NC STATE UNIVERSITY

Forensic Entomology

Insects as Indicators of the Postmortem Interval

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Scope and Application

- Determination of the PMI
- Cause and manner of death
- Determination of death location
- Placement of body after death
- Criminal misuse of insects
- Abuse of children and elderly

Why is Entomological Evidence Important?

In cases +72 hours postmortem, entomological evidence is the most statistically significant item that can be used to establish a possible PMI.

Methods Used to Establish the PMI

Species succession:

The PMI is determined from the presence or absence of arthropod species on a corpse or in the surrounding environment.

One potential problem: This method is best suited for climates that are very stable in temperature (both day to day, and throughout the year).

Methods Used to Establish the PMI

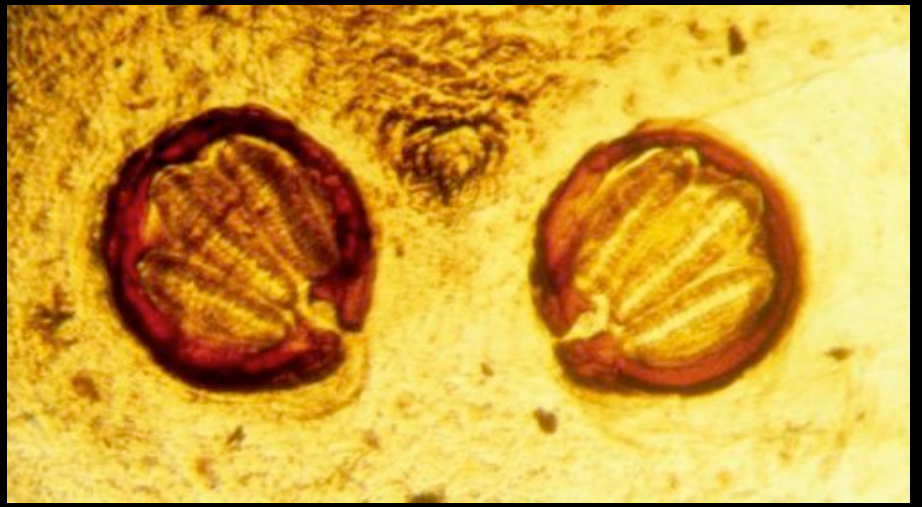
Species Succession

- Stage of the insect life cycle

Methods Used to Establish the PMI

Stage of the insect life cycle:

The PMI is determined from the life stage of particular insect species present. Typically used when hourly developmental data is not available.



Methods Used to Establish the PMI

Species Succession

- Stage of the insect life cycle
- Rate of development

Rate of Development

Length of Maggot

Rate of Development

Length of Maggot

Rate of Development

Size of Crop

Methods Used to Establish the PMI

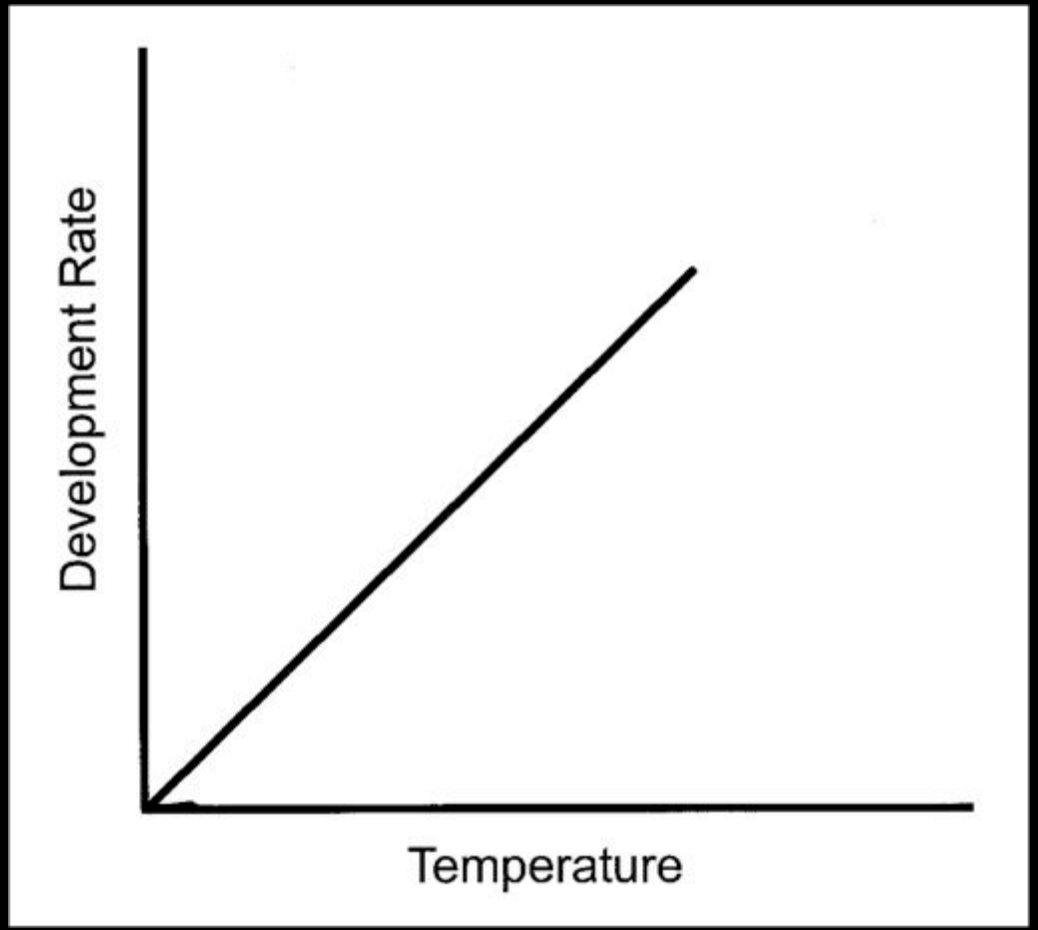
Species Succession

- Stage of the insect life cycle
- Banding of the cephaloskeleton
  - Not present in the larva of all species

Methods Used to Establish the PMI

Species Succession

- Stage of the insect life cycle
- Accumulated degree methodology
  - Can be in “days” or “hours” depending on your data

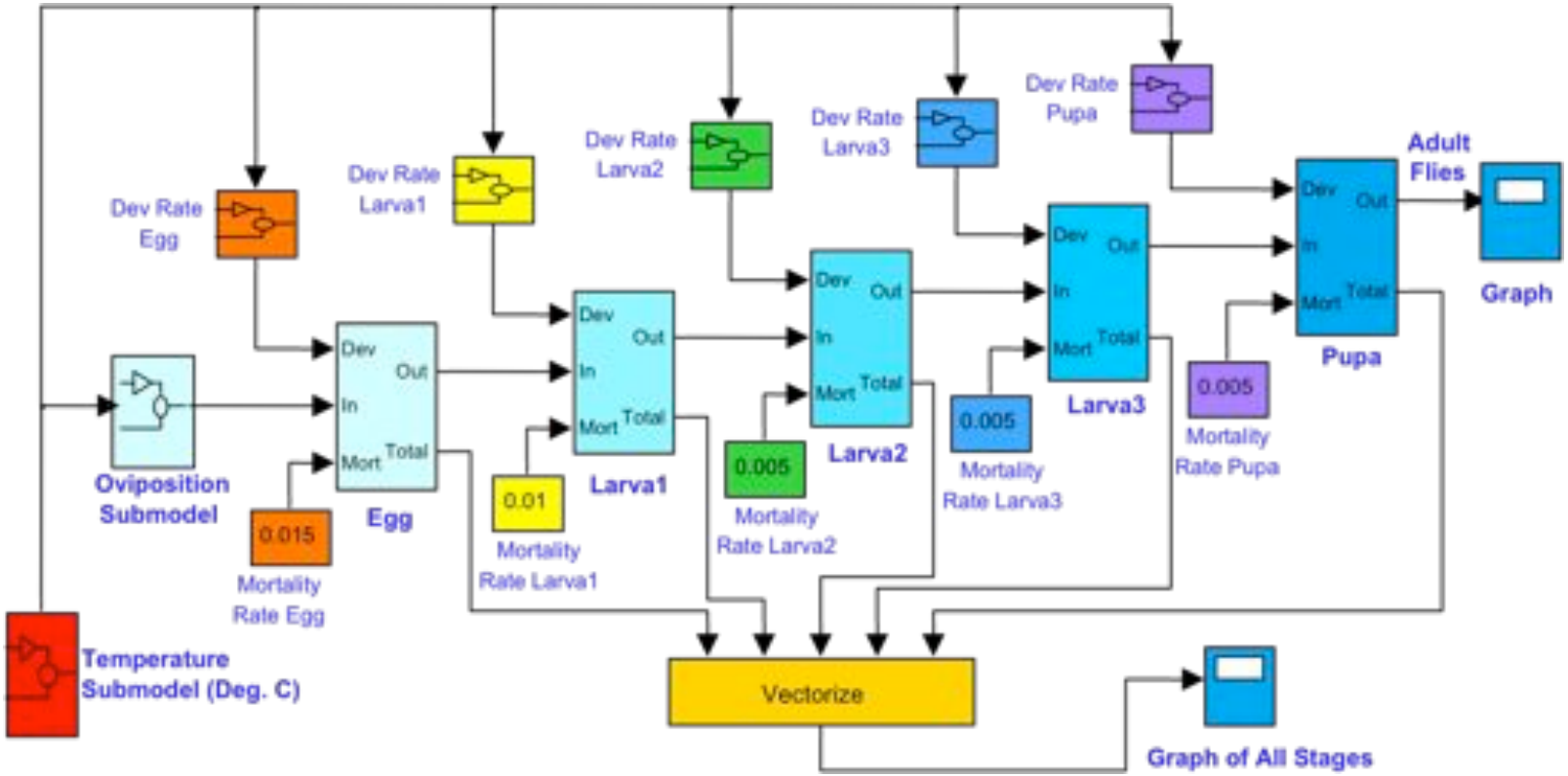

Development Rate
Temperature

Methods Used to Establish the PMI

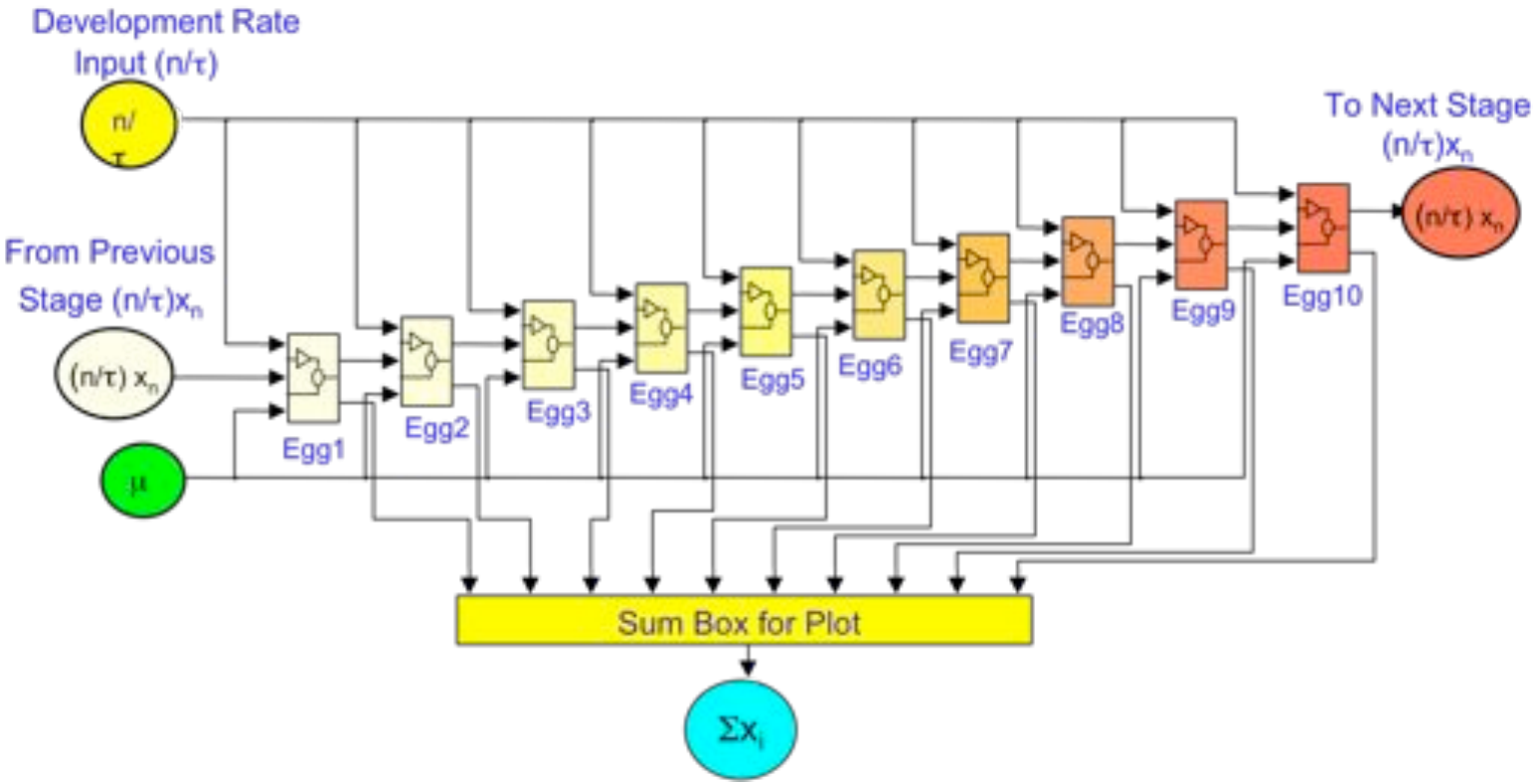
Species Succession

- Stage of the insect life cycle
- Accumulated degree methodology
- Computer modeling

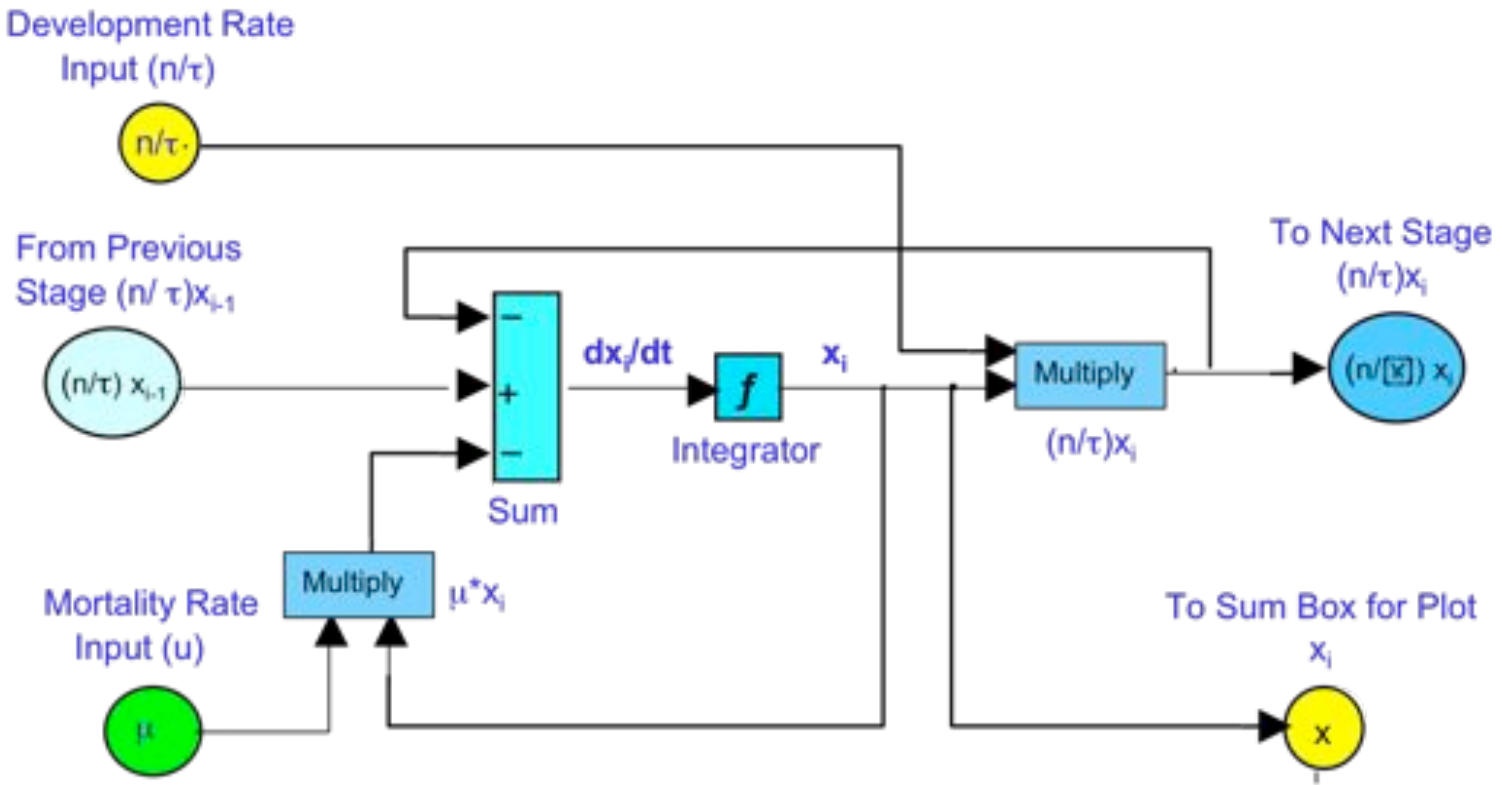
The Maggot Model



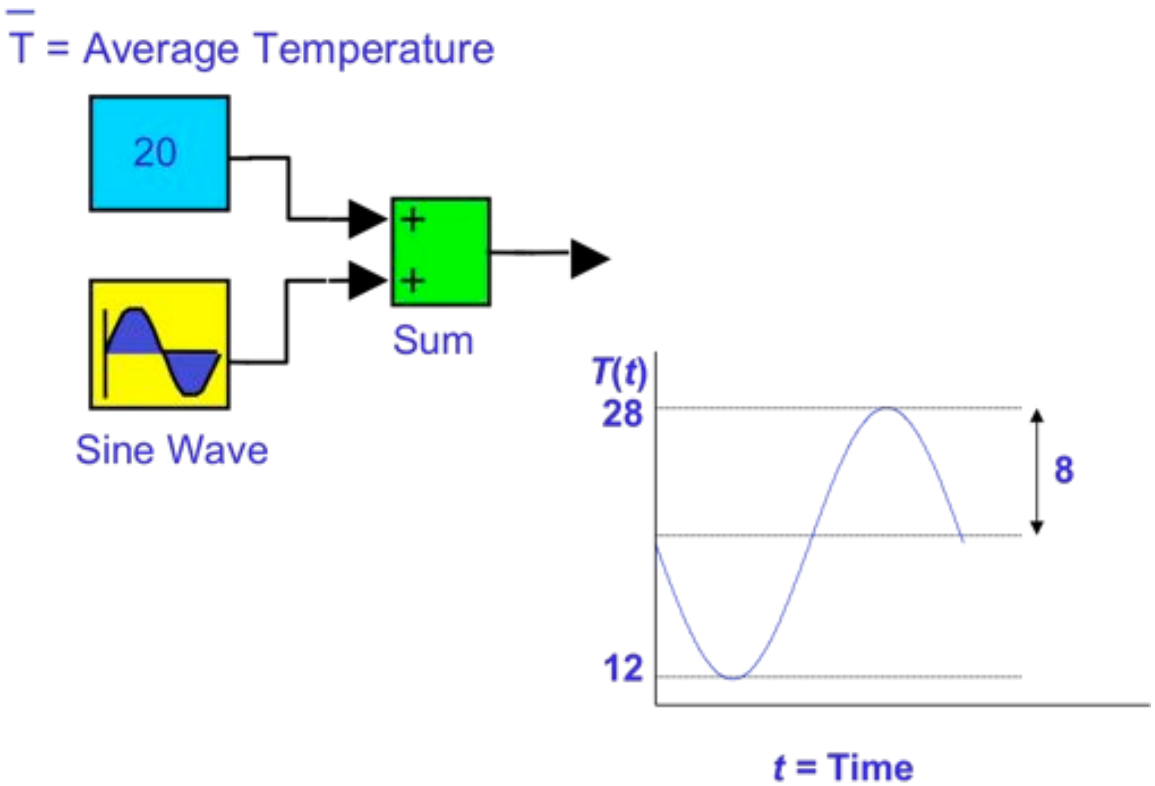
Distributed Dela Within a Lifestage



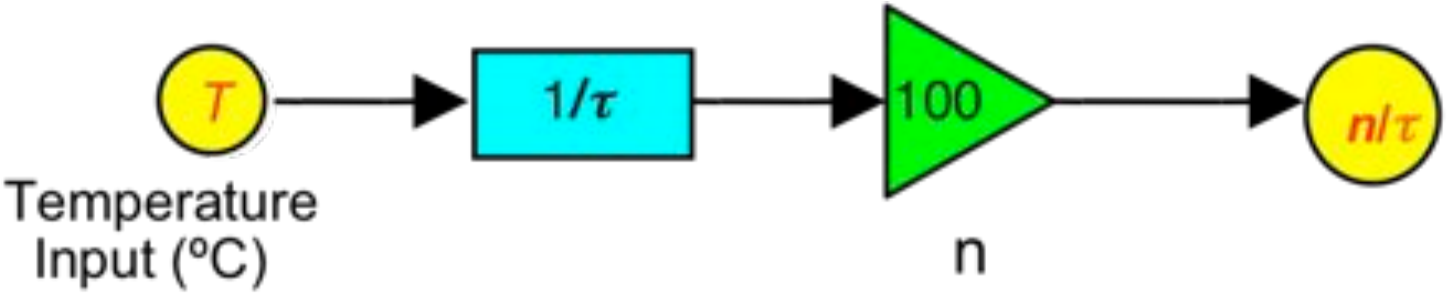
Single Developmental Substage



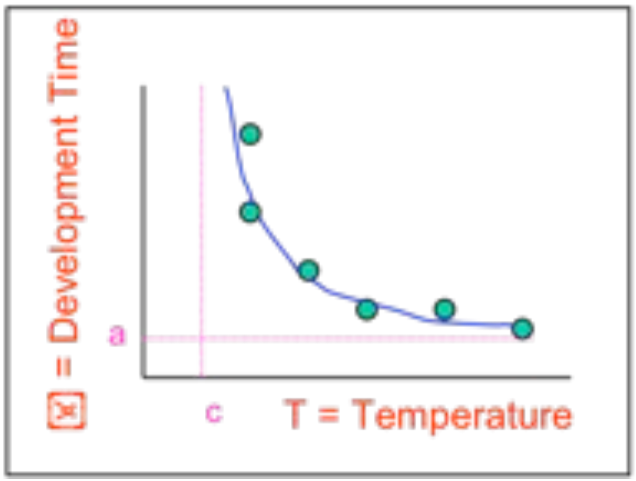
Temperature Submodel



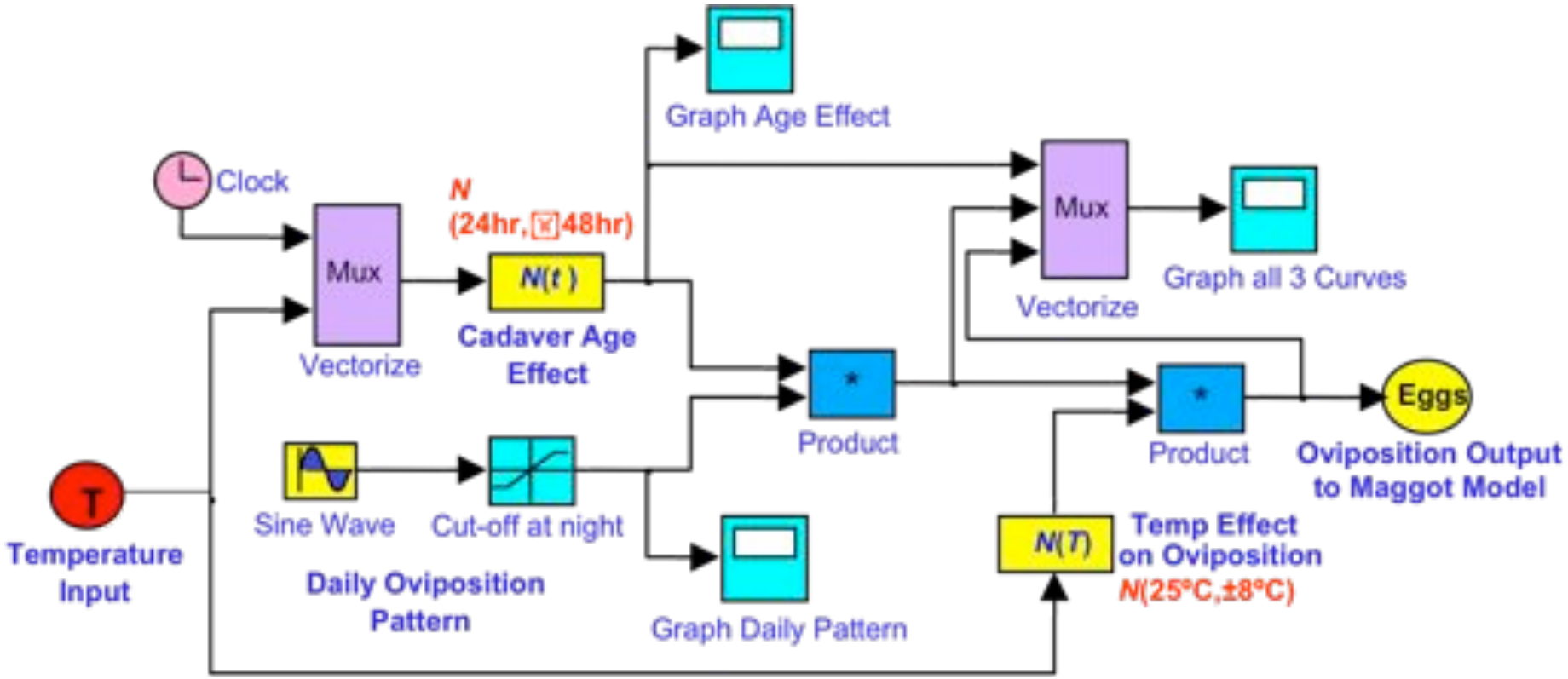
Development Rate Submodel (L_2)



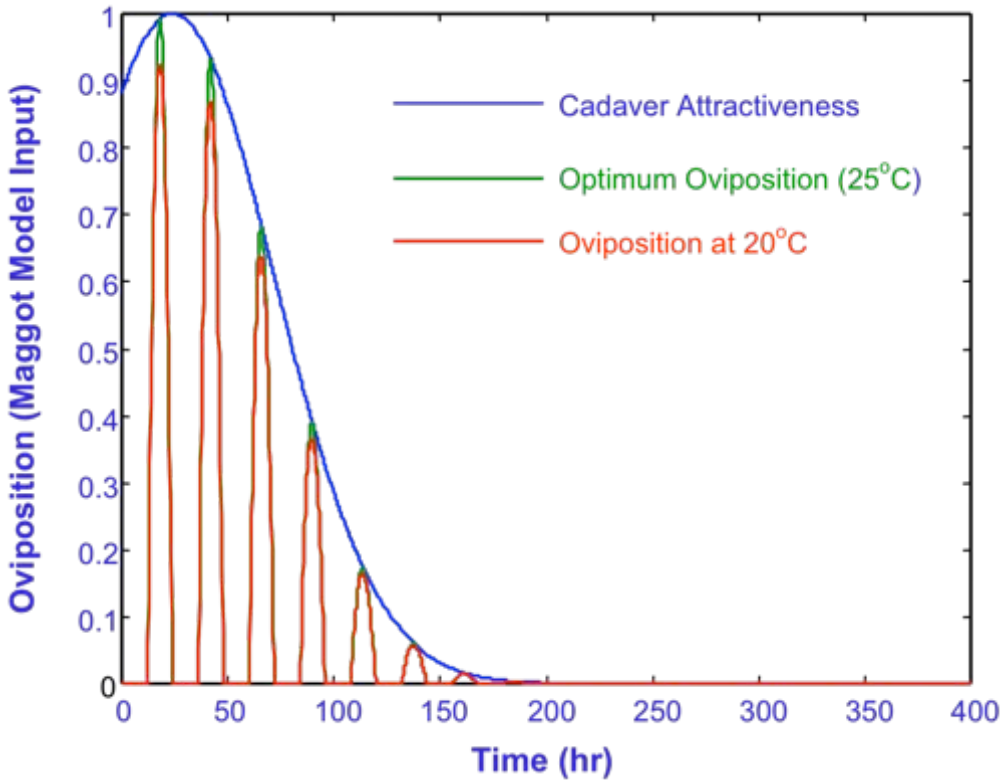
a = minimum time (16hr)
b = degree days (352)
c = temperature threshold 10°C



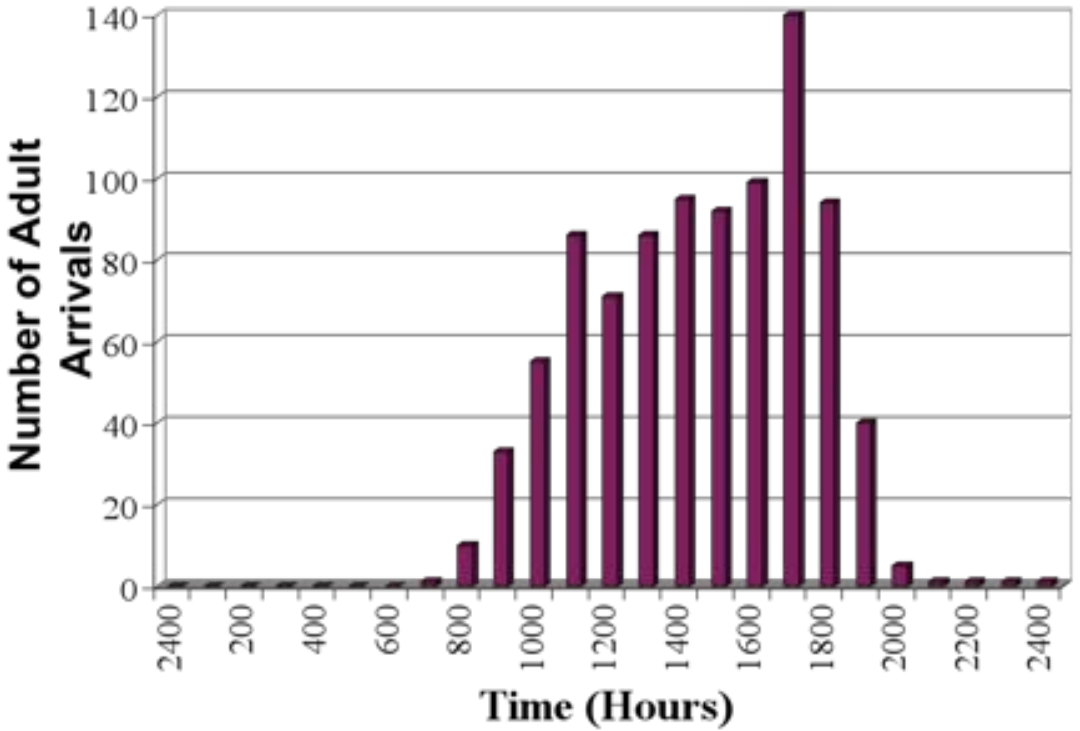
Oviposition Input Submodel



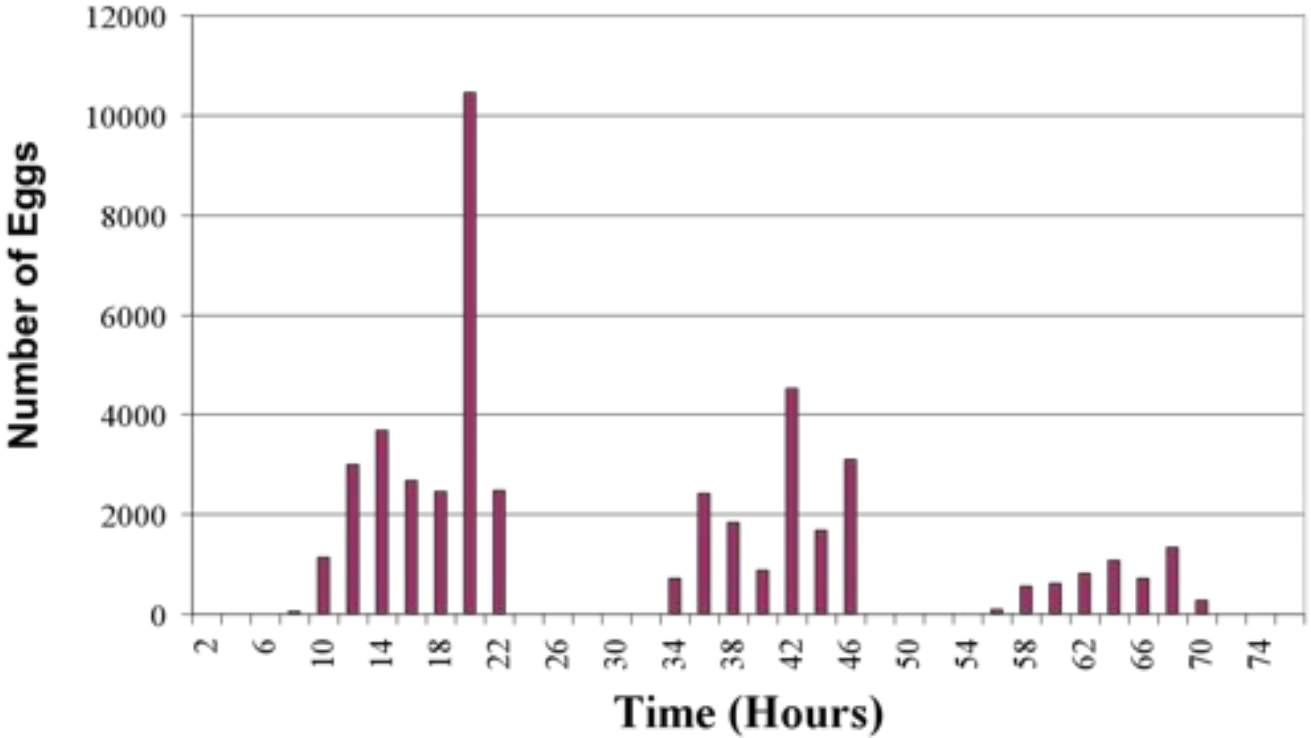
Oviposition Input Model

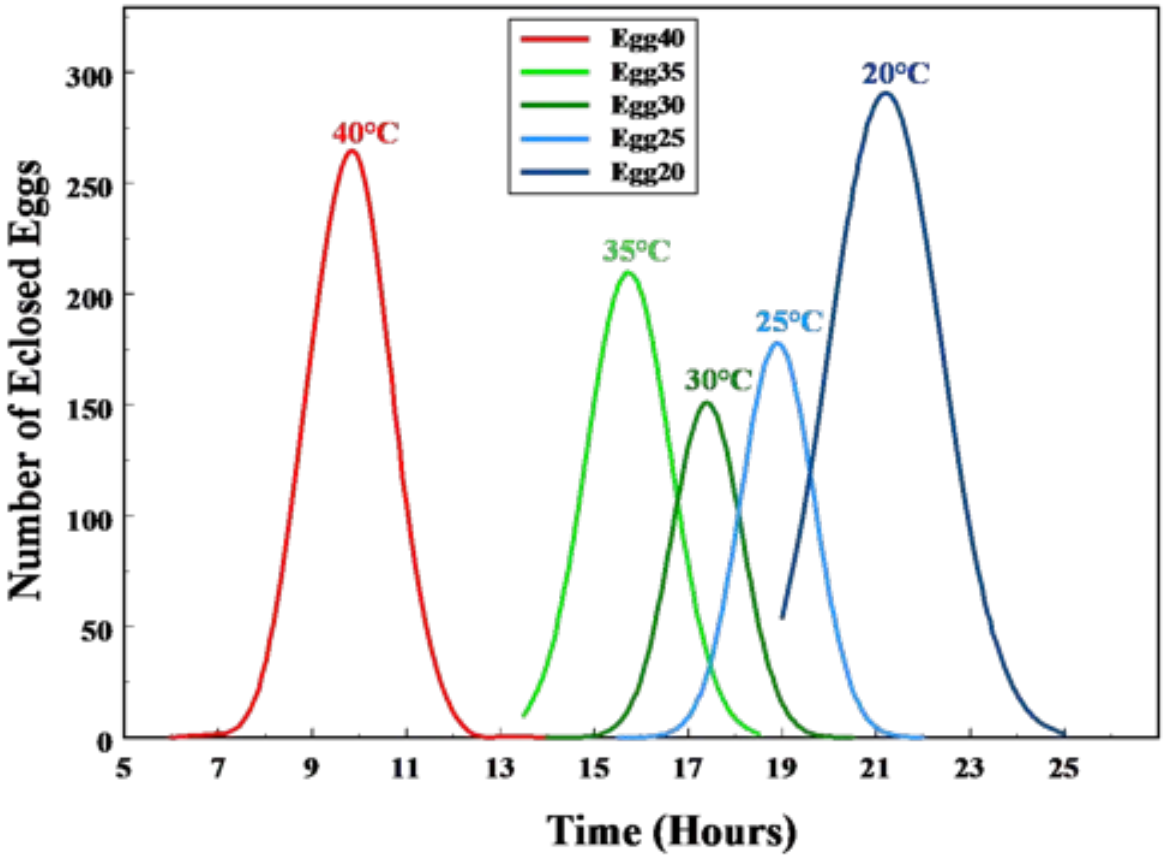


Adult Arrivals During Initial 24 Hours of Exposure

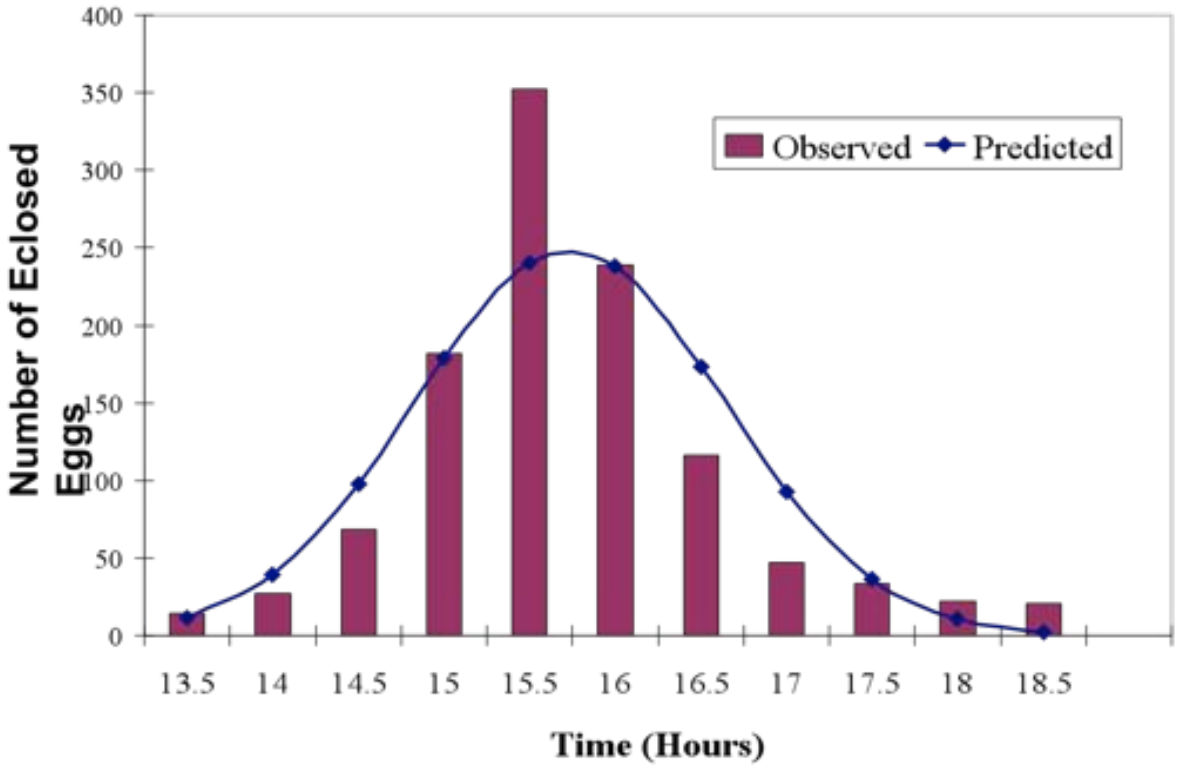


Oviposition Activity Over a Three Day PMI

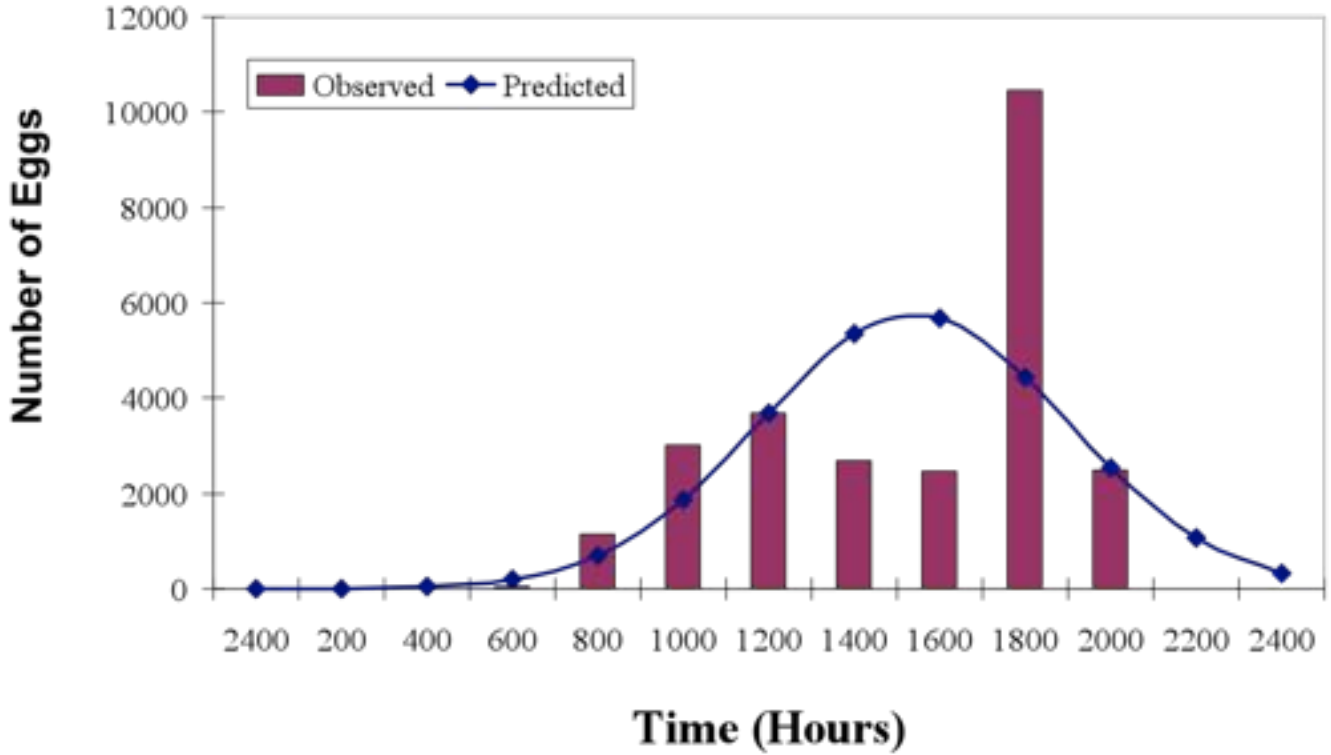



Egg40
Egg35
Egg30
Egg25
Egg20
40°C
35°C
30°C
25°C
20°C
Number of Eclosed Eggs
0
50
100
150
200
250
300
5
7
9
11
13
15
17
19
21
23
25
Time (Hours)

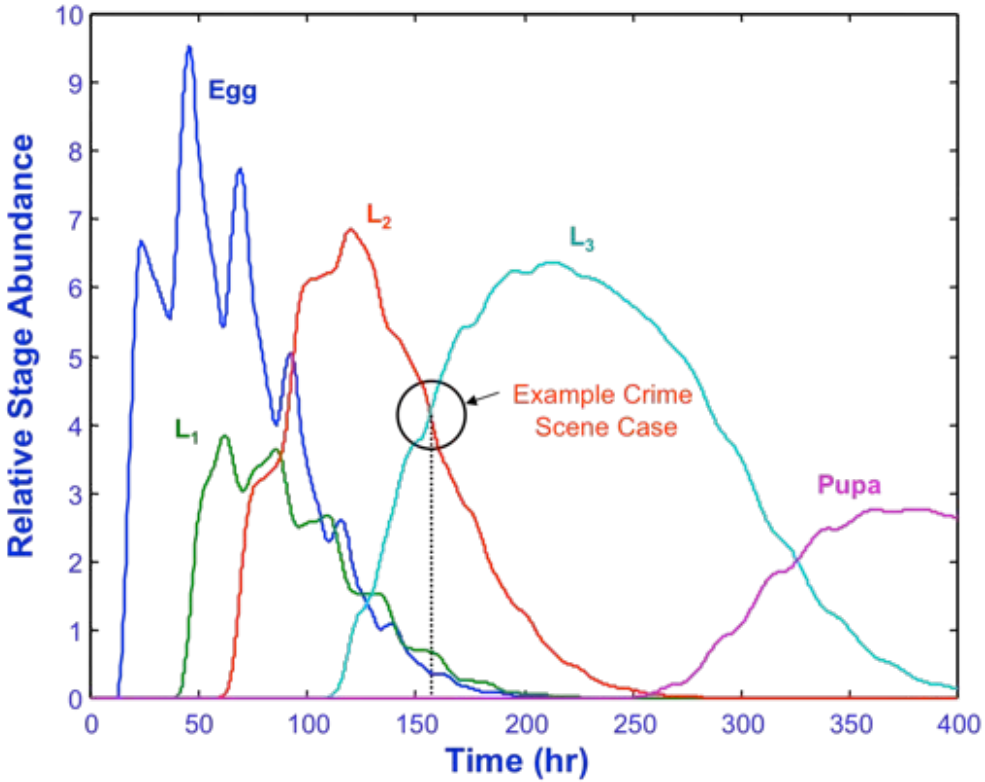
Phormia Regina Eggs Hatch at 35C



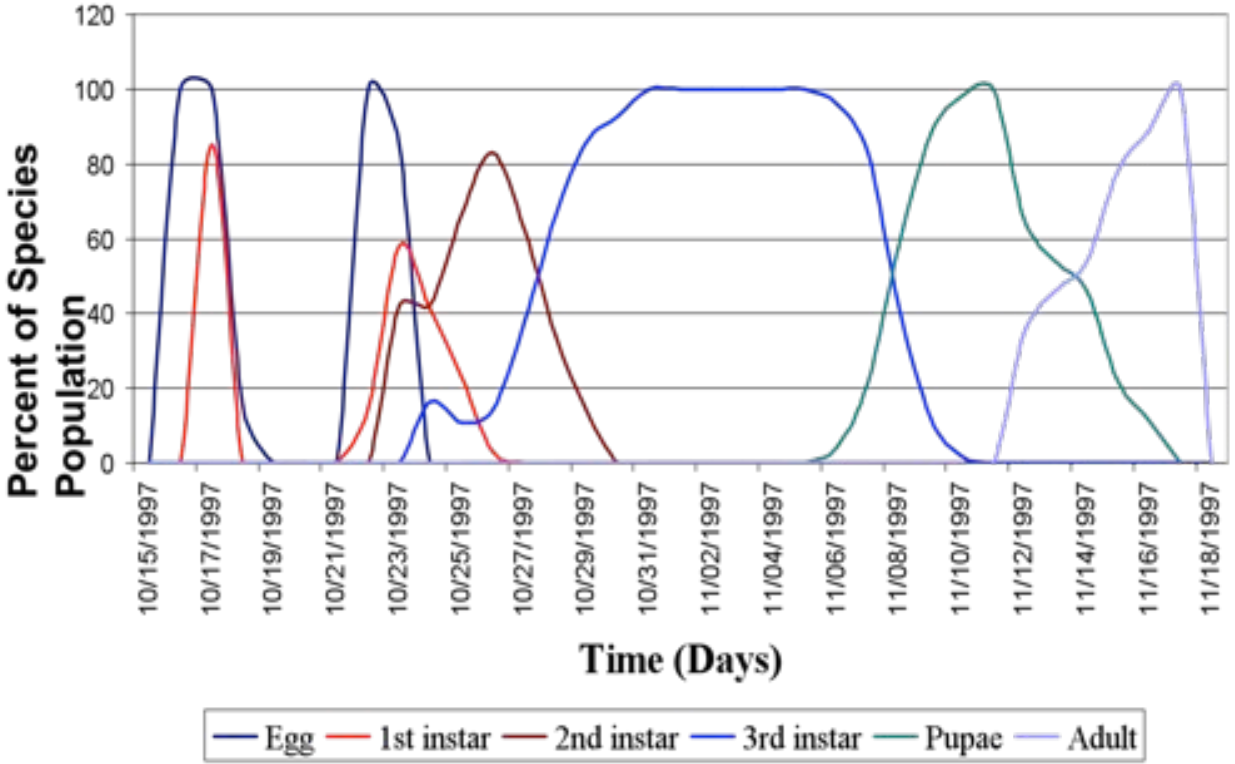
Ovipositions During Initial 24 Hours of Exposure



Maggot Model Output (Dusk, 20°C)



Chrysomya Rufifacies on Exposed Cadaver



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