/2008	15:45	CM	F	0.0393	0.2	32.0
B	9/6/2008	15:45	CR	F	0.0554	0.2	32.0
B	9/6/2008	15:45	CR	F	0.0551	1.3	32.0
B	9/6/2008	15:45	CM	F	0.0607	1.4	32.0
B	9/6/2008	15:45	CM	F	0.0347	1.4	32.0
B	9/6/2008	15:45	CM	F	0.0471	1.4	32.0
B	9/6/2008	15:45	CR	F	0.0613	1.4	32.0
B	9/6/2008	15:45	CR	F	0.0643	1.4	32.0
B	9/6/2008	15:45	CR	F	0.0628	1.4	32.0
B	9/6/2008	15:45	CR	F	0.0559	1.4	32.0
B	9/6/2008	15:45	CR	F	0.0257	1.4	32.0
B	9/6/2008	15:45	CM	F	0.0598	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0586	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0171	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0292	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0450	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0517	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0509	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0557	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0556	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0535	1.5	32.0
B	9/6/2008	15:45	CR	F	0.0551	1.5	32.0
B	9/6/2008	15:45	CR	F	0.0707	1.5	32.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	15:45	CR	F	0.0711	1.5	32.0
B	9/6/2008	15:45	CR	F	0.0589	1.5	32.0
B	9/6/2008	15:45	CM	F	0.0162		32.0
B	9/6/2008	15:45	CM	F	0.0493		32.0
B	9/6/2008	15:45	CM	F	0.0491		32.0
B	9/6/2008	15:45	CM	F	0.0395		32.0
B	9/6/2008	15:45	CM	F	0.0251		32.0
B	9/6/2008	15:45	CR	F	0.0507		32.0
B	9/6/2008	15:45	CR	F	0.0660		32.0
B	9/6/2008	15:45	CR	F	0.0373		32.0
B	9/6/2008	15:45	CR	F	0.0459		32.0
B	9/6/2008	15:45	CR	F	0.0368		32.0
B	9/6/2008	15:45	CM	M	0.0270		32.0
B	9/6/2008	15:45	CM	M	0.0250		32.0
B	9/6/2008	15:45	CM	M	0.0333		32.0
B	9/6/2008	15:45	CR	M	0.0254		32.0
B	9/6/2008	16:45	CM	F	0.0516	0.1	33.0
B	9/6/2008	16:45	CM	F	0.0262	0.2	33.0
B	9/6/2008	16:45	CR	F	0.0405	0.2	33.0
B	9/6/2008	16:45	CR	F	0.0588	0.2	33.0
B	9/6/2008	16:45	CR	F	0.0496	0.3	33.0
B	9/6/2008	16:45	CR	F	0.0491	0.3	33.0
B	9/6/2008	16:45	CM	F	0.0438	1.2	33.0
B	9/6/2008	16:45	CM	F	0.0444	1.3	33.0
B	9/6/2008	16:45	CR	F	0.0440	1.3	33.0
B	9/6/2008	16:45	CM	F	0.0449	1.4	33.0
B	9/6/2008	16:45	CM	F	0.0336	1.4	33.0
B	9/6/2008	16:45	CM	F	0.0329	1.4	33.0
B	9/6/2008	16:45	CR	F	0.0587	1.4	33.0
B	9/6/2008	16:45	CR	F	0.0500	1.4	33.0
B	9/6/2008	16:45	CM	F	0.0465	1.5	33.0
B	9/6/2008	16:45	CM	F	0.0310	1.5	33.0
B	9/6/2008	16:45	CM	F	0.0314	1.5	33.0
B	9/6/2008	16:45	CM	F	0.0456	1.5	33.0
B	9/6/2008	16:45	CM	F	0.0455	1.5	33.0
B	9/6/2008	16:45	CM	F	0.0511	1.5	33.0
B	9/6/2008	16:45	CR	F	0.0635	1.5	33.0
B	9/6/2008	16:45	CR	F	0.0649	1.5	33.0
B	9/6/2008	16:45	CR	F	0.0607	1.5	33.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	16:45	CM	F	0.0583		33.0
B	9/6/2008	16:45	CM	F	0.0278		33.0
B	9/6/2008	16:45	CM	F	0.0477		33.0
B	9/6/2008	16:45	CM	F	0.0532		33.0
B	9/6/2008	16:45	CM	F	0.0452		33.0
B	9/6/2008	16:45	CM	F	0.0411		33.0
B	9/6/2008	16:45	CR	F	0.0287		33.0
B	9/6/2008	16:45	CR	F	0.0362		33.0
B	9/6/2008	16:45	CR	F	0.0431		33.0
B	9/6/2008	16:45	CM	M	0.0287		33.0
B	9/6/2008	16:45	CM	M	0.0286		33.0
B	9/6/2008	16:45	CM	M	0.0312		33.0
B	9/6/2008	16:45	CM	M	0.0251		33.0
B	9/6/2008	16:45	CM	M	0.0344		33.0
B	9/6/2008	17:45	CM	F	0.0451	0.1	34.0
B	9/6/2008	17:45	CM	F	0.0446	0.1	34.0
B	9/6/2008	17:45	CM	F	0.5540	0.1	34.0
B	9/6/2008	17:45	CR	F	0.0517	0.1	34.0
B	9/6/2008	17:45	CR	F	0.0519	0.1	34.0
B	9/6/2008	17:45	CR	F	0.0356	0.2	34.0
B	9/6/2008	17:45	CR	F	0.0362	0.2	34.0
B	9/6/2008	17:45	CM	F	0.0387	0.3	34.0
B	9/6/2008	17:45	CR	F	0.0524	1.2	34.0
B	9/6/2008	17:45	CM	F	0.0459	1.3	34.0
B	9/6/2008	17:45	CM	F	0.0461	1.4	34.0
B	9/6/2008	17:45	CR	F	0.0460	1.4	34.0
B	9/6/2008	17:45	CM	F	0.0471	1.5	34.0
B	9/6/2008	17:45	CM	F	0.0442	1.5	34.0
B	9/6/2008	17:45	CM	F	0.0332	1.5	34.0
B	9/6/2008	17:45	CM	F	0.0502	1.5	34.0
B	9/6/2008	17:45	CM	F	0.0537	1.5	34.0
B	9/6/2008	17:45	CM	F	0.0571	1.5	34.0
B	9/6/2008	17:45	CR	F	0.0435	1.5	34.0
B	9/6/2008	17:45	CR	F	0.0364	1.5	34.0
B	9/6/2008	17:45	CM	F	0.0421		34.0
B	9/6/2008	17:45	CR	F	0.0438		34.0
B	9/6/2008	17:45	CR	F	0.0350		34.0
B	9/6/2008	18:45	CM	F	0.0291	0.1	35.0
B	9/6/2008	18:45	CM	F	0.0565	0.2	35.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	18:45	CM	F	0.0536	0.2	35.0
B	9/6/2008	18:45	CM	F	0.0387	0.2	35.0
B	9/6/2008	18:45	CM	F	0.0528	0.2	35.0
B	9/6/2008	18:45	CM	F	0.0529	0.2	35.0
B	9/6/2008	18:45	CM	F	0.0368	0.2	35.0
B	9/6/2008	18:45	CM	F	0.0463	0.2	35.0
B	9/6/2008	18:45	CM	F	0.0388	0.2	35.0
B	9/6/2008	18:45	CM	F	0.0454	0.2	35.0
B	9/6/2008	18:45	CR	F	0.0430	0.2	35.0
B	9/6/2008	18:45	CR	F	0.0515	0.2	35.0
B	9/6/2008	18:45	CR	F	0.0308	0.2	35.0
B	9/6/2008	18:45	CR	F	0.0300	0.2	35.0
B	9/6/2008	18:45	CM	F	0.0535	0.3	35.0
B	9/6/2008	18:45	CM	F	0.0308	0.3	35.0
B	9/6/2008	18:45	CM	F	0.0585	0.3	35.0
B	9/6/2008	18:45	CR	F	0.0506	0.3	35.0
B	9/6/2008	18:45	CR	F	0.0649	0.3	35.0
B	9/6/2008	18:45	CM	F	0.0535	0.4	35.0
B	9/6/2008	18:45	CM	F	0.0693	1.2	35.0
B	9/6/2008	18:45	CM	F	0.0432	1.3	35.0
B	9/6/2008	18:45	CM	F	0.0368	1.3	35.0
B	9/6/2008	18:45	CM	F	0.0603	1.3	35.0
B	9/6/2008	18:45	CM	F	0.0336	1.4	35.0
B	9/6/2008	18:45	CM	F	0.0527	1.4	35.0
B	9/6/2008	18:45	CM	F	0.0497	1.4	35.0
B	9/6/2008	18:45	CR	F	0.0443	1.4	35.0
B	9/6/2008	18:45	CM	F	0.0236	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0584	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0574	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0313	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0276	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0206	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0290	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0292	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0346	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0684	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0484	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0413	1.5	35.0
B	9/6/2008	18:45	CR	F	0.0594	1.5	35.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	18:45	CR	F	0.0508	1.5	35.0
B	9/6/2008	18:45	MEGA	F	0.0842	1.5	35.0
B	9/6/2008	18:45	CM	F	0.0401		35.0
B	9/6/2008	18:45	CM	F	0.0474		35.0
B	9/6/2008	18:45	CM	F	0.0319		35.0
B	9/6/2008	18:45	CM	F	0.0292		35.0
B	9/6/2008	18:45	CM	F	0.0434		35.0
B	9/6/2008	18:45	CM	F	0.0447		35.0
B	9/6/2008	18:45	CM	F	0.0308		35.0
B	9/6/2008	18:45	CM	F	0.0284		35.0
B	9/6/2008	18:45	CM	F	0.0651		35.0
B	9/6/2008	18:45	CM	F	0.0318		35.0
B	9/6/2008	18:45	CR	F	0.0564		35.0
B	9/6/2008	18:45	CR	F	0.0561		35.0
B	9/6/2008	18:45	CR	F	0.0566		35.0
B	9/6/2008	18:45	CR	F	0.0334		35.0
B	9/6/2008	18:45	CM	M	0.0285		35.0
B	9/6/2008	18:45	CM	M	0.0248		35.0
B	9/6/2008	18:45	CM	M	0.0298		35.0
B	9/6/2008	18:45	CM	M	0.0350		35.0
B	9/6/2008	18:45	CM	M	0.0405		35.0
B	9/6/2008	18:45	CM	M	0.0371		35.0
B	9/6/2008	18:45	CM	M	0.0406		35.0
B	9/6/2008	18:45	CM	M	0.0263		35.0
B	9/6/2008	18:45	CM	M	0.0417		35.0
B	9/6/2008	18:45	CR	M	0.0542		35.0
B	9/6/2008	18:45	CR	M	0.0463		35.0
B	9/6/2008	18:45	CR	M	0.0307		35.0
B	9/6/2008	19:45	CM	F	0.0388	0.1	36.0
B	9/6/2008	19:45	CR	F	0.0516	0.1	36.0
B	9/6/2008	19:45	CM	F	0.0467	0.2	36.0
B	9/6/2008	19:45	CM	F	0.0433	0.2	36.0
B	9/6/2008	19:45	CM	F	0.0340	0.2	36.0
B	9/6/2008	19:45	CM	F	0.0511	0.2	36.0
B	9/6/2008	19:45	CM	F	0.0461	0.2	36.0
B	9/6/2008	19:45	CR	F	0.0311	1.2	36.0
B	9/6/2008	19:45	CM	F	0.0466	1.3	36.0
B	9/6/2008	19:45	CM	F	0.0604	1.3	36.0
B	9/6/2008	19:45	CM	F	0.0400	1.3	36.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/6/2008	19:45	CM	F	0.0467	1.4	36.0
B	9/6/2008	19:45	CM	F	0.0485	1.4	36.0
B	9/6/2008	19:45	CM	F	0.0522	1.4	36.0
B	9/6/2008	19:45	CM	F	0.0605	1.4	36.0
B	9/6/2008	19:45	CM	F	0.0588	1.4	36.0
B	9/6/2008	19:45	CM	F	0.0381	1.4	36.0
B	9/6/2008	19:45	CM	F	0.0413	1.4	36.0
B	9/6/2008	19:45	CM	F	0.0603	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0496	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0422	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0449	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0444	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0431	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0398	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0408	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0248	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0436	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0520	1.5	36.0
B	9/6/2008	19:45	CM	F	0.0653		36.0
B	9/6/2008	19:45	CM	F	0.0543		36.0
B	9/6/2008	19:45	CM	F	0.0433		36.0
B	9/6/2008	19:45	CM	F	0.0426		36.0
B	9/6/2008	19:45	CM	F	0.0377		36.0
B	9/6/2008	19:45	CM	M	0.0357		36.0
B	9/6/2008	19:45	CM	M	0.0430		36.0
B	9/6/2008	19:45	CM	M	0.0487		36.0
B	9/6/2008	19:45	CM	M	0.0473		36.0
B	9/6/2008	19:45	CR	M	0.0486		36.0
B	9/6/2008	19:45	CR	M	0.0459		36.0
B	9/7/2008	8:45	CM	F	0.0523	0.3	49.0
B	9/7/2008	8:45	CM	F	0.0472	0.4	49.0
B	9/7/2008	8:45	CM	F	0.0493	0.4	49.0
B	9/7/2008	8:45	CR	F	0.0526	0.4	49.0
B	9/7/2008	8:45	CR	F	0.0374	0.4	49.0
B	9/7/2008	8:45	CR	F	0.0564	0.4	49.0
B	9/7/2008	8:45	CR	F	0.0524		49.0
B	9/7/2008	8:45	CR	M	0.0238		49.0
B	9/7/2008	8:45	CR	M	0.0253		49.0
B	9/7/2008	9:45	CR	F	0.0388	0.1	50.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	9:45	CM	F	0.0248	0.1	50.0
B	9/7/2008	9:45	CM	F	0.0265	0.1	50.0
B	9/7/2008	9:45	CM	F	0.0386	0.1	50.0
B	9/7/2008	9:45	CR	F	0.0293	0.1	50.0
B	9/7/2008	9:45	CR	F	0.0620	0.1	50.0
B	9/7/2008	9:45	CR	F	0.0273	0.1	50.0
B	9/7/2008	9:45	CR	F	0.0400	0.1	50.0
B	9/7/2008	9:45	CR	F	0.0282	0.1	50.0
B	9/7/2008	9:45	CR	F	0.0614	0.1	50.0
B	9/7/2008	9:45	CM	F	0.0509	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0647	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0472	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0208	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0562	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0549	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0414	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0537	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0389	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0353	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0501	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0482	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0460	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0382	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0683	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0434	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0487	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0534	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0250	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0573	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0575	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0450	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0659	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0681	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0602	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0397	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0548	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0588	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0317	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0498	0.2	50.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	9:45	CR	F	0.0319	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0444	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0373	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0533	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0674	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0390	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0371	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0497	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0492	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0543	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0307	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0474	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0658	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0673	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0666	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0445	0.2	50.0
B	9/7/2008	9:45	CR	F	0.0410	0.2	50.0
B	9/7/2008	9:45	CM	F	0.0442	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0302	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0409	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0590	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0356	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0710	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0427	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0508	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0484	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0546	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0485	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0526	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0388	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0610	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0283	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0427	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0293	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0442	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0554	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0537	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0438	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0606	0.3	50.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	9:45	CR	F	0.0653	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0472	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0603	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0410	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0558	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0648	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0448	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0750	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0616	0.3	50.0
B	9/7/2008	9:45	CR	F	0.0648	0.3	50.0
B	9/7/2008	9:45	MEGA	F	0.0610	0.3	50.0
B	9/7/2008	9:45	CM	F	0.0665	0.4	50.0
B	9/7/2008	9:45	CR	F	0.0614	0.4	50.0
B	9/7/2008	9:45	CR	F	0.0638	0.4	50.0
B	9/7/2008	9:45	CR	F	0.0537	0.4	50.0
B	9/7/2008	9:45	CR	F	0.0591	0.4	50.0
B	9/7/2008	9:45	CR	F	0.0516	0.4	50.0
B	9/7/2008	9:45	CR	F	0.0615	0.4	50.0
B	9/7/2008	9:45	CR	F	0.0567	0.5	50.0
B	9/7/2008	9:45	CR	F	0.0388	0.5	50.0
B	9/7/2008	9:45	CR	F	0.0469	0.5	50.0
B	9/7/2008	9:45	CR	F	0.0472	0.5	50.0
B	9/7/2008	9:45	CM	F	0.0545	1.3	50.0
B	9/7/2008	9:45	CM	F	0.0286	1.5	50.0
B	9/7/2008	9:45	CM	F	0.0356	1.5	50.0
B	9/7/2008	9:45	CM	F	0.0416		50.0
B	9/7/2008	9:45	CM	F	0.0606		50.0
B	9/7/2008	9:45	CM	F	0.0412		50.0
B	9/7/2008	9:45	CM	F	0.0365		50.0
B	9/7/2008	9:45	CR	F	0.0532		50.0
B	9/7/2008	9:45	CR	F	0.0536		50.0
B	9/7/2008	9:45	CR	F	0.0563		50.0
B	9/7/2008	9:45	CR	F	0.0491		50.0
B	9/7/2008	9:45	CR	F	0.0300		50.0
B	9/7/2008	9:45	CR	F	0.0569		50.0
B	9/7/2008	9:45	CR	F	0.0576		50.0
B	9/7/2008	9:45	CR	F	0.0369		50.0
B	9/7/2008	9:45	CR	F	0.0467		50.0
B	9/7/2008	9:45	CR	F	0.0503		50.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	9:45	CR	F	0.0545		50.0
B	9/7/2008	9:45	CR	F	0.0669		50.0
B	9/7/2008	9:45	CM	M	0.0139		50.0
B	9/7/2008	9:45	CM	M	0.0200		50.0
B	9/7/2008	9:45	CM	M	0.0459		50.0
B	9/7/2008	9:45	CM	M	0.0216		50.0
B	9/7/2008	9:45	CM	M	0.0377		50.0
B	9/7/2008	9:45	CR	M	0.0228		50.0
B	9/7/2008	10:45	CM	F	0.0289	0.1	51.0
B	9/7/2008	10:45	CM	F	0.0511	0.1	51.0
B	9/7/2008	10:45	CM	F	0.0531	0.1	51.0
B	9/7/2008	10:45	CM	F	0.0447	0.1	51.0
B	9/7/2008	10:45	CM	F	0.0448	0.1	51.0
B	9/7/2008	10:45	CR	F	0.0401	0.1	51.0
B	9/7/2008	10:45	CR	F	0.0260	0.1	51.0
B	9/7/2008	10:45	CR	F	0.0420	0.1	51.0
B	9/7/2008	10:45	CR	F	0.0395	0.1	51.0
B	9/7/2008	10:45	CR	F	0.0506	0.1	51.0
B	9/7/2008	10:45	CM	F	0.0561	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0309	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0560	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0596	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0439	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0425	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0296	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0592	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0467	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0338	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0583	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0490	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0401	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0369	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0556	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0488	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0463	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0332	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0378	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0282	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0410	0.2	51.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	10:45	CR	F	0.0359	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0306	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0512	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0183	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0598	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0553	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0486	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0701	0.2	51.0
B	9/7/2008	10:45	CR	F	0.0211	0.2	51.0
B	9/7/2008	10:45	CM	F	0.0410	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0623	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0525	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0583	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0659	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0581	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0403	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0374	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0474	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0556	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0405	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0510	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0550	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0467	0.3	51.0
B	9/7/2008	10:45	CR	F	0.0583	0.3	51.0
B	9/7/2008	10:45	CR	F	0.0577	0.3	51.0
B	9/7/2008	10:45	CR	F	0.0617	0.3	51.0
B	9/7/2008	10:45	CR	F	0.0610	0.3	51.0
B	9/7/2008	10:45	CM	F	0.0506	0.4	51.0
B	9/7/2008	10:45	CM	F	0.0555	0.4	51.0
B	9/7/2008	10:45	CM	F	0.0623	0.4	51.0
B	9/7/2008	10:45	CM	F	0.0626	0.4	51.0
B	9/7/2008	10:45	CR	F	0.0322	0.4	51.0
B	9/7/2008	10:45	CM	F	0.0400	1.5	51.0
B	9/7/2008	10:45	CM	F	0.0635	1.5	51.0
B	9/7/2008	10:45	CM	F	0.0527	1.5	51.0
B	9/7/2008	10:45	CM	F	0.0343	1.5	51.0
B	9/7/2008	10:45	CR	F	0.0241	1.5	51.0
B	9/7/2008	10:45	CR	F	0.0533	1.5	51.0
B	9/7/2008	10:45	CM	F	0.0492		51.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	10:45	CM	F	0.0491		51.0
B	9/7/2008	10:45	CM	F	0.0645		51.0
B	9/7/2008	10:45	CM	F	0.0553		51.0
B	9/7/2008	10:45	CM	F	0.0444		51.0
B	9/7/2008	10:45	CM	F	0.0245		51.0
B	9/7/2008	10:45	CM	F	0.0549		51.0
B	9/7/2008	10:45	CR	F	0.0187		51.0
B	9/7/2008	10:45	CR	F	0.0594		51.0
B	9/7/2008	10:45	CR	F	0.0512		51.0
B	9/7/2008	10:45	CR	F	0.0688		51.0
B	9/7/2008	10:45	CR	F	0.0544		51.0
B	9/7/2008	10:45	CR	F	0.0578		51.0
B	9/7/2008	10:45	CR	F	0.0380		51.0
B	9/7/2008	10:45	CR	F	0.0437		51.0
B	9/7/2008	10:45	CM	M	0.0451		51.0
B	9/7/2008	10:45	CR	M	0.0179		51.0
B	9/7/2008	11:45	CM	F	0.0520	0.1	52.0
B	9/7/2008	11:45	CR	F	0.0425	0.1	52.0
B	9/7/2008	11:45	CR	F	0.0677	0.1	52.0
B	9/7/2008	11:45	CR	F	0.0274	0.1	52.0
B	9/7/2008	11:45	CM	F	0.0455	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0340	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0457	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0430	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0308	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0536	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0325	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0354	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0377	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0395	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0576	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0605	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0621	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0504	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0558	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0336	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0488	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0546	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0422	0.2	52.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	11:45	CR	F	0.0366	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0221	0.2	52.0
B	9/7/2008	11:45	CR	F	0.0428	0.2	52.0
B	9/7/2008	11:45	CM	F	0.0507	0.3	52.0
B	9/7/2008	11:45	CM	F	0.0476	0.3	52.0
B	9/7/2008	11:45	CM	F	0.0512	0.3	52.0
B	9/7/2008	11:45	CR	F	0.0405	0.3	52.0
B	9/7/2008	11:45	CR	F	0.0462	0.3	52.0
B	9/7/2008	11:45	CR	F	0.0435	0.3	52.0
B	9/7/2008	11:45	CR	F	0.0409	0.3	52.0
B	9/7/2008	11:45	CR	F	0.0555	0.3	52.0
B	9/7/2008	11:45	CM	F	0.0553	0.4	52.0
B	9/7/2008	11:45	CM	F	0.0505	1.0	52.0
B	9/7/2008	11:45	CM	F	0.0526	1.2	52.0
B	9/7/2008	11:45	CR	F	0.0487	1.5	52.0
B	9/7/2008	11:45	CM	F	0.0515		52.0
B	9/7/2008	11:45	CM	F	0.0467		52.0
B	9/7/2008	11:45	CR	F	0.0523		52.0
B	9/7/2008	11:45	CR	F	0.0521		52.0
B	9/7/2008	11:45	CR	F	0.0605		52.0
B	9/7/2008	11:45	CR	F	0.0210		52.0
B	9/7/2008	11:45	CR	F	0.0714		52.0
B	9/7/2008	12:45	CR	F	0.0700	0.1	53.0
B	9/7/2008	12:45	CM	F	0.0449	0.1	53.0
B	9/7/2008	12:45	CR	F	0.0266	0.1	53.0
B	9/7/2008	12:45	CR	F	0.0357	0.1	53.0
B	9/7/2008	12:45	CM	F	0.0292	0.2	53.0
B	9/7/2008	12:45	CM	F	0.0341	0.2	53.0
B	9/7/2008	12:45	CM	F	0.0380	0.2	53.0
B	9/7/2008	12:45	CM	F	0.0241	0.2	53.0
B	9/7/2008	12:45	CM	F	0.0389	0.2	53.0
B	9/7/2008	12:45	CM	F	0.0436	0.2	53.0
B	9/7/2008	12:45	CR	F	0.0496	0.2	53.0
B	9/7/2008	12:45	CR	F	0.0514	0.2	53.0
B	9/7/2008	12:45	CR	F	0.0487	0.2	53.0
B	9/7/2008	12:45	CR	F	0.0393	0.2	53.0
B	9/7/2008	12:45	CM	F	0.0276	0.3	53.0
B	9/7/2008	12:45	CM	F	0.0446	0.3	53.0
B	9/7/2008	12:45	CM	F	0.0529	0.3	53.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	12:45	CR	F	0.0440	0.3	53.0
B	9/7/2008	12:45	CR	F	0.0552	0.3	53.0
B	9/7/2008	12:45	CR	F	0.0491	0.5	53.0
B	9/7/2008	12:45	CM	F	0.0419	1.5	53.0
B	9/7/2008	12:45	CR	F	0.0410	1.5	53.0
B	9/7/2008	12:45	CR	F	0.0307		53.0
B	9/7/2008	12:45	CM	M	0.0213		53.0
B	9/7/2008	12:45	CM	M	0.0209		53.0
B	9/7/2008	13:45	CM	F	0.0485	0.2	54.0
B	9/7/2008	13:45	CR	F	0.0403	0.2	54.0
B	9/7/2008	13:45	CR	F	0.0519	0.2	54.0
B	9/7/2008	13:45	CR	F	0.0488	0.2	54.0
B	9/7/2008	13:45	CR	F	0.0549	0.2	54.0
B	9/7/2008	13:45	CR	F	0.0415	0.2	54.0
B	9/7/2008	13:45	CR	F	0.0580	0.2	54.0
B	9/7/2008	13:45	CM	F	0.0517	0.3	54.0
B	9/7/2008	13:45	CM	F	0.0357	0.3	54.0
B	9/7/2008	13:45	CM	F	0.0311	0.3	54.0
B	9/7/2008	13:45	CR	F	0.0512	0.3	54.0
B	9/7/2008	13:45	CR	F	0.0402	0.4	54.0
B	9/7/2008	13:45	CR	F	0.0453	0.4	54.0
B	9/7/2008	13:45	CM	F	0.0385		54.0
B	9/7/2008	14:45	CR	F	0.0364	0.1	55.0
B	9/7/2008	14:45	CR	F	0.0257	0.1	55.0
B	9/7/2008	14:45	CM	F	0.0431	0.2	55.0
B	9/7/2008	14:45	CM	F	0.0435	0.2	55.0
B	9/7/2008	14:45	CR	F	0.0379	0.2	55.0
B	9/7/2008	14:45	CM	M	0.0243		55.0
B	9/7/2008	15:45	CR	F	0.0456	0.1	56.0
B	9/7/2008	15:45	CR	F	0.0381	0.2	56.0
B	9/7/2008	15:45	CR	F	0.0359	0.2	56.0
B	9/7/2008	15:45	CR	F	0.0203	0.2	56.0
B	9/7/2008	15:45	CR	F	0.0271	0.2	56.0
B	9/7/2008	15:45	CM	F	0.0472	0.3	56.0
B	9/7/2008	15:45	CM	F	0.0370	0.3	56.0
B	9/7/2008	15:45	CM	F	0.0270	0.3	56.0
B	9/7/2008	15:45	CR	F	0.0389	0.3	56.0
B	9/7/2008	15:45	CR	F	0.0329	0.3	56.0
B	9/7/2008	15:45	CR	F	0.0590	0.3	56.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	15:45	CR	F	0.0209	0.4	56.0
B	9/7/2008	15:45	CR	F	0.0415	0.4	56.0
B	9/7/2008	15:45	CM	F	0.0473	0.7	56.0
B	9/7/2008	15:45	CM	F	0.0547	1.5	56.0
B	9/7/2008	15:45	CR	F	0.0334		56.0
B	9/7/2008	15:45	CM	M	0.0340		56.0
B	9/7/2008	16:45	CR	F	0.0380	0.1	57.0
B	9/7/2008	16:45	CR	F	0.0421	0.2	57.0
B	9/7/2008	16:45	CR	F	0.0544	0.2	57.0
B	9/7/2008	16:45	CR	F	0.0277	0.2	57.0
B	9/7/2008	16:45	CM	F	0.0389	0.3	57.0
B	9/7/2008	16:45	CR	F	0.0564	0.5	57.0
B	9/7/2008	16:45	CM	F	0.0353	1.5	57.0
B	9/7/2008	16:45	CM	F	0.0402	1.5	57.0
B	9/7/2008	17:45	CM	F	0.0408	0.1	58.0
B	9/7/2008	17:45	CR	F	0.0476	0.1	58.0
B	9/7/2008	17:45	CR	F	0.0289	0.1	58.0
B	9/7/2008	17:45	CM	F	0.0458	0.2	58.0
B	9/7/2008	17:45	CR	F	0.0243	0.2	58.0
B	9/7/2008	17:45	CR	F	0.0415		58.0
B	9/7/2008	17:45	CR	F	0.0321		58.0
B	9/7/2008	17:45	CR	M	0.0393		58.0
B	9/7/2008	17:45	CR	M	0.0228		58.0
B	9/7/2008	17:45	CR	M	0.0260		58.0
B	9/7/2008	18:45	CR	F	0.0195	0.1	59.0
B	9/7/2008	18:45	CR	F	0.0343	0.1	59.0
B	9/7/2008	18:45	CM	F	0.0538	0.2	59.0
B	9/7/2008	18:45	CR	F	0.0581	0.2	59.0
B	9/7/2008	18:45	CR	F	0.0537	0.2	59.0
B	9/7/2008	18:45	CR	F	0.0501	0.2	59.0
B	9/7/2008	18:45	CR	F	0.0509	0.2	59.0
B	9/7/2008	18:45	CR	F	0.0511	0.3	59.0
B	9/7/2008	18:45	CR	F	0.0355	0.4	59.0
B	9/7/2008	18:45	CM	F	0.0435	0.5	59.0
B	9/7/2008	18:45	CR	F	0.0513	0.5	59.0
B	9/7/2008	18:45	CM	F	0.0379	0.7	59.0
B	9/7/2008	18:45	CR	F	0.0588	0.8	59.0
B	9/7/2008	18:45	CM	F	0.0265		59.0
B	9/7/2008	18:45	CM	F	0.0389		59.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	9/7/2008	18:45	CM	F	0.0396		59.0
B	9/7/2008	18:45	CM	F	0.0347		59.0
B	9/7/2008	18:45	CR	F	0.0307		59.0
B	9/7/2008	18:45	CR	F	0.0418		59.0
B	9/7/2008	18:45	CR	F	0.0302		59.0
B	9/7/2008	18:45	CR	F	0.0571		59.0
B	9/7/2008	18:45	CM	M	0.0297		59.0
B	9/7/2008	18:45	CM	M	0.0263		59.0
B	9/7/2008	18:45	CR	M	0.0253		59.0
B	9/7/2008	18:45	CR	M	0.0586		59.0
B	9/7/2008	18:45	CR	M	0.0268		59.0
B	9/7/2008	18:45	CR	M	0.0441		59.0
B	9/7/2008	19:45	CM	F	0.0586	1.5	60.0
C	9/5/2008	12:45	CM	F	0.0500	1.5	5.0
C	9/5/2008	14:45	CR	F	0.0495	1.4	7.0
C	9/5/2008	15:45	CM	F	0.0645	1.5	8.0
C	9/5/2008	15:45	CM	F	0.0463	1.5	8.0
C	9/5/2008	15:45	CM	F	0.0213		8.0
C	9/5/2008	16:45	CM	F	0.0390	0.1	9.0
C	9/5/2008	16:45	CR	F	0.0616	1.5	9.0
C	9/5/2008	16:45	CM	F	0.0647		9.0
C	9/5/2008	16:45	CM	F	0.0372		9.0
C	9/5/2008	17:45	CM	F	0.0497	1.4	10.0
C	9/5/2008	17:45	CM	F	0.0502	1.4	10.0
C	9/5/2008	17:45	CR	F	0.0577	1.4	10.0
C	9/5/2008	17:45	CM	F	0.0586	1.5	10.0
C	9/5/2008	17:45	CR	F	0.0614	1.5	10.0
C	9/5/2008	18:45	CM	F	0.0474	1.5	11.0
C	9/5/2008	18:45	CM	F	0.0521	1.5	11.0
C	9/5/2008	18:45	CR	F	0.0693	1.5	11.0
C	9/5/2008	18:45	CR	F	0.0442	1.5	11.0
C	9/5/2008	18:45	CR	F	0.0684	1.5	11.0
C	9/5/2008	18:45	CM	F	0.0553		11.0
C	9/5/2008	18:45	CM	F	0.0459		11.0
C	9/5/2008	18:45	CM	F	0.0500		11.0
C	9/5/2008	18:45	CM	F	0.0659		11.0
C	9/5/2008	18:45	CM	F	0.0515		11.0
C	9/5/2008	18:45	CM	M	0.0333		11.0
C	9/5/2008	19:45	CM	F	0.0560	1.5	12.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/5/2008	19:45	CR	F	0.0413	1.5	12.0
C	9/5/2008	19:45	CM	F	0.0558		12.0
C	9/5/2008	19:45	CM	F	0.0651		12.0
C	9/5/2008	19:45	CM	F	0.0586		12.0
C	9/5/2008	19:45	CM	F	0.0528		12.0
C	9/5/2008	19:45	CM	M	0.0323		12.0
C	9/5/2008	19:45	CM	M	0.0346		12.0
C	9/6/2008	8:45	CM	M	0.0387		25.0
C	9/6/2008	9:45	CM	F	0.0368	1.3	26.0
C	9/6/2008	9:45	CM	F	0.0622		26.0
C	9/6/2008	9:45	CM	M	0.0307		26.0
C	9/6/2008	9:45	CM	M	0.0246		26.0
C	9/6/2008	10:45	CM	F	0.0498	0.2	27.0
C	9/6/2008	10:45	CM	F	0.0438	0.5	27.0
C	9/6/2008	10:45	CM	F	0.0410	1.0	27.0
C	9/6/2008	10:45	CM	F	0.0496	1.4	27.0
C	9/6/2008	10:45	CM	F	0.0540	1.5	27.0
C	9/6/2008	10:45	CM	F	0.0438	1.5	27.0
C	9/6/2008	10:45	CM	F	0.0433	1.5	27.0
C	9/6/2008	10:45	CM	F	0.0407	1.5	27.0
C	9/6/2008	10:45	CM	F	0.0571	1.5	27.0
C	9/6/2008	10:45	CR	M	0.0401		27.0
C	9/6/2008	11:45	CR	F	0.0581	0.1	28.0
C	9/6/2008	11:45	CM	F	0.0538	0.1	28.0
C	9/6/2008	11:45	CM	F	0.0498	0.2	28.0
C	9/6/2008	11:45	CM	F	0.0313	1.3	28.0
C	9/6/2008	11:45	CR	F	0.0210	1.3	28.0
C	9/6/2008	11:45	CM	F	0.0411	1.4	28.0
C	9/6/2008	11:45	CM	F	0.0457	1.4	28.0
C	9/6/2008	11:45	CM	F	0.0265	1.4	28.0
C	9/6/2008	11:45	CR	F	0.0316	1.4	28.0
C	9/6/2008	11:45	CM	F	0.0410	1.5	28.0
C	9/6/2008	11:45	CM	F	0.0527	1.5	28.0
C	9/6/2008	11:45	CM	F	0.0564	1.5	28.0
C	9/6/2008	11:45	CM	F	0.0519	1.5	28.0
C	9/6/2008	11:45	CM	F	0.0494	1.5	28.0
C	9/6/2008	11:45	CM	F	0.0493	1.5	28.0
C	9/6/2008	11:45	CR	F	0.0406	1.5	28.0
C	9/6/2008	11:45	CR	F	0.0373	1.5	28.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/6/2008	11:45	CR	F	0.0427	1.5	28.0
C	9/6/2008	11:45	CM	F	0.0392		28.0
C	9/6/2008	11:45	CR	F	0.0242		28.0
C	9/6/2008	11:45	CR	F	0.0537		28.0
C	9/6/2008	11:45	CM	M	0.0368		28.0
C	9/6/2008	12:45	CR	F	0.0307	0.1	29.0
C	9/6/2008	12:45	CM	F	0.0410	0.1	29.0
C	9/6/2008	12:45	CR	F	0.0334	0.1	29.0
C	9/6/2008	12:45	CR	F	0.0388	0.1	29.0
C	9/6/2008	12:45	CM	F	0.0431	0.2	29.0
C	9/6/2008	12:45	CM	F	0.0430	1.3	29.0
C	9/6/2008	12:45	CM	F	0.0548	1.3	29.0
C	9/6/2008	12:45	CM	F	0.0460	1.4	29.0
C	9/6/2008	12:45	CM	F	0.0544	1.4	29.0
C	9/6/2008	12:45	CM	F	0.0483	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0493	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0527	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0326	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0554	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0427	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0450	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0352	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0419	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0496	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0504	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0431	1.5	29.0
C	9/6/2008	12:45	CR	F	0.0419	1.5	29.0
C	9/6/2008	12:45	CR	F	0.0219	1.5	29.0
C	9/6/2008	12:45	CR	F	0.0442	1.5	29.0
C	9/6/2008	12:45	CR	F	0.0332	1.5	29.0
C	9/6/2008	12:45	CR	F	0.0668	1.5	29.0
C	9/6/2008	12:45	CR	F	0.0569	1.5	29.0
C	9/6/2008	12:45	CR	F	0.0513	1.5	29.0
C	9/6/2008	12:45	CR	F	0.0180	1.5	29.0
C	9/6/2008	12:45	CM	F	0.0312		29.0
C	9/6/2008	12:45	CM	F	0.0345		29.0
C	9/6/2008	12:45	CM	F	0.0298		29.0
C	9/6/2008	12:45	CR	F	0.0703		29.0
C	9/6/2008	12:45	CR	F	0.0360		29.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/6/2008	13:45	CM	F	0.0462	0.1	30.0
C	9/6/2008	13:45	CM	F	0.0297	0.1	30.0
C	9/6/2008	13:45	CM	F	0.0419	1.2	30.0
C	9/6/2008	13:45	CM	F	0.0505	1.5	30.0
C	9/6/2008	13:45	CM	F	0.0525	1.5	30.0
C	9/6/2008	13:45	CM	F	0.0614	1.5	30.0
C	9/6/2008	13:45	CM	F	0.0618	1.5	30.0
C	9/6/2008	13:45	CM	F	0.0451	1.5	30.0
C	9/6/2008	13:45	CM	F	0.0509	1.5	30.0
C	9/6/2008	13:45	CR	F	0.0513	1.5	30.0
C	9/6/2008	13:45	CR	F	0.0632	1.5	30.0
C	9/6/2008	13:45	CR	F	0.0592	1.5	30.0
C	9/6/2008	13:45	CR	F	0.0294	1.5	30.0
C	9/6/2008	13:45	CR	F	0.0604	1.5	30.0
C	9/6/2008	13:45	CM	F	0.0547		30.0
C	9/6/2008	13:45	CM	F	0.0392		30.0
C	9/6/2008	13:45	CM	F	0.0376		30.0
C	9/6/2008	13:45	CR	F	0.0400		30.0
C	9/6/2008	13:45	CR	F	0.0437		30.0
C	9/6/2008	14:45	CM	F	0.0197	0.1	31.0
C	9/6/2008	14:45	CM	F	0.0287	0.1	31.0
C	9/6/2008	14:45	CM	F	0.0295	0.1	31.0
C	9/6/2008	14:45	CR	F	0.0572	0.1	31.0
C	9/6/2008	14:45	CR	F	0.0310	0.1	31.0
C	9/6/2008	14:45	CR	F	0.0478	0.3	31.0
C	9/6/2008	14:45	CM	F	0.0377	1.4	31.0
C	9/6/2008	14:45	CM	F	0.0606	1.5	31.0
C	9/6/2008	14:45	CM	F	0.0338	1.5	31.0
C	9/6/2008	14:45	CM	F	0.0386	1.5	31.0
C	9/6/2008	14:45	CM	F	0.0443	1.5	31.0
C	9/6/2008	14:45	CM	F	0.0514	1.5	31.0
C	9/6/2008	14:45	CM	F	0.0551	1.5	31.0
C	9/6/2008	14:45	CM	F	0.0456	1.5	31.0
C	9/6/2008	14:45	CM	F	0.0476	1.5	31.0
C	9/6/2008	14:45	CR	F	0.0640	1.5	31.0
C	9/6/2008	14:45	CR	F	0.0713	1.5	31.0
C	9/6/2008	14:45	CR	F	0.0299	1.5	31.0
C	9/6/2008	14:45	CR	F	0.0513	1.5	31.0
C	9/6/2008	14:45	CM	F	0.0355		31.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/6/2008	14:45	CM	F	0.0392		31.0
C	9/6/2008	14:45	CM	F	0.0464		31.0
C	9/6/2008	14:45	CR	F	0.0336		31.0
C	9/6/2008	14:45	CR	F	0.0344		31.0
C	9/6/2008	14:45	CR	F	0.0484		31.0
C	9/6/2008	14:45	CR	F	0.0273		31.0
C	9/6/2008	14:45	CM	M	0.0393		31.0
C	9/6/2008	14:45	CM	M	0.0294		31.0
C	9/6/2008	14:45	CR	M	0.0101		31.0
C	9/6/2008	15:45	CM	F	0.0353	0.1	32.0
C	9/6/2008	15:45	CM	F	0.0527	0.2	32.0
C	9/6/2008	15:45	CM	F	0.0342	0.2	32.0
C	9/6/2008	15:45	CM	F	0.0524	0.3	32.0
C	9/6/2008	15:45	CM	F	0.0635	0.3	32.0
C	9/6/2008	15:45	CR	F	0.0549	0.3	32.0
C	9/6/2008	15:45	CM	F	0.0400	1.2	32.0
C	9/6/2008	15:45	CR	F	0.0451	1.3	32.0
C	9/6/2008	15:45	CM	F	0.0462	1.4	32.0
C	9/6/2008	15:45	CM	F	0.0518	1.4	32.0
C	9/6/2008	15:45	CM	F	0.0691	1.4	32.0
C	9/6/2008	15:45	CM	F	0.0501	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0421	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0435	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0619	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0616	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0440	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0408	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0534	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0415	1.5	32.0
C	9/6/2008	15:45	CR	F	0.0349	1.5	32.0
C	9/6/2008	15:45	CR	F	0.0540	1.5	32.0
C	9/6/2008	15:45	CR	F	0.0178	1.5	32.0
C	9/6/2008	15:45	CM	F	0.0279		32.0
C	9/6/2008	15:45	CM	F	0.0447		32.0
C	9/6/2008	16:45	CM	F	0.0490	0.1	33.0
C	9/6/2008	16:45	CM	F	0.0421	0.1	33.0
C	9/6/2008	16:45	CR	F	0.0316	0.1	33.0
C	9/6/2008	16:45	CM	F	0.0514	0.2	33.0
C	9/6/2008	16:45	CM	F	0.0513	0.2	33.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/6/2008	16:45	CM	F	0.0432	0.2	33.0
C	9/6/2008	16:45	CR	F	0.0523	0.2	33.0
C	9/6/2008	16:45	CR	F	0.0626	0.2	33.0
C	9/6/2008	16:45	CR	F	0.0530	0.2	33.0
C	9/6/2008	16:45	CR	F	0.0677	0.2	33.0
C	9/6/2008	16:45	CR	F	0.0509	0.3	33.0
C	9/6/2008	16:45	CM	F	0.0472	0.4	33.0
C	9/6/2008	16:45	CM	F	0.0398	1.2	33.0
C	9/6/2008	16:45	CM	F	0.0501	1.3	33.0
C	9/6/2008	16:45	CM	F	0.0596	1.4	33.0
C	9/6/2008	16:45	CM	F	0.0594	1.4	33.0
C	9/6/2008	16:45	CR	F	0.0197	1.4	33.0
C	9/6/2008	16:45	CM	F	0.0392	1.5	33.0
C	9/6/2008	16:45	CM	F	0.0546	1.5	33.0
C	9/6/2008	16:45	CM	F	0.0536	1.5	33.0
C	9/6/2008	16:45	CM	F	0.0469	1.5	33.0
C	9/6/2008	16:45	CM	F	0.0409	1.5	33.0
C	9/6/2008	16:45	CR	F	0.0480	1.5	33.0
C	9/6/2008	16:45	CR	F	0.0344	1.5	33.0
C	9/6/2008	16:45	CM	F	0.0316		33.0
C	9/6/2008	16:45	CM	F	0.0459		33.0
C	9/6/2008	16:45	CM	F	0.0584		33.0
C	9/6/2008	16:45	CM	F	0.0269		33.0
C	9/6/2008	16:45	CM	F	0.0279		33.0
C	9/6/2008	16:45	CM	F	0.0387		33.0
C	9/6/2008	16:45	CM	F	0.0382		33.0
C	9/6/2008	16:45	CM	F	0.0441		33.0
C	9/6/2008	16:45	CM	F	0.0603		33.0
C	9/6/2008	16:45	CM	F	0.0375		33.0
C	9/6/2008	16:45	CM	F	0.0387		33.0
C	9/6/2008	16:45	CM	F	0.0433		33.0
C	9/6/2008	16:45	CM	F	0.0396		33.0
C	9/6/2008	16:45	CM	F	0.0754		33.0
C	9/6/2008	16:45	CM	F	0.0532		33.0
C	9/6/2008	16:45	CM	F	0.0398		33.0
C	9/6/2008	16:45	CM	F	0.0461		33.0
C	9/6/2008	16:45	CM	F	0.0367		33.0
C	9/6/2008	16:45	CR	F	0.0426		33.0
C	9/6/2008	16:45	CR	F	0.0363		33.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/6/2008	16:45	CM	M	0.0404		33.0
C	9/6/2008	16:45	CM	M	0.0377		33.0
C	9/6/2008	16:45	CM	M	0.0333		33.0
C	9/6/2008	16:45	CM	M	0.0427		33.0
C	9/6/2008	16:45	CR	M	0.0257		33.0
C	9/6/2008	16:45	CR	M	0.0304		33.0
C	9/6/2008	17:45	CM	F	0.0385	0.1	34.0
C	9/6/2008	17:45	CM	F	0.0413	0.1	34.0
C	9/6/2008	17:45	CM	F	0.0474	0.1	34.0
C	9/6/2008	17:45	CM	F	0.0583	0.2	34.0
C	9/6/2008	17:45	CR	F	0.0267	0.2	34.0
C	9/6/2008	17:45	CM	F	0.0403	0.3	34.0
C	9/6/2008	17:45	CM	F	0.0509	0.3	34.0
C	9/6/2008	17:45	CM	F	0.0343	0.3	34.0
C	9/6/2008	17:45	CR	F	0.0259	0.3	34.0
C	9/6/2008	17:45	CR	F	0.0603	1.3	34.0
C	9/6/2008	17:45	CR	F	0.0542	1.4	34.0
C	9/6/2008	17:45	CM	F	0.0496	1.5	34.0
C	9/6/2008	17:45	CM	F	0.0488	1.5	34.0
C	9/6/2008	17:45	CM	F	0.0391	1.5	34.0
C	9/6/2008	17:45	CR	F	0.0556	1.5	34.0
C	9/6/2008	17:45	CR	F	0.0514	1.5	34.0
C	9/6/2008	17:45	CM	F	0.0290		34.0
C	9/6/2008	17:45	CM	F	0.0335		34.0
C	9/6/2008	17:45	CM	F	0.0606		34.0
C	9/6/2008	17:45	CM	F	0.0435		34.0
C	9/6/2008	17:45	CM	F	0.0406		34.0
C	9/6/2008	17:45	CM	F	0.0291		34.0
C	9/6/2008	17:45	CM	F	0.0592		34.0
C	9/6/2008	17:45	CR	F	0.0341		34.0
C	9/6/2008	17:45	CM	M	0.0237		34.0
C	9/6/2008	17:45	CM	M	0.0268		34.0
C	9/6/2008	17:45	CM	M	0.0299		34.0
C	9/6/2008	17:45	CR	M	0.0305		34.0
C	9/6/2008	17:45	CR	M	0.0420		34.0
C	9/6/2008	17:45	CR	M	0.0303		34.0
C	9/6/2008	18:45	CM	F	0.0248	0.1	35.0
C	9/6/2008	18:45	CR	F	0.0462	0.1	35.0
C	9/6/2008	18:45	CR	F	0.0474	0.1	35.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/6/2008	18:45	CR	F	0.0221	0.1	35.0
C	9/6/2008	18:45	CM	F	0.0542	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0536	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0314	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0466	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0524	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0415	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0524	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0460	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0512	0.2	35.0
C	9/6/2008	18:45	CR	F	0.0527	0.2	35.0
C	9/6/2008	18:45	CR	F	0.0580	0.2	35.0
C	9/6/2008	18:45	CR	F	0.0494	0.2	35.0
C	9/6/2008	18:45	CR	F	0.0475	0.2	35.0
C	9/6/2008	18:45	CR	F	0.0204	0.2	35.0
C	9/6/2008	18:45	CR	F	0.0338	0.2	35.0
C	9/6/2008	18:45	CM	F	0.0485	0.3	35.0
C	9/6/2008	18:45	CM	F	0.0465	0.3	35.0
C	9/6/2008	18:45	CR	F	0.0485	0.3	35.0
C	9/6/2008	18:45	CM	F	0.0526	0.4	35.0
C	9/6/2008	18:45	CM	F	0.0504	0.5	35.0
C	9/6/2008	18:45	CM	F	0.0536	1.3	35.0
C	9/6/2008	18:45	CM	F	0.0573	1.4	35.0
C	9/6/2008	18:45	CM	F	0.0546	1.5	35.0
C	9/6/2008	18:45	CM	F	0.0525	1.5	35.0
C	9/6/2008	18:45	CM	F	0.0314	1.5	35.0
C	9/6/2008	18:45	CM	F	0.0626	1.5	35.0
C	9/6/2008	18:45	CR	F	0.0586	1.5	35.0
C	9/6/2008	18:45	CR	F	0.0666	1.5	35.0
C	9/6/2008	18:45	CR	F	0.0376	1.5	35.0
C	9/6/2008	18:45	CM	F	0.0398		35.0
C	9/6/2008	18:45	CM	F	0.0275		35.0
C	9/6/2008	18:45	CM	F	0.0377		35.0
C	9/6/2008	18:45	CM	F	0.0521		35.0
C	9/6/2008	18:45	CM	F	0.0363		35.0
C	9/6/2008	18:45	CM	F	0.0325		35.0
C	9/6/2008	18:45	CM	F	0.0306		35.0
C	9/6/2008	18:45	CM	F	0.0283		35.0
C	9/6/2008	18:45	CM	F	0.0257		35.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/6/2008	18:45	CM	F	0.0567		35.0
C	9/6/2008	18:45	CM	F	0.0431		35.0
C	9/6/2008	18:45	CM	F	0.0567		35.0
C	9/6/2008	18:45	CM	F	0.0476		35.0
C	9/6/2008	18:45	CM	F	0.0380		35.0
C	9/6/2008	18:45	CM	F	0.0540		35.0
C	9/6/2008	18:45	CM	F	0.0587		35.0
C	9/6/2008	18:45	CM	F	0.0508		35.0
C	9/6/2008	18:45	CM	F	0.0533		35.0
C	9/6/2008	18:45	CM	F	0.0432		35.0
C	9/6/2008	18:45	CM	F	0.0619		35.0
C	9/6/2008	18:45	CM	F	0.0561		35.0
C	9/6/2008	18:45	CM	F	0.0414		35.0
C	9/6/2008	18:45	CR	F	0.0353		35.0
C	9/6/2008	18:45	CR	F	0.0463		35.0
C	9/6/2008	18:45	CR	F	0.0471		35.0
C	9/6/2008	18:45	CR	F	0.0360		35.0
C	9/6/2008	18:45	CR	F	0.0234		35.0
C	9/6/2008	18:45	CR	F	0.0124		35.0
C	9/6/2008	18:45	CR	F	0.0251		35.0
C	9/6/2008	18:45	CR	F	0.0561		35.0
C	9/6/2008	18:45	CM	M	0.0370		35.0
C	9/6/2008	18:45	CM	M	0.0338		35.0
C	9/6/2008	18:45	CM	M	0.0397		35.0
C	9/6/2008	18:45	CM	M	0.0319		35.0
C	9/6/2008	18:45	CR	M	0.0373		35.0
C	9/6/2008	18:45	CR	M	0.0420		35.0
C	9/6/2008	19:45	CM	F	0.0493	0.2	36.0
C	9/6/2008	19:45	CM	F	0.0483	0.2	36.0
C	9/6/2008	19:45	CM	F	0.0397	0.2	36.0
C	9/6/2008	19:45	CM	F	0.0357	0.3	36.0
C	9/6/2008	19:45	CM	F	0.0534	0.3	36.0
C	9/6/2008	19:45	CM	F	0.0455	0.3	36.0
C	9/6/2008	19:45	CM	F	0.0517	1.3	36.0
C	9/6/2008	19:45	CM	F	0.0483	1.3	36.0
C	9/6/2008	19:45	CM	F	0.0435	1.4	36.0
C	9/6/2008	19:45	CM	F	0.0476	1.4	36.0
C	9/6/2008	19:45	CM	F	0.0475	1.4	36.0
C	9/6/2008	19:45	CR	F	0.0534	1.4	36.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/6/2008	19:45	CM	F	0.0417	1.5	36.0
C	9/6/2008	19:45	CM	F	0.0606	1.5	36.0
C	9/6/2008	19:45	CM	F	0.0393	1.5	36.0
C	9/6/2008	19:45	CM	F	0.0636	1.5	36.0
C	9/6/2008	19:45	CM	F	0.0378	1.5	36.0
C	9/6/2008	19:45	CM	F	0.0257	1.5	36.0
C	9/6/2008	19:45	CM	F	0.0675	1.5	36.0
C	9/6/2008	19:45	CR	F	0.0492	1.5	36.0
C	9/6/2008	19:45	CR	F	0.0554	1.5	36.0
C	9/6/2008	19:45	CM	F	0.0505		36.0
C	9/6/2008	19:45	CM	F	0.0426		36.0
C	9/6/2008	19:45	CM	F	0.0353		36.0
C	9/6/2008	19:45	CR	F	0.0422		36.0
C	9/6/2008	19:45	CM	M	0.0305		36.0
C	9/6/2008	19:45	CM	M	0.0323		36.0
C	9/6/2008	19:45	CM	M	0.0234		36.0
C	9/6/2008	19:45	CR	M	0.0469		36.0
C	9/6/2008	19:45	CR	M	0.0325		36.0
C	9/7/2008	8:45	CM	F	0.0510	0.4	49.0
C	9/7/2008	8:45	CR	F	0.0541	0.6	49.0
C	9/7/2008	9:45	CM	F	0.0287	0.1	50.0
C	9/7/2008	9:45	CR	F	0.0414	0.1	50.0
C	9/7/2008	9:45	CR	F	0.0359	0.1	50.0
C	9/7/2008	9:45	CR	F	0.0247	0.1	50.0
C	9/7/2008	9:45	CR	F	0.0794	0.1	50.0
C	9/7/2008	9:45	CM	F	0.0515	0.2	50.0
C	9/7/2008	9:45	CM	F	0.0416	0.2	50.0
C	9/7/2008	9:45	CM	F	0.0381	0.2	50.0
C	9/7/2008	9:45	CM	F	0.0353	0.2	50.0
C	9/7/2008	9:45	CM	F	0.0257	0.2	50.0
C	9/7/2008	9:45	CR	F	0.0517	0.2	50.0
C	9/7/2008	9:45	CR	F	0.0344	0.2	50.0
C	9/7/2008	9:45	CR	F	0.0583	0.2	50.0
C	9/7/2008	9:45	CM	F	0.0469	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0494	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0487	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0524	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0426	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0416	0.3	50.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/7/2008	9:45	CM	F	0.0506	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0432	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0397	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0490	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0532	0.3	50.0
C	9/7/2008	9:45	CR	F	0.0462	0.3	50.0
C	9/7/2008	9:45	CR	F	0.0373	0.3	50.0
C	9/7/2008	9:45	CR	F	0.0283	0.3	50.0
C	9/7/2008	9:45	CM	F	0.0431	0.4	50.0
C	9/7/2008	9:45	CR	F	0.0580	0.5	50.0
C	9/7/2008	9:45	CM	F	0.0472	1.4	50.0
C	9/7/2008	9:45	CM	F	0.0429		50.0
C	9/7/2008	9:45	CM	F	0.0346		50.0
C	9/7/2008	9:45	CM	F	0.0480		50.0
C	9/7/2008	9:45	CM	F	0.0421		50.0
C	9/7/2008	9:45	CR	F	0.0551		50.0
C	9/7/2008	9:45	CR	F	0.0225		50.0
C	9/7/2008	9:45	CR	F	0.0224		50.0
C	9/7/2008	9:45	CM	M	0.0171		50.0
C	9/7/2008	10:45	CR	F	0.0388	0.1	51.0
C	9/7/2008	10:45	CM	F	0.0458	0.1	51.0
C	9/7/2008	10:45	CR	F	0.0534	0.1	51.0
C	9/7/2008	10:45	CM	F	0.0430	0.2	51.0
C	9/7/2008	10:45	CM	F	0.0498	0.2	51.0
C	9/7/2008	10:45	CM	F	0.0424	0.2	51.0
C	9/7/2008	10:45	CM	F	0.0462	0.2	51.0
C	9/7/2008	10:45	CM	F	0.0377	0.2	51.0
C	9/7/2008	10:45	CM	F	0.0504	0.2	51.0
C	9/7/2008	10:45	CR	F	0.0558	0.2	51.0
C	9/7/2008	10:45	CR	F	0.0493	0.2	51.0
C	9/7/2008	10:45	CR	F	0.0310	0.2	51.0
C	9/7/2008	10:45	CR	F	0.0538	0.2	51.0
C	9/7/2008	10:45	CR	F	0.0499	0.2	51.0
C	9/7/2008	10:45	CR	F	0.0603	0.2	51.0
C	9/7/2008	10:45	CM	F	0.0595	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0424	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0414	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0244	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0558	0.3	51.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/7/2008	10:45	CM	F	0.0473	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0565	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0484	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0265	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0539	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0458	0.3	51.0
C	9/7/2008	10:45	CR	F	0.0567	0.3	51.0
C	9/7/2008	10:45	CR	F	0.0484	0.3	51.0
C	9/7/2008	10:45	CR	F	0.0412	0.3	51.0
C	9/7/2008	10:45	CR	F	0.0511	0.3	51.0
C	9/7/2008	10:45	CR	F	0.0560	0.3	51.0
C	9/7/2008	10:45	CR	F	0.0432	0.3	51.0
C	9/7/2008	10:45	CM	F	0.0317	0.4	51.0
C	9/7/2008	10:45	CM	F	0.0297	0.4	51.0
C	9/7/2008	10:45	CM	F	0.0273	0.4	51.0
C	9/7/2008	10:45	CR	F	0.0366	0.5	51.0
C	9/7/2008	10:45	CR	F	0.0410	1.4	51.0
C	9/7/2008	10:45	CM	F	0.0574	1.5	51.0
C	9/7/2008	10:45	CR	F	0.0549	1.5	51.0
C	9/7/2008	10:45	CM	F	0.0282		51.0
C	9/7/2008	10:45	CM	F	0.0331		51.0
C	9/7/2008	10:45	CM	F	0.0581		51.0
C	9/7/2008	10:45	CM	F	0.0428		51.0
C	9/7/2008	10:45	CR	F	0.0372		51.0
C	9/7/2008	10:45	CR	F	0.0428		51.0
C	9/7/2008	10:45	CR	F	0.0532		51.0
C	9/7/2008	10:45	CR	F	0.0214		51.0
C	9/7/2008	10:45	CM	M	0.0336		51.0
C	9/7/2008	10:45	CR	M	0.0186		51.0
C	9/7/2008	11:45	CR	F	0.0131	0.1	52.0
C	9/7/2008	11:45	CM	F	0.0416	0.1	52.0
C	9/7/2008	11:45	CR	F	0.0138	0.1	52.0
C	9/7/2008	11:45	CM	F	0.0319	0.2	52.0
C	9/7/2008	11:45	CR	F	0.0476	0.2	52.0
C	9/7/2008	11:45	CR	F	0.0290	0.2	52.0
C	9/7/2008	11:45	CR	F	0.0352	0.2	52.0
C	9/7/2008	11:45	CM	F	0.0475	0.3	52.0
C	9/7/2008	11:45	CR	F	0.0410	0.3	52.0
C	9/7/2008	11:45	CM	F	0.0264	1.5	52.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/7/2008	11:45	CR	F	0.0220		52.0
C	9/7/2008	11:45	CR	M	0.0355		52.0
C	9/7/2008	12:45	CM	F	0.0340	0.1	53.0
C	9/7/2008	12:45	CM	F	0.0459	0.1	53.0
C	9/7/2008	12:45	CR	F	0.0489	0.1	53.0
C	9/7/2008	12:45	CR	F	0.0607	0.1	53.0
C	9/7/2008	12:45	CM	F	0.0488	0.2	53.0
C	9/7/2008	12:45	CM	F	0.0420	0.2	53.0
C	9/7/2008	12:45	CM	F	0.0322	0.2	53.0
C	9/7/2008	12:45	CM	F	0.0250	0.2	53.0
C	9/7/2008	12:45	CR	F	0.0354	0.2	53.0
C	9/7/2008	12:45	CR	F	0.0641	0.2	53.0
C	9/7/2008	12:45	CR	F	0.0460	0.2	53.0
C	9/7/2008	12:45	CR	F	0.0321	0.2	53.0
C	9/7/2008	12:45	CR	F	0.0437	0.2	53.0
C	9/7/2008	12:45	CR	F	0.0541	0.2	53.0
C	9/7/2008	12:45	CR	F	0.0528	0.2	53.0
C	9/7/2008	12:45	CR	F	0.0699	0.3	53.0
C	9/7/2008	12:45	CR	F	0.0388	0.3	53.0
C	9/7/2008	12:45	CM	F	0.0475	0.6	53.0
C	9/7/2008	12:45	CM	F	0.0402		53.0
C	9/7/2008	12:45	CR	F	0.0282		53.0
C	9/7/2008	12:45	CM	M	0.0379		53.0
C	9/7/2008	12:45	CM	M	0.0366		53.0
C	9/7/2008	13:45	CM	F	0.0470	0.2	54.0
C	9/7/2008	13:45	CM	F	0.0345	0.2	54.0
C	9/7/2008	13:45	CR	F	0.0573	0.2	54.0
C	9/7/2008	13:45	CR	F	0.0485	0.2	54.0
C	9/7/2008	13:45	CR	F	0.0317	0.2	54.0
C	9/7/2008	13:45	CM	F	0.0385	0.3	54.0
C	9/7/2008	13:45	CR	F	0.0430	0.4	54.0
C	9/7/2008	13:45	CM	F	0.0352	1.3	54.0
C	9/7/2008	14:45	CM	F	0.0342	0.2	55.0
C	9/7/2008	14:45	CM	F	0.0483	0.2	55.0
C	9/7/2008	14:45	CR	F	0.0349	0.2	55.0
C	9/7/2008	14:45	CR	F	0.0248	0.2	55.0
C	9/7/2008	14:45	CR	F	0.0435	0.2	55.0
C	9/7/2008	14:45	CR	F	0.0390	0.2	55.0
C	9/7/2008	14:45	CR	F	0.0293	0.2	55.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/7/2008	14:45	CR	F	0.0428	0.2	55.0
C	9/7/2008	14:45	CR	F	0.0312	0.2	55.0
C	9/7/2008	14:45	CR	F	0.0155	0.2	55.0
C	9/7/2008	14:45	CM	F	0.0435	0.3	55.0
C	9/7/2008	14:45	CM	F	0.0192	0.3	55.0
C	9/7/2008	14:45	CM	F	0.0504	0.3	55.0
C	9/7/2008	14:45	CR	F	0.0458	0.3	55.0
C	9/7/2008	14:45	CR	F	0.0509	0.3	55.0
C	9/7/2008	14:45	CR	F	0.0508	0.3	55.0
C	9/7/2008	14:45	CM	F	0.0332	1.5	55.0
C	9/7/2008	14:45	CR	F	0.0488		55.0
C	9/7/2008	14:45	CR	F	0.0263		55.0
C	9/7/2008	14:45	CM	M	0.0387		55.0
C	9/7/2008	14:45	CM	M	0.0403		55.0
C	9/7/2008	14:45	CR	M	0.0263		55.0
C	9/7/2008	14:45	CR	M	0.0359		55.0
C	9/7/2008	14:45	CR	M	0.0183		55.0
C	9/7/2008	16:45	CR	F	0.0225	0.1	57.0
C	9/7/2008	16:45	CR	F	0.0343	0.1	57.0
C	9/7/2008	16:45	CR	F	0.0235	0.1	57.0
C	9/7/2008	16:45	CR	F	0.0216	0.1	57.0
C	9/7/2008	16:45	CM	F	0.0435	0.2	57.0
C	9/7/2008	16:45	CM	F	0.0259	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0532	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0223	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0219	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0513	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0385	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0489	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0265	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0415	0.2	57.0
C	9/7/2008	16:45	CR	F	0.0381	0.2	57.0
C	9/7/2008	16:45	CM	F	0.0396	0.3	57.0
C	9/7/2008	16:45	CM	F	0.0280	0.3	57.0
C	9/7/2008	16:45	CR	F	0.0375	0.3	57.0
C	9/7/2008	16:45	CR	F	0.0531	0.3	57.0
C	9/7/2008	16:45	CM	F	0.0521	0.4	57.0
C	9/7/2008	16:45	CR	F	0.0474	0.4	57.0
C	9/7/2008	16:45	CM	F	0.0423	0.5	57.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/7/2008	16:45	CM	F	0.0447		57.0
C	9/7/2008	16:45	CM	F	0.0372		57.0
C	9/7/2008	16:45	CR	F	0.0326		57.0
C	9/7/2008	16:45	CR	F	0.0395		57.0
C	9/7/2008	16:45	CR	M	0.0269		57.0
C	9/7/2008	17:45	CR	F	0.0320	0.1	58.0
C	9/7/2008	17:45	CR	F	0.0265	0.1	58.0
C	9/7/2008	17:45	CR	F	0.0218	0.1	58.0
C	9/7/2008	17:45	CR	F	0.0238	0.1	58.0
C	9/7/2008	17:45	CR	F	0.0325	0.1	58.0
C	9/7/2008	17:45	CM	F	0.0319	0.2	58.0
C	9/7/2008	17:45	CM	F	0.0313	0.2	58.0
C	9/7/2008	17:45	CM	F	0.0171	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0353	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0401	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0453	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0229	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0177	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0365	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0270	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0357	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0388	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0323	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0274	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0422	0.2	58.0
C	9/7/2008	17:45	CR	F	0.0276	0.2	58.0
C	9/7/2008	17:45	CM	F	0.0456	0.3	58.0
C	9/7/2008	17:45	CM	F	0.0325	0.3	58.0
C	9/7/2008	17:45	CM	F	0.0392	0.3	58.0
C	9/7/2008	17:45	CM	F	0.0372	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0172	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0584	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0334	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0506	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0320	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0313	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0292	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0334	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0330	0.3	58.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/7/2008	17:45	CR	F	0.0485	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0586	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0562	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0494	0.3	58.0
C	9/7/2008	17:45	CR	F	0.0292	0.3	58.0
C	9/7/2008	17:45	CM	F	0.0309	0.4	58.0
C	9/7/2008	17:45	CR	F	0.0491	0.4	58.0
C	9/7/2008	17:45	CR	F	0.0412	0.4	58.0
C	9/7/2008	17:45	CR	F	0.0330	0.4	58.0
C	9/7/2008	17:45	CR	F	0.0391	0.4	58.0
C	9/7/2008	17:45	CR	F	0.0729	0.4	58.0
C	9/7/2008	17:45	CM	F	0.0158	0.5	58.0
C	9/7/2008	17:45	CM	F	0.0421	0.5	58.0
C	9/7/2008	17:45	CR	F	0.0462	0.5	58.0
C	9/7/2008	17:45	CR	F	0.0543	0.5	58.0
C	9/7/2008	17:45	CR	F	0.0387	1.5	58.0
C	9/7/2008	17:45	CM	F	0.0299		58.0
C	9/7/2008	17:45	CR	F	0.0199		58.0
C	9/7/2008	17:45	CR	F	0.0382		58.0
C	9/7/2008	17:45	CR	F	0.0233		58.0
C	9/7/2008	17:45	CR	F	0.0300		58.0
C	9/7/2008	17:45	CR	F	0.0307		58.0
C	9/7/2008	17:45	CR	F	0.0227		58.0
C	9/7/2008	17:45	CM	M	0.0182		58.0
C	9/7/2008	17:45	CR	M	0.0154		58.0
C	9/7/2008	17:45	CR	M	0.0368		58.0
C	9/7/2008	17:45	CR	M	0.0160		58.0
C	9/7/2008	17:45	CR	M	0.0192		58.0
C	9/7/2008	17:45	CR	M	0.0225		58.0
C	9/7/2008	17:45	CR	M	0.0110		58.0
C	9/7/2008	17:45	CR	M	0.0093		58.0
C	9/7/2008	17:45	CR	M	0.0332		58.0
C	9/7/2008	17:45	CR	M	0.0250		58.0
C	9/7/2008	17:45	CR	M	0.0257		58.0
C	9/7/2008	17:45	CR	M	0.0287		58.0
C	9/7/2008	17:45	CR	M	0.0181		58.0
C	9/7/2008	17:45	CR	M	0.0065		58.0
C	9/7/2008	18:45	CM	F	0.0454	0.1	59.0
C	9/7/2008	18:45	CR	F	0.0369	0.1	59.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/7/2008	18:45	CR	F	0.0343	0.1	59.0
C	9/7/2008	18:45	CR	F	0.0330	0.1	59.0
C	9/7/2008	18:45	CR	F	0.0375	0.1	59.0
C	9/7/2008	18:45	CM	F	0.0638	0.2	59.0
C	9/7/2008	18:45	CM	F	0.0452	0.2	59.0
C	9/7/2008	18:45	CM	F	0.0534	0.2	59.0
C	9/7/2008	18:45	CM	F	0.0496	0.2	59.0
C	9/7/2008	18:45	CM	F	0.0428	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0394	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0378	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0281	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0231	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0574	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0488	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0311	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0242	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0412	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0291	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0576	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0552	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0381	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0392	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0599	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0567	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0346	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0359	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0416	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0280	0.2	59.0
C	9/7/2008	18:45	CR	F	0.0406	0.3	59.0
C	9/7/2008	18:45	CR	F	0.0529	0.3	59.0
C	9/7/2008	18:45	CR	F	0.0442	0.3	59.0
C	9/7/2008	18:45	CR	F	0.0314	0.3	59.0
C	9/7/2008	18:45	CR	F	0.0355	0.3	59.0
C	9/7/2008	18:45	CR	F	0.0310	0.3	59.0
C	9/7/2008	18:45	CR	F	0.0412	0.4	59.0
C	9/7/2008	18:45	CR	F	0.0467		59.0
C	9/7/2008	18:45	CR	F	0.0400		59.0
C	9/7/2008	18:45	CR	F	0.0382		59.0
C	9/7/2008	18:45	CR	F	0.0258		59.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	9/7/2008	18:45	CM	M	0.0367		59.0
C	9/7/2008	18:45	CR	M	0.0309		59.0
C	9/7/2008	18:45	CR	M	0.0466		59.0
C	9/7/2008	18:45	CR	M	0.0390		59.0
C	9/7/2008	18:45	CR	M	0.0184		59.0
C	9/7/2008	19:45	CR	F	0.0482		60.0
C	9/7/2008	19:45	CR	M	0.0755		60.0
Winter Trial #1							
A	1/7/2009	15:45	CV	F	0.0687	0.1	6.0
A	1/8/2009	13:45	CV	F	0.0271		28.0
A	1/8/2009	16:45	PR	F	0.0643	1.0	31.0
A	1/8/2009	16:45	PR	F	0.0741	1.3	31.0
A	1/9/2009	12:45	CV	F	0.0536	1.2	51.0
A	1/9/2009	13:45	PR	F	0.0488	0.1	52.0
A	1/9/2009	14:45	PR	F	0.0563	1.0	53.0
A	1/9/2009	14:45	PR	F	0.0349	1.2	53.0
A	1/9/2009	14:45	PR	F	0.0473		53.0
A	1/9/2009	14:45	PR	F	0.0559		53.0
A	1/9/2009	14:45	PR	M	0.0221		53.0
A	1/9/2009	15:45	PR	F	0.0342	0.8	54.0
A	1/9/2009	15:45	CM	F	0.0463	1.5	54.0
A	1/9/2009	16:45	PR	F	0.0595		55.0
A	1/11/2009	11:45	PR	F	0.0511	0.1	98.0
A	1/11/2009	12:45	PR	F	0.0667	0.9	99.0
A	1/11/2009	12:45	PR	F	0.0497	1.1	99.0
A	1/11/2009	12:45	PR	M	0.0367		99.0
A	1/11/2009	13:45	CV	F	0.0580	0.1	100.0
A	1/11/2009	14:45	PR	F	0.0523	0.8	101.0
A	1/11/2009	15:45	PR	F	0.0558	1.0	102.0
A	1/12/2009	12:45	PR	F	0.0437	0.1	123.0
A	1/12/2009	12:45	PR	F	0.0639	1.0	123.0
A	1/12/2009	12:45	PR	F	0.0361	1.2	123.0
A	1/12/2009	13:45	PR	F	0.0674	1.1	124.0
A	1/12/2009	13:45	CV	F	0.0381		124.0
A	1/12/2009	13:45	PR	F	0.0512		124.0
A	1/12/2009	14:45	PR	F	0.0527	0.1	125.0
A	1/12/2009	14:45	PR	F	0.0457	0.7	125.0
A	1/12/2009	14:45	PR	F	0.0429	0.9	125.0
A	1/12/2009	14:45	PR	F	0.0475	0.9	125.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
A	1/12/2009	14:45	PR	F	0.0541	1.0	125.0
A	1/12/2009	14:45	PR	F	0.0491	1.0	125.0
A	1/12/2009	14:45	PR	F	0.0314	1.0	125.0
A	1/12/2009	14:45	PR	F	0.0560	1.0	125.0
A	1/12/2009	14:45	PR	F	0.0687	1.1	125.0
A	1/12/2009	14:45	PR	F	0.0489		125.0
A	1/12/2009	15:45	PR	F	0.0454	0.9	126.0
A	1/12/2009	15:45	PR	F	0.0408	1.0	126.0
A	1/12/2009	15:45	PR	F	0.0410	1.0	126.0
A	1/12/2009	15:45	PR	F	0.0557	1.1	126.0
A	1/12/2009	15:45	PR	F	0.0314		126.0
A	1/13/2009	12:45	PR	F	0.0589	1.1	147.0
A	1/13/2009	13:45	PR	F	0.0303	0.9	148.0
A	1/13/2009	13:45	PR	F	0.0518	1.0	148.0
A	1/13/2009	13:45	PR	F	0.0552		148.0
A	1/13/2009	14:45	PR	F	0.0514	1.2	149.0
B	1/8/2009	11:45	CV	F	0.0285	0.1	26.0
B	1/8/2009	11:45	PR	F	0.0585	1.0	26.0
B	1/8/2009	11:45	PR	F	0.0608		26.0
B	1/8/2009	12:45	CV	F	0.0774	0.2	27.0
B	1/8/2009	12:45	CV	F	0.0728	1.7	27.0
B	1/8/2009	13:45	CV	F	0.0388	1.0	28.0
B	1/8/2009	14:45	PR	F	0.0409		29.0
B	1/8/2009	15:45	PR	M	0.0522		30.0
B	1/8/2009	16:45	PR	F	0.0616		31.0
B	1/9/2009	12:45	PR	F	0.0473	0.1	51.0
B	1/9/2009	15:45	PR	F	0.0796	0.4	54.0
B	1/9/2009	15:45	PR	F	0.5980	0.8	54.0
B	1/9/2009	15:45	PR	M	0.0314		54.0
B	1/9/2009	16:45	PR	F	0.0522	0.5	55.0
B	1/9/2009	16:45	PR	F	0.0666	0.8	55.0
B	1/9/2009	16:45	PR	F	0.0684	1.0	55.0
B	1/11/2009	12:45	PR	F	0.0279	0.1	99.0
B	1/11/2009	12:45	CV	F	0.7300	1.6	99.0
B	1/11/2009	12:45	PR	M	0.0413		99.0
B	1/11/2009	13:45	PR	F	0.0477	0.7	100.0
B	1/11/2009	13:45	PR	F	0.0375	1.1	100.0
B	1/11/2009	14:45	PR	F	0.0563	1.0	101.0
B	1/11/2009	14:45	CV	F	0.0457	1.4	101.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	1/11/2009	15:45	PR	F	0.0508	0.1	102.0
B	1/11/2009	15:45	PR	F	0.0617	0.1	102.0
B	1/11/2009	15:45	PR	F	0.0398	1.0	102.0
B	1/12/2009	11:45	CV	F	0.0491	0.1	122.0
B	1/12/2009	12:45	PR	M	0.0361		123.0
B	1/12/2009	13:45	PR	F	0.0505	1.0	124.0
B	1/12/2009	13:45	PR	F	0.0591	1.0	124.0
B	1/12/2009	13:45	PR	F	0.0640	1.0	124.0
B	1/12/2009	13:45	CV	F	0.0594	1.4	124.0
B	1/12/2009	14:45	PR	F	0.0469	0.8	125.0
B	1/12/2009	14:45	PR	F	0.0440	0.8	125.0
B	1/12/2009	14:45	PR	F	0.0591	1.0	125.0
B	1/12/2009	14:45	PR	F	0.0529	1.0	125.0
B	1/12/2009	15:45	PR	F	0.0333	1.1	126.0
B	1/12/2009	15:45	PR	F	0.0621	1.2	126.0
B	1/12/2009	15:45	PR	M	0.0544		126.0
B	1/13/2009	12:45	PR	F	0.0480	0.3	147.0
B	1/13/2009	12:45	PR	F	0.0607		147.0
C	1/8/2009	12:45	CV	F	0.0361	1.4	27.0
C	1/8/2009	13:45	CV	F	0.0483	0.1	28.0
C	1/8/2009	13:45	CV	F	0.0803	1.4	28.0
C	1/8/2009	13:45	PR	F	0.0679		28.0
C	1/8/2009	14:45	PR	F	0.0572	1.0	29.0
C	1/8/2009	14:45	CV	F	0.0561	1.4	29.0
C	1/8/2009	14:45	CV	F	0.0830		29.0
C	1/8/2009	14:45	PR	F	0.0585		29.0
C	1/8/2009	15:45	PR	F	0.0602	1.1	30.0
C	1/8/2009	15:45	CV	F	0.0226	1.3	30.0
C	1/8/2009	15:45	PR	M	0.0338		30.0
C	1/8/2009	16:45	PR	F	0.0326	1.1	31.0
C	1/8/2009	16:45	PR	F	0.0270	1.2	31.0
C	1/8/2009	16:45	PR	F	0.0672		31.0
C	1/9/2009	13:45	PR	M	0.0430		52.0
C	1/9/2009	15:45	PR	F	0.0555	1.1	54.0
C	1/9/2009	16:45	PR	F	0.0552	0.5	55.0
C	1/9/2009	17:45	PR	F	0.0594	1.2	56.0
C	1/11/2009	11:45	PR	F	0.0400	0.5	98.0
C	1/11/2009	11:45	CV	F	0.0459		98.0
C	1/11/2009	12:45	PR	F	0.0624	0.6	99.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	1/11/2009	12:45	PR	F	0.0637	1.0	99.0
C	1/11/2009	12:45	PR	F	0.0394	1.0	99.0
C	1/11/2009	12:45	PR	F	0.0525	1.1	99.0
C	1/11/2009	12:45	PR	M	0.0400		99.0
C	1/11/2009	13:45	PR	F	0.0701	0.4	100.0
C	1/11/2009	13:45	CV	F	0.0578	0.5	100.0
C	1/11/2009	13:45	PR	F	0.0697	1.0	100.0
C	1/11/2009	13:45	PR	F	0.0459	1.2	100.0
C	1/11/2009	14:45	PR	F	0.0593	0.5	101.0
C	1/11/2009	14:45	PR	F	0.0531	0.8	101.0
C	1/11/2009	14:45	PR	F	0.0487	0.9	101.0
C	1/11/2009	14:45	PR	F	0.0281	1.0	101.0
C	1/11/2009	14:45	PR	F	0.0530	1.0	101.0
C	1/11/2009	14:45	PR	F	0.0527	1.1	101.0
C	1/11/2009	14:45	PR	F	0.0569	1.1	101.0
C	1/11/2009	14:45	PR	F	0.0572		101.0
C	1/11/2009	14:45	PR	F	0.0639		101.0
C	1/11/2009	14:45	PR	F	0.0556		101.0
C	1/11/2009	14:45	PR	F	0.0603		101.0
C	1/11/2009	14:45	PR	F	0.0619		101.0
C	1/11/2009	15:45	PR	F	0.0370	0.1	102.0
C	1/11/2009	15:45	PR	F	0.0726	0.1	102.0
C	1/11/2009	15:45	PR	F	0.0547	0.9	102.0
C	1/11/2009	15:45	PR	F	0.0580	1.0	102.0
C	1/11/2009	15:45	PR	F	0.0466	1.1	102.0
C	1/11/2009	15:45	PR	F	0.0556	1.2	102.0
C	1/11/2009	15:45	PR	F	0.0665	1.2	102.0
C	1/12/2009	10:45	PR	F	0.0613	0.1	121.0
C	1/12/2009	11:45	PR	F	0.0322	0.1	122.0
C	1/12/2009	11:45	PR	F	0.0815	0.1	122.0
C	1/12/2009	11:45	CV	F	0.0837	0.2	122.0
C	1/12/2009	12:45	PR	F	0.0669	1.0	123.0
C	1/12/2009	12:45	PR	F	0.0583	1.0	123.0
C	1/12/2009	12:45	PR	F	0.0469	1.0	123.0
C	1/12/2009	13:45	PR	F	0.0640	0.2	124.0
C	1/12/2009	13:45	PR	F	0.0377	0.6	124.0
C	1/12/2009	13:45	PR	F	0.0457	0.7	124.0
C	1/12/2009	13:45	PR	F	0.0573	0.9	124.0
C	1/12/2009	14:45	PR	F	0.0515	1.0	125.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
C	1/12/2009	14:45	PR	F	0.0566	1.0	125.0
C	1/12/2009	14:45	PR	F	0.0551	1.0	125.0
C	1/12/2009	14:45	PR	F	0.0580	1.0	125.0
C	1/12/2009	15:45	PR	F	0.0521	0.1	126.0
C	1/12/2009	15:45	PR	F	0.0481	1.0	126.0
C	1/12/2009	15:45	PR	F	0.0287	1.0	126.0
C	1/12/2009	15:45	PR	F	0.0502	1.0	126.0
C	1/12/2009	15:45	PR	F	0.0565		126.0
C	1/13/2009	11:45	PR	F		0.4	146.0
C	1/13/2009	13:45	CV	F	0.0484	0.1	148.0
C	1/13/2009	13:45	PR	F	0.0468	0.2	148.0
C	1/13/2009	14:45	PR	F	0.0555	1.2	149.0
Winter Trial #2							
A	2/28/2010	13:30	CV	F	0.0380	1.3	101.0
A	2/28/2010	15:30	CV	F	0.0531	0.1	103.0
A	2/28/2010	15:30	CV	F	0.0379	0.3	103.0
A	3/3/2010	11:30	CV	F	0.0396	0.3	171.0
A	3/3/2010	11:30	PR	M	0.0400		171.0
A	3/3/2010	13:30	CV	F	0.0802	0.4	173.0
A	3/3/2010	13:30	CV	F	0.0250	0.2	173.0
A	3/3/2010	15:30	CV	F	0.0486	0.2	175.0
A	3/4/2010	10:30	CV	F	0.0221	0.1	194.0
A	3/4/2010	11:30	CV	F	0.0390	0.1	195.0
A	3/4/2010	12:30	PR	M	0.0387		196.0
A	3/4/2010	12:30	PR	M	0.0402		196.0
A	3/4/2010	12:30	PR	F	0.0596	1.2	196.0
A	3/4/2010	13:30	CV	F	0.0604	1.3	197.0
A	3/4/2010	14:30	CV	F	0.0526	0.1	198.0
A	3/4/2010	16:30	CV	F	0.0831	0.1	200.0
A	3/5/2010	14:30	PR	M	0.0522		222.0
B	3/2/2010	11:30	PR	M	0.0426		147.0
B	3/2/2010	14:30	PR	F	0.0519	1.2	150.0
B	3/3/2010	11:30	CV	F	0.0290	0.1	171.0
B	3/3/2010	13:30	CV	F	0.0560	0.5	173.0
B	3/3/2010	13:30	LS	F	0.0237	1.3	173.0
B	3/3/2010	15:30	CV	F	0.0842	1.5	175.0
B	3/3/2010	15:30	PR	F	0.0690	1.2	175.0
B	3/4/2010	10:30	CV	F	0.0943	1.5	194.0
B	3/4/2010	11:30	CV	F	0.0546	1.5	195.0

Position	Date	Time	Species	Sex	Mass	Ovariole Length (mm)	Postmortem Interval at Collection
B	3/4/2010	15:30	PR	F	0.0557	0.2	199.0
B	3/5/2010	14:30	CV	F	0.0603	0.2	222.0
B	3/5/2010	15:30	CV	F	0.0745	1.5	223.0
C	2/27/2010	12:30	CV	F	0.0353	0.3	76.0
C	3/2/2010	11:30	CV	F	0.0689	0.3	147.0
C	3/3/2010	12:30	CV	F	0.0579	1.3	172.0
C	3/3/2010	14:30	CV	F	0.0339	0.1	174.0
C	3/3/2010	14:30	PR	M	0.0434		174.0
C	3/3/2010	15:30	PR	F	0.0518	1.2	175.0
C	3/3/2010	16:30	CV	F	0.0790	1.5	176.0
C	3/4/2010	12:30	CV	F	0.0872	1.5	196.0
C	3/4/2010	14:30	PR	M	0.0397		198.0
C	3/5/2010	12:30	CV	F	0.0256	0.3	220.0
C	3/5/2010	14:30	PR	M	0.0419		222.0
C	3/5/2010	14:30	PR	F	0.0588	0.7	222.0

APPENDIX C

CRITICAL WEIGHT FOR *COCHLIOMYIA MACELLARIA* LARVAE

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	1	M	Fed	56	0.0120	50	0.0361	108	214	
1	2	F	Fed	56	0.0103	56	0.0355	102	214	
1	3	F	Fed	56	0.0106	50	0.0360	108	214	
1	4	F	Fed	56	0.0101	50	0.0380	108	214	
1	5	F	Fed	56	0.0104	50	0.0318	108	214	
1	6	M	Fed	58	0.0100	48	0.0296	108	214	
1	7	M	Fed	58	0.0139	48	0.0326	108	214	
1	8	F	Fed	58	0.0100	48	0.0304	108	214	
1	9	F	Fed	58	0.0105	54	0.0293	102	214	
1	10	M	Fed	58	0.0105	48	0.0331	108	214	
1	11	M	Fed	60	0.0109	52	0.0295	102	214	
1	12	M	Fed	60	0.0139	64	0.0341	96	220	
1	13	F	Fed	60	0.0105	64	0.0271	96	220	
1	14	F	Fed	60	0.0107	52	0.0313	102	214	
1	15	M	Fed	60	0.0126	46	0.0309	108	214	
1	16		Fed	62	0.0154					Y
1	17	M	Fed	62	0.0203	44	0.0367	108	214	
1	18	M	Fed	62	0.0157	44	0.0349	108	214	
1	19	F	Fed	62	0.0132	62	0.0329	90	214	
1	20	F	Fed	62	0.0144	44	0.0323	108	214	
1	21	F	Fed	64	0.0337	48	0.0390	102	214	
1	22	M	Fed	64	0.0275	48	0.0342	102	214	
1	23	M	Fed	64	0.0238	66	0.0276	108	238	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	24	M	Fed	64	0.0308	60	0.0337	90	214	
1	25	F	Fed	64	0.0293	48	0.0309	102	214	
1	26	M	Fed	66	0.0256	40	0.0369	108	214	
1	27		Fed	66	0.0181					Y
1	28	F	Fed	66	0.0218	46	0.0330	102	214	
1	29	F	Fed	66	0.0219	46	0.0369	102	214	
1	30	M	Fed	66	0.0220	40	0.0364	108	214	
1	31	F	Fed	68	0.0268	44	0.0360	102	214	
1	32	F	Fed	68	0.0260	44	0.0342	102	214	
1	33	F	Fed	68	0.0354	56	0.0387	96	220	
1	34	F	Fed	68	0.0207	56	0.0302	96	220	
1	35	F	Fed	68	0.0241	44	0.0332	102	214	
1	36	F	Fed	70	0.0308	36	0.0384	108	214	
1	37		Fed	70	0.0225	54	0.0300			
1	38	M	Fed	70	0.0256	42	0.0369	102	214	
1	39	M	Fed	70	0.0289	48	0.0368	96	214	
1	40	F	Fed	70	0.0324	42	0.0364	102	214	
1	41	F	Fed	72	0.0304	40	0.0353	102	214	
1	42	F	Fed	72	0.0293	40	0.0440	102	214	
1	43	M	Fed	72	0.0331	40	0.0421	102	214	
1	44		Fed	72	0.0226	46	0.0361			
1	45	F	Fed	72	0.0219	40	0.0333	102	214	
1	46	F	Fed	74	0.0243	56	0.0349	108	238	
1	47	F	Fed	74	0.0292	44	0.0375	96	214	
1	48	M	Fed	74	0.0294	38	0.0355	102	214	
1	49	F	Fed	74	0.0128	44	0.0293	102	220	
1	50	M	Fed	74	0.0261	38	0.0356	102	214	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	51	M	Fed	76	0.0244	42	0.0294	96	214	
1	52	F	Fed	76	0.0454	48	0.0334	90	214	
1	53	F	Fed	76	0.0310	42	0.0327	96	214	
1	54	F	Fed	76	0.0549	54	0.0364	96	226	
1	55	F	Fed	76	0.0484	42	0.0413	96	214	
1	56	M	Fed	78	0.0506	52	0.0256	96	226	
1	57	F	Fed	78	0.0319	46	0.0331	96	220	
1	58	F	Fed	78	0.0468	40	0.0325	96	214	
1	59	M	Fed	78	0.0482	34	0.0302	108	220	
1	60	M	Fed	78	0.0535	46	0.0342	96	220	
1	61	F	Fed	80	0.0508	38	0.0368	102	220	
1	62	M	Fed	80	0.0398	32	0.0338	102	214	
1	63	M	Fed	80	0.0401	50	0.0333	96	226	
1	64	M	Fed	80	0.0473	32	0.0330	102	214	
1	65	F	Fed	80	0.0409	38	0.0303	96	214	
1	66	F	Fed	94	0.0434	30	0.0292	96	220	
1	67	F	Fed	94	0.0495	30	0.0332	90	214	
1	68	M	Fed	94	0.0513	18	0.0364	102	214	
1	69	M	Fed	94	0.0438	30	0.0366	96	220	
1	70	F	Fed	94	0.0512	30	0.0368	96	220	
1	71	F	Fed	106	0.0364	6	0.0307	108	220	
1	72	M	Fed	106	0.0386	6	0.0305	108	220	
1	73	M	Fed	106	0.0390	6	0.0338	102	214	
1	74	M	Fed	106	0.0430	6	0.0363	102	214	
1	75	F	Fed	106	0.0271	18	0.0206	96	220	
1	76	F	Mass-Rear	118			0.0399	96	214	
1	77	F	Mass-Rear	118			0.0325	96	214	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	78	F	Mass-Rear	118			0.0319	96	214	
1	79	F	Mass-Rear	118			0.0362	96	214	
1	80	M	Mass-Rear	118			0.0346	96	214	
1	1		Nonfed	56	0.0093					
1	2		Nonfed	56	0.0104					
1	3		Nonfed	56	0.0090					
1	4		Nonfed	56	0.0109					
1	5		Nonfed	56	0.0111					
1	6		Nonfed	58	0.0089					
1	7		Nonfed	58	0.0111					
1	8		Nonfed	58	0.0104					
1	9		Nonfed	58	0.0101					
1	10		Nonfed	58	0.0099					
1	11		Nonfed	60	0.0144					
1	12		Nonfed	60	0.0098					
1	13		Nonfed	60	0.0099					
1	14		Nonfed	60	0.0105					
1	15		Nonfed	60	0.0128					
1	16		Nonfed	62	0.0218					
1	17		Nonfed	62	0.0194					
1	18		Nonfed	62	0.0100					
1	19		Nonfed	62	0.0181	50	0.0088			
1	20		Nonfed	62	0.0157					
1	21		Nonfed	64	0.0246					
1	22		Nonfed	64	0.0281					
1	23		Nonfed	64	0.0312					
1	24		Nonfed	64	0.0156					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	25		Nonfed	64	0.0214					
1	26		Nonfed	66	0.0087					
1	27	M	Nonfed	66	0.0180	52	0.0083	96	214	
1	28		Nonfed	66	0.0195					
1	29	F	Nonfed	66	0.0204	46	0.0108	102	214	
1	30		Nonfed	66	0.0219					
1	31	M	Nonfed	68	0.0230	44	0.0121	78	190	
1	32	M	Nonfed	68	0.0228	44	0.0131	78	190	
1	33	F	Nonfed	68	0.0259	44	0.0163	78	190	
1	34	F	Nonfed	68	0.0225	38	0.0122	90	196	
1	35	F	Nonfed	68	0.0230	44	0.0119	90	202	
1	36	M	Nonfed	70	0.0251	36	0.0153	90	196	
1	37	F	Nonfed	70	0.0181	36	0.0103	108	214	
1	38	F	Nonfed	70	0.0188	36	0.0133	90	196	
1	39	F	Nonfed	70	0.0277	36	0.0173	90	196	
1	40		Nonfed	70	0.0278	36	0.0181	90	196	
1	41	F	Nonfed	72	0.0271	34	0.0187	90	196	
1	42	F	Nonfed	72	0.0330	34	0.0235	84	190	
1	43	M	Nonfed	72	0.0273	34	0.0188	84	190	
1	44	F	Nonfed	72	0.0245	34	0.0168	90	196	
1	45	F	Nonfed	72	0.0287	40	0.0188	90	202	
1	46	F	Nonfed	74	0.0323	32	0.0216	108	214	
1	47		Nonfed	74	0.0256	32	0.0152	96	202	
1	48	F	Nonfed	74	0.0242	32	0.0163	90	196	
1	49	M	Nonfed	74	0.0344	32	0.0228	108	214	
1	50	M	Nonfed	74	0.0273	44	0.0308	96	214	
1	51	M	Nonfed	76	0.0484	36	0.0142	102	214	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	52	F	Nonfed	76	0.0356	30	0.0242	90	196	
1	53		Nonfed	76	0.0407	30	0.0198	108	214	
1	54	F	Nonfed	76	0.0456	54	0.0228	96	226	
1	55	M	Nonfed	76	0.0384	30	0.0230	108	214	
1	56	F	Nonfed	78	0.0683	16	0.0302	120	214	
1	57	M	Nonfed	78	0.0594	28	0.0282	108	214	
1	58	F	Nonfed	78	0.0458	28	0.0243	108	214	
1	59	M	Nonfed	78	0.0535	28	0.0172	96	202	
1	60	M	Nonfed	78	0.0474	28	0.0175	108	214	
1	61	M	Nonfed	80	0.0317	32	0.0181	102	214	
1	62	M	Nonfed	80	0.0376	26	0.0235	108	214	
1	63	F	Nonfed	80	0.0371	32	0.0237	102	214	
1	64	F	Nonfed	80	0.0466	32	0.0309	102	214	
1	65		Nonfed	80	0.0131					
1	66	F	Nonfed	94	0.0398	30	0.0261	96	220	
1	67	F	Nonfed	94	0.0452	24	0.0333	96	214	
1	68	M	Nonfed	94	0.0488	18	0.0358	102	214	
1	69	F	Nonfed	94	0.0496	36	0.0315	108	238	
1	70	M	Nonfed	94	0.0528	30	0.0380	102	226	
1	71	M	Nonfed	106	0.0369	18	0.0288	90	214	
1	72	F	Nonfed	106	0.0378	24	0.0293	96	226	
1	73	F	Nonfed	106	0.0332	30	0.0244	102	238	
1	74	M	Nonfed	106	0.0328	18	0.0257	96	220	
1	75	M	Nonfed	106	0.0418	24	0.0301	96	226	
2	1		Fed	67	0.0093	60	0.0179			
2	2	F	Fed	67	0.0094	84	0.0169	96	247	
2	3	M	Fed	67	0.0109	60	0.0141	108	235	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	4	F	Fed	67	0.0093	60	0.0183	108	235	
2	5		Fed	67	0.0106	60	0.0178			
2	6	F	Fed	69	0.0084	58	0.0163	108	235	
2	7	M	Fed	69	0.0070	94	0.0149	96	259	
2	8		Fed	69	0.0081	58	0.0182			
2	9	M	Fed	69	0.0087	82	0.0141	96	247	
2	10	F	Fed	69	0.0114	58	0.0150	120	247	
2	11		Fed	71	0.0167	56	0.0209			
2	12	F	Fed	71	0.0135	56	0.0171	96	223	
2	13		Fed	71	0.0075					Y
2	14	F	Fed	71	0.0088	56	0.0201	108	235	
2	15		Fed	71	0.0091					Y
2	16	F	Fed	73	0.0130	78	0.0261	108	259	
2	17	F	Fed	73	0.0137	78	0.0149	72	223	
2	18	F	Fed	73	0.0133	54	0.0181	108	235	
2	19		Fed	73	0.0141	78	0.0168			
2	20		Fed	73	0.0142					Y
2	21		Fed	75	0.0116					
2	22		Fed	75	0.0134					Y
2	23	F	Fed	75	0.0096	76	0.0204	96	247	
2	24	F	Fed	75	0.0162	52	0.0271	96	223	
2	25		Fed	75	0.0122	94	0.0123			
2	26		Fed	77	0.0129	110	0.0072			
2	27		Fed	77	0.0215	50	0.0181			
2	28	F	Fed	77	0.0128	74	0.0209	96	247	
2	29	F	Fed	77	0.0212	50	0.0223	108	235	
2	30	M	Fed	77	0.0244	50	0.0244	96	223	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	31		Fed	79	0.0161					Y
2	32	M	Fed	79	0.0156	60	0.0187	96	235	
2	33		Fed	79	0.0168	48	0.0138			
2	34	F	Fed	79	0.0150	96	0.0159	84	259	
2	35	M	Fed	79	0.0142	120	0.0221	48	247	
2	36	F	Fed	81	0.0159	40	0.0155	138	259	
2	37		Fed	81	0.0109	58	0.0116			
2	38	F	Fed	81	0.0174	46	0.0174	108	235	
2	39		Fed	81	0.0148	70	0.0186			
2	40	M	Fed	81	0.0206	46	0.0187	108	235	
2	41		Fed	83	0.0191					Y
2	42	F	Fed	83	0.0137	44	0.0190	108	235	
2	43	M	Fed	83	0.0280	44	0.0226	96	223	
2	44	F	Fed	83	0.0242	44	0.0192	108	235	
2	45		Fed	83	0.0105	68	0.0138			
2	46	M	Fed	85	0.0232	42	0.0209	96	223	
2	47	F	Fed	85	0.0194	66	0.0174	96	247	
2	48	M	Fed	85	0.0201	60	0.0168	90	235	
2	49	M	Fed	85	0.0259	42	0.0181	108	235	
2	50	M	Fed	85	0.0246	42	0.0199	108	235	
2	51	F	Fed	87	0.0281	40	0.0223	96	223	
2	52	M	Fed	87	0.0220	40	0.0192	96	223	
2	53	F	Fed	87	0.0186	40	0.0160	96	223	
2	54	M	Fed	87	0.0231	40	0.0221	108	235	
2	55		Fed	87	0.0101					
2	56	F	Fed	89	0.0152	80	0.0104	90	259	
2	57	F	Fed	89	0.0151	80	0.0119	90	259	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	58	M	Fed	89	0.0170	62	0.0125	96	247	
2	59	F	Fed	89	0.0172	38	0.0205	108	235	
2	60	F	Fed	89	0.0208	62	0.0215	96	247	
2	61	F	Fed	91	0.0204	60	0.0144	96	247	
2	62	F	Fed	91	0.0228	36	0.0179	108	235	
2	63	M	Fed	91	0.0165	72	0.0146	96	259	
2	64	M	Fed	91	0.0226	36	0.0210	108	235	
2	65	M	Fed	91	0.0170	54	0.0132	90	235	
2	66	M	Fed	97	0.0311	30	0.0308	108	235	
2	67	M	Fed	97	0.0288	30	0.0239	108	235	
2	68	F	Fed	97	0.0209	36	0.0250	102	235	
2	69	M	Fed	97	0.0222	30	0.0214	108	235	
2	70	F	Fed	97	0.0237	48	0.0223	90	235	
2	71		Fed	103	0.0182					Y
2	72	F	Fed	103	0.0174	48	0.0141	96	247	
2	73	M	Fed	103	0.0297	36	0.0217	96	235	
2	74	M	Fed	103	0.0266	24	0.0334	120	247	
2	75		Fed	103	0.0198	48	0.0179			
2	76	F	Fed	109	0.0218	42	0.0171	96	247	
2	77	F	Fed	109	0.0222	36	0.0195	102	247	
2	78		Fed	109	0.0253	36	0.0213			
2	79		Fed	109	0.0227	42	0.0189			
2	80	F	Fed	109	0.0226	30	0.0178	96	235	
2	81	F	Fed	115	0.0233	42	0.0182	102	259	
2	82	F	Fed	115	0.0224	36	0.0198	96	247	
2	83	M	Fed	115	0.0264	36	0.0247	108	259	
2	84	F	Fed	115	0.0236	36	0.0225	96	247	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	85	F	Fed	115	0.0220	36	0.0223	96	247	
2	86	M	Fed	121	0.0195	6	0.0240	120	247	
2	87	M	Fed	121	0.0239	6	0.0262	108	235	
2	88	M	Fed	121	0.0236	6	0.0265	108	235	
2	89	F	Fed	121	0.0220	30	0.0223	96	247	
2	90	F	Fed	121	0.0233	30	0.0232	96	247	
2	91	M	Mass-Rear	127			0.0231	108	235	
2	92	F	Mass-Rear	127			0.0205	120	247	
2	93	F	Mass-Rear	127			0.0199	108	235	
2	94	M	Mass-Rear	127			0.0275	108	235	
2	95		Mass-Rear	127			0.0221			
2	1		Nonfed	67	0.0111					
2	2		Nonfed	67	0.0090					
2	3		Nonfed	67	0.0114					
2	4		Nonfed	67	0.0106					
2	5		Nonfed	67	0.0100					
2	6		Nonfed	69	0.0087					
2	7		Nonfed	69	0.0087					
2	8		Nonfed	69	0.0088					
2	9		Nonfed	69	0.0093					
2	10		Nonfed	69	0.0089					
2	11		Nonfed	71	0.0102					
2	12		Nonfed	71	0.0127					
2	13		Nonfed	71	0.0076					
2	14		Nonfed	71	0.0067					
2	15		Nonfed	71	0.0102					
2	16		Nonfed	73	0.0075					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	17		Nonfed	73	0.0127					
2	18		Nonfed	73	0.0157					
2	19		Nonfed	73	0.0110					
2	20		Nonfed	73	0.0086					
2	21		Nonfed	75	0.0184					
2	22		Nonfed	75	0.0118					
2	23		Nonfed	75	0.0106					
2	24		Nonfed	75	0.0158					
2	25		Nonfed	75	0.0114					
2	26		Nonfed	77	0.0218					
2	27		Nonfed	77	0.0134					
2	28		Nonfed	77	0.0149					
2	29		Nonfed	77	0.0124					
2	30		Nonfed	77	0.0142					
2	31		Nonfed	79	0.0206					
2	32	M	Nonfed	79	0.0182	54	0.0102	114	247	
2	33		Nonfed	79	0.0188					
2	34		Nonfed	79	0.0132					
2	35		Nonfed	79	0.0204	42	0.0113			
2	36		Nonfed	81	0.0192					
2	37		Nonfed	81	0.0118					
2	38		Nonfed	81	0.0155					
2	39		Nonfed	81	0.0103					Y
2	40		Nonfed	81	0.0118					
2	41	M	Nonfed	83	0.0230	50	0.0145	102	235	
2	42		Nonfed	83	0.0180					
2	43	M	Nonfed	83	0.0223	44	0.0147	96	223	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	44		Nonfed	83	0.0135					
2	45		Nonfed	83	0.0145					
2	46		Nonfed	85	0.0203	42	0.0132			
2	47	M	Nonfed	85	0.0241	36	0.0137	90	211	
2	48	M	Nonfed	85	0.0228	42	0.0146	108	235	
2	49		Nonfed	85	0.0152					
2	50		Nonfed	85	0.0222					
2	51	F	Nonfed	87	0.0206	52	0.0114	96	235	
2	52		Nonfed	87	0.0220					
2	53	F	Nonfed	87	0.0254	40	0.0218	96	223	
2	54	M	Nonfed	87	0.0261	34	0.0160	90	211	
2	55	F	Nonfed	87	0.0220	40	0.0218	96	223	
2	56		Nonfed	89	0.0208	74	0.0090			
2	57	M	Nonfed	89	0.0276	38	0.0223	96	223	
2	58	F	Nonfed	89	0.0255	32	0.0170	90	211	
2	59	M	Nonfed	89	0.0143	38	0.0098	96	223	
2	60		Nonfed	89	0.0200	62	0.0101			
2	61	F	Nonfed	91	0.0250	36	0.0171	96	223	
2	62		Nonfed	91	0.0240					
2	63	M	Nonfed	91	0.0267	48	0.0138	96	235	
2	64	M	Nonfed	91	0.0257	36	0.0207	96	223	
2	65	F	Nonfed	91	0.0216	36	0.0162	96	223	
2	66	F	Nonfed	97	0.0196	30	0.0152	96	223	
2	67	M	Nonfed	97	0.0252	30	0.0218	108	235	
2	68	M	Nonfed	97	0.0242	30	0.0220	96	223	
2	69	F	Nonfed	97	0.0283	30	0.0228	96	223	
2	70	F	Nonfed	97	0.0180	54	0.0110	96	247	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	71	M	Nonfed	103	0.0235	24	0.0198	108	235	
2	72	F	Nonfed	103	0.0228	24	0.0221	108	235	
2	73	F	Nonfed	103	0.0252	24	0.0226	96	223	
2	74	M	Nonfed	103	0.0249	30	0.0218	102	235	
2	75	F	Nonfed	103	0.0305	36	0.0245	96	235	
2	76	M	Nonfed	109	0.0265	36	0.0210	102	247	
2	77	F	Nonfed	109	0.0237	30	0.0208	96	235	
2	78	M	Nonfed	109	0.0296	30	0.0246	96	235	
2	79	F	Nonfed	109	0.0265	30	0.0225	96	235	
2	80	M	Nonfed	109	0.0193	30	0.0162	96	235	
2	81	M	Nonfed	115	0.0309	42	0.0237	102	259	
2	82	F	Nonfed	115	0.0308	36	0.0271	96	247	
2	83	F	Nonfed	115	0.0254	36	0.0208	96	247	
2	84	F	Nonfed	115	0.0284	42	0.0195	102	259	
2	85	F	Nonfed	115	0.0246	24	0.0203	96	235	
2	86	F	Nonfed	121	0.0188	11	0.0184	103	235	
2	87	M	Nonfed	121	0.0185	18	0.0171	108	247	
2	88	F	Nonfed	121	0.0249	6	0.0246	108	235	
2	89	M	Nonfed	121	0.0217	6	0.0226	108	235	
2	90	F	Nonfed	121	0.0234	6	0.0227	108	235	
3	1	F	Fed	75	0.0150	78	0.0305	114	267	
3	2	M	Fed	75	0.0083	78	0.0322	114	267	
3	3	M	Fed	75	0.0118	72	0.0272	108	255	
3	4	M	Fed	75	0.0141	84	0.0284	96	255	
3	5	F	Fed	75	0.0095	84	0.0234	96	255	
3	6		Fed	77	0.0090					
3	7		Fed	77	0.0140					Y

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	8		Fed	77	0.0041					Y
3	9		Fed	77	0.0064	76	0.0274			
3	10		Fed	77	0.0084					
3	11	F	Fed	79	0.0155	80	0.0342	96	255	
3	12		Fed	79	0.0148					
3	13	F	Fed	79	0.0076	80	0.0219	108	267	
3	14	F	Fed	79	0.0164	80	0.0447	96	255	
3	15		Fed	79	0.0190	86	0.0142			
3	16	F	Fed	81	0.0157	78	0.0412	108	267	
3	17	M	Fed	81	0.0129	72	0.0420	102	255	
3	18	M	Fed	81	0.0161	78	0.0094	108	267	
3	19		Fed	81	0.0115					
3	20	M	Fed	81	0.0110	78	0.0419	120	279	
3	21	M	Fed	83	0.0151	70	0.0251	114	267	
3	22		Fed	83	0.0127					
3	23		Fed	83	0.0179	76	0.0467			
3	24	M	Fed	83	0.0168	64	0.0291	96	243	
3	25	M	Fed	83	0.0178	76	0.0313	96	255	
3	26	M	Fed	85	0.0252	74	0.0379	108	267	
3	27		Fed	85	0.0252					
3	28	F	Fed	85	0.0150	68	0.0152	114	267	
3	29	M	Fed	85	0.0142	68	0.0191	90	243	
3	30	F	Fed	85	0.0145	68	0.0295	114	267	
3	31	F	Fed	87	0.0195	66	0.0309	90	243	
3	32		Fed	87	0.0196					Y
3	33	F	Fed	87	0.0253	66	0.0302	90	243	
3	34	M	Fed	87	0.0160	72	0.0282	96	255	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	35	M	Fed	87	0.0139	72	0.0303	96	255	
3	36	M	Fed	89	0.0165	64	0.0301	102	255	
3	37	F	Fed	89	0.0161	64	0.0306	102	255	
3	38	M	Fed	89	0.0152	70	0.0280	96	255	
3	39	M	Fed	89	0.0202	70	0.0260	84	243	
3	40	M	Fed	89	0.0189	58	0.0296	108	255	
3	41	M	Fed	93	0.0188	60	0.0300	102	255	
3	42	M	Fed	93	0.0243	60	0.0308	102	255	
3	43	F	Fed	93	0.0163	66	0.0365	96	255	
3	44		Fed	93	0.0263					Y
3	45	M	Fed	93	0.0187	60	0.0282	102	255	
3	46	F	Fed	95	0.0149	64	0.0218	84	243	
3	47	F	Fed	95	0.0299	58	0.0291	114	267	
3	48	M	Fed	95	0.0341	58	0.0276	102	255	
3	49	M	Fed	95	0.0201	76	0.0306	84	255	
3	50	M	Fed	95	0.0211	64	0.0278	96	255	
3	51	M	Fed	97	0.0187	62	0.0284	84	243	
3	52	F	Fed	97	0.0377	56	0.0391	102	255	
3	53	F	Fed	97	0.0335	62	0.0311	96	255	
3	54		Fed	97	0.0203					Y
3	55	M	Fed	97	0.0209	62	0.0279	96	255	
3	56	F	Fed	99	0.0512	48	0.0363	96	243	
3	57	F	Fed	99	0.0282	54	0.0311	102	255	
3	58	M	Fed	99	0.0247	60	0.0264	96	255	
3	59	F	Fed	99	0.0259	54	0.0282	102	255	
3	60	M	Fed	99	0.0342	48	0.0276	108	255	
3	61	F	Fed	105	0.0340	42	0.0295	120	267	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	62	M	Fed	105	0.0327	48	0.0268	114	267	
3	63	M	Fed	105	0.0267	60	0.0271	102	267	
3	64	F	Fed	105	0.0524	54	0.0396	96	255	
3	65	F	Fed	105	0.0226	48	0.0150	114	267	
3	66	M	Fed	111	0.0323	42	0.0288	114	267	
3	67	M	Fed	111	0.0395	48	0.0282	96	255	
3	68	M	Fed	111	0.0324	48	0.0298	108	267	
3	69	F	Fed	111	0.0259	60	0.0309	114	267	
3	70	F	Fed	111	0.0577	42	0.0445	114	267	
3	71	F	Fed	117	0.0417	42	0.0337	108	267	
3	72	M	Fed	117	0.0367	42	0.0318	120	279	
3	73	M	Fed	117	0.0378	30	0.0272	120	267	
3	74		Fed	117	0.0522					Y
3	75	M	Fed	117	0.0558	30	0.0379	120	267	
3	76	F	Fed	123	0.0425	36	0.0311	96	255	
3	77	M	Fed	123	0.0384	42	0.0358	114	279	
3	78	F	Fed	123	0.0412	36	0.0329	120	279	
3	79	M	Fed	123	0.0319	54	0.0326	114	291	
3	80	F	Fed	123	0.0341	30	0.0326	114	267	
3	81	M	Fed	129	0.0413	18	0.0275	120	267	
3	82	F	Fed	129	0.0465	36	0.0328	114	279	
3	83	F	Fed	129	0.0574	24	0.0401	114	267	
3	84	F	Fed	129	0.0495	36	0.0392	114	279	
3	85	F	Fed	129	0.0536	30	0.0360	108	267	
3	86	M	Mass-Rear	147			0.0388	120	267	
3	87	F	Mass-Rear	147			0.0365	120	267	
3	88	M	Mass-Rear	147			0.0370	120	267	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	89	F	Mass-Rear	147			0.0448	132	279	
3	90	F	Mass-Rear	147			0.0394	120	267	
3	1		Nonfed	75	0.0109					
3	2		Nonfed	75	0.0113					
3	3		Nonfed	75	0.0093					
3	4		Nonfed	75	0.0101					
3	5		Nonfed	75	0.0068					
3	6		Nonfed	77	0.0124					
3	7		Nonfed	77	0.0069					
3	8		Nonfed	77	0.0137					
3	9		Nonfed	77	0.0070					
3	10		Nonfed	77	0.0067					
3	11		Nonfed	79	0.0152					Y
3	12		Nonfed	79	0.0133					
3	13		Nonfed	79	0.0126					
3	14		Nonfed	79	0.0137					
3	15		Nonfed	79	0.0123					
3	16		Nonfed	81	0.0181					
3	17		Nonfed	81	0.0145					Y
3	18		Nonfed	81	0.0188					
3	19		Nonfed	81	0.0129					
3	20		Nonfed	81	0.0136					
3	21	F	Nonfed	83	0.0254	76	0.0118	84	243	
3	22		Nonfed	83	0.0211					
3	23		Nonfed	83	0.0080					
3	24		Nonfed	83	0.0163					
3	25		Nonfed	83	0.0112					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	26		Nonfed	85	0.0183					
3	27		Nonfed	85	0.0162					
3	28		Nonfed	85	0.0204					
3	29		Nonfed	85	0.0185					
3	30		Nonfed	85	0.0179					
3	31		Nonfed	87	0.0146					
3	32		Nonfed	87	0.0183					
3	33		Nonfed	87	0.0127					
3	34		Nonfed	87	0.0201					
3	35		Nonfed	87	0.0150					
3	36	M	Nonfed	89	0.0257	70	0.0164	72	231	
3	37	M	Nonfed	89	0.0218	70	0.0172	72	231	
3	38	M	Nonfed	89	0.0202	70	0.0115	84	243	
3	39		Nonfed	89	0.0223					
3	40	F	Nonfed	89	0.0211	70	0.0126	84	243	
3	41		Nonfed	93	0.0155					
3	42	M	Nonfed	93	0.0205	72	0.0118	78	243	
3	43	F	Nonfed	93	0.0280	66	0.0175	72	231	
3	44		Nonfed	93	0.0122					
3	45		Nonfed	93	0.0131					
3	46	M	Nonfed	95	0.0236	70	0.0139	66	231	
3	47		Nonfed	95	0.0157					
3	48	F	Nonfed	95	0.0255	64	0.0197	84	243	
3	49	M	Nonfed	95	0.0215	64	0.0114	84	243	
3	50		Nonfed	95	0.0143					
3	51	M	Nonfed	97	0.0431	62	0.0196	84	243	
3	52		Nonfed	97	0.0263					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	53	F	Nonfed	97	0.0248	56	0.0221	90	243	
3	54	M	Nonfed	97	0.0425	68	0.0125	78	243	
3	55	F	Nonfed	97	0.0200	68	0.0103	78	243	
3	56		Nonfed	99	0.0337					
3	57	F	Nonfed	99	0.0251	66	0.0113	78	243	
3	58	M	Nonfed	99	0.0315	60	0.0169	84	243	
3	59	M	Nonfed	99	0.0371	60	0.0200	84	243	
3	60	M	Nonfed	99	0.0344	60	0.0239	84	243	
3	61	M	Nonfed	105	0.0382	60	0.0202	78	243	
3	62	F	Nonfed	105	0.0340	54	0.0214	84	243	
3	63	F	Nonfed	105	0.0538	54	0.0325	84	243	
3	64	F	Nonfed	105	0.0440	48	0.0239	90	243	
3	65	F	Nonfed	105	0.0374	48	0.0199	90	243	
3	66	M	Nonfed	111	0.0618	48	0.0348	96	255	
3	67	M	Nonfed	111	0.0416	48	0.0229	84	243	
3	68	M	Nonfed	111	0.0465	48	0.0323	96	255	
3	69	M	Nonfed	111	0.0503	48	0.0260	84	243	
3	70		Nonfed	111	0.0439					Y
3	71	F	Nonfed	117	0.0421	42	0.0283	108	267	
3	72	M	Nonfed	117	0.0591	42	0.0367	96	255	
3	73	F	Nonfed	117	0.0391	36	0.0251	102	255	
3	74	M	Nonfed	117	0.0370	42	0.0246	108	267	
3	75	M	Nonfed	117	0.0502	36	0.0329	114	267	
3	76	F	Nonfed	123	0.0514	30	0.0342	114	267	
3	77	M	Nonfed	123	0.0418	30	0.0275	114	267	
3	78	F	Nonfed	123	0.0375	36	0.0284	108	267	
3	79	M	Nonfed	123	0.0223	36	0.0155	108	267	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	80	M	Nonfed	123	0.0219	36	0.0128	108	267	
3	81		Nonfed	129	0.0298					Y
3	82		Nonfed	129	0.0404					
3	83	F	Nonfed	129	0.0562	24	0.0311	114	267	
3	84	M	Nonfed	129	0.0662	18	0.0373	108	255	
3	85	F	Nonfed	129	0.0466	42	0.0255	96	267	
4	1	F	Fed	85	0.0089	68	0.0151	102	255	
4	2	F	Fed	85	0.0091	74	0.0254	96	255	
4	3	M	Fed	85	0.0089	74	0.0266	96	255	
4	4		Fed	85	0.0073					Y
4	5		Fed	85	0.0090	68				
4	6		Fed	87	0.0085					Y
4	7	M	Fed	87	0.0072	72	0.0221	108	267	
4	8		Fed	87	0.0056					Y
4	9	F	Fed	87	0.0090	66	0.0251	126	279	
4	10		Fed	87	0.0092					Y
4	11		Fed	89	0.0060	76	0.0224			
4	12	F	Fed	89	0.0104	70	0.0305	96	255	
4	13	F	Fed	89	0.0125	88	0.0303	114	291	
4	14	F	Fed	89	0.0076	94	0.0136	108	291	
4	15	F	Fed	89	0.0064	70	0.0255	120	279	
4	16		Fed	93	0.0152					Y
4	17	F	Fed	93	0.0190	60	0.0363	126	279	
4	18	F	Fed	93	0.0063	66	0.0237	132	291	
4	19	M	Fed	93	0.0085	60	0.0305	126	279	
4	20		Fed	93	0.0145					Y
4	21	F	Fed	95	0.0116	64	0.0299	96	255	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	22		Fed	95	0.0090	70	0.0303	102	267	
4	23		Fed	95	0.0085					
4	24		Fed	95	0.0110					
4	25	F	Fed	95	0.0102	70	0.0372	114	279	
4	26	M	Fed	97	0.0138	56	0.0332	126	279	
4	27		Fed	97	0.0155					Y
4	28		Fed	97	0.0098	74	0.0295	96	267	
4	29	F	Fed	97	0.0290	74	0.0369	84	255	
4	30	F	Fed	97	0.0124	74	0.0286	120	291	
4	31	F	Fed	99	0.0160	54	0.0365			
4	32		Fed	99	0.0319					Y
4	33		Fed	99	0.0058					
4	34		Fed	99	0.0178	60	0.0308	108	267	
4	35		Fed	99	0.0145					Y
4	36		Fed	101	0.0221	52	0.0309	114	267	
4	37	M	Fed	101	0.0380	52	0.0373	126	279	
4	38		Fed	101	0.0121					Y
4	39	F	Fed	101	0.0159	64	0.0322	90	255	
4	40		Fed	101	0.0093	64	0.0221			
4	41	M	Fed	103	0.0227	44	0.0295	144	291	
4	42		Fed	103	0.0123					
4	43	M	Fed	103	0.0146	50	0.0348	126	279	
4	44		Fed	103	0.0230					Y
4	45	F	Fed	103	0.0223	56	0.0382	120	279	
4	46	F	Fed	105	0.0144	60	0.0246	114	279	
4	47	M	Fed	105	0.0199	54	0.0269	120	279	
4	48		Fed	105	0.0216	54	0.0266	108	267	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	49	M	Fed	105	0.0146	54	0.0229	96	255	
4	50		Fed	105	0.0222					
4	51	F	Fed	107	0.0360	46	0.0336	114	267	
4	52		Fed	107	0.0422	58				
4	53		Fed	107	0.0298					Y
4	54		Fed	107	0.0269	58				
4	55	F	Fed	107	0.0335	52	0.0379	108	267	
4	56	F	Fed	109	0.0399	50	0.0368	108	267	
4	57	F	Fed	109	0.0317	62	0.0376	108	279	
4	58	M	Fed	109	0.0271	50	0.0252	108	267	
4	59	F	Fed	109	0.0319	56	0.0215	102	267	
4	60	M	Fed	109	0.0287	50	0.0264	96	255	
4	61	F	Fed	111	0.0490	36	0.0446	108	255	
4	62	M	Fed	111	0.0268	48	0.0250	120	279	
4	63	F	Fed	111	0.0157	42	0.0286	102	255	
4	64	F	Fed	111	0.0235	48	0.0302	120	279	
4	65		Fed	111	0.0131					Y
4	66	M	Fed	117	0.0530	36	0.0347	114	267	
4	67	M	Fed	117	0.0442	42	0.0330	120	279	
4	68		Fed	117	0.0357					Y
4	69	F	Fed	117	0.0328	48	0.0361	126	291	
4	70	M	Fed	117	0.0433	54	0.0418	120	291	
4	71	F	Fed	123	0.0451	30	0.0397	114	267	
4	72		Fed	123	0.0338					Y
4	73	F	Fed	123	0.0409	48	0.0421	120	291	
4	74	F	Fed	123	0.0368	42	0.0333	114	279	
4	75		Fed	123	0.0416					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	76	M	Fed	129	0.0720	24	0.0428	114	267	
4	77	M	Fed	129	0.0568	24	0.0354	126	279	
4	78	F	Fed	129	0.0412	36	0.0322	114	279	
4	79	M	Fed	129	0.0412	30	0.0326	132	291	
4	80	F	Fed	129	0.0464	36	0.0346	114	279	
4	81	M	Fed	141	0.0490	18	0.0399	108	267	
4	82	F	Fed	141	0.0475	30	0.0377	108	279	
4	83	M	Fed	141	0.0460	30	0.0387	120	291	
4	84	M	Fed	141	0.0485	24	0.0371	126	291	
4	85	F	Fed	141	0.0490	24	0.0352	126	291	
4	86	M	Mass-Rear	159			0.0311	96	255	
4	87	M	Mass-Rear	159			0.0361	120	279	
4	88	F	Mass-Rear	159			0.0421	120	279	
4	89	M	Mass-Rear	159			0.0324	120	279	
4	90	F	Mass-Rear	159			0.0423	132	291	
4	1		Nonfed	85	0.0105					
4	2		Nonfed	85	0.0082					
4	3		Nonfed	85	0.0060					
4	4		Nonfed	85	0.0075					
4	5		Nonfed	85	0.0073					
4	6		Nonfed	87	0.0074					
4	7		Nonfed	87	0.0074					
4	8		Nonfed	87	0.0116					
4	9		Nonfed	87	0.0126					
4	10		Nonfed	87	0.0056					
4	11	F	Nonfed	89	0.0225	70	0.0109	96	255	
4	12		Nonfed	89	0.0168					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	13		Nonfed	89	0.0129					
4	14		Nonfed	89	0.0060					
4	15		Nonfed	89	0.0073					
4	16		Nonfed	93	0.0149					
4	17		Nonfed	93	0.0100					
4	18		Nonfed	93	0.0079					
4	19		Nonfed	93	0.0121					
4	20		Nonfed	93	0.0066					
4	21		Nonfed	95	0.0119					
4	22		Nonfed	95	0.0170					
4	23		Nonfed	95	0.0126	64	0.0092			
4	24	F	Nonfed	95	0.0166	64	0.0103			
4	25	F	Nonfed	95	0.0217	76	0.0112			
4	26		Nonfed	97	0.0260					
4	27		Nonfed	97	0.0149	54	0.0079			
4	28		Nonfed	97	0.0236					
4	29		Nonfed	97	0.0121					
4	30		Nonfed	97	0.0152					
4	31		Nonfed	99	0.0145					
4	32		Nonfed	99	0.0302	60	0.0160			
4	33	F	Nonfed	99	0.0272	60	0.0133	84	243	
4	34		Nonfed	99	0.0105					
4	35		Nonfed	99	0.0170					
4	36		Nonfed	101	0.0120					
4	37	F	Nonfed	101	0.0274	58	0.0134	96	255	
4	38	M	Nonfed	101	0.0345	58	0.0186	96	255	
4	39		Nonfed	101	0.0096					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	40		Nonfed	101	0.0166	70	0.0074			
4	41	M	Nonfed	103	0.0268	56	0.0136	96	255	
4	42		Nonfed	103	0.0140					
4	43		Nonfed	103	0.0149					
4	44		Nonfed	103	0.0152					
4	45	F	Nonfed	103	0.0194	62	0.0145	90	255	
4	46		Nonfed	105	0.0244					Y
4	47	M	Nonfed	105	0.0175	60	0.0084	102	267	
4	48	F	Nonfed	105	0.0309	54	0.0180	96	255	
4	49	F	Nonfed	105	0.0321	60	0.0194	90	255	
4	50		Nonfed	105	0.0173					Y
4	51	M	Nonfed	107	0.0345	52	0.0193	96	255	
4	52	M	Nonfed	107	0.0369	52	0.0262	96	255	
4	53	F	Nonfed	107	0.0216	52	0.0119	96	255	
4	54		Nonfed	107	0.0167	64	0.0069			
4	55		Nonfed	107	0.0141					
4	56		Nonfed	109	0.0315					
4	57	M	Nonfed	109	0.0245	50	0.0131	96	255	
4	58	M	Nonfed	109	0.0470	50	0.0298	96	255	
4	59		Nonfed	109	0.0328					
4	60	M	Nonfed	109	0.0264	56	0.0140	102	267	
4	61		Nonfed	111	0.0301					Y
4	62	F	Nonfed	111	0.0369	54	0.0245	90	255	
4	63	F	Nonfed	111	0.0295	48	0.0167	96	255	
4	64	F	Nonfed	111	0.0187	54	0.0113	90	255	
4	65	M	Nonfed	111	0.0178	48	0.0091	96	255	
4	66		Nonfed	117	0.0344	36	0.0209			

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	67	F	Nonfed	117	0.0524	42	0.0387	108	267	
4	68	F	Nonfed	117	0.0498	42	0.0317	108	267	
4	69		Nonfed	117	0.0396	36				
4	70	F	Nonfed	117	0.0310	42	0.0211	96	255	
4	71	M	Nonfed	123	0.0406	42	0.0294	90	255	
4	72	F	Nonfed	123	0.0444	36	0.0296	108	267	
4	73	F	Nonfed	123	0.0478	30	0.0312	126	279	
4	74	M	Nonfed	123	0.0303	36	0.0228	120	279	
4	75	F	Nonfed	123	0.0290	42	0.0219	114	279	
4	76	M	Nonfed	129	0.0598	30	0.0321	120	279	
4	77	M	Nonfed	129	0.0538	30	0.0317	108	267	
4	78	F	Nonfed	129	0.0578	24	0.0336	102	255	
4	79		Nonfed	129	0.0455	24	0.0258			
4	80	F	Nonfed	129	0.0508	30	0.0277	120	279	
4	81	F	Nonfed	141	0.0480	18	0.0399	108	267	
4	82	M	Nonfed	141	0.0390	18	0.0278	120	279	
4	83	M	Nonfed	141	0.0402	24	0.0292	114	279	
4	84	M	Nonfed	141	0.0465	12	0.0331	126	279	
4	85	F	Nonfed	141	0.0518	18	0.0373	132	291	
5	1	M	Fed	75	0.0072	84	0.0222	96	255	
5	2	F	Fed	75	0.0063	72	0.0261	120	267	
5	3	M	Fed	75	0.0125	84	0.0245	84	243	
5	4	F	Fed	75	0.0115	84	0.0191	84	243	
5	5	M	Fed	75	0.0097	84	0.0189	96	255	
5	6		Fed	77	0.0099	88				
5	7	M	Fed	77	0.0117	82	0.0359	96	255	
5	8	F	Fed	77	0.0100	88	0.0250	78	243	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	9	M	Fed	77	0.0097	82	0.0234	84	243	
5	10	F	Fed	77	0.0086	76	0.0237	90	243	
5	11	M	Fed	79	0.0077	74	0.0261	90	243	
5	12	F	Fed	79	0.0082	80	0.0282	84	243	
5	13	F	Fed	79	0.0076	74	0.0265	90	243	
5	14	F	Fed	79	0.0108	80	0.0339	84	243	
5	15	M	Fed	79	0.0104	86	0.0221	78	243	
5	16		Fed	81	0.0202					Y
5	17		Fed	81	0.0109					Y
5	18		Fed	81	0.0123					Y
5	19	M	Fed	81	0.0115	72	0.0223	90	243	
5	20		Fed	81	0.0074					Y
5	21	F	Fed	83	0.0098	76	0.0301	84	243	
5	22	F	Fed	83	0.0112	82	0.0253	78	243	
5	23	F	Fed	83	0.0085	76	0.0206	84	243	
5	24		Fed	83	0.0098					Y
5	25		Fed	83	0.0076					Y
5	26		Fed	85	0.0089					Y
5	27		Fed	85	0.0145					Y
5	28	M	Fed	85	0.0151	74	0.0246	84	243	
5	29	F	Fed	85	0.0131	68	0.0330	102	255	
5	30		Fed	85	0.0063					Y
5	31	M	Fed	87	0.0270	72	0.0332	96	255	
5	32	M	Fed	87	0.0120	66	0.0297	90	243	
5	33	F	Fed	87	0.0206	72	0.0313	84	243	
5	34	M	Fed	87	0.0242	78	0.0333	78	243	
5	35	M	Fed	87	0.0135	78	0.0224	78	243	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	36	F	Fed	89	0.0195	70	0.0306	96	255	
5	37	M	Fed	89	0.0261	64	0.0353	102	255	
5	38	F	Fed	89	0.0168	70	0.0292	96	255	
5	39	F	Fed	89	0.0207	76	0.0270	78	243	
5	40		Fed	89	0.0204	64	0.0253			
5	41	F	Fed	93	0.0223	66	0.0289	84	243	
5	42		Fed	93	0.0322	66				
5	43	F	Fed	93	0.0302	60	0.0329	90	243	
5	44		Fed	93	0.0162	66				
5	45		Fed	93	0.0132					Y
5	46		Fed	95	0.0330					Y
5	47	M	Fed	95	0.0318	64	0.0270	84	243	
5	48		Fed	95	0.0104	70				
5	49		Fed	95	0.0332	58	0.0251			
5	50		Fed	95	0.0281					Y
5	51	F	Fed	97	0.0423	62	0.0344	84	243	
5	52	F	Fed	97	0.0229	56	0.0271	90	243	
5	53	F	Fed	97	0.0332	74	0.0278	72	243	
5	54	F	Fed	97	0.0263	62	0.0267	84	243	
5	55	F	Fed	97	0.0221	56	0.0274	90	243	
5	56	F	Fed	99	0.0225	54	0.0271	90	243	
5	57	F	Fed	99	0.0183	60	0.0245	84	243	
5	58	F	Fed	99	0.0247	66	0.0266	78	243	
5	59		Fed	99	0.0348					Y
5	60	M	Fed	99	0.0359	54	0.0264	90	243	
5	61	F	Fed	105	0.0407	54	0.0258	96	255	
5	62	M	Fed	105	0.0424	60	0.0304	90	255	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	63	M	Fed	105	0.0174	54	0.0247	96	255	
5	64	M	Fed	105	0.0461	60	0.0330	96	255	
5	65	F	Fed	105	0.0314	48	0.0293	90	243	
5	66	M	Fed	111	0.0148	42	0.0208	90	243	
5	67	F	Fed	111	0.0536	48	0.0346	108	267	
5	68	F	Fed	111	0.0505	60	0.0394	96	267	
5	69	F	Fed	111	0.0266	54	0.0280	78	243	
5	70	F	Fed	111	0.0439	48	0.0331	96	255	
5	71	M	Fed	117	0.0422	42	0.0320	96	255	
5	72	F	Fed	117	0.0356	42	0.0241	96	255	
5	73	F	Fed	117	0.0461	48	0.0312	90	255	
5	74	F	Fed	117	0.0484	48	0.0344	90	255	
5	75	M	Fed	117	0.0382	42	0.0293	96	255	
5	76	M	Fed	123	0.0462	54	0.0349	102	279	
5	77	M	Fed	123	0.0317	48	0.0278	84	255	
5	78		Fed	123	0.0331					Y
5	79	F	Fed	123	0.0457	30	0.0379	102	255	
5	80	F	Fed	123	0.0523	36	0.0408	96	255	
5	81	M	Fed	129	0.0447	24	0.0283	114	267	
5	82	F	Fed	129	0.0572	30	0.0309	96	255	
5	83		Fed	129	0.0569					Y
5	84	F	Fed	129	0.0476	24	0.0370	126	279	
5	85	M	Fed	129	0.0572	36	0.0361	114	279	
5	86	F	Mass-Rear	153			0.0404	114	267	
5	87	F	Mass-Rear	153			0.0379	114	267	
5	88	M	Mass-Rear	153			0.0427	114	267	
5	89	M	Mass-Rear	153			0.0378	114	267	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	90	M	Mass-Rear	153			0.0409	126	279	
5	1		Nonfed	75	0.0057					
5	2		Nonfed	75	0.0085					
5	3		Nonfed	75	0.0050					Y
5	4		Nonfed	75	0.0053					
5	5		Nonfed	75	0.0055					
5	6		Nonfed	77	0.0139					
5	7		Nonfed	77	0.0107					
5	8		Nonfed	77	0.0106					
5	9		Nonfed	77	0.0123					
5	10		Nonfed	77	0.0074					
5	11		Nonfed	79	0.0087					
5	12		Nonfed	79	0.0095					Y
5	13		Nonfed	79	0.0072					
5	14		Nonfed	79	0.0097					Y
5	15		Nonfed	79	0.0087					
5	16		Nonfed	81	0.0074					
5	17		Nonfed	81	0.0108					
5	18		Nonfed	81	0.0148					
5	19		Nonfed	81	0.0111					Y
5	20		Nonfed	81	0.0101					
5	21		Nonfed	83	0.0210	76	0.0064			
5	22		Nonfed	83	0.0128					
5	23		Nonfed	83	0.0113					
5	24		Nonfed	83	0.0142					
5	25		Nonfed	83	0.0088					
5	26		Nonfed	85	0.0142					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	27		Nonfed	85	0.0137	74	0.0029			
5	28	M	Nonfed	85	0.0233	68	0.0146	90	243	
5	29		Nonfed	85	0.0203					
5	30		Nonfed	85	0.0119	74	0.0048			
5	31	M	Nonfed	87	0.0232	72	0.0112	84	243	
5	32	M	Nonfed	87	0.0231	72	0.0121	72	231	
5	33		Nonfed	87	0.0176					
5	34		Nonfed	87	0.0210	72				
5	35	M	Nonfed	87	0.0231	72	0.0111	72	231	
5	36		Nonfed	89	0.0119					
5	37		Nonfed	89	0.0135					
5	38		Nonfed	89	0.0090					
5	39	M	Nonfed	89	0.0217	64	0.0093	114	267	
5	40		Nonfed	89	0.0180	70	0.0072			
5	41		Nonfed	93	0.0191					
5	42		Nonfed	93	0.0188					
5	43		Nonfed	93	0.0215	66	0.0031			
5	44	M	Nonfed	93	0.0346	60	0.0140	78	231	
5	45		Nonfed	93	0.0192					
5	46		Nonfed	95	0.0151					
5	47	M	Nonfed	95	0.0323	64	0.0176	72	231	
5	48	M	Nonfed	95	0.0216	70	0.0094	66	231	
5	49		Nonfed	95	0.0113					
5	50	M	Nonfed	95	0.0181	64	0.0089	108	267	
5	51	F	Nonfed	97	0.0311	62	0.0169	72	231	
5	52	M	Nonfed	97	0.0338	68	0.0176	66	231	
5	53	M	Nonfed	97	0.0269	68	0.0107	78	243	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	54	M	Nonfed	97	0.0237	62	0.0098	72	231	
5	55		Nonfed	97	0.0146					
5	56	M	Nonfed	99	0.0486	66	0.0250	66	231	
5	57		Nonfed	99	0.0155	60	0.0061			
5	58		Nonfed	99	0.0279	60				
5	59	F	Nonfed	99	0.0424	54	0.0199	78	231	
5	60	F	Nonfed	99	0.0405	60	0.0211	72	231	
5	61	M	Nonfed	105	0.0375	48	0.0189	78	231	
5	62	M	Nonfed	105	0.0476	54	0.0260	84	243	
5	63	F	Nonfed	105	0.0369	48	0.0198	90	243	
5	64	F	Nonfed	105	0.0436	60	0.0239	78	243	
5	65	M	Nonfed	105	0.0357	60	0.0160	78	243	
5	66	F	Nonfed	111	0.0609	42	0.0346	78	231	
5	67	M	Nonfed	111	0.0357	48	0.0171	84	243	
5	68	M	Nonfed	111	0.0479	48	0.0294	84	243	
5	69		Nonfed	111	0.0353	54	0.0209			
5	70	M	Nonfed	111	0.0451	48	0.0260	84	243	
5	71	M	Nonfed	117	0.0431	42	0.0265	84	243	
5	72	M	Nonfed	117	0.0432	42	0.0237	84	243	
5	73	M	Nonfed	117	0.0411	42	0.0247	84	243	
5	74	M	Nonfed	117	0.0497	42	0.0314	84	243	
5	75	M	Nonfed	117	0.0552	36	0.0356	114	267	
5	76	M	Nonfed	123	0.0540	42	0.0320	66	231	
5	77	M	Nonfed	123	0.0351	36	0.0208	84	243	
5	78	F	Nonfed	123	0.0538	30	0.0397	90	243	
5	79	F	Nonfed	123	0.0388	36	0.0212	84	243	
5	80	F	Nonfed	123	0.0371	36	0.0372	96	255	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	81	F	Nonfed	129	0.0567	24	0.0369	102	255	
5	82	M	Nonfed	129	0.0515	30	0.0397	96	255	
5	83	F	Nonfed	129	0.0544	24	0.0326	102	255	
5	84	F	Nonfed	129	0.0515	24	0.0319	102	255	
5	85	F	Nonfed	129	0.0520	30	0.0276	96	255	
6	1		Fed	85	0.0060					Y
6	2		Fed	85	0.0085	80	0.0144			
6	3	M	Fed	85	0.0074	80	0.0140	78	158	
6	4	M	Fed	85	0.0071	80	0.0158	78	158	
6	5	F	Fed	85	0.0091	74	0.0261	96	170	
6	6	M	Fed	87	0.0138	78	0.0242	90	170	
6	7	M	Fed	87	0.0083	72	0.0130	108	182	
6	8		Fed	87	0.0077					
6	9		Fed	87	0.0107					
6	10		Fed	87	0.0087					Y
6	11	F	Fed	89	0.0065	70	0.0255	108	182	
6	12	M	Fed	89	0.0103	76	0.0258	102	182	
6	13		Fed	89	0.0127					Y
6	14	F	Fed	89	0.0095	76	0.0204	90	170	
6	15	F	Fed	89	0.0064	76	0.0110	102	182	
6	16		Fed	93	0.0068					Y
6	17	M	Fed	93	0.0128	72	0.0290	90	170	
6	18		Fed	93	0.0135	66	0.0307			
6	19	M	Fed	93	0.0092	72	0.0223	78	158	
6	20		Fed	93	0.0122	66	0.0178			
6	21	M	Fed	95	0.0199	70	0.0329	90	170	
6	22	M	Fed	95	0.0116	70	0.0217	90	170	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
6	23	F	Fed	95	0.0078	76	0.0161	72	158	
6	24		Fed	95	0.0047					Y
6	25		Fed	95	0.0120					Y
6	26	F	Fed	97	0.0218	62	0.0294	84	158	
6	27	M	Fed	97	0.0263	68	0.0148	78	158	
6	28	M	Fed	97	0.0192	62	0.0255	108	182	
6	29		Fed	97	0.0069					Y
6	30		Fed	97	0.0107					
6	31	F	Fed	99	0.0148	66	0.0204	78	158	
6	32		Fed	99	0.0190	60	0.0161			
6	33	F	Fed	99	0.0115	66	0.0242	90	170	
6	34	M	Fed	99	0.0159	66	0.0227	102	182	
6	35	M	Fed	99	0.0259	66	0.0315	90	170	
6	36	F	Fed	101	0.0268	58	0.0306	84	158	
6	37	M	Fed	101	0.0294	58	0.0288	84	158	
6	38		Fed	101	0.0169					Y
6	39		Fed	101	0.0183					Y
6	40	F	Fed	101	0.0185	58	0.0248	84	158	
6	41	M	Fed	103	0.0213	68	0.0276	84	170	
6	42	M	Fed	103	0.0208	68	0.0239	84	170	
6	43	M	Fed	103	0.0269	62	0.0324	102	182	
6	44		Fed	103	0.0138					Y
6	45	M	Fed	103	0.0148	56	0.0270	84	158	
6	46	F	Fed	105	0.0246	54	0.0292	84	158	
6	47	F	Fed	105	0.0216	60	0.0236	78	158	
6	48	F	Fed	105	0.0217	54	0.0230	84	158	
6	49		Fed	105	0.0241	54	0.0298			

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
6	50	F	Fed	105	0.0220	54	0.0293	84	158	
6	51	M	Fed	107	0.0406	58	0.0356	78	158	
6	52	M	Fed	107	0.0258	58	0.0325	78	158	
6	53		Fed	107	0.0161					
6	54		Fed	107	0.0181	58				
6	55	M	Fed	107	0.0315	58	0.0247	78	158	
6	56	M	Fed	109	0.0181	50	0.0186	84	158	
6	57	F	Fed	109	0.0251	50	0.0284	84	158	
6	58	M	Fed	109	0.0272	56	0.0277	78	158	
6	59	M	Fed	109	0.0181	56	0.0242	78	158	
6	60		Fed	109	0.0118					Y
6	61	M	Fed	111	0.0391	48	0.0363	108	182	
6	62		Fed	111	0.0336	54				
6	63	M	Fed	111	0.0254	54	0.0251	78	158	
6	64	M	Fed	111	0.0240	48	0.0293	84	158	
6	65	M	Fed	111	0.0303	48	0.0342	84	158	
6	66	M	Fed	117	0.0415	48	0.0354	102	182	
6	67	M	Fed	117	0.0361	42	0.0342	132	206	
6	68	F	Fed	117	0.0373	48	0.0410	90	170	
6	69		Fed	117	0.0436					Y
6	70	M	Fed	117	0.0402	42	0.0392	108	182	
6	71	F	Fed	123	0.0489	36	0.0425	108	182	
6	72		Fed	123	0.0380					Y
6	73	M	Fed	123	0.0498	42	0.0341	102	182	
6	74	M	Fed	123	0.0501	48	0.0419	108	194	
6	75	M	Fed	123	0.0377	42	0.0336	102	182	
6	76	M	Fed	129	0.0520	36	0.0348	90	170	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
6	77	F	Fed	129	0.0570	42	0.0370	108	194	
6	78	M	Fed	129	0.0323	42	0.0291	108	194	
6	79	F	Fed	129	0.0224	36	0.0254	114	194	
6	80	M	Fed	129	0.0375	30	0.0310	96	170	
6	81	M	Fed	141	0.0587	24	0.0409	114	194	
6	82		Fed	141	0.0574					Y
6	83	M	Fed	141	0.0582	30	0.0398	108	194	
6	84	F	Fed	141	0.0570	24	0.0434	126	206	
6	85	M	Fed	141	0.0594		0.0404		206	
6	86	F	Mass-Rear	177			0.0488	114	206	
6	87	M	Mass-Rear	177			0.0427	114	206	
6	88	M	Mass-Rear	177			0.0474	114	206	
6	89	M	Mass-Rear	177			0.0446	114	206	
6	90	F	Mass-Rear	177			0.0450	126	218	
6	1		Nonfed	85	0.0074					
6	2		Nonfed	85	0.0064					
6	3		Nonfed	85	0.0078					
6	4		Nonfed	85	0.0059					
6	5		Nonfed	85	0.0068					
6	6		Nonfed	87	0.0092					
6	7		Nonfed	87	0.0078					
6	8		Nonfed	87	0.0128					
6	9		Nonfed	87	0.0160					
6	10		Nonfed	87	0.0096					
6	11		Nonfed	89	0.0111					
6	12		Nonfed	89	0.0083					
6	13		Nonfed	89	0.0081					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
6	14		Nonfed	89	0.0056					
6	15		Nonfed	89	0.0096					
6	16		Nonfed	93	0.0101					
6	17		Nonfed	93	0.0079					
6	18		Nonfed	93	0.0124					
6	19		Nonfed	93	0.0057					
6	20		Nonfed	93	0.0118					
6	21		Nonfed	95	0.0112					
6	22		Nonfed	95	0.0093					
6	23		Nonfed	95	0.0087					
6	24		Nonfed	95	0.0066					
6	25		Nonfed	95	0.0097					
6	26		Nonfed	97	0.0143					
6	27		Nonfed	97	0.0091					
6	28		Nonfed	97	0.0079					
6	29		Nonfed	97	0.0136					
6	30		Nonfed	97	0.0146					
6	31	F	Nonfed	99	0.0270	72	0.0153	72	158	
6	32		Nonfed	99	0.0154					
6	33		Nonfed	99	0.0133					
6	34		Nonfed	99	0.0185	72	0.0080	72	158	
6	35		Nonfed	99	0.0116					
6	36		Nonfed	101	0.0097					
6	37		Nonfed	101	0.0228					
6	38		Nonfed	101	0.0181					
6	39		Nonfed	101	0.0240	64	0.0022			
6	40		Nonfed	101	0.0193					

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
6	41		Nonfed	103	0.0173					
6	42	F	Nonfed	103	0.0253	62	0.0097	78	158	
6	43	M	Nonfed	103	0.0329	62	0.0147	78	158	
6	44		Nonfed	103	0.0199					
6	45	F	Nonfed	103	0.0272	62	0.0116	78	158	
6	46	M	Nonfed	105	0.0318	54	0.0159	84	158	
6	47	M	Nonfed	105	0.0321	66	0.0177	72	158	
6	48	M	Nonfed	105	0.0227	60	0.0116	78	158	
6	49	F	Nonfed	105	0.0189	60	0.0086	90	170	
6	50	F	Nonfed	105	0.0247	54	0.0137	84	158	
6	51	F	Nonfed	107	0.0332	58	0.0190	78	158	
6	52	F	Nonfed	107	0.0198	58	0.0103	78	158	
6	53	F	Nonfed	107	0.0366	52	0.0204	84	158	
6	54	F	Nonfed	107	0.0264	58	0.0123	78	158	
6	55		Nonfed	107	0.0385	52				
6	56	M	Nonfed	109	0.0219	50	0.0106	84	158	
6	57	M	Nonfed	109	0.0299	56	0.0169	78	158	
6	58	M	Nonfed	109	0.0301	56	0.0173	78	158	
6	59	M	Nonfed	109	0.0269	50	0.0130	84	158	
6	60	F	Nonfed	109	0.0300	50	0.0178	84	158	
6	61	M	Nonfed	111	0.0353	54	0.0195	78	158	
6	62	F	Nonfed	111	0.0360	60	0.0220	72	158	
6	63	M	Nonfed	111	0.0289	60	0.0148	72	158	
6	64	F	Nonfed	111	0.0251	54	0.0128	78	158	
6	65	M	Nonfed	111	0.0333	54	0.0187	90	170	
6	66	F	Nonfed	117	0.0312	48	0.0196	102	182	
6	67	F	Nonfed	117	0.0451	42	0.0229	108	182	

Trial	ID	Sex	Treatment	Age at Pull (h)	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
6	68	M	Nonfed	117	0.0434	42	0.0256	96	170	
6	69	M	Nonfed	117	0.0383	42	0.0199	96	170	
6	70	F	Nonfed	117	0.0447	48	0.0249	102	182	
6	71	M	Nonfed	123	0.0517	36	0.0295	108	182	
6	72	F	Nonfed	123	0.0494	36	0.0333	96	170	
6	73	F	Nonfed	123	0.0509	36	0.0308	96	170	
6	74	F	Nonfed	123	0.0395	42	0.0246	102	182	
6	75		Nonfed	123	0.0172	48	0.0064			
6	76	M	Nonfed	129	0.0386	24	0.0178	114	182	
6	77		Nonfed	129	0.0294	24	0.0123			
6	78	F	Nonfed	129	0.0342	36	0.0194	102	182	
6	79		Nonfed	129	0.0240	22				Y
6	80	F	Nonfed	129	0.0500	30	0.0269	96	170	
6	81	F	Nonfed	141	0.0622	18	0.0355	120	194	
6	82	F	Nonfed	141	0.0583	18	0.0301	120	194	
6	83	M	Nonfed	141	0.0460	18	0.0295	120	194	
6	84	M	Nonfed	141	0.0593	24	0.0340	114	194	
6	85	F	Nonfed	141	0.0601	12	0.0370	126	194	

APPENDIX D

CRITICAL WEIGHT FOR *COCHLIOMYIA MACELLARIA* LARVAE UNDER SIMULATED COMPETITION

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	1	M	Fed	66	0.0092	86	0.03	108	260	
1	2		Fed	66	0.0245	86	0.0182			
1	3	F	Fed	66	0.0163	62	0.0301	108	236	
1	4	M	Fed	66	0.0125	62	0.0127	108	236	
1	5	M	Fed	66	0.0187	62	0.0309	108	236	
1	6	M	Fed	68	0.0118	78	0.0357	114	260	
1	7		Fed	68	0.0161					Y
1	8		Fed	68	0.0129					Y
1	9		Fed	68	0.018					Y
1	10	F	Fed	68	0.012	78	0.0177	114	260	
1	11	M	Fed	70	0.0139	58	0.0351	108	236	
1	12		Fed	70	0.0138					Y
1	13	F	Fed	70	0.0104	82	0.029	108	260	
1	14		Fed	70	0.0129					Y
1	15		Fed	70	0.0136					Y
1	16		Fed	72	0.0172					Y
1	17		Fed	72	0.0163					Y
1	18		Fed	72	0.0153					Y
1	19		Fed	72	0.0189					Y
1	20		Fed	72	0.0118					
1	21	F	Fed	74	0.0124	72	0.032	114	260	
1	22	F	Fed	74	0.0111	66	0.0425	108	248	
1	23	M	Fed	74	0.0148	66	0.0317	120	260	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	24	M	Fed	74	0.018	66	0.0382	120	260	
1	25	M	Fed	74	0.0125	54	0.0399	108	236	
1	26	M	Fed	76	0.0187	52	0.0341	132	260	
1	27	F	Fed	76	0.0238	76	0.0313	108	260	
1	28	F	Fed	76	0.0204	58	0.035	126	260	
1	29	F	Fed	76	0.0158	76	0.0401	108	260	
1	30		Fed	76	0.0281					Y
1	31	F	Fed	78	0.0208	50	0.0378	120	248	
1	32		Fed	78	0.0308					Y
1	33	F	Fed	78	0.0278	56	0.0256	126	260	
1	34		Fed	78	0.0226					Y
1	35	F	Fed	78	0.0231	62	0.0307	120	260	
1	36	M	Fed	80	0.0313	60	0.0375	120	260	
1	37		Fed	80	0.033					Y
1	38	F	Fed	80	0.0218	72	0.0428	108	260	
1	39		Fed	80	0.0319	66	0.0329			
1	40		Fed	80	0.0126					Y
1	41		Fed	82	0.0319					Y
1	42	F	Fed	82	0.0308	70	0.037	108	260	
1	43		Fed	82	0.0318					Y
1	44	F	Fed	82	0.031	52	0.0353	126	260	
1	45	M	Fed	82	0.034	70	0.0353	108	260	
1	46	F	Fed	86	0.029	48	0.0301	114	248	
1	47		Fed	86	0.0292					Y
1	48	M	Fed	86	0.0232	60	0.0305	114	260	
1	49		Fed	86	0.035					Y
1	50		Fed	86	0.0372					Y

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	51		Fed	90	0.0372					Y
1	52		Fed	90	0.0389					Y
1	53		Fed	90	0.0171					Y
1	54		Fed	90	0.0623					Y
1	55	F	Fed	90	0.0139	62	0.0301	108	260	
1	56	F	Fed	94	0.0242	58	0.0299	108	260	
1	57	M	Fed	94	0.0501	40	0.0408	126	260	
1	58	F	Fed	94	0.0341	46	0.0403	120	260	
1	59	M	Fed	94	0.0264	34	0.029	108	236	
1	60		Fed	94	0.0396					Y
1	61	M	Fed	98	0.0419	54	0.0406	120	272	
1	62	F	Fed	98	0.0314	54	0.0392	120	272	
1	63	F	Fed	98	0.0458	48	0.0385	114	260	
1	64	M	Fed	98	0.0362	54	0.0378	120	272	
1	65		Fed	98	0.0454					Y
1	66	M	Fed	102	0.0345	44	0.0309	114	260	
1	67	M	Fed	102	0.0562	44	0.0396	126	272	
1	68		Fed	102	0.0564					Y
1	69	F	Fed	102	0.0466	44	0.0446	114	260	
1	70	M	Fed	102	0.0503	50	0.0381	120	272	
1	71	F	Fed	106	0.0474	34	0.0341	120	260	
1	72	M	Fed	106	0.0469	40	0.0388	114	260	
1	73		Fed	106	0.0558	46	0.0378			
1	74	F	Fed	106	0.0384	46	0.0325	108	260	
1	75		Fed	106	0.0602					Y
1	76	F	Fed	110	0.0482	42	0.0339	108	260	
1	77	M	Fed	110	0.0508	36	0.0384	114	260	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	78	M	Fed	110	0.0586	36	0.0385	114	260	
1	79	F	Fed	110	0.055	36	0.0436	114	260	
1	80	M	Fed	110	0.0569	42	0.0457	120	272	
1	81	F	Fed	116	0.0596	36	0.0446	120	272	
1	82	F	Fed	116	0.0567	36	0.0431	132	284	
1	83		Fed	116	0.0463					Y
1	84	F	Fed	116	0.0477	36	0.0339	120	272	
1	85	F	Fed	116	0.0617				284	
1	86	M	Mass-Rear	152			0.0489	108	260	
1	87	F	Mass-Rear	152			0.043	108	260	
1	88	M	Mass-Rear	152			0.0449	108	260	
1	89	F	Mass-Rear	152			0.0509	108	260	
1	90	F	Mass-Rear	152			0.0458	120	272	
1	1		Nonfed	66	0.0174					
1	2		Nonfed	66	0.0155					
1	3		Nonfed	66	0.014					
1	4		Nonfed	66	0.011					
1	5		Nonfed	66	0.0113					Y
1	6		Nonfed	68	0.013					Y
1	7		Nonfed	68	0.0083					
1	8		Nonfed	68	0.0202					
1	9		Nonfed	68	0.0155					
1	10		Nonfed	68	0.0206					
1	11		Nonfed	70	0.0105					
1	12		Nonfed	70	0.0115					
1	13		Nonfed	70	0.0122					
1	14		Nonfed	70	0.019					

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	15		Nonfed	70	0.053					Y
1	16		Nonfed	72	0.012					
1	17		Nonfed	72	0.035					
1	18		Nonfed	72	0.0088					
1	19		Nonfed	72	0.0104					
1	20		Nonfed	72	0.0203					
1	21		Nonfed	74	0.0125					
1	22		Nonfed	74	0.0139					
1	23		Nonfed	74	0.0151					
1	24		Nonfed	74	0.0097					
1	25		Nonfed	74	0.0186					
1	26		Nonfed	76	0.0233					
1	27		Nonfed	76	0.0156					
1	28		Nonfed	76	0.0232					
1	29		Nonfed	76	0.0266					
1	30		Nonfed	76	0.0257					
1	31		Nonfed	78	0.0252					
1	32		Nonfed	78	0.0357					
1	33		Nonfed	78	0.0212					
1	34		Nonfed	78	0.0133					
1	35		Nonfed	78	0.0187					Y
1	36	F	Nonfed	80	0.0281	42	0.0119	114	236	
1	37		Nonfed	80	0.0183					Y
1	38	M	Nonfed	80	0.0363	42	0.0157	114	236	
1	39	M	Nonfed	80	0.0377	42	0.0171	114	236	
1	40		Nonfed	80	0.0289					Y
1	41	M	Nonfed	82	0.0489	40	0.0221	114	236	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	42		Nonfed	82	0.0247					Y
1	43		Nonfed	82	0.029					
1	44		Nonfed	82	0.0416					Y
1	45		Nonfed	82	0.0243					
1	46	F	Nonfed	86	0.037	36	0.0204	114	236	
1	47	F	Nonfed	86	0.0271	36	0.0169	114	236	
1	48	M	Nonfed	86	0.0359	36	0.0192	114	236	
1	49		Nonfed	86	0.0173					
1	50	M	Nonfed	86	0.0248	36	0.0156	114	236	
1	51	F	Nonfed	90	0.0606	38	0.0405	108	236	
1	52	F	Nonfed	90	0.0288	38	0.0181	108	236	
1	53	F	Nonfed	90	0.0375	32	0.0277	114	236	
1	54	F	Nonfed	90	0.054	14	0.027	132	236	
1	55		Nonfed	90	0.0222					Y
1	56		Nonfed	94	0.0233					Y
1	57	M	Nonfed	94	0.0428	28	0.0347	114	236	
1	58	F	Nonfed	94	0.0455	34	0.0307	108	236	
1	59	F	Nonfed	94	0.042	46	0.0143	96	236	
1	60	F	Nonfed	94	0.0387	34	0.0328	108	236	
1	61	F	Nonfed	98	0.0409	30	0.0273	108	236	
1	62		Nonfed	98	0.0391					Y
1	63	M	Nonfed	98	0.0506	30	0.0339	108	236	
1	64	M	Nonfed	98	0.0448	42		96	236	
1	65		Nonfed	98	0.0376					Y
1	66		Nonfed	102	0.0712					Y
1	67	F	Nonfed	102	0.046	38	0.0315	96	236	
1	68	F	Nonfed	102	0.0397	38	0.0239	96	236	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
1	69		Nonfed	102	0.0347					Y
1	70		Nonfed	102	0.0463					Y
1	71		Nonfed	106	0.0637					Y
1	72	F	Nonfed	106	0.0554	34	0.0427	120	260	
1	73	F	Nonfed	106	0.0658				260	
1	74	F	Nonfed	106	0.0493	40	0.0337	114	260	
1	75	F	Nonfed	106	0.0521	40	0.0364	114	260	
1	76		Nonfed	110	0.0674					Y
1	77		Nonfed	110	0.0435					Y
1	78		Nonfed	110	0.0615					Y
1	79		Nonfed	110	0.0629					Y
1	80		Nonfed	110	0.0518					Y
1	81	F	Nonfed	116	0.0622	36	0.0404	108	260	
1	82		Nonfed	116	0.044					Y
1	83	M	Nonfed	116	0.0579	30	0.0414	126	272	
1	84	F	Nonfed	116	0.0742	30	0.051	114	260	
1	85	M	Nonfed	116	0.0636	36	0.0501	108	260	
2	1	F	Fed	68	0.0112	60	0.0401	132	260	
2	2		Fed	68	0.0085					Y
2	3	M	Fed	68	0.008	78	0.0231	90	236	
2	4	M	Fed	68	0.0068	54	0.0367	114	236	
2	5	F	Fed	68	0.0084	60	0.0288	108	236	
2	6		Fed	70	0.0101					Y
2	7		Fed	70	0.0103					Y
2	8	M	Fed	70	0.0131	76	0.025	90	236	
2	9		Fed	70	0.0088					Y
2	10		Fed	70	0.0103					Y

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	11	F	Fed	72	0.0212	56	0.0368	108	236	
2	12		Fed	72	0.0114					Y
2	13		Fed	72	0.0119					
2	14		Fed	72	0.0102	56	0.0176	108	236	
2	15		Fed	72	0.0101					Y
2	16	F	Fed	74	0.0231	54	0.0384	108	236	
2	17		Fed	74	0.0131					Y
2	18		Fed	74	0.0089					
2	19	M	Fed	74	0.0186	54	0.0347	108	236	
2	20		Fed	74	0.0152					Y
2	21	F	Fed	76	0.0223	52	0.0204	108	236	
2	22	M	Fed	76	0.0191	52	0.0326	108	236	
2	23	M	Fed	76	0.0111	70	0.0215	90	236	
2	24	F	Fed	76	0.013	52	0.018	108	236	
2	25	M	Fed	76	0.0153	58	0.0275	102	236	
2	26	M	Fed	78	0.0111	50	0.0258	108	236	
2	27	M	Fed	78	0.0231	44	0.0339	114	236	
2	28	F	Fed	78	0.0133	68	0.0254	90	236	
2	29	F	Fed	78	0.0166	74	0.0259	96	248	
2	30		Fed	78	0.0098					Y
2	31	F	Fed	80	0.0265	48	0.0427	108	236	
2	32		Fed	80	0.0176					Y
2	33	F	Fed	80	0.0188	66	0.0366	90	236	
2	34		Fed	80	0.0249					Y
2	35	F	Fed	80	0.022	48	0.0344	108	236	
2	36		Fed	82	0.0116					Y
2	37		Fed	82	0.0337					Y

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	38		Fed	82	0.0153					Y
2	39		Fed	82	0.0296					Y
2	40	F	Fed	82	0.0246	58	0.0286	96	236	
2	41	F	Fed	84	0.0285	44	0.0353	108	236	
2	42	M	Fed	84	0.0292	44	0.029	108	236	
2	43	M	Fed	84	0.0312	62	0.0374	90	236	
2	44	F	Fed	84	0.0373	44	0.0432	108	236	
2	45		Fed	84	0.0196					Y
2	46		Fed	86	0.0328					Y
2	47	M	Fed	86	0.0315	54	0.042	96	236	
2	48		Fed	86	0.0439					Y
2	49		Fed	86	0.0362					Y
2	50		Fed	86	0.0294					Y
2	51		Fed	90	0.0367					Y
2	52	M	Fed	90	0.041	44	0.0314	114	248	
2	53	M	Fed	90	0.0393	38	0.0369	108	236	
2	54	F	Fed	90	0.0265	44	0.0405	102	236	
2	55	F	Fed	90	0.0412	44	0.0414	102	236	
2	56	F	Fed	94	0.0359	52	0.0314	102	248	
2	57	F	Fed	94	0.0307	52	0.029	90	236	
2	58		Fed	94	0.0393					
2	59	M	Fed	94	0.0341	34	0.0312	108	236	
2	60	F	Fed	94	0.0291	46	0.0261	96	236	
2	61	F	Fed	98	0.038	48	0.0426	90	236	
2	62	M	Fed	98	0.0312	54	0.0379			
2	63	F	Fed	98	0.0285	48	0.0278	90	236	
2	64	F	Fed	98	0.0273	48	0.0365	90	236	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	65		Fed	98	0.0511					Y
2	66		Fed	102	0.0248					Y
2	67		Fed	102	0.0389					Y
2	68	F	Fed	102	0.0332	50	0.0357	96	248	
2	69		Fed	102	0.0254					
2	70		Fed	102	0.0346					Y
2	71	F	Fed	106	0.0575	40	0.0399	90	236	
2	72	M	Fed	106	0.0554	40	0.0376	102	248	
2	73	F	Fed	106	0.0478	40	0.032	102	248	
2	74		Fed	106	0.0492					Y
2	75	M	Fed	106	0.0569	46	0.037	84	236	
2	76	M	Fed	110	0.0503	42	0.0358	96	248	
2	77		Fed	110	0.0306					
2	78	F	Fed	110	0.0538	42	0.0359	96	248	
2	79	M	Fed	110	0.0412	42	0.0381	108	260	
2	80		Fed	110	0.0386					Y
2	81	F	Fed	116	0.0452	30	0.0425	102	248	
2	82		Fed	116	0.0419	36	0.0351	96	248	
2	83	M	Fed	116	0.0493				260	
2	84		Fed	116	0.0467					Y
2	85	F	Fed	116	0.0285	36	0.0313	108	260	
2	86	F	Mass-Rear	134			0.0268	102	236	
2	87	F	Mass-Rear	134			0.0301	102	236	
2	88	M	Mass-Rear	134			0.0286	102	236	
2	89	M	Mass-Rear	134			0.0301	102	236	
2	90	M	Mass-Rear	134			0.0273	102	236	
2	1		Nonfed	68	0.0104					

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	2		Nonfed	68	0.0115					
2	3		Nonfed	68	0.0078					
2	4		Nonfed	68	0.008					
2	5		Nonfed	68	0.007					
2	6		Nonfed	70	0.0105					
2	7		Nonfed	70	0.0096					
2	8		Nonfed	70	0.0159					
2	9		Nonfed	70	0.0087					
2	10		Nonfed	70	0.0126					
2	11		Nonfed	72	0.0172					
2	12		Nonfed	72	0.0185					
2	13		Nonfed	72	0.0121					
2	14		Nonfed	72	0.0151					
2	15		Nonfed	72	0.0136					
2	16		Nonfed	74	0.0204					
2	17		Nonfed	74	0.0193					
2	18		Nonfed	74	0.0135					Y
2	19		Nonfed	74	0.0128					
2	20		Nonfed	74	0.0093					
2	21		Nonfed	76	0.0147					
2	22		Nonfed	76	0.0174					
2	23		Nonfed	76	0.019					
2	24		Nonfed	76	0.0148					
2	25		Nonfed	76	0.0097					
2	26		Nonfed	78	0.0199					
2	27		Nonfed	78	0.0196					
2	28		Nonfed	78	0.03					Y

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	29		Nonfed	78	0.0153					
2	30		Nonfed	78	0.0152					
2	31	M	Nonfed	80	0.0238	48	0.0138	108	236	
2	32	F	Nonfed	80	0.0316	42	0.0195	114	236	
2	33		Nonfed	80	0.0176					Y
2	34		Nonfed	80	0.0142					
2	35		Nonfed	80	0.0151					
2	36	M	Nonfed	82	0.0343	40	0.0234	114	236	
2	37	F	Nonfed	82	0.021	46	0.0117	108	236	
2	38	F	Nonfed	82	0.0249	40	0.0178	114	236	
2	39	F	Nonfed	82	0.0197	46	0.0115	108	236	
2	40	M	Nonfed	82	0.0218	46	0.0126	108	236	
2	41	M	Nonfed	84	0.0259	38	0.0107	114	236	
2	42		Nonfed	84	0.0207					Y
2	43	F	Nonfed	84	0.0255	44	0.0144	108	236	
2	44		Nonfed	84	0.0231					Y
2	45		Nonfed	84	0.0349					Y
2	46		Nonfed	86	0.038					Y
2	47	M	Nonfed	86	0.0312	36	0.0192	114	236	
2	48		Nonfed	86	0.0195					Y
2	49		Nonfed	86	0.0269					Y
2	50	F	Nonfed	86	0.0294	42	0.0208	108	236	
2	51	F	Nonfed	90	0.0566	38	0.0355	108	236	
2	52	M	Nonfed	90	0.0395	38	0.0213	108	236	
2	53	M	Nonfed	90	0.0238	38	0.0154	108	236	
2	54	F	Nonfed	90	0.0392	32	0.0277	114	236	
2	55	M	Nonfed	90	0.0278	38	0.0176	108	236	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	56	M	Nonfed	94	0.0432	28	0.0377	114	236	
2	57	M	Nonfed	94	0.0362	34	0.0255	108	236	
2	58	F	Nonfed	94	0.0237	34	0.0229	108	236	
2	59	F	Nonfed	94	0.0374	34	0.0271	108	236	
2	60	F	Nonfed	94	0.0264	34	0.0175	108	236	
2	61	M	Nonfed	98	0.0383	42	0.0279	96	236	
2	62	M	Nonfed	98	0.019	48	0.0121	90	236	
2	63	F	Nonfed	98	0.0374	30	0.0326	108	236	
2	64	F	Nonfed	98	0.0449	30	0.0325	108	236	
2	65	F	Nonfed	98	0.022	48	0.0123	90	236	
2	66	F	Nonfed	102	0.0348	38	0.027	96	236	
2	67	F	Nonfed	102	0.0367	26	0.0274	108	236	
2	68	F	Nonfed	102	0.0337	26	0.0284	108	236	
2	69		Nonfed	102	0.0306	31	0.0218			
2	70	F	Nonfed	102	0.0314	32	0.0261	102	236	
2	71	M	Nonfed	106	0.0582	22	0.0494	108	236	
2	72	F	Nonfed	106	0.0435	22	0.0426	108	236	
2	73	F	Nonfed	106	0.0663	40	0.0419	102	248	
2	74	F	Nonfed	106	0.0455	22	0.0366	108	236	
2	75	F	Nonfed	106	0.0522	40	0.0313	90	236	
2	76	F	Nonfed	110	0.0472	36	0.0398	114	260	
2	77	F	Nonfed	110	0.0546	36	0.036	90	236	
2	78	F	Nonfed	110	0.0466	36	0.0319	90	236	
2	79	M	Nonfed	110	0.0488	36	0.0311	90	236	
2	80	F	Nonfed	110	0.0549	36	0.0397	90	236	
2	81	F	Nonfed	116	0.0573	30	0.0406	90	236	
2	82	F	Nonfed	116	0.0521	36	0.0444	108	260	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
2	83	F	Nonfed	116	0.0411	30	0.0329	90	236	
2	84	F	Nonfed	116	0.0502	36	0.0389	96	248	
2	85	F	Nonfed	116	0.0458	36	0.0364	108	260	
3	1	M	Fed	66	0.0104	56	0.0339	114	236	
3	2	F	Fed	66	0.0143	50	0.0214	120	236	
3	3	F	Fed	66	0.0163	56	0.0358	126	248	
3	4	F	Fed	66	0.0194	56	0.0388	114	236	
3	5		Fed	66	0.0124					Y
3	6	M	Fed	68	0.0142	54	0.0373	114	236	
3	7	F	Fed	68	0.0113	54	0.0291	114	236	
3	8		Fed	68	0.0236					Y
3	9		Fed	68	0.0165					Y
3	10	F	Fed	68	0.015	54	0.0375	138	260	
3	11	F	Fed	70	0.0206	58	0.0355	108	236	
3	12		Fed	70	0.0148					Y
3	13	M	Fed	70	0.0173	52	0.0421	126	248	
3	14		Fed	70	0.0193					Y
3	15	M	Fed	70	0.0175	52	0.0442	114	236	
3	16	F	Fed	72	0.0165	50	0.0381	114	236	
3	17	F	Fed	72	0.0144	56	0.032	108	236	
3	18		Fed	72	0.0212					
3	19	F	Fed	72	0.0399	50	0.0428	114	236	
3	20	M	Fed	72	0.0212	56	0.0413	108	236	
3	21	F	Fed	74	0.024	54	0.0449	108	236	
3	22	M	Fed	74	0.0282	42	0.0441	120	236	
3	23	F	Fed	74	0.0183	54	0.039	108	236	
3	24		Fed	74	0.0216					Y

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	25		Fed	74	0.0146					Y
3	26	M	Fed	76	0.0301	58	0.0449	102	236	
3	27		Fed	76	0.0283					Y
3	28		Fed	76	0.0181					Y
3	29	M	Fed	76	0.0224	46	0.0395	126	248	
3	30	M	Fed	76	0.0336	52	0.0396	108	236	
3	31	M	Fed	78	0.0163	50	0.0286	108	236	
3	32		Fed	78	0.0299					Y
3	33		Fed	78	0.039					Y
3	34		Fed	78	0.0242					Y
3	35	F	Fed	78	0.0275	44	0.043	114	236	
3	36	M	Fed	80	0.0412	42	0.04	126	248	
3	37	F	Fed	80	0.0472	54	0.0401	102	236	
3	38	M	Fed	80	0.0398	48	0.0389	108	236	
3	39	F	Fed	80	0.0487	48	0.0349	108	236	
3	40		Fed	80	0.0362					Y
3	41		Fed	82	0.0238					Y
3	42	M	Fed	82	0.0331	52	0.0398	114	248	
3	43	M	Fed	82	0.0474	22	0.0385	132	236	
3	44	F	Fed	82	0.0448	52	0.0392	102	236	
3	45	F	Fed	82	0.0231	46	0.0342	108	236	
3	46	M	Fed	86	0.0549	36	0.0489	114	236	
3	47		Fed	86	0.0525	42	0.0321			
3	48		Fed	86	0.0462					Y
3	49	M	Fed	86	0.0622	36	0.0455	126	248	
3	50		Fed	86	0.0559					Y
3	51	M	Fed	90	0.0626	32	0.0434	126	248	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	52	F	Fed	90	0.0377	38	0.0433	108	236	
3	53	F	Fed	90	0.0594	32	0.0489	138	260	
3	54	M	Fed	90	0.0587	38	0.0408	108	236	
3	55	F	Fed	90	0.0553	32	0.0436	126	248	
3	56	M	Fed	94	0.0686	34	0.0437	108	236	
3	57	M	Fed	94	0.0577	34	0.0456	108	236	
3	58	F	Fed	94	0.0646	34	0.0478	108	236	
3	59	M	Fed	94	0.0638	28	0.0476	114	236	
3	60	M	Fed	94	0.0626	34	0.0464	108	236	
3	61	M	Fed	98	0.0613	36	0.0511	102	236	
3	62	M	Fed	98	0.0682	30	0.0477	108	236	
3	63	M	Fed	98	0.0628	30	0.0474	108	236	
3	64	M	Fed	98	0.0521	54	0.0426	108	260	
3	65	F	Fed	98	0.0621	30	0.049	108	236	
3	66		Fed	102	0.0402	50	0.0386			
3	67	F	Fed	102	0.0702	38	0.0493	96	236	
3	68	M	Fed	102	0.0542	26	0.042	108	236	
3	69	F	Fed	102	0.0741	44	0.0583	126	272	
3	70		Fed	102	0.0639	38	0.0464	108	248	
3	71	F	Fed	106	0.0698	34	0.0471	120	260	
3	72	F	Fed	106	0.0714	22	0.053	108	236	
3	73	M	Fed	106	0.0665	34	0.0541	120	260	
3	74	F	Fed	106	0.082	46	0.0414	120	272	
3	75	M	Fed	106	0.0765	22	0.024	108	236	
3	76	F	Fed	110	0.0637	36	0.048	114	260	
3	77	F	Fed	110	0.0613	18	0.0456	132	260	
3	78	F	Fed	110	0.0664	36	0.0487	114	260	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	79	F	Fed	110	0.0685	18	0.0493	120	248	
3	80	F	Fed	110	0.07	18	0.0492	144	272	
3	81	M	Fed	116	0.0705	12	0.0515	156	284	
3	82		Fed	116	0.0736					Y
3	83	F	Fed	116	0.0639	12	0.0453	132	260	
3	84	F	Fed	116	0.0593	30	0.0491	114	260	
3	85	F	Fed	116	0.0655	24	0.0559	120	260	
3	86	M	Mass-Rear	146			0.0401	114	260	
3	87	F	Mass-Rear	146			0.0509	114	260	
3	88	M	Mass-Rear	146			0.0479	114	260	
3	89	M	Mass-Rear	146			0.0504	126	272	
3	90	M	Mass-Rear	146			0.047	114	260	
3	1		Nonfed	66	0.0145					
3	2		Nonfed	66	0.0233					
3	3		Nonfed	66	0.0205					
3	4		Nonfed	66	0.0213					
3	5		Nonfed	66	0.0174					
3	6		Nonfed	68	0.0112					
3	7		Nonfed	68	0.0184					
3	8		Nonfed	68	0.018	48	0.0078			
3	9		Nonfed	68	0.0192					Y
3	10		Nonfed	68	0.0146					
3	11		Nonfed	70	0.0145					
3	12		Nonfed	70	0.0219	36	0.0097			
3	13		Nonfed	70	0.0208	36	0.0094			
3	14		Nonfed	70	0.0181					
3	15		Nonfed	70	0.0141					

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	16	M	Nonfed	72	0.0238	48	0.0144	130	236	
3	17		Nonfed	72	0.0157					
3	18		Nonfed	72	0.0175					
3	19		Nonfed	72	0.0154					
3	20		Nonfed	72	0.0134					Y
3	21	F	Nonfed	74	0.0282	32	0.0178	130	236	
3	22		Nonfed	74	0.0173					Y
3	23	F	Nonfed	74	0.0305	32	0.015	130	236	
3	24		Nonfed	74	0.0214	42	0.0125			
3	25	M	Nonfed	74	0.0255	32	0.0191	130	236	
3	26	F	Nonfed	76	0.0305	30	0.0196	130	236	
3	27		Nonfed	76	0.0239	40	0.0125			
3	28		Nonfed	76	0.0255	34	0.0136			
3	29		Nonfed	76	0.0232	34	0.0137			
3	30	F	Nonfed	76	0.0274	40	0.0187	120	236	
3	31	F	Nonfed	78	0.046	28	0.0273	130	236	
3	32	F	Nonfed	78	0.0345	74	0.0234	84	236	
3	33	M	Nonfed	78	0.037	38	0.0169	120	236	
3	34	F	Nonfed	78	0.033	28	0.0215	130	236	
3	35	M	Nonfed	78	0.0287	28	0.0144	130	236	
3	36	F	Nonfed	80	0.042	26	0.0278	130	236	
3	37	M	Nonfed	80	0.034	42	0.0164	114	236	
3	38	M	Nonfed	80	0.0415	36	0.0176	120	236	
3	39		Nonfed	80	0.0476					Y
3	40	M	Nonfed	80	0.0345	36	0.0152	120	236	
3	41	M	Nonfed	82	0.0503	34	0.0323	120	236	
3	42		Nonfed	82	0.0322	40	0.0178			

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	43		Nonfed	82	0.0235					Y
3	44	F	Nonfed	82	0.0378	34	0.0207	120	236	
3	45	F	Nonfed	82	0.0518	24	0.0321	130	236	
3	46	F	Nonfed	86	0.0551	36	0.0281	114	236	
3	47		Nonfed	86	0.0449					Y
3	48	M	Nonfed	86	0.0523	30	0.0316	120	236	
3	49	M	Nonfed	86	0.063	36	0.0399			
3	50		Nonfed	86	0.0535					Y
3	51	F	Nonfed	90	0.0686	32	0.0375	114	236	
3	52	F	Nonfed	90	0.0595	38	0.0332	108	236	
3	53	M	Nonfed	90	0.0585	32	0.0337	114	236	
3	54	F	Nonfed	90	0.0605	32	0.0366	114	236	
3	55	M	Nonfed	90	0.0581	32	0.0358	126	248	
3	56	M	Nonfed	94	0.0645	28	0.0367	114	236	
3	57	M	Nonfed	94	0.0654	28	0.0401	114	236	
3	58	M	Nonfed	94	0.0697	28	0.0445	114	236	
3	59	M	Nonfed	94	0.0648	28	0.0443	114	236	
3	60	F	Nonfed	94	0.0648	34	0.0366	108	236	
3	61	M	Nonfed	98	0.058	30	0.0352	108	236	
3	62	M	Nonfed	98	0.073	24	0.0487	114	236	
3	63	M	Nonfed	98	0.0526	30	0.0316	108	236	
3	64	F	Nonfed	98	0.0645	30	0.0446	108	236	
3	65	F	Nonfed	98	0.0713	30	0.0447	108	236	
3	66	F	Nonfed	102	0.0749	32	0.0487	114	248	
3	67		Nonfed	102	0.0679					Y
3	68		Nonfed	102	0.0725					Y
3	69	F	Nonfed	102	0.0675	26	0.0504	108	236	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
3	70	M	Nonfed	102	0.0649	20	0.055	114	236	
3	71	M	Nonfed	106	0.0828	22	0.052	108	236	
3	72	F	Nonfed	106	0.0724	22	0.0489	108	236	
3	73	F	Nonfed	106	0.0684	22	0.047	108	236	
3	74	F	Nonfed	106	0.0766	22	0.0496	108	236	
3	75		Nonfed	106	0.0536	34	0.033			
3	76		Nonfed	110	0.0615					Y
3	77	F	Nonfed	110	0.0636	36	0.0424	114	260	
3	78	M	Nonfed	110	0.0685	36	0.0467	114	260	
3	79	M	Nonfed	110	0.0606	18	0.0489	108	236	
3	80	M	Nonfed	110	0.0536	18	0.0413	108	236	
3	81		Nonfed	116	0.052	30	0.0486			
3	82	M	Nonfed	116	0.0588	30	0.0461	114	260	
3	83		Nonfed	116	0.0573	36	0.0491			
3	84	F	Nonfed	116	0.0618	30	0.0548	114	260	
3	85	F	Nonfed	116	0.0714	36	0.0549	108	260	
4	1	F	Fed	72	0.0143	60	0.0104	90	222	
4	2	F	Fed	72	0.026	60	0.0093	90	222	
4	3		Fed	72	0.0134					Y
4	4		Fed	72	0.0067					
4	5		Fed	72	0.0122					Y
4	6		Fed	74	0.0091					
4	7		Fed	74	0.0132					Y
4	8		Fed	74	0.0149					
4	9		Fed	74	0.0125					
4	10		Fed	74	0.013					
4	11	M	Fed	76	0.0186	56	0.0175	90	222	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	12	F	Fed	76	0.0219	56	0.0238	90	222	
4	13	F	Fed	76	0.0373	56	0.0203	90	222	
4	14		Fed	76	0.0207					
4	15	F	Fed	76	0.0203	56	0.0176	90	222	
4	16	F	Fed	78	0.0252	54	0.0116	90	222	
4	17	F	Fed	78	0.0279	54	0.0118	90	222	
4	18	M	Fed	78	0.0221	54	0.0124	90	222	
4	19	F	Fed	78	0.0215	54	0.0168	90	222	
4	20		Fed	78	0.0132					
4	21		Fed	80	0.0209	52				
4	22	M	Fed	80	0.0179	52	0.0145	90	222	
4	23		Fed	80	0.0292					Y
4	24	F	Fed	80	0.0274	52	0.0134	90	222	
4	25		Fed	80	0.0202	52				
4	26	F	Fed	82	0.0312	50	0.0233	90	222	
4	27	F	Fed	82	0.0343	50	0.0287	90	222	
4	28	F	Fed	82	0.0277	50	0.0297	90	222	
4	29		Fed	82	0.0301					
4	30	F	Fed	82	0.0253	50	0.0161	90	222	
4	31	F	Fed	84	0.0216	48	0.0143	90	222	
4	32	F	Fed	84	0.0272	48	0.0118	90	222	
4	33	F	Fed	84	0.0297	48	0.0224	90	222	
4	34	M	Fed	84	0.0443	48	0.0219	90	222	
4	35	M	Fed	84	0.021	48	0.0149	90	222	
4	36	M	Fed	86	0.0285	46	0.0185	90	222	
4	37	M	Fed	86	0.0175	40	0.0221	96	222	
4	38		Fed	86	0.0293					Y

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	39	M	Fed	86	0.0133	58	0.0093			
4	40	M	Fed	86	0.0301	46	0.0245	90	222	
4	41	M	Fed	88	0.0335	38	0.0256	96	222	
4	42		Fed	88	0.0383					Y
4	43	F	Fed	88	0.0276	44	0.0216	90	222	
4	44		Fed	88	0.0253					Y
4	45	F	Fed	88	0.0242	44	0.018	102	234	
4	46	M	Fed	90	0.032	42	0.0294	102	234	
4	47	F	Fed	90	0.0195	54	0.0293	102	246	
4	48	F	Fed	90	0.0219	42	0.0238	90	222	
4	49		Fed	90	0.0251					Y
4	50	M	Fed	90	0.0176	54	0.0223	114	258	
4	51	M	Fed	92	0.0361	46	0.0294	96	234	
4	52	F	Fed	92	0.0346	46	0.0261	96	234	
4	53	F	Fed	92	0.0241	46	0.0247	96	234	
4	54	M	Fed	92	0.0187	40	0.0182	90	222	
4	55	F	Fed	92	0.0226	52	0.0226	102	246	
4	56	M	Fed	94	0.0204	44	0.0258	96	234	
4	57	M	Fed	94	0.0203	44	0.0311	96	234	
4	58	F	Fed	94	0.0336	50	0.0315	102	246	
4	59	M	Fed	94	0.0382	44	0.0264	96	234	
4	60	F	Fed	94	0.032	50	0.0274	102	246	
4	61	F	Fed	96	0.0418	66	0.0373	96	258	
4	62	F	Fed	96	0.033	72	0.0428	102	270	
4	63	F	Fed	96	0.039	48	0.029	102	246	
4	64	F	Fed	96	0.0394	54	0.0343	96	246	
4	65	F	Fed	96	0.0285	48	0.0325	102	246	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	66	M	Fed	102	0.0471	66	0.0309	114	282	
4	67	M	Fed	102	0.046	42	0.0295	102	246	
4	68		Fed	102	0.0408	36	0.0284			
4	69	F	Fed	102	0.0466	42	0.0298	102	246	
4	70	F	Fed	102	0.04	42	0.0294	102	246	
4	71	M	Fed	108	0.0449	36	0.0326			
4	72	M	Fed	108	0.0474	30	0.0323	108	246	
4	73	M	Fed	108	0.0458	36	0.0341	114	258	
4	74	M	Fed	108	0.0401	54	0.0314	96	258	
4	75		Fed	108	0.0464					
4	76	F	Fed	114	0.0499	30	0.0358	114	258	
4	77		Fed	114	0.0594					Y
4	78	M	Fed	114	0.0431	30	0.0356	114	258	
4	79	M	Fed	114	0.0339	30	0.0327	114	258	
4	80	F	Fed	114	0.0402	36	0.036	108	258	
4	81	M	Fed	120	0.0545	30	0.0471	108	258	
4	82	F	Fed	120	0.0453	42	0.0391	96	258	
4	83	M	Fed	120	0.0523	30	0.0388	108	258	
4	84	F	Fed	120	0.0456	30	0.0356	108	258	
4	85	M	Fed	120	0.054	24	0.0413	114	258	
4	86	M	Mass-Rear	144			0.0403	114	258	
4	87	M	Mass-Rear	144			0.0388	114	258	
4	88	M	Mass-Rear	144			0.0396	114	258	
4	89	M	Mass-Rear	144			0.0385	114	258	
4	90	M	Mass-Rear	144			0.0372	114	258	
4	1		Nonfed	72	0.0075					
4	2		Nonfed	72	0.0131					

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	3		Nonfed	72	0.0137					
4	4		Nonfed	72	0.0134					
4	5		Nonfed	72	0.0123					
4	6		Nonfed	74	0.0102					
4	7		Nonfed	74	0.0215					
4	8		Nonfed	74	0.0146					
4	9		Nonfed	74	0.0152					
4	10		Nonfed	74	0.0138					
4	11		Nonfed	76	0.0235					
4	12		Nonfed	76	0.0285					
4	13		Nonfed	76	0.0122					
4	14		Nonfed	76	0.0155					
4	15		Nonfed	76	0.023					Y
4	16		Nonfed	78	0.0192					
4	17		Nonfed	78	0.0248					
4	18		Nonfed	78	0.0264					
4	19		Nonfed	78	0.0246					
4	20		Nonfed	78	0.016					
4	21	M	Nonfed	80	0.0199	52	0.0089	90	222	
4	22		Nonfed	80	0.0228					
4	23	M	Nonfed	80	0.029	52	0.0139	90	222	
4	24	M	Nonfed	80	0.0351	52	0.0155	90	222	
4	25	F	Nonfed	80	0.0299	52	0.0136	90	222	
4	26		Nonfed	82	0.0186					
4	27		Nonfed	82	0.0141					
4	28	M	Nonfed	82	0.0332	50	0.0153	90	222	
4	29	F	Nonfed	82	0.0273	50	0.0116	90	222	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	30		Nonfed	82	0.0186					
4	31		Nonfed	84	0.0274	48	0.01			
4	32		Nonfed	84	0.0188					
4	33	M	Nonfed	84	0.0458	48	0.0192	90	222	
4	34	M	Nonfed	84	0.0292	48	0.0116	90	222	
4	35		Nonfed	84	0.0243	48	0.0084			
4	36	M	Nonfed	86	0.0251	46	0.0093	102	234	
4	37	F	Nonfed	86	0.0313	46	0.0132	90	222	
4	38		Nonfed	86	0.0262	46	0.0083			
4	39	F	Nonfed	86	0.0271	46	0.0097	90	222	
4	40		Nonfed	86	0.0152					
4	41		Nonfed	88	0.0272					
4	42	F	Nonfed	88	0.0224	44	0.0101	90	222	
4	43	F	Nonfed	88	0.0342	44	0.0175	90	222	
4	44		Nonfed	88	0.0161					Y
4	45		Nonfed	88	0.0121					
4	46	M	Nonfed	90	0.0226	42	0.0086	102	234	
4	47	F	Nonfed	90	0.0261	42	0.0117	90	222	
4	48	M	Nonfed	90	0.0353	42	0.0192	90	222	
4	49	F	Nonfed	90	0.0271	42	0.0109	102	234	
4	50	M	Nonfed	90	0.0284	42	0.011	90	222	
4	51	M	Nonfed	92	0.0391	40	0.0229	90	222	
4	52	F	Nonfed	92	0.0428	40	0.0214	90	222	
4	53		Nonfed	92	0.0269					Y
4	54	F	Nonfed	92	0.0335	40	0.0195	90	222	
4	55		Nonfed	92	0.0218	40	0.0081			
4	56	M	Nonfed	94	0.0404	38	0.0253	102	234	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	57	M	Nonfed	94	0.0347	38	0.0226	90	222	
4	58	M	Nonfed	94	0.0274	50	0.0144	102	246	
4	59		Nonfed	94	0.0201	38	0.0115			
4	60	M	Nonfed	94	0.0205	38	0.0101	102	234	
4	61		Nonfed	96	0.0391					Y
4	62	M	Nonfed	96	0.042	42	0.0212	96	234	
4	63	F	Nonfed	96	0.0162	42	0.025	96	234	
4	64	F	Nonfed	96	0.0426	42	0.0246	96	234	
4	65	M	Nonfed	96	0.0377	30	0.0202	108	234	
4	66	F	Nonfed	102	0.0544	48	0.0273	96	246	
4	67	M	Nonfed	102	0.0463	30	0.0298	90	222	
4	68	M	Nonfed	102	0.0435	42	0.0241	102	246	
4	69	F	Nonfed	102	0.0388	30	0.0226	90	222	
4	70	M	Nonfed	102	0.0304	30	0.0165	102	234	
4	71	M	Nonfed	108	0.0556	36	0.0299	114	258	
4	72	F	Nonfed	108	0.0551	36	0.03	102	246	
4	73		Nonfed	108	0.0459					Y
4	74	M	Nonfed	108	0.0592	36	0.0348	114	258	
4	75	M	Nonfed	108	0.0506	30	0.0313	108	246	
4	76	M	Nonfed	114	0.0602	30	0.0345	114	258	
4	77	M	Nonfed	114	0.0548	30	0.0355	102	246	
4	78	F	Nonfed	114	0.0473	30	0.0334	114	258	
4	79	M	Nonfed	114	0.0483	36	0.0321	108	258	
4	80	F	Nonfed	114	0.0493	30	0.0363	114	258	
4	81	F	Nonfed	120	0.0452	24	0.0322	114	258	
4	82	F	Nonfed	120	0.0538	30	0.0361	108	258	
4	83	M	Nonfed	120	0.0472	30	0.0325	108	258	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
4	84	M	Nonfed	120	0.0551	30	0.0365	108	258	
4	85	F	Nonfed	120	0.0544	24	0.039	102	246	
5	1		Fed	72	0.0114					
5	2		Fed	72	0.0169					
5	3		Fed	72	0.0158					
5	4		Fed	72	0.0101					Y
5	5		Fed	72	0.0113					
5	6		Fed	74	0.0093					Y
5	7		Fed	74	0.0151					
5	8	M	Fed	74	0.0136	58	0.0185	90	222	
5	9	M	Fed	74	0.013	58	0.0172	90	222	
5	10		Fed	74	0.0097					Y
5	11	F	Fed	76	0.0173	56	0.0212	90	222	
5	12		Fed	76	0.0147					Y
5	13		Fed	76	0.0131					Y
5	14		Fed	76	0.015					Y
5	15	F	Fed	76	0.025	56	0.014	90	222	
5	16	M	Fed	78	0.0147	54	0.0156	90	222	
5	17		Fed	78	0.0179					Y
5	18		Fed	78	0.0105					
5	19		Fed	78	0.0195					Y
5	20		Fed	78	0.014					Y
5	21		Fed	80	0.0179					
5	22	M	Fed	80	0.017	52	0.0109	90	222	
5	23		Fed	80	0.0143					Y
5	24		Fed	80	0.0104					
5	25		Fed	80	0.0109					

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	26		Fed	82	0.0152					Y
5	27	F	Fed	82	0.027	50	0.0198	90	222	
5	28		Fed	82	0.0173					Y
5	29		Fed	82	0.0127					Y
5	30		Fed	82	0.0092					
5	31	F	Fed	84	0.0187	48	0.0137	102	234	
5	32		Fed	84	0.0144					Y
5	33	F	Fed	84	0.0198	48	0.0147	102	234	
5	34		Fed	84	0.011					
5	35		Fed	84	0.0103					
5	36		Fed	86	0.0162					Y
5	37		Fed	86	0.02					Y
5	38	F	Fed	86	0.0138	52	0.0121	96	234	
5	39		Fed	86	0.0143					Y
5	40		Fed	86	0.0117					
5	41		Fed	88	0.0213	44	0.0143			
5	42	F	Fed	88	0.0125	44	0.0145	102	234	
5	43		Fed	88	0.0262					Y
5	44		Fed	88	0.0101					
5	45		Fed	88	0.008					Y
5	46		Fed	90	0.0239					Y
5	47	M	Fed	90	0.0225	42	0.0182	102	234	
5	48		Fed	90	0.0161					Y
5	49		Fed	90	0.0185					Y
5	50		Fed	90	0.0151					Y
5	51		Fed	92	0.0182					Y
5	52	M	Fed	92	0.0194	40	0.0168	102	234	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	53	F	Fed	92	0.0223	46	0.0248	108	246	
5	54		Fed	92	0.02					Y
5	55		Fed	92	0.0169					Y
5	56	F	Fed	94	0.0356	44	0.0354	108	246	
5	57	M	Fed	94	0.0162	44	0.0182	108	246	
5	58		Fed	94	0.0167					Y
5	59	M	Fed	94	0.0143	50	0.0212	102	246	
5	60		Fed	94	0.0233					Y
5	61	F	Fed	96	0.0411	44	0.0361	120	258	
5	62	F	Fed	96	0.0175	48	0.0167	102	246	
5	63	M	Fed	96	0.0248	42	0.0265	108	246	
5	64		Fed	96	0.0278					Y
5	65		Fed	96	0.0329					Y
5	66	F	Fed	102	0.0308	42	0.0202	96	234	
5	67		Fed	102	0.0256					Y
5	68	F	Fed	102	0.0384	36	0.0252	108	246	
5	69		Fed	102	0.042					
5	70		Fed	102	0.0309					Y
5	71		Fed	108	0.0462					Y
5	72		Fed	108	0.0398					Y
5	73		Fed	108	0.0372					Y
5	74		Fed	108	0.0395					Y
5	75	M	Fed	108	0.0287	36	0.0263	114	258	
5	76	F	Fed	114	0.0637	30	0.0392	102	246	
5	77		Fed	114	0.0339					Y
5	78		Fed	114	0.0409					Y
5	79	M	Fed	114	0.0359	36	0.0234	108	258	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	80		Fed	114	0.0574					Y
5	81	M	Fed	120	0.0394	48	0.0311	90	258	
5	82	F	Fed	120	0.0625	48	0.0529	102	270	
5	83	M	Fed	120	0.0466	24	0.0315	102	246	
5	84		Fed	120	0.051					Y
5	85	M	Fed	120	0.0413	30	0.036	108	258	
5	86	M	Mass-Rear	150			0.0473	108	258	
5	87	M	Mass-Rear	150			0.0416	108	258	
5	88	M	Mass-Rear	150			0.0473	108	258	
5	89	M	Mass-Rear	150			0.0424	108	258	
5	90	M	Mass-Rear	150			0.0485	108	258	
5	1		Nonfed	72	0.0073					
5	2		Nonfed	72	0.0127					
5	3		Nonfed	72	0.0098					
5	4		Nonfed	72	0.0116					
5	5		Nonfed	72	0.0163					
5	6		Nonfed	74	0.0117					
5	7		Nonfed	74	0.007					
5	8		Nonfed	74	0.0089					
5	9		Nonfed	74	0.0124					
5	10		Nonfed	74	0.0104					
5	11		Nonfed	76	0.0221					Y
5	12		Nonfed	76	0.0254					Y
5	13		Nonfed	76	0.021					Y
5	14		Nonfed	76	0.0142					Y
5	15		Nonfed	76	0.0113					
5	16		Nonfed	78	0.0177					

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	17		Nonfed	78	0.0079					
5	18		Nonfed	78	0.0174					
5	19		Nonfed	78	0.0108					
5	20		Nonfed	78	0.0102					
5	21		Nonfed	80	0.0175					
5	22		Nonfed	80	0.0121					Y
5	23		Nonfed	80	0.0091					
5	24		Nonfed	80	0.0112					
5	25		Nonfed	80	0.0144					Y
5	26		Nonfed	82	0.0121					Y
5	27		Nonfed	82	0.0158					
5	28		Nonfed	82	0.0159					
5	29		Nonfed	82	0.0179					
5	30		Nonfed	82	0.0155					
5	31		Nonfed	84	0.013					
5	32		Nonfed	84	0.0148					
5	33		Nonfed	84	0.0216					
5	34		Nonfed	84	0.0171					
5	35		Nonfed	84	0.0127					
5	36		Nonfed	86	0.0167					
5	37	M	Nonfed	86	0.0285	52	0.0147	84	222	
5	38		Nonfed	86	0.0145					Y
5	39		Nonfed	86	0.0131					
5	40	M	Nonfed	86	0.0153	46	0.0082	90	222	
5	41	M	Nonfed	88	0.0185	44	0.0102	90	222	
5	42	F	Nonfed	88	0.0266	44	0.0144	90	222	
5	43	F	Nonfed	88	0.0227	44	0.0101	90	222	

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	44	F	Nonfed	88	0.02	50	0.0117	96	234	
5	45		Nonfed	88	0.0137					
5	46	F	Nonfed	90	0.0341	42	0.0196	90	222	
5	47		Nonfed	90	0.0145					
5	48		Nonfed	90	0.0133					
5	49	M	Nonfed	90	0.0248	42	0.0151	90	222	
5	50		Nonfed	90	0.0159					
5	51	M	Nonfed	92	0.0307	40	0.0155	90	222	
5	52		Nonfed	92	0.0313					
5	53	M	Nonfed	92	0.0299	46	0.0169	84	222	
5	54	M	Nonfed	92	0.0317	40	0.0195	90	222	
5	55		Nonfed	92	0.0151					
5	56	M	Nonfed	94	0.0386	38	0.0212	102	234	
5	57		Nonfed	94	0.0174	56	0.0078			
5	58	F	Nonfed	94	0.0201	38	0.0152	90	222	
5	59	M	Nonfed	94	0.0339	38	0.0197	90	222	
5	60	M	Nonfed	94	0.03	38	0.0176	102	234	
5	61	F	Nonfed	96	0.0347	36	0.0198	102	234	
5	62	M	Nonfed	96	0.0295	36	0.0173	102	234	
5	63		Nonfed	96	0.0304					Y
5	64		Nonfed	96	0.0178					
5	65	M	Nonfed	96	0.0265	36	0.0131	90	222	
5	66	M	Nonfed	102	0.0325	36	0.0172	96	234	
5	67	F	Nonfed	102	0.0415	36	0.0244	96	234	
5	68	M	Nonfed	102	0.0306	36	0.0151	96	234	
5	69		Nonfed	102	0.0371					Y
5	70		Nonfed	102	0.0561					Y

Trial	ID	Sex	Treatment	Age at Pull	Larval Mass (g)	Hours from Pull to Pupariation	Pupal Mass (g)	Pupal Duration (h)	Total Age (h)	Escaped
5	71	M	Nonfed	108	0.0577	30	0.032	96	234	
5	72	F	Nonfed	108	0.0338	30	0.0178	96	234	
5	73	M	Nonfed	108	0.049	30	0.027	108	246	
5	74	F	Nonfed	108	0.0456	30	0.0326	96	234	
5	75		Nonfed	108	0.027					Y
5	76		Nonfed	114	0.0229	30	0.0124			
5	77	F	Nonfed	114	0.0617	24	0.0378	108	246	
5	78	F	Nonfed	114	0.0575	30	0.0357	114	258	
5	79	F	Nonfed	114	0.0407	24	0.0245	120	258	
5	80	F	Nonfed	114	0.0392	24	0.0242	120	258	
5	81	M	Nonfed	120	0.0522	24	0.033	102	246	
5	82	F	Nonfed	120	0.0612	24	0.0406	114	258	
5	83	M	Nonfed	120	0.058	18	0.0369	120	258	
5	84	F	Nonfed	120	0.0629	24	0.038	114	258	
5	85		Nonfed	120	0.0533					Y

VITA

Name: Rachel Margaret Mohr

Address: Department of Entomology
Mail Stop 2475
Texas A&M University
College Station, TX, 77843-2475

Email Address: rmmohr@gmail.com

Education: B.S., Entomology, Texas A&M University, 2004
M.S., Entomology, University of California, Riverside, 2007
Ph.D., Entomology, Texas A&M University, 2012