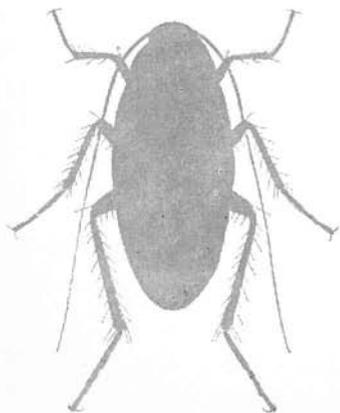
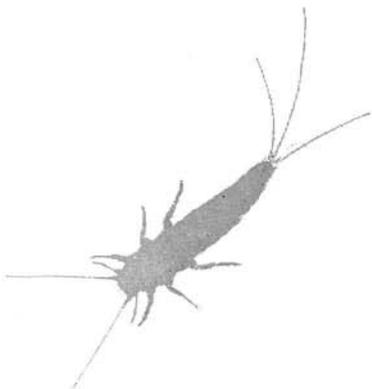


INSECTS in HOUSES

J. P. Johnson

Neely Turner



THE CONNECTICUT
AGRICULTURAL EXPERIMENT STATION

NEW HAVEN

Foreword

Station entomologists have investigated household insects for almost 60 years. More extensive work on biology and control of these insects was undertaken in 1931 by B. H. Walden and Neely Turner. The results of their studies, and information from notes of others in the Department of Entomology, provided material for Bulletin 400 in 1937, revised as Circular 171 in 1949.

The present Circular is a complete revision, bringing both control measures and the occurrence of the pests up to date. Notes and observations made by R. B. Friend and M. P. Zappe, both of whom have retired, and by John C. Schread and W. T. Brigham have been consulted in preparing the manuscript.

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INSECTS in HOUSES

J. P. Johnson and Neely Turner

Over the course of the centuries, insects have adapted to the ways of man and have found food and shelter in houses. The most modern structure, built to exclude water, heat, and cold, may serve as a suitable place for insects to live. The most spotless housekeeping will not prevent entry of insects nor eliminate them entirely. Furthermore, natural control or the "balance of nature" operates too slowly to be helpful. Even though most household insects have parasites and predators, few people are patient enough to let nature take its course.

The insects in houses are of four sorts: (1) Pests of man or his pets, (2) pests of stored food, (3) pests of fabric, paper, and wood, and (4) casual invaders.

This report has been prepared to enable home owners to identify the more common household insects and to give some information on methods of control. Pest control companies (sometimes called exterminators) operate throughout the state, and specialize in the control of pests. They have materials and methods of application which make their services useful and, in severe infestations, almost necessary. In most commercial establishments, such as restaurants, bakeries, food stores, hotels, and many apartment houses the services of pest control companies have been found more effective than do-it-yourself methods.

Insecticides and Methods of Application

Household insects have been controlled either by fumigation or by insecticides. For many years fumigation was the most effective control. The gases available require special handling, and some are dangerous unless used by an expert. Because fumigants must be used by expert operators, no details are given here.

Highly effective insecticides, applied without vacating and sealing the house, have now largely replaced the use of fumigants.

The requirements for household insecticides are hard to meet. There must be no hazard to the occupants of the building from poisonous materials, no fire hazard, and no damage to the house or its contents. Few materials meet all these requirements. Those mentioned in this publication have been investigated thoroughly, experiments have shown them to be effective, and they create no health hazard to the occupants. Directions for safe use of the materials are printed on the labels.

Sprays

The sprays used in controlling household insects may be of two types, (1) residual sprays, to kill mostly by leaving a residue toxic to insects, or (2) space sprays, which are designed especially to kill flying insects on contact.

Residual sprays may best be applied with a hand sprayer which produces comparatively coarse droplets, because these leave more residue. The materials are usually labelled for control of ants or roaches.

Space sprays to kill flying insects must be applied in much smaller droplets that stay suspended in the air long enough to reach the flying insects. They are usually labelled to control flies or mosquitoes. The most popular form of space spray is the aerosol bomb, in which gas propulsion replaces the labor of pumping a hand sprayer.

Most household sprays of both types are compounded by mixing the insecticide with a petroleum oil base, using a solvent if necessary. The oil vehicle is usually a highly refined light oil, with a flash point high enough to avoid hazard of explosion.

Dusts

For many years pyrethrum and sodium fluoride dusts were used to control roaches. They were replaced by sprays of chlordane which were more effective and left less visible residue. Recently roaches resistant to chlordane have been found in Connecticut. This has forced a return to the use of dusts and development of new materials.

Insecticides

DDT and chlordane are highly toxic to many household insects, and if used properly do no harm to people, cats, dogs, or birds. Both are toxic to fish, however, and aquaria should be covered with plastic film or newspapers during spraying and until the spray droplets all settle.

Pyrethrum is practically non-toxic to people and pets, and is only slightly toxic to fish. The formulations made for use in houses should be reasonably safe if aquaria are covered during spraying.

Rotenone is also of low toxicity to people and pets. It is very poisonous to fish and is not suitable for use around aquaria.

In ant baits the active ingredient may be either thallium sulfate or some form of arsenic. Both are poisonous to people but are used in very small quantities in the baits. The principal hazard in their use is the remote possibility that one might consume the contents of an entire package accidentally.

The control of household insects in the typical house by the methods suggested here should require a relatively small amount of insecticide. For instance, if a pint of roach spray does not eliminate the occasional roach in a kitchen, either the spray is not effective or roaches are coming from a place not sprayed. Thus the situation requires study rather than repeated spraying with the same material in the same places. If infestations persist or enlarge in spite of continued treatment, it would seem logical to call in a pest control operator.

Resistance

Many species of insects have "developed resistance" to many different kinds of insecticides. Thus houseflies in Connecticut, and in fact in most parts of the world, can no longer be killed by DDT. In houses, use of pyrethrum has solved this problem. There has been only one case of resistance of mosquitoes to DDT in Connecticut. Resistance of roaches to chlordane seems to be increasing.

To date the only practical solution to this problem of resistance has been development of an effective insecticide of a different type. Such alternate materials are available if needed. Thus Diazanone and malathion seem to be effective in controlling roaches resistant to chlordane.

Pests of Fabrics, Paper, or Wood

Clothes Moths and Carpet Beetles

Clothes moths and carpet beetles are serious pests of woolen fabrics, furs, piano felts, and feathers in pillows. The webbing clothes moth is the common species here. The small, buff-colored moths are about a fourth of an inch long. They prefer darkness but occasionally fly about in lighted rooms at night, avoiding bright lights. Live moths are frequently seen in infested clothing. They live only two or three weeks, and do not feed. Each female may deposit about 100 eggs on woolen clothing, nap of furniture upholstery, furs, or rugs. The eggs are white, very fragile, and not firmly attached.

The white larvae may hatch in from four days to four weeks, depending on the temperature. They start feeding immediately, and spin a thin tube of silk in which they stay. Fully grown larvae are about three-eighths of an inch long and white with dark heads. The cocoon is spun in or near infested fabrics. In heated buildings there may be two generations a year.

Clothes moths seldom attack clothing that is worn regularly. Most of

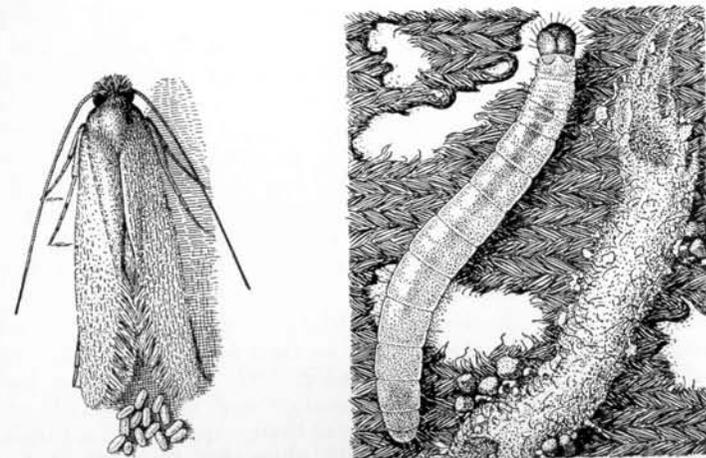


Figure 1. The webbing clothes moth and moth eggs. At right, larva of the webbing clothes moth and silken tube from which it has emerged. See text for information on the size of this and other insects.

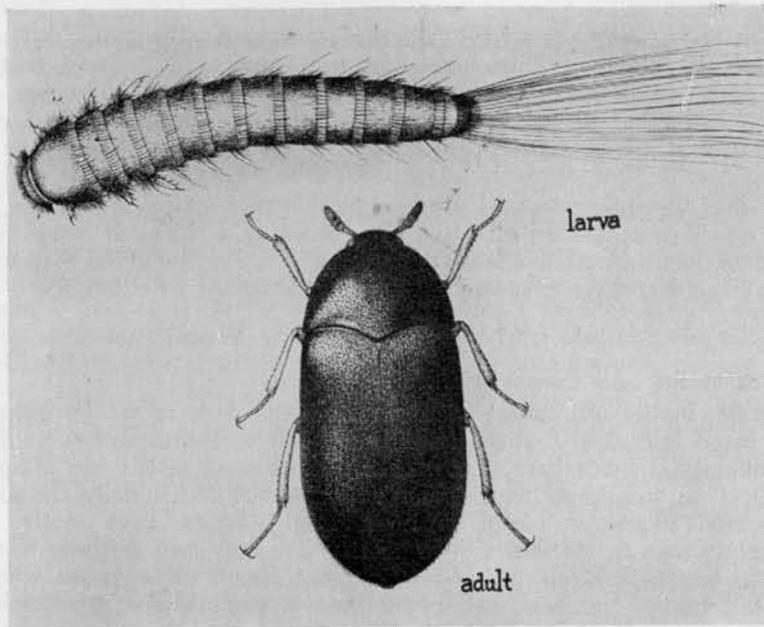


Figure 2. Larva and adult of the black carpet beetle.

the damage is done to stored clothing and particularly to soiled garments. Furthermore, serious infestations build up only over long periods of time without disturbance. A very serious infestation in a house was traced to an unused feather pillow.

Carpet beetles are as common as clothes moths in Connecticut. As the name implies, they were originally pests of wall-to-wall carpet. The larvae liked large cracks in the floor, and fed on the woolen pile of the carpet. Cleaning removed the cut pile, leaving a bare streak in the carpet.

For many years, wall-to-wall carpets in homes were out of style. The carpet beetles adapted very quickly to this change, breeding either in stored fabrics or in lint accumulated in cracks and behind baseboards. Infestations have flourished, particularly in apartments. For some unknown reason, the larvae migrate when they are partly grown, and at that time cause most of their damage to clothing. They usually eat only the projecting fibres unless the fabric is soiled. Tests show that milk spots are particularly chosen.

The most common species is the black carpet beetle. The adult is shiny black and less than a quarter of an inch long. The larvae are light brown, almost half an inch long, slender, with a conspicuous brush of hairs. The buffalo carpet beetle is smaller and marked with reddish, white, and yellow spots. The larva is less than a quarter of an inch long, brown with blackish bristles, and with characteristic tufts of terminal hairs.

Both clothes moths and carpet beetles breed in birds' nests, where they consume feathers. The moths may fly into houses, but the usual

source of infestation is an infested fabric brought into the house. The carpet beetle adults feed on the flowers of spirea shrubs, which are commonly used in ornamental plantings. They may crawl into houses through small cracks.

The larvae prefer soiled or dusty clothing as food. Therefore, it is advisable to keep all susceptible materials dry-cleaned or washed in order to prevent damage, and especially to clean them before storing them for any length of time. It is possible to keep clean woolens in an ordinary closet with little danger if the clothing is sunned and brushed at frequent intervals. The brushing crushes or removes the eggs and many of the larvae, and heat and light either kill or drive off the larvae. It is necessary to brush thoroughly all folds or pockets in which the larvae might hide.

The chief value of a well-made cedar chest is that it provides a tight receptacle in which to store uninfested clothing. The volatile oil of cedar will kill newly hatched larvae but does not always kill moths nor prevent damage by any older larvae introduced with the clothing. Cedar chests should be kept closed to prevent loss of the volatile oil. Cedar-lined closets, as ordinarily constructed and used, will not prevent damage.

Paper garment bags or cardboard closets with tight-fitting double doors will protect uninfested clothing as long as they are sealed tight. A pound of paradichlorobenzene in a cloth bag, hanging at the top of such containers should protect the clothing for several weeks.

Clothing stored in trunks and boxes may be fumigated by placing about one-half pound of paradichlorobenzene in the top of each container

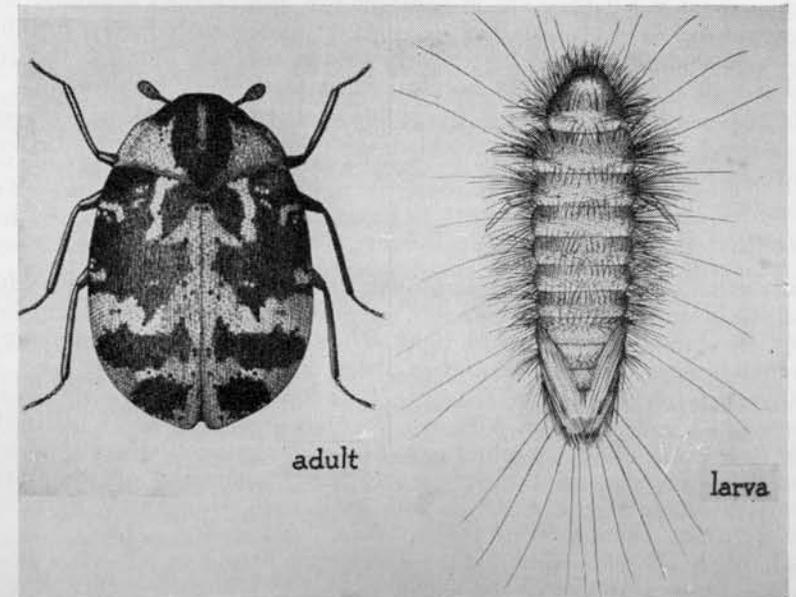


Figure 3. The buffalo carpet beetle.

or scattering it over the clothing. The fumigation will be more effective if the temperature is above 70° F. A new supply of paradichlorobenzene should be added every six months.

After such treatment any clothing worn next to the body should be aired before use since paradichlorobenzene is irritating to tender portions of the skin.

DDT sprays or aerosol bombs may be used to kill moths in flight. Usually, however, not enough moths are seen at any one time to justify such a practice. Use of such sprays in a closet full of clothing is also of doubtful value because the spray cannot penetrate the clothing. Spraying the cracks in a closet might be of some value in killing moths.

Residues of DDT on clothing will kill clothes moths but do not make the clothing "moth-proof." A light spraying using a 5 per cent DDT solution should protect the garments until they are cleaned again.

Moth-proofing compounds can be used on woollens most effectively during the course of manufacture. The better materials usually make the wool permanently moth-proof. It is much more difficult to apply these materials effectively in the home. Residue sprays of DDT and other similar materials cannot be classed as moth-proofing compounds.

Pianos. Piano felts may be protected by putting four ounces of paradichlorobenzene in a muslin bag inside the piano case and closing all openings. This is especially necessary in warm weather and the case should be kept closed as much as possible. Sprays should not be applied unless it is certain that they will not injure the piano parts.

Rugs and Carpets. Many woolen rugs and most hair rug pads are now moth-proofed during manufacture. If not, some care is necessary to prevent damage by clothes moths and carpet beetles. Such rugs are seldom damaged if they are in constant use and cleaned regularly with a vacuum cleaner. Infestation may occur underneath heavy furniture which is seldom moved. Particularly in the summer months, the rugs under such furniture should be cleaned at least every two weeks.

If rugs are stored, or if a house is left vacant for several months, each room-sized rug should be sprinkled with one pound of paradichlorobenzene, rolled, wrapped tightly with strong paper, and sealed.

Silverfish

Silverfish are small, wingless insects, silver gray and about one-third of an inch long, with three slender "tails." They prefer warm damp locations for breeding and avoid light. They are especially abundant in basements near the furnace and in attics during the summer.

Silverfish feed on starchy foods, such as flour dust, paste and paper in bindings of books, and on piles of discarded newspapers. An infestation may develop in highly starched curtains in storage, and when abundant, silverfish have damaged hanging curtains. In chewing off the starch silverfish frequently cut the fabric, and may damage rayon fabrics although they cannot digest the rayon.

Silverfish are seldom more than a nuisance except in materials stored in basements and attics. Occasionally in the renovation of a heavily infested house they do cause serious damage to new wallpaper, starting their work while the paste is still wet.

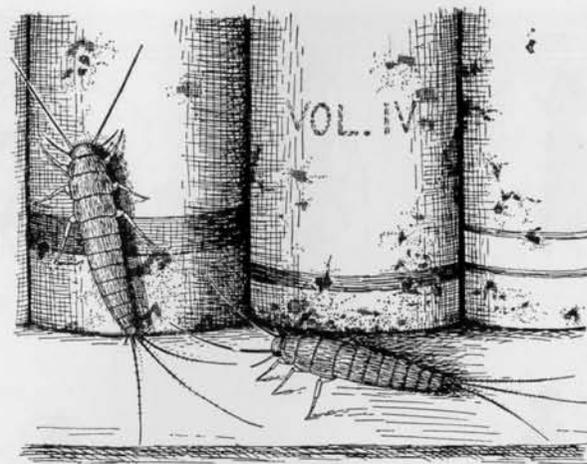


Figure 4. Silverfish feed on starch and cause serious damage to books.

DDT dusts or sprays are highly effective in killing silverfish. They should be applied to the areas where the silverfish are breeding. Thorough spraying of the floor and shelving under cartons or other stored materials is usually sufficient. If they start breeding in a library, spraying the empty shelves with DDT should give effective control.

Psocids

Psocids or booklice are very small, soft-bodied insects not over one-sixteenth of an inch long. They have occurred in large numbers in a few houses in Connecticut. They apparently feed on fungi, and thus are encouraged by damp conditions. The severe infestations investigated here were either in houses that had been damaged by fire and water, or houses just completed. In these houses moisture encouraged growth of molds, and the infestation developed rapidly.

Psocids usually do very little damage, although they will damage any starchy paper material such as book bindings and wallpaper. They are killed easily by using a DDT spray but others will appear immediately unless the source of infestation is removed. The best way to do that is to dry out the house and provide ventilation. New houses heated for a couple of weeks dry out enough to stop the infestation.

Termites

Termites are pests of the wood portions of the house. They nest in the ground and gain access to the wood in buildings through filled masonry porches, cracks in foundations, and the like. They work entirely within the wood and are seen only when winged adults swarm into the building. These adults are black, about a fourth of an inch long, with four wings much longer than the body. The swarms may occur as early as January and as late as July.

Winged ants may also appear, especially in the summer. Ants are always wasp-waisted, termites are not. The front wings of ants are larger than the hind wings; all the wings of termites are about the same

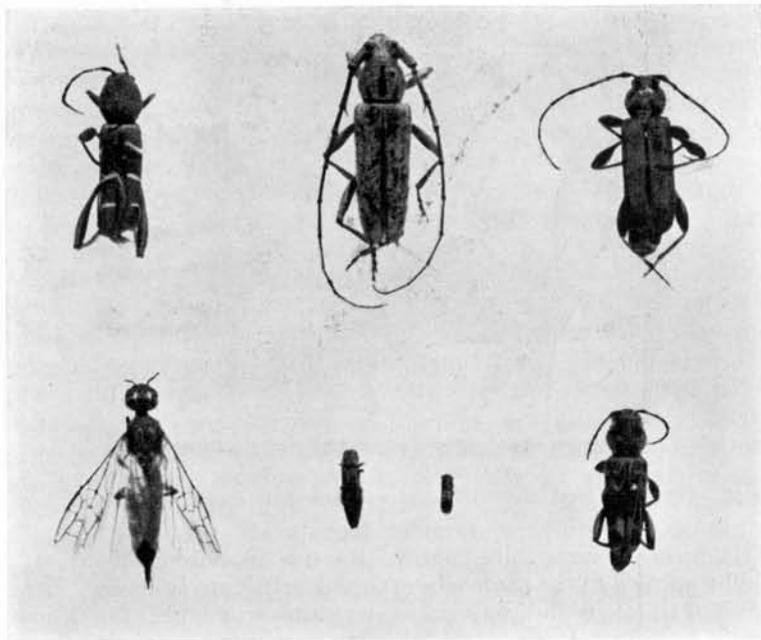


Figure 5. Some of the insects found in firewood. Left to right, upper, red-headed ash borer, spined bark borer, and tanbark borer. Left to right, lower, woodwasp, oak buprestid, smaller European elm bark beetle, and rustic borer.

size. The wings of ants have a few large veins; the wings of termites have a network of fine veins. Termites may occur by the hundreds, appearing suddenly from the infested wood; winged ants appear in small numbers. Finally, the wings of ants stay attached for several days, while termites break off their wings soon after emerging and run about seeking moist soil.

Control of termites is discussed in our Circular 172.

Carpenter Ants (see page 17)

Wood-boring Beetles

Many kinds of wood-boring beetles may be brought into the house in fireplace wood. Most of these attack only freshly cut trees. Eggs are deposited soon after the tree is cut, and the larvae continue to develop in the stored wood. Some species require two or three years for development and thus may emerge from the wood stored in the house.

With few exceptions, beetles of this sort cannot infest the lumber in houses. They are simply a nuisance. Unless they occur in large numbers, no special control measures are necessary. If they are abundant, a household DDT spray should kill them.

There is no direct proof that any house in Connecticut has been infested with termites, carpenter ants, powder-post beetles, or the old-house borer (all pests of lumber) from infested fireplace wood. Such an infestation is of course possible, because these pests certainly originated in forests and now seem to be associated with lumber. Most of our fire-

place wood is oak, ash, beech, hickory, or other hardwood. Most of the lumber in houses is softwood, such as pine and fir. Thus risk of introducing a serious pest of the structure in fireplace wood is limited.

Pests of Man and His Pets

Bedbugs

The only insect living on man and associated with houses is the bedbug. This insect is by no means common but does occur.

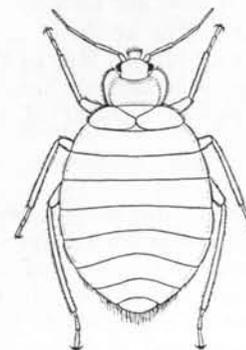


Figure 6. Bedbug.

The bedbug is a wingless sucking insect that lives on human blood. Its body is wide and flat, enabling it to hide in cracks in furniture, under loose wallpaper, and in cracks in floors and walls. Eggs are deposited by mature females in these places, usually in infested rooms. The young bugs look like the mature, and, under favorable conditions, may complete their development within six weeks. They also feed on human blood and require a blood meal before each of the five molts. Bedbugs hide during the day and move about and feed only at night. They are able to live for several months without food and thus maintain an infestation in a vacant house.

The first indication of an infestation of bedbugs may be the discovery of itching bite marks in the morning. If there are very many bedbugs, their characteristic odor will be noticeable.

Bedbugs may be carried from place to place in baggage or in the clothing of transients. They may be brought into houses on infested furniture. The adults have no wings, but they may crawl from one part of a building to another, or even into adjoining buildings. The exact source of an infestation may be unknown.

The development of DDT sprays provided a highly effective control for bedbugs. A coarse spray of 5 per cent DDT in oil applied to cracks in infested rooms, to infested furniture, and to beds, particularly the frame and springs, provides excellent control. Like other insects, bedbugs have developed some resistance to DDT, and in some places this insecticide is no longer effective. To date, no authentic cases of such resistance have been found in Connecticut, but they may occur in the future. Malathion and Diazanone have been suggested as alternate insecticides for DDT-resistant bedbugs.

Mosquitoes

Mosquitoes are invaders of houses. These insects breed only in stagnant water, and some species invade houses readily. The rain-barrel mosquito has become so adapted to breeding around habitations, and invades houses so frequently, that it might well be called the house mosquito. The adults come in for one of two reasons, in search of a blood meal, or to hibernate. Several species may invade the house late in the fall and hide in some dark corner. They seldom feed before spring. Mosquitoes that come in earlier in the season are usually hunting food.

Mosquitoes become most active at dusk, and may be carried in on the clothing of people entering houses late in the evening. They can be killed easily by use of a spray or aerosol bomb containing either DDT or pyrethrum. A more complete account of the mosquito problem is given in Bulletin 632.

Flies

Flies of several species frequently invade houses. The common house fly has become much less abundant with the decline in the number of horses but may be numerous locally. Several other species, such as the stable fly, the flesh flies, and the cluster fly (which breeds on earthworms) may also invade houses, especially to hibernate. Flies are seldom abundant in screened houses, and the few that do come in may be killed by use of pyrethrum sprays or aerosols.

Fleas

Some insects breed on cats and dogs and may also attack people. Fleas and ticks are the most common of these pests.

The most prevalent flea in Connecticut is the dog flea. This species breeds both on cats and dogs and does not occur in large numbers unless a cat or dog is or has been present. Adult fleas are small and

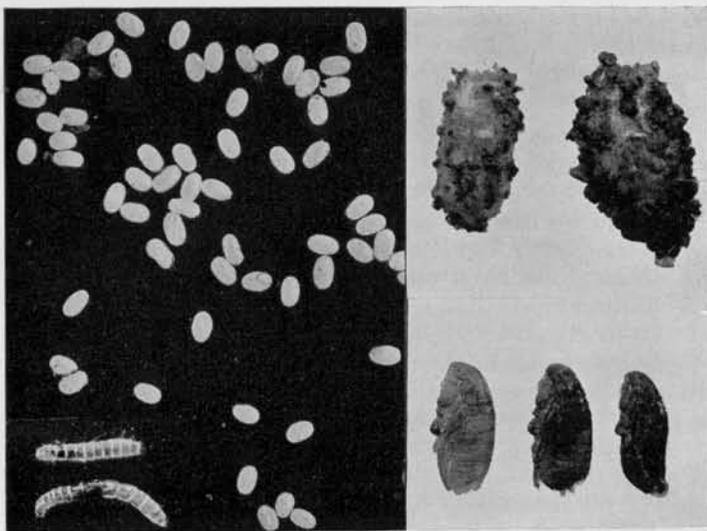


Figure 7. Eggs and larvae of the dog flea are shown at left, cocoons at upper right and pupae at lower right.

brown, with legs well developed for jumping. They live in the hairs of the host and pierce the skin to feed by sucking blood. Eggs are deposited among the hairs, but are not attached and usually are shaken off. Large numbers of eggs accumulate where the animals sleep. The white worm-like larvae feed on organic matter in lint and dust and on bits of skin, hair, and dried blood. They pupate in a cocoon and may emerge in about a week.

Very large infestations develop when a house in which there was a cat or dog is closed for some time. The larvae continue to hatch from the eggs, feed to maturity, and emerge. When the house is reopened there may be hundreds of hungry fleas ready to bite the people as well as pets. The severity of such infestations might be reduced by thorough cleaning before the house is vacated, destroying or spraying the animal bedding, and spraying the floors of all rooms used by the pet.

Sprays such as DDT or pyrethrum may be used to kill fleas. Each room should be sprayed thoroughly, with special attention to the floor. Fleas on dogs may be killed by using DDT flea powder. It is not suitable for cats because they lick their fur. Pyrethrum or specially prepared flea powder may be used on cats.

Ticks

Ticks are becoming very much more abundant in Connecticut. The brown dog tick is less than one-half inch long when fully grown and is reddish brown in color. Like other ticks, the abdomen of females is bluish after a blood meal. The female ticks leave the dogs and lay their eggs in cracks and crevices. The young hatch and crawl about hunting a dog for food and are nocturnal in habit. This species seldom bites people.

The American dog tick is slightly larger and darker brown in color. The engorged female drops to the ground and lays her eggs there. The young crawl up on grass and shrubbery and wait for an animal to pass by. They may live without feeding for a year. After feeding, they drop off to the ground, moult, and go through the same process again.

Dogs become infested by wandering through grass and brush where the nymphs are waiting. The adult is the stage that may attack people. This species is capable of transmitting spotted fever.

The brown dog tick may be controlled by dusting or washing the dog with DDT and by spraying egg-harboring areas with a DDT household spray.

The American dog tick can also be controlled on dogs by DDT treatments. Infested outdoor areas may be sprayed with DDT, using the sprays formulated for plants (emulsions or wettable powders).

Use of mosquito repellents on cotton or woolen clothing will give some protection against ticks. Rayon may be damaged by the repellents.

Mites

Mites that breed on rats or mice may frequently attack people in houses infested with these rodents. The mite, *Allodermanyssus sanguineus* H., attacks mice and carries a disease known as rickettsial pox from mouse to man. Both the mites and the disease have been found in Connecticut. The first step in control is to rid the premises of rodents.

the second to apply a combination spray of pyrethrum and rotenone to kill the mites. Since human disease is involved, the services of an experienced pest control operator are helpful.

Pests of Stored Food

International commerce in grains, dried fruits, drugs, spices, and furs and hides has distributed many species of insects all over the world. Thus we have not only the native species occurring commonly in food-stuffs, but also those of many other countries. In spite of the care most food processors use to produce a clean product, an occasional lot of food may be lightly infested. If this food is stored for weeks or months, the infestation develops and the insects invade other stored foods.

Cockroaches

Cockroaches are common and persistent pests that may occur where unpackaged food is available. They eat any food soft enough for them to bite, but prefer starchy materials such as bread, potatoes, apples, and the like. They may migrate from one area to another in apartment houses, and may also be brought into the kitchen in parcels from infested food-handling establishments.

Three species are common in Connecticut. The German cockroach (sometimes called the Croton-bug) is a native of Europe. The winged adults are slightly more than one-half inch long and light brown with two dark brown stripes on the thorax. The young which hatch from egg capsules deposited by the females, are wingless and about an eighth of an inch long. They mature in about three months.

The Oriental cockroach is, as the name implies, native to the Orient. It is a little more than an inch long, and the females are nearly black and have very short wings. The males are dark brown, with longer wings. Development of this roach from egg to adult takes about a year. The Oriental roach is more common here than it was 20 years ago. It now infests food-handling establishments rather regularly.

The American cockroach is native to this country. The adults are about an inch and a half long and brown with large wings. This cockroach is very common in the southern states. In Connecticut it is frequently found in dumps where it lives on scraps of food contained in refuse. In the fall the roaches may migrate into dwellings nearby. Development from egg to adult takes more than a year.

The brown-banded cockroach is a native of Africa and is becoming more common in Connecticut. It is about the same size and color as the German cockroach, but lacks the two dark stripes on the thorax of the German species. As the name indicates, the wings are twice-banded with brownish-yellow stripes. The brown-banded cockroach climbs walls freely, and likes to hide behind pictures and picture molding. It completes its development in five or six months.

Cleanliness is essential in avoiding large infestations of roaches. Once a kitchen is infested, only the quantity of food available limits the number of roaches. Places in which food is kept should be absolutely clean of refuse. Roaches are secretive in habit and range about only in the dark. Consequently the fewer the hiding places, the more difficulty roaches have in becoming established. They like to crawl into cracks

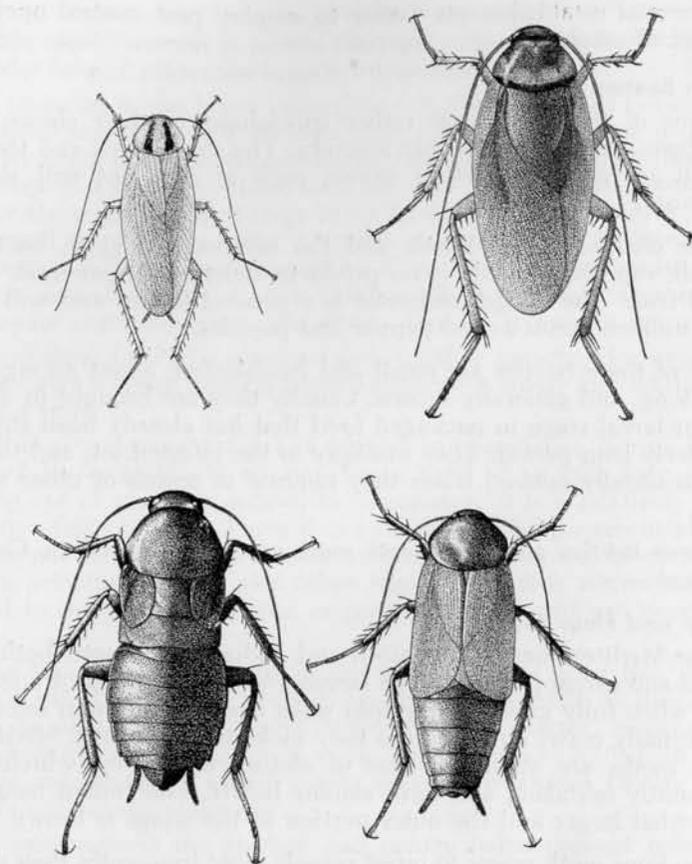


Figure 8. The German cockroach is shown at upper left, the American cockroach at upper right. Female of the Oriental cockroach is at lower left, male at right.

during the day. Cabinets and storage platforms can be built so that there are no hidden recesses in which roaches may hide. Sanitary cove construction may be used in kitchens instead of ordinary wooden baseboards.

Even under the most sanitary conditions, roaches may become established from a nearby infestation.

Chlordane sprays have given excellent control of roaches. Thorough spraying of the cracks where the roaches hide has given protection for several weeks. The spray should not be used on foodstuff or on shelves where food in paper cartons is to be stored.

In some commercial establishments in Connecticut roaches have developed resistance to chlordane, so that it no longer controls them effectively. The alternative spray most effective is Diazanone ($\frac{1}{2}$ or 1 per cent). However, if chlordane does not control roaches in dwelling houses, it is suggested that a pest control operator be called in. Most

commercial establishments prefer to employ pest control operators for control of roaches.

Grain Beetles

Some of the insects are rather specialized in their choice of food. The bean weevil attacks only legumes. The rice weevil and the granary weevil are partial to whole grains, such as rice, but will also attack macaroni.

The confused flour beetle and the saw-toothed grain beetle attack cereals, especially whole grain products, dehydrated pet food, and even dried fruit. The drugstore beetle is a general feeder and will breed in such unlikely items as red pepper and paprika.

All of these beetles are small and hardshelled, about an eighth of an inch long, and generally brown. Usually they are brought in during the egg or larval stage in packaged food that has already been stored for a relatively long period. They multiply in the infested lot, and the infestation is usually noticed when they migrate in search of other sources of food.

These beetles are the insects most commonly found in Connecticut kitchens.

Grain and Flour Moths

The Mediterranean flour moth and Indian meal moth both occur in cereal and cereal products. The larvae are white and about one-half inch long when fully grown. They spin webs over and through infested food, and usually crawl about before they make their cocoons. Mediterranean flour moths are about the size of clothes moths, for which they are frequently mistaken, and have similar habits. The Indian meal moth is somewhat larger and the outer portion of the wings is brown.

The flour moth seems to infest cereals more frequently than dried fruit or nuts. The Indian meal moth is more abundant in dried fruit, candies, nuts, dehydrated dog food, and whole-wheat cereals.

Since food storage is usually in small packages, most housewives prefer to destroy infested food rather than trying to salvage it. More general infestations may be prevented by frequent examination of stored food, particularly during the warm months. If the larvae or beetles have scattered, all of the food should be moved from the shelves and the shelves and cracks sprayed thoroughly with a DDT or pyrethrum household spray. After 24 hours the shelves should be washed thoroughly with soap and water, and the food and dishes replaced. The food and dishes should not be sprayed. Packages of food that have been exposed to infestation but contain no larvae can be sterilized by heating to 120° F. for four hours. Higher temperatures are more effective but may cook the food.

Mites

Occasionally mites may breed either in cereal or in cheese. These are very small, pale in color, with four pairs of legs. They breed in moist cereal or in cheese which has been stored for months. Destroying the infested food and washing the shelves with soap and water should control them.

Ants

Ants are more common in houses than any other insect. Some ants nest in or under houses, others are invaders in search of food.

Most common is the black carpenter ant; the largest in Connecticut. The workers are about half an inch long and the females an inch long. All are jet black although some varieties may have a reddish thorax. In nature they nest in trees, where they excavate soft or rotting wood as a home for the colony. They forage from these nests, sometimes making a distinct trail through the grass. Colonies are also found in fence posts, utility poles, and columns or cornices of buildings where moisture has gained an entrance. They do not consume the wood, but large colonies can excavate extensive nests. The direct damage is usually not great.

The principal food of carpenter ants is other insects. However, they will range over a house hunting food. They search singly and do not seem to make a trail.

The European pavement ant is second in abundance in our houses. This small brownish-black ant, not over a third of an inch long, is seen swarming out of cracks in sidewalks in summer. It is a relatively recent importation from Europe, where it is a rural ant. The pavement ant may nest underneath concrete porches or terraces or in concrete block foundations. Its principal food is also other insects, but it is somewhat more attracted to the pantry than the carpenter ant and will eat sweets and greases.

At one time the most common ant here was the very tiny reddish Pharoah's ant. This species nests in houses, makes trails to stored food and can be an exasperating pest. It loves peanut butter, crackers, and cake rich with shortening, and even bacon grease spilled in sinks. Strangely enough, after being nearly extinct for almost twenty years, Pharoah's ant is now returning.

Cleanliness around the kitchen and pantry helps prevent infestation by ants. They find their food by constant searching, especially on the floor next to baseboards and the base of cabinets. If they find crumbs of attractive food, they are attracted to this area and invade cabinets.

Control. The most effective method of control depends on the habits of the ant invading the house.

Carpenter ants range singly and do not make trails, so residual sprays are not very effective. The best way to use sprays on them is to locate the nest and spray directly into it. As they excavate wood, they discard the fragments, which usually fall beneath the entrance of the nest. This sawdust-like refuse can help to locate the nest. A chlordane spray made and labelled for the purpose may be sprayed directly into the opening.

Residual sprays are more effective in controlling the pavement ant and Pharoah's ant. Chlordane ant sprays may be applied to the floor and baseboard or the base of cabinets over which the ants have their trails. The residue will kill any ants that walk over it for several weeks. However, ants will continue to come in until all of the young in the colony mature and are killed, and the queen is left to starve.

For complete control of these two species, and for carpenter ants when the nest cannot be located, the use of ant baits has been very successful. These baits are so prepared that there is not enough poison to kill the

worker at one feeding. The workers carry back the poisoned bait, and feed it to the ant larvae and to the queen. After a couple of meals the larvae begin to die, and after three or four meals the workers are killed. Thus the entire colony may be destroyed.

Several types of ant baits are on the market, all formulated on this principal. Some are marketed in containers that serve as a dispenser. These are excellent provided the openings are large enough to permit the ants to enter. Some baits are prepared as solids in small containers, with directions to add enough water to make a syrup. There are also baits in jelly form in tubes, with directions for putting out small amounts where the ants are seen.

At times these prepared baits will not be as attractive as desired. Addition of a very small drop of peanut butter or bacon grease to the bait sometimes helps. If the ants are feeding on any particular food, such as shortbread, a few crumbs may be stirred into the bait.

Raw hamburger is said to be attractive to carpenter ants, and a piece the size of a match head might be smeared thoroughly with an ant bait to get them started eating it.

These baits contain such small amounts of poison that there is little hazard in their proper use. Homemade metal containers can be used when there are small children or pets in the house.

Dermestids

Several species of Dermestid beetles may occur in houses. Most of these feed on meat. With modern refrigeration and curing they are no longer a problem on foodstuffs.

Dermestes (cadaverinus) ater might well be called the incinerator beetle. It sometimes infests incinerators in houses when the fire does not destroy all the garbage. The adult beetles are apparently attracted down the chimney by the odor and lay eggs in the garbage. Occasionally a heavy infestation builds up, and the adults leave the incinerator and scatter throughout the building. Clean burning of the garbage avoids infestation.

Similar larvae or adults may also be found in houses with no apparent source of breeding. Investigation usually reveals that they have bred on carcasses of birds, squirrels, rats, or in prepared pet food. This type of infestation usually develops in a vacant summer cottage, fireplace windshelf, or in the attic of a house. Ordinarily good housekeeping is the only control required.

Casual Invaders

A number of insects that hibernate have found houses to their liking. In terms of requests for information the most common are the elm leaf beetle, the ladybird beetles, the common wasps and flies.

The *elm leaf beetle* lays its eggs on elm leaves, where the larvae feed and mature. The adults hibernate and sometimes enter the house by the hundreds. They are oblong and flattened, about a fourth of an inch long, buff with an olive-green stripe along the outer edge of each wing cover. They get into attics through small cracks or openings and sometimes through cracks in foundations. During the fall they hide, but when warm days come in late winter and early spring they become active.

The common *ladybird beetles* have a similar hibernating habit but usually do not occur in such large numbers.

Neither of these beetles will damage a house or its contents. However, they can become a nuisance. If their invasion into the living quarters is delayed until spring, they will usually fly out of open windows. If the weather is still cold, they usually stay in the house. If they are occurring in nuisance numbers, it might be well to find their hibernating place and spray them with a household DDT or pyrethrum spray. The entrance holes or cracks should be found and closed or screened to prevent further invasion. These can be located by putting light-proof covers on the attic windows, and finding the openings by light leaks. Louvres should also be screened.

Wasps also use dwellings for hibernation in much the same way as these beetles. They can become more than a nuisance because of the possibility of stings. Wasps, too, may be killed by pyrethrum or DDT sprays, or, if only a few are present, with a fly swatter.

The *clover mite (Bryobia praetiosa Koch)* is a persistent and common invader. These mites are very small, and vary in color from greenish to brown. They are barely visible to the naked eye and have been described as "grains of pepper that move."

These mites feed and breed on grass and other plants, such as shrubs, trees, and clover. For some reason they seem to be more abundant on new properties than those with established plantings. In the fall they crawl up the foundation and hibernate under the clapboards or shingles, where they may also lay eggs. They too start their invasion of the house in the fall but are most abundant in the spring. They will not damage the house or its contents, but occasionally will crawl over the skin causing irritation although they do not bite.

The best prevention is the application of a spray to kill mites to shrubbery planted close to the house, and to a strip of lawn at least ten feet wide around the house. Any good miticide should be effective, and Aramite, Diazanone, and Kelthane have been used successfully. The spray may be applied in September as soon as night temperatures start dropping to the 40's, as this stimulates the mites to seek hibernating quarters. The spray itself is most effective if applied when the temperature is 70° or above. The labels on the packages of spray material give directions for dilution and safe use. Pyrethrum contact sprays may be used to kill the mites in the house.

Spiders sometimes become very abundant in houses, especially in the basement. Some species live and breed in houses, others are invaders. Their food is insects, and they can persist and accumulate only if the house contains insects. If a basement becomes heavily populated by spiders, use of a pyrethrum aerosol bomb to kill insects should starve the spiders out even if it does not kill all of them.

The *house centipede* also lives on insects. It is by no means common but is found occasionally. Centipedes, like spiders, will disappear if the food insects are controlled.

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