

# Crime Solving Insects

## THINGS TO REMEMBER

- The progression of insect life follows a **pattern**, and the developmental rates of flies are relatively **predictable**.
- The rate of insect development is influenced by temperature because insects are **ectothermic** (cold blooded).
- The **postmortem interval**—the time between death and discovery of the corpse – can be estimated using insect evidence, temperature data, and other factors
- Not all **fly species** are found everywhere, and this can provide important information also.
- Flies & beetles have **complete** metamorphosis—**egg, larva, pupa, and adult**.
- After the adults mate, the females lay eggs onto corpses - usually near natural **body openings or wounds**.
- The length of the life cycle varies between species and is dependent on **temperature**.

## STAGES OF DECAY

- 1 - Fresh Stage** - Begins at the moment of death and lasts until the body becomes bloated. Blow flies and flesh flies are among the first to find the body.
- 2 - Bloated Stage** - Begins when the body becomes inflated due to the production of gases from bacteria that begin to putrefy the body or cause it to decompose. House flies now join the other flies and their maggots form feeding masses that help to liquefy the tissues of the body.
- 3 - Decay Stage** - Begins when the skin breaks and the gases escape. Maggot masses are large and very active as they grow older and larger. This is the stage of decomposition that smells bad. At the end of this stage, the maggots leave the corpse in search of a place to pupate in the soil.
- 4 - Post-Decay Stage** - Most of the flesh is gone from the corpse, with only cartilage, bone, and skin remaining. This stage is devoid of flies. Some beetles continue to feed on the highly desiccated or dried remains.

**Table 1: Body Length Development of Flies at 72° F**

L = Larvae P = Pupae A = Adult Measurement Unit: Millimeter

Days after Death	<i>Musca domestica</i> House fly	<i>Calliphora vomitoria</i> Blow fly	<i>Sarcophaga carnaria</i> Flesh fly	<i>Piophilina nigriceps</i> Skipper fly
1		Egg	L 9-11	
2	Egg	L 9-11	L 12-16	
3	Egg	L 9-11	L 17-20	
4	L 6	L 12-16	L 21-25	
5	L 6	L 12-16	L 26-30	Egg
6	L 7-11	L 17-20	L 31-35	Egg
7	L 12-16	L 17-20	L 36-40	L 3
8	L 17-20	L 21-25	L 41-44	L 3
9	L 21-25	L 21-25	L 44-46	L 4-6
10	L 26-30	L 26-30	L 44-46	L 7-9
11	L 31-35	L 26-30	P 38-40	L 10-13
12	P 26-29	L 31-35	P 38-40	L 14-16
13	P 26-29	L 31-35	P 38-40	P 13-15
14	P 26-29	P 31-34	P 38-40	P 13-15
15	P 26-29	P 31-34	P 38-40	P 13-15
16	P 26-29	P 31-34	P 38-40	P 13-15
17	P 26-29	P 31-34	P 38-40	P 13-15
18	A 30-32	P 31-34	P 38-40	P 13-15
19		P 31-34	A 42-45	A 16-18
20		P 31-34		
21		A 36-38		

**Table 2: Ecological information for certain species of flies.** The delays/accelerations are given in number of days relative to the schedule in Table 1.

		<i>Musca domestica</i> House fly	<i>Calliphora vomitoria</i> Blow fly	<i>Sarcophaga carnaria</i> Flesh fly	<i>Piophilina nigriceps</i> Skipper fly
Temperature (°F)	55°	delayed 4	delayed 4.5	delayed 4	delayed 3
	65°	delayed 4	delayed 3	delayed 2	delayed 1
	80°	accelerated 1	accelerated 2	accelerated 1.5	accelerated 1
	85°	accelerated 3	accelerated 4	accelerated 3	accelerated 2
Ecological Traits	Habitat	urban and rural	urban and rural	urban and rural	urban
	Lighting	full to partial sun	partial sun to shady	prefers sunny	prefers sunny
	Drugs	no effect	sensitive to effects	no effect	no effect

Modified from Smith (1986)

**Did you know?** Flesh flies do not lay eggs, but deposit newly hatched maggots directly onto the corpse.

### Species Key

#### House Fly



#### Blow Fly



#### Flesh Fly



#### Skipper Fly



#### Pupae

Fly species determined by size

# Case Studies



## Case #1

Species & Stage	Size (mm)	Age

1. Approximately how long has this animal been dead?
2. Why are maggots of different ages found in the body?
3. Other than temperature, what abiotic (external to the corpse) conditions would you want to obtain from the weather station to help you to be more confident of your time of death estimation?

## Case #2

Species & Stage	Size (mm)	Age

1. Approximately how long has this animal been dead?
2. What effect, if any, do the outside temperatures have on your estimation of time of death in this case?

3. How does the fact that the windows were closed relate to the populations of flies you observed in and around the corpse?

4. Do you suspect foul play? Explain.

## Case #3

Species & Stage	Size (mm)	Age

1. Approximately how long has this animal been dead?
2. What effect, if any, does oleandrin have on your estimation of time of death?

3. What effect, if any, does temperature have on your estimation of time of death in this case?

4. Do you suspect foul play? Explain.

## Case #4

Species & Stage	Size (mm)	Age

1. Approximately how long has this animal been dead?
2. What effect, if any, does temperature have on your estimation of time of death in this case?
3. Do you suspect foul play? Explain.