

Major pests in historic buildings: moths, silverfish and booklice

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Many insects and various animals such as termites, wood boring beetles, silverfishes, rats, bats, birds, spiders and others, live in intimate contact with the man, associated with the cities, invading and colonizing inhabited places, damaging buildings, transmitting diseases to other animals and to human beings themselves. These synanthropic animals (animals that live with humans) can often be considered urban pests because of their high adaptability, reproductive capacity and the amount of food and shelter found in urbanized areas, causing great inconvenience and discomfort at all social levels. The four elements, water, shelter, food and access generated by environmental imbalance (garbage, poor sanitation, inadequate water treatment, etc.) inherent to human culture itself, which allows many pests to enjoy the unconscious hospitality of the towns, making the day-to-day life of its inhabitants difficult.

Moths (clothes moths, grain and stored products moths) **and Silverfishes**

Many insects, known to us as "moths," are considered important pests in urban areas infesting clothes, papers, carpets, upholstery, books, dried fruit, grain or other stored foods and many other products, manufactured or not. In urban areas, we can identify two distinct groups of moths, gathered in one order: clothes moths and stored product moths, both belonging to the Order Lepidoptera (moths and butterflies). It is also known a plethora of pest moths in agricultural crops, attacking vegetables and fruit,

causing huge losses to agriculture. There are also species of moths that feed on the wax of the honeycomb produced by bees, destroying them and causing great losses to apiarists.

a) Silverfish (Order Thysanura)

The Thysanura order (silverfish) are among the most primitive insects known to man. This small and cosmopolitan Order is represented, so far, for 370 species identified and divided into five families. They do not have wings, are small to medium (0.85 to 1.3 cm) size, their bodies are elongated, generally dorso-ventrally flattened, with two or three caudal filaments, being the chewing mouthparts.

They are omnivores, feeding on a host of products like flour, paper, book covers (cardboard), wallpaper, fabrics and clothes among others. Of nocturnal habits, they live mainly in dark and moist environments. They are very agile and quickly hide in cracks in furniture, cabinets, baseboards and boxes, the latter being the main vehicle for spreading the plague, carried along with books and household items when people move houses. Some moths have adapted well to urban environments and are considered important pests at home, such as species *Lepisma saccharina* L. They feed on all kinds of starchy substances such as starch of books, binders, papers, stickers, etc.. In homes, feed on clothing, linens and silks, and starches in general. In museums, libraries, textile mills, supermarkets, hotels and many other shops, the moths should be monitored closely, to avoid severe infestations and serious damage.

The Thysanura, in general, have no economic importance in the agricultural point of view. In the biological development of the Thysanura, the young stages are extremely similar to adults', differing only in size and sexual maturity (ametabolic).

Depending on the species, climate, food source, among many other factors, the eggs can hatch in about 10 to 60 days, growing the juveniles who go through seedlings in a row, taking on average 2 to 3 months until they reach adulthood, when the growth ceases. The adult silverfish can live for more than four years. Most of the species found in urban areas (residential, commercial, etc.) are silvery gray.

b) Clothes Moths (Order Lepidoptera)

Clothes moths are small moths of clothing belonging to the family Tineidae, of the Order Lepidoptera, gender *Tinea* being of the most economically importance in urban areas. Unlike book moths, clothes moths have a biological development called complete metamorphosis, i.e., the eggs hatch the larvae (immature phase) completely distinct from the adult phase (moth). In some species, the caterpillars weave a flat small elliptical case for their protection. Inside this protective shell, the caterpillar develops feeding avidly from a multitude of materials such as carpets, woolen garments, fabrics, upholstery, among many others.

They are easily identifiable when viewed scrolling through the walls or cabinets housing. The caterpillar, after some time, turns into pupa and then in a butterfly, winged adult stage and with reproductive capacity.

c) Grain and Stored Products Moths (Order Lepidoptera)

There are many pests found in grains such as corn, wheat and rice and various stored products such as fruits and dried mushrooms, flour products, breakfast cereals, biscuits, chocolates and more. The main genera found infesting grain and stored products are

Plodia, *Cadra* and *Ephestia*. The moths have emerged as important pests because they develop in foods, destroying them and contaminating them with their feces, body fragments (scales, wings, legs and even dead insects) and characteristic silk threads. The caterpillars of many species of moths leave traces of their passage through food, through the secretion of silk threads, similar to "webs", which serve for better locomotion for food and protection when near pupation. Some time after pupation, the adult moth (male or female) emerges, performs the following cycle and mates, laying eggs, infecting new foods or reinfesting the substrate source. Small moths are pale, little showy, varying from species to species. The life cycle of moths in stored products is varied, depending on the infesting species, temperature, relative humidity, food, among many other factors. Usually the cycles are completed in relatively short time, ranging from a few weeks to few months.

Prevention and control and moth control

Prevention and control of moths, in general, depend on constant monitoring, getting an eye to the beginning of the infestation, always easiest to control. For books and clothes moths, people should avoid the accumulation of old papers, keep books and magazines in adequate and clean places, avoid points of moisture (especially in dark offices or sinks), prevent the entry of objects in cardboard boxes from infested sites, keep baseboards and cracks clean by using a vacuum cleaner, periodically inspect clothes, carpets and other objects likely to be infested, maintain shelves, cupboards and cabinets clean and airy. Attacked clothes may be placed in plastic bags and placed in freezer for a few days, killing eggs and mites (or bugs) weeds. Food contaminated or suspected of the attack of moths should be discarded. In very severe infestations, the use

of certain insecticides, applied by a professional pest controller, will certainly be the most viable option for control.

Psocoptera (Booklice or Psocids):

Popularly called Booklice or Psocids, the Psocoptera (Order Psocoptera) are very small insects, depending on the species are provided with wings, measuring 1-3 mm in length. Some species are yellowish or gray or brown. The head of these insects is relatively large. The mouthparts are the chewing type with serrated jaws in the inner edge. The antennae are filiform. Psocoptera eggs are laid singly or in groups, may or may not be covered by silk or rubbish. Most species goes through six stages of nymph. Some species are gregarious, living under a thin layer of silk, on tree trunks and in moist places. They feed from cereals, pollen, insect fragments and similar substances and especially from fungi present on the paper and walls, tiles, backgrounds cabinets, among others, undermining the entire surface where there is this kind of organism. In large numbers they can cause damage to documents and bindings producing small holes and irregular contour.