**Nature’s Witness: Forensic Entomology Lab**

**Introduction:** Forensic entomology is the application of the scientific study of insects to criminal and civil investigations. Forensic entomology experts testify in court in many diverse cases ranging from the origins of insects in food and termites in houses to murders and suspicious deaths.

Forensic entomology rarely links a particular suspect with a crime or location. Rather, it provides data used to estimate the time that elapsed between the actual death and when the body was first discovered. This period is referred to as the post mortem interval or PMI.

The insects of most forensic interests are the flies (dipterans) and beetles (coleopterans). Within these two groups the number of species are massive, with over 300,000 species of beetles and 86,000 of flies in the world. There are two families of carrion flies: the blowflies, in the family Calliphoridae, and the flesh flies, in the family Sarcophagidae. Adult calliphorid flies are easily identified by their iridescent blue, green, copper, or black bodies. Sarcophagid flies, on the other hand, are grayish, usually with three distinct longitudinal dark stripes on the dorsal thorax. Some species of beetles also live on carrion, but they are less common, and arrive later, than carrion flies.

Cadavers decompose in four stages: fresh, bloated, decay, and dry. The time the body spends in any individual stage will vary depending on environmental conditions: warm, wet weather speeds decay, while cold, dry weather slows it. Different insects are attracted to each of the four different stages of decomposition. The ordered series of insects attracted to the decomposing body is called a succession. The succession pattern is useful in estimating how long a cadaver has been exposed to the insects. In addition to succession, the larval development rates help forensic entomologists estimate the PMI.

**Fly Development Times**

The following charts show the time in hours individuals of each species spend in each life stage at a standard temperature, 21 ⁰C. Notice the species development times are somewhat different. It requires 21 hours for the egg from **Species A** to reach first Instar, while it takes 25 hours for **Species B**.

Species A:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Temp (⁰C)** | **Egg** | **1st Instar** | **2nd Instar** | **Feeding****3rd Instar** | **Migrating****3rd Instar** | **Pupa** |
| 21 | 21 | 31 | 26 | 50 | 118 | 240 |

Species B:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Temp (⁰C)** | **Egg** | **1st Instar** | **2nd Instar** | **Feeding****3rd Instar** | **Migrating****3rd Instar** | **Pupa** |
| 21 | 25 | 37 | 31 | 60 | 124 | 286 |

**Vocabulary**

Carrion – dead and putrefying flesh; rottenness; anything vile

Fauna – the animals of a given region or period, considered as a whole

Instar – a stage of an insect or other arthropod between molts; differences between instars may occur in changed body proportions or increase or decrease in the number of body segments

Larvae – the newly hatched, earliest stages of insects and other animals that undergo metamorphosis, differing markedly in form and appearance from the adult.

**Materials:** Species A life stages (3 sets), Species B (3 sets), Evidence Collection (6 vials), Forceps (12), dissection microscope

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_

**Prelab Questions:**

1. What is the role of a forensic entomologist in a homicide investigation?

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2. Why are insects important when determining post mortem interval (PMI)?

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3. What is an instar?

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**Scenario:**

Two murder victims are found at a cabin (same scenario from Blood Spatter lab). When the double homicide victims were discovered, they were found to be in the advanced stages of decomposition. In an attempt to determine the post-mortem interval and establish a time of death, maggots were collected from the face and wounds of both victims. These specimen were then placed into vials with 70% ethanol to preserve them for later identification.

**Objective:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Safety:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lab Procedure:**

A. Examine the two common species (Species A & B) of flies found near the cabin, scene of the crime. Write or draw your observation in the species separation worksheet.

B. Your instructor will assign you to analyze vial form one of six crime scene samples. Place each under your dissection scope. Using your knowledge of Fly Life Cycle, determine the life stage of the individual. Record data in your paper and on the board (put a tick mark).

C. When everyone has finished analyzing their individuals, copy the data from both grids onto your Data Collection Worksheet, recording the number of individuals of each species and life stage.

D. Using the charts in the introduction determine the minimum number of hours needed for the oldest life stage of ach species to develop.

Calculation:

Conclusion: