

COCKROACHES:

Identification, Biology, and Control

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Cockroaches are among the most disagreeable insects that must be dealt with by occupants of homes, apartments, or commercial establishments. In addition to their repulsive and annoying characteristics, they eat or contaminate human food and leave a persistent, objectionable odor in infested areas. Foraging or feeding cockroaches also spread human disease by depositing disease organisms on food, dishes, or other items.

LIFE CYCLE AND BEHAVIOR

Cockroaches grow and mature by gradual metamorphosis. Three stages make up the life cycle: egg, nymph, and adult. Generations overlap, so all stages may be found at any time of year.

Females deposit eggs in bean-shaped or purselike leathery egg cases called oothecae. These are dropped or attached to out-of-the-way places by the females shortly after their formation. Egg cases of the various species are quite distinctive and may be used as an aid in determining what species are involved in an infestation (Fig. 1).

The nymphs which hatch from the eggs resemble the adults, except that they are smaller, have undeveloped wings, and frequently are a somewhat different color. Nymphs develop rather slowly, growing by progressive stages—each stage terminated by molting of the skin that permits the insect to increase in size. Nymphs may molt 5–13 times before transforming into adults; the number depends on the species and local conditions.

Cockroaches typically are nocturnal insects; they only appear during the day when disturbed or when an excessively large infestation erupts. Cracks and crevices are favored hiding and breeding areas.

In the Pacific Northwest, four cockroach species frequent homes, apartment complexes,



Fig. 1. Cockroach egg cases (actual lengths indicated by lines). Top and bottom: Oriental (————); American (————); German (————); Brownbanded (————).

or commercial establishments. They differ enough that the control techniques used against one species may not be effective against another. Because various combinations of these cockroaches may occur in a building at the same time, you must accurately identify the species present before beginning control procedures.

COCKROACH SPECIES

German Cockroach, *Blattella germanica*

The German cockroach is the most common cockroach in the Pacific Northwest; it appears in homes, apartments, restaurants, hospitals, or other buildings where food is stored, prepared, or served. The adult is $\frac{1}{2}$ inch long, pale brown, and has two dark brown lengthwise stripes on the shield behind the head. Adults are winged but rarely fly. Under ideal conditions, they may live up to 12 months.

The slender egg case is $\frac{1}{3}$ inch long and light tan. The female carries it at the tip of her abdomen until the eggs are nearly ready to hatch (Fig. 2). The case is then dropped in a secluded location and the nymphs emerge one to two days later. A female may produce four to eight egg cases during her lifetime, each containing 30–48 eggs.

German cockroach nymphs are darker than adults. The most characteristic marking is a single pale brown stripe separating two dark brown stripes running about halfway down the middle of the upper abdomen. The nymphal stage is completed in $1\frac{1}{2}$ –4 months.

The German cockroach produces more eggs and has more generations per year (three to four) than other cockroaches; thus, a troublesome infestation can develop rapidly after the chance introduction of a few individuals. These cockroaches often are accidentally brought into buildings with groceries (especially bagged potatoes and onions), beverage cartons and cases, used furniture and appliances, and dry cleaning. Adults also may migrate from nearby infested dwellings. German cockroaches normally inhabit the kitchen but also occur in the bathroom, particularly if the kitchen and bathroom share a common wall. During the day, adults and nymphs hide clustered together under, around, or even in the walls of appliances such as stoves, refrigerators, and dishwashers; around sinks, especially in the dead space between the sink and wall; beneath or around the water heater; under, inside, or in cracks around cabinets, closets, and pantries; and behind baseboard molding.

American Cockroach, *Periplaneta americana*

The American cockroach is the largest cockroach found in dwellings. The adult is $1\frac{1}{2}$ inches long, reddish brown to brown, and has a light yellow or tan band around the edge of the shield behind the head. Both sexes have well-developed wings and can fly. The wings of the male extend slightly beyond the tip of the abdomen (Fig. 3), while those of the female do not. Adults may live up to 15 months.

The egg case is dark brown and approximately $\frac{1}{3}$ inch long. The female deposits the

egg case in sheltered areas on or near the floor, usually close to a food source. She frequently conceals the case with debris which she attaches to its surface. Egg cases are formed at the rate of about one per week until 15–90 have been produced. Each contains 16 eggs.

Young nymphs are grayish brown. Each progressive molt becomes more reddish brown. The time required to complete the nymphal stage varies from 5–15 months.

The American cockroach is most commonly found in restaurants, supermarkets, and other commercial buildings where food is prepared or stored. It also may invade apartments or homes from sewer systems via the plumbing. Within a household, this cockroach prefers to live in cluttered basements, feeding upon stored paper goods and seepage from around sewage pipes. When an infestation increases in size, individuals may spread to the kitchen, bathroom, or other rooms.

Brownbanded Cockroach, *Supella longipalpa*

The brownbanded cockroach adult is $\frac{1}{2}$ – $\frac{5}{8}$ inch long. The female's wings are a uniform reddish brown to dark brown. Those of the male are dark brown at the base, becoming increasingly lighter toward the tips. Both sexes have a light yellow or pale brown band that runs across the base of the wings and another broken band a third of the distance from the base. The male's wings cover the abdomen completely; the female's wings are short and never cover all of the abdomen (Fig. 4). The female's abdomen is much broader and more rounded than the male's. These cockroaches are very active, and the adults jump when disturbed; only males can fly. Adults may live from 3 to 11 months.

The egg cases are a light reddish brown, $\frac{1}{4}$ inch long, and are usually attached in clusters to furniture, draperies, wall decorations, shelving, and ceilings. Each case contains 16 eggs. A female may produce 10–20 cases in her lifetime.

The nymphs are readily identified by two yellow bands that cross the upper abdomen. The developmental period of the nymphs ranges from three to six months.



Fig. 2. German Cockroach, *Blattella germanica*, female. Note protruding egg case. (Actual length ———)



Fig. 3. American Cockroach, *Periplaneta americana*, male. (Actual length ———)



Fig. 4. Brownbanded Cockroach, *Supella longipalpa*, female. Note bands across wings. (Actual length ———)



Fig. 5. Oriental Cockroach, *Blatta orientalis*, female. (Actual length ———)

Brownbanded cockroaches are more apt to be found in private residences than in commercial buildings. Adults and immatures prefer to hide in warm, elevated areas near the ceiling, behind wall decorations and loose wallpaper, in closets, beneath or inside upholstered furniture, and in electrical appliances such as television sets, stereos, and toasters. These cockroaches may infest any room in a dwelling. As a result they often are more difficult to control than other cockroach species.

Oriental Cockroach, *Blatta orientalis*

The adult oriental cockroach is uniformly glossy dark brown to black. The female is 1¹/₄

inches long, with a broad abdomen and stubby wings (Fig. 5). The male is 1 inch long, slender, and has wings which cover two-thirds of the upper abdomen. Neither sex will fly nor even run very quickly when disturbed. Adult longevity ranges from one to six months.

Egg cases are dark reddish brown, 1/2 inch long, and appear slightly inflated. The female deposits the case in a sheltered location near a food supply. Anywhere from 8–15 egg cases are produced per female, with each case containing 16 eggs.

Immature oriental cockroaches are the same color as the adults. The nymphal stage requires about one year for completion.

The oriental cockroach feeds on a wide

range of decaying organic matter and has the reputation of being the filthiest of the household-infesting species. Outdoors, these insects dwell in cool, moist habitats—beneath decomposing leaves or stones in flower and garden mulching materials, in trash and garbage piles, and in municipal sewer systems. Occasionally, during unseasonably cool periods or with the onset of fall weather, a mass movement of oriental cockroaches into buildings may occur. These cockroaches invade structures through sewer drainpipes, foundation cracks, ventilators and poorly fitting doors. Normally this species does not become abundant in buildings. Nevertheless, populations can become very large at times, especially in moist areas such as basements, near drains or leaky water pipes, and beneath refrigerators, sinks, and washing machines.

COCKROACH CONTROL

Prevention and Sanitation

Prevention is the key to successful cockroach control. Preventive measures will minimize cockroach invasion of buildings and eliminate or greatly reduce availability of food, water, and shelter. It is much easier and usually less costly to keep cockroaches on the outside than it is to get rid of them once inside.

Discourage these insects from entering buildings by sealing any cracks of $\frac{1}{8}$ inch or more in foundations and exterior walls. Examine the seal around air conditioners, doors, windows, and other structural openings to ensure no gaps permit cockroach entry. Store refuse in durable, securely covered containers. Do not keep next to a building. Inspect incoming merchandise such as beverage cartons, groceries, dry cleaning, luggage, and used appliances or furniture for hitchhiking cockroaches or their egg cases.

Inside a dwelling, eliminate all cockroach hiding areas and food sources. Repair cracks and holes in floors, walls, and ceilings and seal openings around plumbing fixtures, furnace flues, electrical outlets, between window sills and walls, and along baseboards or ceiling moldings. Repair leaky water faucets and pipes.

Sanitation or cleanup will aid considerably in cockroach control. Do not leave unwashed dishes, kitchen utensils, and exposed food products overnight. Clean up spilled liquids. Clean areas beneath cabinets, furniture, sinks, stoves, and refrigerators often. Also clean cupboards, pantry shelves, and storage bins where tiny particles of food frequently accumulate. Keep kitchen wastes and dry pet food in cockroach-proof containers. If pets are fed indoors, do not leave leftover food in the feeding dish overnight. Dispose of accumulated stored papers, boxes, or other nonessential items, since these items provide excellent hiding and breeding sites for cockroaches.

Insecticides

Use either nonresidual or residual insecticides to reduce cockroach infestations. Nonresidual insecticides kill cockroaches by direct contact with the insect during the application; residual insecticides leave deposits on treated surfaces that kill cockroaches for variable periods of time after the application. One treatment rarely results in total control; retreatments are usually necessary. Frequency of treatment will depend on sanitation practices, thoroughness of insecticide application, and structural vulnerability to reinfestation.

The type of insecticide and the application method used will depend on the location and nature of the infestation. No one insecticide is best, but various combinations can be effective. Regardless of the insecticide selected, apply a chemical to areas where cockroaches hide during the day or regularly travel at night. This will kill more individuals than a chemical applied to areas which cockroaches seldom frequent.

Residual sprays. Apply oil-base or water-emulsion sprays as spot or crack and crevice treatments. These insecticides are available in pressurized containers, in nonpressurized containers with built-in spray pumps, and as concentrates to mix with water before applying with sprayers, or a paint brush. When applied, the spray should wet or dampen the treated surface but not to the point of puddling or running. Use oil-base insecticides with care; they may dull, stain, or injure asphalt tile, linoleum,

painted surfaces, plaster, certain plastics, houseplants, and rubber backing on carpet. They also may create a fire hazard when used near an open flame on a gas stove, furnace, or water heater. In these situations, use water-emulsion sprays. Take precautions with water-emulsion sprays. They may stain light-colored carpeting, draperies, wallpaper, and other water-soluble materials, or even short out electrical circuits. Water emulsions don't adhere as well as oil-base sprays to glass and metal.

Nonresidual sprays. Nonresidual sprays are most useful for finding the location and size of cockroach infestations. These sprays are sold in ready-to-use pressurized containers (aerosol bombs). A nonresidual spray by itself will not provide adequate control. Combine with a residual insecticide for a high degree of control. Use a small amount of spray squirted into harborage areas to force rapid movement of cockroaches onto surfaces previously treated with the residual material.

Dusts. Cockroaches also can be controlled by using insecticidal dusts. Dusts may be placed deep into cracks and crevices, wall voids, under large appliances and furniture, around electrical outlets and wiring, on very smooth or porous surfaces, and in other areas where spray applications might be impractical or unsafe. Dusts generally provide longer residual control than sprays but become ineffective in wet locations. Dusts are available in ready-to-use form. Dusts leave a barely visible, uniform deposit on the treated surface. Follow all label directions.

Sometimes a combination of dust and spray treatments is more effective than either alone. When using with sprays, apply dusts after the spray has dried.

Baits

There has been a significant shift from spraying for cockroach control to using baits. This has led some pest management professionals to believe that the predominant use of baits has caused an increase in bedbug problems. This is largely speculation at this time. Follow bait labels closely and use exactly the amount indicated and don't over apply. Apply

to all apparent cockroach activity areas throughout the dwelling. There are a number of bait types available and using a variety of baits can enhance control.

Insect growth regulators

Insect Growth Regulators (IGRs) are synthetic versions of naturally occurring insect hormones. IGRs disrupt normal growth and development in cockroaches. These chemicals have a very low toxicity to nontarget organisms and possess long residual activity. When older cockroach nymphs contact surfaces treated with IGRs, they mature into malformed winged adults that are incapable of reproduction; adult cockroaches exposed to IGRs are not adversely affected. The cockroach population declines over time as the older individuals die and no further young cockroaches are produced. Population reductions are usually apparent three to six months after an IGR application. For faster results against an existing cockroach population, and to provide protection against subsequent cockroach invasions, IGRs are typically used in conjunction with other insecticides or management procedures.

Traps

Trapping is an effective way to reduce cockroach populations, especially when combined with preventive and insecticidal measures. Trapping can determine harborage areas and infestation severity, monitor effectiveness of chemical controls, and detect population increases that may require insecticide treatment. Several types of traps are available. Most are about the size of a large matchbox, have openings at both ends, and have a very sticky adhesive and slow-release food attractant inside (Fig. 6a). Cockroaches detect the food odor, enter the trap, and are immobilized by the adhesive.

Position traps (with both ends unobstructed) to intercept cockroaches as they travel to and from hiding and feeding areas. If no cockroaches are caught in a trap after two nights, change its location. A properly placed trap can catch numerous cockroach adults and

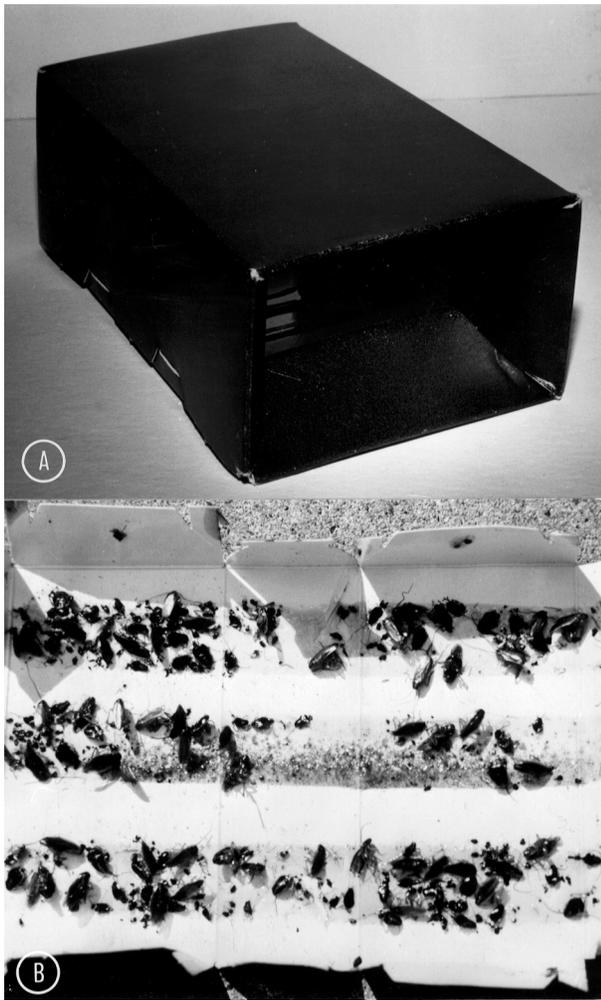


Fig. 6. A. Cockroach trap. B. Trap opened to reveal captured German cockroaches.

nymphs daily (Fig. 6b). Traps are particularly effective against brownbanded and German cockroaches. The number of traps required for a building will vary with the kind of cockroach present and the severity and location of the infestation. Traps are inexpensive, convenient to use, disposable, and contain no toxic insecticide.

PROFESSIONAL CONTROL

If a severe or widespread cockroach infestation occurs, or if you are in doubt as to proper control measures, employ a reputable pest management professional (exterminator). These professionals have the materials and training to do a thorough job.

CAUTION: USE INSECTICIDES WISELY AND SAFELY

All insecticides are poisonous. They always must be handled carefully to minimize the possibility of harm to humans and animals by direct contact or through contamination of food and water. The key to safety is a knowledge of the hazards involved in handling and applying insecticides.

1. Read the product label; understand the directions and precautions before preparing or applying. Use the recommended rates. Excessive application increases cost and may be hazardous.
2. Remove aquariums, birds, cats, dogs, and other pets and their food and water dishes before applying insecticides. Keep children and pets off sprayed surfaces until dry.
3. Avoid repeated or prolonged contact of insecticides with the skin and prolonged breathing of spray mist or dust.
4. Never eat or smoke during or after insecticide application without first washing hands and face.
5. If insecticide is spilled on clothing or skin, immediately remove clothing and wash the exposed skin thoroughly with soap and water. Wash contaminated clothing separately.
6. Store insecticides under lock and key. Keep them in closed, labeled, original containers in a dry place where they cannot contaminate foodstuffs and medicines and where pets, children or irresponsible persons cannot reach them.
7. Dispose of empty containers and unused sprays in a safe manner as directed by the insecticide label. If no directions are given, triple rinse the container (except aerosols) and hold for a hazardous waste day in your area.
8. In case of poisoning, take the victim to a physician without delay. If possible, take along the insecticide container involved so the physician can determine the poison(s) and prescribe the proper treatment.

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Use pesticides with care. Apply them only to plants, animals, or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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