



### **Entomology in Action: The Steven Truscott Case:**

On September 1959 in a Canadian courtroom, 14-year-old Steven Truscott was found guilty of raping and murdering his classmate 12-year-old Lynne Harper. Sentenced to death Truscott became the youngest person to sit on Canada's death row. His death sentence was eventually commuted to life in prison. Throughout the years, Truscott has maintained his innocence. He claims that on June 9, 1959, he was riding his bicycle when he met Lynne Harper near the school they both attended. She asked him for a ride to the highway because she wanted to see a man who kept ponies at his house. Truscott gave Harper a lift and dropped her off at the highway. As he was cycling back he saw a car stop where Harper was standing. She got into the car and the car drove off. That was the last time Lynne Harper was seen alive. Her body was found two days later not too far from where Truscott dropped her off.

The main evidence presented in the case consisted of the medical evidence on the time of Lynne Harper's death. The Court relied on the opinion of the attending pathologist, Dr. Penistan that Lynne died where her body was found and that her death occurred between 7:00 and 7:45 p.m. on June 9. Dr. Penistan based his opinion on the time of death on his observations of the stomach contents of the deceased, the degree to which rigor mortis affecting the body had subsided, and the extent to which the body had decomposed.

The cause of Lynne Harper's death has never been in dispute. Lynne's assailant strangled her by winding her blouse tightly around her neck and securing it with a knot. The time of her death has been the subject of intense controversy from the outset. The theory as presented at trial was that the window of time within which the suspect could have killed Lynne was a narrow one, namely, from about 7 to 8 p.m. on the evening of June 9. The Prosecution did not suggest that the suspect had the opportunity to kill Lynne some time later that evening. If Lynne was killed some time after the suspect returned to the school grounds at about 8 p.m., the Crown's theory collapsed. Conversely, if Lynne was killed before the suspect returned to the school grounds at about 8 p.m., then it was virtually certain that he killed her. He acknowledged being with her and was seen with her on his bicycle after 7 p.m. that evening in close proximity to Lawson's Bush where

her body was found. Dr. Penistan attended at the scene where Lynne Harper's body was found at about 4:45 p.m. on June 11. He was accompanied by the Senior Medical Officer at the R.C.A.F. Station in Clinton, Flight Lieutenant Dr. David Hall Brooks. Dr. Penistan began his autopsy on the body at 7:15 p.m. that same evening and Dr. Brooks assisted him.

The theory behind the use of entomology to determine time of death is simple. The key concept is the "postmortem interval" or "PMI", that is, the interval between the time of death and the collection of insect specimens from the body. With knowledge of the colonization habits of the insects and how soon after death they deposit their eggs or larvae on a corpse, one should be able to make an estimate of the time of death. While there are different ways of estimating the PMI using entomological information, the experts involved in this case used the type of analysis employed in the following method.

The entomologist first identifies the species of insect larvae (also referred to as maggots) collected from the body and their stage of development at the time of collection. Using data on rates of larval development that have been assembled over many years, as well as other information such as the air temperature where the body was located, the entomologist calculates how long the larvae must have been on the body to reach the stage observed when the samples were collected. If the insect is of a species known to deposit eggs or larvae on a corpse very soon after death, the PMI should closely correspond with the time of death. An important factor is identifying the oldest larvae, since it is the oldest larvae that will provide the most accurate PMI. Put another way, the entomologist wants to collect the larvae that have been on the body for the longest time. There are, of course, other variables in this exercise and many come into play in this case.

The critical questions in this case are whether it is possible to identify the type of insects that were found on the body and the stage of development they had reached at the time of collection. In 1969 after serving ten years in prison, Truscott was paroled. He took on an alias and maintained a private life for thirty plus years. Recently Truscott has requested an appeal, and many feel that important evidence was overlooked in this case. Since the crime occurred over 40 years ago, it becomes difficult to sort through all of the facts. Some of the evidence has been destroyed. Some of the people involved in the investigation are no longer living.

Your job is to review the entomological data to determine if the prosecution has an accurate PMI for this victim and in essence whether or not the suspect is guilty. His life and reputation is in your hands!

The Facts:

\*The flies involved in this case are diurnal, that is, they do not deposit eggs or larvae at night. However, larvae will continue to grow during the night, provided there is sufficient heat available.

\*This case concerns two families of flies: *Sarcophagidae* or flesh flies and *Calliphoridae* or blow flies. We use the common terminology of flesh flies and blow flies.

\*The blow fly was identified as belonging to the genus *Calliphora* or blue bottle flies.

\*Flesh flies arrive after death and deposit first instar larvae. Blow flies arrive after death and deposit eggs. Blow flies lay hundreds of eggs at a time, while flesh flies deposit many fewer live larvae.

\*Since flesh flies lay maggots rather than eggs, larger flesh fly maggots may actually have colonized the remains after or at the same time as blow flies. Therefore, it is necessary to determine the PMI that is indicated by both the flesh flies and the blow flies, since it is not possible to know which was on the body for the longest time based solely on length.

\*The victim had fly eggs deposited on hair and abdomen, eggs and larvae (maggots) were found around the nose, mouth and genitals.

\*The maggots were about 1/16<sup>th</sup> to 1/4<sup>th</sup> in long.

\*The largest blow fly larvae from the face and abdomen were up to 2 mm in length, *i.e.*, slightly more than one-sixteenth of an inch. This is consistent with the first instar.

\*The flesh flies were early to mid-second instar.

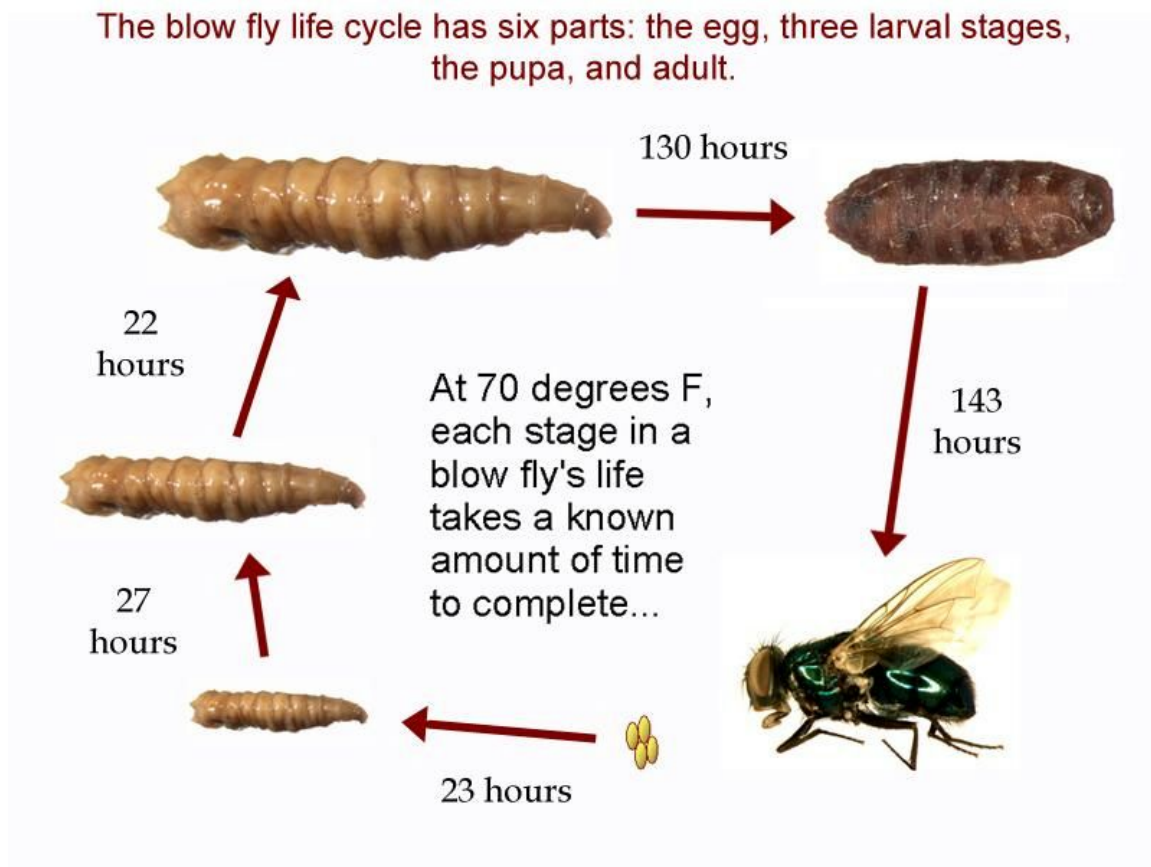
\*Blow flies are attracted to mucous membranes in the facial area and are not generally seen in large numbers in the genital area. The flesh flies, which typically colonize the body somewhat later, would select areas to colonize other than the face so as to avoid competition with the blow flies and to maximize the likelihood that their offspring would survive.

\*The time to start the calculation of the PMI is at approximately 8:00 p.m. on June 11.

\*The theory as presented at trial was that the window of time within which the suspect could have killed Lynne was a narrow one, namely, from about 7 to 8 p.m. on the evening of June 9.

\*In this case, no maggots were reared in the laboratory; therefore the only estimates made in the initial trial were based on size. Today, we would use controlled rearing to get much more accurate estimates of PMI.

### **Student Worksheet:**



Fill in the chart below using the above illustration. Answer the questions that follow.

From	To	Hours	ADH at 70 degrees F
Egg			
First			
Second			
Third			
Pupa			

- How many total hours is the blue bottle fly's life cycle at 70 degrees Fahrenheit?
- How many days \_\_\_\_\_ hours \_\_\_\_\_ ?
- What is the ADH for this published study?
- If maggots from the victim were allowed to fully develop and pupate into adults in the lab at 77 degrees Fahrenheit, and it took 290 hours, what would be the ADH?
- What is the thermal energy?
- Using the chart below, determine the average temperature at the crime scene. \_\_\_\_\_ degrees Fahrenheit.

Date:	Average Temperature
May 23	52
May 24	54
May 25	56
May 26	60
May 27	60
May 28	54
May 29	52
May 30	52
May 31	55
June 1	55
June 2	50
June 3	50
June 4	51
June 5	52
June 6	54
June 7	56
June 8	60
June 9	54
June 10	54
June 11	54

g. Based on the Blow fly data, what was the PMI? What was the TOD (date and time)?

***Flesh Fly Life Cycle at 81 degrees Fahrenheit***

From	To	Hours	ADH at 81 degrees F
First	Second	26	
Second	Third	18	
Third	Pupa	166	
Pupa	Adult	288	

a. How many total hours is the flesh fly's life cycle at 81 degrees Fahrenheit?

b. How many days \_\_\_\_\_ hours \_\_\_\_\_ ?

c. What is the ADH for this published study?

d. If maggots from the victim were allowed to fully develop and pupate into adults in the lab at 77 degrees Fahrenheit, and it took 500 hours, what would be the ADH?

e. What is the thermal energy?

f. Based on the Flesh fly data, what was the PMI? What was the TOD (date and time)?

***Conclusion:***

a. Do you believe the suspect committed the crime based on the entomological

data? Explain your answer using the PMIs you determined from both fly species.

- b. Why is it very important to also consider that the flies are diurnal?
- c. Why did you have to determine the PMI from both fly species?
- d. Do you feel it is accurate to use only size of larva to judge PMI (as was done in the original case)?