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The book moth (Thysanura: Lepismatidae).

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The book moth belongs to the Order Thysanura and the Family Lepismatidae. The Lepismatidae family is a family of primitive wingless insects with around 190 described species. This family contains the two most familiar members of the Zygentoma order: the silverfish and the firebrat. It is one of the five families of the Zygentoma order. Insects in the order Thysanura do not have wings. Its elongated, flat body, with antennae at the ends, resembles that of a small cockroach. The difference is in the grayness. For this reason, these specimens are also called silverfish (Figure 1) [1-12].

Figure 1. *Thermobia domestica* (Packard, 1837). Sources: Foto 171150944, (c) James Bailey, and https://www.biodiversity4all.org/photos/171150944.

They do not have wings, they are flat, with a slightly rounded back and a very elongated body. At the end of the body, they have three antennas that are longer than the body itself. Moths have 4 stages of development: larva, pupa with cocoon, pupa without cocoon and adult. The moth can increase throughout the year. However, its cycle is accelerated in the warmer periods of spring and summer. Book moths have nocturnal habits. Other species are cosmopolitan (they spread across most of the globe) and live inside human homes, hiding during the day behind books, pictures, and cracks, avoiding direct contact with light. In this case, they will feed on whatever they find, such as glue from books, wallpaper and anything that contains starch. They have legs adapted for running and, if they lose a leg, regeneration soon takes place (Figure 2) [1-12].

Figure 2. *Thermobia domestica* (Packard, 1837) Pest books and newspapers. Lepismatidae Paper-feeding insects – silverfish.

Source: https://www.istockphoto.com/es/foto/thermobia-domestica-libros-de-plagas-y-peri%C3%B3dicos-lepismatidae-insectos-que-se-gm1170355096-323828567.

Female bookworms lay 1 to 3 eggs per day in cracks or under objects, with abiotic potential of 1,500 to 3,500 individuals. The eggs, to develop, require 22 to 32°C and RH% of 50 to 75 %. They range in size from 1 to 15 mm, being smooth white and turning beige and rough towards hatching. At 32°C the larval period is 19 days and can last up to 43 days at 22°C. The nymphs already have external genital appendages and carry out numerous ecdyses during their lives at least four molts and can even regenerate limbs such as legs that have been lost. It is not known for sure when they enter the stage. The average life cycle (egg-adult) is 90 to 120 days at 27°C and adult longevity can reach 3.5 years at 27°C, two years at 29°C and 15 years at 32°C (Figure 3) [1-12].

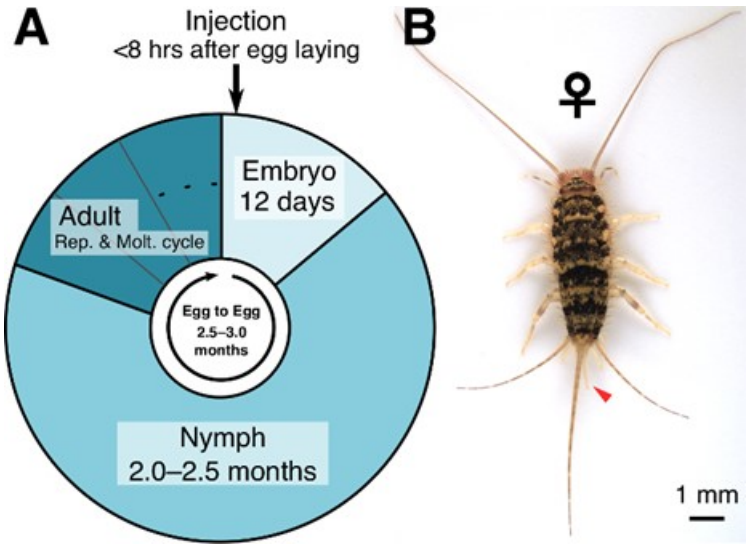

Figure 3. Egg microinjection and efficient mating for genome editing in *Thermobia domestica* firebrat.
Source: https://pubmed.ncbi.nlm.nih.gov/33165318/.

Book moths avidly feed on almost anything rich in protein, wheat flour, paper, and books, causing extensive damage to warehouses, homes, and libraries. They destroy cotton curtains and fabrics but reject artificial silk and wool. They run fast, like cockroaches. They depend on the humidity of the location, which means that the more humid and darker the environment, the more common the infestation is. The best way to avoid moth infestations is to keep the environment clean and ventilated, as they like humid environments. Recommended for monitoring and controlling moths of the Zygentoma order, popularly known as bookworms or silverfish. The silverfish moth trap is made up of a cardboard structure, covered with high-adhesion glue and food attractants [1-12].

Lepisma saccharina Linnaeus, 1758.

Size: 0.85 to 1.3 cm. Longevity: up to 4 years. Gray color. Laying: they can lay 1,000 to 3,500 eggs during their lifetime, depositing two to three eggs per day. The male and female run excitedly throughout the process, which consists of the deposition of a spermatophore by the male. Then, the fertilizer capsule is collected by the female. Food: carbohydrates such as sugars and starch, paper, book cover glue, hair, dandruff, dirt, cotton, linen, silk, artificial fibers, and even dead insects. In times of famine, they can spoil leather items and artificial fiber fabrics. They can go without eating for several months. Communicable diseases and transmitted pathogens: do not cause any type of disease and do not bite [1-12].

Preventive measures: Avoid the accumulation of old papers; Keep books and magazines in suitable and clean places; Avoid moisture points; Prevent the entry of objects in cardboard boxes from infested locations; Keep baseboards and crevices clean using a vacuum cleaner; Periodically inspect clothing, carpets, and other susceptible objects; Frequently remove dust from furniture, pictures, curtains, and carpets; Seal cracks and grooves in the structure, where these insects can shelter. The moth is found mainly in houses, and rarely in nature. It can live in a variety of places, including kitchens, bathrooms, basements, and attics [1-12].

Thermobia domestica (Packard, 1837).

Each female lays around 100 millimeter-sized eggs in cracks. They are white, smooth, oval. They take a month to hatch and require a humid environment. From the egg comes the nymph which grows, and undergoes several molts, at least six, until it reaches the adult stage, which takes approximately 3 months. They can live up to 4 years. In terms of their development, young forms are like adults, except for being smaller. They develop directly without undergoing metamorphosis. In the Brazilian climate, development is completed in approximately one year [1-12].

Its length is 12 to 13 mm. It does not have a metallic appearance, being characterized by the presence of dark spots on the abdomen. They are less dependent on RH%. The female oviposits 1 to 3 eggs (0.8 to 1 mm) in cracks and crevices, with an average of 50 per clutch. The most favorable environmental conditions for its development are 32 to 41°C and 76 to 85% RH%. The period of development from egg to adult of this bookworm is on average 2 to 4 months under the conditions described above. Adults live from 1 to 2.5 years and can undergo up to 60 ecdyses, highlighting that this development model is quite rare and attributed to its primitive conditions [1-12].

Hotter and more humid places than those preferred by bookworms, with temperature being the most critical point for their development, requiring at least 32°C. In homes, bookworms are found in “boilers”; They can also be common in bakeries, kitchens, and factories where steam is used. They are commonly observed in steam ducts where there is metallic protection and fiberglass inside, characterizing an environment very favorable to their development. They feed on trash, crumbs, silk, rayon, and viscose [1-12].

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