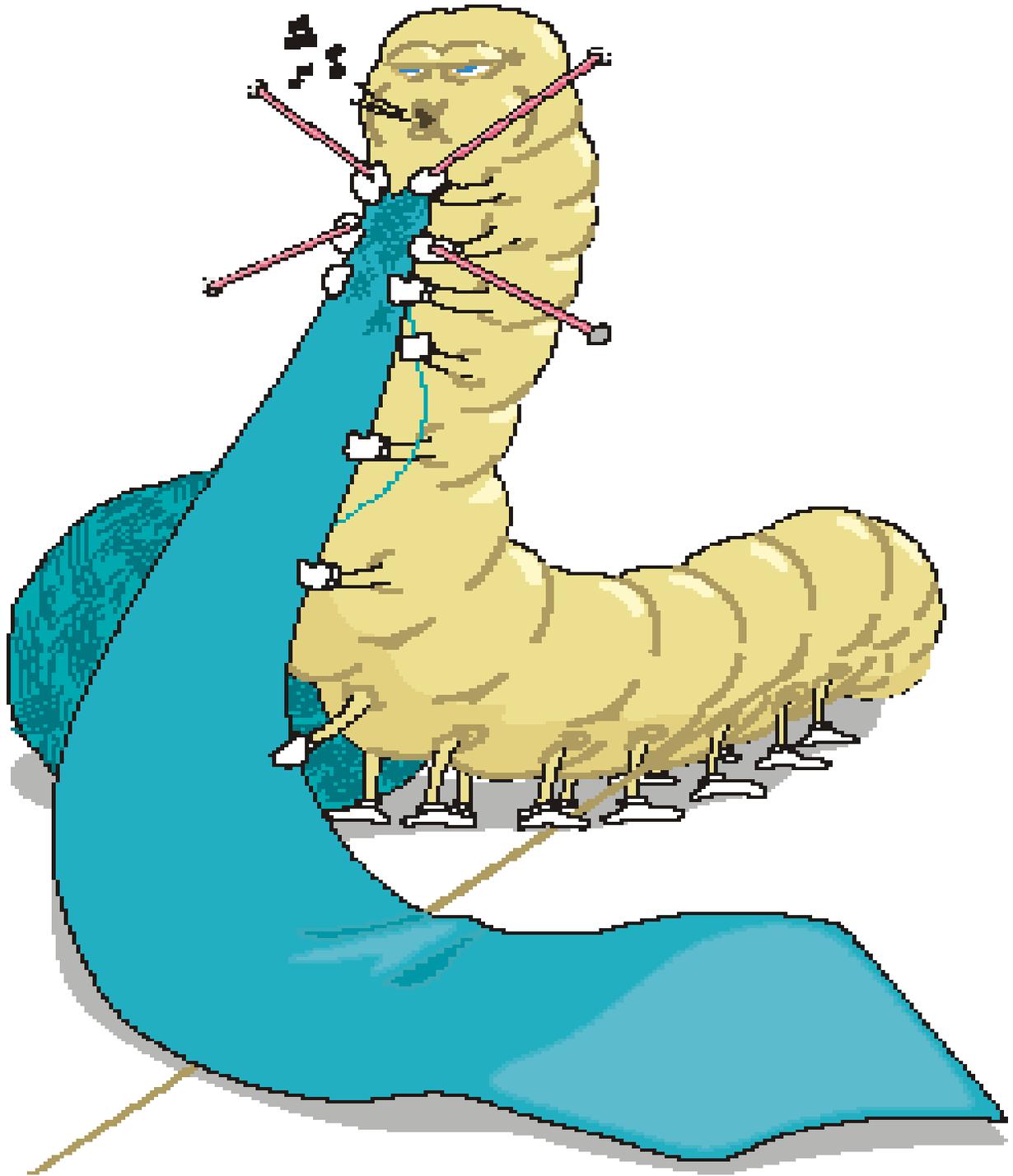
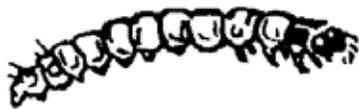


CHAPTER 28

THE BEST CONTROL FOR FABRIC PESTS



CLOTHES MOTHS

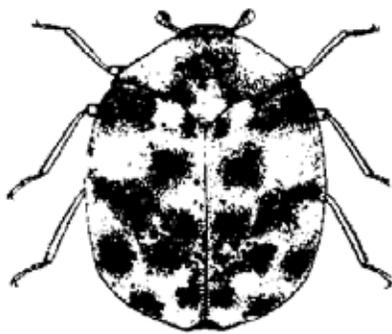


WEBBING LARVA

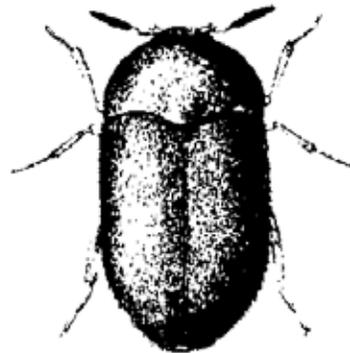


CASEMAKING LARVA

DERMESTID BEETLES



VARIED CARPET BEETLE



BLACK CARPET BEETLE



GENERAL DESCRIPTION

Fabric, or textile pest infestations sometimes present the most difficult pest control problems you can encounter. Except for fumigation, volatile, synthetic pesticide use is never an effective control for textile pest problems.

Textiles that are infested and consumed by pests are usually (dirty) wool-based such as woolen clothing, carpets, and tapestries. Two types of insects are responsible for the usual woolen fabric damage but by their nature these pests — carpet beetles and clothes moths— feed on a broader diet than wool alone. Besides textiles made of processed wool, many other substances with a high-protein content are eaten by these insects. One particular protein, keratin, is present in wool and other hair or fur. The same material is also found in feathers, skins, horns and hoofs. Other materials that are high in protein are insect bodies, pollen, silk, grains and seeds (particularly the “germ,” as in wheat germ, or non-starchy portions). Insects are the only animals capable of digesting keratin. Only a few microorganisms and fungi in other kingdoms are keratin reducers or feeders. **Dirty or stained articles are particularly susceptible to pest attack, so always clean your clothes, fabrics and textiles before storing them away. If you must fumigate, fumigate with carbon dioxide.**

Fabric pests - carpet beetles and clothes moths developed originally as scavengers, consuming pollen, wool, dead insects, feathers, fur and hide of dead birds and mammals. Many species still feed on dead insects, the molted skins and pupal cases of moths, silkworms, tent caterpillars, mud daubers, yellow jackets, wasps, hornets, dead bees and pollen.

Textile pests are generally secretive and develop in food that decomposes slowly. As populations of textile pests increase, individual adults and mature larvae migrate away from the infestation to mate or pupate in protected solitude. This activity often is the only signal that a pest infestation is present. The four groups of carpet beetles and two species of clothes moths can be identified from specimens of either adults or larvae.

Cedar wood chests are often recommended to protect fabrics from clothes moths and carpet beetles. However, only freshly cut cedar wood is toxic or repellent to fabric pests, and then only in tightly sealed, airtight container. By the time the wood is two years old, there is no toxic effect left. (Of course, a tightly sealed [taped] box of any material will usually keep pests out.)

Pliny in book 12 of his Natural History, reported that the fruits and leaves of citron, or Assyrian apple (*Malus assyria*) have an exceptionally strong scent that “penetrates garments stored with them and keeps off injurious insects.” Nicholas Culpeper in his 1633 English Physician and Complete Herball noted “wormwood being laid among clothes will make a moth scorn to meddle with clothes as much as a lion scorns to meddle with a mouse or an eagle with a fly.” W. Coles in his 1657 book Adam in Eden: or Nature’s Paradise, noted that the galls of sumac will keep moths from garments and woolen clothes “giving unto them a good scent, and therefore it is much used to be laid in wardrobes, chests, presses and the like.”

Fabric pests are insects that feed on and damage natural fibers, synthetics, animal hair, fur, feathers, horns, hoofs, clothing, upholstery, carpeting, draperies, linens and other fabrics. Some of these pests are able to digest and utilize the animal protein keratin as an energy source and, therefore, feed on hides, furs, hair, feathers, animal horns, clothing, carpets, rugs, fabrics, lint, wood, silk and preserved insects and other museum specimens. Several fabric pests are also important stored-products pests (such as black carpet beetles, silverfish and firebrats). Destroy all badly infested materials. Routinely clean out your closets and discard or donate woolens and susceptible clothing which no longer fit or are no longer used. If you have insulation which is of a plant or animal origin, remove it from the structure. Inspect for and remove any nest, dead animal or bird carcasses that may be in wall voids, chimneys or fireplace areas. Keep accumulation of lint to a minimum and vacuum thoroughly with a HEPA filter in areas where hair and other natural fibers accumulate. Thoroughly clean all heating ducts and cold air returns at least once per year. Remove all bird, insect and rodent nests in the fall before the start of cool weather. Always wash or dry clean woolens before storing them for the summer. Place cleaned or washed woolens in tightly sealed, insect-free chests or plastic bags. **Proper dry cleaning and laundering (especially with borax) kills all stages of these pests. Lightly dust with food-grade DE.**

Try using sachets of any of the following: dried lemon peels, dried tomato leaves, lavender, bay leaves, whole cloves, cedar chips, dried rosemary, mint, whole peppercorns, thyme, ginseng, or several combinations of the same to repel fabric pests.

Four orders of insects have species considered to be fabric pests: the Coleoptera (carpet beetles), the Lepidoptera (clothes and webbing moths), the Thysanura (silverfish and bristletails) and the Orthoptera (crickets).

Each year widespread damage is caused by fabric pests, primarily two moth and four carpet beetle species. This is because the clothes we wear and the furnishings we surround ourselves with are made from once-living plants or animals and are simply a potential food source for a large number of fungi and insects, so we must continually and properly protect these articles from their attacks. Although crickets are capable of damaging fabrics, they cannot digest keratin. Silverfish and firebrats are primarily pests of paper products, but some also attack stored food products as do some of the dermestid beetles. In order to grow and develop, the larvae of fabric pests need vitamin B and certain salts which they usually get from soiled materials. Vitamin B and/or these salts are found in human sweat and urine, milk, coffee, fruit juices, tomato juice, beef gravy, etc. so, obviously, **the best control is proper laundering and/or dry cleaning, good sanitation and prevention.** Be sure to properly clean, store and care for all articles subject to pest attack and eliminate all infested, out of style/size, surplus and/or discarded items, e.g., furs, feathers, trophies, hides, silks and woolens, etc., especially if no longer of any value. Anything subject to attack that is not used or needed should be simply given away, destroyed or thrown away. Inside the building, a good vacuum is essential and must be used on a regular basis to remove materials, e.g., dead insects, lint, loose fibers, human and pet hair and other proteinaceous materials from clothes and furnishings, etc. Accumulation of any materials that are subject to pest attack in cracks, crevices, underneath objects and in corners can create potential breeding areas. Furnishings and clothes should be cleaned routinely. Do not store dirty clothing with clean clothes. Cereals, spices and pet foods in open containers should be promptly used or discarded.

All materials susceptible to fabric pest attack should be brushed, vacuumed, washed in Safe Solutions Enzyme Cleaner with Peppermint or borax or dry cleaned routinely because fabric pest eggs and small larvae are often difficult to see.

Clothing, rugs, sheets, etc. should be dry cleaned or washed in hot soapy water with borax and then dried in a hot dryer; this will kill all stages of fabric pests. Labeled clothing and furs should be professionally cleaned. If wall-to-wall carpeting is infested and the infestation is located on the underneath side, remove the carpeting, then thoroughly clean both sides and dry in the direct sun or frozen before reattaching. If fabric-covered furniture is infested, professional dry cleaning may be required because the larvae may be feeding from inside the fabric outward or inside the stuffing; freezing or heating the individual piece/item also are alternative control techniques.

For infested plant materials such as cereals, species, herbs, nuts, seeds, etc., simply remove and discard all of infested materials; then follow up with routine cleaning and caulk all cracks and crevices. Prevention also consists of storage of all susceptible materials in tight-sealing glass containers. Cedar-lined closets and chests are only somewhat effective in repelling moths. Remove clothing and expose to hot, direct sunlight for 2 days. Store only cleaned or well sunned clothing. Dry cleaning kills carpet beetles (and moths). Avoid accumulations of dust and lint in corners, along moldings, in hot and cold air ducts. HEPA Vacuum such areas thoroughly and frequently. Remove and properly dispose of all disposable vacuum bags.

To reduce or prevent the invasion from the outside by clothes moths and/or carpet/dermestid beetles, be sure to remove the nests of birds and insects, such as wasps and hornets, as soon as they abandon them for the season. The removal of flowering shrubs which attract carpet/dermestid beetles from around the foundation is advisable, especially *Spiraea* spp. and crepe myrtle.

CARPET BEETLE OVERVIEW

All species of hide and carpet beetles belong in the beetle family Dermestidae. Adult beetles have short, clubbed antennae, are black in color or with yellow-white or orange scales (observable only with a good hand lens), or covered with fine smooth hair. The females can lay eggs throughout the year; the adults tend to be cyclical and most active in spring. Adults commonly feed on flowers and flower pollen. The larvae are responsible for most textile damage. They can be long lived; when food is scarce, their larvae continue to molt for longer periods, waiting out a food supply.

HIDE AND CARPET BEETLE

Adults:

- The **Larder Beetle** (*Dermestes lardarius*) is large, oblong, and will grow from 1/4" to 3/8" long; it has a dull, dark or black head and thorax, and its wing covers behind the thorax are half dull yellow, and the latter half, black. The **Hide Beetle** (*Dermestes maculatus*) is large, oblong 1/4" to 3/8" long. Its dorsal or top surface is dark-brown or black, sometimes with white scales on margin of thorax; the under-surface usually is also covered with white scales.
- Some other species of *Dermestes* resemble the hide beetle with similar habits, e.g., the Incinerator beetle and the Leather beetle.
- The **Black Carpet Beetle** (*Attagenus unicolor*, also called *A. megatoma* and *A. piceus*) is oblong to oval in shape; it is 1/8" in length, dark brown or black, and is not shiny.
- The **Common Carpet Beetle** (*Anthrenus scrophulariae*), the **Furniture Carpet Beetle** (*Anthrenus flavipes*), and the **Varied Carpet Beetle** (*Anthrenus verbasci*) are about 1/8" long or less. They are mottled, and are covered with yellow, white, orange, and black small flat scales (visible with a good hand lens).
- **Warehouse and Cabinet Beetles** (*Trogoderma*) are small, about 1/8" long or longer, and are dull dark-brown or black-mottled with tan markings.
- The **Imported Carpet Beetle** (*Anathrenus scrophulariae*) The adults prefer to feed on the pollen of spiraeas. This carpet beetle was recently introduced into the USA and the larvae were first found eating carpets in Buffalo, NY.

Larvae:

Dermestid larvae are hairy beetle grubs from less than 1/8" long to about 1/2" long. Larvae can be separated into the same groups as the adults:

- The **Larder Beetle** is long, about 1/2", hairy, dark brown in color with two teeth on the sides of the end segment pointing rearward.
- The **Hide Beetle** has the same characteristics as the Larder beetle, except the end segment teeth are curved upward.
- The **Black Carpet Beetle** is carrot-shaped; its body extends from about 1/4" to about 1/2". The front end is widest and tapers to the rear. It is covered with dark-brown to golden-red hair. It has a long twisted tuft of hairs at the narrow tail end which may be worn down or broken off.
- The **Common Carpet Beetle**, the **Furniture Carpet Beetle**, and the **Varied Carpet Beetles** are dark, short and less than 1/4 inch. They are wider in the middle than at front or rear end, with dark hair bristles that extend out from body. The tail end is darker with short brushes of bristles.
- **Warehouse and Cabinet Beetles** usually are small, but they may reach 1/4 inch. They are long, capsule-shaped, a light cream color, with a dark row of hairs across each segment, and reddish-brown bristles of short hairs on the segments of the blunt tail end.
- The larvae of the **Imported Carpet Beetle** is known as the Buffalo Moth; they are 1/4" long and covered with dark brown, erect bristling hairs. Kill them with boiling water and/or steam or rug cleaners with Safe Solutions Enzyme Cleaner with Peppermint.

HIDE OR LEATHER BEETLES AND LARDER BEETLES

Dermestes maculatus (DeGeer) and *Dermestes lardarius* (Linnaeus)

The name *Dermestes* is from the Greek, it means "to devour a skin."

These beetles (from which the entire family takes its name) are larger than other Dermestids, but rather than feeding on fabrics or grain, their larvae commonly eat bird and mammal flesh. They feed in remote dark places preferring their food dry rather than spoiled. The larvae of these beetles will attack cured meats, like ham, newly hatched poultry, and they are often found infesting dead birds caught in a chimney or wall void, or mice that were caught in traps or succumbed to poison. Larvae consume all the flesh and the heavier hairs, leaving a perfectly-cleaned skeleton in a small pile of fluffy undercoat hair. The **Hide Beetle**, in particular, is used in museums to clean vertebrate skeletons. Both beetles eat leather, but the larder beetle is found more in homes, cabins and curing sheds. **They can also infest wooden beams and timbers.**

INCINERATOR BEETLE

Another species that resembles the hide beetle is the **Incinerator Beetle**. This beetle infests the wettest, unburned portions of garbage found in corners of open incinerators. Adults fly to lights and enter buildings from these incinerators.

BLACK CARPET BEETLES

Attagenus

Black carpet beetle adults are frequently found near the larval infestation inside buildings. In the spring they will, on occasion, fly inside from feeding outside on flowers. Black carpet beetles also infest grain elevators and mills; in homes and other buildings they most commonly infest woolen fabrics. Black carpet beetles also infest stored woolen clothes such as suits, uniforms, skirts, blankets, felt and wool yarn.

COMMON, FURNITURE AND VARIED CARPET BEETLES

Anthrenus

These very small, somewhat brightly-colored beetles are responsible for infesting woolens, furs, feathers, hair-stuffed antique furniture, woolen carpets and blankets; they are known to destroy insect collections, reducing individual specimens to piles of tiny fecal pellets.

WAREHOUSE AND CABINET BEETLES OR TROGODERMA BEETLES

Trogoderma

The several common *Trogoderma* species are most often found on high-protein plant material processed into dry pet food, wheat germ and other less starchy grain commodities.

CONTROL AND MANAGEMENT OF CARPET BEETLES

Inspection - Inspection for Dermestid beetle infestations depends first on the type or kind of beetle identified.

- Look for accumulations of cast skins and large amounts of fecal pellets as well as irregular holes and loose patchy fur.
- Advise occupants to take all woolen goods, e.g., clothing and furs out of closets and brush them. (Note: Brushing helps to dislodge eggs and larvae infestations are discovered in the process.)
- Look in every storage box, under all furniture setting on wool rugs and carpets. Inspect tapestries, insect collections and grain products. Inspect every closet, attic and basement into their far reaches.
- Use commercial pheromone traps in museums, etc. as part of your intelligent pest management® plan.

Habitat Alteration

- Advocate discarding or cleaning any wool or fur product that has not been cleaned since wearing.
- Recommend moving furniture and cleaning the entire wool carpet in infested rooms.
- Insist on thorough vacuuming of all rooms for pet hair that can support small beetle populations.
- Routinely clean with Safe Solutions, Inc. Enzyme Cleaner with or without Peppermint and/or borax.
- Clothes should be separated into uninfested, cleaned woolens or stained and dirty articles that need to be dry cleaned. Dry cleaning kills all stages of the beetle, and cleaned woolen fabrics retard the growth of the beetle larvae. There is a greater likelihood that furs or woolens in long-term home storage will be infested than those that are used seasonally. Washing with Safe Solutions, Inc. Enzyme Cleaners with or without Peppermint and/or borax also kills all stages of the beetle.
- Have all cleaned fur, feather, and woolen products stored in tight chests or good plastic garment bags. Furs are best kept safely in refrigerated vaults at furriers.

Intelligent Pest Management® Control

- Practice proper sanitation.
- Thoroughly steam clean, rinse-and-vac or at least vacuum all storeroom/closet baseboards and corners.
- Caulk/seal all cracks and crevices of infested rooms after the infestation is vacuumed.
- Lightly dust with food-grade DE.
- Routinely clean with diluted Safe Solutions, Inc. Enzyme Cleaner with or without Peppermint and/or borax or steam clean on a routine basis.

Follow-up - Conduct an intelligent pest management® plan emphasizing routine monitoring in high risk areas such as museums, woolen or fur storage facilities, etc. Use pheromone traps for effective monitoring. Housekeeping staff should reinspect annually, and you should monitor records regularly. Emphasize educational programs for housekeeping and/or curatorial staff and storage management personnel in critical facilities.

CARPET BEETLE DESCRIPTION

ORDER - Coleoptera

COLEOPTERA DESCRIPTION

Note: The order Coleoptera contains the beetles with the first pair of wings being highly modified and adapted to form hard, horny wing covers or wing cases, known as the elytra, which cover and protect the second pair of wings which are membranous and are folded up beneath them. The functional (flying) wings are, thus, invisible unless the insect is actually flying or preparing for flight. Many beetles, however, lack functional wings entirely. Beetles are further characterized by the prothorax being large and to some extent movable and by the mouth-parts being adapted for biting. They have a complete metamorphosis and the larvae show a very wide range of forms and habits. There are about a quarter of a million different species of beetles on earth which constitute the largest order in the animal kingdom. These beetles have become adapted to live in a very wide range of environments and to utilize a wide variety of substances as foodstuffs. It has been thought that the hard, well-fitting exoskeleton has been an important factor in their evolution as the dominant insect order on the earth. Remember in order to pass through each molt, they inject a small amount of chitinase or protease enzymes to shed their exoskeleton so “bathe” them in Safe Solutions, Inc. Enzyme Cleaner with or without Peppermint to destroy their “dominance.”

Carpet Beetle Overview

Immature carpet beetle feed on dried animal products such as wool, silk, felt, hair, fur, feathers, dead animals, and stuffed trophy heads. They do not feed on synthetic fabrics, but sometimes damage wool-synthetic blends or synthetics when they are dirty or stained with urine, sweat or food.

Carpet beetle larvae are repelled by light and are usually found burrowed deeply into infested material or in little-used drawers, cases, and storage bins. To grow, they molt and shed their skins. In heavy infestations, you may find large numbers of these light-colored shed skins. The adults are often seen crawling up walls and congregating on window ledges.

There are many species of carpet beetles. In addition, many common beetles resemble carpet beetles. Be sure to get the pest beetle properly identified so that you can zero in on the infested goods and likely harborage sites. Four species of carpet beetle are the most likely to be found:

Black carpet beetle (*Attagenus unicolor*) is the most abundant and destructive of the carpet beetles. The adult is 1/8-3/16” long, a solid dark brown or dull black color, and more elongate than carpet beetles described below. The larva is less than 1/4” long and carrot-shaped. It is covered with golden brown hairs and has a characteristic “tail” of long hairs at the rear end.

Varied carpet beetle (*Anthrenus verbasci*) is primarily a scavenger. It is common in the nests of birds, on dead animals, and in insect collections, but can damage woolens, carpets, wall hangings, hides, horns, and bone artifacts. Small populations often go unnoticed behind furniture or along baseboards feeding on accumulated

lint, hair, food crumbs, dead insects, and other organic debris. The adult is about 1/8" long, oval to round, with splotches of white, yellow, and black on its back. The larva is tear-drop shaped and covered with rows of light brown hairs.

Common carpet beetle (*Anthrenus scrophulariae*) attacks carpets, woolens, and animal products such as feathers, furs, leather, silks, mounted museum specimens, and pressed plants. The adult is about 1/8" long with a band of orange scales down the middle of its back. The larva is reddish-brown and covered with brown or black hairs. A mature larva is active and moves rapidly.

Furniture carpet beetle (*Anthrenus flavipes*) attacks furniture (particularly old horsehair-stuffed furniture) and items made from wool, fur, feathers, silk, horns, and tortoise shell. The adult is about 1/8" long, and is rounded and blackish with variable mottling of yellow and white scales on the back and yellow scales on the legs. The larva is difficult to tell from the common carpet beetle.

FAMILY - Dermestidae

TYPE METAMORPHOSIS - Complete.

Egg - Eggs are laid on food supplies, in dark secluded places, woolens, upholstered furniture, cracks around baseboards, warm air shafts and other places wherever dust and lint are left to accumulate.

Larva - Worm-like; the only stage that causes the damages by feeding.

Pupa - Quiet period of transformation into the adult stage.

Adult - Winged males and females whose sole purpose is that of reproduction. The front pair of wings are modified into hard body coverings known as elytra. Adults feed on pollen, especially *spirea* and *pyracantha*.

TYPE MOUTHPARTS - Chewing.

DISEASE ASPECTS - Carpet beetles have been known to cause dermatitis, irritation of the nasal passages and sinuses and more generalized allergies. The small hairs on the larvae are the cause of the problems. Hide beetles are carcass- and hide-feeders and they can spread bacilli or spores of anthrax, a disease of cattle and sheep that can be passed to humans. The larvae are pests wherever suitable food exists, e.g., grains, cereals, fabrics, clothing, carpeting, hides, furs, preserved specimens and stored food stuffs. Carpet beetles have been seen massing outside on plants, e.g., *spirea*, dogwood, *ceanothus* (redroot), crepe myrtle, wild aster and buckwheat daisy. Clean or spray routinely with diluted Safe Solutions Enzyme Cleaners. Lightly dust with food-grade DE.

CLOTHES MOTH OVERVIEW

Clothes moths fare better in warm humid climates and so southern regions in the U. S. have historically produced more infestations than northern areas.

Adults: Adult moths are very secretive. They are very small and never fly to lights, choosing instead to remain in dark areas or not to fly at all. They scuttle down into dark folds of textiles or fur. Clothes moths need humidity. So control by turning on the (closet) lights and reducing humidity. Properly install air conditioners, fans and/or dehumidifiers.

The **Webbing Clothes Moth**, *Tineola bisselliella* (Hummel), has a length at rest of 1/4" to 1/3" with a wing span of less than 1/2" from tip to tip. Its head and front wings are a golden buff. Larvae spin fine silk over the area of their infestation. Fecal pellets, pupal cases and cast head capsules catch in the silk creating a messy accumulation. The larvae are stationary and feed in only one area.

The **Casemaking Clothes Moth**, *Tinea pellionella* (Linnaeus), is the same size as the Webbing Clothes Moth, but its head and front wings are dusty brown or tan with three small dark spots on each front wing. Casemaking clothes moth larvae feed on woolen yarn but incorporate tiny strands into a silken bag or tube or case that covers

their abdomen, protecting them from the environment and natural predators. They crawl with three pairs of legs and hold the case with hooks on stumpy abdominal legs and drag the case along - the larvae are fairly mobile. The color of their cases give an indication of the color of the infested material.

LARVAE:

The **Webbing Clothes Moth** larvae are small, creamy white caterpillars. The Webbing Clothes Moth larvae is between 1/4" to less than 1/2" at most with a white, shiny body. It has a brown head and a brown segment behind the head. It is often found in loose silk webbing.

The **Casemaking Clothes Moth** larvae are slightly longer than larvae of the Webbing Clothes moth. It is very light or white with a dark brown head. The segment behind its head is dark brown. The caterpillar constructs a case about its body which it carries about when feeding. Mature larvae after leaving the infestation attach to ceilings and walls and pupate inside the case.

CONTROL AND MANAGEMENT OF THE CLOTHES MOTH

The most important method is good housekeeping and proper sanitation.

Inspection

- All woolens should be inspected where clothes moths have been sighted, especially clothing that is stained or has been worn and not cleaned or sealed in plastic.
- Vacuum, shake and/or brush woolens to dislodge eggs. Wash in or Safe Solutions Enzyme Cleaner with Peppermint and/or borax or dry clean.
- Carefully inspect any wool products imported from Central and South America.
- Don't forget to inspect attics, ventilation ducts, furnace filters and other areas where lint, hair, dust and dead insects can accumulate.

Habitat Alteration

Clothes moths cannot live on clean wool. They are very dependent upon sweat, food or urine-stained wool, fur, silk, and feathers. Without certain vitamins produced by microorganisms growing on the stains, clothes moth larvae will die. **So clean all wool products routinely.**

- Recommend dry cleaning or washing in Safe Solutions Enzyme Cleaner with or without Peppermint and borax of all woolens that are in need of it or dirty. **Caution: Enzymes may also "eat" some natural dyes.**
- Advocate that all occupants inspect all wool products in storage and discard all those whose use is not projected in the near future. It is better to give old, unused woolens away than to wait until they are infested and destroy the articles that you do use.
- Where there is sudden activity of flying moths, look for areas where water leaks have brought about increased humidity. Then have all areas with high humidity ventilated and/or dehumidified and/or install fans or air conditioners.

Intelligent Pest Management® Control

- Practice proper and thorough sanitation.
- Sweep or vacuum with a HEPA filter or rinse-and-vac regularly to remove lint and/or hair from floors, shelves and drawers.
- Clean woolen products and/or rinse them in sodium borate or borax.
- Lightly dust with food-grade DE.
- Use an air conditioner, dehumidifier and fans.
- Clothing bags, cedar chests and/or closets will only protect clean (uninfested) articles.

Follow-up - Develop a pest management program with an emphasis on monitoring for critical museum or stage drama collections. Historical textiles cannot always be cleaned; closely monitor stained tapestries, clothing, furniture coverings, and stuffings. Review all records regularly, and provide educational programs to curatorial

staff and those in textile storage businesses. Try spot treating with diluted Safe Solutions, Inc. Enzyme Cleaner with Peppermint to see if it creates stains or discolorations or try spraying borax or disodium octoborate tetrahydrate on these textiles. Lightly dust with food-grade DE as needed.

CLOTHES MOTHS DESCRIPTION

In years past, sheep were “treated” with “registered,” chlorinated hydrocarbon insecticide poisons such as endrin, toxaphene or DDT to kill their external parasites; this also created insect-resistant wool. Thankfully, these persistent carcinogenic and toxic insecticide poisons are no longer being used as a sheep dip or spray, but as a result there has been an increase in clothes moth problems, requiring **IPM** controls or protective measures or the use on synthetic fibers which help reduce clothes moth infestations. Clothes moths are small, silvery-beige moths with a wing span of less than 1/2”. They have narrow wings fringed with long hairs. Small grain and flour-infesting moths are often confused with clothes moths. However, clothes moths have different flying habits. They avoid light and are rarely seen flying. Clothes moths prefer dark corners, closets, and storage areas, and usually remain out-of-sight. **Turn on the lights and install fans.**

The primary food of clothes moth larvae is soiled woolens, but they also feed on dirty silk, felt, fur, feathers, and hairs. In museums they often damage woolen clothes (particularly old military uniforms), feather hats, dolls and toys, bristle brushes, weavings, and wall hangings. **Clean everything.**

ORDER - Lepidoptera

FAMILY - Tineidae.

TYPE METAMORPHOSIS - Complete. The usual life cycle can last from 2 months to 2½ years.

Egg - Laid singly on products in which the larva feeds. Each female can lay 100-150 eggs which normally hatch in about five days.

Larva - Worm or caterpillar stage is the only stage that damages by feeding. Small, white caterpillars about 1/16” long when newly hatched they grow to about 1/3” when fully grown.

Pupa - Silken web or cocoon stage in which transformation from caterpillar to moth takes place. This web or tough cocoon may be the only sign of the pest’s presence and infestation. The adult moth emerges in one to four weeks.

Adult - Winged males and females live solely for the purpose of reproduction. They do not feed. These small (less than ½” long) yellowish or brownish moths are normally not attracted to lights and prefer to hide when disturbed.

TYPE MOUTHPARTS - Chewing in the larval stage and siphoning in the adult stage.

DAMAGES - Not known to be vectors of disease. They damage dirty carpets, clothing, rugs, brushes, felts, hair, furs, upholstery, cotton, wool, silk, linen, synthetic fabrics and paper. **Routinely clean to control these pests.**

INITIAL SUMMARY

Fabrics made of wool, furs and feathers, are attacked by a few species of beetles and moths that can consume a protein called keratin. These pests also consume grains, leather, meat, and horn as well as dead insect skeletons. **Routine cleaning will control all these pests!**

Originally, these insects were scavengers of mammal and birds nests, dead vertebrate bodies, and seeds. When humans began using these materials as food and clothing, these pests came along too. Fabric pests destroy textiles, tapestries, and carpets in museums, clothing in homes, and furs in warehouses and stores; these are often both expensive and unique products. The pests do not thrive in cleaned textiles and wool because they need certain vitamins produced by fungi found along with stains of perspiration, urine and human food; added to

this is a requirement for moisture. Use dehumidifiers, fans and/or air conditioners and practice proper sanitation, exclusion, storage and cleaning and habit reduction. Routinely clean with diluted Safe Solutions, Inc. Enzyme Cleaner with or without Peppermint and/or borax.

Plaster Bagworms - (You may not have clothes moths after all.)
Tineloia walsinghami (Busck)

Plaster bagworms are small caterpillars similar in appearance and closely related to clothes moths. The larvae of bagworms live in a flattened, gray, watermelon seed-shaped cases about 1/2" long. Each case is constructed of silken fiber and sand particles, lint, paint fragments, and other debris attached. The case has a slit-like opening at each end, and the larvae are able to move around and feed from either end.

Plaster bagworms are easily seen on light-colored walls. They are common in garages and around windows. Close examination of the house may reveal bagworms attached to the underside of chairs, bookcases and other furniture. They are often found along the edge of rugs, near baseboards, or on the lower edges of walls. Bagworms are quite common in garages and underneath buildings. The larvae mainly feed on spider webs and webs; however, they will also feed on fabrics made of natural fiber in houses.

Management of plaster bagworms is similar to management of clothes moths. Good housekeeping is extremely important, especially the removal of all spider webs. Sweep down and/or vacuum, routinely spray and/or remove any spider webs and bagworm cases and you will also control the spiders and bag worms. Clean with diluted Safe Solutions, Inc. Enzyme Cleaner and borax.

SPECIFIC PEST DESCRIPTIONS

SPECIFIC EXAMPLES OF CARPET BEETLES

COMMON CARPET BEETLE

Anthrenus scrophulariae(Linnaeus)

Class - Insecta, Order - Coleoptera

Family - Dermestidae, Metamorphosis - Complete

Also known as "carpet beetle, buffalo moth, buffalo bug, beetle or the old-fashioned carpet beetle".

Adult - Small, rounded, gray to blackish in color with minute white and orange scales on the back with a longitudinal band of orange-red scales down the middle of the back. Length is about 1/16-1/8" oval in shape. When touched, the adult "plays possum". They feed on nectar and pollen.

The adults fly in the daytime.

Larva - Body is an elongated, stout, widest posteriorly. Color is reddish-brown and covered by numerous brown and/or black hairs. It attains a length of about 1/4". Very active; it looks like it is running rather than crawling; about 5 - 6 instars in about 66 days. Larvae will eat irregular holes or slits in fabrics, carpet, hides, leather, furs, silks, mounted museum specimens and pressed plant specimens, plants, wool and feathers; they have caused dermatitis; adults found on *Spiraea*, *Ceanothus* (a chaparral shrub), wild buckwheat daisy and wild aster flowers; they enter homes on cut flowers. Abdominal sternites are hardened or sclerotized. No webbing is seen.

Pupa - Pupates within the last larval skin in about 12 - 15 days, but the beetle usually remains in the skin about 18 days before leaving.

Egg - Small, white with projections at one end; 30 - 60 are attached to the materials fed upon and hatch in 10 - 20 days.

DAMAGES - Only the larvae attack and feed on hair, bristles, clothing, plant materials, carpets, woolens, silk, museum specimens, furs, feathers, insect collections and similar products. This species causes dermatitis in humans. Fabrics normally have extensive surface damage with irregular holes scattered here and there, carpets



(without pads) tacked to the floor are likely to have slits following the cracks. Furs and brushes usually have the hair tips damaged making uneven areas. Causes dermatitis.

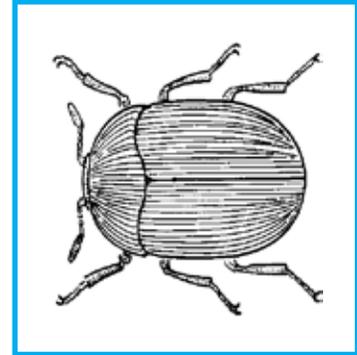
INTELLIGENT PEST MANAGEMENT® CONTROL - Find the source(s) of the infestation(s) and eliminate them and/or treat infested materials with heat or cold. Practice proper sanitation - examine cut flowers before bringing them inside. Lightly dust with food-grade DE as needed.

BLACK CARPET BEETLE

Attagenus unicolor (Brahm)

The most common and destructive (beetle) pest encountered. It was originally called *Attagenus megatoma* (F) or *piceus* (Oliv.). It causes the greatest damage.

Adult - Dull to shiny black to dark brown with brownish antennae and legs, elliptical in shape, 1/8" to 1/4" long and about half as wide. Frequently found outdoors in spring and summer in the sunlight eating pollen, particularly of spiraea. The distal end of the antennae is twice as long in the male as it is in the female.



Larvae - Appear quite tiny, with elongated cigar or carrot-shaped bodies that grow to about 5/16" to 1/2" long, shiny golden brown to chocolate to dark brown to almost black in color, they are covered with short, stiff hairs and have a long tuft of hairs at the tail. Can take almost a year to pupate. Will play "possum" when touched or disturbed. They tend to avoid lighted areas. They move so slowly they appear to be gliding. They roam wildly. The larval skins are often mistaken for living grubs. Series of 5 - 11 normal molts completed in 9 months to 3 years; up to 20 molts when conditions are unfavorable. They often bore into food containers.

Pupa - Larvae pupate within the last larval skin; lasts 6 - 24 days.

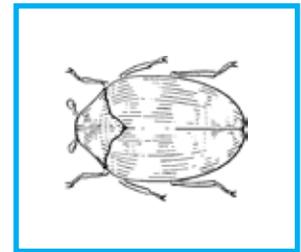
Egg - Very small, fragile, pearly white; approximately 50 - 90 are produced over a period of about 3 weeks and usually deposited in lint found in dark, protected places, e.g., behind baseboards, cracks and crevices, air ducts, etc. They are very fragile so vigorously vacuum, brush and/or clean thoroughly and routinely with diluted enzyme cleaners and caulk carefully.

DAMAGES - Most destructive and widespread of all the carpet beetle pests - the black carpet beetle larvae are also general feeders on both dead animal and plant materials: hair, fur, horns, feathers, dead birds, birds' nests, bird manure, dry horse and cow carcasses, seeds, grains, cereals, woolen rugs, clothing, carpeting, felts, skins, yarn, velvet, silk, hair-filled mattresses, upholstered furniture, wool-filled blankets, house insulation with sheep wool or cattle hair, meat, insect meal, kid leather, dry milk powders, casein, books, cayenne pepper, dried pupae of silkworms, pet food, nuts, spilled flours, various meals and pollen.

On fabrics, larvae tend to surface graze but are quite capable of making small or large irregular holes. On furs, they cut the hairs at their bases and leave the hide undamaged. The larvae may burrow through packing materials to get to the food inside. Cast skins and frass in the form of tiny irregular pellets are frequently found in infested materials.

The adults are usually found outside on flowers, particularly in the spring and especially on *Spiraea* spp., often eating the pollen. They can also be found in the nests of birds, rodents and insects such as wasps and around spider webs. Inside, adults are often found at windows during the spring. The actual breeding areas can be quite diverse, e.g., wall/ceiling voids where larva can feed on dead insects; rodent baits in attics, crawl spaces and basements; old electrical wire insulation; abandoned wasp and hornet nests in attics or under eaves; bird nests; light fixtures containing dead insects; behind and under baseboards where lint and pet hair accumulate; insulation which contains animal hair, etc. The larvae tend to wander about feeding here and there, and can be found far from the primary source of infestation. **When disturbed, the larva curls up and "plays possum"**.

VARIED CARPET BEETLE
***Anthrenus verbasci* (Linnaeus)**



Adult - Blackish with an irregular pattern of white, brown and dark yellow dense scales on the pronotum and wing covers or elytra. Adult is oval, about 1/16" to 1/8" long and strongly convex in shape. Older adults may appear to be solid brown or black. Feed on pollen outside; look near your windows in spring. Tarsi 5, 5, 5; antenna short, with 3-segmented, compact club. **May be found in abandoned nests of bees and wasps.**

Larva - Hairy, dark brown to black with light to dark brown stripes; rather wide in proportion to its length and is wider in back than in front. About 1/5" - 1/4" long. Anywhere from 5 - 30 instars. Usually molt about 6 - 8 times in 7-11 months. At each end it has 3 tufts of bristles and hair. The hair in these tufts are called haustisetae because they are made up of segments shaped like arrowheads. These hairs are irritating to the skin, nose and lungs. When touched it forms itself into "fuzzy" little round, golden, beautiful "balls". Larva tend to wander about. Their favorite food is dead insects and spiders. They often live as scavengers in bird, bee and mud dauber nests. They are also important museum pests.

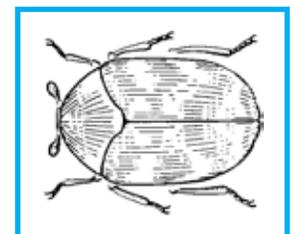
Pupa - Within the last larval skin or exoskeleton in usually about 2 weeks (4 - 30 days).

Egg - Initially white, becomes cream colored, rough with short, spine-like projections at one end; between 20 - 100 are laid - usually about 40 eggs deposited during spring and early summer in the nests of birds, dead cluster flies, or other dead insects, rodent baits, bees, wasps and spiders outside or inside on wool, animal skins, furs, specimens, rugs, leather, feathers, horns, whale bones, silk, hair, dried plants/insects and/or any dried materials of animal origin, but, females do not always lay their eggs on larval food materials. Hatch in about 17 - 18 days. They can not be dislodged by shaking. The female begins laying 4 days after fertilization and continues for up to 2 weeks.

DAMAGE AND SIGNS OF INFESTATION - Larvae feed on ethnographic and insect collections, fabrics, hornet and wasp nests, horn, bone, furs, skins, grains, cayenne pepper, feathers, hair, fish, manure, silk, leather, dead insects, animals and spiders, nests of birds, bees, wasps and spiders, carpets, woolen goods, stuffed animals, leather book bindings, whalebone, fish manure, dried silkworm pupae, rye meal, cacao, red pepper, corn, and insect collections. Fabrics typically have much surface damage and holes here and there, but larvae can cause large irregular holes in material. Furs and brushes have mostly the tips of hairs damaged, leaving uneven areas. With museum insect specimens, the accumulation of fine powder/frass beneath the specimen is often the only indication of these beetle's presence or infestation. Larval caste skins are often present. Frass/droppings are minute, irregular in form, often the color of the material being fed upon. The larvae may burrow through packaging materials when seeking food and will feed on drywood termites after fumigation has killed them. Fabrics usually have much surface damage with irregular holes scattered here and there.

CONTROL - Find the primary source(s) of infestation(s) and eliminate them. Ask about previous rodent, bird, fly and/or ladybird infestations and check those areas too! Try using heat or cold to control infestations in valuable collections and/or items. Routinely clean with Safe Solutions, Inc. Enzyme Cleaners and/or borax. Don't forget to look in the attic, bird and insect nests and/or collections. Lightly dust with food-grade DE.

FURNITURE CARPET BEETLE
***Anthrenus flavipes* (LaConte)**
Formerly known as *Anthrenus vorax* (Waterhouse)



Adult - Small, oval in shape, body blackish, mottled by a highly variable pattern of yellow and white scales on the back with a heavy coating of yellow scales on the femora of the legs. It is about 1/16-1/8" long. Larger and more round than the varied carpet beetle; white underneath; once its scales fall off it appears solid black. Not more than twice as long as it is broad. Antenna short, with a 3-segmented compact club. Tarsi 5, 5, 5.

Larvae - Thickly covered with brownish hairs, they are somewhat elongated or oval-shaped, widest posteriorly;

they vary in color, according to age, from white to yellow to dark red or chestnut brown depending upon the food source and age. Attains a length of about 3/16-1/4". Broader in front. They go through 6 - 12 molts over a period of 3 - 6 months. Abdominal sternites sclerotized or hardened.

Pupa - Completed within the last larval skin; white, soft stage inside the split larval skin. The pupal state lasts 14 - 19 days at room temperature. The adult may remain in the skin 1 - 10 weeks before leaving.

Egg - Females lay 35 - 100 eggs in 1 - 3 batches (average of 60) small, soft, white eggs laid in clutches on the surface of upholstered furniture, clothing and in cracks and crevices. Hatch in 9 - 21 days.

DAMAGES - Larva often feed on upholstered furniture, clothing, carpeting, textiles, plant materials, brushes, wool, silk, hair, fur, felt, feathers, insects, blood and horn. When stained with blood, sweat, urine or feces, cotton, linen, rayon, jute and paper are also chewed upon as well as horse-hair filled furniture, bristles, tortoise shell, animal excreta, stained linen, softwood, leather, bags containing animals products, dried silkworm pupae and cocoons, dead mice, dead insects, dried cheese, old grain, casein, dried blood and the glue of book bindings. Fabrics have much surface damage with irregular holes scattered about.

INTELLIGENT PEST MANAGEMENT® CONTROL - Clean and find the primary source(s) of infestation(s) and eliminate them. Routinely clean with Safe Solutions, Inc. Enzyme Cleaners and/or borax. Ask about previous rodent, bird, fly and/or ladybird infestations and check those areas too! Try using heat or cold to control infestations in valuable collections and/or items. Lightly dust with food-grade DE.

CARPET BEETLE INTELLIGENT PEST MANAGEMENT® CONTROL OVERVIEW - **The key to controlling all carpet beetles is to find the primary sources of infestation and eliminate them.** Inspect carefully carpeting, drapes, clothing, furs, fabric-covered furniture and stored products. Don't forget to inspect nests of insects (bees, wasps and hornets), spiders, birds and rodents. Carpet beetles can be found feeding on feathers left by birds in nests and on roofs. Look in attics, inside and at susceptible plants outdoors. In general, white or cream-colored flowers seem to be attractive to these pests outside, so be careful not to bring them inside; you may wish to move flowering shrubs away from the building. Keep screens in good repair. Remove accumulations of lint in clothes dryers, washers and vents. The thorough inspection should be partners with good sanitation practices, so be sure all clothing is properly cleaned before storage. Try cleaning or spraying infested articles with diluted Safe Solutions, Inc. Enzyme Cleaners or their Peppermint Soap, but be careful - all protease enzymes "eat" protein material and may cause some damages. Borax or disodium octoborate tetrahydrate will protect materials "permanently" (until they are washed out) and do not volatilize - but be careful they are toxic to people and pets if eaten or ingested.

HIDE BEETLES - (3 Species)

ORDER - Coleoptera

FAMILY - Dermestidae

BLACK LARDER BEETLE (INCINERATOR) BEETLE

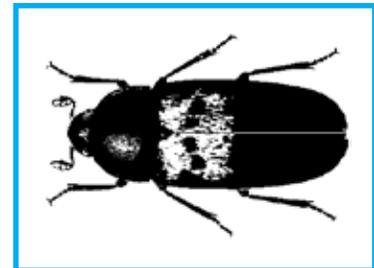
***Dermestes ater* (DeGeer), occasionally referred to as *Dermestes cadaverinus* (F.)**

Larva can be found feeding on mouse cadavers in walls of buildings; partially burned food and other kitchen wastes in incinerators; pet foods.

LARDER BEETLE

***Dermestes lardarius* (Linnaeus)**

Larvae can be found feeding on stored ham, bacon, meats, cheese, dried museum specimens, stored tobacco, dried fish, dog biscuits; can damage and tunnel slightly into wood; can penetrate lead and tin but not zinc or aluminum; pest of silkworm cultures; reported to attack just hatched chickens and ducklings.



HIDE BEETLE OR LEATHER BEETLE

Dermestes maculatus (DeGeer)

Larvae can be found feeding on hides and skins; used to clean carcasses and museum specimens; known to survive on smoked meat and dried cheese, but cannot live on fat alone; larvae can tunnel short distances into wood. Adult wing covers or elytra are uniformly dark in color and the underneath surface is for the most part white. Used by forensic entomologists to determine the time of death.

WAREHOUSE BEETLE OR CABINET BEETLES OR TROGODERMA BEETLES

Trogoderma spp., e.g. *Trogoderma variable* (Ballion), formerly known as *Trogoderma parabile* (Beal)

ORDER - Coleoptera

FAMILY - Dermestidae

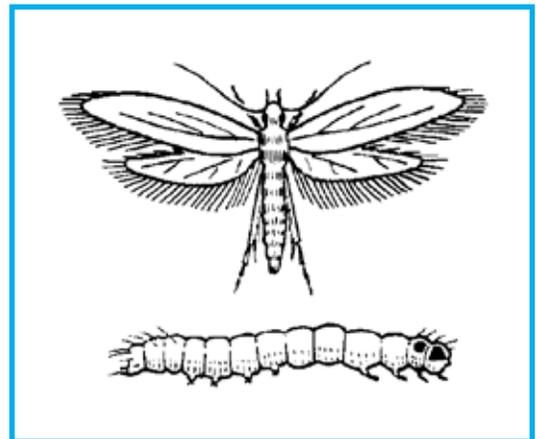
The adult beetle is about 1/8" long and brownish-black. The larval stage is about 1/4" long and varies in color as it ages from a yellow-white to a dark brown. Larvae have been found feeding on barley, wheat, animal feeds, grains and pollen; also found in seeds, dead animals, cereals, candy, cocoa, cookies, corn, corn meal, dog food, fish meal, flour, dead insects, dry milk powder, nut meats, dried peas, potato chips, noodles, spaghetti and dried spices.

SPECIFIC EXAMPLES OF COMMON CLOTHES MOTHS

WEBBING CLOTHES MOTH

Tineola bisselliella (Hummel)

Adult - They also live outdoors in bird nests, bee cells and similar locations. Because of the adults imperfect mouth parts, they cannot eat and prefer to hide in dark areas of closets, but will flit about the margins of lit areas. Their ability to disappear is one of their characteristics. They are common throughout the U. S. Small, body covered by shiny buff/golden scales. Have *fluffy or silky* reddish setae (hairs) on the head. The wings are spotless and have about a 1/2" span (from wing tip to wing tip; fringed with a row of long, golden hairs. The forewings (the part seen while at rest) are a pale, ochreous buff, almost a golden color, and in certain lights they appear to glitter like gold. It is normally not attracted to light. Usually only the males can fly; the females are too pregnant/full of eggs to fly and only run or walk. They are often confused with the Angoumois grain moth that flies by day. **Seldom occurs in very dry areas, so use and properly maintain a dehumidifier and/or air conditioner and/or fans.**



Larva - Shiny, creamy-white, translucent, greasy-looking worm or caterpillar with a dark head and molt at least 4 times and up to 45 times during its developmental period from 35 days to 2½ years! The 1/24" larvae eventually attains a length of 1/4" to 1/2" and eventually spins a loose, open-ended, web-like gallery containing silk, excrement and fabric fibers over the object it feeds on and in floor cracks. Larva are often *colored* by the dyes in the fabrics they feed on. No eyes are visible, but it will crawl away from light to hide. **This is the most common clothes moth pest encountered in the U. S.** There are six thoracic legs, each terminating in a claw. Five abdominal segments each bear a pair of fleshy prolegs, those on the last abdominal segment are somewhat larger and are known as *claspers*. At the base of each proleg there is a circlet of small hooks which enable the larva to walk firmly over a variety of substances. In order to climb a polished surface such as glass, the larva secretes a silken pad which sticks to the smooth surface and allows the legs to obtain a firm grasp. Silk is secreted from large glands in the thorax and head of the larva and is extruded from the spinneret, a tube-like organ situated on the underside of the head. They produce random patches of webbing over the infested material. They have chewing or biting mandibles, and can develop at 20% - 30% relative humidity, but they are very susceptible to the least amount of drying, so use a dehumidifier and fans. They prefer a relative humidity of 75%. **Control the humidity and you control the pest.**

DAMAGE AND SIGNS OF INFESTATION - Larvae feed on protein-based materials and animal products, e.g., wool clothing, carpets, rugs, upholstered furniture, furs, stored wool, animal bristles in brushes and even wool felts in pianos. Synthetic fabrics are also fed on, especially if blended with wool. Larvae may use cotton fibers to make their pupal cases. Damage generally appears in hidden locations such as under collars or cuffs or clothing, in crevices of upholstered furniture and in areas of carpeting covered by furniture. Fabrics stained by foods, perspiration or urine are more subject to infestation. Larval period can take 30 days to over 2½ years! **So clean!** Note: Under a microscope damaged goods will be seen to have the webbing clothes moth larvae's characteristic bun-shaped particles of excrement scattered about wherever they have been active; usually the droppings are the same color as the fabric *food*. This is the most common fabric pest in the United States.

Pupa - The larva encloses itself in a well hidden silken case containing excrement and fabric fibers about 1/6" to 1/4" long. 8 - 10 days in the summer; 3 - 4 weeks in winter.

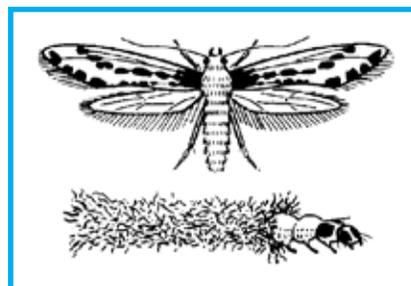
Egg - Slightly sticky, ivory white, oval, about 1/24" long. After attaching/gluing about 40 - 100 eggs to threads of fabric (cotton, wool, silk, etc.), the female moth dies. Only the fertilized eggs hatch. Hatching occurs when the larva, which has been occupying a "U" position in the egg, chews its way out. Under a microscope you can see a reticulate pattern. **You can also trap these pests with pheromone traps.**

CASEMAKING CLOTHES MOTH

***Tinea pellionella* (Linnaeus)**

A/K/A Case-Bearing Clothes Moth

Adult - Small 3/8" - 1/2" body and the upper-side of the forewings (that part of the wings visible when the moth is at rest) are pale, shining buff or brown in color with three rather faint dark spots which may or may not be distinct. The wing span is a little less than 1/2" and the wing scales rub off easily. They shun light. Commonly found in the Southern states, but generally distributed throughout the U. S.



Larva - Spins an open-ended cigar-shaped case of silk and fabric fibers which it carries about at all times; if removed the larva dies. The main part of the case is constructed of silk, but attached to it are fibers of wool and various debris so that the case usually assumes the color of the materials which the larva is infesting, which often makes their detection difficult. The larvae never leave their cases and when ready to pupate do so only after sealing both ends. When moving, it will thrust out the head and legs. The larva reaches a length of about 3/8" - 1/2". Generally located in a crack or crevice, not on the infested material. This stage lasts 30 - 90 days. Usually found around undisturbed carpets and drapes. **Prefers 90% relative humidity, so air condition, install dehumidifiers and/or fans.**

Pupa - When ready to pupate, the larva, dragging the case along, withdraws to a protected crevice or crack often near the ceiling, and then seals up both ends of its case with silk. When ready to emerge the pupa forces its way through the thin silk membrane before the pupal skin ruptures and the moth emerges.

Egg - Very fragile, ivory white, oval, about 1/24" long and barely visible to the naked eye; under a microscope you can see longitudinal ridges.

DAMAGE AND SIGNS OF INFESTATION - Casemaking clothes moth larvae attack primarily materials of animal origin and secondarily those of plant origin. Animal-origin materials include feather-filled objects, e.g., furniture comforters, pillows, mattresses, wool, rugs, furs, mummified carcasses, taxidermy mounts and piano felts. Plant-origin materials include tobacco, various herbs and seasonings, hemp, various plant-based drugs, linseed, almonds, saffron, etc. This pest is particularly fond of feathers and fur. Carefully look in the usual places. Check the air ducts and cold air returns; if infested, have them professionally cleaned with diluted enzyme cleaner.

CARPET MOTH OR TAPESTRY MOTH OR WHITE-TIP CLOTHES MOTH

***Trichophaga tapetzella* (Linnaeus)**

When at rest this moth closely resembles a bird dropping. The front third of the forewing is black and the rest is white. The white part of the wing may be mottled to a greater or lesser extent with a few black or gray spots

and the front of the head is also covered with white hairs. This species is the largest of the clothes moths.

Life Cycle - The biology of this moth has not been studied to the same extent as have the other species of wool-destroying moths. In a room maintained at 65° F. all stages may be present throughout the year.

Larva - The larvae of this species are said normally to infest coarser materials than the other clothes moths, examples being horsehair, old woolens, fur, feathers, stuffings and skins. It is more usually found in sheds, barns and outhouses than inside buildings. The larvae construct rough silken tunnels or tubes in the infested materials in which they live and feed. Although the inside of the tunnel is smooth, the outside is to some extent camouflaged with fecal pellets, bits of fiber and hair and other material which has been bitten off by the larvae.

Pupa - A cocoon is formed of tough silk and the pupa makes its way partly out of it before the adult emerges. The empty pupal cases protrude from the infested material.

Note: other moth pests of fabrics include: the Brown House Moth, *Hoffmannophila pseudospretella* (Staint.) formerly (*Borkhausenia*), the Brown-dotted moth, *Acedes fusciputitella*, the Fan Palm caterpillar, *Litoprosopus coachellae* (Hill), the Plaster bag worm, *Tineloia walsinghami* (Busck) and the White-shouldered moth, *Endrosis sarcitrella* (Linnaeus). The Brown House moth is a.k.a. the false (fake) clothes moth.

In dealing with clothes moth infestations, first remove all clothes from the closets, shake and place in the sunlight and vacuum or steam clean with a Vapor Dragon® all cracks and crevices; then caulk carefully. You can also have the clothing dry-cleaned or washed in borax and Safe Solutions, Inc. Enzyme Cleaners.

INTELLIGENT PEST MANAGEMENT® CONTROL NOTES - Before undertaking a fabric pest control program, the first step is to determine the real source of the infestation. This is of prime importance because clothes moths and carpet beetles can fly from their original breeding sites to feeding grounds. But it never hurts to clean with Safe Solutions, Inc. Enzyme Cleaners and vacuum or steam clean thoroughly and to properly install and maintain dehumidifiers, air conditioners and fans. Lightly dust with food-grade DE as needed.

FABRIC PEST CONTROL OVERVIEW - Find the primary source of infestation; remove it quickly for these pests can fly and attack new feeding grounds very quickly. If over-stuffed furniture is heavily infested, remove and dispose of it. If clothing is infested, wash it in borax or dry clean it. Routinely and thoroughly vacuum all possible harborage points where lint accumulates, including rugs and carpet, baseboard areas, moldings, heating and cooling ducts, floor furnaces, behind stairways, dressers, chests, trunks, clothes closets and particularly behind shelves and other hiding places; then carefully caulk all cracks and crevices. Routinely wash and clean with or Safe Solutions, Inc. Enzyme Cleaners or their Peppermint Soap and/or borax or sodium borate.

INTELLIGENT PEST MANAGEMENT® GUIDELINES FOR CARPET BEETLE CONTROL - Remember, carpet beetles are among the most difficult fabric pests to control due to their ability to find food in obscure places and to disperse widely throughout your building. Long-term control depends on you carefully integrating the use of caulking, sanitation, exclusion and temperature/humidity changes. Note: The eggs of the black carpet beetle are extremely resistant to synthetic pesticide poisons, so why even think about using these toxins? Routinely clean carpets with Safe Solutions, Inc. Enzyme Cleaners and/or borax and/or sodium borate or steam clean or lightly dust with the food-grade DE.

You can monitor adult carpet beetles by using sticky traps baited with an appropriate pheromone. Several traps located throughout your building can show you where beetles are coming from; they are also useful for monitoring the effectiveness of your IPM control techniques. Check traps once or twice a week. Pheromone traps can also be used to augment other control methods when used to attract adult males in small, confined areas. Be sure you have correctly identified the type of beetle you are fighting.

- **Properly identify** the species. Lower the humidity with dehumidifiers and fans.
- **Find** the primary source of the infestation and eliminate it.
- **Properly dispose** of all badly infested articles.
- **Trap** and remove rather than poison rodents.
- **Store** pet food and other dried foods in tightly sealed glass containers.
- **Eliminate** all visible of lint, hair, dead insects and other debris that service as food for carpet beetles.
- **Routinely and thoroughly clean** with Safe Solutions, Inc. Enzyme Cleaners and/or borax and brush or

- steam clean; then lightly dust with Safe Solutions, Inc. food-grade DE.
- **Destroy** any badly infested clothing, rugs or other items.
- **Remove** all spider webs with dead insects, bird, rodent, bee, wasp or other animal nests may harbor insects. Keep flowering plants and shrubs away from the walls.
- **Inspect** cut flowers before bringing them into a building as they may harbor adult beetles.
- **Clean and caulk or patch** cracks and crevices in floors, walls, closets and other places where lint accumulates. Use Safe Solutions, Inc. Enzyme Cleaners or their Peppermint Soap or natural soaps wherever possible. Spot treat as needed with Not Nice to Bugs®.
- **Screen** windows, doors and vents with fine mesh against the migration from flowering plants.
- **Vacuum** and steam-clean susceptible carpets and furniture. Carefully dispose of vacuumed debris to avoid recontamination.
- **Temperatures** of +130° F. will kill all stages of any insect in 3 hours.
- **Freeze** infested materials at 0° F. for at least one week.
- **Proper laundering in Safe Solutions, Inc. Enzyme Cleaners and borax and/or dry cleaning will destroy all stages of life.**
- **Fumigate** with 60% carbon dioxide for at least one week.
- **If safely possible, clean infested items with borax or sodium borate; if not, try cleaning with diluted Safe Solutions Enzyme Cleaner with Peppermint.**

Regular and thorough cleaning of rugs, draperies, upholstered furniture, closets and other locations where carpet beetles congregate is the most simple but effective preventative and control technique you have. Frequent, thorough vacuuming is the most effective way of removing food sources as well as carpet beetle eggs, larvae and adults. Fabrics can be protected by keeping them cleaned to remove any food and perspiration stains which may attract carpet beetles that feed in the stained areas. Mounted animal specimens, such as museum specimens or trophies, should be regularly cleaned or periodically placed in a freezer for several hours. Try spraying them with sodium borate or borax and/or Safe Solutions Enzyme Cleaner with Peppermint. **Check if discolorations or stains occur first.** Stored woolens, linens and furs should be periodically inspected then aired, brushed and hung in the light. If infestations are found, freeze, launder or dry clean and seal in a tightly sealed, protective plastic bag or other tightly sealed containers before storing away to destroy carpet beetle adults, larvae and eggs. Only if **all** of the above **IPM** controls fail do we suggest you apply a spot application of a labeled pesticide poison such as boric acid, or sodium borate. Apply residual insecticide poisons only as spot applications. Confine your spot insecticide applications to the edges of floor coverings, under rugs and furniture, the floors and walls of closets, shelving where susceptible fabrics are stored, and in cracks and crevices and other lint-accumulating areas. Carefully apply talcum powder, baking soda, boric acid, silica gel and/or food-grade diatomaceous earth in attics and wall voids and other inaccessible places. Freezing or heating techniques can be also used when infestations are extensive. Fumigants such as naphthalene and insecticide-impregnated resin strips, labeled for control of carpet beetles on fabrics, will protect susceptible objects in tightly closed containers. These strips slowly release an insecticide poison vapor providing prolonged protection, but are often dangerous and toxic to human occupants too. Infested furniture or similar objects can be removed from the building and treated in fumigation vaults and/or by heating or freezing them properly. If you cannot store garments in commercially sealed containers, store them with pieces of camphor or treat them with BT or sodium borate or borax and store them in containers (with silica gels, diatomaceous earth or boric acid) that are taped closed. As a last resort, treat carpets with borax, sodium borate, food-grade DE or BT per labeled directions. **Caution: All insecticides are poisons, e.g., even naphthalene vapors can produce toxic reactions in sensitive individuals and some may also cause staining or running of fabric dyes, so use them only as a last resort.** Especially avoid the use of paradichlorobenzene (PDB) because it may be carcinogenic (cancer-causing). **Remember, there are no safe poisons! Notify all occupants before applying any poisons. Try all alternatives first!**

INTELLIGENT PEST MANAGEMENT® GUIDELINES FOR CLOTHES MOTHS - Control of clothes moths also depends on your sanitation and caulking programs, which help prevent infestations; protect suspect fabrics by utilizing temperature controls when necessary. **Clothes moths are attracted to the food, beverage, sweat and urine stains in woolens and other materials, not to the wool itself.** For this reason, garments must be properly cleaned thoroughly before being stored away for extended periods of time. Diluted enzyme cleaner or peppermint soap or borax will remove the attraction; use whenever possible, **but make sure they do not discolor the fabric(s) before using them.** Lower the humidity with fans, dehumidifiers and/or air conditioning and decrease the chances of any clothes moth surviving. **Keep the lights on.**

Moth larvae and cocoons are very fragile. Thus, regular steam cleaning or vacuuming and shaking, or brushing and airing of woolens, fur and feather garments, blankets and other fabrics are very effective in preventing moth damage. If the humidity can be kept low inside buildings, this will create an environment that is not suitable for clothes moth development. Building construction that is free of all visible cracks and crevices also controls clothes moth problems, so caulk and seal very carefully. Eliminate old birds' nests in or on the building because they may be sources of moth infestations. In addition, remove all plant growth that encourages nesting areas.

Trap rather than poison rodents. (Inaccessible dead carcasses can become a source of clothes moths, beetle infestations and unpleasant odors.) **Regular, thorough vacuuming of all lint and thorough and routine cleaning of susceptible clothing, carpets, closets and storage areas is an important factor in clothes moth control.** Strong vacuums should be routinely used to remove all organic debris, lint, adults, eggs and larvae. Clothing and other fabrics should be periodically shaken and brushed to remove any insects or eggs; carefully inspect all seams, collars and cuffs. To keep from attracting moths, launder in Safe Solutions Enzyme Cleaner with Peppermint and borax or dry clean soiled fabrics before they are stored or hung in a closet. In laboratory studies eggs, larvae and adults of webbing clothes moths were killed after four minutes at 2,450 MHz in a Sharp Carousel Microwave Oven. Whenever possible, store garments, blankets, linens and rugs in tightly sealed boxes or containers with food-grade diatomaceous earth, silica gels, or a light dusting of boric acid. Simple placement of infested materials in temperatures of 0° F. or below for only several hours often results in good control. Cold storage at temperatures between 40° F. and 42° F. can further protect expensive clothing and furs from moth damage. You may construct a trap using 2 - 3 cotton balls saturated on one side with sardine, tuna or cod liver oil; then attach the dry side to a flypaper strip and hang from the ceiling in the infested area. Replace all traps every two weeks or as soon as they become cluttered with moths. When you drop the temperature from 50° to 18° F. before storage at 40° F. to 42° F., this will kill all stages of moth life. Furniture or clothing placed outdoors for several hours at 0° F. often results in good control. Steam cleaning or dry cleaning effectively kill all stages of clothes moths. **(Steam may damage some articles.)** If you heat the furniture or clothing to 103° F. for a day, it will kill the larva, at temperatures of 130° F., all stages of any insect are dead in 3 hours. Temperatures greater than 122° F. kills most insects in minutes, but it takes days, weeks, or even months to kill them all at temperatures of 14° F., once they acclimate themselves to lower temperatures.

Caution: Dermestid Beetle -The best way to control dermestid beetles is by vacuuming. Never kill dermestid beetles because if you kill them, as their dead bodies dry up, their little spines easily break off, become airborne and can adversely effect you as the spines from the larvae. These spine-like hairs can penetrate clothing and your skin, causing pruritic rashes, dermatitis and lymphadenitis. If ingested or inhaled, these hairs can cause gastrointestinal and respiratory diseases.

Sprays using diluted Safe Solutions Enzyme Cleaner with Peppermint* and/or borax provide quick knockdown of clothes moths, and most can be carefully sprayed directly on fabrics if needed (in situations where fabrics cannot be laundered or dry cleaned). Some pyrethrin insecticides may not leave persistent toxic residues and could be used as a last resort for clothes moth control, but try routine vacuuming first. Then try dusting with food-grade DE or DE with pyrethrin. Only if all else fails, use a spot residual poison spray along baseboards, margins of carpets, in closets and in storage areas. Try mopping with CB Mop Up®** or borax first. Also spray under furniture and other areas where moths occur. Before treating any fabric with an insecticide poison or pestisafe®, test a small, inconspicuous part of the fabric to be certain the spray will not cause staining or running of dyes. **Remember there are no safe, "registered" poisons! Notify all occupants before applying any volatile poison.**

Be careful even if you use borax, boric acid, or sodium borates not to allow children, pets, or wildlife access to these toxins. All boron products are toxic if eaten by anyone or anything!

Remember! Routine sanitation and proper inspection are your most important control options and a vital part of Intelligent Pest Management®!

Fabric Pests - Typical First Strikes by Housekeeping and Maintenance

- 1. Practice proper sanitation. Routinely dust, vacuum all lint, human and animal hair and other organic debris and clean** the entire area with Safe Solutions Enzyme Cleaner with Peppermint (1 oz. per gal. water) natural soaps or steam clean. **Promptly remove vacuum bags, animal nests, animal carcasses, garbage and/or dead insects.**
- 2. Mix ½ pound rosemary, ½ pound mint, ¼ pound ginseng, and 2 tablespoons cloves and put in cheese**

cloth bags to be used as a sachets. **Dust lightly with baking soda or talcum powder or Comet® or food-grade DE.**

3. **Try sachets** of any of the following: French marigold, lemon verbena, pennyroyal, dried lemon peels, dried lavender, cedar chips, tobacco, coriander, southernwood, bay leaves, whole cloves, cedar chips, dried rosemary and mint or whole peppercorns. Patchoulli, clove, cedar, citronella and/or lavender oils also can be added. Wash with Safe Solutions Enzyme Cleaner with Peppermint monthly.
4. **Keep clothes, textiles and fabrics clean and stored in sealed, plastic storage containers or airtight chests;** never put clothing or fabric or textiles away dirty; wash with borax and diluted Safe Solutions Enzyme Cleaner. Shake them and place them in direct sunlight. Store them in areas below 45° F.
5. **Routinely clean carpets and rugs** with 1 oz. - 2 oz. Safe Solutions, Inc. Enzyme Cleaner and/or 1 cup of borax per 1 gal. water in a rinse-and-vac. Routinely remove lint, human and pet hair, fur and feathers and other organic debris. Spot treat as needed with Not Nice to Bugs®.
6. **“Fumigate”** with carbon dioxide in a bag or sealed garbage container.
7. **All stages of fabric pests can be controlled if the infested article is sealed in an intact plastic bag** and put in a deep freezer for at least 3 days at 0° F. or put the items that can not be harmed by heat in 130° F. - 140° F. heat for 1 - 4 hours to kill the insects.
8. **Clothing storage:** Store seasonal or other unused and clean clothing in black garbage bags with 2 sticks of wrapped peppermint gum to help keep the pests at bay. **If clean materials are stored in tightly sealed containers, they should be safe from infestation.**
9. The camphor plant also produces a powerful, antiseptic, volatile oil that that controls clothes moths and other pests, but it has been banned in some counties due to its high phenol content.
10. Traps can be made using cloth pads lightly treated with sardine oil as bait.
11. Caulk and repair all cracks and crevices.
12. Fabrics that are infected can be submerged in hot (at least 120° F.), soapy water for at least 2 - 4 hours to kill larvae and eggs.
13. **If you still have fabric pests, read the entire chapter.**

The economic consequences of the growing resistance to volatile, “registered,” synthetic insecticide poisons can be easily documented in the Rio Grande Valley of Texas. At first, boll weevil infestations (and their natural predators) were “controlled” by intensive insecticide poison applications. Resistance quickly developed and other volatile, “registered,” synthetic pesticide poisons were used. Secondary pests created by these insecticide poisons also became cotton destroyers, so still more “registered” insecticide poisons were applied to “control” them. The secondary pests also quickly became resistant to these other “registered” insecticide poisons. When it got to the point that the cotton crop still suffered heavy losses even after 18 applications of “registered” insecticide poisons during each growing season, cotton farming was simply abandoned in that region. Another example of how great this lie is, “Better living through chemistry.” If you kill all of your predator allies you will lose the war! **Use common sense, not “registered” poisons!** G-d naturally controls the pests better than any synthetic pesticide poison; if He did not, there would not be plants on earth.

Note: The Sierra Magazine, May/June 1999 issue, noted in part: Nearly one-quarter of all “registered” pesticide poisons used in the United States are applied to cotton, and the overall intensity and amount of poison use is increasing every year. World-wide, more pesticide poisons are sprayed on cotton than any other crop. Poisons banned for food crops are still being sprayed on cotton. Every year in the U. S., half a million tons of cotton seed oil goes into salad dressings, baked goods and snacks. Another 3 million tons of cotton seed is fed to dairy and beef cattle, which also eat vast amounts of cotton by-products known as “gin trash.” (Foreign-produced cotton seed oil is sometimes extracted with a mixture of hexane and benzene, a known carcinogen that is very difficult to remove.) Residues from “registered” pesticides such as the defoliant DEF have frequently appeared on California Department of Food and Agriculture scans of cotton seed and cotton by-products over the past decade. Cotton seed oil, however, is rarely tested for “registered” pesticide poison contamination. There is no data available to see if the cotton is or is not contaminated or how badly.

Beetle Note: There are more than 350,000 known species of beetles; one out of every 5 known species of all living things is a beetle. The oldest beetle fossils are about 250 million years old. They live everywhere on earth except Antarctica. There are more known species of beetles than any other living organism on earth! The tiniest beetles are fungus beetles barely 1/100 of an inch long. Some of the tropical beetles are more than 6” long. Beetles come in incredible shapes, sizes and colors. There are 40,000 different species of just ground beetles. There are over 35,000 known species of scarab beetles, e.g., June bugs, Japanese beetles, flower beetles, etc.

There are beetles that live on the land and beetles that live under water and beetles that live underground and some that live in our food and fabrics.

****Check out CB Mop Up at:**

<http://www.cbproproducts.com/products.php4?color=C44C04&title=Dusts&conditional=category%3D%27Dusts%27>



***Safe Solutions products may be purchased online at:**

<http://www.safesolutionsinc.com>

or by telephone at:

1-888-443-8738.



