

Fumigants & Pheromones

Digital Newsletter Delivered by Insects Limited, Inc.

Issue 17878

Identifying Clothes Moth Damage and Frass



Patrick Kelley, BCE
President of Insects Limited

It has been many months since you wore that favorite red sweater of yours, but now that the cooler temperatures have started to creep in you immediately go to look for it in your closet.

As you pull it from the shelf, you notice a dirty spot around the collar.

Extending it away from you, you now see gaping holes in several areas that were not there before.

You scream to yourself, "What Caused This?!".

It is likely that your mind jumps to the conclusion that you have [clothes moths](#), but how can you tell for sure? The first part of this two-part article will lay out what signs to look for that suggest that your damage was caused by clothes moths compared to mechanical damage, damage by [carpet beetles](#) or by other means. Part 2 will detail what the appearance of the frass looks like for the [webbing clothes moth](#) as opposed to the [casemaking clothes moth](#), and how moth frass may appear different than carpet beetle frass.



[Webbing clothes moth](#) damage on wool will present itself as silken tubes as seen in the photo (left) or as frass-covered feeding tubes as seen on the photo (right). Occasionally, you might also find cream colored larvae and live and dead adult moths. Photo by E. Estabrook, Insects Limited, Inc.

Part 1: Damage

When you first notice a hole in a sweater or other clothing, the first thing that you should examine is how clean or dirty the area around the hole is. Using a good magnifying glass to closely inspect the area around the hole will make it easier to see some of the detail.

Insect Damage: When insects cause damage, they will almost always leave clues of their presence. When it is clothes moths causing the damage, these clues will be in the form of dirty frass (insect excrement), wisps of silk webbing, feeding tubes and pupal cases.

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When the damage is caused by carpet (Dermestid) beetles, the clues will be frass pellets and numerous larval shed skins near the damage. Holes caused by insects feeding on wool will often have a slightly depressed area surrounding the hole where the insect has grazed on the surface of the textile but not all the way through.

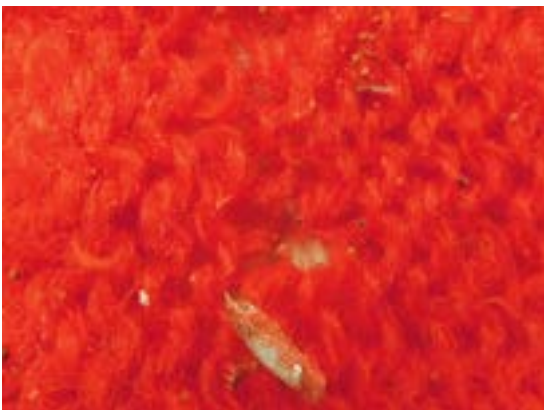
Mechanical Damage: If there is no dirt or frass surrounding the hole and the item has not been recently cleaned, there is a good chance that the damage was caused by another means. Mechanically caused holes can form when sharp metal edges on desks, tables or in other work areas snag and cut the fabric as we walk past or lean against these surfaces. If you find multiple articles of your clothing with damage and that damage is all in the same physical spot on the clothing (E.g. All the holes are located just below your belly button, or at the same point on your right side, etc.) and there is no evidence of insect activity around the holes, then they were likely caused by a sharp edge that you don't even realize that you come in contact with. It could possibly even be your clothing getting caught in the seatbelt of your car day after day.

Chemical Damage: Another common cause of holes in clothing is chemicals that eat through the fabric. If chemicals, such as bleach or acidic cleaners, are accidentally splashed onto clothing or picked up on the clothing as we lean against tables or place our arms on counter tops, it can cause the fabric to become brittle and break away. This can leave small or large holes in the clothing itself. Look for signs of discoloration or material that breaks away easily when you touch it.

Excessive Heat Damage: Burn holes caused by cigarette ashes or small embers from a grill or fire can burn or melt holes into clothing without us even knowing it. When this occurs, the area around the inside of the hole may appear black or melted. A simple sniff test may indicate if fire was involved.

Because cotton and synthetic materials are not a food source to clothes moths or carpet beetles, holes in these types of materials will almost always be caused by sharp edges, chemicals or just plain wear and tear. The exception to this rule can occur when cotton or synthetic fabrics are hanging or laying directly adjacent to heavy populations of clothes moths on wool, feather or other natural fibers. If the cotton or synthetic materials have human perspiration or food stains on them, these can be attractive to the clothes moth larvae and small areas of damage can occur.

In this circumstance, the clothes moth larvae are looking for nutrients in the stains such as salt or food nutrients. Cotton and synthetic fabrics are not a food source for insects and the damage should be minimal.



A close examination of a hole in a sweater reveals a cylindrical pupal case and loose frass indicating that casemaking clothes moth, *Tinea pellionella* caused this damage. Photo by P. Kelley, Insects Limited, Inc.



Webbing Clothes Moth Frass Casemaking Clothes Moth Frass
In the photo above, the clumpy, frass-covered feeding tubes and pupal cases on the left indicate webbing clothes moth, *Tineola bisselliella* damage, and the cylindrical pupal cases and loose frass on the right indicate casemaking clothes moth, *Tinea pellionella* damage.
Photo BBy E. Estabrook, Insects Limited, Inc.

Part 2 Frass:

Definition from the Oxford Dictionary: /fras/ noun, mid 19th century: from German Frass, from fressen 'devour'. = **the excrement of insect larvae.**

Once we have narrowed down the cause of the damage done to our clothing to be from insects, it can be beneficial to know which species you are dealing with so you will have a better understanding of your enemy. Knowing the exact species that you are dealing with will give you valuable information to battle this pest. This information includes things such as the length of the life cycle, preferred temperatures and humidity of the insect, preferential food sources, and it will guide you on which [pheromone lure](#) you will want to use to monitor for this pest. Frass, by its definition of being excrement of the insect larvae, will often be close in color to the clothing that is the insect's food source. So, as the examples of a red wool sweater show in the pictures above and below, the frass from the larvae feeding on that sweater will also be red in color.



[Webbing Clothes Moth Frass](#) [Casemaking Clothes Moth Frass](#)

Webbing clothes moth frass will be held together by silken threads and will appear lumpy and dirty as seen in the photo on the left. Casemaking clothes moth frass will be loose and granular and will easily fall away from the clothing as seen in the frass on the right of the photo above.

Photo by E. Estabrook, Insects Limited, Inc.

Webbing clothes moth frass: The frass from the [webbing clothes moth](#), *Tineola bisselliella*, and the casemaking clothes moth, *Tinea pellionella*, are different in appearance. The webbing clothes moth frass is bound together by silk fibers produced by the moth larvae as they feed, whereas the casemaking frass is comprised of relatively loose fecal pellets that do not stick together. The webbing clothes moth will create lumpy-looking feeding tunnels covered in their frass, and their pupal cases will also be covered in the peppery-looking frass.

Casemaking clothes moth frass: The [casemaking clothes moth](#) will simply drop their frass on the surface of the wool, and the frass will easily fall away if that item is picked up and moved. The casemaking larvae will always carry their protective cylindrical case with them. The pupal case is usually the same color as the fabric they are feeding on. As the larvae feed with their head poking out one side of the case, they will force their fecal pellets out of the other side. The pellets (or frass) will fall onto the surface of the clothing and sit there until gravity knocks them away.

Carpet beetle frass: In contrast to the clothes moths, if [carpet beetles](#) are causing the damage, we will almost always find the telltale empty shed skins from the larvae on the clothing or directly adjacent to the clothing. Some [dermestid](#) beetles will shed their skins up to 20 times as a larva feeds and grows prior to them pupating. These empty husks that the larvae leave behind are very light in weight and can be blown away with a small puff of air. The frass itself of carpet beetles can vary in size and shape depending on the species. Some, like the varied carpet beetle, *Anthrenus verbasci*, will have oval or rounded frass while other species of dermestid beetle will have a peppery looking frass.

In any identification of frass that we might undertake, we need to be good detectives and look at every clue that we can see. With a bit of knowledge and a good eye, we can figure out who our enemy might be that is feeding on the wool.



Signs of dermestid beetle activity on wool will often present itself with the presence of larval shed skins. Some dermestid beetles will shed their skins up to 20 times as a larva and these skins and associated frass will alert you that carpet beetles are the ones causing the damage. Photo by P. Kelley, Insects Limited, Inc.



Closeup of dermestid beetle shed skins and peppery frass. Photo by P. Kelley, Insects Limited, Inc.

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Issue 178

New and Improved Product from Insects Limited: Moth-Resistant Garment Bag

Insects Limited is now offering *Moth-Resistant Garment Bags* as part of a complete clothes moth management solution. ([Freezer Bags](#), [Garment Bags](#), [Pheromone Traps](#))

A customer-driven need for better garment bags that keep out clothes moths and carpet beetles initially started our research into this dilemma.

A year and a half later, after tedious design changes and field testing, gave us an end product that we are happy with.

Moth-Resistant Garment Bags

New and Improved Product

GreenWay

GreenWay

Scientifically proven to prevent clothes moths from entering the bags and damaging your clothing.

Insects Limited
CORPORATION

[GreenWay Moth-Resistant Garment Bags](#) offer the best amenities of standard garment bags while adding scientifically proven designs to prevent clothes moths from entering the bags and damaging your clothing. What makes this garment bag better is that once your garments have been placed inside, there are no penetrations anywhere on the bag that allow clothes moths to enter. There are no holes in the bag around the hanger or along any seams.

Entomologists and engineers have combined their knowledge of insects and materials to produce a unique zipper mechanism that becomes completely sealed when closed. A double layer of quality hook and loop fasteners on either side of the termination point of the zipper prevents moths from picking up the attractive odors of furs, feathers, and wools and creates a moth-barrier into the bag.

A clear view window on the front of the bag allows the user to keep an eye on the garments inside to make sure that no moth activity is going on.

The design has been designed and tested specifically to keep garments clean and to keep pest moths out.

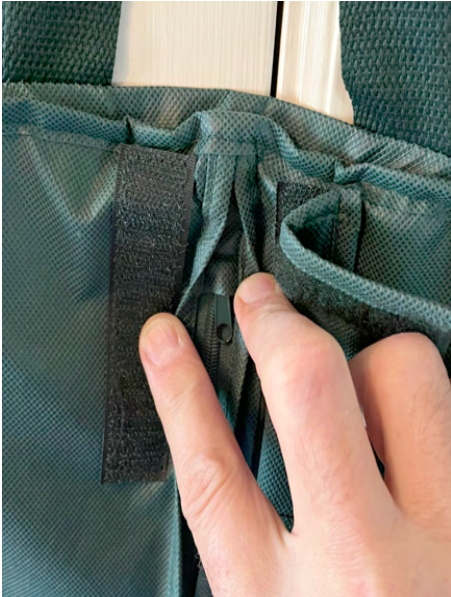
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Attributes

- Made from a soft non-woven environmental fabric to keep garments clean and dry
- Absolutely no penetrations in the sealed bag that allow moth entry
- Insect -blocking sealable full zipper front that prevents pest entry
- A clear view window for visual inspection of the garments inside
- A self-enclosed and efficient hangar system specifically designed to prevent moths
- Holds up to 6 or more garments depending on size
- Designed to be used in any closet setting
- Rigid Backing Plate to prevent sagging



"There was a void of garment bags on the market that were effective against clothes moths. Insects Limited listened to its customers and went to work.

Our new GreenWay Garment Bag has been specifically engineered to prevent moths from entering and they are an excellent way to protect valued articles of clothing."

– Pat Kelley, Insects Limited President

[Learn more or order online today!](#)

GreenWay is an Insects Limited brand.



FREEZER BAGS



Clothes moth larvae and eggs can be killed with a long exposure to freezing temperatures. Items that you wish to freeze can be placed in our Freezer Treatment Bags.


CLOTHES MOTH MANAGEMENT SOLUTIONS



Insects Limited, Inc. is an insect pheromone company based on science, education, and innovation here to solve your pest problem.


insectslimited.com

GARMENT BAGS



Our garment bags were designed and tested by entomologists specifically for clothes moth prevention. These will protect and prevent further attacks from moths that may have been missed or reintroduced into the home.

CLOTHES MOTH PHEROMONE TRAPS



After freezing and storing your personal items, pheromone traps can help you monitor and evaluate the effectiveness of all your effort.

Our Clothes Moth Kit pairs the science of insect biology to the technology of a trapping system to assist you with the task of removing these pests from your environment.

Clothes Moth Flat Trap Kit (IL-120)

Clothes Moth kits feature the Insect Limited's signature pheromone Bullet Lures™ that attract three separate species of clothes moth with a controlled release of pheromone over 3 months.



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Issue 178

"Start with the Insect First!" The Cornerstone of Integrated Pest Management for Stored Product Insects



Ethan Estabrook, BCE
Research Entomologist and Product Support, Insects Limited

In the grand narrative of food security, pests play the part of the uninvited guests.

Given the pressing global challenge to feed an ever-growing population, the 'Start with the insect first' approach is crucial.

This approach holds particular importance when it comes to stored product insects, the quiet underminers of our collective food security efforts.

A Bite into Our Food Supply

[Stored product insects](#) account for significant losses in post-harvest stages. They feed on, breed in, and contaminate stored food, resulting in significant quality and quantity losses. From grain to dried fruits, no stored food product is truly safe from their insidious damage. Therefore, understanding and managing these pests effectively is key to safeguarding our food supplies and feeding a hungry world.



Figure 1. Insect damage to wheat over 128 days. Photo Credit: Edmond Bonjour, Oklahoma State University Extension

Identification: Know Your Enemy

An integral part of 'Starting with the insect first' is [proper pest identification](#). Knowing your adversary's identity allows you to understand its behavior, life cycle, and food preferences. Different insects pose different threats and require different management approaches. Misidentification can lead to ineffective treatments and unnecessary costs. Thus, correctly identifying the pest is the foundation of successful Integrated Pest Management (IPM).

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Figure 2. Red flour beetle and rice weevil on kernels of wheat.

Behavior and Life Cycle: The Pest's Playbook

Knowing an insect's behavior and life cycle provides insight into its weak points, which can be exploited for effective management. For instance, understanding an insect's breeding season or its attraction to certain food products can inform when and where to apply treatments. This understanding can significantly improve treatment effectiveness and efficiency.

Treatment Effectiveness: The Right Tool for the Job

Choosing the right treatment for the right insect is paramount. Treatments vary in effectiveness based on the pest's identity, life stage, and other factors. Thus, starting with the insect first ensures that the most effective treatments are utilized, reducing unnecessary treatments and minimizing potential impacts on non-target organisms.

Monitoring and Evaluation: Keep Your Friends Close, and Your Pests Closer

Continual monitoring and evaluation of pest populations and treatment effectiveness are essential components of IPM. Regular [monitoring](#) allows for early pest detection and intervention, preventing large-scale infestations. Evaluating the success of treatments ensures resources are not wasted on ineffective methods, while providing valuable data for future pest management.



Figure 3. Remote pheromone monitoring device called the SightTrap from Insects Limited. Photo Credit: Ethan Estabrook

Feeding a Hungry World: Every Grain Counts

Every successful intervention against [stored product insects](#) is a step towards food security. By preserving the integrity of our stored food products, we ensure that more food reaches the plates of those who need it. This is the broader goal of 'Starting with the insect first' - it is not just about managing pests, but about protecting food to help feed a hungry world.

The 'Start with the pest first' approach forms the backbone of effective IPM for stored product insects. It reminds us that each pest management journey begins with understanding the pest. Let's continue to build our knowledge and skills in IPM, and contribute to the global effort to feed our growing world.



Figure 4. Lesser grain borer damage to wheat over 6 months. Photo Credit: Ethan Estabrook, Insects Limited

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Are Termites Cockroaches?



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As we grapple with the complexities of pests, a thought-provoking question emerges: "Are termites cockroaches?"

While seemingly distinct, termites and cockroaches are in fact closely related members of the superorder Dictyoptera, characterized by unique traits including the capacity to encase eggs within an ootheca (in some species), gradual metamorphosis (paurometabolous), and a perforation in the tentorium or internal skeletal structure of the head.



Figure 1. Castes of termites: worker, soldier, winged reproductive, and wing detail. Photo Credit: University of Florida Extension

The Similarities: More Than Meets the Eye

Despite their distinctions, termites and cockroaches share a surprising array of morphological and biological similarities. Both have mandibulate chewing mouthparts, filiform (thread-like) antennae, large pronotums (in some termite species), small compound eyes, and show variations in sexual dimorphism. Their behavioral tendencies also overlap - they both prefer warm, moist, dark, sheltered environments, and construct nests in crevices, under bark, or within soil. Communication, too, is a common ground, with both using [pheromones](#) and tactile signals.

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Even their construction methods bear striking resemblance. Some cockroaches use debris mixed with saliva to conceal their oothecae, while subterranean termites utilize this material for nest building and foraging tubes. Certain species, such as the brown-hooded cockroach and the *Mastotermes darwiniensis* termite, even display similar social behaviors and reproductive structures.



Figure 2. Basal termite species, *Mastotermes darwiniensis* including a) juvenile nymph with workers b) winged reproductives c) wingless reproductives. Photo Credit: David McClenaghan released on Commonwealth Scientific and Industrial Research Organization SciencelImage

The Diet: Shared Eating Habits and Ecosystem Roles

Both termites and some cockroaches partake in coprophagy, the consumption of their own fecal pellets. This allows them to extract nutrients and share microbes beneficial for digestion. Although cockroaches are omnivores and termites specialize in consuming wood, their digestive systems share a similar structure.

Both harbor symbiotic relationships with various protozoans and bacteria that break down cellulose and produce methane. As a result, termites and cockroaches together account for nearly 20% of global methane emissions, making their ecological role more significant than it may seem at first glance.



Figure 3. German cockroach life stages. Photo Credit: Department of Entomology, University of Nebraska-Lincoln

The Genetic Connection: Evidence of Shared Ancestry

Recent genetic DNA analysis provides compelling evidence that termites are, in essence, social cockroaches, tracing back to a common ancestor. This notion is supported by Paul Eggleton, an entomologist at the Natural History Museum in London. According to Eggleton, the close relationships between termite parents and offspring could have laid the groundwork for their complex social system to evolve. The practice of consuming each other's droppings may have led to the evolution of wood breakdown in termites, a key part of their ecological role.

All Termites Are Cockroaches, But Not All Cockroaches Are Termites

In the context of Integrated Pest Management (IPM), it's crucial to acknowledge that all termites are indeed cockroaches due to their shared ancestry and characteristics. However, not all cockroaches are termites. This distinction between the two remains vital for effective pest management strategies.

Our understanding of pests is constantly evolving, just like the pests themselves. We must continue to adapt and learn. After all, 'Start with the pest first' is the [Insects Limited](#) motto, reminding us to fully comprehend the creatures we seek to manage, for effective pest control starts with understanding.