

# Forensic Entomology Research on Guam

**Bohart, George E. and J. Linsley Gressitt 1951.** Filth-inhabiting Flies Of Guam. Bishop Museum Bulletin 254. 152 pages.

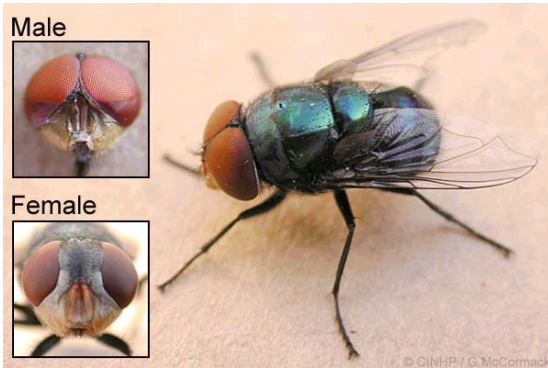
<http://hbs.bishopmuseum.org/pubs-online/pdf/bull204.pdf>

**Jenson, Lynda M. and Ross H. Miller 2001.** Estimating filth fly (Diptera: Calliphoridae) development in carrion in Guam. Micronesica 34(1) p. 11-25.

[http://www.wptrc.org/userfiles/file/jensen\\_miller.pdf](http://www.wptrc.org/userfiles/file/jensen_miller.pdf)

**Lopez, Joseph D. Sr., Ross H. Miller and Aubrey Moore [in preparation].** Decomposition of pigs on Guam.

# *Chrysomya megacephala* (Diptera: Calliphoridae) oriental latrine fly



*Chrysomya rufifacies* (Diptera: Calliphoridae)  
hairy maggot blow fly

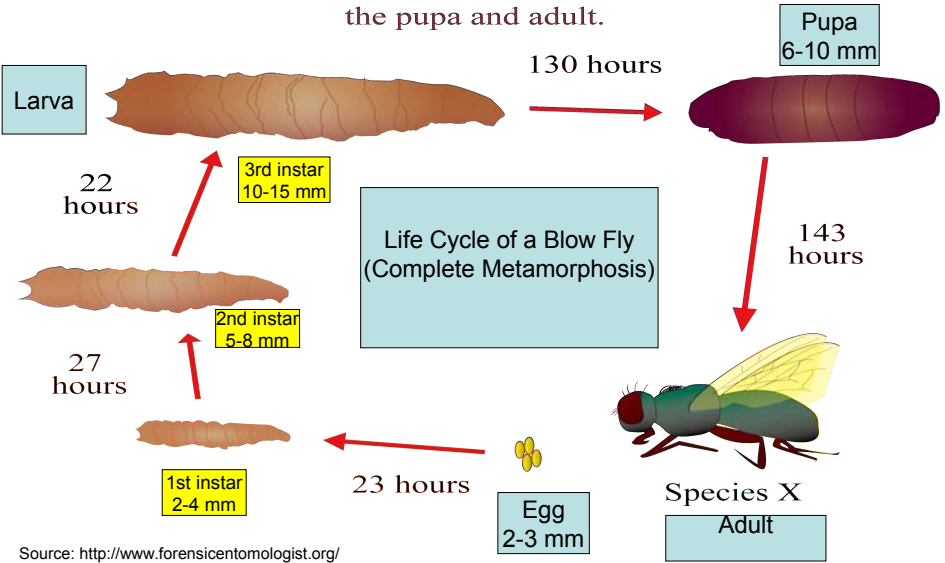


# *Sarcophaga dux* (Diptera: Sarcophagidae) miser flesh fly



NOT TO SCALE

The blow fly life cycle has six parts: the egg, three larval stages, the pupa and adult.

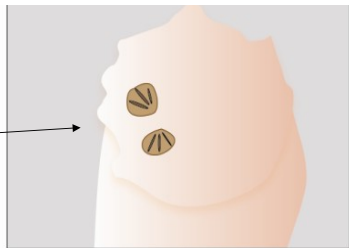


Source: <http://www.forensicentomologist.org/>

A maggot (larval stage)

Posterior blunt part (spiracles for breathing)

Anterior pointed part (mouth for eating)



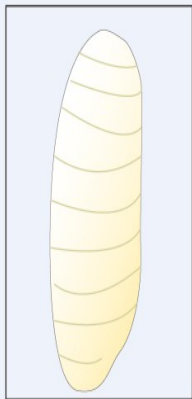
Two spiracles (each with 3 slits)  
→ 3rd instar

Remarks:

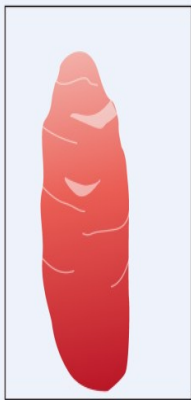
1st instar → 1 slit within each spiracle

2nd instar → 2 slits within each spiracle

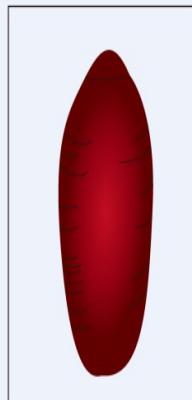
3rd instar → 3 slits within each spiracle



0 Hour Puparium



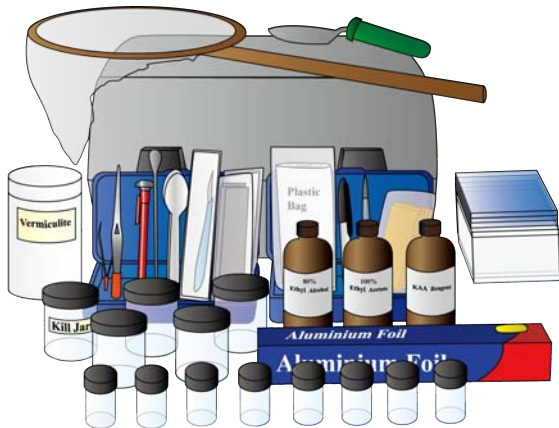
3 Hour Puparium



20 Hour Puparium

The puparial case is usually oval in shape and changes colour over time. The colour of the puparial case of different blow fly species varies.

# Forensic Entomology Kit



## Forensic Entomology Kit Contents:

- Butterfly Net, collapsible
- Specimen Bags
- Evidence Labels
- Plain Labels
- Kill Jar
- Forceps
- Thermometer
- Molded Paint Brush
- Spoonula (Stainless Steel)
- Plastic Spoons
- Disposable Scalpel
- Plastic Maggot Container
- Aluminium Foil
- 100% Ethyl Acetate
- 80% Ethyl Alcohol Solution
- Marker
- Plastic toolbox Case

Source: <http://store.sirchie.com/Search.aspx?k=Forensic+entomology+kit>

(SIRCHIE)



# PMI (Post Mortem Interval)

- PMI – the time elapsed since death
- PMI usually correlates with the age of the oldest immature blow fly stage developing on the corpse.
- Depending on the species of the blow flies and the environment such as ambient air temperature the development of the blow flies may take several weeks or months.

- A dead body is a rich source for carrion animals which include insects and other arthropods such as beetles.

# Effect of temperature on the rate of development of insects

- Insects (e.g. blow flies) are cold-blooded animals and their level of activity including the growth rate depends on the temperature of the surrounding environment.
- Insects require a certain amount of heat energy to develop from one stage in their life cycle to another stage.
- The heat energy is required for the enzyme-controlled biochemical reactions of insects

# Basic Assumptions in using ADH to calculate PMI

- Blow flies will lay eggs on the corpse as soon as they discover the dead body.
- Weather conditions (e.g. temperature) recorded at a site distant from the crime scene reflect the conditions at the crime scene.
- Surrounding air temperatures are the major factors affecting the rate of the development of the blow flies.

# Why do forensic entomologists need to collect and rear blow flies?

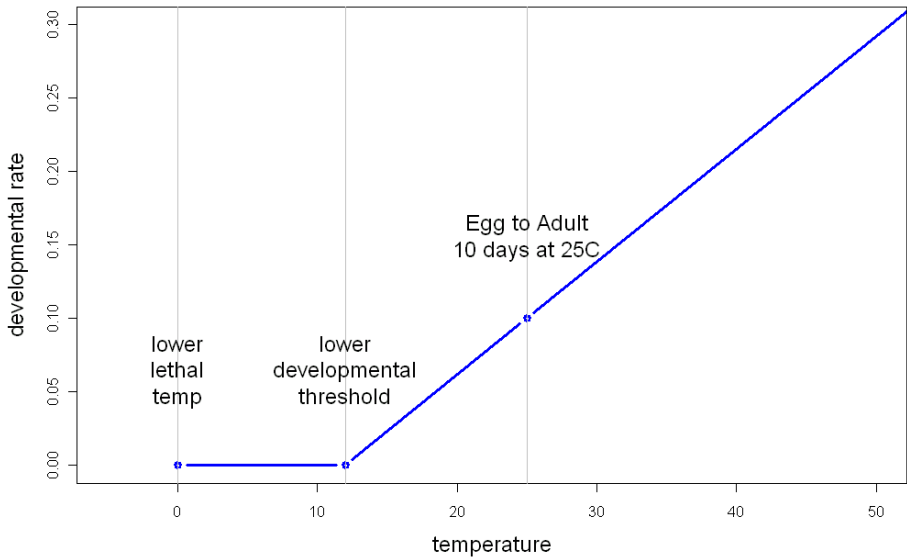
- A forensic entomologist will collect several specimens of blow fly species found at the crime scene for later identification at a laboratory because the larvae of many blow flies look much alike.
- The larvae will be raised in a temperature-controlled chamber until the flies emerged as adults (for the exact species identification)

# Many factors other than temp. may affect development of blow flies:

- Buried bodies
- Bodies found in enclosed spaces (e.g. a room, a wardrobe)
- Bodies exposed to sun
- Bodies in water
- Bodies in a car
- Bodies wrapped with a carpet, etc.

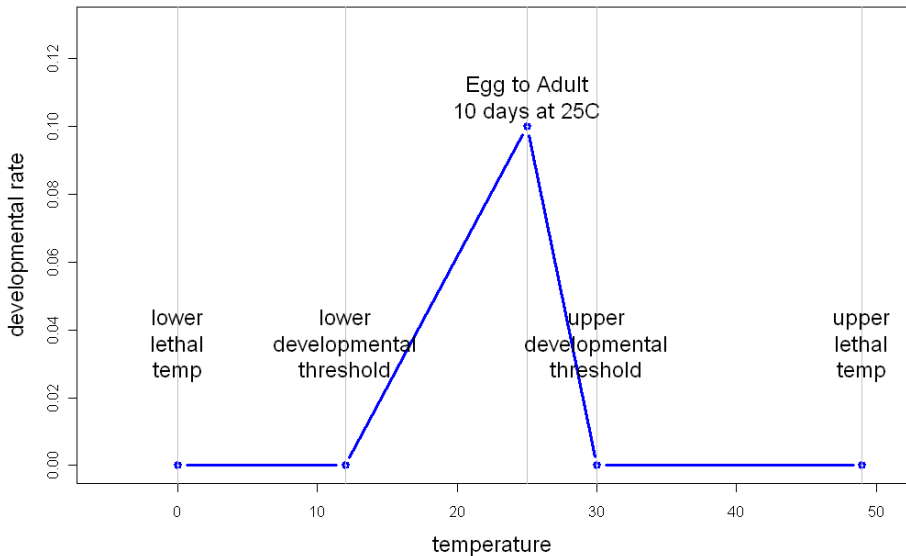
- Seasons
- Urban vs rural scenes

### Simple model for *Chrysomya* sp.





### Better model for Chrysomya sp.



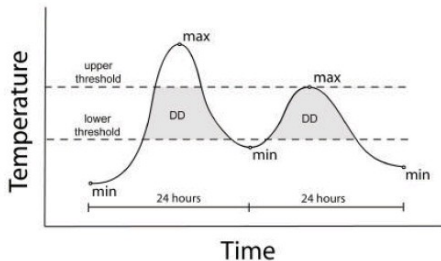
# From Reiter, C. and M. Grassberger 2002. Post-mortem interval estimation using insect development data. Proceedings of the First European Forensic Entomology Seminar

Proceedings of the First European Forensic Entomology Seminar

Post Mortem Interval Estimation

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Figure 4. Accumulated degree-days between lower and upper developmental threshold.  
When calculating degree-days in forensic cases, the upper developmental threshold can usually be ignored.



## Guam Antonio B. Won Pat International Airport (GUM) Temperature Chart

Guam GUM Airport Temperatures	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Guam - Maximum Celcius (°C)	29	29	30	31	31	31	30	30	30	30	30	29	30
Guam - Minimum Celcius (°C)	22	23	24	25	25	25	25	25	23	24	24	24	24



Fig 1, 0.05 days Post Mortem



Fig 2, 0.05 days Post Mortem



Fig 3, 0.06 days Post Mortem

Figure 7, Pigs 1, 2 & 3 first placed on surface 9, September 2010.



Pig 1, 3 days Post Mortem



Pig 2, 3 days Post Mortem



Pig 3, 3 days Post Mortem

Figure 8, Pigs 1, 2 & 3, 12, September 2010.



Pig 1, 5 days Post Mortem



Pig 2, 5 days Post Mortem



Pig 3, 5 days Post Mortem

Figure 9, Pigs 1, 2 & 3, 14, September 2010.



Pig 1, 14 days Post Mortem



Pig 2, 14 days Post Mortem

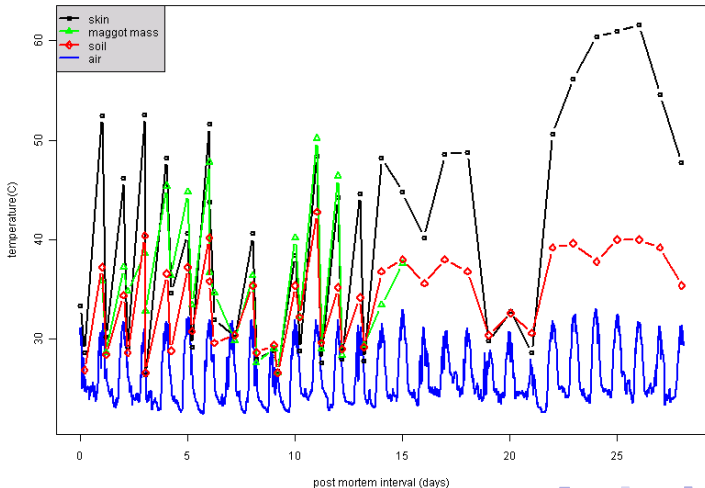


Pig 3, 14 days Post Mortem

Figure 10, Pigs 1, 2 & 3. 23, September 2010.

# Data from Lopez Pig Study

Pig 1





# Data from Lopez Pig Study

Fig 1 - first 10 days

