
SILVERFISH AND FIREBRATS

Integrated Pest Management In and Around the Home

If items on your bookshelf have chewed-on pages and bindings, suspect the look-alike household pests silverfish and firebrats. Both insects have enzymes in their gut that digest cellulose, and they choose bookcases, closets, and places where books, clothing, starch, or dry foods are available.

Silverfish and firebrats are nocturnal and hide during the day. If the object they are hiding beneath is moved, they will dart toward another secluded place. They come out at night to seek food and water. Both insects prefer dry food such as cereals, flour, pasta, and pet food; paper with glue or paste; sizing in paper including wallpaper; book bindings; and starch in clothing. Household dust and debris, dead insects, and certain fungi also are important sources of food. However, they can live for several months without nourishment.

Large numbers of these insects can invade new homes from surrounding wild areas, especially as these areas dry out during the summer. They also can come in on lumber, wallboard, and similar products. Freshly laid concrete and green lumber supply humidity, while wallpaper paste provides food.

IDENTIFICATION

The common silverfish, *Lepisma saccharina*, is shiny, silver or pearl gray, and about $\frac{1}{2}$ inch long, although it can grow as long as $\frac{3}{4}$ inch. The common firebrat, *Thermobia domestica*, is shiny, a mottled gray or brown, and about $\frac{1}{2}$ inch long. Adults of both species are slender, wingless, soft-bodied insects with 2 long, slender antennae (Fig. 1). Their bodies taper gradually from front to rear to 3 long, thin, taillike appendages.

Although small nymphs (those that are less than $\frac{1}{8}$ inch long) lack scales, both large nymphs and adults have them. If you see scales around or beneath damaged items, it is a good indication that these pests are the culprits. The scales are delicate, dustlike, and slightly incandescent in the light, and they stick to most surfaces.

LIFE CYCLE

Eggs of both species are about $\frac{1}{25}$ of an inch long. The females lay the eggs in crevices, on cloth, or buried in food or dust. The average clutch contains 50 eggs, but this can vary from 1 to 200. Firebrat eggs hatch in about 14 days and silverfish eggs in about 19 to 32 days. In colder environments eggs can remain dormant for up to 6 weeks, hatching as soon as the temperature rises.

Newly hatched nymphs are about $\frac{1}{16}$ of an inch long, plump, white, and have no scales. They acquire their scales about 12 days after their fourth molt; at that point the firebrat and silverfish look like smaller versions of the adults and gradually grow in size until they reach maturity (Fig. 2). Unlike other insects, firebrats and silverfish molt continuously throughout their life, passing through 45 to 60 instars or development stages. Firebrats live about 2 years and silverfish about 3 years.

When the temperature is below 50°F, firebrats can take as long as 300 days and silverfish as long as 500 days to develop into adults. When it is above 75°F, it can take firebrats as few as 40 days and silverfish as little as 60 days to develop into adults.

Adults have an interesting courtship in which males attract females with a mating dance that includes antennae



Figure 1. Adult firebrat (left) and silverfish.



Figure 2. Firebrat adult (left) and nymphal instars, or development stages.

contact and head wagging, after which the male deposits a protected capsule containing sperm for the female to pick up. To keep the capsule from drying out, males often will lay it on a moist surface, so it is common to see adult insects clustered around damp areas when mating. Firebrats and silverfish tend to crowd together in a central hiding place during the day to rest, and it is here where the females often lay their eggs. Both sexes produce pheromones, or chemicals, that initiate these aggregations, and when these insects crowd together, it helps regulate the temperature and humidity around the eggs and young nymphs.

Silverfish live and develop in damp, warm places, preferring areas such as laundry rooms that are 71° to 90°F. At higher temperatures, the relative humid-

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ity must be above 75%. As their common names implies, firebrats thrive best in very warm, dry places with a relative humidity as low as 30% and temperatures above 90°F, with the optimum being 98° to 102°F. However, they can survive at temperatures ranging from freezing to well above 100°F. You can find them around ovens, heating units, fireplaces, hot water pipes, attics during the summer, and the furnace during winter. In apartments and homes, this insect crawls along pipelines and through openings in walls or floors from one level to another. Sometimes you'll see these pests in your bathtub or sink. Even though they can't crawl up through the drain, if they fall in they can't climb up the slippery sides to escape.

DAMAGE

Firebrats and silverfish have very weak mandibles, or jaws, which causes them to scrape, instead of bite, the surface of paper (Fig. 3). Page discoloration often occurs because of the fungi associated with their feeding damage. On paper and fabrics feeding usually begins in one area and spreads as unconnected, irregularly shaped holes.

MANAGEMENT

Since firebrats and silverfish are nocturnal, you usually won't see them. To detect and monitor infestations, use cockroach sticky traps. You also can use small, glass jars covered on the outside with masking tape. The insects climb up the tape, fall into the jars, and can't climb back up the slick sides. Place these traps or jars in corners and along edges where foraging is likely. Because these insects can travel long distances while looking for food, it can be difficult to pinpoint the infestation source.

To prevent silverfish and firebrat infestations, keep basements, laundry rooms, and bathrooms—especially shower stalls—clean and dry. Household dust and debris are important sources of food, so routine cleaning will help provide effective control. In addition, periodically clean out closets, cabinets, and storage containers. Patch holes or spaces around pipes and conduits, and

repair leaks and drips in plumbing. Silverfish require a lot of moisture, so using dehumidifiers in closed spaces can help discourage these pests. Ventilation from fans can reduce relative humidity to a point that is intolerable to silverfish. Because collections of magazines, papers, and books provide food and harborage, occasionally move these items around in your bookcase. Keep food in containers with tight lids, especially dry, processed items.

Chemical Control

Hundreds of commercially available insecticides list firebrats and silverfish on their labels. However, most of these products haven't been adequately tested. Insecticides aren't required to control light infestations or an occasional insect; these can be managed by reducing water sources and through physical control. Reserve chemical use for large infestations. Insecticides won't be effective unless you also remove the moisture, food, and hiding places that allow these pests to thrive.

If you have an infestation, household sprays containing synergized pyrethrin and pyrethroids such as bifenthrin, cyfluthrin, tetramethrin, and phenothrin should kill firebrats and silverfish on contact and provide some residual activity. Direct small amounts of these aerosol or liquid sprays into cracks and crevices in doors and window casings, along edges and intersections such as baseboards, in closets, bookcases, and places where pipes go through walls, and into voids and other suitable, dark hiding places. Because some sprays have oil-solution bases, don't apply them near electric motors, gas pilot flames, or other places where they can start fires. Follow label directions. Don't allow these materials to get into sinks, drains, water, or food.

A variety of commercial baits and dusts also are available. However, baits aren't very successful in treating silverfish and firebrats, because they tend not to feed on them. Similarly, several of the inorganic dusts containing boric acid are ineffective against firebrats. However, some inorganic dust products containing synergized pyrethrin



Figure 3. Firebrat damage to paper includes feeding (large, dark spots), grazing (gray areas and missing letters), discoloration due to fungi (dark brown spots), and scales and fecal debris (lighter brown spots).

(including certain boric acid or silica gel products) are very effective against firebrats and silverfish if you apply the product directly on pests. Labels limit use of some inorganic dust products in open areas. Be sure to check the label.

Apply dusts with a bulb duster, powder blower, or a plastic squeeze bottle to leave a fine layer of the material in the area you are treating. If the layer is too thick, the surface will be slippery. Apply into areas as described above for sprays, paying special attention to cracks, crevices, and wall voids that serve as congregation sites.

Inorganic dusts such as silica gel and pyrethrin (e.g. Drione) and diatomaceous earth (e.g. Perma-Guard) remain effective indefinitely in dry locations. If dust deposits get wet and then dry, they will cake, making them difficult for insects to pick up. You might need to periodically re-treat moist areas. Follow label directions. Foggers aren't recommended to treat silverfish and firebrat infestations.

A properly and thoroughly applied insecticide will show results in a few weeks. If control doesn't occur in 2 or 3 weeks, silverfish or firebrats probably are coming from untreated areas and secluded harborages. Seek out these areas for treatment, and eliminate water sources. It is almost impossible to control large populations of silverfish and firebrats unless you have removed dripping water and moist surfaces.

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To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

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WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original, labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Pesticides applied in your home and landscape can move and contaminate creeks, rivers, and oceans. Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down the sink or toilet. Either use the pesticide according to the label, or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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