Name____________________

CSI: Crime Solving Insects

Featured scientists: Kristi Bugajski and Parker Stoller from Valparaiso University

Research Background:

Most people think that maggots are gross, but they are important decomposers in many ecosystems. Without maggots and other decomposers, we would all trip over the bodies of dead organisms every time we went outside! Not only do maggots break down dead animal bodies in nature, but they also decompose human bodies!

Forensic entomology is a science that uses these amazing insects to help the criminal justice system. Maggots are the larvae of blow flies. Remember the next time you swat away a fly, these little insects help police solve crimes! Adult blow flies are usually the first to arrive at a crime scene with a dead body. The blow flies lay their eggs, or **oviposit**, shortly after their arrival. These eggs hatch and become maggots that feed on the body. Scientists can use the age of the maggot to help estimate how long someone has been dead. The longer a body has been dead, the longer ago the eggs hatched and the older the maggot larvae will be.

Kristi and Parker, two forensic entomologists, were in the field one day, documenting the timing of blow fly oviposition. They noticed something unexpected! There were wasps stuck in the traps they were using to catch blow flies. The scientists wondered if these wasps can affect a blow fly's decision to oviposit because wasps attack adult blow flies and also eat their eggs. Kristi and Parker knew that blow flies have an incredible sense of smell and sight. They wondered if blow flies are able to use their senses to detect if a wasp is near a body and then choose to avoid the area or delay laying their eggs. The scientists predicted that blow flies should delay their oviposition when wasps were present near a body. If wasps indeed cause blow flies to delay oviposition, this could change how scientist's use maggot age to determine how long ago a body died.

Scientist Parker using an insect net to catch blow flies in the field.

To test their idea, the scientists did 10 trials in the field. They used bait cups

Name____________________

One of the 30 control bait cups with a large number of blow flies on the chicken liver

that contained chicken liver to simulate a dead human body. A total of 9 bait cups were used in each of the 10 trials, for a total of 90 cups. Of the 9 cups used in each trial, three contained only chicken liver, to represent a body with no wasps present. These cups were used as **controls**. Three cups contained chicken liver and a wasp pinned to the side of the bait cup so that there was a **visual cue** of the wasp. The final three cups had a crushed wasp sprinkled over chicken liver to see if blow flies could use a **smell cue** to tell that a wasp was present without seeing them. Kristi and Parker checked the cups every half hour for the presence of blow fly eggs. If they saw any eggs, they recorded the time of oviposition in hours after sunrise. They then brought the maggots to the lab and raised them to the third larval stage and identified them to species.

Scientific Questions: What effect does the presence of a wasp have on blow fly oviposition? Do blow flies use either smell or visual clues to detect wasps?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation or a description of a pattern, which can then be tested with experimentation or other types of studies.

Name____________________

<u>Scientific Data</u>: The entomologists were interested in determining the average number of hours after sunrise that it took for blow flies to lay eggs. The data the researchers recorded in this table are the number of flies on the bait at each half hour after sunrise. They added up each of their three cups per trial, and then added up all 10 trials.

Use the data below to answer the scientific questions:

Time (Hours After Sunrise)	**Control**	**Smell**	**Visual**
6.5	1	2	1
7	0	2	2
7.5	3	5	3
8	8	4	2
8.5	1	1	2
9	3	2	2
9.5	3	0	6
10	2	3	1
10.5	1	0	1
11	1	3	1
11.5	0	2	0
12	2	0	1

	Control	**Smell**	**Visual**
Total Number of Flies			
Weighted Mean Time of Oviposition			
Standard Error*	**1.9**	**1.7**	**1.8**

** Standard error (SE) tells us how accurate our estimate of the mean is likely to be and depends on the number of replicates in an experiment and how much variation is in the data.*

Name____________________

What data will you graph to answer the questions?

Independent variable: ____

Dependent variable: ____

Draw your graph below: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.

Interpret the data:

Make a claim that answers each of the two scientific questions.

Name____________________

What evidence was used to write your claim? Reference specific parts of the table or graph.

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about blow flies' sense of smell and sight.

Did the data support Kristi and Parker's hypothesis? Use evidence to explain why or why not. If you feel the data were inconclusive, explain why.

<u>Your next steps as a scientist</u>: Science is an ongoing process. What new question(s) should be investigated next to build on Kristi and Parker's research? What future data should be collected to answer your question(s)?