THE SILVERFISH IN A NEW ROLE

RUTH E. SLABAUGH

University of Illinois, Urbana, Illinois

Silverfish—swiftly moving wingless insects of the order Thysanura, have been known for many years as pests of libraries and museums where they chew off labels, bindings and sheet edges. The invention in recent years of the synthetic fabric, rayon, has given these insects a new food item. Manufacturers and finishers of rayon cloth have become interested in an investigation of damage by silverfish because of the increasingly many reports of damage. Although most of the damage occurs in homes, the housewife usually complains to the retail store manager, and he in turn often refers the case to the manufacturer since the holes and roughened spots resemble manufacturing defects.

There are two species of silverfish that may be found in the household. The firebrat, *Thermobia domestica*, flourishes in a temperature as high as 100° F., while the true silverfish, *Lepisma saccharina*, prefers a much cooler habitat. Both species demand a high relative humidity or access to moisture. Thus, it is common to find *Thermobia domestica* in bakeries and *Lepisma saccharina* in greenhouses. The firebrat seems to be better adapted to home conditions and is the species most often found there.

During an investigation by the author on the relationship of the silverfish, *Thermobia domestica* to rayon injury, reports of damage were received from cities throughout the United States. No doubt injury occurs whenever the insects become so numerous that they spread over an entire house. The situation in the towns of Champaign and Urbana, Illinois is probably typical of many localities. *Thermobia domestica* was very numerous in these towns during the summer of 1937. Houses were found to be swarming with this insect. Where individuals were so plentiful, they had not confined themselves to cupboards, closets, drawers, the attic and basement where they are usually found, but had spread into the living rooms and had attacked such rayon articles as curtains, knit underwear and dresses.

Damage to rayon fabrics is easy to detect if examined microscopically. Even with the naked eye it is not difficult to identify. It consists of scraped areas or actual holes. The outline of the holes is irregular and jagged. Under the microscope the ends of the fibers cut off by the firebrat have a swollen, jagged appearance, which is quite different from ordinary cut ends. Clinging to the fibers and visible to the eye as minute silvery specks are numerous scales. These scales are very easily detached from the body of the silverfish and are scattered over the area on which the insect feeds. The powdery-like excrement also clings closely to the fabric and may serve for identification. However, if the damaged article is roughly handled or cleaned, the scales and excrement are shaken off and identification must be made by the appearance of the damage and the cut fibers.

It has been a question whether the silverfish eats rayon for the fiber itself or for the finishing agents used upon it. *Thermobia domestica* will readily eat pure viscose and cuprammonium rayon, exclusive of any finish. An examination of the excrement of insects fed upon these yarns shows that the silverfish can digest these particular kinds of rayon. However, there must be some necessary food element lacking since the insects die off if fed for a long period on rayon alone. An examination of the digestive tract did not reveal any protozoan symbionts, such as are present in cellulose-eating termites.

The firebrat has two sources of food in rayon articles for not only is the rayon attractive, but some of the finishing agents are very eagerly sought. Certain finishing agents used upon rayon are much more attractive to the firebrat than others. These insects have long been known to be fond of starch, as evidenced by their frequency in bakeries, and their attacks on starched clothing. Thus, any rayon fabric containing an appreciable amount of starch would be a source of food. Gums of various sorts are very commonly used on rayons and were found to be attractive to silverfish. The lighter vegetable and mineral oils, gelatine and glycerine are eaten. The

rayon fabrics containing sulfonated compounds were not very attractive since either the sulphur or the fatty matter is disagreeable to the insects. Experiment showed that the degree of attractiveness is inversely proportional to the amount of fatty material contained. Spencer (1924) found that sulfonated paper was not attractive to *Thermobia domestica.*

Since silverfish are easily and cheaply destroyed it would seem that the easiest way to prevent their attacks on rayon would be to destroy them before they increase to injurious numbers. However, since they are nocturnal insects and often cause damage before their presence is suspected, it may be feasible to attempt to render rayon immune to silverfish attacks as wool is now being proofed against clothes moths and carpet beetles.

REFERENCES

Spencer, George J. 1924. Life history and control measures of the silverfish *Thermobia domestica* Pack. Unpublished thesis. University of Illinois.

Slabaugh, Ruth E. 1934. The relationship of the silverfish, *Thermobia domestica,* to injury to rayon. Unpublished thesis. University of Illinois.