

DESIGNING THE CASE FOLDERS

Use this guide to help prepare the Case Folders used in the Explain and Extend sections of the “Crime Solving Insects” lesson. While there are only four different cases, one of which is used as a whole-class model, you may wish to make multiple copies of each case depending on your class size and the number of groups you expect to be at each station.

Materials Needed

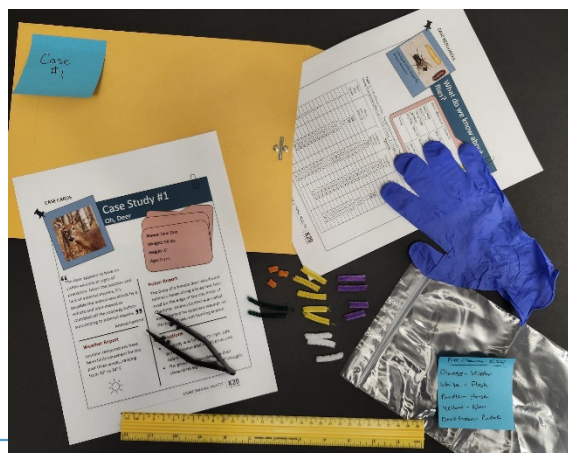
- Case Resources handout (attached; pages 2–3; one per folder)
- Case Cards handout (attached; pages 4–7; one case per folder)
- Rulers (one per folder)
- Colored pipe cleaners (at least five different colors)
- Plastic bags filled with appropriately measured lengths of colored pipe cleaners (one per case)
- Scissors to cut pipe cleaners
- Forceps or tweezers for each folder (optional)
- Plastic or latex gloves for each group (optional)
- Folders

Preparing for the Lesson

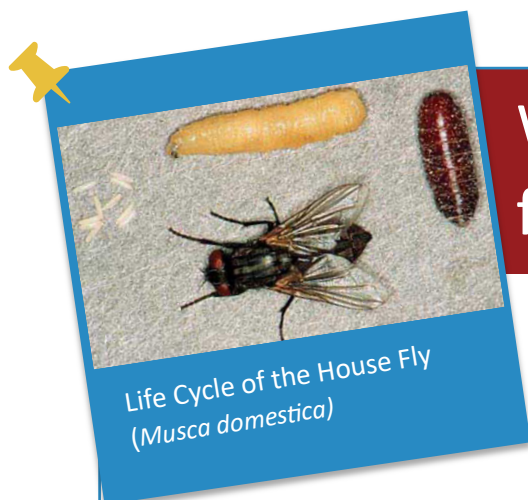
Prepare the Case Folders for each case (see examples below). Consider making multiple copies of cases based on classroom needs.

Case Folders contain:

- Bug Bag (fill a plastic bag with pipe cleaners cut to sizes listed in Table 1 on page 8; label each bag with a case number)
- Case Cards handout (print one-sided)
- Case Resources handout (can be printed one-sided or double-sided)
- Ruler with millimeter measurements
- Forceps or tweezers (optional)
- Plastic or latex gloves for each group (optional)



CASE RESOURCES



What do we know about flies?

KEY

<i>Musca domestica</i>	House fly	Blue
<i>Calliphora vomitoria</i>	Blow fly	Yellow
<i>Sarcophaga carnaria</i>	Flesh fly	white
<i>Piophilina nigriceps</i>	Skipper fly	Pink
Pupae	species of pupae can't be determined except by size	Brown

Table 1: Life History of Flies. The development of body length (in millimeters) of some fly species during their metamorphosis at 72° F (L = Larvae, P = Pupae, A = Adult Fly).

Days after Death	Species			
	<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		

What *else* do we know about flies?

SPECIES

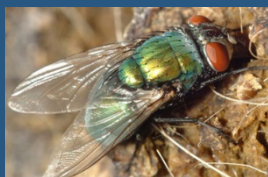


Table 2: Ecological information for certain species of flies. The developmental delays and accelerations are given in number of days relative to the developmental schedule in Table 1 above.

		<i>Musca domestica</i> House fly	<i>Calliphora vomitoria</i> Blow fly	<i>Sarcophaga carnaria</i> Flesh fly	<i>Piophilidae</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

Adapted from:

Bambara, S., & Carloye, L. (2006). *Crime solving insects*. North Carolina Cooperative Extension Service.
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Anderson, M., & Kaufman, P. (n.d.). *Common green bottle fly - lucilia sericata (meigen)*. Ask IFAS.
https://entnemdept.ufl.edu/creatures/livestock/flies/lucilia_sericata.htm

Diaz, L., & Kaufman, P. (2013). *Sarcophaga crassipalpis Macquart - a flesh fly*. Ask IFAS.
https://entnemdept.ufl.edu/creatures/misc/flies/sarcophaga_crassipalpis.htm

Lewis, C., Kaufman, P. E., & Entomology and Nematology Department. (2010, January). *Cheese skipper - piophilidae casei (linnaeus)*. Ask IFAS.
https://entnemdept.ufl.edu/creatures/urban/flies/cheese_skipper.htm

Sanchez-Arroyo, H., & Capinera, J. (2017, April). *House fly - musca domestica linnaeus*. Ask IFAS.
https://entnemdept.ufl.edu/creatures/urban/flies/house_fly.htm

CASE CARDS



Case Study #1

Canine Caper

Name: Terry

Weight: 45 lbs.

Height: 21"

Age: 3 years

“ I don’t understand...She was just here this morning. Why did this happen? ”

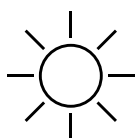
—Eyewitness

“ She was my best friend. She never hurt anybody. Who would do this? This isn’t fair. ”

—Owner

Weather Report

Daytime temperatures have been variable over the past three weeks, ranging from 75 °F to 94 °F. Skies have been sunny.



Police Report

The body of a large pit bull terrier was found inside a walk-in basement at a home in Cary. Maggots were found concentrated in the head and region behind the shoulder. The windows were closed, although the open curtains allowed sunlight to enter, and the air conditioner was set at 72 °F.

Observations

- No immediate signs of struggle or forced entry.
- Body found lying on its side near the center of the basement.



Case Study #2

Oh, Deer

Name: Jane Doe

Weight: 98 lbs.

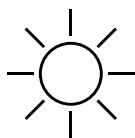
Height: 6'

Age: 5 years

“ The deer appears to have no visible wounds or signs of predation. Given the location and lack of external injuries, it's possible the animal was struck by a vehicle and later moved, or the animal stumbled off the roadway before succumbing to internal injuries. ”

Weather Report

Daytime temperatures have been consistent for the past three weeks, ranging from 70 °F to 74 °F.



Police Report

The body of a female deer was found behind a fence along a busy two-lane road at the edge of the city limits of Charlotte. Animal Control was called and reported no apparent wounds on the body. It was not hunting season.

Observations

- The body was lying on its right side, partially concealed by tall grass and debris.
- The ground surrounding the deer showed no significant signs of struggle.



Case Study #3

Dandy's Death

Name: Charlie
Weight: 950 lbs.
Height: 15 hands high
Age: 18 months

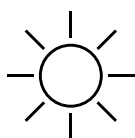
“

The horses in the pasture fidgeted with anticipation when they heard Mr. Johnson's lawn mower nearby. Little did anyone know that one of them would soon end up dead as a result. ”

—Eyewitness

Weather Report

Daytime temperatures have been unusually warm over the past three weeks, ranging from 84 °F to 86 °F.



Police Report

The body of a young male horse was found in a pasture in a small town near Wilmington. The autopsy from the vet school reveals that the cardiac glycoside oleandrin (a powerful heart stimulant) was present in the body. Oleander is found in the oleander plant. Oleander is a common ornamental shrub in this area, but none grows within 200 feet of the pasture.

Observations

- No visible external injuries.
- Charlie was found lying on his left side near the center of the pasture.



Case Study #4

Porky's Peril

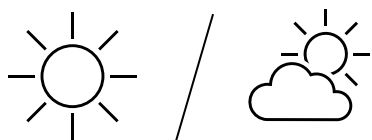
Name: Hamlet
Weight: 150 lbs.
Height: 15" tall, 3' long
Age: 10 years

“This is an unusual and troubling discovery for our community. We take matters of animal welfare seriously. I have full confidence in our investigators and forensic experts to determine what happened.”

—Mayor

Weather Report

Daytime temperatures have been average over the past three weeks, ranging from 70 °F to 73 °F. Temperatures in the woods would be approximately 5 degrees cooler due to the lack of sun in the shady environment.



Police Report

The body of a large pot-bellied pig was found in a dense stand of evergreen trees far from any urban area in Buncombe County. Hairs around the pig's neck were worn away in a band pattern.

Observations

- No immediate signs of predation or scavenging.
- Hamlet was lying on his side, partially obscured by fallen branches.

Table 1. Bug Bag content. Cut pipe cleaners into the different lengths listed below, in millimeters, to represent maggots and pupae collected from each body in each case. Ensure that you have 2–3 pipe cleaners of each length to make up a “sample” collected from the body.

You may choose whichever colors of pipe cleaner you prefer, but all pupae should be one color and the fly species of each pupae should not be able to be determined by anything except size.

Update the “Key” on page 2 of the Case Resources handout to reflect the colors you selected.

Case Number	House Fly (mm)	Blow Fly (mm)	Flesh Fly (mm)	Skipper Fly (mm)	Pupae (mm)
Case #1	6	—	15	—	—
Case #2	29; 20	25; 29	29	9	39
Case #3	28	35	45	—	33
Case #4	6; 19	18	9; 15	5	—

Teacher Tips

Pipe cleaners, as opposed to other materials like yarn or curling ribbon, are recommended to represent the maggots and pupae for multiple reasons:

1. Pipe cleaners keep their shape, which helps avoid confusion when students are measuring them. Materials like yarn can be pulled taut or left loose.
2. Curling ribbon, when cut small, can be create confusion between length and width measurements.
3. Flat curling ribbon can be harder to pick up and work with.

Consider laminating the Case Cards and Case Resources handouts for longevity and durability, especially if you plan to reuse these resources in the future.