

Fumigants & Pheromones

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Issue 170

It's the Damp Life for Me - Notorious bugs found in high moisture environments



Patrick Kelley, BCE
President of Insects Limited













*As fragrant scents of storage shelves from arid turn to damp
When winter melts and springtime rains and moisture starts to ramp
The creatures small, find pleasures now in dank and clammy settings
For silverfish, and psocid too, their bounties ne'er be ending -
Pat Kelley 2022*

Please excuse my attempt at "buggy" poetry above, but I couldn't resist.

It is amazing to me that, excluding the oceans, [insects](#) and arthropods inhabit nearly every environment that we have on earth. This includes the icy conditions on some of the highest mountain peaks, and some of the hottest and driest desert conditions around the globe.

It is not surprising then, to know that there are quite a few species that tend to thrive in damp conditions. A few of these critters fall under the category of being a "pest" since they are capable of munching away on materials that we sometimes store in high moisture environments including paper and cardboard. Most though, are simply indicators to us that high moisture situations exist somewhere nearby. These critters can also indicate to us that we have gaps or cracks in our buildings that allow the creepy crawlers to enter from the damp areas outdoors. Let's take a close look at 12 of the main bugs that show themselves when the moisture is high and go through them one by one below.

"Damp Dozen"

1. Silverfish 	2. Booklice 	3. Minute Brown Scavenger Beetles 
4. Sowbugs 	5. Pillbugs 	6. Millipedes 
7. Centipedes 	8. Springtails 	9. Earwigs 
10. House Crickets 	11. Fungus Gnats 	12. Foreign Grain Beetles 

Insects Limited Product Guide

Our newest product guide is a must-see. The 20-page full-color and fully illustrated booklet can be viewed as a hard copy, online, or as a [PDF HERE](#).



Silverfish

Silverfish and similar species are in the order Zygentoma (older literature, Thysanura) which is considered one of the most primitive of the living insect orders. There are four species considered common in North America; the [Common Silverfish \(*Lepisma saccharina*\)](#), the [Gray Silverfish \(*Ctenolepisma longicaudata*\)](#), the Firebrat (*Thermobia domestica*), and the Four-Lined Silverfish (*Ctenolepisma lineata*). Though most are generally cosmopolitan in distribution, the Gray Silverfish is found mostly in the Midwest U.S. to California and the southern states as well as rising populations across Europe. The presence of the Silverfish, *Lepisma saccharina* indicates a cool and humid environment. Gray Silverfish will favor areas of high temperature, while Firebrats need even hotter temperatures. Adverse to light, they all tend to be found in dark areas of suitable climates with an abundant supply of food. However, their presence at a feeding site that is not warm or humid, may indicate a nearby preferred micro-climate. The color of the different species can vary. Common Silverfish = silvery metallic; Gray Silverfish = dull gray; Four Lined Silverfish = dark and light scales appear as four lines running down back; Firebrat = large patches of dark scales on the back. In Europe, the small and white *Ctenolepisma calva* is also found and is spreading in museums and buildings. (Information from [MuseumPests.net](#))

Booklice

Psocids are known as booklice because of their affinity for damp, moldy books. They are not parasitic lice (although are now classified in the same order, Psocodea. Older literature refers to the order, Psocoptera) and pose no threat to humans or pets. There are 4,408 species on all continents, including Antarctica with about 260 species in the United States and Canada. Psocids are small, and they need high humidity or moisture to live. They are an indicator species, implying past or present dampness in an environment. The different species have different environmental parameters under which they thrive or die. As of 2018, there are no published studies on one of the common species known as a booklouse, *Liposcelis corrodens*. Typically, the lower the relative humidity (RH), the less chance this insect will survive. Populations of the species *Liposcelis entophilus* will die in 6 days in an environment of 43% RH while populations of *Liposcelis paeta* will die in 16 days in an environment of 50% RH. Most species of psocids do not survive in RH environments below 50%, while population increases of psocids occur in environments with RH readings of 65% and above. Environmental temperatures greater than 37° C (99° F) are usually high enough to kill most psocid species with the exception of *L. paeta* which tends to be more heat resistant. These insects start to become active at temperatures as low as 10° C (50° F) and will increase in their feeding and activity up to 32° C (90° F). Common places for psocid populations to thrive include windowsills, under building siding, tree trunks, shrubs, flowers, around garden hoses, under bricks and rocks, around light fixtures, and under boxes. Outdoor populations of barklice can occasionally come inside and be mistaken for booklice. Barklice generally have wings and can be color-accented on the body and wing veins whereas booklice do not. (Information from [MuseumPests.net](#))

Minute Brown Scavenger Beetles

Many species of beetles fall under the category of minute brown scavenger beetles. Both the ecology and morphology of this taxon are described at the family level of Latridiidae; however diagnostic features of this group include elongate and oval-shaped bodies and brown to dark brown coloration. Currently, the family consists of 1,050 species with 140 represented in the United States and 55 in Canada. In the wild, Latridiids are found in open and forested environments among decomposing vegetation including leaf litter, herbaceous vegetation, inside or on trees, and decomposing wood. They have also been observed in bird, mammal and Hymenoptera (bee & wasp) nests. Adult beetles and larvae are fungivores and mainly feed on the hyphae and spores of filamentous fungi; however several species in this taxon also feed on slime molds. *Dienerella argus* is considered a pest organism of dried grains and other stored products, and its global distribution can be attributed to its accidental

introduction inside shipping crates that have been transported internationally. Some of the most common species encountered are *Cartodere constricta*, *Lathridius minutus*, and *Dienerella filum*.

Their presence is an indicator that the ideal damp conditions exist for their fungal food source to thrive. Species in this taxon are also commonly referred to as "mold beetles" or "plaster beetles" because integrated pest management professionals associate their presence with damp sheetrock material. (Information from MuseumPests.net) *Photo credit: Mike Quigley, The Peary-MacMillan Arctic Museum & Arctic Studies Center, Bowdoin College, MuseumPests.net*

Snowbugs

Sowbugs along with pillbugs are the only crustaceans that have become completely adapted to terrestrial habitats. Both have oval bodies that are convex above and flat or hollow beneath. They rarely reach more than $\frac{3}{4}$ inch (19 mm) in length. The head and abdomen are small, but the thorax is comparatively large, composed of seven hardened, individual but overlapping plates. Both isopods have seven pairs of legs with the large pair appearing only after the first molt. Sowbugs can be identified by their two prominent tail-like appendages and the fact that they cannot roll up like the pillbug. Pillbugs and sowbugs are distributed worldwide. They prefer moist locations and are found under rotting wood or vegetable debris of all kinds. They are usually more active at night. At times, sowbugs and pillbugs may bury themselves several inches below the surface of soil. (*Information from Handbook of Pest Control by Mallis, Tenth Ed., 2011*)

Pillbugs

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Millipedes

Millipedes normally live outdoors where they feed on damp and decaying wood and vegetable matter, as well as tender roots and green leaves on the ground. Their slow-crawling, rounded bodies have two pairs of legs on each body segment except for the first three which have but one pair of legs on each segment. About 1,000 different species exist in the USA. Many millipede species protect themselves by using glands that produce an unpleasant odor. Springtime migrations from decorative wood mulch or wooded areas can translate into thousands of millipedes migrating onto the outside of a home or other building. Any gaps or cracks in the building envelope will allow large numbers of millipedes to enter inside. (*Information partially taken from Handbook of Pest Control by Mallis, Tenth Ed., 2011*) *Photo credit: P.Kelley - Insects Limited*

Centipedes

The house centipede is an arthropod characterized by its odd number of pairs of jointed legs, segmented body, and exoskeleton that periodically molts as the centipede grows. All centipedes are primarily nocturnal. They are ground hunters and are shy of light, though some species are seen actively in daylight as well. Lacking a waxy waterproofing layer on their cuticle, they prefer dark, damp

environments. In nature, they are found in wooded areas within rotting wood and under rocks and ground cover. They will enter manmade structures through cracks, uncapped blocks, missing mortar, and floor drains.

The house centipede's presence is an indicator of an increased level of other potentially harmful pests, as well as elevated humidity levels within the facility, both of which promote an ideal habitat for the centipede.

While centipedes are known for their disturbing appearance, typically they do not present a serious threat to humans. All centipedes have venom glands which they use to hunt prey. Their bite may cause temporary discomfort and pain to humans but in most cases, bites are unlikely to occur unless the centipede is deliberately handled. (Information from MuseumPests.net)

Springtails

Springtails are classified in the order Collembola. They are most commonly found in soil, but can also be found in drains, leaf litter, logs, dung, caves, shorelines, water surfaces, etc. There are many species, and they have worldwide distribution. They are sometimes referred to as "snow fleas" for their ability to survive severely cold temperatures and are sometimes mistaken for fleas indoors because of their small size and their ability to propel through the air or "jump." The difference is that fleas use hind legs to jump, and springtails use their tail-like appendage called a "furcula" to propel themselves. The presence of adults and immature springtails is a sign of infestation. Springtails usually infest areas that are dark, damp, and humid. In structure, they are often found in floor drains or feeding on perpetually damp wood. (Information from MuseumPests.net) *Photo credit: USDA <https://www.fs.usda.gov/research/news/highlights/ecology-soil-arthropod-fauna-tropical-forests-review-studies-puerto-rico>*

Earwigs

The name earwig comes from superstition that they purposely crawl into the ear of people during their sleep and lay eggs whose larvae bore into the brain. This is, of course, not true. The distinct-looking earwig has prominent forceps-like cerci extending from their abdomen. These cerci look like little scissors and can be both an offensive and defensive weapon for this insect. The cerci of females are generally straighter than the sharply curved cerci of the males. Earwigs will nest and lay their eggs beneath the soil and prefer dark moist habitats in plant leaves, beneath wooden boards or within dark and moist, man-made environments. (*Information from Handbook of Pest Control by Mallis, Tenth Ed., 2011*) *Photo credit: University of Nebraska – Department of Entomology*

House Crickets

This long and yellowish-brown cricket with three dark brown bands on its head will reach a size of $\frac{3}{4}$ - 1 inch (19 – 22 mm) in length. They have long, thin antennae. This insect prefers warm, moist environments and can be found in kitchens, in basements and around water heaters. They can be considered a pest, as they will chew on clothing and have been noted to be especially destructive to wool and silk. During warm weather, the crickets live comfortably outdoors beneath piles of debris, rocks, and lumber. As cool temperatures outdoors begin, they find their way inside and seek out warm and moist environments. (*Information from Handbook of Pest Control by Mallis, Tenth Ed., 2011*)

Fungus Gnats













These small, dark, delicate flies have long wings and spindly legs. Fungus gnats are weak fliers and are usually found near their breeding source. A common breeding source is the moist soil in over-watered, potted plants. Female flies lay their eggs in moist organic debris or in potted soil. Hundreds

of fungus gnats can erupt from the soil of a single, over-watered house plant. (*Information from Handbook of Pest Control by Mallis, Tenth Ed., 2011*)

Foreign Grain Beetles

This little brown beetle is only 1/12 inch (2 mm) in length. They have two rounded projections coming out of the front corners of the prothorax that look a bit like shoulder pads. This beetle is attracted to damp and moldy grains where it feeds on the mold, fungi, and dead insects that occur in the grain. This beetle does not breed in conditions below 65% humidity. Although called a grain beetle, this beetle is a common pest in newly built homes after rain has soaked structural beams prior to the roof being put on. Populations can reach into the thousands of beetles in optimum conditions. Water leaks can also give rise to large population explosions. (*Information from Handbook of Pest Control by Mallis, Tenth Ed., 2011*) Photo credit: Canadian Grain Commission

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Stored Product Pests in the Food Distribution/Food Warehouse Setting



Brandon Oldham (CP-FS)
Sr. Corporate Food Safety Specialist

While a lot of focus is given to pest prevention and control in the production world, I want to move on down the chain of custody to warehousing and distribution.

There are a multitude of ways stored product pests and their issues arise in this setting.

Warehouses are high volume, high traffic hubs for products that come from all over the world.

They can house a vast variety of items.

This makes an integrated pest management system very complex and involved.

We can all agree that prevention is the best approach to pest management. Doing your part to be without, or to minimize exposure, is the most cost effective way to protect your reputation and prevent things like product damage, contamination, customer compensation, and worst of all, recalls.

Inbound inspection could arguably be the most important part of exclusion and prevention. Large vessels filled with massive quantities of sustenance that come from a vast array of environments and climates, could potentially be the perfect storm to triggering an infestation in your facility. Thorough product inspections being performed by trained individuals should be an integral part of your pest management program.

High risk product should be prioritized and heavily scrutinized, but **no trailer or shipment should be omitted**. All employees involved with the inbound process should, at the very least, have knowledge of what to look for.

- Insects and evidence of harborage and damage caused by them.
- Rodents and the indications of activity.
- As well as other signs of the product or trailer itself having been affected by poor sanitation and/or poor pest prevention practices from wherever or whoever the product is coming from.

Zero tolerance of any stored product pests and/or their evidence is best practice, but thresholds should be set to prompt rejections or corrective actions. Proper pest identification will help guide productive conversations around protecting the supply chain.

The Trojan Horse



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Training of employees can range from initial on-boarding/orientation training, to one point lesson communication. Utilizing employee engagement meetings and different kinds of visual media can help with that transmission. Real time, hands on experience is worth its weight in food as well. Employees being able to put their eyes on issues seen by other team members can create a positive pest exclusion environment, culture, and confidence in a support system.

The job isn't done here....



To make certain the product that has been inspected stays pest free, the probing must continue within the storage areas. As confident as your receiving team may be about their process and execution, sometimes things can be overlooked or, quite frankly, invisible to the naked eye at the time of receipt.

Exterior pressure, environmental pressure, seasonal pressure, and the fact that the common human is present, can all potentially expose the product stored in your warehouse as well.

All efforts should be made to close off any and all entry points from the outside world.

A preventative maintenance program (PMP) should include pest proofing activities. Things like door seals, dock leveler gaskets, screening on fans, vents, and drains should be in place and damage free. Walls, floors, and ceilings should be crack and crevice free so they can be easily cleaned to prevent any access or harborage areas. All these items need to be replaced routinely as part of the PMP. Good employee practices need to be communicated so actions can be monitored and accountability can take place. Leaving doors open, not cleaning up after one's self, or improperly performing sanitation duties could attract pests and trigger an infestation, whether it be from a food source, harborage initiator, or accidental introduction from the exterior.

Inspections of all areas of the warehouse are crucial. Trained eyes should be looking for all things mentioned during the inbound inspection process. Areas to inspect include; the warehouse as a whole (roofs, ceilings, floors and drains), utility rooms, office areas, break rooms, and other nooks and crannies conducive to pest activity. This includes drop ceilings and crawl spaces. Monitoring devices should be deployed strategically to help with these inspections.

Questions to Consider When Inspecting a Warehouse

- What pests are associated with the type of product you store?
- What pests are part of the ecosystem that surround your facility or exist in nature within your region, climate zone?
- Are there other businesses around your property that might naturally attract pest activity (farming, land fill, rail yards)?
- Do any of your employees bring bagged lunches, or have locker rooms where belongings from home are stored?

All these things should be considered when completing a pest assessment on your building. This pest risk assessment is to be utilized to decide what type of monitoring devices are needed and where they should initially be placed. Other assessments might be done after inspection. Monitoring device data is recorded over time so high pressure areas can be inspected appropriately and corrective actions can help minimize activity.

Sanitation should be top priority when handling food, as it also goes hand-in-hand with pest prevention. In a lot of ways sanitation is pest control. Having a sanitation program, including both the interior and exterior of the building, eliminates food sources and harborage material. Cleaning in and around your warehouse also helps make inspections much easier. It is much easier to find pest evidence with a floor or ground space free of product, debris, and dust/dirt. Whether this be droppings, urine, webbing, cast skins, or the pest itself. Sanitation work can also uncover things needing to be fixed by maintenance.

Preserve Your Reputation

Outbound inspections are your last chance to be proactive in most cases. Just as trained individuals are responsible for bringing clean product in, trained individuals need to verify the product stayed pest free while in possession of it. This is done by inspecting before loading for shipping. There needs to be an inspection of the conveyance vessel. This guarantees it is in sound condition, without contaminants that will expose the product while loading or while being transported to its destination. Just like inspecting your facility, ensure the container has no passage to the exterior through cracks, holes or damage to door seals.

In all steps mentioned throughout this article, we need to make sure that records are created, filled out completely, and retained. Examples being; inbound inspection reports, facility inspection reports and monitoring device data, outbound inspection reports, training records, rejection records, sanitation records, and 3rd party reports whether it be pest control or outside cleaning companies. **If it's not written down it never happened.** These documents can all help provide clarity as to where a problem with pests may have started, and could potentially keep your company's name out of the negative headlines. Having these documents will also support/guide corrective actions with vendors or help deflect or denounce blame from a customer or consumer.

In summary, protecting your storage facility from pests is just as important as protecting a production facility. In many cases, warehouses store product from multiple vendors. If a problem presents itself within that warehouse it could potentially damage the reputation of many brand names, regardless of fault. In every case, the cost of a well-run, dynamic pest prevention program will always cost less than an infestation, especially one that has customer or consumer impact.

The following are images courtesy of by Brandon Oldham (CP-FS), Sr. Corporate Food Safety Specialist

Examples of Rodent issues:



A living mouse inside a food package –Brandon Oldham (CP-FS), Sr. Corporate Food Safety Specialist



Mouse droppings on food containers –Brandon Oldham (CP-FS), Sr. Corporate Food Safety Specialist



Large amounts of rodent droppings on an incoming trailer –Brandon Oldham (CP-FS), Sr. Corporate Food Safety Specialist

Examples of Insect Issues:



Indianmeal moth webbing and feeding on birdseed –Brandon Oldham (CP-FS), Sr. Corporate Food Safety Specialist



Red-legged ham beetle emerging from a punctured package –Brandon Oldham (CP-FS), Sr. Corporate Food Safety Specialist



Beetles inside a package of rice –Brandon Oldham (CP-FS), Sr. Corporate Food Safety Specialist



Cigarette beetles in a package of pasta –Brandon Oldham (CP-FS), Sr. Corporate Food Safety Specialist