

IPM for Silverfish, Firebrats, and Booklice in Schools

INTRODUCTION

Silverfish, firebrats, and booklice are discussed together here because they occur in the same or similar habitats. They prefer dark, moist environments with a supply of starchy foods or molds. Although they are all found in similar environments, silverfish and firebrats are not closely related to booklice. These nuisance pests can feed on wallpaper pastes, natural textiles, books, and manuscripts. They also feed on molds growing on various surfaces.

Silverfish, firebrats, and booklice can live both indoors and outdoors. They are frequently introduced into a building with boxes of materials that have been stored in damp basements or attics, but they also can wander in from the outside. Silverfish and firebrats are fast-moving and can travel throughout buildings. Once these insects find a good source of food, however, they stay close to it. In general, they cause little damage, but may cause people to take radical action based on their fear of insects.

SILVERFISH AND FIREBRATS

Identification and Biology

Silverfish and firebrats belong to an insect order called Thysanura. Insects in this order characteristically have three long, tail-like appendages about as long as the body. These insects are wingless, with chewing mouth parts, long antennae, and a body covered with scales. The mouthparts of silverfish and firebrats are used for biting off small particles or for scraping at surfaces. The most common species inhabiting buildings are in the genera *Lepisma* (silverfish) and *Thermobia* (firebrat). The silverfish (*Lepisma saccharina*) is about $\frac{1}{2}$ inch long when fully grown and covered with silvery scales. It is grayish to greenish in color and its body has a flattened-carrot shape. The firebrat (*Thermobia domestica*) has a mottled appearance with patches of white and black, and is shaped like the silverfish.

Silverfish and firebrats eat material high in protein, sugar, or starch, including cereals, moist wheat flour, starch in book bindings, sizing in paper, and paper under which there is glue or paste. These insects often attack wallpaper, eating irregular holes through the paper to get

at the paste. Silverfish may bite very small holes in various fabrics, including cotton, linen (they can digest cellulose to some extent), and silk. Firebrats will feed extensively on rayon, whereas silverfish usually damage it only slightly.

Characteristics of the silverfish:

- lays eggs in any season, usually in secluded places
- has a 3- to 4-month life cycle from egg to adult
- prefers moist areas (75 to 97 percent humidity) and moderate temperatures (70° to 80°F)
- is active at night or in dark places, and is rarely seen unless disturbed during cleaning
- may be found throughout the building—sometimes in boxes and books, or in glass utensils and sinks they have fallen into
- leaves yellowish stains on fabric
- outdoors, lives in nests of insects, birds (especially pigeons), and mammals, and under the bark of trees

Characteristics of the firebrat:

- lays eggs in cracks and crevices
- has a 2- to 4-month life cycle from egg to adult
- prefers moist areas with temperatures above 90°F
- is active at night or in dark places
- found where heat and starches are present (for example, in bakeries); also found in furnace rooms, steam pipe tunnels, and partition walls of water heater rooms

BOOKLICE (PSOCIDS)

The most common booklouse (*Liposcelis* spp.) is a small, grayish, soft-bodied insect with chewing mouthparts and long antennae. It is flat and superficially resembles the shape of the head louse. The common house-dwelling booklouse is wingless. The size of an adult is approximately $\frac{1}{25}$ to $\frac{1}{12}$ inch. Because they feed chiefly on mold, booklice cause little direct damage to plants and wood. They are commonly found in confined areas like the bindings of books, where they eat the starch sizing in the bindings and along the edges of pages.

Most of the information in this chapter was modified from:

Powell, T.E. *IPM for Silverfish, Firebrats, and Booklice in Schools*. University of Florida School IPM Web site at <http://schoolipm.ifas.ufl.edu/tp12.htm>. May 1998.

Jacobs, S. B. *Booklice*. The Pennsylvania State University. Entomology-NP-2. 1998.

Jacobs, S. B. *Silverfish*. The Pennsylvania State University. Entomology-SP-3. 1998.

Characteristics of the booklouse:

- has a life cycle from egg to adult lasting about 110 days
- prefers warm, moist conditions that are conducive to the growth of mold and mildew and require humidity of at least 60 percent
- found in books and paper products
- sometimes found on houseplants, where they may be feeding on honeydew (a protein-rich substance excreted by plant-eating insects such as aphids), or more likely, on the sooty mold that grows on the honeydew

DETECTION

Silverfish are found in bookcases, on closet shelves, behind baseboards, and in wallpaper, window or door frames, wall voids, attics, and subfloor areas. They prefer bathrooms and kitchens because of the moisture. Firebrats will be found in similar but warmer areas. Both silverfish and firebrats molt as many as 50 times during their life, so the appearance of cast skins can be used to detect their presence. Booklice prefer damp and warm habitats, so they are most numerous during the spring and summer. New buildings are not immune to booklice infestation.

If you suspect that damage to books, carpets, curtains, or other materials is due to silverfish or firebrats, confirm your suspicions using the following test:

- Mix flour and water to the consistency of house paint.
- Coat one or more 3-by-5-inch index cards with the paste.
- Let the cards dry, and place them where you have spotted the damage.
- If silverfish or firebrats are in the vicinity, they will be attracted to the card and will feed on the paste. Characteristic feeding marks appear as minute scrapings in irregular patterns. In addition, the edge of the card may be notched.

If you see groups of small, whitish insects in damp areas, suspect booklice, particularly if mold is present or the area smells moldy. Remember that booklice are considerably smaller than silverfish, and lack the telltale three long bristles at their hind end.

Silverfish, firebrats, and booklice also can be detected by placing sticky cockroach traps in the area where damage is occurring. When the insects are caught, they should be preserved in alcohol for professional identification.

MANAGEMENT OPTIONS

Physical Control

Dehumidifying

Booklice, silverfish, and firebrats are living indicators of excessive moisture. If the moisture is not eliminated, it may bring more serious problems, such as termites, carpenter ants, and wood rot.

Dehumidifying reduces the moisture content of the air. Some methods for dehumidifying an area include:

- Mending leaking pipes.
- Ventilating closed rooms and attics.
- Eliminating standing water.
- Using a dehumidifier.
- Replacing any single-glazed windows that repeatedly accumulate condensation with double-glazed windows.
- Using anhydrous calcium carbonate or silica gel to absorb free moisture. Do not use these agents in areas open to children.

Drying Stored Articles

Periodic airing and drying of articles stored in damp areas may help reduce the mold on which booklice feed.

Disposing of moldy articles is often the simplest way of removing an infestation in an area.

Chemical Control

If nonchemical methods alone do not solve the problem, then integrating a pesticide into your management program may be warranted. Pesticides must be used in accordance with their EPA-approved label directions. Some insecticides are registered for managing silverfish and firebrats and/or booklice indoors, whereas others are registered for outdoor use only. **Pennsylvania law allows pesticide applications in schools only by certified applicators, registered technicians, or by noncertified applicators or nonregistered technicians under the direct supervision of a certified applicator. The law also mandates a 7-hour reentry period for common access areas whenever pesticides are applied.**

Diatomaceous earth, borate-based insecticidal dust products, and silica aerogel can be used to kill these insects. Diatomaceous earth and borate-based products must be kept dry to be most effective.

Dusts should be applied only in cracks and crevices, crawl spaces, and other areas that are relatively inaccessible to humans and pets. Wear a dust mask or professional-quality respirator to provide proper lung protection when applying any dust.

Some baits for ants, crickets, and roaches are also labeled for silverfish and may be useful in some situations.

Residual sprays are labeled for silverfish and firebrats and can be applied where the pests are most commonly seen.

Products commonly found in schools, such as bleach, ammonia, and salt, can be mixed with water and used to kill molds on surfaces where booklice feed.