General Life Cycle of Flies

There are typically 3 larval stages. The last one will normally wander from the food source.
“Big Flies”
Common Scavenging Species of Blow Flies

- Black blow fly
- Blue bottle flies
- Green bottle flies
Most blow flies develop on carrion

(animal manure may be another breeding material for some species)
Green bottle flies often are associated with animal feces but may develop in carrion.
Maggots crawling in the home?

Likely source is a dead animal behind a wall or elsewhere in the home.
If animals die within a building, blow flies will often find them. This may be followed by wandering maggots, later lots of adult flies in the building.

INFESTED BRITAIN Summer heatwave and cheap rat poison has sparked a plague of MAGGOTS in the UK

Peter Higgs, who runs PGH Pest Control and Prevention, tells Sun Online he has received an unprecedented number of call outs to deal with maggots over the past week.

Maggots dropping from our ceilings

“We’ve had at least a hundred calls over the summer. That’s more than double what we’d normally receive,” he says.

“It’s not just maggots in bins, they’re dropping from the ceiling in homes and shops.”

This may be followed by wandering maggots, later lots of adult flies in the building.
The last stage larva, when it has finished feeding, will usually wander from the food.
Garbage in Dumpster – How quickly could flies develop in this source?
Critical concern: How long between when eggs are laid until full-grown larvae migrate to sites for pupation?
Garbage in Dumpster – How quickly could flies develop in this source?

Assumption: Temperatures during the day are warm enough for adult flies to be active (above 50F) and lay eggs

Assumption: Temperature in the pile is at 72F
Insects are cold-blooded, and their rate of development depends on the temperature around them.

This is a table of how long it would take – in hours – for 3 common kinds of flies to develop **if the temperature averaged** 22°C/71.6°F

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of Gen.</th>
<th>Egg</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>Prepupa</th>
<th>Pupa</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. cooleyi</td>
<td>25-30</td>
<td>24</td>
<td>18</td>
<td>48</td>
<td>96</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>P. regina</td>
<td>23-25</td>
<td>12</td>
<td>15</td>
<td>10</td>
<td>50</td>
<td>56</td>
<td>10</td>
</tr>
<tr>
<td>C. vomitoria</td>
<td>22-31</td>
<td>25</td>
<td>24</td>
<td>50</td>
<td>52</td>
<td>98</td>
<td>24</td>
</tr>
</tbody>
</table>
**Interval between egg laying and end of 3rd instar (at 71.6 degrees F)**

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<td>24</td>
</tr>
</tbody>
</table>

- **Sarcophagid fly** – 3.75 days
- **Black blow fly** – 3.6 days
- **Blue bottle fly** – 6.4 days
Development (hours) of *Lucilia sericata* at different temperatures

<table>
<thead>
<tr>
<th>Life stage</th>
<th>7.5</th>
<th>10.0</th>
<th>12.5</th>
<th>15.0</th>
<th>17.5</th>
<th>20.0</th>
<th>22.5</th>
<th>25.0</th>
<th>27.5</th>
<th>30.0</th>
<th>32.5</th>
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<tbody>
<tr>
<td>Egg–1st</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>17</td>
<td>12</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1st–2nd</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>28</td>
<td>19</td>
<td>14</td>
<td>11</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
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<tr>
<td>2nd–3f</td>
<td>79</td>
<td>79</td>
<td>79</td>
<td>39</td>
<td>26</td>
<td>20</td>
<td>16</td>
<td>13</td>
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<td>10</td>
<td>9</td>
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<tr>
<td>3f–3m</td>
<td>143</td>
<td>143</td>
<td>143</td>
<td>71</td>
<td>48</td>
<td>36</td>
<td>29</td>
<td>24</td>
<td>20</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>3m–Pupal</td>
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<td>335</td>
<td>335</td>
<td>167</td>
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<td>67</td>
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<td>48</td>
<td>42</td>
<td>37</td>
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<tr>
<td>Pupal–Adult</td>
<td>527</td>
<td>527</td>
<td>527</td>
<td>263</td>
<td>176</td>
<td>132</td>
<td>105</td>
<td>88</td>
<td>75</td>
<td>66</td>
<td>59</td>
</tr>
</tbody>
</table>
Period of time between egg laying and wandering larvae of the green bottle fly

- **Average temperature 59F**
  - Egg-wandering 155 hours
  - Period of wandering <167 hours

- **Average temperature 68F**
  - Egg-wandering 79 hours
  - Period of wandering <84 hours

- **Average temperature 77F**
  - Egg-wandering 52 hours
  - Period of wandering <56 hours
Control of Blow Flies in the Home

- Eliminate breeding sites in and around the building
- Seal/Screen to exclude flies originating from outdoors
- Traps?
Fly Traps for Blow Flies?
– Attractive to adults, yes. Help with overall control - maybe, maybe not.
Sticky Fly Traps?

May capture some flies, particularly house flies, if placed in location where flies congregate.
Blow flies in homes in winter months

Cluster flies

Blue bottle flies
Cluster Flies
*Pollenia* spp.

The most common indoor flies during the cool months.
Curly golden hairs mark cluster flies
Cluster flies are parasites of earthworms – they are not ‘filth flies’
Cluster fly searching for a site to lay eggs
Cluster fly larvae and worm host
There are three common species of cluster flies found within homes in Colorado

- *Pollenia pediculata*
- *Pollenia rudis*
- *Pollenia angustigena*
Scenario for Cluster Fly Invasion of a Building

- Flies move to sunlit vertical surfaces during period when seeking winter shelter
- Flies move upward as sun sets
- Flies enter upper areas of building, cluster behind walls
Management of Cluster Flies

• Prevention
  – Seal all openings prior to time when cluster flies enter buildings
  – Pyrethroid insecticides can be applied to exterior around openings
  – Insecticide dusts can be blown into wall voids to kill flies behind walls.
Management of Cluster Flies

• **Coping**
  – Explain nature of problem
    • Transient nuisance invader
    • Self-limiting; no breeding occurs indoors
    • Not a filth fly
  – Vacuum individuals as they are observed
Fly Traps for Cluster Flies?
– They are not responsive to fly trap lures
Sticky Fly Traps?

May capture some flies, if placed in location where flies congregate.
“Medium-Sized Flies”
House Fly (*Musca domestica*)
House flies breed in many materials but decaying vegetable/fruit material is favored.
Little house fly – and some closely related flies – develop primarily on animal waste. Some are particularly noted to be associated with poultry waste.
Small dung flies/ Sphaerocerid flies

May develop at sites where large amounts of moist decaying organic matter is present

Small dung flies on a dime
Sticky Fly Traps?

May capture some flies, particularly house flies, if placed in location where flies congregate.
Ceroxys *latiusculus* – A picture-winged fly that commonly enters buildings in autumn
This one was on the inside of my front door on Sunday
Ceroxys latiusculus – A picture-winged fly that commonly enters buildings in autumn.

Larvae develop in plants of the genus *Senecio*.
“Small Flies”

- Humpbacked flies
- Fungus gnats
- Vinegar flies/Small fruit flies
- Moth flies
Vinegar/Small Fruit Flies

Diptera: Drosophilidae
Small fruit flies attracted to an overripe peach
Small fruit fly larvae developing in overripe peach
Time flies like an arrow; fruit flies like a banana.

Postscript: Unfortunately fact checking indicates that Groucho Marx was not the first person to use this phrase – and may never have said it.

Developing small fruit flies/vinegar flies in an overripe banana.
Vinegar fly larvae develop on yeasts that grow on overripe fruit or in other sources of damp vegetable matter.
Residue in containers, such as those kept for recycling, can support larvae of small fruit flies.
Control of Small Fruit Flies/Vinegar Flies in the Home

• Eliminate all sources of breeding material
  – Remove, promptly consume or refrigerate all susceptible fruits
  – Clean out any residues that may allow yeasts to grow

• Trap out residual adults
A simple vinegar ("fruit") fly trap

Note: Adults may live close to a month, so trapping and exclusion must be sustained for weeks
Fungus Gnats

Diptera: Mycetophilidae,
Adult fungus gnats are small with a gnat-like body form. They are weak fliers that make short, skipping flights.
Eggs
Larvae
Pupae
Adult

Photos and graphic courtesy of Raymond Cloyd, Kansas State University
Adult fungus gnats usually live for only 4-5 days. Females lay eggs in soil cracks along surface.
Fungus gnat larvae require 3-4 weeks or more before being full grown. They primarily eat fungi and decaying plant matter.
Fungus gnat larva on a potato slice
Fungus Gnat – Cultural Controls

- Reduce watering frequency
- Eliminate sources of decaying vegetation
Larvae of fungus gnats feed primarily on fungi.

Potting soil that remains moist is most favorable to fungus gnats.
Biological Controls for Fungus Gnat Larvae

- Soil predator mite (Stratiolaelaps scimitus)
- Entomopathogenic nematodes (Steinernema feltiae)
- Bacillus thuringiensis var. israelensis (Bti)
Several strains of Bt are sold. Each is specific in the type of insect it can control:

- **kurstaki, aizawi** strains (leaf feeding Lepidoptera larvae)
- **tenebrionis** strain (leaf beetles)
- **israelensis** strain (mosquito, gnat, black fly larvae)
Mosquito bits label has been changed to now allow use for fungus gnats in house plants.
Psychodidae

Drain Flies/Moth Flies

Associated with bacterial slime coating surfaces of drains in buildings.
Larvae of the moth flies are associated with bacterial slime coating surfaces of drains/plumbing. They are also called filter flies, as they can become very abundant in water filter beds.
Humpbacked flies
aka drain flies,
phorid flies

Diptera: Phoridae
Larvae of humpbacked flies live in moist, semi-solid media. This can occur in drains, or sometimes occurs when there has been a break in plumbing.
Control of Drain Flies

• Identify source of origin
  • Clean drains in a manner that eliminates food sources
    – Cleaning must remove all debris, surface film of bacterial slime
      • Normal drain cleaners insufficient
      • Drain cleaners that foam, break down debris can be effective
      • Scrubbing out drain can be useful
  • Fix leaking, cracked plumbing, if necessary
A sticky card placed over a drain can determine if it is the source of the flies.
Control of Drain Flies

• Identify source of origin

• Clean drains in a manner that eliminates food sources
  – Cleaning must remove all debris, surface film of bacterial slime
    • Normal drain cleaners insufficient
    • Drain cleaners that foam, break down debris can be effective
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• Fix leaking, cracked plumbing, if necessary
Control of “Drain Flies”

• Identify source of origin
• Clean drains in a manner that eliminates food sources
  – Cleaning must remove all debris, surface film of bacterial slime
    • Normal drain cleaners insufficient
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    • Scrubbing out drain can be useful
• Fix leaking, cracked plumbing, if necessary
Humpbacked flies
aka drain flies,
phorid flies
Diptera: Phoridae

Small dung flies
Spharerocecid flies
Diptera: Sphaerocecididae
Indoor Flies
Indoor Ants
Some fundamentals first:

- Metamorphosis pattern
- Castes
  - Winged vs. non-winged forms
- Size variations
- The pedicel (one lump - or two?)
Complete metamorphosis

Figure 3. Life cycle of the ant.
Ant larvae and pupae (within cocoons) tended by workers
A Bug’s Life – The Worst Representation Involving Ants Hollywood has ever produced
Queen

A fully fertile female

Often – but not always - one per colony

Have wings initially (for mating flight)

Remove wings after mating

Scars on trunk where wings were attached
Field ant workers
Field Ants – Winged Reproductive Forms

Top: Male
Bottom: Female
Carpenter ant worker
Winged males and females
Winged forms (male, queens) emerge episodically in large masses for mating flights.
Soon after mating the males die and the female ant seeks a safe location to start a new colony.

The wings are shed and the wing muscles help nourish her during colony establishment.

**Hilltopping:** Winged males and females (from many colonies) aggregate at prominent points in the landscape.
Winged reproductive males and females meet over prominent points in the landscape.

Mating balls of ants under that tree.
Harvester ants and the ‘hilltopping’ phenomenon
Harvester ants and the ‘hilltopping’ phenomenon

1801 California Ave., Denver
(Century Link sign at top)
Solution? Build a bigger skyscraper and the ants will go there.
In abrupt episodes, workers push the winged stages from the colony.

After the nuptial flight, the males die and the females each try to establish a new colony.
Carpenter ant queen without wings (dealate)
Aluminum cast of a harvester ant nest
Red imported fire ant – a polymorphic species
Pavement ant – a monomorphomic species
Ants and honeydew
Honeydew production
Ants and Aphids
A Mutualistic Relationship

- Aphids provide food – *honeydew*
- Ants provide protection
Some ant (females) have a functional stinger and (most) can inject some type of venom.

Ants do not have a barbed stinger.
Ants in the subfamily Formicinae do not sting.

Some will use formic acid or other chemicals in defense.
Ants that may occur in a building in Colorado include:

- Field ants (*Formica* spp.)
- Carpenter ants (*Camponotus* spp.)
- Odorous house ant (*Tapinotema sessile*)
- Pavement ant (*Tetramorium immigrans*)
- Pharaoh ant (*Monomorium pharaonis*)
Field Ants – *Formica* spp.

A common group of ants outdoors – A temporary ant found in homes in early spring
Thorax noticeably indented
One hump (node) on pedicel
Field ants – aka “thatcher ants”
These ants will also collect honeydew to supplement their diet.

Field ants are predators of other soft-bodied invertebrates.
Field ants collecting aphid honeydew

Field ants collecting sugary secretion from peony buds
Harbingers of Spring

Robin (left); Field ants temporarily forage in homes (below)
Thorax smoothly humped (no indentation)
One hump (node) on pedicel
Most species of carpenter ants nest in wood.

They *do not* eat wood.
Carpenter ant tunneling
Expelled sawdust at colony openings
Debris expelled from carpenter ant nest
Carpenter Ants

• Nest in wood
  – Produce clean, debris-free galleries
• May produce satellite colonies in structures
• Feed heavily on honeydew
  – Live, dead insects are other common foods
• Are primarily night active
Odorous house ant
• **Medium sized** (1/8-1/10 inch/2.4-3.3 mm)
  – Monomorphemic
• **One node on pedicel, but flattened and concealed**
Odorous house ants heavily utilize honeydew
Mulches provide favorable nest sites for odorous house ants
Mulch and vegetation covering the foundation may also cover up ant activity around your home.
Myrmicine Ants

- Possess stinger
- Pedicel is two-humped (two nodes)
- Examples
  - Pavement ant
  - Pharaoh ant
  - Fire ants
  - Harvester ants
Pavement ant – a monomorphomic species
Two humps (nodes) on pedicel
Grooves on head
Nests are shallow and usually under rocks, pavement or similar cover.
Flickers feed heavily on pavement ants
Pavement ant raids are common.
Raiding events by pavement ants can be commonly observed, as colonies define boundaries.
Sweets, oils, and protein-rich foods may alternately be favored by pavement ants.
Sausage shrine produced by ants (pavement ants?)

Interesting oddity!
This was not a funeral honoring the bee. The ants were surrounding it with available debris to hide it – so they could cut it up among themselves and bring it back to their nest for food!
Pharaoh ants are extremely small (2 mm).

Nests are small, often located in small cavities, and often include scattered secondary (satellite) nests.
Control of Ants in the Home

• Eliminate food resources
• Eliminate water resources
• Bait to reduce colony size
• Seal/caulk entry points
• Sprays?
Eliminate Sources of Water
Eliminate Alternate Sources of Food
Pavement ants working within my home over the past few weeks

Food source: Honeydew produced by soft scales and mealybugs on my houseplants
Baiting for Ants
Fundamentals of Ant Baiting

• Match bait to feeding habits of target ant species
• Use slow-acting toxicant
• Remove alternate food sources
• Place bait near foragers
• Maintain bait quality
• Replenish baits as needed
Fundamentals of Ant Baiting

• Match bait to feeding habits of target ant species
  • Use slow-acting toxicant
  • Remove alternate food sources
  • Place bait near foragers
  • Maintain bait quality
  • Replenish baits as needed
Other Food Preferences

• Oily materials
  – Pharaoh ant
  – Pavement ant (often)

• Sweet materials
  – Field ant
  – Carpenter ants
  – Odorous house ants
  – Pavement ants (sometimes)
Fundamentals of Ant Baiting

- Match bait to feeding habits of target ant species
- **Use slow-acting toxicant**
  - Boric acid
  - Hydramethylnon
  - Indoxcarb
  - Fipronil
- Remove alternate food sources
- Place bait near foragers
- Maintain bait quality
- Replenish baits as needed
Borax or Boric Acid based baits
Borates used for wood protection

Boric acid used for ant and cockroach control

Primary uses of boron–based insecticides
Hydramethylnon – an insect growth regulator type of insecticide
A hydramethyphon product used on ants outdoors.
Fipronil
Carpenter Ant Baits

- Special baits are designed for these type of ants
  - Must be liquid or moist gel
  - Sugar based
Fundamentals of Ant Baiting

- Match bait to feeding habits of target ant species
- Use slow-acting toxicant

**Remove alternate food sources**
- Place bait near foragers
- Maintain bait quality
- Replenish baits as needed

Note: Once you have removed alternate food/water sources and set out the baits – leave the ants alone.

You want them to visit the bait undisturbed – that is the point.
Fundamentals of Ant Baiting

- Match bait to feeding habits of target ant species
- Use slow-acting toxicant
- Remove alternate food sources
- Place bait near foragers
- Maintain bait quality
- Replenish baits as needed
Boric acid can be used as a tracking powder

Boric acid is picked up and returned to the colony – similar effects of baiting.
Eliminate entry points used by ants
Use multiple approaches to eliminate ants from a home
Effectiveness of sprays indoors for ant control? Mostly a supplement to other primary methods.
Control of Ants in the Home

• Eliminate food resources
• Eliminate water resources
• Bait to reduce colony size
• Seal/caulk entry points
• Sprays?
Moth (filter) flies are flies, but they look like tiny moths.

The multiplume moth is a moth that doesn’t look like any other kind of moth.
Multiplume moth

*Alucita montana*

- A fairly common nuisance invader of homes in upper elevation, forested sites of the state.
- Larvae develop as a leafminer, feeding on snowberry.
Questions?

whitney.cranshaw@colostate.edu
This presentation will be posted at the Colorado State Insect Information Website

- Housed at Department of Agricultural Biology
- Within “Entomology”
- “Insect Information”
  - Extension presentations are posted at the bottom of the page, most recent at end
About 200 fact sheets on Colorado “Bugs” linked here

This presentation will be found here