Lab 11: Pests of Humans, Animals, and Property

The insects covered in this lab are

Medical and Veterinary Pests:

- ticks, including the blacklegged tick, *Ixodes scapularis* Say (Acari: Ixodidae)
- mosquitoes (Diptera: Culicidae)
- bed bug, *Cimex lectularius* L. (Hemiptera: Cimicidae)
- cat flea, *Ctenocephalides felis* (Bouché) (Siphonaptera: Pulicidae)
- lice, especially the human body louse, *Pediculus humanus humanus* L. (Phthiraptera: Pediculidae)
- bot flies and "grubs" (Diptera: Oestridae)
- house fly, *Musca domestica* L., and stable fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae)
- spiders: brown recluse, *Loxosceles reclusa* Gertsch & Mulaik (Araneae: Sicariidae), and black widow, *Latrodectus mactans* (Fabricius) (Araneae: Theridiidae)

Household Pests:

- cockroaches (Blattaria: Blattidae and Blattellidae)
- crickets (Orthoptera: Gryllidae)
- pantry pests (stored-grain pests)
- multicolored Asian lady beetle, *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae)

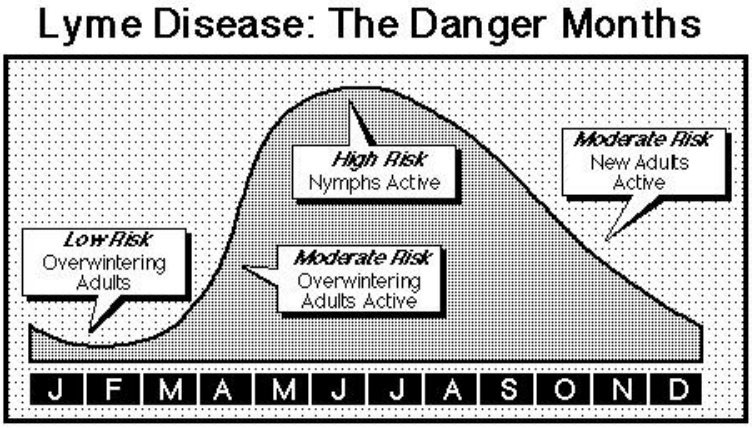
Structural and property pests:

- eastern subterranean termite, *Reticulitermes flavipes* (Kollar) (Isoptera: Termitidae)
- carpenter ants, *Camponotus* spp. (Hymenoptera: Formicidae)

Station 1. Blacklegged tick and Lyme disease.

Several tick species are common pests of wild animals, livestock, pests, and humans in North America and throughout the world. On a world-wide basis, ticks are vectors of many pathogens that cause debilitating and life-threatening diseases of humans and animals. A concise review of the ticks found in Illinois is available on the Illinois Department of Public Health's web site at http://www.idph.state.il.us/envhealth/pccommonticks.htm . Use this reference to answer questions about Illinois ticks and the diseases they transmit.

In 1975 a "new" disease carried by ticks occurred at alarming levels near the town of Old Lyme, Connecticut. The disease, now known as Lyme disease, is transmitted by ticks in the genus *Ixodes*. In the eastern United states, the vector is *Ixodes scapularis*, the blacklegged tick. (This tick also has been called the deer tick and *Ixodes dammini*, but it is recognized now as *I. scapularis*.) Lyme disease, caused by the spirochete *Borrelia burgdorferi*, begins with a bulls-eye rash around the site of the tick bite, but the pathogen becomes systemic, and symptoms can include meningitis, heart irregularities, reduced vision, memory loss, temporary paralysis, pain with numbness or weakness in the limbs, and arthritis. Avoiding tick bites and treating the disease in its early stages with antibiotics are essential.



Upper left: Stages of the blacklegged tick (Illinois Dept. of Public Health); upper right: bulls-eye rash (NY Medical College); bottom: periods of relative risk for blacklegged tick bites and Lyme disease transmission (Univ. of Rhode Island).

References:

- Anon. Undated. Common Ticks. Illinois Department of Public Health, http://www.idph.state.il.us/envhealth/pccommonticks.htm
- Anon. Undated. Lyme Disease. Illinois Department of Public Health, http://www.idph.state.il.us/public/hb/hblyme.htm
- Anon. Undated. Lyme Disease Transmission. http://www.cdc.gov/lyme/

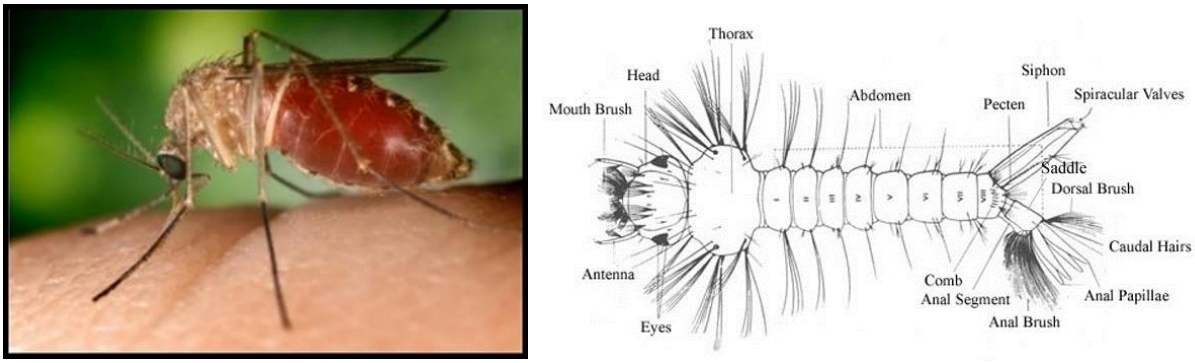
Station 2. Illinois mosquitoes.

Several species of mosquitoes occur commonly in Illinois and elsewhere in North America. The Identification Guide to Common Mosquitoes of Florida (http://fmel.ifas.ufl.edu/key/) provides keys to many species and illustrates the characteristics used to distinguish them. The form of antennae and palpae, along with abdominal shape and leg banding, are characteristics used in identification of adults. Click on the pictures in the keys to see the characteristics of different species.

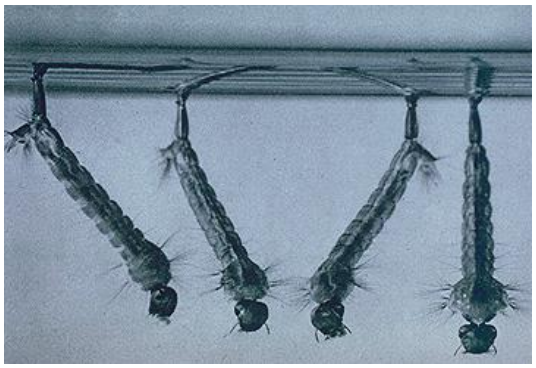
Two web references on Illinois mosquitoes are "Mosquitoes" on the University of Illinois IPM site (http://www.ipm.uiuc.edu/hyg/insects/mosquitoes/) and Illinois Department of Public Health's page (http://www.idph.state.il.us/public/hb/hbmosquito.htm) also entitled simply "Mosquitoes." These references point out that common species include the inland floodwater mosquito, *Aedes vexans*, and container-breeding mosquitoes such as *Culex pipiens*, the northern house mosquito, other *Culex* species, and *Aedes albopictus*, the Asian tiger mosquito. The inland floodwater mosquito, though very common and a painful biter, is not a common vector of human pathogens, though it does transmit the dog

heartworm pathogen, as do *Culex* species. *Culex* species transmit various encephalitis viruses, including West Nile virus.

Worldwide, mosquitoes in the genus *Anopheles* transmit malaria, and those in the genus *Aedes* transmit yellow fever and dengue; these and other mosquito-borne diseases kill and disable millions of humans every year.



Left: engorged female mosquito (CDC); right: mosquito larva (M. Hildreth, South Dakota State Univ.)



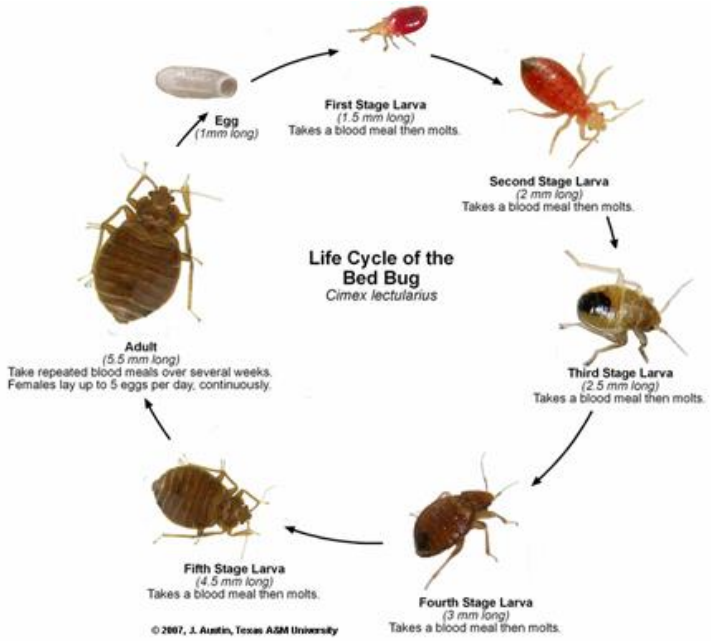
Mosquito larvae with their siphons at the surface for air.

References:

- Anon. 2007. Mosquitoes. Illinois Department of Public Health, http://www.idph.state.il.us/public/hb/hbmosquito.htm
- Anon. Undated. Mosquitoes. University of Illinois, http://www.ipm.uiuc.edu/hyg/insects/mosquitoes/
- Cutwa-Francis, M. M., and G. F. O'Meara. Undated. Identification Guide to Common Mosquitoes of Florida. http://fmel.ifas.ufl.edu/key/

Station 3. Bed bug.

Bed bugs were common pests in the United States through the early 1900s. Improved hygiene and the use of DDT all but eliminated this insect in much of North America even though infestations persisted in areas of Africa, Asia, and eastern Europe. In recent years bed bugs have become much more common again, and most populations are resistant to one or more of the insecticides labeled for use against them.



Adult bed bugs are nearly ¼-inch long, reddish brown, and wingless. Their mouthparts are piercing-sucking stylets that arise from the front of the head. Adults live for several months and lay one or two eggs per day; all stages feed on the blood of humans (and some other animals). They are active and feed at night, then hide in secluded locations during the daytime; locations include mattresses, box springs, headboards, baseboards, and the cushions of chairs and couches. They also seek shelter in suitcases and other luggage brought into hotel rooms or bedrooms and can be moved to new locations along with these items. Signs of bed bug infestations include brownish spots of excrement along seams of mattresses or other sites where they hide during the daytime. Although bed bugs are not known to transmit any pathogens that cause human disease, their bites leave painful inflamed welts. Because many bed bug populations are resistant to common insecticides available for use indoors, some people have resorted to using insecticides intended for use on crops, landscape plants, or other outdoor surfaces. Many of these insecticides contain volatile solvents that can be toxic and flammable indoors, and many are too toxic to be used where people are in constant contact with the residues.

Be sure to be able to distinguish between bed bugs and lice (identification, behavior, and vector status), and know what methods besides the use of insecticides are important in managing and preventing bed bug infestations.

Reference:

- Potter, M.F. 2008 Bed Bugs. University of Kentucky ENTFACT 636. http://www.ca.uky.edu/entomology/entfacts/ef636.asp

Station 4. Cat flea.

The most common flea on dogs and cats in the United States is the cat flea. Adults suck blood from their hosts, and larvae feed on a variety of decaying organic matter, especially the dried feces of adult fleas.

Cat flea adult (left) and larva (right) (Ken Gray Collection, Oregon State Univ.).

Examine the specimens of these insects provided at this station, and be sure to be able to see the genal and pronotal combs on the adults. Flea control is based primarily on the use of insecticides directly to pets. Keeping cats indoors also limits exposure to fleas. Vacuuming carpets where pets are kept indoors (and discarding the vacuum bag) reduces adult and larval numbers but does not eliminate infestations.

Reference:

- Merchant, M. Undated. Safer flea control. Texas A & M University. http://citybugs.tamu.edu/factsheets/biting-stinging/others/ent-3001/

Station 5. Human body louse.

There are over 900 species of lice in North America and over 3,000 worldwide. Nearly all land vertebrates have one or more louse species that feed on them. Lice are obligate parasites; immatures and adults take blood meals from their hosts in order to develop and reproduce. The human body louse, *Pediculus humanus humanus*, the human head louse, *Pediculus humanus capitus*, and the pubic louse, *Phthiris pubis*, are the species found on humans.

As discussed in lectures, human body louse is important as a vector of at least a few human pathogens, the most important of which is the rickettsia that causes epidemic typhus. Be sure to scroll down through the reference below by Conlon to read about the impact of louse-borne typhus on Napoleon's army in the 19th Century and on Russia during World War I.

Stages of the human body louse. Photo by John Clark, Kyong Sup Yoon and Joseph P. Strychartz, University of Massachusetts.

References:

- Conlon, J.M. Undated. The historical impact of epidemic typhus. In: Insects, Disease, and History. http://entomology.montana.edu/historybug/TYPHUS-Conlon.pdf
- Weems, H.W., and T.R. Fasulo. 2007. Body louse and head louse. University of Florida, http://entnemdept.ufl.edu/creatures/urban/human_lice.htm

Station 6. Bot flies and "grubs".

OK, your first reaction here is going to be "yuck!" These are the flies whose larvae develop as parasites under the skin or elsewhere internally in mammals. Rodent bot flies and cattle grubs develop (primarily) subcutaneously; horse bot flies develop in the stomach of horses, and sheep bot flies (oestrid head maggots) develop in the nasal sinuses of sheep; a similar species in deer is called the deer head maggot.. And yes, there are human bot flies as well, though not in the United States. Read about these insects in general in the brief reference by Turpin (2007), and for information on two of the agriculturally important bot flies, read the reference by Kaufman et al. (2006) on cattle grubs.

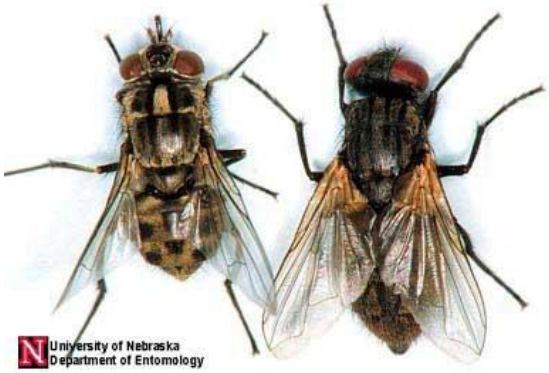
References:

- Sanchez-Arroyo, H. 2011. Cattle grubs. University of Florida, http://entnemdept.ufl.edu/creatures/livestock/cattle_grub.htm
- Turpin, T. 2007. Bots in the world of insects are flies. In: On Six Legs, Purdue University, http://www.agriculture.purdue.edu/agcomm/newscolumns/archives/OSL/2007/June/070614OSL.htm

Top left and right: human bot fly larva (L: Tom Kalisch, Univ. of Nebraska; R: wildernessclassroom.com). Bottom left: rodent bot fly (Univ. of Florida). Bottom right: rabbit bot fly adult (Univ. of Nebraska).

Station 7. House fly and stable fly.

These flies are very common throughout the United States during warm weather, and many people fail to distinguish between them. However, stable flies are blood feeders and house flies are not. Use the references provided to answer questions on these insects in your assignment.



Stable fly (L) and house fly (R) (Univ. of Nebraska)

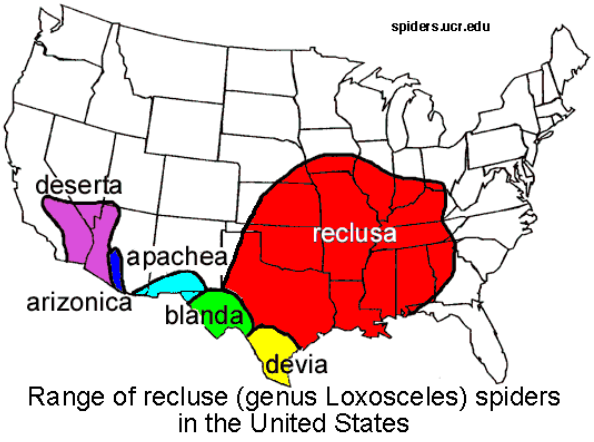
References:

- Anon. Stable Fly. http://ipm.ncsu.edu/AG369/notes/stable_fly.html
- Sanchez-Arroyo, H., and J. Capinera. House fly. University of Florida, http://entnemdept.ufl.edu/creatures/urban/flies/house_fly.htm

Station 8. Brown recluse and black widow spiders.

Although a few other spiders can bite humans and inject a venom that causes a mild allergic reaction, these are the two truly poisonous spiders encountered in large areas of the United States. They differ considerably in their geographic range and behavior, as well as in the nature of the venom that causes a poisonous reaction in humans.

Left: brown recluse spider (Univ. of Wisconsin); right: black widow spider (Texas A & M Univ.).



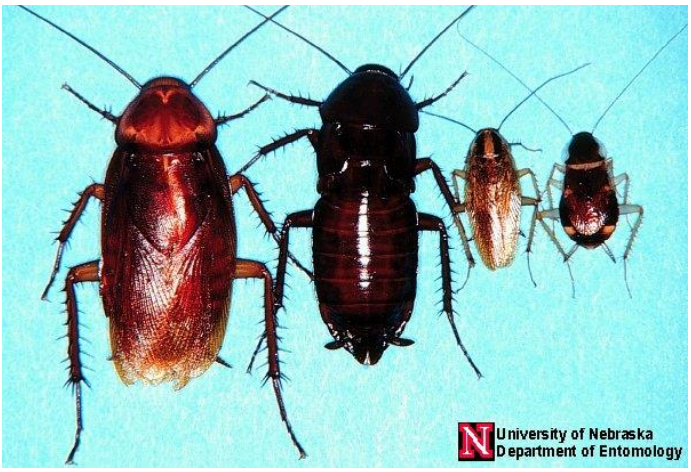
Map by Univ. of California, Riverside.

References:

- Jones, S. Undated. Black widow spider. Ohio State University HYG-2061A-04 http://ohioline.osu.edu/hyg-fact/2000/2061A.html
- Vetter, R. 2005. How to identify and misidentify a brown recluse spider. University of California, Riverside, http://spiders.ucr.edu/recluseid.html

Station 9. Cockroaches

Although additional species of cockroaches may be found outdoors in the Midwest and several more are common in southern states, the four pest species here are the American cockroach, the oriental cockroach, the German cockroach, and (least important) the brownbanded cockroach. Use the reference provided to learn about managing these insects.



Left to right: American, oriental, German, and brownbanded cockroaches (University of Nebraska).

Reference:

- Peairs, F.B. 2006. Cockroaches. Colorado State University, http://www.ext.colostate.edu/pubs/insect/05553.html

Station 10. Crickets

Left: field cricket female. Right: house cricket male (above) and female (below). Photos by J. Kalisch, Univ. of Nebraska.

OK, you hear them chirping around and inside the house in the fall every year, so you ought to know at least a little something about them. Use the reference provided to be able to distinguish between them and to learn about their life histories.

Reference:

- Newton, B. 2008. Crickets. http://www.uky.edu/Ag/CritterFiles/casefile/insects/crickets/crickets.htm.

Station 11. Pantry pests and stored-grain insects.

Several species of beetles, a few lepidopterans, some psocids, some mites, and a few other miscellaneous insects infest stored cereal products, candies, nuts, raisins, pet food, etc. in cupboards and elsewhere in homes throughout the United States. They often are referred to as "pantry pests" in such situations. The keys to preventing or controlling infestations of these pests center on sanitation, exclusion (including sealing containers), avoiding long-term storage, and using freezing temperatures to kill existing infestations or prevent development. Also found in homes are insects that feed on animal fibers such as wool clothing or rugs. Among them are clothes moths and carpet beetles (dermestids).

Similar pests infest stored grains, flour mills, museums, and other agricultural and commercial settings that provide concentrations of the foods these insects eat. In such situations they are called stored-grain insects or stored-product insects. Because these stored goods are often moved around the world in trade, many of these pests are cosmopolitan now, and nations everywhere face similar problems in managing them. Post-harvest losses of grains to insects and related pests around the world sometimes exceed in-field losses by a great deal.

References:

- Ogg, B. 2007. Managing pantry pests. University of Nebraska, http://lancaster.unl.edu/pest/resources/pantrypests304.shtml
- Weinzierl, R. 2007. Insect pest management for stored grain. University of Illinois, http://www.ipm.uiuc.edu/pubs/iapmh/05chapter.pdf

Station 12. Multicolored Asian lady beetle.

Multicolored Asian lady beetles (Iowa State Univ.)

You know of this insect as a predator in field crops, forests, and gardens. Now let's remember the less desirable aspects of its life history Use the reference below to answer questions for your assignment.

Reference:

- Jones, S., and J. Boggs. Undated. Multicolored Asian lady beetle. Ohio State University, http://ohioline.osu.edu/hse-fact/1030.html

Station 13. Eastern subterranean termite

Reference:

- Potter, M. 2004. Protecting your home against termites. University of Kentucky, http://www.ca.uky.edu/entomology/entfacts/ef605.asp

Station 14. Carpenter ants

New carpenter ant queen with brood (J. Kalisch, Univ. of Nebraska).

Reference:

- Ogg, B. 2007. Carpenter ant management. University of Nebraska, http://lancaster.unl.edu/pest/resources/CarpAnt004.shtml

Study questions on pests of humans, animals, and property

1. Station 1. (a) What are the most common ticks in Illinois? (b) List the diseases that each species transmits.
2. Station 1. What steps can be taken to reduce the risk of tick bites and infections?
3. Station 2. What are the two main types of mosquitoes in Illinois and how do they differ? Name one or more species in each group.
4. Station 2. What is West Nile virus, and what can be done to prevent it or reduce the risk of acquiring it?
5. Stations 3 and 5. (a) How do beg bugs differ from lice (identification, behavior, and life cycle)? (b) What are the three different lice that occur on humans and how are they controlled? (c) Describe the magnitude of losses caused by louse-borne epidemic typhus during the Napoleonic wars in the 19th century and during World War I (for the military and civilian populations). Why is bedbug control so difficult now?
6. Station 6. What is the life cycle of the cattle grub and how is it managed?
7. Station 7. Describe how the stable fly and the house fly differ (in appearance, food, life history, and impact).
8. Station 8. Describe the brown recluse spider (appearance, habitat, life history). What are the symptoms of its bite?
9. Station 9. Describe the American, oriental, and German cockroaches so that you can distinguish them from each other. What nonchemical control practices are important for cockroach control?
10. Station 11. List at least six different pantry pests and summarize the steps used for preventing problems with these insects in homes.
11. Station 12. What are the problems caused by multicolored Asian lady beetle? What steps can be used to prevent or manage those problems?
12. Station 13. What steps can be taken to prevent termite infestations in buildings?
13. Stations 13 and 14. Describe the differences between carpenter ants and termites (appearance, life histories, habitats, and damage).