The Filth on Filth Flies

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COOPERATIVE EXTENSION

Arizona Pest Management Center

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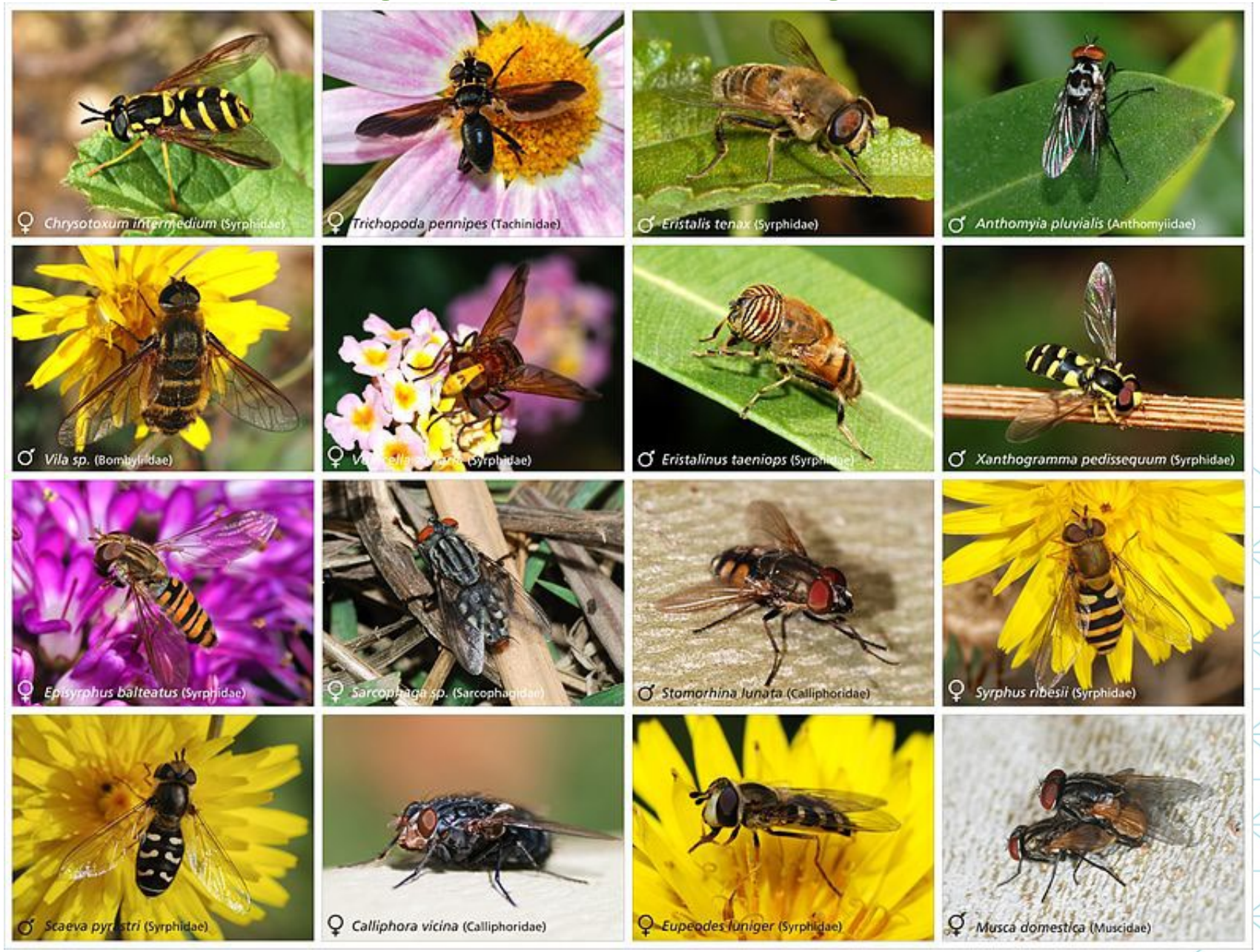
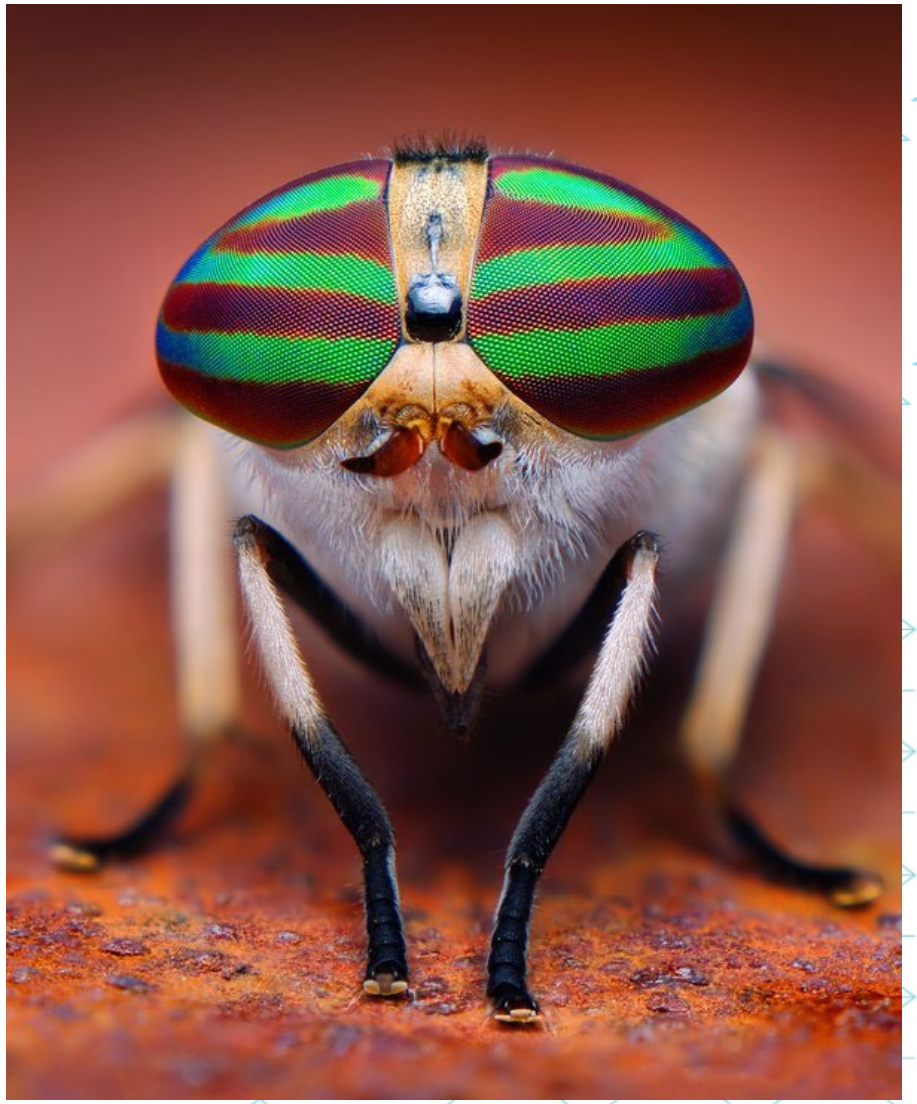
Diptera Diversity



Order Diptera: The Flies

- 4th most diverse insect order
- Worldwide distribution
- ~ 160,000 species
- Economic and ecological significance –
  - biting, annoying pests,
  - vectors,
  - pollinators,
  - predators,
  - parasitoids,
  - decomposers,
  - prey



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Order Diptera: The Flies

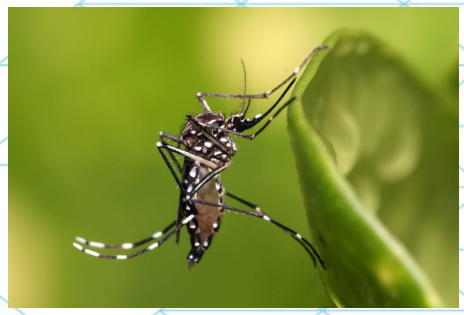
- Two major suborders

Brachycera

- Stout, stocky or round bodies
- Short, stiff antennae
- Larvae - maggots (no distinct head or appendages)
- Adults and larvae - terrestrial, live in different kinds of decaying organic matter
- E.g., house flies, flesh flies, horse flies, fruit flies, etc.

Nematocera

- Slender, elongated bodies,
- Long, feathery antennae
- Larvae usually aquatic (heads can be differentiated from their bodies
- Adults are terrestrial, feed on nectar or organic matter
- E.g., mosquitoes, midges, gnats, crane flies, etc.



Flies – Quick Overview

Diptera: di=two, ptera=wing

- Only one pair of membranous wing visible
- Second pair of wings functions as a balance organ - **the haltere**
- Wings cannot completely fold over abdomen
- Piercing/sucking, sponging or chewing mouthparts
- Larvae (maggots) – headless, legless, feed on plant and animal tissue
- Adults feed on dead/decaying material

Excellent fliers!

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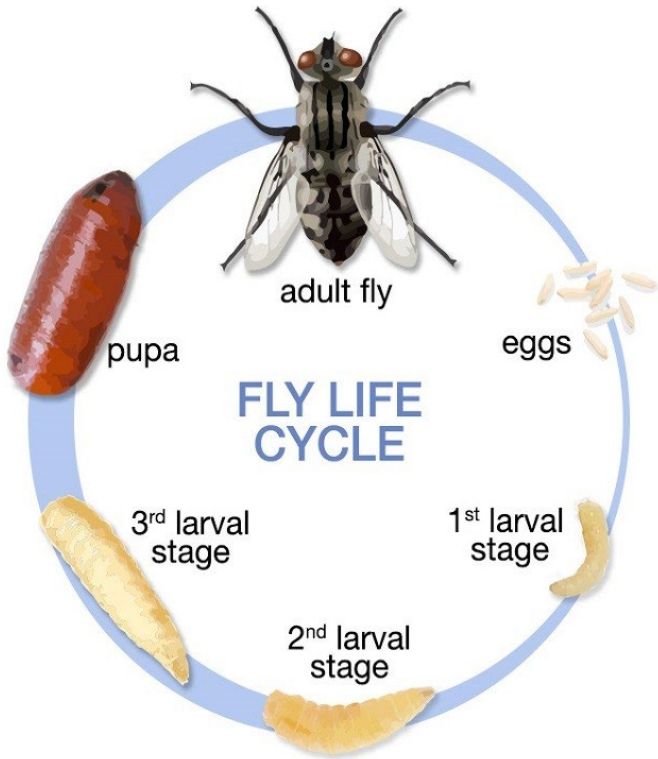
Flies – Life cycle

- Flies are holometabolous - Four stages in life cycle: egg, larva, pupa, and adult.
- In favorable conditions, the life cycle (egg to adult) usually takes eight days.
- In two weeks, one filth fly may lay more than 1,000 eggs.
- Eggs resemble miniature rice grains
- Larvae (maggots) are creamy white, headless (no distinct head capsule), legless, carrot shaped.
- Puparium – yellow to black, barrel shaped



Fly Facts

- Filth flies cannot chew; they have to suck up their food.
- Flies do not have eyelids; they have to rub their eyes with their feet to keep them clean.
- Flies taste, smell, and feel with the hairs that cover their bodies. Flies actually taste what they walk on.
- Flies can walk on smooth surfaces using sticky soft pads on their feet that act like glue. This allows them to walk on vertical glass surfaces and even upside down.

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Filth Flies

- Breed in filthy matter (manure, garbage, cadavers, etc.
- Considered pests because
  - nuisance insects
  - contaminate food and other surfaces
  - disease vectors – carry and spread pathogens

Species:

- House flies
- Blow flies
- Flesh flies
- Drain flies

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House fly

Blow fly

Drain fly

Flesh fly

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House flies

- The most common domestic flies, found all over the world.
- Adults are small dark gray flies, about ¼ inch in length.
- Dark red eyes and a light grayish-tan colored abdomen.
- Thorax has dark stripes that run lengthwise.
- House flies do not bite or sting but they can be extremely annoying, when flying into homes and settling on food and other surfaces.

House flies

- Transmit several microorganisms including those causing diarrhea, dysentery, typhoid, food poisoning, cholera, and eye infections.
- They mechanically carry these pathogens on their body surfaces and hair, as well as within their digestive tracts, expelling them through saliva, vomit and feces.

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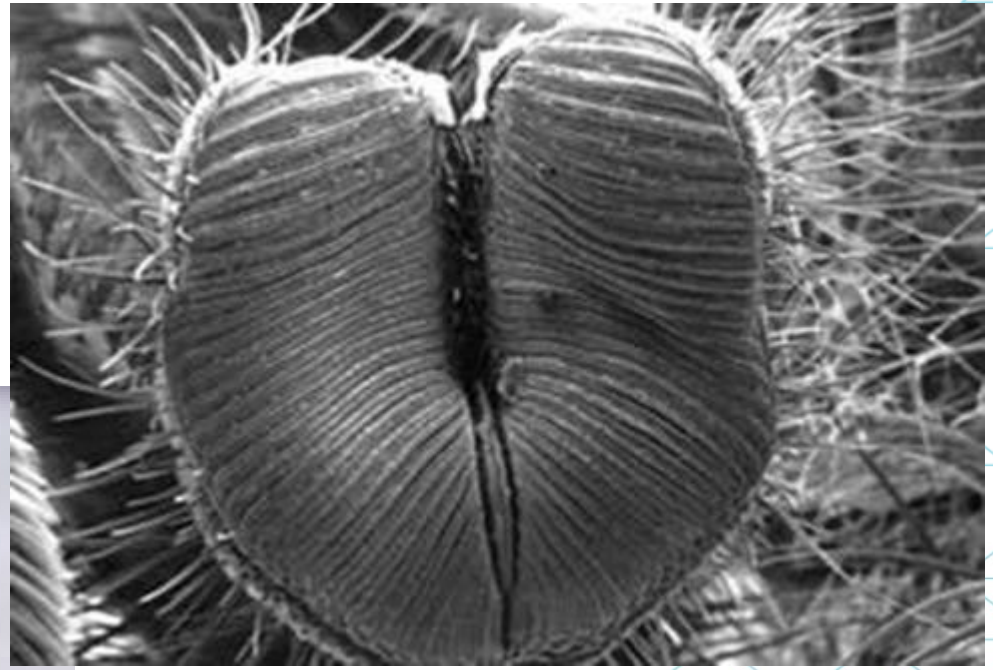
House flies

- Sponging mouthparts
- Do not bite or chew



House flies

House fly Eating
https://www.youtube.com/watch?v=N23E4jYTExk

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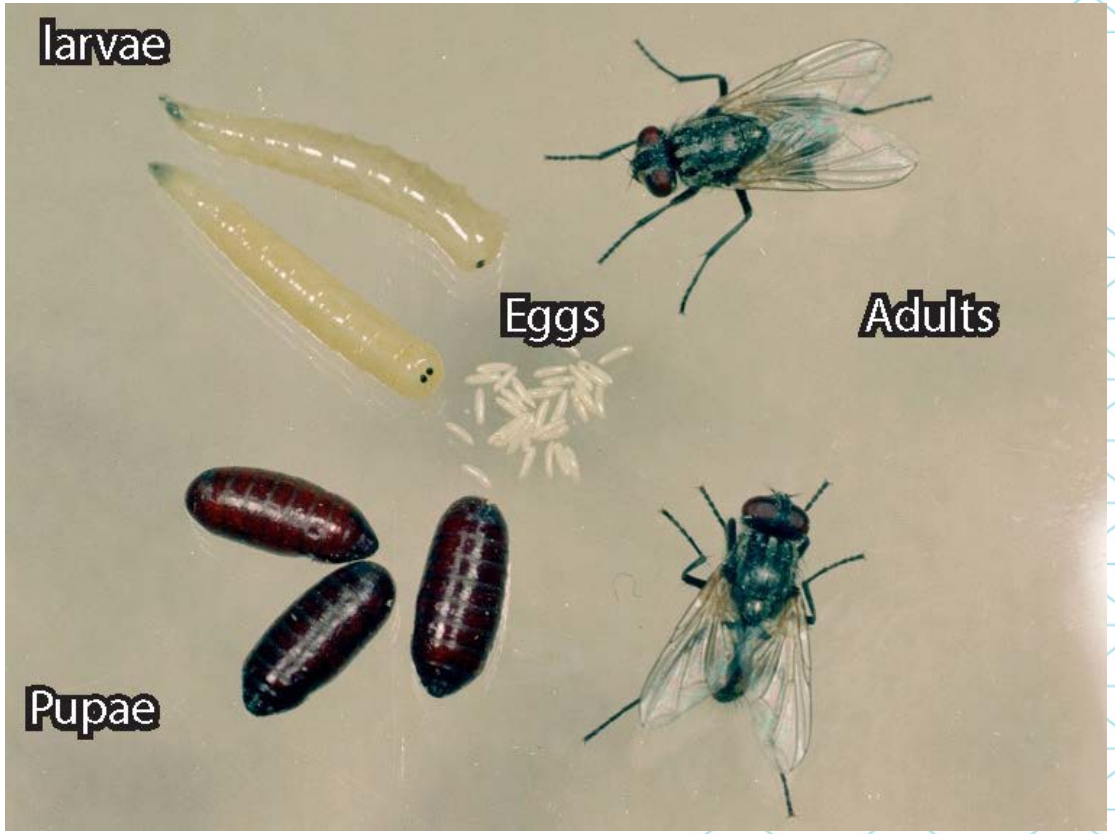
House fly life cycle

- Extremely short life-cycles,
- About 15 days from egg to adult under temperatures of 25 - 30^{o}C
- The females lay hundreds of eggs, and live for over a month, so populations can easily explode in 2-3 months of favorable conditions.
- House fly larvae develop in 50-60% moisture levels so extreme heat is not ideal for their development.



House flies

How flies lay eggs
https://www.youtube.com/watch?v=S50QeMFepWo

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House fly look-alikes

Little house flies

- Smaller than house flies
- Distinguished by the lack of distinct stripes on the thorax.
- More common during the cooler months and their numbers diminish as the temperatures rise during summer.
- Do not enter indoors as frequently as house flies, prefer outdoor areas close to homes such as patios, porches, and garages.
- Often hover at face height, causing great annoyance during outdoor activities near homes.
- Not regarded as significant carriers of human pathogens.

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House fly look-alikes

Stable flies

- Very often confused with house flies, also have the dark stripes on the thorax,
- Lighter colored, wider abdomen with spotted pattern (not checkered),
- Bayonet-like mouthpart (proboscis) protruding from the front of the head.
- Both male and female stable flies feed on blood, and their bites are painful and irritating.
- Most abundant in locations close to stables, attack horses, cattle and other domestic animals.
- Prefer to feed on the legs and lower body in cattle, horses and humans, but in dogs and smaller animals, they feed on the external ears.

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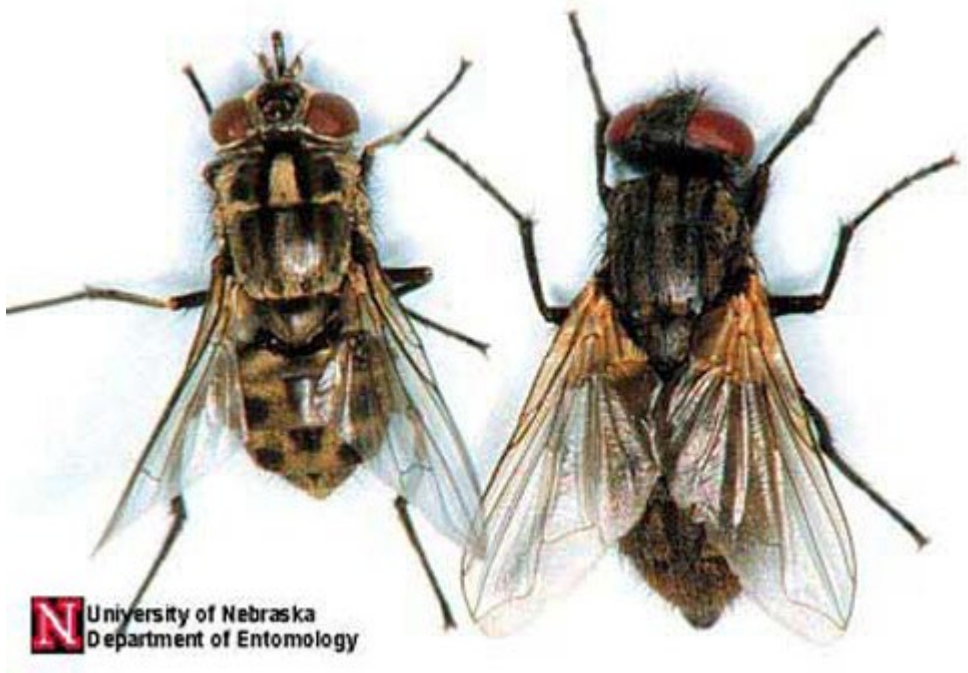
House fly look-alikes

Stable flies VS. House flies

- Rest at an angle to the surface, with head raised above abdomen, whereas house flies rest with their abdomen flat and parallel to the surface.



- Blood feeders, carry and spread pathogens, but not a significant cause of concern.

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House fly look-alikes

Flesh flies

- Often mistaken for houseflies due to their color, habits and habitats, but most species are much larger, up to ½ inch in length.
- Adults have three dark stripes that run lengthwise on the thorax and abdomen has a gray checkered pattern, often with a red tip.
- Majority are scavengers, feeding and breeding in carcasses of various other organisms.
- Also thrive in decaying vegetable matter and excrement, and can be found around compost pits and poorly maintained toilets and pet waste.

Other filth flies

Blow flies/blue bottles/green bottles

- Easily distinguished from other filth flies, by their shiny, metallic blue, green or bronze coloration.
- Mostly larger than house flies, reaching up to ½ inch in length.
- Feed on carrion or other decaying organic matter, especially feces, and are very common in dog parks, as well as around other animal droppings or manure.

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Other filth flies

Phorid flies/humpbacked flies/scuttle flies

- Small flies, about $^{1}/_{16}{}^{th}$ to $^{1}/_{8}{}^{th}$ inch in length,
- Yellowish-brown to gray in color, with a small head and dark eyes.
- Humpbacked appearance when viewed from the side.
- Scuttle across surfaces in short, jerky movements rather than flying.
- Often found in many of the same outdoor locations as the other filth flies,
- Indoors, frequently near drains and are therefore sometimes called drain flies.

Other filth flies

Vinegar flies/fruit flies

- Tiny flies, about $^{1}/_{16}{}^{th}$ inch in length, yellowish-brown or tan in color.
- Transverse dark bands around the abdomen.
- Males are slightly smaller and have a distinct dark patch at the end of the abdomen.
- Eye color can vary, but red is common.
- Adults are always found in and around fruit, vegetables, or any other sugary or fermenting organic material.

Other filth flies

Drain flies/moth flies

- Tiny flies, about $^{1}/_{8}{}^{th}$ inch in length, dark-grayish brown in color, with long feathery antennae and furry, leaf-shaped wings covered with soft hairs, giving them a miniature moth-like appearance. These hairs leave a powdery residue if the fly is crushed.
- Adult flies can fly, but weakly in short, hopping movements.
- Usually nocturnal and found in damp environments in homes and other structures (bathroom and kitchen sink drains, showers, laundry and floor drains).

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Concerns with Filth Flies

House flies can transmit a large number of diseases to humans

- Over 100 different pathogens have been recorded from house flies, over 65 are transmitted successfully
- Some diseases transmitted by house flies and their respective pathogens:
- Viruses: Polio, Infectious hepatitis
- Rickettsiae: Q fever
- Bacteria: Anthrax, Cholera, Shigella, Salmonella, E. coli, Staphylococcus aureus, Yaws spirochaetes
- Protozoans: Entamoeba, Cryptosporidium, Giardia
- Helminths: Ascaris, Tapeworm

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Concerns with Filth Flies

Mechanical transmission of pathogens (mechanical vectors)

- Transfer of pathogens from a contaminated source to a clean substrate or host surface.
- Biological association between pathogen and vector is not necessary.
- No development or multiplication of pathogen in the vector.
- Multiplication of the pathogen may occur in the original host and environment.
- Usually, multiple routes of infection or contamination.
- Direct mechanical transmission– e.g. eye gnats feeding on eye secretions can transmit yaws (chronic skin infection)
- Indirect mechanical transmission – e.g. ingestion of maggots from carcasses or contaminated food can result in enteric diseases.

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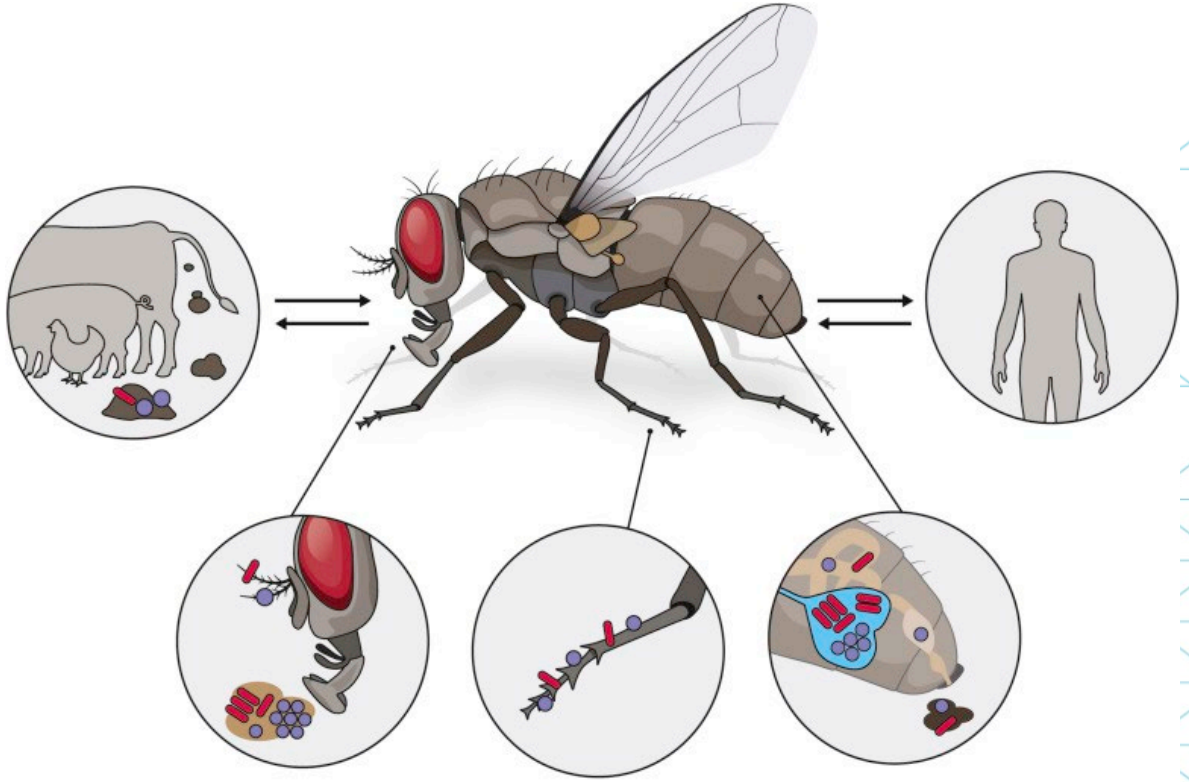
Concerns with Filth Flies

Important parameters in mechanical transmission

- Presence of setae on the vector
- Type of feeding behavior (biting, sponging)
- Regurgitation behavior
- Association with human dwellings
- Defecation patterns
- Stability of the pathogen in the environment
- Infectiousness of the pathogen
- Number and type of vectors
- Host immunity



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Concerns with Filth Flies

Myiasis

- Infestation of organs and tissues of humans or animals by fly larvae for some period of time.
- The larvae may feed upon living or dead tissues, or ingested food of the host.
- Accidental / facultative myiasis (due to accidental ingestion – can include enteric (stomach), recto/urogenital (excretory openings) or through skin wounds.
- The larvae are passively transported through the host tissue or digestive tract (no development).

Can occur in unsanitary conditions following extreme events!

Concerns with Filth Flies

Myiasis

- Some species display obligate myiasis (use living host tissue for development). E.g., bot flies.
- Control of myiasis involves :
  - Control of fly populations
  - Avoidance of infestation by reducing overcrowding, sleeping outdoors or on the ground, dress or cover wounds properly, and exclude or pest-proof homes and structures
  - Treatment of infestations with antibiotics may be necessary in some cases.

Medical use of myiasis – Maggot therapy

Many fly species that display accidental myiasis are also important in Forensic Entomology

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During and after extreme events

- Massive increases in populations of **flies** occur – short life cycle, high reproductive capacity.
- This drastically increases the frequency of contact with people, and spreading of potential diseases.

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During and after extreme events

- Receding flood waters often they leave behind moist organic debris.
- These are prime breeding sites for filth flies and provide nutrient rich larval habitats.

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During and after extreme events

- **Flies and rodents** are opportunistic invaders.
- These are an important group of pests that flourish after an extreme weather event, especially involving flooding.

  - Extended power outages, and damaged, overflowing sewer systems cause drastic landscape changes, leaving behind spilled sewage, spoiled food and rotting vegetation/landscape materials all of which are attractive to both flies (feeding and egg-laying sites) and rodents (feeding and harborage).

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Fly management

Name this plant

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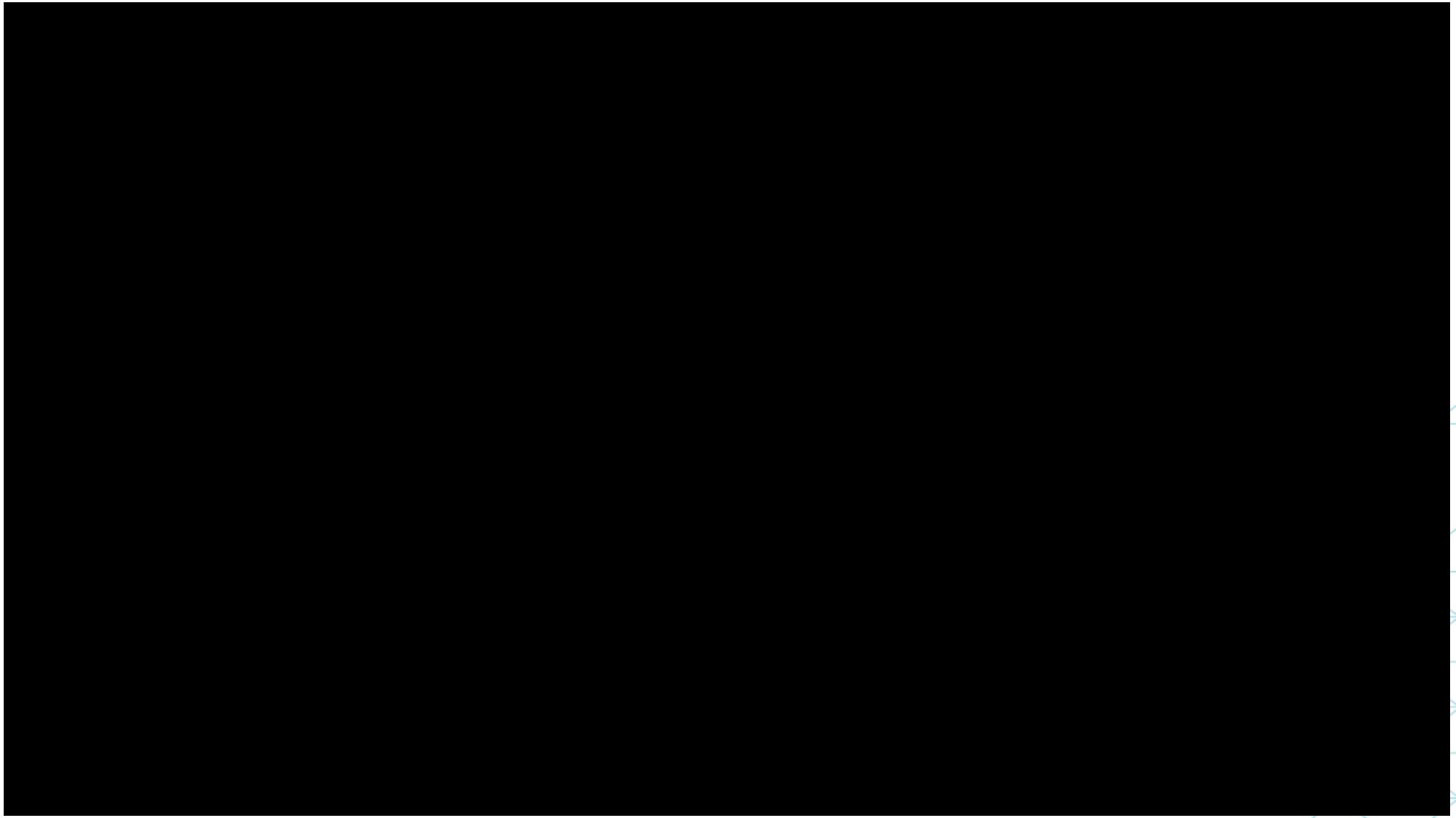
IPM for flies

- High reproductive rate, short lifespan, enable them to easily develop resistance to some commonly used pesticides
- Good sanitation practices, removal of larval breeding sources, adult's habitats alternation, and exclusion/pest proofing methods should be properly implemented
- Pesticide applications should be used only as the last resort depending on the situation and as instructed in the product label



Here’s How That Annoying Fly Dodges Your Swatter | Deep Look
https://www.youtube.com/watch?v=jBPFCvEhv9Y
Deep Look Channel

Fly Management = Waste Management

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Fly Management = Waste Management

Fly traps

http://www.thehealthyhomeeconomist.com/wp-content/uploads/2013/07/fly-trap.jpg

http://www.rinconvitova.com/images/fly%20trap%20jumbo%20bag%20doorway.jpg

http://www.coachcox.co.uk/wp-content/uploads/2008/05/flies.jpg

IPM for flies

- Kitchens, cafeterias and dining halls are especially vulnerable to flies because of the presence of food.
- Make sure to wipe down counter tops, work surfaces, food serving and dining areas promptly after use, to remove food remains and residues.
- Never leave food items open. Store food in a refrigerator airtight containers or under mesh screens to prevent flie from accessing.
- Clean up spills immediately, rinse the used mops and wash cloths thoroughly with clean water and store or hang them so that they can dry well.

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IPM for flies

- Place food waste in trash cans with lids and strong liners that do not rip or tear easily, and take the trash out to an outdoor dumpster or trash receptacle at the end of the day.
- Ensure that outdoor dumpsters are emptied on a regular basis before they are overfull, and keep dumpster lids closed.

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IPM for flies

- Periodically clean out the insides of trash cans to remove accumulated organic matter. Outdoor dumpsters may also be pressure washed, and old, damaged dumpsters with worn out lids and sides may be replaced on request by your waste management service providers.

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IPM for flies

- Keep outdoor dumpsters at a distance of at least 50 feet from external doorways.

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IPM for flies

- Clean out clogged sinks and drain pipes periodically.
- Organic matter buildup inside drains can be removed using a bacterial or enzymatic drain cleaner, followed by very hot water. For thick deposits, manual cleaning with a stiff brush may be required.

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IPM for flies

- Fix water leaks and eliminate any other moisture problems indoors as well as outdoors.
- Look for watermarks on ceiling tiles and walls. Remember: adult flies may be in one area, but the origin of the infestation may be another place.

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IPM for flies

- Regularly clean out roof gutters and storm drains.
- Ensure free flow of water, avoid water logging.

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IPM for flies

- Keep mulch and bark levels in potted plants to a minimum.
- Don’t overwater plants and don’t allow water to stand in drainage pans.

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IPM for flies

Physical control

- **Pest proofing is your first line of defense** to keep flies and many other pests out of your homes and buildings.
- Maintain door sweeps and seals, weather stripping and door and window screens in good repair. Seal cracks and gaps around doors and windows.

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IPM for flies

Mechanical control

- Fans to create air barriers in doorways to kitchens can stop flies from entering
- Fly zappers – electric devices. Use UV.
- Fly tapes – sticky tapes that trap flies

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IPM for flies

Chemical control (Should be used as a last resort only)

- In most home situations, chemical pesticides are not necessary.
- In extreme event situations, when normal sanitation or mechanical methods are not sufficient to bring down populations, chemicals may be used
- Non-residual pyrethrin aerosol sprays to kill flying adults
- Residual products can be used on walls or harborages where flies rest
- Treatment of manure pits, or garbage dumps is done in some cases to kill larvae (maggots) but is often ineffective
- Toxic baits are available, but without proper sanitation, baits will never be effective
- Insecticide resistance is a big concern

Biting flies

Deer fly

Horse fly

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Fly Trivia

- Chocolate comes from fruits of the cacao tree of South America. Its flowers are pollinated by the chocolate midge, **a tiny fly** less than 1/8 inch long. Without this fly, there would be no chocolate.

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Fly Trivia

- **Casu marzu – the world's most dangerous cheese!**
- A type of cheese delicacy made by introducing maggots of the cheese fly into sheep milk cheese, to promote fermentation and breaking down.
- The cheese has to be consumed when the maggots are alive!
- Once the maggots are dead, it is considered unsafe.

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