



Meet the Dirty Dozen

1. Webbing clothes moth
2. Casemaking clothes moth
3. Varied carpet beetle
4. Black carpet beetle
5. Warehouse/Cabinet beetles
6. Hide beetle/ Larder beetles
7. Cigarette / Drugstore beetles
8. Silverfish / Firebrats
9. Psocid / Booklouse
10. Powderpost beetles
11. Cockroaches
12. Mice



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1. **Webbing Clothes Moth**
Tineola bisselliella



Brown head capsule with no case around body

Tuft of reddish orange hair Uniform 10K gold/buff color


Photo Insects Limited

Webbing Clothes Moth

- Food:** Clothing moth larvae feed on wool, hair, feathers, furs, upholstered furniture, occasionally on dead insects, dry dead animals, animal and fish meals, milk powders such as casein, and nearly all animal products such as bristles, dried hair and leather. Adults do not eat.
- Life Cycle:** Adult moths lay 100-150 eggs. The larvae is the damaging stage. They are white and vary in size from 1/16" when first hatched up to 1/3" when full grown. The length of the larval period depends largely on the environmental conditions and the quality of food.
- Trap use and placement:** This trap is placed on the floor indoors in closets and rooms where woolen, silk fabrics, furs, or items with feathers are stored. One trap per closet or storage room can attract and catch the male moths. This trap will act as an early warning tool to help prevent destruction of woolen items and other fabrics.

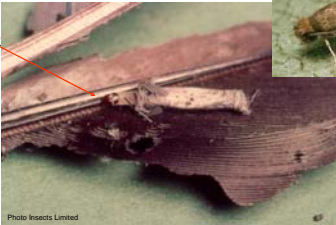
Other Identifying Features of Webbing Clothes Moth

- *Granular frass (like ground pepper)
- *Webbing on surface of textiles
- *Damage to feathers, furs, silk, wool, felt, satin, cotton (holes, missing, loose)
- *Pupae (cocoon) on material (especially edges)
- *Pheromone Odor



Courtesy of Insects Limited, Inc.
 Westfield, IN, USA
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2. **Case-making Clothes Moth**
Tinea pellionella



Brown or Black head

Photo Charles Bakot

Photo Insects Limited

Larvae carry a cocoon like case with them

Casemaking Clothes Moth

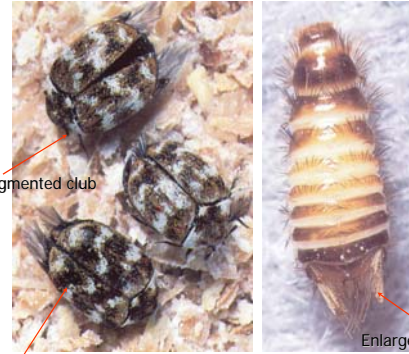
- If you have clothes moths and it's not the Webbing Clothes Moth, chances are you have Case-making Clothes Moths. Materials left undisturbed for some time or stored in dark places (such as a closet, attic, or drawer) are most severely injured by these insects. The adults are slightly smaller than the Webbing Clothes Moth. Body and wings are colored buff to golden with a brownish tinge, except for three dark spots on the front wings. The eyes are wider than the space between them. The brown headed larvae will spin a silken case that carries around with them as they feed.

Food: Clothing moth larvae feed on wool, hair, feathers, furs, upholstered furniture, occasionally on dead insects, dry dead animals, animal and fish meals, milk powders such as casein, and nearly all animal products such as bristles, dried hair and leather. Adults do not eat.

Life Cycle: 33 - 48 days, depending on environment. Adult moths lay 100-150 eggs. The larvae is the damaging stage. They are white with brown heads and vary in size from 1/4" when first hatched up to 1/3" when full grown. The length of the larval period depends largely on the environmental conditions and the quality of food.

- Trap use and placement:** This trap is placed on the floor indoors in closets and rooms where woolen, silk fabrics, furs, or items with feathers are stored. One trap per closet or storage room can attract and catch the male moths. This trap will act as an early warning tool to help prevent destruction of woolen items and other fabrics.

3. Varied Carpet Beetle *Anthrenus verbasci*



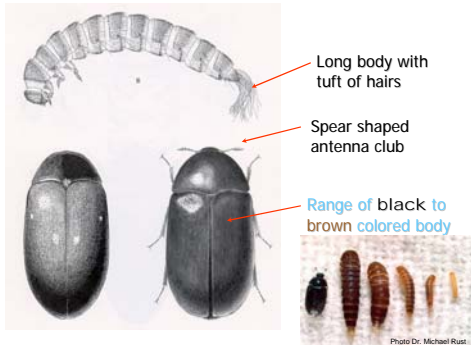
Three segmented club

Elongated scales of varied colors

Enlarged tuft of hairs

4. Black Carpet Beetle

Attagenus spp.



Long body with tuft of hairs

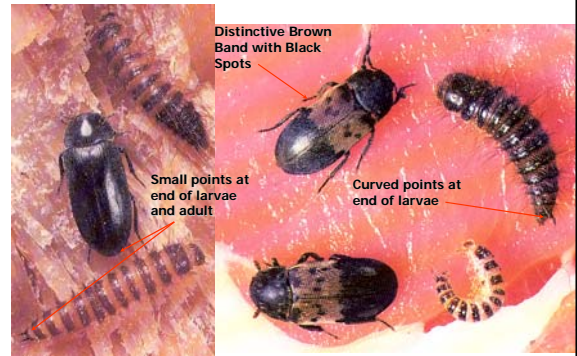
Spear shaped antenna club

Range of black to brown colored body

Photo Dr. Michael Russi

5. Hide Beetle & Larder Beetle

Dermestes maculatus & *Dermestes lardarius*



Distinctive Brown Band with Black Spots

Small points at end of larvae and adult

Curved points at end of larvae

6. Warehouse / Cabinet Beetle

Trogoderma spp.



Mottled color pattern with no scales.

Four pairs of tufts of hairs



Photo: Ami Kalisch, UNL, Entomology

Warehouse/Cabinet Beetle

- This small, oval beetle is a common pest of many types of artifacts. The adult is a tiny black beetle with white or lightly colored markings on its back. The larvae are orange-brown in color and look hairy. Warehouse beetles feed primarily on animal products, but will readily feed on grain and cereal products. The hairs of the larvae can cause allergic reactions in sensitive individuals especially when swallowed.
Food: This beetle is a voracious feeder and will feed on a wide variety of items including: seeds, dead animals, cereals, corn, corn meal, nut meats, dried vegetables and plant material and fish meal.
Life Cycle: The life cycle from egg to adult can be completed in 43 days, but they can stay in diapause (hibernation) for up to two years.
Trap Use and Placement: The male Warehouse Beetle is extremely attracted to the pheromone Bullet Lures. No Survivor traps are hung in areas where botanicals are stored. Traps can be hung along a wall or placed on shelves or within drawers where herbarium storage takes place.

Other Features of Dermestids

- Cast skins (loose, hairy, thin)
- Fine frass (minute round balls)
- Damage to feathers, furs, hair, silk, wool, felt, satin, Insect collections, hides and parchment or vellum (hide beetle)
- Feed on materials made or stored with grains such as corn or wheat



Dermestid Cast Skin Features

- Varied Carpet beetle
 - short skins with brush like hairs at end
- Black Carpet beetle
 - long skins with long straight or curly hairs at end
- Warehouse beetles
 - medium length skins with short tufts and long curly hairs



7.

Cigarette & Drugstore Beetles

Lasioderma serricorne

Stegobium paniceum

Saw-toothed antennae



Last three segments of antennae elongated

Deep pitted lines on wings

- **CIGARETTE BEETLE (*Lasioderma serricorne*)**
- This destructive insect is a serious pest of dried plant material. It can also cause serious damage to books. The Cigarette beetle is a small brown beetle measuring 2-3 mm in length. The Cigarette beetle is closely related to the Drugstore beetle which can cause difficulty in identification. However, with some training they can be distinguished easily. The Cigarette beetle has wings covered in small hairs whereas the Drugstore beetle's wings have rows of punctations.

Food: This beetle feeds on a great diversity of edible and non edible products. They may infest stored food products such as spices, rice, dry pet foods, as well as seeds, pharmaceuticals, and books among many other materials. It is especially important as a pest of tobacco products.

Life Cycle: Females lay the eggs in the larval food and hatch in 6 to 10 days. The larval period lasts 5 to 10 weeks. The pupal period lasts 2 to 3 weeks. The entire life cycle takes about 10 to 12 weeks. Adults live up to a month.

Trap Use and Placement: There are three trap designs available for this beetle. No Survivor traps are hung in areas where foods are stored, while the Serrico trap and Tobacco Beetle Trap can be hung along a wall or placed on shelves with stored food or on the floor in these areas. These traps should be protected from sunlight and wind during use.

- **DRUGSTORE BEETLE (*Stegobium paniceum*)**

• **Food:** This insect is also a common pest of dried plant matter. It can cause serious damage to books and preserved plant material.

Life Cycle: Females lay the eggs one-by-one in the larval food source. The larval period lasts from four to five months. The cocoon lasts 12 to 18 days. The complete life cycle takes about seven months.

Trap use and Placement: This trap is currently unavailable. Check with Insects Limited for future availability.

Other Identifying Features of Cigarette Beetle or Drugstore Beetle

- Exit holes from materials such as horn, antler, cigars, papier-mâché, freeze dried animal specimens (looks like powderpost damage)
- Feed on herbarium materials (leaves, stem and seeds)



Photo Insects Limited

Drugstore Beetle Damage on an Animal Mount

8.

Silverfish and Firebrats

Lepisma saccharina & *Thermobia domestica*

Long antennae

three tail filaments

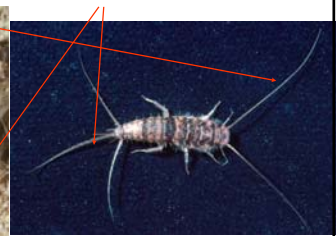


Photo Dr. Michael Rust

Silvery (Silverfish)

or mottled in color (Firebrat)

Silverfish & Firebrats

- Silverfish and their close relatives Firebrats are characterized by three long tail-like appendages arising from the tip of the abdomen. They have chewing mouthparts, long antennae and the body is almost always covered with scales. When viewed from the top, silverfish have a carrot-shaped outline. They are usually a steel gray or metallic silver color and are about 1/2 - 3/4 inch (12 - 18 mm) in length. They prefer warm, damp, dark undisturbed areas.

Food: These insects may roam some distance in search of food. They consume both carbohydrates and proteins. Silverfish are pests of paper and paper products as well as textiles. They are particularly fond of paper with a glaze on it. The glaze is usually a starch compound which they prefer. They will also eat the glue backing in wallpaper. They prefer textiles that are cotton or artificial silk. They generally will not attack woolsens or true silk.

Life Cycle: Females adults lay one to two eggs a day. They can live up to 3 and a half years passing through an unknown number of molts.

Trap Use and Placement: A simple sticky (blunder) trap is currently the best means to monitor for silverfish and firebrats. The trap should be a flat design (Rather than a tray design) to allow for easy entry into the trap. If silverfish damage is suspected, place an index card covered in flour paste in that area. If they are present, feeding marks on the card will reveal their presence.

Other Identifying Features of Silverfish and Firebrats

- Damage to silk, satin, paper and glued materials with high starch content
- Irregular holes or tracks in thin fabric or paper products



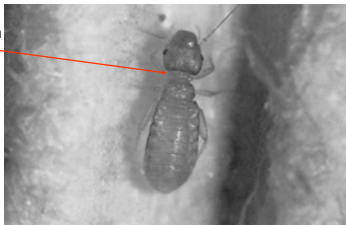
Example of Silverfish Damage

9.

Psocids or Booklouse

Psocoptera

Constriction at thorax



Less than 1/8 inch in length

Booklice

- Psocids or Booklice have long, filamentous antennae and a characteristic bulging clypeus (the area just above the mouthparts). They have chewing mouthparts and the wings of domestic species are usually absent. They range in size from 1/25 to 1/13 of an inch (1 to 2 mm) in length. Coloration is from almost colorless to gray or light brown.

Food: Psocids feed upon microscopic molds. Thus, any manufactured material of plant origin that would support the growth of these molds is susceptible to their attack. They are found in nature on the bark of trees and shrubs, preferring damp, warm, undisturbed environments. In museum settings, they can commonly be found in books and book bindings, storage boxes, paper goods and herbaria collections.

Life Cycle: Psocids undergo simple metamorphosis to develop to maturity. Eggs will hatch 21 days after being laid. This nymph will reach sexual maturity in 24 to 85 days. Females lay anywhere from 20 - 50 eggs depending on the time of year. Their total life span is from 24 to 110 days.

Trap Use and Placement: A simple sticky (blunder) trap is currently the best means to monitor for psocids. The trap should be a flat design (Rather than a tray design) to allow for easy entry into the trap. Due to size of this pest, close examination of the sticky trap is required to accurately check for their presence.

10.

Powderpost Beetle

Anobiium punctatum – Wood Boring Pest

Small ridge on thorax



Frass of Powderpost Beetles

- Anobiidae - Powderpost beetles
 - loose frass in galleries
 - smooth to gritty (like a fine sand)
- Lyctidae - True powderpost beetles
 - loose frass in galleries
 - very smooth (like flour)
- Bostrichidae - False powderpost beetles
 - tightly packed coarse frass in galleries



Example of Powderpost Beetle Damage



Example of Lyctid Beetle Damage

11.

Cockroaches

Blattella germanica

Periplaneta americana

Two black bars on shield



1/2 inch in length

Light shading on shield



1.5 inches in length

German Cockroach

- The German cockroach is 5/8 inches in length and is brown in color. There are two prominent black stripes running down the broad shield behind the head.
- **Food:** This nasty little guy will eat almost anything - even hair and fingernails. This insect is common in areas with access to food and water (i.e. break room/bathroom).
- **Life cycle:** The life cycle from egg to adult takes about a month, and populations can become huge if not kept under control. A new pheromone trap has recently become available for this pest.

Trap use and placement: These traps should be placed in areas where cockroaches are likely to be encountered concentrating on the kitchen and bathroom. The traps work best when placed along the edges of the floor and in corners. They also should be placed in the cabinet under the sink.

Other Features of Cockroaches

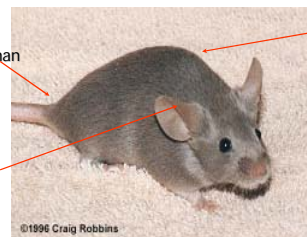
- Cast skins or egg cases
- Fecal spots on wood or paper
- Droppings (resembles sand)
- Odor
- Usually always near a moisture and food source, including paper products

12.

House Mouse

Mus musculus

Tail as long or longer than body



Dark brown to grey body color, light grey underneath

Large ears

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Other Identifying Features of Mice

- Droppings
3-6mm long, pointed on both ends, firm
- Nesting with paper and textiles
- Gnawing or chewed marks
- Urine stains
- Mousy smell



Mouse and Rat Droppings



Example of rodent gnawing damage

Prevention Program for All Pests

- Identify materials at risk
- Monitor with pheromones and traps
- Store in environments hostile to pests
(but acceptable to artifacts)
 - temperatures below reproductive range (65°F)
 - humidity below or above pest optimum
 - provide air circulation and light when possible
- Clean all incoming materials
- Pest proof storage (microclimates?)

- Vacuum for cleaning up textile material, hair, lint, food crumbs, plant material from floors, shelves, cabinets, drawers
- Prevent migration of pests from outdoors through structural pest proofing
- Create landscapes outdoors that do not attract carpet beetles, silverfish, psocids, mice etc.



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