

Colorado Coalition for School IPM Newsletter

November 2019

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Colorado Coalition for School IPM Agency Partner Spotlight: The Fungus Among Us

The Fungus Among Us - Restoring Ecosystems and Controlling Pests

By Marcia Anderson, PhD

Remember walking through the forest and seeing mushrooms, the reproductive structure of a fungus, growing on rotting tree trunks or decaying woodchips? One of the main benefits of fungi is that they help break down and recycle organic material, making nutrients available for new life.



I recently received a call from a Head Start program director in the Pacific Northwest asking about mushrooms growing in the woodchips on their playground. She was concerned because toddlers tend to put everything in their mouths, including mushrooms. They roped off the area until the local cooperative extension service

identified the mushrooms as being non-toxic. This interaction served as a reminder of how little most people know about fungi. There is, however, much to discover.

Fungi have been around for 1.3 billion years, but we are just beginning to discover many of their benefits. Aside from being a culinary treat, certain fungi are key elements in restoring ecosystems and allies in helping farmers protect valuable agricultural crops.



Turkey tail fungus (*Trametes versicolor*) helping to break down a fallen tree.

Photo: National Park Service

Research indicates that fungi have potential applications in pollution remediation through a process known as mycoremediation. That is the use of fungi to break down or remove a range of contaminants, including oils and toxic chemicals, from the environment. This form of biological remediation can filter toxins from stormwater runoff and help clean up industrial oil spills.

According to research, these fungi may be able to remove or detoxify chemicals, such as polycyclic aromatic hydrocarbons, polychlorinated biphenyls, petroleum compounds, and heavy metals like mercury and lead. The fungal mycelium, or vegetative part of the fungus, absorbs and converts



A look at a fungus' mycelial phase.

Photo: M. Anderson

the hydrocarbons in these contaminants into carbohydrates. Research using oyster mushrooms has shown significant pollutant removal from both soil and water.

Similarly, research has shown that turkey tail mushrooms are suitable for

mercury remediation; garden giant mushrooms can be used for E. coli removal; and mycobooms, straw rafts containing mushroom mycelium, can absorb oil from water.

Fungi are also used as biological pesticides, or biopesticides, that target specific insect pests and plant diseases. Biopesticides are considered less toxic than their chemical counterparts and are comparatively safer environmentally. Termed mycoinsecticides, some fungi act as parasites of insects and can protect plants from certain infections and diseases, thereby enhancing crop production.



Carpenter ants are the target of a biological pesticide.

Photo: David Cappaert; Bugwood.org

For example, one biological pesticide used in agriculture is *Trichoderma* spp., a beneficial fungus that colonizes plant roots and outcompetes disease-causing fungi. *Trichoderma* protects plants from soil-borne pathogens in non-food crops, fruiting vegetables, cole crops, legumes, herbs, cucurbits, berries, and small fruits. A side

benefit is that, over time, it stimulates plant growth and increases plant defenses.

Another commercially used biopesticide, *Beauveria bassiana*, is a fungus that acts on insects including aphids, whiteflies, thrips, fire ants, and bedbugs. The fungal bodies adhere to the insect's exoskeleton and slowly dissolve a hole in the insect's body. The fungus penetrates the body, proliferates, and produces spores that subsequently liquefy the insect's internal organs. Its slow action allows time for the target insect to pick up the fungal spores and infect the rest of the colony. The best news is that it does not affect non-target organisms.

Another fungal biopesticide, *Pythium oligandrum*, protects crops and turf from roughly 20 soil-borne pathogens. *Muscodora albus* is a fungal biopesticide that is an alternative to the fumigant methyl bromide. It is used to protect food commodities from post-



A feeding female *Anopheles gambiae* mosquito can transmit malaria-causing parasites. Credit: CDC/James Gathany

harvest decay. It is also used on ornamental plants, seeds, and seedlings to protect against soil-borne diseases.

In tropical countries, manufacturers have combined the use of entomopathogenic biopesticides and insecticide-treated bed nets to control the mosquitoes that carry malaria. Sprays of some fungal spores are pathogenic to mosquitoes during specific portions of their life cycle and affect their metabolic and reproduction rates. Fungal infection consequently reduces the mosquito's ability to transmit diseases. The World Health Organization has been testing the biopesticide *Beauveria bassiana* to reduce malarial transmission, resulting in a high mosquito mortality and rapid reductions in feeding and flight capability.

The growth of the biopesticide market, including these fungal-based controls, comes in response to the increasing demand for more natural pest control tools. Biopesticides can complement conventional chemical pesticides and are cost effective and eco-friendly. Biopesticides can be incorporated into any Integrated Pest Management program, contributing to sustainable pest control and healthy environment.

For more information on biopesticides, visit the EPA [biopesticide webpage](#). In addition, Paul Stamets' [TED lecture on mushrooms](#) discusses how mushrooms can save the world.

Integrated Pest Management in Child Care Centers Webinar



Tuesday, December 10, 2019 | 2 - 3 PM ET

Followed by a 30-minute Q&A session

[Register Now](#)

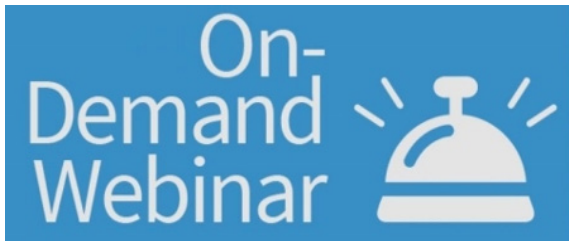
This webinar will prepare you to—

- Understand basic integrated pest management (IPM) program implementation strategies;
- Review the top five pests of concern in this unique environment;
- Utilize various IPM tactics in pest vulnerable areas in child care centers; and

- Determine who is responsible for pest management services for these structures.

Featured Presenters:

- Christina Wilkinson, Senior Environmental Scientist, California Department of Pesticide Regulation
- Karina Campos, Environmental Scientist, California Department of Pesticide Regulation
- Marcia Anderson, Ph.D., U.S. Environmental Protection Agency Center for Integrated Pest Management



Miss a webinar? No problem! Many of our webinars are available for on-demand viewing on EPA's [website](#).

Questions? If you have any questions about IPM or upcoming webinars, please contact us at ipm@epa.gov

Featured Bug of the Month: Kissing Bugs

"Kissing Bugs" (Conenose Bugs) and Insects of Similar Appearance in Colorado

Whitney Cranshaw

Quick Facts

"Kissing bugs", also known as "conenose bugs" or "bloodsucking conenose bugs", are a type of insect that feeds on blood of mammals and other vertebrates, including humans.

Only one species of kissing bug has ever been found in Colorado, *Triatoma protracta* (western conenose). Records of this insect in the state are clustered in rural sites in western Colorado where it usually has been found in association with its primary wild animal host, woodrats (packrats). A few historical records exist indicating the western conenose may occur in some rural areas east of the Continental Divide.



Figure 1. Adult of the western conenose, *Triatoma protracta*, the only "kissing bug" that occurs anywhere in Colorado

Kissing bugs are known to transmit an organism (*Trypanosoma cruzi*) that can produce Chagas disease. Recently it was reported that this pathogen was found in Colorado among in the western conenose and in wild animal hosts. It has never been found to infect humans in Colorado.

There are several insects that are very commonly mistaken for "kissing bugs" that occur in the state including masked hunter, bee assassins, and western conifer-seed bug.

"Kissing bugs" (*Triatoma* species) are insects that feed on the blood of various wild animals, particularly rodents. Mammals are their most common hosts but they will occasionally feed on birds and reptiles. Other names for these insects are "conenose bugs" or "bloodsucking conenose bugs".

Humans are occasionally bitten by these insects, which feed at night, producing a bite that is painless (a "kiss"). There may be no noticeable effect of their bite, although an allergic reaction (itching, swelling,

etc.) to the saliva of the bug may occur in some people that are bitten more than one time. The greatest concern about these insects is that they can transmit a pathogen (*Trypanosoma cruzi*) that produces **Chagas Disease**. A good source of information on Chagas Disease is the Centers for Disease Control (CDC) at: <https://www.cdc.gov/parasites/chagas/>

“Kissing Bugs” (Conenose Bugs) in Colorado



Figure 2. Specimens of the “kissing bug” *Triatoma protracta* housed at the CSU Museum of Arthropod Diversity. Some of these are from western Colorado. Females are larger than males. This is the only “kissing bug” that has ever been found in Colorado.

As a group, “kissing bugs” (conenose bugs) are most common in the tropical areas of the Americas. They do occur in some parts of the United States, predominantly the southern half of the country.

One species of “kissing bug” is native to Colorado. The species, *Triatoma protracta*, sometimes known as the **western conenose**, occurs in low populations in rural areas of extreme western Colorado.

Museum records of this species at the CSU Museum of Arthropod Diversity include one record from Mesa Verde (Montezuma County), one from San Miguel County, one from Garfield County (dating to 1945) and a few from Mesa County. However, there is an historical record of it apparently from a mining camp in Gilpin County and in a rural site in El Paso County. Assuming these records are accurate, western conenose may exist in some sites east of the Continental Divide.

The western conenose bug is not a species found in urban sites. It resides in natural areas in close association with certain wild animal hosts, particularly nests of wood rats (*Neotoma* spp.). Most often these insects are found in homes in close proximity with nesting woodrats, although there are cases where western conenose has transferred to dogs, on which the western conenose may feed and reproduce.

Interest – and concern – about these insects in Colorado spiked in 2019 following a national press release that identified, for the first time, that the organism that can produce Chagas disease (*Trypanosoma cruzi*) was present in Colorado. News reporting of this finding appears to have been widely perceived by the general public to suggest that this organism is new to Colorado; furthermore many of the reports incorrectly cited a different species of “kissing bug” as being present in Colorado (*Triatoma sanguisuga*) and that it was extending its range into the state, further flaming public concerns. There is nothing to indicate that this is the case. Rather, the detection of *T. cruzi* in Colorado is due to the fact that only recently has a dedicated effort been made to try and detect this organism among Colorado populations of this uncommon insect. And the only conenose/“kissing” bug ever found in the state remains *Triatoma protracta*.

Furthermore, there has never been a human case of Chagas disease originating from a bite of a “kissing bug” in Colorado. The detection of the organism that can produce Chagas disease was found in wild animal hosts and in *Triatoma protracta* collected in western Colorado. Fortunately the “kissing bug” found in Colorado has habits that make it less likely to transmit Chagas disease to humans than other kinds of kissing bugs that occur elsewhere.

Presently the Colorado Department of Public Health and Environment is tracking the distribution of “kissing bugs” in the state. Their website, which includes information on where one can send samples of insects suspected of being a “kissing bug”, is at: <https://www.colorado.gov/pacific/cdphe/chagas>

Colorado Insects of Similar Appearance to “Kissing Bugs”

There are several kinds of insects present in Colorado that are commonly mistaken for “kissing bugs”. Most of these are distantly related insects in the same insect family as are the “kissing bugs” – the assassin bugs (Hemiptera: Reduviidae).

There are at least 23 species of assassin bugs that occur in Colorado. All others, except *T. protracta*, develop as predators of other insects and do not feed on blood of mammals. Many are important as natural enemies of insect pests in crops and forests. One of these, known as the “masked hunter”, can be found in Colorado homes, feeding on insects that occur indoors.

Although their feeding habits are different, “kissing bugs”, including the species found in western Colorado, often have a shape and general

appearance that is similar to many other assassin bugs. All assassin bugs have an elongated head – the “conenose”. All have “piercing-sucking” mouthparts, used to feed on fluids (e.g., blood of insects) that appear as a “beak” from the front of the head. The elongated head and “beak” is also present among some plant feeding bugs, notable those in the leaf-footed bug family Hemiptera: Coreidae).

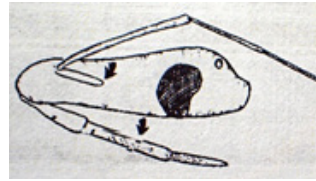


Figure 4. Head area of a western conenose (left) and masked hunter (right). These can be distinguished by the size/shape of the “beak” that contains their mouthparts and where the antennae are located on their “beak”.



Figure 3. Masked hunter. Adults of this insect are often found indoors during summer, where they feed on insects present in buildings. This is the insect that most closely resembles the “kissing bug” that occurs in the state.

Three insects present commonly in Colorado are most often mistaken for “kissing bugs”:

Masked hunter

(*Reduvius personatus*).

This is also a kind of assassin bug and is probably the insect that most closely resembles the western conenose, the “kissing bug” found in Colorado. Masked hunter is the only assassin bug commonly found indoors, where it feeds on the various insects that live in homes or incidentally wander indoors. It also occurs outdoors. The masked hunter is found statewide and the adult insects are almost always observed during midsummer.

The common name of this insect refers to the immature form. It is wingless and generally gray in color. It also has a body that is somewhat sticky, and various debris (lint, sawdust, etc.) that it wanders through covers and masks its body. Information on this insect can be found at: [https://webdoc.agsci.colostate.edu/bspm/Hexapoda%20\(Insects\)/MaskedHunterRevised2017.pdf](https://webdoc.agsci.colostate.edu/bspm/Hexapoda%20(Insects)/MaskedHunterRevised2017.pdf)

The masked hunter – and all assassin bugs that feed on insects – can bite if handled. The bite of these assassin bugs can produce immediate pain, unlike the painless bites of the night-feeding “kissing bugs” that feed on vertebrates. However, the masked hunter does not transmit any pathogens when it bites and the pain normally will soon subside. (Note: It is a useful precaution to disinfect the area following a bite by insects, spiders or ticks to prevent the wound from becoming infected by bacteria.)

Bee assassin (*Apiomerus* species). The bee assassins are large assassin bugs that normally will be found on flowers of all manner of outdoor plants. They do not occur indoors. Bee assassins are ambush hunters that prey on flower visitors, including bees. Three species of bee assassins occur in the state and they are most commonly found in rangeland areas, versus urban sites. They are never found within homes



Figure 5. A bee assassin, waiting for prey at a flower.

***Zelus luridus*.** The most common assassin bug found in yards and gardens in many areas of Colorado is *Zelus luridus* (no common name). This insect is usually pale green and is mostly found on trees or shrubs, where it hunts all manner of insects that may feed on or visit the plant. It does not occur in homes. Its slender



Figure 6. *Zelus luridus*, a common species of assassin bug that feeds on insects in many yards and gardens.

body and color easily distinguish this insect from a “kissing bug”.

Like all the assassin bugs that feed on insects, if handled they may bite – and it hurts.

More information on this species can be found at: [https://webdoc.agsci.colostate.edu/bspm/Hexapoda%20\(Insects\)/ZelusRevised2017.pdf](https://webdoc.agsci.colostate.edu/bspm/Hexapoda%20(Insects)/ZelusRevised2017.pdf)

Western conifer-seed bug (*Leptoglossus occidentalis*). The western conifer-seed bug <https://extension.colostate.edu/docs/pubs/insect/05588.pdf> is a type of leaffooted bug (Hemiptera: Coreidae) and both adults and immature stages mostly feed on seeds of conifers (e.g., pines) and other trees and shrubs. No noticeable plant damage is produced by these insects, except for reduction in seed production.



Figure 7. Western conifer-seed bug is a common nuisance invader of homes in Colorado in autumn. A harmless insect, it frequently mistaken for a “kissing bug”.

Western conifer-seed bugs very commonly attract attention because they *often enter buildings in autumn* seeking shelter through the cold months. It is one of the most common of the insect “nuisance invaders” that wander into Colorado buildings during autumn, rivaling the notorious boxelder bug in this regard. The western conifer-seed bug is usually found indoors from September through November, but may survive indoors into winter.

Their large size, rather bizarre appearance, and ability to produce an odor that some find unpleasant make this insect an unwelcome, although harmless, “nuisance invader” of homes. A fact sheet on western conifer-seed bug that provides more information can be found at:

There are a few other kinds of leaffooted bugs that occur on plants outdoors, and these may have a superficial resemblance to assassin bugs. Closely related to the western conifer-seed bug is the western leaffooted bug (*Leptoglossus clypealis*), which develops on seeds of various rangeland plants, such as yucca. Perhaps best known is the squash bug (*Anasa tristis*),

a common pest on squash family plants. Prickly pear cacti host the opuntia bug (*Chelinidea vittiger*). These are not insects that normally would ever be found in a home.

Current Pests: What Are You Seeing?

Arapahoe, Douglas, & Elbert Counties

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

Denver Metro Area

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

Eastern Plains Counties

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

El Paso & Teller Counties

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

High Country Counties

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

Northern Front Range

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

Pueblo & Fremont Counties

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

Southwestern Counties

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

Tri-River Counties

Household Insects

Indian meal moth: Adults are most commonly observed flying about homes during early winter.

Fungus gnats: Adults begin to be observed around windows and around the soil of potted plants where they originate.

Boxelder bugs, conifer seed bugs, multicolored Asian lady beetles: Overwintering adults continue to be active in and around homes during warm days.

Fruit flies: Flies from overripe fruit continue to be present in homes.

Source: <http://bspm.agsci.colostate.edu/outreach-button/insect-information/> (Yard/Garden Insect Calendars)

Credits

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