FORENSIC ENTOMOLOGY

WHAT DO THEY DO?

Forensic entomologists apply their knowledge of entomology to provide information for criminal investigations.

A forensic entomologist's job may include:

- Identification of insects at various stages of their life cycle, such as eggs, larva, nymphs, pupa, and adults.
- Collection and preservation of insects as evidence.
- Determining an estimate for the postmortem interval or PMI (the time between death and the discovery of the body) using factors such as insect evidence, weather conditions, location and condition of the body, etc.
- Testifying in court to explain insect-related evidence found at a crime scene.

INSECTS AS EVIDENCE

Forensic entomologists use their knowledge of **insects** and and their **life cycles** and **behaviors** to give them clues about a crime. Most insects used in forensic investigations are in two major orders: **Diptera** (flies) and **Coleoptera** (beetles).

Species succession may provide clues for investigators. Some insect species may feed on a fresh corpse, while another species may prefer to feed on one that has been dead for two weeks. Other insect species that prey on the insects feeding on the corpse may also be found.

Weather data is also an important tool in analyzing insect evidence from a corpse. Investigators will make note of the temperature of the **air**, **ground** surface, the **interface area** between the body and the ground, and the **soil** under the body as well as the temperature inside any **maggot masses**. They will also collect weather data related to daily **temperature** (highs/lows) and **precipitation** for a period of time before the body was discovered to the day the insect evidence was collected.

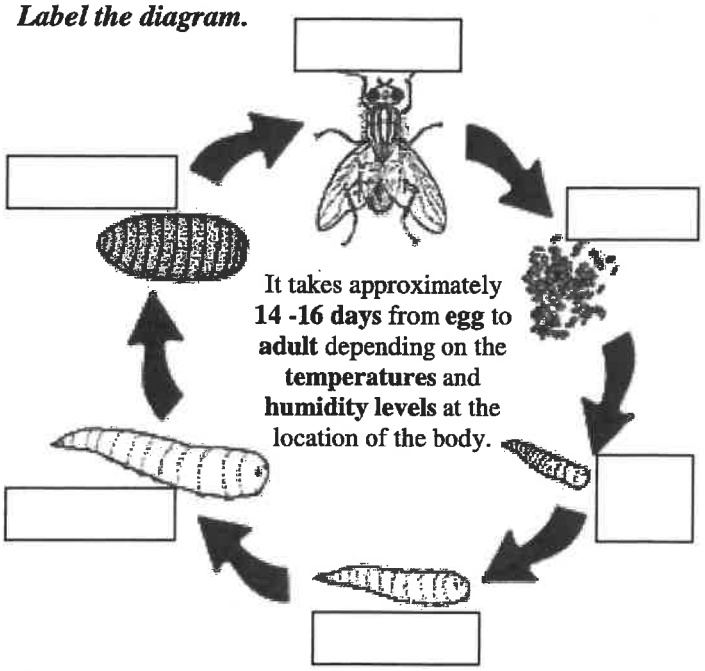
Other factors that might affect their PMI estimates:

1. Was the body was enclosed in an area or wrapped in a material that would have prevented flies from finding the corpse and laying eggs?
2. Were other insect species present that may have affected the development of the collected species?
3. Were there drugs or other poisons in or on the body that might have affected the larvae's development?

BLOW FLY LIFE CYCLE

Blow flies are attracted to dead bodies and often arrive within minutes of the death of an animal. They have a **complete** life cycle that consists of **egg, larva, pupa**, and **adult** stages.

Label the diagram.



1st – Adult flies lay eggs on the carcass especially at wound areas or around the openings in the body such as the nose, eyes, ears, anus, etc.

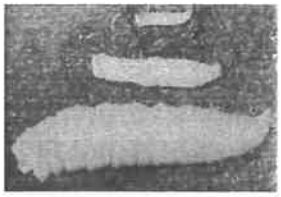
2nd – Eggs hatch into larva (maggots) in 12-24 hours.

3rd – Larvae continue to grow and molt (shed their exoskeletons) as they pass through the various instar stages.

- 1st Instar - 5 mm long after 1.8 days
- 2nd Instar - 10 mm long after 2.5 days
- 3rd Instar – 14-16 mm long after 4-5 days

4th – The larvae (17 mm) develop into pupa after burrowing in surrounding soil.

5th – Adult flies emerge from pupa cases after 6-8 days.

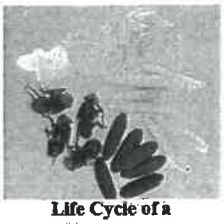


Blow Fly Larva

Did you know?

Maggots can be used to test a corpse for the presence of poisons or drugs. Some drugs can speed up or slow down the insect's development.

Early Stage Decomposition



Life Cycle of a Calliphoridae Fly

Blow & Greenbottle Flies (Calliphoridae)
Metallic thorax and abdomen

Flesh Fly (Sarcophagidae)
Striped thorax

Late Stage Decomposition

House Fly (Muscidae)

Cheese Skipper (Piophilidae)

Early Stage Decomposition

Carrion Beetles (*Silphidae*)
Adults & larvae feed on fly larvae

Early to Late Stage Decomposition

Rove Beetles (*Staphylinidae*)
Predator of fly eggs

Clown Beetles (*Histeridae*)
Predator of fly eggs

Late Stage Decomposition

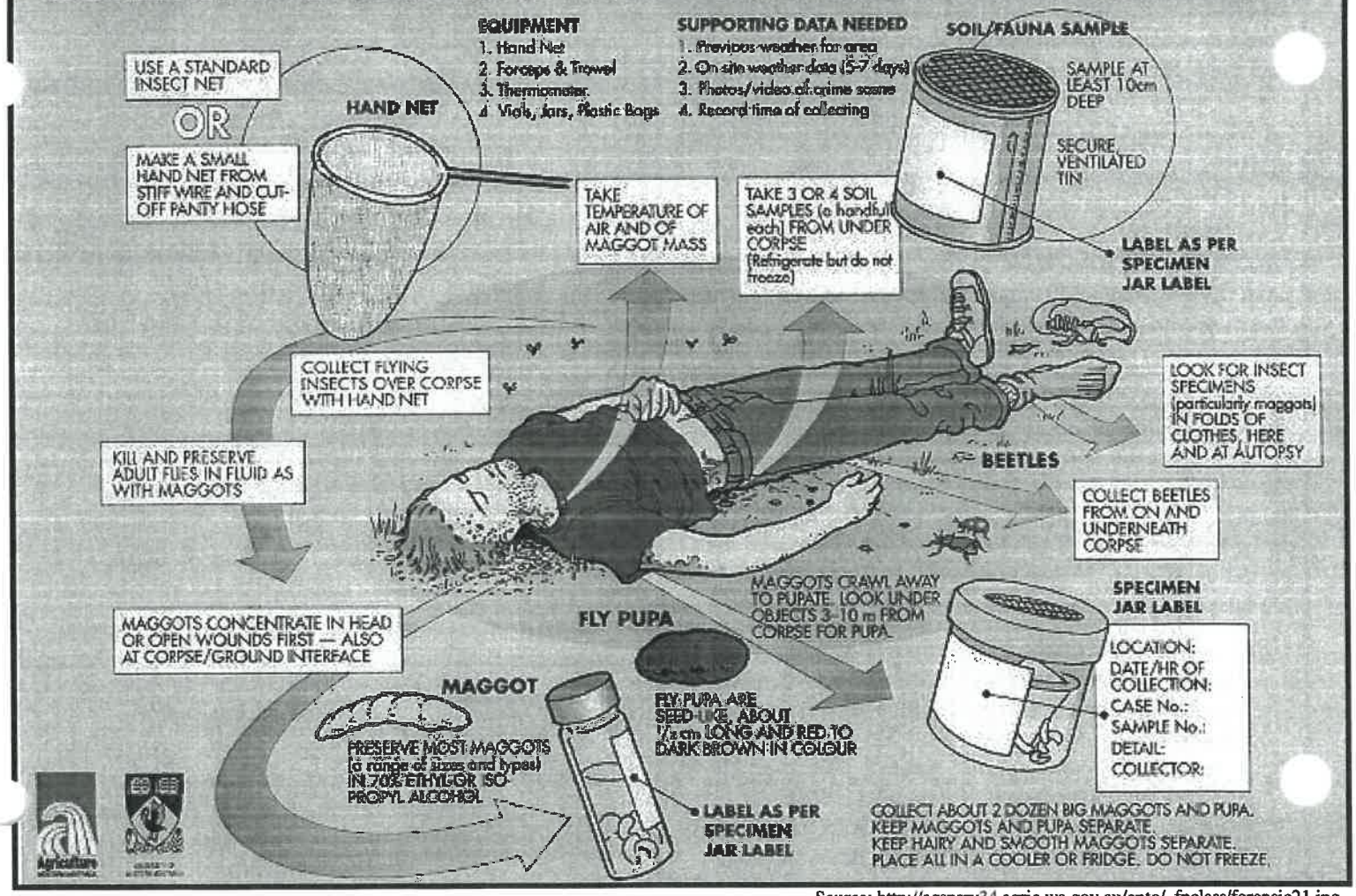
Ham & Checkered Beetles (*Cleridae*)
Predator of flies & beetles; also feed on dead tissue

Hide Beetles (*Scarabidae*)
Usually the last to arrive

Skin Beetles (*Dermestidae*)
Feed on dried skin & tissues

Did you know? The "Body Farm" in Knoxville, Tennessee is a university research facility to investigate human decomposition under various conditions in order to understand the factors which affect its rate.

COLLECTING INSECTS FOR FORENSIC INVESTIGATIONS



Source: http://agspsrv34.agric.wa.gov.au/ento/_fpclass/forensic21.jpg

Name _____

1. What do they do?

Forensic _____ apply their knowledge of entomology to provide information for criminal investigations.

A forensic entomologist's job may include:

- Identification of insects at various stages of their _____ _____, such as eggs, larva, pupa, and adults.
- Collection and preservation of insects as _____.
- Determining an estimate for the postmortem interval or _____ (the time between death and the discovery of the body) using factors such as insect evidence, weather conditions, location and condition of the body, etc.
- _____ in court to explain insect-related evidence found at a crime scene.

2. Insects as Evidence

Forensic entomologists use their knowledge of insects and their life cycles and _____ to give them clues about a crime.

Most insects used in investigations are in two major orders: _____ (flies) and _____ (beetles).

Species _____ may also provide clues for investigators. Some species may to feed on a _____ corpse, while another species may prefer to feed on one that has been dead for two weeks. Investigators will also find other insect species that _____ on the insects feeding on the corpse.

3. Other Factors

_____ data is also an important tool in analyzing insect evidence from a corpse. Investigators will make note of the temperature of the _____, ground surface, the interface area between the body and the ground, and the _____ under the body as well as the temperature inside any _____ masses. They will also collect weather data related to daily _____ (highs/lows) and _____ for a period of time before the body was discovered to the time the insect evidence was collected.

What are some other factors that could affect a forensic entomologist's estimate of PMI? _____

_____

_____

_____

4. Blow Fly Life Cycle

Blow flies are attracted to dead bodies and often arrive within _____ of the death of an animal. They have a _____ life cycle that consists of egg, larva, pupa, and adult stages.

Label the life cycle diagram.

Fill in the blanks below.

1st – Adult flies lay eggs on the carcass.

2nd – Eggs hatch into larva (maggots) in ___-___ hours.

3rd – Larvae continue to grow and molt (shed their exoskeletons) as they pass through the various instar stages.

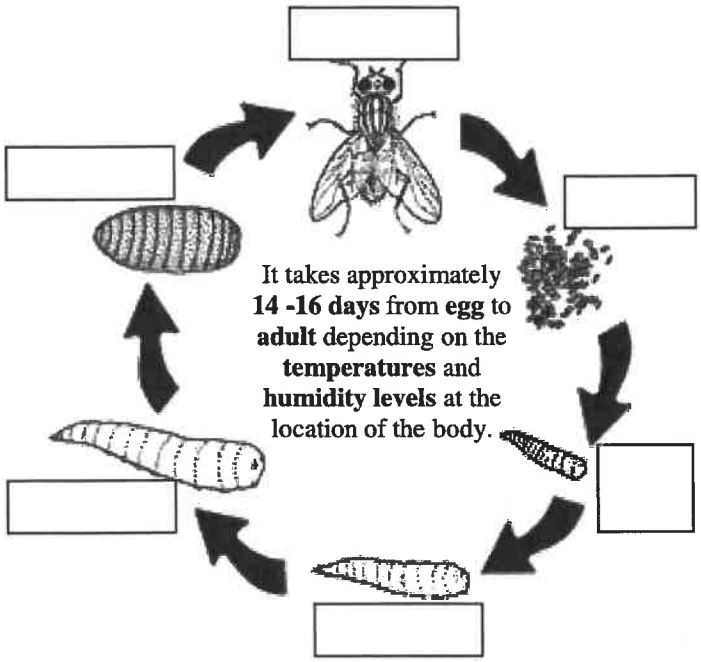
1st Instar - 5 mm long after _____ days

2nd Instar - 10 mm long after _____ days

3rd Instar – 14-16 mm long after ____ days

4th – The larvae (17 mm) develop into pupa after burrowing in surrounding soil.

5th – Adult flies emerge from pupa cases after __-__ days.



CRIME SCENE CREATURES — Online Activity

#1 - What is the crime? _____

#2 - Identify each tool by letter and then draw an line to connect it to its function.

____ Forceps
____ Ventilated jars
____ Thermometer
____ Hand net
____ Trowel
____ Specimen Jars
____ Weather Station

- Used to dig up soil samples
- Used to store live species
- Used to collect crawling insects
- Used to collect flying insects
- Used to collect & preserve specimens
- Used to collect weather data
- Used to take temperatures (air, soil, masses)

#3 - Which specimens did you take back to the lab? Circle the five that you chose.

Scorpion	Small Maggots	Spider
Beetle	Empty Pupa Cases	Fly Eggs
Large Maggots	Adult Fly	Fly (Crumpled Wings)

#4 - What was the correct PMI? _____

#5 - Which two specimens were most helpful in finding the correct answer? _____