

(J. Kalisch 1995)

Figure 3-1. "Eeek!...A cockroach in our dinner! Smash it, honey, smash it!"

Chapter 3

Cockroach Biology

Cockroaches are very primitive insects. Their ancestors lived 200-350 million years ago in the Carboniferous Period, even before the dinosaurs. This geological period is sometimes called the “Age of Cockroaches” because they were so abundant. At this time, the climate on the earth was warm and moist, ideal conditions for them to thrive. Although climatic conditions are cooler and less humid now, present-day cockroach species are surprisingly similar to those preserved in fossils from the distant past.

Living Requirements

In general, cockroaches adapted to living with people need four things to successfully live in a home. They need water, food, shelter and warmth. When we go about our daily activities (cooking, eating, bathing), we provide these requirements, which is why cockroaches survive so well with us. Cockroaches generally will not survive very well in a vacant home. Different cockroaches have slightly different requirements, which will be helpful in knowing where to inspect and later, focus your control efforts.

Life Cycle, Behavior and Habitat

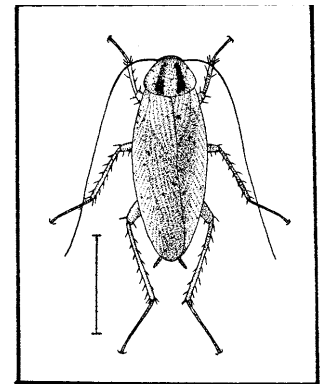
The cockroach is exceedingly hardy. It thrives on only crumbs and can survive a couple weeks without food or water. Cockroaches often live in cracks and crevices so small we can easily overlook them. Because they are such good survivors, it is essential to have a basic understanding of the cockroach life cycle, behavior and habitat before attempting any control tactic. Information about how long cockroaches live, and the number of eggs they produce is called their *life cycle*. Habits or things they do during their entire life cycle can be thought of as *behavior*. The place where cockroaches live and eat is called their *habitat*. The

life cycle, behavior and habitat of each cockroach species will be described in detail.

German Cockroach (*Blattella germanica*)

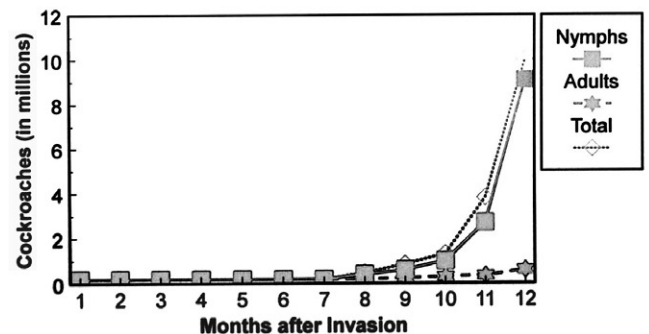
Life Cycle. The German cockroach has a tremendous capacity to produce offspring. A female German cockroach produces an egg case (the scientific term is ootheca) containing 30-40 eggs. The female carries this egg case for about three weeks until the day the eggs hatch. She then goes into hiding before dropping her egg case. This behavior reduces possible harm to the female and her eggs. The immature German cockroaches (nymphs) grow fast when conditions are favorable. Nymphs emerging from the egg cases will molt (shed their skins) six or seven times in about 60 days. After the last molt, adult cockroaches emerge fully winged and sexually mature.

The female German cockroach can produce as many as eight egg cases and more than 300 offspring! If half of the nymphs are females, and each of them



(Conn. Agr. Exp. Sta.)

Figure 3-2.



(C. Ogg)

Figure 3-3. Reproductive potential of the German cockroach.

produces 300 nymphs, and if half of those nymphs are females, and they each produce 300 nymphs. . . I think you begin to get the idea! It is theoretically possible for one female German cockroach to produce more than 100,000 cockroaches in one year! (Figure 3-3)

Behavior and Habitat. German cockroaches gather, or *aggregate* in warm, humid, dark places near food and water. They like porous surfaces like wood, paper or cardboard better than nonporous surfaces like metal. Cockroaches “mark” these porous surfaces with an aggregation pheromone, found in their feces. A *pheromone* is a chemical produced by one cockroach which affects the behavior of others. This aggregation pheromone attracts other cockroaches, especially the tiniest immature stages, which usually stay in these hidden places until they are larger. These tiny cockroaches don’t need to venture into the outside world for food because they feed on the feces of the adults. Examples of gathering places are cracks and crevices of counter tops, wooden cabinets, in wall and ceiling voids, in and around refrigerators, dishwashers, stoves, washers and dryers and water heaters.

German cockroaches have a high water requirement and are most likely to be found infesting kitchens and bathrooms. If food, water and shelter are available, the cockroach population can multiply rapidly when temperatures are warm. When any one of these resources is limited or is eliminated, populations can’t grow and may even decline.

Inspections. Look for German cockroaches (alive or dead), droppings (see Figure 3-10), shed or cast off skins and empty egg cases. Concentrate your efforts on undisturbed areas of high humidity where water is found (kitchens and bathrooms). Use sticky traps to detect infestations and help estimate the size of the cockroach problem (Chapter 4).

Brownbanded Cockroach (*Supella longipalpa*)

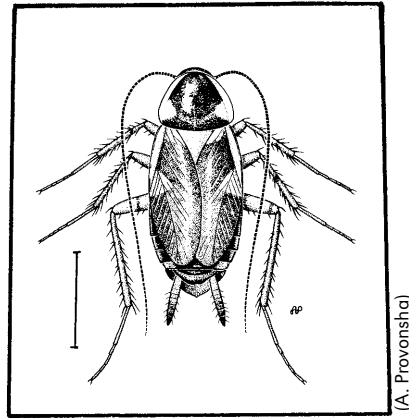


Figure 3-4.

(A. Provansha)

Life Cycle. The egg case, containing 13-18 eggs, is glued to inconspicuous places in the habitat, such as on furniture, behind picture frames, walls and ceilings. Egg cases hatch in about 50 days. In her lifetime (approximately six months) the female brownbanded cockroach can deposit as many as 14 egg cases. Nymphs molt six to eight times over a five- to six-month time span, before emerging as sexually mature winged adults. Male brownbanded cockroaches readily fly when disturbed.

A single, female brownbanded cockroach has the potential to produce about 250 offspring. But, because of the long time required for nymphs to grow into sexually mature adults, large populations are not produced as quickly as those of the German cockroach. In addition, because the egg cases are glued to objects in the environment, they are susceptible to drying out, attack by fungi and other mortality factors which all contribute to a low-hatch rate. Brownbanded cockroach infestations are less common than German cockroaches.

Behavior and Habitat. Brownbanded cockroaches build up their highest populations in high temperature areas. They do not need as much water as German cockroaches, so they often thrive in drier locations. They are often found in locations at eye-level or above, such as in cabinets, around closet shelves, behind pictures, in warm areas near motors of refrigerators, electric clocks, timers and television sets. Other favorite habitats are around the braces of kitchen chairs and tables, around objects on the wall and in shower stalls. Their egg cases can be found attached to rough surfaces like walls and textured ceilings but can also be found around the kitchen sink, desks, tables and other furniture (Figure 3-5).

Inspections. Inspections are similar to those for German cockroaches, but also look for droppings, cast skins, alive or dead individuals and egg cases glued to places in higher and drier areas. Because brownbanded cockroaches take longer to develop and hatch eggs, have such a long development and egg-hatching time, long-term monitoring is especially important.



Figure 3-5. A localized brownbanded infestation was noticed in an office cubicle. The office worker ate lunch at her desk and left food waste in her trash can overnight. She also left partially eaten hard candy in her desk drawer. An inspection of her cubical revealed brownbanded cockroaches infesting her telephone. The warmth from the telephone and food left in the desk encouraged this localized infestation. This photo shows brownbanded egg cases and feces on the underside of the telephone.

Oriental Cockroach (*Blatta orientalis*)

Life Cycle. A female oriental cockroach produces fewer offspring than either the German or the brownbanded females. She can produce up to eight egg cases in a season, but in areas where the winters are cold, like in Nebraska, fewer egg cases (as few as one per year) are produced. The number of offspring may be as low as 16, the number of eggs in a perfectly formed egg case.

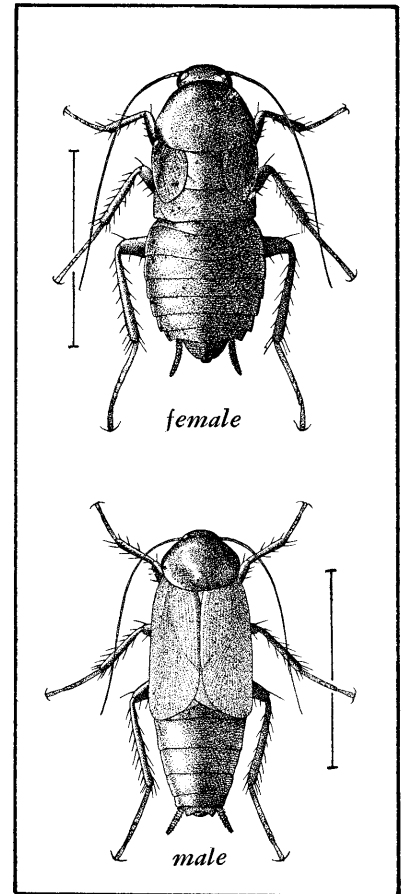


Figure 3-6.

(Conn. Agr. Exp. Sta.)

Within two days after the egg case is produced, it is placed in a sheltered area containing abundant food. In about two months, nymphs emerge and are most active from spring until midsummer. In early spring, only adult oriental cockroaches are found; by late spring nymphs are abundant, and the adults begin to die off. By fall, most individuals are adults (Figure 3-7).

As with the brownbanded species, egg cases are susceptible to drying out, attack by fungus and cannibalism by other cockroaches, if other food is scarce.

Behavior and Habitat. Oriental cockroaches are sometimes called “waterbugs” by people who don’t realize they are a type of cockroach. This nickname reflects their affinity for humid, moist locations. Oriental cockroaches differ from the other three species, because it can live outdoors in

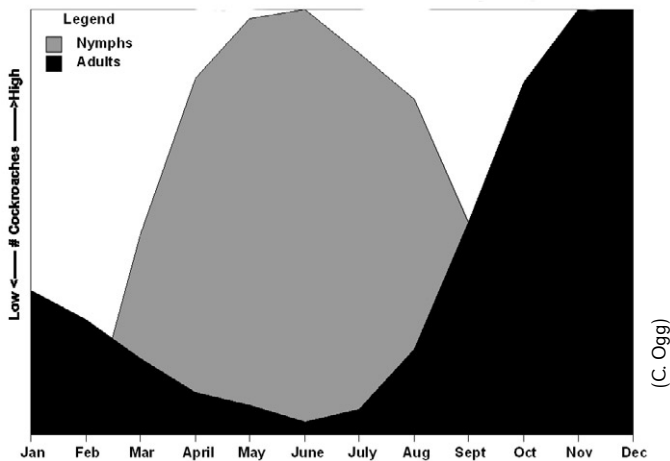


Figure 3-7. Relative number of Oriental cockroach reproduction cycle, showing relative numbers of nymphs and adults during a calendar year.

the northern U.S. Outdoors, oriental cockroaches are found where there is high organic matter, like wood chips or mulch, between soil and the foundation, underneath patio bricks and sidewalks. They sometimes aggregate under garbage cans. During hot, dry periods, they may move indoors to find locations more moist and humid. Indoors, they will be found in basements, especially in cool, damp locations like bathrooms and floor drains. Crawlspace may be infested with oriental cockroaches which may invade homes.

Inspections. Infestations will generally be found in areas of high humidity and cool temperatures, generally basements or lower floors. If you repeatedly see oriental cockroaches on upper floors, search for a hidden moisture problem.

In basements, infestations of these insects can sometimes be located by examining spider webs. In homes without basements, crawlspaces may be the source of oriental cockroaches. In kitchens and bathrooms, look around sinks and bathtubs and check plumbing for leaky pipes. Oriental cockroaches produce large fecal smears indicating moister feces (Figure 3-10), live or dead cockroaches and egg cases. Low populations of oriental cockroaches may exist in a home, but home dwellers may only observe these cockroaches for a month or two in the spring when they are most active. Beware! Oriental cockroach numbers observed in the spring may appear low or under control, only to buildup by midsummer.

American Cockroach (*Periplaneta americana*)

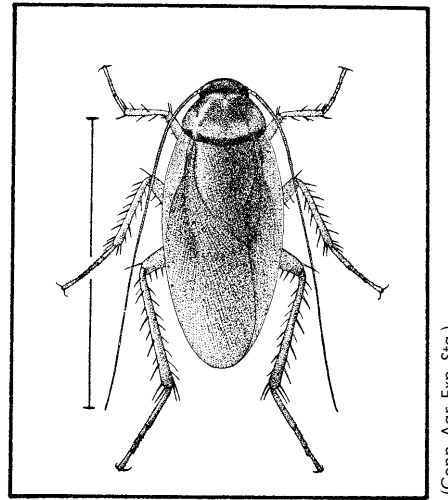


Figure 3-8.

Life Cycle. The American cockroach egg case contains 14-16 eggs. Nymphs emerge in about six weeks and undergo 13 molts over the next 18 months, before reaching the sexually mature adult stage. During warm conditions, adult females produce an egg case in about one week and can live more than a year.

American cockroaches seem to have a tremendous potential for producing offspring. But because of cold winters in northern states, American cockroaches develop at a slower rate and produce fewer offspring than in southern states.

Behavior and Habitat. American cockroach females glue or place their egg case in locations where offspring are likely to survive. In northern states, American cockroaches are abundant in many cities' sewer systems. They can also be found in commercial establishments like restaurants, grocery stores, bakeries and other places where food is prepared or stored. They are most common in boiler rooms, heated steam tunnels, basements around pipes and around water heaters and wet floor drains. American cockroaches can coexist with German cockroaches.

Inspections. American cockroaches are less common in northern states than German and oriental cockroaches. Look for American cockroaches in areas of warmth and high humidity. American cockroach feces may be almost as large as mouse droppings. American cockroaches

are known as “born inebriates,” their desire for fermenting liquids is often very strong. There are many examples of restaurants or bar owners finding American cockroaches in partially empty beer bottles. Bread soaked with beer can be used to attract them. Ongoing inspections, including trapping, are very important because of the long life-span of this cockroach.

**Wood
Cockroaches
(*Parcoblatta
spp.*)**

Behavior and Harborage. Wood cockroaches live in rotted logs, tree stumps, hollow trees, stopped-up rain gutters and in piles of fire wood. Males and females differ greatly in appearance. Wingless females look similar to oriental cockroaches, but are hardly ever seen. A clear area on the outside of the



(J. Kalisch)

Figure 3-9.

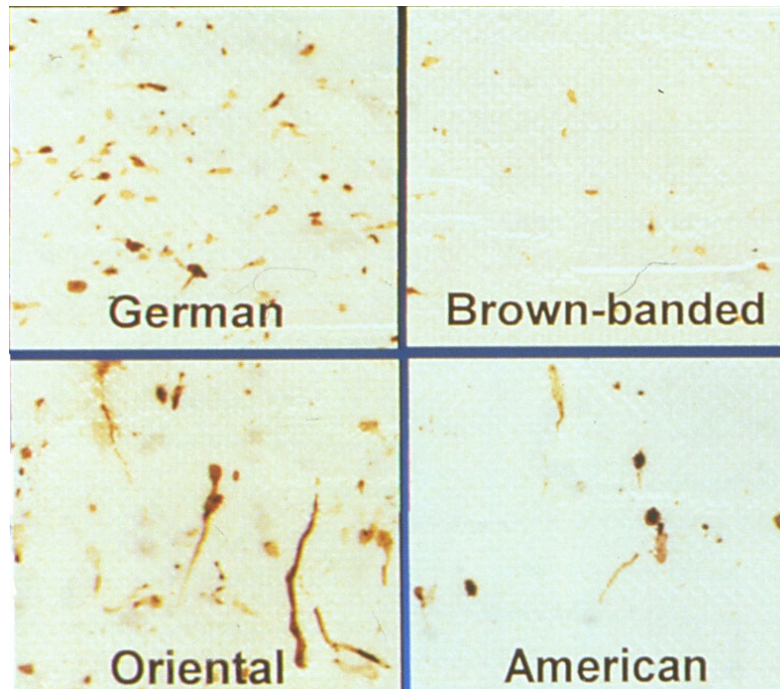
pronotum and margins of the wings differentiate them from domestic cockroaches.

Winged males take flight during late spring in search of females. Males are attracted to light and sometimes accidentally invade homes, where they soon die. Wood cockroaches rarely, if ever breed inside. The best control method is exclusion, by sealing gaps around screens, doors and windows. No chemical control is necessary.

Comparing Cockroach Feces

Entomologists sometimes do odd things to teach about their science. We confined healthy cockroaches in petri dishes, with filter paper on the bottom of the dish. The photos below are what their feces looked like after 24 hours.

What conclusions can be made from this comparison? Not surprisingly, small cockroaches have smaller roach feces than large cockroaches. Cockroaches preferring moist places like German and oriental cockroaches have more liquid feces.



(C. Ogg)

Figure 3-10. Fecal specks and smears of the four domestic cockroaches (enlarged).