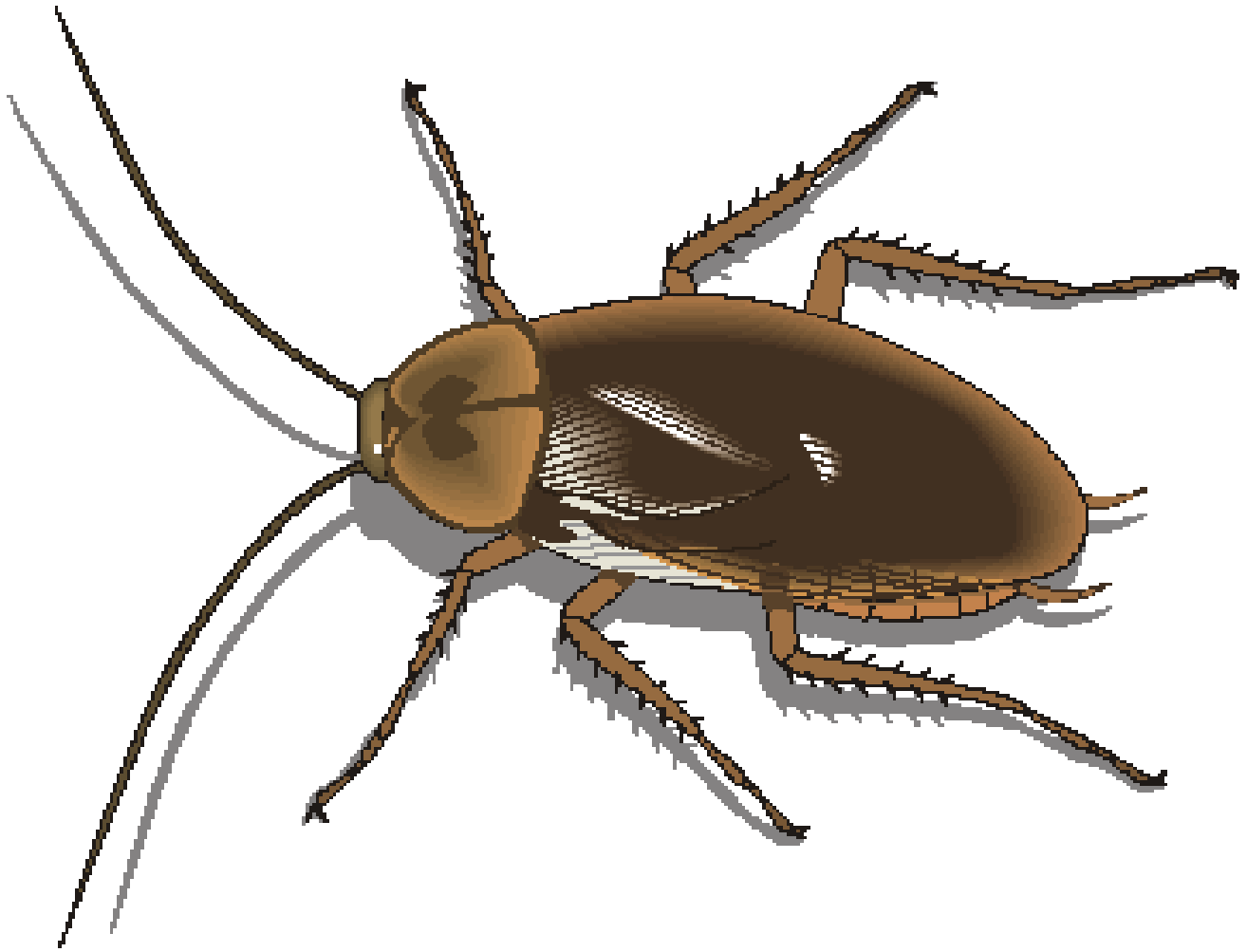


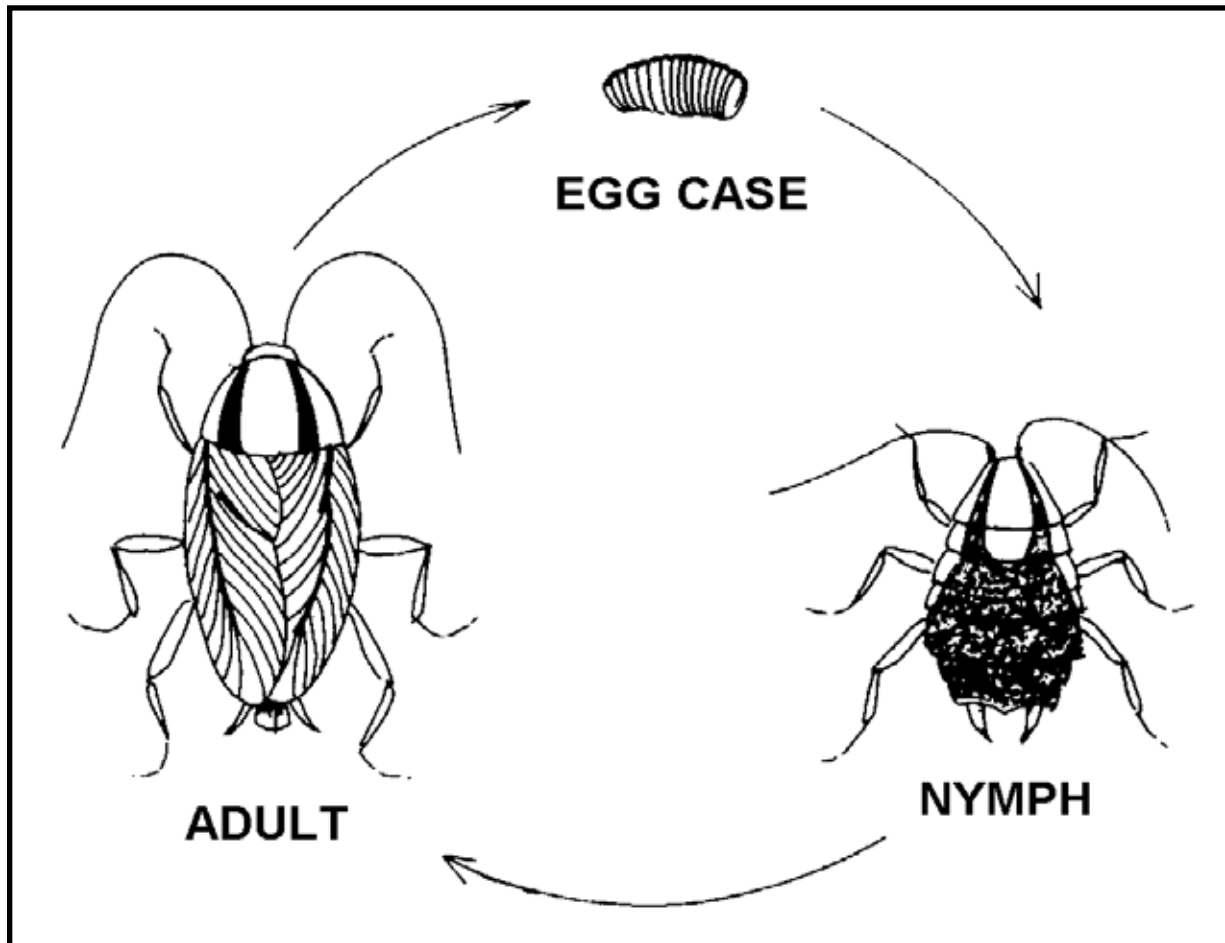
CHAPTER 27

THE BEST CONTROL FOR ROACHES



**“Man did not weave the web of life
He is merely a strand in it
What a man does to the web - he does to himself.” — Chief Seattle**

LIFE CYCLE OF THE COCKROACH



Note: One pair of German cockroaches can theoretically produce enough offspring in one year to carpet the floors of the average home to a depth of 1 meter per year! Cockroaches can live a month without food and a week without water. They can live up to 7 days without a head. The only reason the roach dies then, is that without a mouth it can not drink water and it dies of thirst. They know one another by their odor. Young roaches need only the width of a business card to quickly crawl through spaces. An adult male needs a crack about the thickness of a quarter. A pregnant female needs a crack with a space as tall as two stacked nickels. Over 250 million dollars is spent every year in the U. S. on consumer-use cockroach control products. An estimated 15 million Americans are allergic to cockroaches. To kill cockroaches means you will irritate the allergies in at least the 15 million Americans, so you must only trap them or vacuum them in our homes, schools, offices, etc. The cockroach is probably considered the most disgusting insect known to man. Cockroaches can survive radiation levels equivalent to a thermonuclear explosion and can hold their breath for up to 40 minutes. Cockroaches can not survive in very dusty and/or windy areas. One simple German female can produce over 400,000 per year!

PEST OVERVIEW

There are approximately 4,000 - 7500 species of cockroaches in the world and there are at least 70 described species in the U. S. with at least 41 described species just in Florida, but less than 1% of the known cockroaches invade and inhabit our buildings and may become persistent, unsightly and troublesome pests. Household cockroaches are known carriers of fungi, viruses, protozoa, about 40 species of bacteria pathogenic to vertebrates and intermediate hosts for several species of helminth (flatworms). Cockroaches are considered one of the most adaptable and successful insect groups. In fact, evidence of the continual coexistence with people throughout history is testimony to how adaptable some cockroaches are to the habits of people. Cockroaches are born inebriates and omnivorous scavengers. Our buildings protect cockroaches from the weather and their natural enemies and provide them with ample sources of food and water as well as convenient places for them to hide. Note: One pair of cockroaches can theoretically produce enough offspring in one year to carpet the floors of the average home to a depth of 1 meter per year! In August, 1997, the Journal of Economic Entomology noted: "Even with the promotion of integrated pest management programs for the German cockroach, *Blattella germanica* (L.) The pest control industry has generally relied on the use of chemically-based synthetic insecticides as the key, direct control technique in these integrated pest management (IPM) programs (Gold 1995). The financial backbone of the pest control industry for years has been the "need" for continual chemical cockroach "control."



Cockroaches have survived for more than 350 - 400 million years. Ancient fossils had the same appearance as today's cockroaches: oval and flat with long legs and antennae. The modern cockroach also has the same need for a warm, moist climate. Cockroaches are behaviorally, physiologically and genetically adaptable. While most cockroaches live wild in the tropics and sub-tropics, a few, called urban cockroaches, choose to enjoy the moist, even temperature we maintain in our homes, schools and workplaces. Cockroaches are offensive pests visually and they expel unpleasant smelling secretions that spoil the flavor of food and contaminate the air and are suspected of transporting various disease organisms in much the same way as flies. Their presence increases asthma problems. They feed normally in packs, or aggregations.

On 12/8/06 The Washington Times ran an article entitled Fighting Roaches a Losing Battle. University of Florida scientists suggest mankind can never win the war against German cockroaches, as the hated household pests become resistant to new poisons almost as quickly as the products are produced. "Whatever (pesticide) you throw at them, they have an amazing ability to quickly adapt and overcome adversity," said Phil Koehler, entomology professor at the university's Institute of Food and Agricultural Sciences. **So stop using any/all of these dangerous synthetic and ineffective poisons and actually control roaches and other pests with the Author's safe and far more effective alternatives.**

Note: There is a difference of opinion on the classification of cockroaches. According to many experts, cockroaches belong to the insect order Orthoptera, yet other experts consider cockroaches and praying mantids to belong to a separate order, the Dictyoptera, still others say Blattodea is the correct order but, however you classify them scientifically, almost everyone seems to agree they are considered to be our main insect pest, and a continual source of concern and embarrassment for many people!

Cockroaches will eat virtually anything: sweat, fingernails, glue, grease, paper, soap, paint, each other - anything! They taste with their feet. Most cockroaches are fond of fats and flour, German roaches prefer brown sugar or light Karo Syrup to pure sucrose and carbohydrates to proteins. They also love bread, stale beer, wine, fatty acids, alcohols, e.g., Jack Daniel's Whiskey, peanut butter and are attracted to ground up roaches and their own excrement. Remember this when you mix up your boric acid/sodium borate or food-grade DE baits; **be careful to put them out of the reach of pets, children and wildlife.**



Cockroaches have changed little since they first appeared on earth, as evidenced by their fossil or amber records. Most are tropical or subtropical in origin. They are commonly found in groups and will eat virtually anything. If a man could run as fast as a roach (3 mph) he could run 98 mph! A cockroach can make up to 25 body turns a second the highest known rate in the animal kingdom. See <http://www.hort.uconn.edu/ipm/homegrnd/htms/roachpic.htm> and <http://www.uri.edu/ce/factsheets/sheets/cockroaches.html>.

The general shape of the cockroach is recognized by almost everyone. Cockroaches are oval and flat-bodied which enables them to squeeze into cracks and crevices (including a few ears) and makes it very difficult to seal off all of their hiding areas. A pronotum (a shield-like covering) projects forward over the head. Their long, spiny legs enable them to run very quickly over most surfaces. Domestic cockroaches come out of their (dead air) harborages at night, (only) when there are no fans or air movements from people or from open doors - when a blast of air hits them they can move out of the area at bursts of speed of 200 m.p.h.! Cockroaches have special brain cells to help them run at incredible speeds, e.g., 40 body lengths per second, or at least 10 times faster than human runners, but they spend 75% of the time resting.

The National Pest Control Association 1997 membership survey ranked German cockroaches at 96 based on 100 maximum- its closest competitor the Subterranean termite was only ranked at 80 - obviously we know, the German cockroach is our most economically important building pest. German cockroaches are tan to light-brown to medium-brown in color with two dark stripes down their backs and are about a half-inch long. German cockroaches are nocturnal (active at night) and stay in the dark whenever possible - they rarely fly and prefer dark, moist areas with temperatures warmer than 80°. They prefer secluded locations where they have a surface above and below their bodies including cracks, paper bags, kitchen equipment and cardboard. They are usually found in moist areas such as kitchens and bathrooms. Female (gravid) German cockroaches will not forage (move about) or feed when pregnant - nor will molting German cockroaches move about or feed during the last 1/3 of their instars. **We also know that continually spraying dangerous, volatile, "registered," synthetic pesticide poisons does not and will not ever eliminate or even "control" them.**

Frequently the presence of cockroaches may be detected by the damage they do, by the distinctive odor they give off or by the fecal matter ("frass") they have deposited. Cockroaches may utilize such things as glue, paste, starch and certain color dyes as foods. As a result, such things as stamps, envelopes, book bindings, boxes, draperies and certain wallpapers may show signs of feeding. However, the greatest economic loss from cockroaches is a result of their habit of feeding in libraries, stores, markets and storage areas, etc. In addition to contaminating everything with their vomit, excrement and secretions, roaches also carry the filth from sewers and garbage disposal sites to your dishes and to your food supplies with far more being contaminated and destroyed than is eaten, so practice proper sanitation by keeping food properly sealed or stored in the refrigerator. Keep trash covered. Wash dishes, cans, jars, bottles, cans and mop up spills promptly. Do not allow dirty dishes to accumulate. Clean frequently all surfaces and under refrigerators and stoves where food scraps and crumbs may accumulate. Let the fans run 24 hours a day. Eliminate hiding places such as piles of newspapers, boxes and papers. Caulk cracks and crevices. Use tight-fitting screens. Do not leave pet food or water out overnight. Repair water leaks and sweating pipes. Remove clutter where roaches live and hide. Drop the temperature as often as possible. Steam clean or power wash or at least routinely spray and/or clean with Safe Solution Enzyme Cleaners with Peppermint and/or with borax. Thoroughly inspect and pinpoint all harborages, use blunder or better still install pheromone monitoring traps which not only monitor roach infestations, but if properly used can actually control them. Suspend full pheromone traps over sticky rat traps or rat mats or bowls of diluted Safe Solutions, Inc. enzyme cleaners. You can also make a 2-liter (wasp) trap, put Vaseline® over the area the cap normally screws down onto, invert the "funnel" and then bait with kibble and the pheromone attractant, and seal with duct tape.

Intelligent Pest Management®

1. **Sanitation.** Routinely clean with Safe Solutions Enzyme Cleaner with Peppermint.
2. **Use boric acid or talcum powder or baking soda or Comet® or food-grade DE.** Boric acid is a least-toxic pesticide is available as a general use insecticide. It is excellent in controlling cockroaches and is relatively safe for children, pets and the environment if it is carefully used according to directions. Apply boric acid or, better yet, talcum powder behind walls as a light layer in out-of-the-way areas - under stove and refrigerators, behind the bathroom vanity, within 10 feet of a water source that is dark and warm or inject it into harbor ages. Mix 5% or less boric acid or 2% or less of sodium borate or 4% food-grade DE into a preferred food source such as light Karo® syrup, flour, beer, peanut butter, wine, dough balls, etc.

and colored red, but be very careful to place these poisonous baits where children, pets and/or wildlife cannot reach them. Routinely clean with Safe Solutions Enzyme Cleaner with Peppermint and/or sodium borate or 20 Mule Team® Borax, http://www.dialcorp.com/index.cfm?page_id=56. Spray Not Nice to Bugs®.

3. **Remove food sources.** Remove all possible food sources that contain high levels of starch and water, e.g., potatoes. **Sanitation is 85% of controlling roach infestations.** Date and rotate all stored products. Properly store all food and garbage.
4. **Baits** - may be the simplest way to control roaches, but they do create other problems, e.g., asthma problems and odor/sanitation problems. Set out dry cement and water; the roaches will ingest both and die. Baits are discussed later in the chapter, and also may be used to attract roaches to traps. You can also use pheromone traps or roach excrement to attract roaches to your baits. Try aspartame/beer baits.
5. **TRAPS - Sticky Traps with Boiled Raisins.** Boil a handful of raisins for one to two minutes and place three or four in the center of a sticky glue board or double-sided carpet tape. The smell of the starch, sugar and free-moisture will lure these pests to their death. Put pheromone traps down. When filled put the filled trap's pheromone piece on a rat board or mat or suspend it over diluted enzyme cleaner. Take any jar with a rounded lip - cover the outside with a paper towel or masking tape etc.- grease the upper inside lip with a thin layer of Vaseline® or petroleum jelly. Put the jar against an inside wall or inside a cabinet or wherever you have seen roaches - bait with a piece of beer soaked bread, dog kibble, etc. To kill the trapped roaches simply pour in hot soapy water or freeze. Traps are also discussed later in the chapter. Try aspartame and beer baits.
6. **Fill a baby-food jar with 1/2" of beer and some pieces of bread or wine and/or raw potato and/or dog kibble.** Wrap the exterior of the jar with masking tape to give the roaches footing to climb up and then spread a thin layer of petroleum jelly along the inner upper inch of the jar so they can not escape. They will crawl in and die/drown. You can also pour in hot soapy water or freeze the trapped roaches.
7. **Roaches die at 23° F. and prefer temperatures over 80° F.** If the weather permits, leave suspect products and household goods in a car trunk or other outdoor secure areas overnight or longer, this also controls silverfish, clothes moths and Indian meal moths or store them in walk-in freezers or refrigerated trucks. **Routinely lower the temperature.**
8. **Vacuum at night** with red or yellow lights and/or use aerosol cans of air to "flush" them out. Start 1 hour after dark and continue until no more roaches are seen - caulk all "active" cracks. Come back at weekly intervals and revacuum until no more pests are seen, or blast them with air and vacuum them during the day, caulking as you go. This is the safest and quickest way to control roaches and many other pests, and you do not have to breathe any more dead insects. **Caulk or fill with foam any areas where you saw activity.** Spray Not Nice to Bugs® as needed.
9. **Install fans and dehumidifiers** and properly maintain - most roaches hate dry conditions and moving air, so leave fans run 24/7. Use a hair dryer for spot treatments.
10. **Safe Solutions, Inc. Enzyme Cleaners** - Routinely clean and flood drains with Safe Solutions Enzyme Cleaners. **Spraying roaches with diluted enzyme cleaner quickly kills them.**
11. **Prevention** - Inspect grocery bags, cardboard boxes, drink containers, used furniture and appliances before bringing them into your building. We have controlled roaches by simply unpacking supplies outside the building before bringing them inside and by properly installing negative ion plates inside the building. **Caulk, seal and install doorsweeps. Remove all cardboard and paper bags. Clean with enzyme cleaner and/or borax. Repel them with garlic, cedar, catnip or citrus oils, bay leaves, sage, Japanese mint or Scotch spearmint.**
12. **Caulking** - Seal all visible cracks (or anywhere you can slide a business card); seal or remove all loose vinyl cove base molding, mop boards and/or trim; fill all openings with foam. (Remember, however, normally there are less roaches in drafty homes as in tightly sealed homes.) **So caulk and turn on several fans!**
13. **Sanitation**- A very small amount of food and water will supply a large colony of cockroaches. Promptly clean up all spills, repair leaking plumbing and properly store human and pet food in sealed containers and/or refrigerators. Add Safe Solutions, Inc. enzyme cleaners to all of your drains, sewers and grease traps on a monthly basis. Develop and maintain a regularly scheduled cleaning program using diluted Safe Solutions, Inc. enzyme cleaners/borax.
14. **Eliminate all visible sources of food and water as soon as possible.** The poorer the sanitation the greater the number of roaches in the building.
15. **Cleaning**- Routinely clean and mist with diluted Safe Solutions, Inc. enzyme cleaners. Your initial clean-out would be best achieved with a power washer and enzyme cleaner - You will not believe the instant

pest control and cleanliness you will achieve! Do not forget to actually move appliances, stored items, pallets, tables, etc. and thoroughly clean them and the areas under all of these objects.

16. **Habitat reduction-** Properly install dehumidifiers, air conditioners, fans, caulk and seal all cracks and crevices. Remove all newspaper and magazine piles, grocery bags and all cardboard boxes. Remove refrigerator fiberglass insulation by the motor and condenser. Reduce the amount of cardboard, fill all hollow frames and/or legs. Trim all branches that touch or overhang the building - add diluted Safe Solutions, Inc. enzyme cleaners to all drains monthly. Cockroaches like to eat bird droppings because of the seeds, so remove all bird droppings. **Remove all conditions conducive to cockroach infestation.**
17. **Temperature & Humidity-** Routinely lower the temperature as low as possible and properly maintain and use dehumidifiers and fans. Repair all leaking plumbing and other moisture problems as quickly as possible. Treat all cracks and crevices with hot air from a hair dryer or tile softener - be careful not to start a fire and/or blister paint. **Drop the relative humidity to 45 or less and you control the roaches.**
18. **Inspection & Monitoring -** Routinely (get on your knees and/or back and) inspect under all objects, install pheromone or at least blunder sticky traps or double-sided carpet tape in all suspect areas, check the entire area at night with red or yellow lights and mirrors at least once a month. **Flush them with a simple blast of air.**
19. **Floor Drains - All floor drains should be routinely flooded with diluted Safe Solutions, Inc. enzyme cleaners** to clean them and kill all roaches. If possible install a floating tennis ball in the drains so that sewage can pass down, but roaches cannot pass up. Be sure the traps are filled with water to inhibit roach entry. If you are concerned *someone* will forget the above maintenance procedures have screens made for the drains, construct a sleeve of screening that fits down into the drain. This creates more surface area for the water to pass through, but be sure to clean the screens/sleeves *occasionally*.
20. **Airflow -** Roaches hate air movement, so turn some blowers and a fan or two (24/7). They are also repelled by light and temperature extremes and dry, dusty conditions.
21. **Carpet or Duct Tape -** Put out double-sided carpet tape or duct tape (sticky-side up) to trap roaches; the more you use, the more you will catch. Hold the edges down with masking tape.
22. **Barriers -** Roaches can not cross Vaseline or Teflon.
23. **Don't forget to bait** all edges, corners and other areas where roaches live and travel. Make some "luxury apartments" for them - insert toxic baits into (damp) rolled cardboard or folded cardboard so they can feed and hide comfortably. Increase the effectiveness of your *mansion* and/or baits using cockroach droppings (excrement) and/or ground up roaches - use "homemade" baits with aspartame or with less than 5% boric acid or 2% or less sodium borate. Try light Karo Syrup or honey with a non-volatile boron product or 3% food-grade DE in red packing slips secured in out-of-the-reach places at a 45° angle. Be careful!

Young or immature cockroaches resemble adults (that is, they undergo gradual or simple metamorphosis) and have similar feeding habits. Adults of many species have wings, but most species do not really fly; and all immature roaches or nymphs are wingless. Cockroaches are considered major pests of schools, homes, restaurants, hospitals, warehouses, offices and other structures, especially those that handle food and provide warm, moist, cracks and crevices. These insects can contaminate food and eating utensils, destroy fabric and paper products, and impart stains and odors to surfaces they contact. **While in the egg stage cockroaches are all immune to all volatile, synthetic pesticide poisons.** Cockroaches have been found all over the earth in every kind of building, shelter, cave, mine, pit, nest, in basements, ducts, telephones, sewers, radios, televisions, computers, planes, ships, boats, microwaves, septic tanks, walls, musical instruments and even a few ears! For immediate removal, suck up all visible roaches, their egg cases and the food particles they feed upon with a vacuum cleaner with some corn starch or, better still, a rinse-and-vac with some enzyme cleaner. Dry things out with a hair dryer. Mix equal parts of oatmeal or flour with plaster of Paris or hydraulic cement or baking soda and powdered sugar and carefully spread around infested areas. Cockroaches, especially species like the American cockroach that can and do live in direct contact with human feces, may carry and transmit pathogenic bacteria responsible for food poisoning, such as *Salmonella* and *Shigella*, and viral hepatitis organisms. German cockroaches are also believed capable of transmitting *staphylococcus*, *streptococcus* and *coliform* bacteria and are known to be responsible for many allergy and asthma problems. In addition, German cockroaches have been implicated in the increase of asthma and the spread of typhoid, AIDS, dysentery and leprosy organisms. Cockroaches have caused fires by chewing through electrical wiring in computers and television sets. **Cockroaches have destroyed computer discs and tapes and their body fluids can corrode metal. A cockroach will fart about every 15 minutes.**

Living roaches, dead roaches, roach feces, saliva, cast skins, cockroach eggs and their decaying body parts all contain allergens, can contaminate the air with aeroallergens and cause allergic reactions in people. Asian and German roaches harbor more than 25 human pathogens which they normally transmit via their fecal material. **Almost 40% of the U. S. population is allergic to various cockroach allergens.** The more common disease pathogens include bacteria in the genera *Salmonella* (food poisoning), *Staphylococcus*, *Streptococcus*, *Coliform*, *Bacillus* and *Clostridium*, the bacterial *Escherchia coli* (diarrhea) and *Shigella dysenteriae* (dysentery), the protozoan-caused parasitic toxoplasmosis, several parasitic worms, fungi, and infectious hepatitis B antigen. Other known diseases given us courtesy of the cockroach include wound infections, cholera, gastroenteritis, typhoid, respiratory infections, leprosy, gangrene, pneumonia, plague and polio. Recently, a Pasteur Institute report indicated that proviral DNA, homologous to components of human immunodeficiency virus (HIV), the causative agent of the acquired immune deficiency syndrome (AIDS), has been isolated from the genome of American cockroaches in Central Africa, where the disease is epidemic. SARS may be spread by cockroaches. More than 3,000 children in the U. S. die every year from bronchial asthma and the morbidity and mortality of asthma has increased within all groups of asthmatics in the U. S. every year since 1979. Of the 10 to 12 million Americans who suffer from this disease, more than 6,000 die each year. The populations in which asthma has shown the greatest rise are African-Americans, Latin-Americans and inner-city children. There is a 2-month lag between maximum roach build-up and maximum airborne allergen counts. Threshold asthma sensitization levels have been estimated at only about 80 ng per gram of house dust (1 ng = 1 billionth of a gram)! To kill the roaches will obviously not solve the asthma problem; they must be prevented or trapped or vacuumed or repelled or removed in some manner. I believe volatile, synthetic pesticide poisons and cockroach allergens are the main asthma triggers - so vacuum up roaches at night using red or yellow lights with water vacuums, rinse and vacs or dry vacs equipped with HEPA filters (with a little cornstarch in the bag), use negative ion plates and clean (routinely) with Safe Solutions, Inc. Enzyme Cleaner or any of their soaps and/or borax. It should now be obvious that it is insane to continue to kill roaches and leave them to decay to add to the allergen problem. Try the dust mite window fan suggestion of taping 2 activated charcoal filters to either side of a window fan and turning it on to filter the air or use a HEPA air filter to lower the allergen levels of your building. **Never kill cockroaches inside a building where people have allergies; either vacuum them up and/or trap them or you will make their allergies worse.**

Cockroaches (their saliva, fecal material, cast skins and decaying bodies) are the main cause of child asthma in cities. Dr. David L. Rosentreich of Albert Einstein College of Medicine in New York City, lead author of a major study, found that cockroach allergens are the most common trigger of inner-city asthma, and children who live in roach-infested homes have the most severe cases. Dr. Rosentreich estimates that cockroach allergens cause about one-quarter of all asthma in inner cities. Parts of the study, called the National Cooperative Inner-City Asthma Study were reported by the Associated Press in June, 1996 after they were reported at medical meetings. Details of the work are being published in the 1997 New England Journal of Medicine. **It is estimated that over 50% of inner-city asthmatic children are sensitive to cockroach allergens.**

Cockroaches give off proteins, mainly in their saliva and droppings, that trigger strong allergic reactions. **But never forget that dead roaches contain proteins that can cause asthma when they are inhaled. There is a time lag between maximum roach populations and maximum allergen levels.** In roach infested apartments, these so-called antigens are densest in the kitchen, but they get tracked into other rooms and become ground into rugs and furniture. "In a place that is infested, there is cockroach antigen all over the house," said Dr. Peyton Eggleston of John Hopkins University, another of the researchers. "You will find appreciable levels in the bedrooms and the beds, even though they are about 10 times lower than in the kitchen." **If you vacuum them or trap them you will not allow them to decompose in your home.** Yet the Author was not allowed to train the New York Housing Authority on how to safely and far more effectively control cockroaches and their allergens free of charge.

The study was conducted on 476 asthmatic children who were drawn from a larger sample of 1,528 youngsters living in New York City, St. Louis, Baltimore, Chicago, Detroit and Washington, DC. They found that half of the children had high levels of cockroach antigens in their bedrooms. Overall, 37% of the children were allergic to cockroaches, 35% to dust mites and 23% to cats. Children who were both allergic to cockroaches and exposed to high roach levels in their bedrooms were three times as likely as other asthmatic children to need hospitalization for their condition, and they made twice as many unscheduled doctor visits. **Remove the roaches with vacuums and install air filters. Clean with Safe Solutions Enzyme Cleaner with Peppermint and protease enzymes which eat proteins.**

Description and Overview - The cockroach is oval in outline, body usually flattened, head partially or entirely concealed beneath its pronotal shield (expanded pronotum). Its front wings are leathery with veins, although the veins may appear to be reduced. Its antennae are long and threadlike. The abdominal cerci are usually long, not forceps-like. The cockroach's tarsi is 5-segmented. Its mouthparts are adapted for chewing. It is vitally important for you to be able to correctly identify the exact species of cockroach that is causing you a problem. (Note: While the U. S. hosts about 70 roach species, only those I have described are considered to be significant pests.) You must also be familiar with each species' behavior and food preferences because each species has peculiar habits that influence the type of correct IPM controls and methods used and locations where these control efforts should be directed and/or intensified. For example, you may install negative ion plates, but always remember routine sanitation (removal of all food sources) should be an ongoing process. Roach traps may be commercial or homemade, e.g., prepared by setting quart or pint jars against walls containing 2" of beer or a solution of 10 parts water and 1 part molasses; taped on the outside so the roaches can crawl in and down. Baited sticky traps can aid in monitoring problem areas. Baits can be used in these problem areas or vacuums. Never forget to caulk or seal all cracks and crevices, hollow legs and/or frames, holes and entrances around pipes and wires, especially in kitchens, bathrooms and laundry areas. **Clean with diluted Safe Solutions, Inc. enzyme cleaners and borax.**

Cockroaches are nocturnal. They hide in dark, warm areas, especially narrow spaces where the surfaces touch them on both sides. Cockroaches tend to congregate in corners and generally travel along the edges of walls or other surfaces. Periods of greatest activity differ greatly depending on the species. For instance, brown banded cockroaches exhibit their peak activity in the middle of the night, while German cockroaches begin moving about within 1/2 hour after lights are out. Before turning on the lights, use a flashlight with a red or yellow lens to find the pests crawling around in the open. Roaches are not sensitive to light in the red or yellow spectrum, so use the *red or yellow* light to spot these pests and then vacuum them up. Remember, certain life stages may be hidden, e.g., gravid females and nymphs in the last 3 days of their instars, so conduct routine nocturnal *raids*. American cockroaches usually are found living in food-storage areas, basements, steam tunnels and sewers, they prefer fermenting foods, and usually enter a building in via the sewers, or occasionally by migrations. In contrast, Australian cockroaches, which are very similar in appearance, prefer to eat plants but otherwise occupy habitats similar to the American except for sewers, prefer new plant shoots or starchy materials, and are usually brought into a building in potted plants. Therefore, if drains (sewers) and outside areas are not inspected for American cockroaches, or plants for Australian cockroaches, the chance of controlling or eliminating your cockroach problem is greatly reduced. Although the German cockroach is usually the most common roach, it may be possible for a building to be inhabited by more than one cockroach species. Successful management depends on correctly identifying all the species involved and then selecting methods of control that are effective against these species. You must also change the conditions that attracted and favored the infestations in the first place. Several species of wasps, spiders, gecko lizards and the house centipede are predators of cockroaches inside; that is, if you don't mind their "help".

Carefully inspect all areas to locate all of the cockroaches - don't forget to inspect inside hollow legs and frames, electrical junction boxes, steamers, appliances, conduits, false ceilings, drains, wall voids, serving carts, mirrors, boxes and tables, cardboard and behind all wall hangings. Nighttime surveys are preferable as cockroaches are usually nocturnal (active at night). Use a flashlight with a red or yellow lens, a Phillips and flathead screwdriver and a mechanic's or dentist's mirror and search in cracks, under, on top of and around all appliances, outlets, shelving, tables, walls, cabinets, counters, pallets, moldings, around water heaters, and in all other dark locations that may harbor pests. Look for live and dead cockroaches, cast skins, egg capsules, and droppings, all of which aid in identification. Don't forget to use your inspection mirror to observe the back sides of cabinets, shelving, appliances, pans, etc. and inside the legs of all appliances and shelves. Use sticky traps or jar traps, or you can use double-sided carpet tape or duct tape (sticky-side up), to monitor cockroach activity and capture specimens for identification; place traps along walls and other areas where cockroaches are known to travel. Traps must be placed right next to walls, appliances, cabinets and other objects or in intersections for maximum effectiveness. Cover the exterior with a dark man's sock or masking tape so they can climb up easily. **Count the roaches in each trap every 24 hours and then thoroughly investigate the areas where they are hiding.**

Pay particular attention to upgrading cleanliness and maintenance in high roach population areas. Remember that during the day they hide in cracks and crevices, insulation, paper bags, bundled newspapers, pallets, unpainted wood, folded cardboard and other clutter - virtually anywhere that two or more sides of their bodies can touch a surface. If a thorough inspection fails to produce results, an aerosol can of air for flushing or cleaning

with diluted enzyme cleaner with peppermint may help to dislodge any hiding roaches so they can be captured and properly identified. **Remember to carefully record all signs of activity.**

Once the species is correctly identified, begin to plan your control strategy. Map all problem locations of suspected or actual infestation and concentrate your initial control measures on these areas. Your Integrated Pest Management (**IPM**) program should only include nonpoisonous methods such as Safe Solutions Enzyme Cleaners with or without Peppermint, caulking, traps, sanitation and exclusion whenever possible because volatile, synthetic pesticide poisons applied without attention to sanitation are never even temporarily “successful” and are always dangerous to the health of the *other* occupants. Good housekeeping can do much to control cockroaches, especially the careful storage of food, the removal of paper bags and cardboard and daily cleanliness with diluted enzyme cleaner that will prevent the accumulation of even the smallest amounts of food, grease or waste materials.

Sanitation - Eliminate clutter - especially corrugated cardboard, paper and/or plastic grocery bags - which provide hiding/nesting places for roaches. Closely inspect all incoming merchandise, especially groceries and drink cartons for roaches and their egg capsules before bringing them inside. Use a caulking gun to seal all crevices and/or cracks where roaches hide. Hold the gun at a 45° angle to the crack to force caulk into the crack. The caulk should completely fill the crack and adhere firmly to both sides of it. Release the trigger just before reaching the end of the crack. Moisten your finger with soapy water (for latex caulk) or mineral spirits (for other caulks) and smooth the caulk. The limiting factor in the size of a cockroach population is the amount of shelter you leave available; cockroaches favor cracks and voids, spending 70% - 80% of their time resting in these dark harborage. The largest cockroach populations are those with innumerable cracks due to poor construction or maintenance. Sealing cracks and holes should be done wherever possible. Immediate removal of other harborage, such as infested cardboard boxes, paper, rags and other debris, is also helpful. To get a jump start on control and sanitation, use a power washer with enzyme cleaners or soaps in all infested areas you can safely use water. Routinely clean with diluted Safe Solutions, Inc. enzyme cleaners, eucalyptus or peppermint soaps, Mop Up®, borax and/or disodium tetrahydrate octoborate. Use silicone caulk with the odor (if no one is sensitive).



Eliminate all visible sources of food and water as soon as possible. Remember, the poorer the sanitation the larger the number of roaches in a building. Food should be stored in refrigerators, freezers and/or roach-proof containers such as glass jars or sealable plastic dishes. Keep garbage and trash in containers with tight-fitting lids. Daily remove debris, trash, newspapers, rags, paper bags, boxes, and other clutter that provide hiding places and harborage. Eliminate plumbing leaks, e.g., pipes and faucets, and correct other sources of free moisture, e.g., roof leaks, sweating pipes, unscreened drain and sewer openings. Increase ventilation where condensation is a problem. **Note: One leaky faucet can waste 6,000 gallons of water per year.** Vacuum all cracks and crevices to remove debris, roaches, egg cases and food. Then caulk thoroughly. Be sure surfaces where food or beverage spills have taken place are cleaned up immediately. Never leave food or drinks exposed overnight. The more food deposits, debris and excess water left overnight the larger the potential size of your roach problem. Trim shrubbery around buildings to increase light and air circulation, especially near vents. Routinely remove trash and stored items around the outside of buildings that also provide hiding places for cockroaches in the warm months. Properly install screens, weather-stripping and self-closing doors with doorsweeps at the bottom. Adhesive sticky traps are commercially available or you can make your own from equal parts of sugar, corn syrup and water; boil the ingredients together and spread the sticky mixture on brown or yellow paper or pour the mixture into slightly opened match boxes and place in dark areas, e.g., under the sink. Biological control through the use of insect parasites such as wasps or mites and/or the use of its natural enemies/predators, e.g., frogs, gecko lizards, toads or spiders, has shown little real promise for total indoor elimination. Note: Borax cleaners or Mop Up® disodium tetrahydrate octoborate solutions when used according to the label directions actually turn all minute food particles into “baits” and quickly remove all pest problems, but be careful to make sure that people, pets and/or wildlife cannot also eat these toxic baits.

Baits - Put 5% or less boric acid and/or better yet 2% or less disodium octoborate tetrahydrate or 3% food-grade DE or aspartame in anything roaches will eat or drink; mix in a little of their excrement and/or pieces of their dead *buddies* and put them in red containers or red packing slips and you have a bait they will run to; color the bait red to alert people that it is poison and attract the cockroaches. If you simply wet mop the floor with

Mop up[®] or with 1 cup of borax per gallon of water all of the scraps and *food* e.g. grease still left on the floor is now *poisoned bait* and all insects (ants, roaches, etc.) who feed on these materials are all quickly controlled. By the way, an irresistible cockroach bait selection would include white bread, cinnamon rolls, beer, fast food hamburgers, stamp glue, toothpaste, dead roaches, roach droppings or excrements, cheese, canned or dry dog food, bananas, grits, pizza crust, pizza sauce or some combination of these items or the trap choices that follow. Traps and baits should be placed inside or within a foot of all harborages and travel routes you or anyone has observed. **Reapply all baits as soon as they are eaten or drunk.**

Traps - can also be made by taking a 2-liter bottle, cutting off the top, putting Vaseline[®] on the inside edge of the bottle, inserting the inverted top upside down (so it looks like a funnel), taping the exterior edge and/or using an empty Mason jar and painting either exterior flat black or covering either with masking tape or stretching an old man's dark (red especially) sock over the exterior and then smearing the clean inside rim of the jar 1" - 2" wide (so your *prisoners* can not escape) with a thin band of petroleum jelly. Bait either with small amounts of dry dog food, a sliced potato, onion, apple, banana, boiled raisins, some distiller's grain, bacon fat, lamb fat, a slice of bread, beer, beer-soaked bread, a drop or two of anise extract, or some combination of the above or some of the previous bait choices. Wherever you have seen roaches, you may set your traps upright against the corners of the walls of those rooms or under the sink against the walls there. After a successful trapping expedition, cover the jar or bottle with a lid, plastic or aluminum foil and place the jar and its contents upright in your freezer; after a day of freezing dispose of the frozen victims by flushing down the toilet or simply drown them in very hot, sudsy water and then flush them away. Traps are useful in detecting potential problem areas before there is a population explosion there; to locate current problem areas or hiding places and even to reduce or help control roach infestations. **Traps or double-sided carpet tape or duct tape (sticky-side up) placed only 3/4" away from walls or other vertical surfaces caught about half the roaches that traps or carpet/duct tape placed flush against the walls.** Adults can live in a trap for 7 - 10 days and nymphs can stay alive for 2 - 4 days. Try pheromone traps to inspect, monitor and even control roaches, but remember **some health inspectors will not understand that a trapped roach is a good thing and may simply think you are "infested", so routinely remove all traps that have caught roaches.**

False-bottom cupboards, hollow walls, unpainted wood, pallets, cardboard and similar areas are common refuges for cockroaches. In locations where these conditions exist, and where cockroach populations are high and difficult to control, remodel these areas to permanently eliminate the infestations hiding places. If remodeling is too costly or impractical, drill and treat these areas (including concrete block walls) with inorganic dusts such as Comet[®], food-grade diatomaceous earth, silica gel or boric acid powder. Boric acid powder has been shown to be less repellent to cockroaches than silica gel, but diluted Safe Solutions, Inc. enzyme cleaner will kill them on contact and then dry, leaving no (apparent) residue; never use a dust in any false ceiling. The presence of water pipes inside wall voids really aids the growth of a roach infestation. Next to wall voids, electric conduits and junction boxes are the second most important source of hidden cockroach infestations. Conduits serve as *cockroach highways*; they give excellent access routes to other areas in a building. Also inspect behind all false ceilings (if cockroach activity is found there, you can either remodel, trap or install "permanent" fans to blow above the false ceiling until no roach activity is found here). Then drill and inject dusts and/or diluted Safe Solutions, Inc. enzyme cleaner into these other areas. Note: Even an "empty" pop or beer can (without a drop of enzyme cleaner) can provide enough food and water to nourish them for weeks!

Exclusion. If roaches are migrating into a building from outdoors, seal all visible cracks and other openings to the outside. Look for other methods of entry, such as from items brought into the building. Look for ootheca or egg cases glued to undersides of furniture, in refrigerator and other appliance motors, boxes and other items. Locate cracks and/or hidden areas inside the treatment area where cockroaches can hide; seal these with caulking. Routinely add enzyme cleaner to the drains or put a tennis ball in the floor drains to keep them out. **Draw a line of petroleum jelly or sprinkle Comet[®], talc or medicated body powder or food-grade DE to exclude them.**

Pets - Pets such as birds, guinea pigs, rabbits, gerbils and hamsters can contribute greatly to roach populations. Birds are especially troublesome because they scatter seed and/or debris outside their cages. Keep pets in pest proof containers or cages or roaches will enter their cages to get food and water. Store **all** pet foods on pest proof containers.

Vacuums - One hour after dark and/or after the lights go out - re-enter using only red or yellow lights (or a blast of air to “flush” them) - vacuum up all the roaches you see with a vacuum or rinse and vac - put talcum powder or cornstarch in the dry vac about 1 teaspoon full and soapy water in the rinse and vac. **Do not let the wind disturb the cockroaches.** Do this once a week until you see no further activity. The red or yellow lights will not make the roaches run - you should be able to “pet” them - if they do try a different red or yellow light. This is the safest and quickest way to control roaches and many other pests - and you do not have to breathe anymore dead roach parts! **Caulk or fill any areas where you saw activity.**

Individual Control - Don't be afraid to simply squash it with a paper towel or soapy sponge or step on it or use a fly swatter on a survivor or intruder. Thoroughly and routinely vacuum under furniture, appliances, in drawers, cracks and crevices, etc. - dispose of the vacuum bags properly. Caulk all cracks, crevices and other openings. Routinely steam clean infested appliances, garbage receptacles and chutes and furniture with enzyme cleaners or soaps. The key to eliminating roaches is to find and vacuum all active harborages and then caulk and seal these areas. Use bait stations inside computers, appliances and machines is so labeled. If new cockroaches are being introduced on a regular basis, use baking soda, borax, pheromone traps or least-toxic (nonvolatile) baits. But, quite often the *carried-in* roach is only a male or at best an unpregnant female - pregnant females are more apt to hide and do not normally move about, so do not panic when you see one roach - there may not be *millions hiding somewhere* in your home. **Put out a pheromone trap and see if and where you really have a problem.**

Stations baited with molds, e.g., *Metarhizium anisopliae* (Strain ESF1), hydramethylnon, boric acid or avermectin and sticky traps are manufactured as plastic or cardboard units that contain an attractant. Cockroaches enter the bait station or trap through small openings. Traps and bait stations have the advantage that use stomach poisons, molds, insect growth regulators (IGR's), etc., can be confined to a small area rather than being generally dispersed. First try food and/or water prepared with boric acid and/or sodium borate. Keep all baits out of reach of kids, pets and/or wildlife. Daily spray if all else fails with diluted Safe Solutions, Inc. enzyme cleaners and/or eucalyptus or peppermint soaps where it is not possible or desirable to apply boric acid or borax. IGR's are synthetic versions of the juvenile hormones insects produce to supposedly regulate their growth or development from their immature to adult stages. Glenn Gordon has found these materials are ineffective and has seen roaches develop from *sterile* egg cases and the “twisted” offspring can walk over bands of petroleum jelly. There is also some concern IGR's may cause tumors in humans, so we don't advise their use.

Avermectin, an extract from the naturally occurring soil microorganism *Streptomyces avermitilis*, is an effective, relatively fast-acting pesticide bait. It supposedly has a relatively low toxicity to mammals, but it is currently a restricted-use pesticide poison that can be applied only by a commercial pest control operator. Avermectin works both as a lethal internal toxicant and as a contact insecticide. When roaches groom themselves, they ingest the bait, which takes a week or longer to kill 70% to 90% of the roaches, and up to 12 weeks to produce 100% kill. This high degree of effectiveness, coupled with the small amount of toxin required when applied as a bait in cracks and crevices, makes avermectin a valuable control alternative. If you use this product use thin applications of the gel formulation, but if it is still drying out - switch to Maxforce® Gel. <http://www.pctonline.com/msds/msds/maxforce/MaxGranInsctBait10Msds.pdf> **Remember, any “registered,” synthetic pesticide poison use should be made only after all other alternatives have failed.**



Hydramethylnon is a slow-acting stomach poison that must be ingested to be effective. Roaches die within 48 - 96 hours after feeding on the bait. Hydramethylnon has a relatively low toxicity to mammals, and is packaged in small, square plastic discs or bait stations, if properly placed, that reduce the possibility of access by children or pets. The discs come with a double-sided tape so that can be glued to various surfaces out of view, which further reduces the likelihood of contact. The tape also facilitates placement of the bait stations on the back of and the undersides of kitchen drawers, and other surfaces where roaches hide or travel. Like traps, the bait stations are most effective when placed on the edges of walls or corners of rooms where roaches travel. Place them near known roach harborages, drains, sinks, or other possible sources of food or water. **Remember, any “registered,” synthetic pesticide (poison) use should only be made after all other alternatives have failed.**

It is a fact that cockroaches generally become resistant to or simply avoid dangerous deposits of volatile, synthetic pesticide poisons, so they do not work and are dangerous - why use them?

Carbon dioxide fumigations - Cartons of roach-infested belongings can be sealed in plastic bags and fumigated with carbon dioxide gas or dry ice or simply placed in a freezer or *reefer* truck for several days.

One nonvolatile boric acid bait, e.g., NiBAN Granular Bait®, (http://www.nisuscop.com/pdf/products/niban40lb_label.pdf) is a weather-resistant bait for the control of cockroaches, that can be used inside and out. (Active Ingredient: Ortho Boric Acid 5%) It is labeled to control crickets and the following cockroaches: Asian, American, Brown-Banded, Smokey Brown, German and Oriental: For the control of Asian Cockroaches on lawns, ornamental turf, playing fields, parks and areas adjacent to households or public facilities, use a mechanical spreader to apply bait evenly to lawns and playing fields at a rate of 2 pounds per 1000 square feet or 90 pounds per acre. Scatter bait evenly in flower beds, leaf litter, in trash cans or refuse areas. For perimeter treatments, spread bait at a rate of 6 ounces per 100 square feet in a band at least 2 feet wide around foundations, patios, driveways, sidewalks, entrances to homes and buildings or other areas where roaches are present. Apply around landscape lighting, floodlights, streetlamps or other exterior fixtures.

For the control of cockroaches and crickets in and around homes, hotels, apartment buildings, stores and restaurants (non-food areas), warehouses and sewers: Apply NiBAN® at the rate of 4 pounds per 1000 square feet (6 ounces per 100 square feet) of surface area. Spread evenly in crawl spaces, attics, drop ceilings, cellars with dirt or gravel floors, In warehouses, garages and basements, concentrate application along walls and baseboards. Apply in inaccessible areas such as cracks and crevices where insects may hide. Bait may also be placed in removable trays. Locate trays in areas accessible to insects but away from children and pets. Always record the location and number of bait stations. In sewers apply along ledges and around manhole entrances. Treat exterior perimeter areas of buildings in a band at least 2 feet wide and scatter bait in flower beds, leaf litter, wood piles, trash cans and refuse areas. You can make your own boric acid baits with anything you see the roaches eating or drinking - use 1% - 5% boric acid and try to add a few ground roaches and/or their excrement to make your baits more acceptable. Try treating corn meal with 3% or less sodium borate, dry and use this material as a granular bait. A home-made "recipe" can be made by creaming 1/4 cup shortening or bacon drippings with 1/2 c. sugar; then add 8 oz. (**or less**) powdered boric acid or food-grade DE, or aspartame, 1/8 c. flour, 1/8 c. chopped onion and some roach droppings; add enough water or beer to form a soft dough; make little balls and **place where wildlife, children and pets can not reach them** but roaches can.

Nonvolatile boric acid or borax is a very effective insecticide for the control of cockroaches inside buildings and does not cause resistance nor does it appear to present serious health hazards to building occupants, in part because it is a nonvolatile chemical which does not penetrate the skin or contaminate the ambient air (It acts as a stomach poison.). Boric acid powder is slow acting and may take 7 days or more to begin having a significant effect on a cockroach population. Any use of boric acid as an insecticide must be as a registered pesticide poison, and all use must be strictly according to the label. **It is illegal to use medical grade boric acid.** Pest formulations usually contain about 1% of an additive which prevents caking and improves dusting properties. Boric acid does not decompose and, therefore, retains its effectiveness as long as it does not become wet. It is very dangerous if eaten or breathed in, **so be very careful where you place the dusts and/or the baits and/or mop/clean.** Note: An EPA financed study proved the more dangerous synthetic poisons were only 60% effective while the use of boric acid alone was 90% effective in cockroach control.

Dusts of food-grade diatomaceous earth (DE) and silica aerogel (properly applied) are virtually nontoxic to humans and pets, but are effective against roaches. They both kill roaches by destroying their cuticle or outer covering, allowing their internal fluids to leak out, causing the roach to dehydrate and die. But they are abrasive and may irritate the eyes and lungs. Roaches are also repelled by DE unless it is applied at less than 3 oz. per square feet. If you want to reduce this repellency you must add an attractant e.g., if you want to try DE as a (nontoxic) bait or spray, mix 90% freshwater DE with 8% skim milk and 2% yeast extract or 2/3 cups DE to 1/3 cup molasses, cornstarch or powdered sugar or some other attractant, then bait. These sprays or baits of DE are still considered to be nontoxic. **Breathing these dusts may harm your lungs! If you see white, it isn't right!**

Where to Use: Dust baking soda, silica aerogel, diatomaceous earth, talcum powder, medicated body powder, Comet® and/or boric acid powder into out-of-the-way places where cockroaches hide. Remove the kick panels from the front of appliances and carefully dust the area underneath. Drill small holes at the top of kick panels beneath cabinets and carefully inject dusts into these areas. Dust spaces under sinks and in dead spaces between sinks and walls. **Also dust areas where utility pipes pass through walls and wear a mask!**

Method of Application: Dusts can be applied from an aerosol, a bulb duster, a hand-operated or power duster, or sprinkled from a small container or a feather duster. There are also boric acid traps, tablets and pastes. Be sure your application method is consistent with label instructions. **Avoid dispersing the powder into air ducts or food, boron-based products can cause diarrhea and even death if eaten.**

Application Rates - Always follow label information for current application rates. When in doubt, always use less. Always error on the side of safety and not on the side of control.

Precautions - Wear gloves, a respirator and goggles while applying silica aerogel, diatomaceous earth and/or talcum or medicated body powder and/or boric acid powder. Do not inhale the dusts. This material is highly irritating to the eyes and respiratory system. Avoid application in areas where children or pets may come in direct contact with the powder. Do not apply to plants or to soil where plants are growing. Do not eat or swallow these materials, or eat or smoke without first washing.

Hot air quickly destroys roaches. Direct hot air into all cracks and crevices from a hair dryer on high or adjust a tile softener to the *perfect* setting and see what happens - wear a mask and goggles to protect you from flying debris and asbestos. **Another nice tool is a steam cleaner that steams or cleans them to death.**

Natural predators include mice, rats, geckos, lizards, birds, centipedes, mites (e.g., *Pimeliaphilus cunillifei*), nematodes, spiders, toads, frogs, beetles, mantids and ants. There are several parasitic wasps from 1/16" to 1" long that kill cockroaches by drilling a hole in the ootheca or egg case and depositing their own eggs which hatch and eat the developing roach embryos - they obviously do not control German cockroaches very well. **Note: The use of "registered," synthetic pesticide poisons can also kill all of these beneficials.**

Long-term Intelligent Pest Management® Control Note: Cockroaches are known to continue to return to the very same crack/crevice or preferred harborage site no matter how many times they are driven from it, vacuumed from it or poisoned in it. Aggregation pheromones in their droppings are extremely active and are not rendered neutral or destroyed by volatile pesticide poisons. You must totally fill, seal or caulk them in, if you really want permanent roach control. Try routinely cleaning the entire area with Safe Solutions Enzyme Cleaner with Peppermint and sodium borate (in a high pressure washer) and adding some drain cleaner to the drains every week. Roaches do not like drafts so install fans and keep them blowing (24/7). There are less roaches in drafty buildings than in tightly sealed buildings. Roaches will simply leave abandoned apartment units and go next door, not because of a lack of food but because the moisture is lowered in units without tenants - no showers, baths, cooking or people. **Every person gives off a pint of moisture as they sleep in sweat and exhaled air.**

Monitor and Evaluate - Once a cockroach control program has been started, you must evaluate the effectiveness of the controls being used. Use pheromone traps or duct tape sticky-side up or visual (night time) inspections to help you determine if further controls are necessary. If populations persist, reevaluate the situation. Look for other sources of infestations, make sure that all possible entryways are blocked, be certain that food and water sources are eliminated as much as possible, and continue sealing and eliminating hiding places. Repeat all of the controls discussed if necessary. Even when cockroach populations are eliminated, continue to monitor your building with baited traps on a regular basis to make sure a reinfestation is not taking place. Maintain sanitation and exclusion techniques to avoid encouraging a new infestation. If severe reinfestation continues to occur, consider having the infested areas remodeled to reduce the amount of suitable habitat for cockroaches. **Routinely clean with diluted Safe Solutions Enzyme Cleaner with Peppermint.**

DESCRIPTION

CLASS - Insecta

ORDER - Blattaria (named for blattae, the domestic pest of the ancient Greeks)

FAMILIES- Cryptocercidae, Blattidae, Polyphagidae, Blattelidae and Blaberidae

TYPE METAMORPHOSIS - Gradual/Simple

Egg - Found in a capsule or ootheca (of 4 - 60 eggs).

Nymph - The nymph resembles the adult in appearance but is smaller and wingless. (Think you have some albino roaches? All newly emerged cockroaches are white for several hours.)

Adult - Fertile males and females. Parthenogenesis (or egg production without fertilization) does occur in American, brown, brownbanded, Florida woods, German and Oriental cockroaches, but egg capsules produced this way usually fail to hatch or produce only a few nymphs. <http://www.cockroach-pictures.com/>

TYPE MOUTHPARTS - Chewing in all stages.

DISEASE ASPECTS - Cockroaches are known to be vectors of disease, especially intestinal infections, and are capable of carrying disease pathogens. Cockroaches produce secretions/fluids from various points in their bodies which have a foul (unpleasant) odor which may ruin the flavor of food and when the populations is high, impart a characteristic stench to the air in the general vicinity of the cockroach infestation. These insects are thought to be the transmitters of the causal agents (carriers of several disease-producing organisms) of gastroenteritis, food poisoning, dysentery, infectious hepatitis, leprosy, typhus, polio, boils, diarrhea, parasitic toxoplasmosis, cholera, salmonella and other illnesses. Some of the organisms which cause these diseases are carried on the legs and bodies of the cockroaches (similar to the house fly) and are deposited on food and utensils as cockroaches feed and move about. In addition, they cause gross contamination because of their annoying and disgusting habit of depositing saliva, excrement, fluids from their abdominal scent glands and a dark-colored vomit wherever they go. They often are a source of embarrassment and can cause anxiety and psychological distress in some people. Excrement and cast skins and dead roaches contain allergens and cause breathing problems, rashes, watery eyes and sneezing. Cockroaches are a leading cause of allergies - second only to House Dust mites. **Vacuum and clean thoroughly with Safe Solutions Enzyme Cleaner with Peppermint.**

BASIC DESCRIPTION

Cockroaches are stout-bodied insects that have a soft, oval (broad) flattened shape, six long, spiny legs and long antennae, a pronotum (shield-like covering projects over their heads) and they have chewing mouthparts. Adults of most species have well-developed wings. The young nymphs resemble the adults except for the lack of wings and their smaller size. Depending on the house infesting species, roaches are light brown, reddish brown, dark brown and/or black, and some have characteristic markings; most have an unpleasant odor. Each species can be distinguished from each other by their appearance and their characteristic habits and habitats. The adults and immature forms of all roach species that are household pests are all present in established infestations. Cockroaches are normally nocturnal and will usually hide from bright light and only expose themselves to the light if they have no where left to hide, so if you see one during the day, you can be certain you have **many, many** more unwanted *guests*. Cockroaches are among the most common and adaptable of insects on earth and have been able to survive many changing environments is evidenced by the fact that approximately 4,000 species exist in the world today and about 70 species are known to live in the United States. The cockroach was here on earth before mankind and is capable of surviving mankind. They are found in caves, mines, animal burrows, orangutan, termite and ant nests and in all of our buildings. Cockroaches need moisture to survive and follow edges when migrating to and from their harborage to feeding/moisture areas. The English word "cockroach" was first used in 1624 by Captain John Smith.

Repellents - Try dusting with food-grade DE or baking soda or talcum powder or Comet® or spraying with diluted Safe Solutions Enzyme Cleaner with Peppermint, eucalyptus and/or rosemary or cedarwood or catnip essential oils or fresh marigolds or cucumber peels or petroleum jelly or a fan to repel them from an area temporarily.

CONTROL PROBLEMS

Because the cockroach continues to *reappear* no matter how many times it has been *professionally eliminated* from a structure, the pest control industry considers these ancient creatures its bread and butter, so much so that the majority of the pest control industry's income revolves around your need for continual cockroach control using their ineffective volatile poisons! Historically, over 15 billion dollars are spent each year (in the vain attempt) just to poison cockroaches. Obviously, this type of *control* has not worked - we still have the same amount of roaches and the volatile poisons are extremely dangerous to the human occupants and pets of the building. The only real control that can be obtained safely is to reduce the sources of food, water and the harborage points roaches need to survive. For the pest control community to actually control these pests permanently would simply destroy the poison applicators - no one wants to actually control or kill the *goose that lays the golden eggs*. Despite man's constant all out war waged upon this one insect for untold generations, its chances of ever becoming extinct

and/or needing to be placed on a *protected* or an *endangered species* list are considered doubtful at best. They are all born scavengers, but the American roach will even feed on bed bugs when confined with them. They can live for weeks after their head is removed until they starve to death!

More money was historically spent yearly to “control” the lowly cockroach with poisons than any other house infesting pest. Learn the habits of each cockroach so you will know how to actually control these terrible pests. Most cockroaches are tropical or sub-tropical in origin, generally living out of doors and most are only active at night when they emerge from their hiding places to forage for food. Their preferred living area provides them with food and water and is warm and moist. Some tropical roaches only consume vegetation, and some are gaily colored. Cockroaches that inhabit houses not only eat all kinds of human food, with a particular fondness for starchy materials, sweetened or sugary substances, beer and meat, they will also eat a great variety of other materials such as grease, soap, cheese, bone, leather, dead animals, plant materials, glue, paste, cardboard, ink, shoe polish and even dirty clothes. They have even been known to chew the fingernails, hair and eyelashes off sleeping people, especially infants. The most common mistakes in using bait stations is not placing them close enough to the area where roaches live - not eliminating all nearby alternative food choices and/or not using enough bait on stations and/or using too much boric acid or active ingredient.

BASIC THEORY OF COCKROACH CONTROL - Each cockroach has its own peculiar habits and nesting area as different from each other as deer are from beavers. When trying to capture any animal, we try to place our traps where they nest or travel. Therefore, we must learn the habits of all cockroaches, so we will know how and where to effectively control them. Cockroaches spend about 75% of their time hidden in crack and crevice harborages into which they can just squeeze. Therefore, we must first find, then vacuum, power wash or heat or steam or enzyme or dust and then caulk all cracks and crevices and patch all openings that lead into wall voids, etc. The most preferred harborages are those of the proper size that are located nearest food and water sources and are warm and have a high relative humidity. **Control these conditions and you control the roaches.** They are also excellent hitchhikers.

REVIEW OF INTELLIGENT PEST MANAGEMENT® CONTROLS

- 1. Prevention** - Change the conditions conducive to infestation. First eliminate clutter, especially any/all corrugated cardboard, paper and plastic grocery bags, pallets and debris which provide hiding places or shelter for roaches. Properly store food and garbage. Then install dehumidifiers and/or fans or negative ion plates, then daily inspect all incoming items for cockroaches and oothecae (egg cases). Then follow through with routine performance of proper maintenance; make sure the building is in tight physical condition to reduce entry and finally the routine and thorough caulking and patching all cracks and crevices and other openings inside especially plumbing and heating runs. Do not allow eating in any area outside of the dining room or break areas. **Inspect all incoming goods.**
- 2. Good Sanitation** - Continue to eliminate clutter. Adopt cleaning standards that daily reduce the amount of available harborage, garbage, food and water. Routinely and thoroughly clean with enzyme cleaner all shelves, counters, cooking utensils, steamers, floors, fryers, ovens, mops, break areas, soft drink and/or beer dispensers, storage areas, dishwashers, stoves, mixers, refrigerators (don't forget to remove the fiberglass insulation), drawers, sinks, drains, seals, baseboards and all cracks and crevices and then fog or mist all drop ceiling voids and tunnels with Safe Solutions, Inc. Enzyme Cleaners or Eucalyptus or Peppermint Soap and/or borax. The best way to clean is with a power washer. Then dust, use glue traps or simply vacuum all electrical boxes, motors, etc. and your roach problems will drop dramatically. Do not forget to rinse out all returned or recycled pop and beer cans with diluted enzyme cleaner before bringing them inside. There is enough sugar to feed roaches for days in these empty cans and literally thousands of *recycled or returned* cockroaches can be and are brought into a store each day.
- 3. Inspection and Routine Monitoring** - A thorough nocturnal inspection of the entire building using a flushing agent, e.g., an aerosol can of air and (red or yellow covered) flashlight is the key to successful control because it determines which specie is involved and exactly where any/all the infestations/populations are and, therefore, where and what additional treatment is required. Part of any good monitoring or inspection program is the use of cockroach traps; these can either be purchased commercially or home made. They will help you see the real problem. Put down several strips of double-sided carpet tape or duct tape (sticky-side up) to clearly see from where they are coming. To make a cockroach trap take a quart or pint-sized mason jar and tape the outside with masking tape or stretch a dark man's sock over the exterior; then coat the inside of the jar mouth with petroleum jelly, place in the bottom a 10 to 1 mix of

water and molasses, a few inches of beer, some dry kibble and/or a slice of bread with a few drops of beer or a *full* pheromone trap and then set the jar upright in room corners. Cockroaches will climb up and fall into the jar to get the bait, but will not be able to cross the petroleum jelly barrier to escape. You can kill the trapped roaches with hot, soapy water, or simply screw a lid on the jar and put it in the freezer overnight. One of the primary means of initial cockroach infestation is being carried in, is on incoming goods, e.g., infested cardboard and grocery bags; look carefully before putting groceries/products away; leave the bags and boxes outside if possible. Freeze used appliances and furniture before bringing them inside or put them in completely sealed plastic bags with CO₂ for a few days or store them for several weeks or at least carefully inspect with air blasts all incoming goods, furniture, packages and luggage.

4. **Elimination of water sources-** The single most important factor in determining cockroach survival is the availability of water/humidity. Install and maintain fans, air conditioners and/or dehumidifiers. Repair all plumbing leaks. One leaky faucet can waste 6,000 gallons of water a year. Do not overwater plants. Empty refrigerator or air conditioner drip pans or add some Safe Solutions Enzyme Cleaner and/or borax. Repair leaky appliances, sinks and bathtubs. Do not let pet water remain out over night. Eliminate water (inside) humidity with dehumidifiers and/or air conditioners and collection sites outside and/or add a few drops of Safe Solutions Enzyme Cleaner and/or sprinkle some borax.
5. **Humidity-** Most roaches are attracted to moisture and areas with high humidity. Once people move out of an apartment unit and stop breathing, sweating, flushing, bathing, washing, showering and cooking the humidity drops and most roaches move away to a more humid unit. This should tell you a very important control secret. Use desiccating dusts and properly install and maintain dehumidifiers and fans and/or air conditioners. Repair all moisture problems and your roach population will also drop dramatically. Direct hair dryers on high or adjust tile softeners to the *perfect setting* and force dry, hot air into all cracks and crevices and see what happens. **Fans left on 24 hours a day for 3 to 4 weeks will kill them.**
6. **Institute the Intelligent Pest Management® program found in front.** Basically stated, practice proper sanitation; then routinely inspect the area carefully; use 5% or less boric acid or borax or food-grade DE or aspartame baits and/or dust only if and when necessary; paint/seal all bare wood, vacuum and/or steam clean and/or power wash thoroughly; routinely clean thoroughly; correct any moisture problems; seal and/or caulk thoroughly and screen thoroughly. Store all foods and wastes properly. Mop with diluted enzyme cleaner with sodium borate. Install pheromone traps. Vacuum them as they run for blasts of air during the day or vacuum at night with red or yellow lights to physically remove roaches - do this once a week until all activity ceases - remember start one hour after dark or one hour after the lights go out. Remember to dispose of vacuum bags by burning, burying, sealing them in plastic and placing outside in the garbage or after freezing them for several days. Routinely and thoroughly clean with diluted Safe Solutions Enzyme Cleaner with Peppermint. Sprinkle talcum powder or baking soda or Comet®, or food-grade DE and/or mop with borax or Mop Up®. Remove infested fiberglass insulation, paper bags and cardboard boxes. Caulk, caulk, caulk. Use copious amounts of nonvolatile bait with aspartame where they live or travel. Lower the temperature and humidity as often as possible. Spray Not Nice to Bugs® as needed.
7. Later, after all else has failed and only if absolutely necessary carefully make a spot (nonvolatile) insecticide poison application. Start with boric acid or dusts, e.g., food-grade DE, talcum or medicated body powder or Comet® carefully placed in cracks, crevices and voids. **Be sure to carefully read and follow the entire pesticide poison label** regarding kitchen food areas, because some pesticide poisons may be applied only when the kitchen is not in operation while others may not be used in commercial food areas at all.
8. **Follow-up or Maintenance Service** - Once an IPM program is carefully instituted, follow-up usually consists of nocturnal and/or daytime inspections with a flashlight and mirror and/or a flushing agent (canned air) and/or the use of monitoring traps or tapes to find missed or newly introduced cockroaches, and carefully vacuuming or spot treating any active reinfestations found. Search out the source. **Reread the first sections. Clean and/or spray with diluted Safe Solutions, Inc. enzyme cleaner and/or Not Nice to Bugs®**

SPECIFIC EXAMPLES

GERMAN COCKROACH

Blattella germanica (Linnaeus), Family Blattellidae

Also known as Steam Fly, Croton Bug, Shiner, Water Bug; also see Remarks.



DESCRIPTION - As noted previously, German cockroaches have a distinctive flattened shape, spiny legs and long filament-like antennae. Named by Linnaeus in 1767 from specimens collected in Denmark. Despite years and years of intensive chemical efforts to eradicate this pest from human dwellings, it still remains a fact that the German cockroach is the most common roach of all the house-infesting species in the world and it is generally the most persistent and difficult to manage. It prefers to live in dead leaves, garbage piles, cartons, sacks, containers and open bottles outside and will move inside during the summer to locations that provide it with warmth and food, environments that mimic that of their native east Africa. It is the proverbial golden goose to the pest control industry. The German cockroach is our most economically important urban pest, usually found in areas with high humidity and warmth, e.g., furnaces, heating ducts, dishwashers, stoves, refrigerators, etc. If this pest is ever killed or controlled, PCO's will lose the bulk of their income. The German cockroach has a larger number of eggs per capsule than the other species that infest structures. It also has the shortest period to develop from hatching until sexual maturity or a "high reproductive potential". The female also protects and carries the egg capsule (ootheca) protruding from the rear of her abdomen during the entire time the embryos are developing within the eggs. This results in the nymphs avoiding many hazards of the environment which often can affect eggs that remain detached and isolated. German cockroach nymphs are smaller than most other cockroaches and they are able to conceal themselves in many more areas which are inaccessible to individuals of the larger species. German cockroach nymphs tend to group up and stay close to each other, creating a high local population density. They also have aggregation pheromones associated with their excrement, which have the effect of increasing the level of aggregation or grouping of individuals in the population. Its very omnivorous or adaptive feeding habits give the German cockroach increased chances for survival and allow it to persistently maintain high population levels. One female can multiply herself into hundreds in a matter of months. Theoretically it has been estimated that one pair can produce about 400,000 - 575,000 offspring in a year, but others have estimated one pair can produce up to 2 million offspring! Large numbers of German cockroach populations are already resistant to most volatile, synthetic insecticide poisons. German cockroaches are colored light brown to dull brownish yellow. All their limbs are much paler than their bodies. Their pronotum (the section of the thorax [shield] behind the head) has 2 dark brown longitudinal stripes. Their overall length is about 1/2" - 3/4" long. The wings of the female are slightly longer than her body. These roaches normally do not fly but can glide. Male wings are the same length as the body. The male body is longer and narrower than the female. Females are usually darker and their abdomens are more rounded. German cockroaches will spend days in their hiding places at a time without leaving; especially the pregnant females and those nymphs in the last 1/3 of their instars. If you can put a business card in a crack- you can rest assured these roaches can enter and hide there- **so caulk, caulk, caulk! They only live within 10 to 12 feet of food and water, so clean, clean, clean and remember to concentrate your treatment(s) where you see them!**

Nymph - Undeveloped wings, dark (nearly black). Nymphs are sometimes not recognized as cockroaches; they appear quite different than the adults. After molting, they will be ivory white for several hours before turning dark. People who see them at this time often think they are albino cockroaches. (Actually, such observations mean that the cockroach population is so large the nymphs cannot find unoccupied spaces in which to hide and molt, for they normally leave their aggregations to molt in private.) In the first stage, German cockroach nymphs are very dark. In later stages, a single, pale tan stripe appears down the middle from front to rear. This stripe eventually divides the nymphal markings into two dark, long stripes. The stripes remain as two dark streaks on the adult's pronotum, while the rest of the body is covered by the tan or brown wings. Nymphs consume feces containing the aggregation pheromone produced by both sexes. The eggs hatch when the nymphs inside create pressure that splits the case and allows the young to escape. They often will stay around the opened egg capsule after hatching. Then, as they develop, they molt six or seven times before reaching the adult stage. Females often have one more molt than males. When molting, nymphs are very soft and vulnerable. **So they hide! Make them move out with a blast of air or destroy them with fans left running 24/7!**

LIFE CYCLE - Most wary, active, prolific and common of all our indoor roaches. About 75% live in the kitchen, 20% in the bathrooms and 5% elsewhere. Females can live about 200 days. Males have a shorter life span. Note: If there are 1000 German cockroaches in a building and control measures killed 90% of them, then about

100 will survive. If half of these are female, there will be 25 females laying about 40 eggs each month within the month. This results in 1000 new roaches, plus the original 100 survivors, for a total of 1100 adults in about a month. Even with 90% control, there could be more cockroaches after a month than there were before the “control” program started. So, to accomplish a long-term decrease in the pest population a control program must achieve over 96% - 98% control. They can remain alive for 3 weeks without water and 6 weeks without food. They become more active 29 minutes to 2 hours before dark and increase their activity just before daybreak only where populations are extreme will you see them during the day. **They prefer unpainted wood, cardboard and paper surfaces.**



EGGS PER CAPSULE OR OOTHECA - Approximately 30 - 50 (average 37) are carried until a few days before they hatch. If stress or insecticides cause it to abort or be *dropped* more than a day before their normal time to hatch, either none will hatch or only a reduced hatch will result. The capsule is slender, normally two-toned tan and/or yellowish brown in color, about 1/4" - 3/8" in length. The ootheca is completely formed in 48 hours; during its formation it is held upright in the abdomen, but after its completion it is rotated 90° to the right and remains in this position until it is deposited. Half of it protrudes from the female's abdomen. The female carries her ootheca into safe hiding with her, reducing exposure to her offspring from possible harm. In extreme danger, she will detach the capsule and flee. The capsule has a relatively impervious surface to protect its eggs. It does, nonetheless, receive moisture from or give moisture to the gravid female. In extremely dry atmospheres, however, the female will also abort the egg capsule. In all large infestations, there are egg capsules present. **Even if the cockroach population is entirely eliminated, as many as 1 in every 20 fertilized egg capsules in the dead females can still hatch.** Females carrying egg cases are called “gravid”. Nearly 100% of a gravid female's time is spent hiding in cracks and crevices. Flush them out with a blast of air too! **German cockroaches do not like moving air!**

CAPSULES PER FEMALE - 4 - 8 (average 5) will hatch out in about 28 days at room temperature. Formation of the next egg capsule begins within a few weeks. There are many, multiple yearly generations. Females generally carry their egg cases until they are ready to hatch, but will quickly abort them when volatile, synthetic pesticide poisons are sprayed. **Never use these toxins around pregnant women!**

TIME FOR EGGS TO HATCH - 28 days at room temperature. Nymphs may break open the capsule while it is still attached to the female (in the ovipositor). If the female is killed or the capsule is removed from the female more than a few days before hatching, most embryos will not hatch unless there is extreme humidity. Use a dehumidifier and fans and stop your problems before they start.

DAYS AS NYMPHS - 40 to 215 (average 103), depending upon the temperature and relative humidity, passing through 5 - 7 stages or instars before the final molt into adulthood; established populations are generally 75% nymphs or more. During the first and second instars the nymphs are less efficient foragers than older nymphs and adults (Sommer, 1975). After they molt they appear to be “white or albino” roaches for several hours. They prefer to group and live very close together. They are quite active in first half of each stage at night and hide in dark crevices during the day and during the last three days of each instar. Nymphs remain in their harborage 90% - 95% of the time during the last third of the stadium.

Adults - Adult cockroaches emerge from the last nymphal molt fully winged. Only females produce a sexual pheromone. They join a nearby aggregation made up of other adults and larger nymphs. The aggregation is held together by a very short-range odor called the aggregation pheromone associated with their excrement. Adults usually live for 200+ days and have an extraordinary ability to migrate. Females spend most of their adult life in a gravid state during which they feed little and only intermittently (Cochran 1983); therefore, baits must be placed where they can occasionally reach them (as near the aggregations as possible).

Behavior and Harborage - Seek out the big “W’s” (warmth, water and [unpainted, unvarnished] wood), and remember the German roach has a biological need to live in tight spaces or cracks (thigmotaxis) with a surface above and below it- so caulk! They quickly succumb to desiccation at temperatures higher than 120°F. Try to swat one; the breeze that you create makes them run!

Aggregations of cockroaches live in areas of high humidity and nearby food and daily access to water and an average temperature of about 70° F. They prefer to rest on unfinished wood rather than metal or other smooth surfaces. They will find harborage into which they can fit closely. As the number of roaches increase and favorable harborage is filled, roaches are forced to leave the aggregation or remain in less favorable harborage. The aggregation pheromone is found in their feces, which they attach (as specks) in and near their harborages. Roach feces looks like pepper. They will find and mark these new sites during their foraging periods (just before dawn and just after dark). If you see these pests during the day, the population is either extremely large or under considerable stress. Note: Reducing food and water did not reduce populations, but reducing harborage did. The average German roach can slip into a crack less than 1/10" wide so use your business card to find these cracks. **They love powdered molasses.** Mix in aspartame or 4% - 5% food-grade DE for an excellent bait. Note: If you decide to make your own baits remember to alternate the food source - a few years ago a commercial bait manufacturer found that German cockroaches can become behaviorally resistant and began to dislike corn syrup - so the manufacturer had to change the food component of their bait. **Proper and thorough trapping and vacuuming will control German cockroaches far better than baits and residual, "registered" poison sprays and also removes the roach allergens left by dead cockroaches.**

Aggregations: The aggregation pheromone should be called the aggravation pheromone because it causes roaches to cluster together in groups - which truly aggravates many people!

- Serve as the natural group where nymphs soon to be adults and adults of both sexes remain together, thus facilitating mating.
- Are usually maintained in areas with favorable temperature, humidity, food supply, and protection.
- When a piece of filter paper that was used as a shelter in rearing German cockroaches for several days was put into a jar of nymphs - the nymphs aggregated on this paper rather than a clean filter paper in darkness as well as light, but not when the antennae of the nymphs were removed. When German cockroach feces from another batch of Germans was placed on a clean filter paper, the nymphs aggregated there rather than clean one. Even a filter paper sprayed with an extract of German cockroach feces had the same effect. Other feces did not have the same effect. The aggregation hormone is apparently produced by the rectal pad cells of the cockroach and is lipid-soluble. **Remember to include some in your baits and/or red packing slips or red traps with some ground up roaches! If you have a lot of roaches put some pheromone/or feces on carpet or duct tape (sticky-side up) or glue boards or in a wasp trap (2-liter bottle) with Vaseline® barrier inside where you tape the "funnel" to the bottle.**

Mating - Females do not respond to mating behavior for more than one week after becoming adults. Proximity for mating is especially important, as males and females have to touch antennae and exchange sex pheromones to initiate mating. After mating, females feed intensively for several days, then seek secure hiding places where they can be safe with their egg capsules. Such seclusion means that females with egg capsules feed less frequently and are exposed to controls less often. Occupants often first report seeing no adult roaches, but later will observe "little black ones". The occupant is reporting the success of the females with egg capsules that were deep in harborages and did not come in contact with superficially or poorly applied controls, e.g., caulking and vacuuming. Routinely clean all drains and floors with diluted enzyme cleaner and do not leave garbage, dirty dishes, fruit or pet food/water out over night. Pregnant or gravid females spend about 90% of their time not venturing from their harborage. Rarely are gravid females ever found in traps in homes, schools, buildings or aboard ships; flush them out with a blast of air.

Foraging - The foraging pattern of German cockroaches is much less random than one would expect. The roaches leave their harborage and usually go to the first perpendicular surface they find, where they stop, turn and move along the intersection of the two surfaces (usually a floor and a wall). As one can imagine, food crumbs often wind up in the same places, that is in wall moldings, corners made by walls, stoves, counters, canisters, etc.; routinely clean or spray these areas with diluted Safe Solutions, Inc. enzyme cleaners.

Their most convenient harborage is in and around refrigerators, stoves, under sinks and undisturbed cabinets, provides both protection and food. The most favorable humidity level is found in kitchens with sink traps, leaking faucets, standing water, wet sponges, etc. A bathroom is popular because of its toilet bowls, sinks, wet wash cloths, and sometimes, water heaters. While there is less food in bathrooms, toothpaste or food areas are usually nearby or available through holes around plumbing pipes. These pipes provide additional harborage and areas for population expansion into adjacent rooms or apartments.

GEOGRAPHIC DISTRIBUTION - Possible originally native of Central Europe. Now worldwide.

NORMAL HABITAT - **Inside:** Usually found in kitchens and secondarily in bathrooms. **Outside** - Look in dead leaves and rubbish heaps. They are pests in buildings such as schools, homes, hospitals, prisons, stores, warehouses, offices, zoos and restaurants and even become pests on ships, planes and buses. In buildings, they are usually found in food preparation areas, kitchens and bathrooms because they favor warm, humid atmospheres; areas where the temperatures are around 70° to 75° F. are most suitable for their development. They will readily enter cartons, sacks, containers and bottles. With severe infestations, they may occur in other parts of buildings. They can travel up and down garbage chutes, up elevator shafts and drains, through air and heating vents, through cracks and crevices and other openings and above false ceilings, so closely inspect, caulk and seal off these areas very carefully.

These cockroaches are most commonly introduced into buildings via people, laundry, shipped materials, paper products or paper packaging such as potato and onion sacks, grocery bags, cardboard boxes, beer and soft drink cases and via secondhand appliances such as washers, computers, refrigerators, televisions, VCR's, microwaves, etc. They have been observed migrating from building to building on warm evenings, but this rarely occurs. They can and do survive outdoors during the warm months. They prefer warm areas around furnaces and heating ducts. This is a very dangerous area to treat - never use volatile, synthetic pesticide poisons near any heat source because the active and inert ingredients can break down and become extremely dangerous compounds! Most German cockroach populations carry on the surface of their bodies bacteria, e.g., salmonella, staphylococcus, shiquella and proteus that can cause food poisoning, dysentery and sores, so routinely and thoroughly clean with Safe Solutions Enzyme Cleaner with Peppermint.

TIME OF YEAR SEEN - Found throughout year, usually active only at night. They live in dark cracks and crevices. Because they so dislike the light and any breeze they are not seen during the day unless they are disturbed or there are so many of them there is no place left to hide!

LOCATION - The German cockroach is very active. Adults can hide in a crack as small as 1/16" and nymphs can enter even smaller cracks. Both male and the female adults make only occasional short, gliding flights but are fully winged. They are regularly carried from place to place in such things as bagged potatoes and onions, bottle cases and cartons and food packages. They travel readily from one location to another and can pass through very small openings. You must look very closely to find all places in which roaches may be living. Places in which the German cockroach are found can be described by a number of environmental factors. These places will usually be warm, dark and will provide small cracks and crevices or small openings into dark, confined areas. Such places will usually be moist or will be located near some source of water and they also will be close to some sort of food supply. They prefer to rest on wood surfaces or in stacks of newspaper or in paper bags and are normally found clustered closely together. They prefer to hide/rest in cracks, crevices and other small openings, so caulk thoroughly. Look around sinks, cabinets, cupboards, appliance motors, behind baseboards and picture frames and inside paper bags. If found in non-food areas or during the day, you probably are facing a very large infestation. They are thigmotactic, which means they prefer to squeeze into small cracks and crevices where both their backs and undersides make constant contact with a surface. Those roaches are usually found resting and/or feeding in packs or clusters or *patches* in a room. So carefully look for and/or flush with a blast of air and vacuum up these concentrations or aggregations.

ATTRACTED BY LIGHT? No. They run from the light and are nocturnal. Prefer to feed at night and lives in dark cracks.

PROBABLE FOOD PREFERENCES - General feeder on anything of nutritive value including soiled clothing, wallpaper paste, cosmetics, crumbs, glue and soap, but prefers starchy materials and especially fermented materials. They seem to prefer light Karo Syrup, banana peels, white bread, flour, carbohydrates, brown sugar, peanut butter, fatty acids and alcohols. Beer on bread is an excellent bait. Remember this when you make 1% boric acid baits or aspartame or food-grade DE baits. Adults can survive as much as a month and nymphs 10 days without food if they have water. Remove the water supply and the roaches can only survive a maximum of 2 weeks. Deprive them of both for 4 days and they become very stressed and will begin to search for food and/or water during the day. Note: It is known that glucose is a natural repellent to certain German cockroaches - we need to experiment on ways to utilize this fact.

KNOWN TO FLY? No, usually only glide.

DISTRIBUTION, RELATIVE ABUNDANCE AND DANGER - German cockroaches are usually carried about from place to place in returned bottles and/or cans, cardboard, handbags, lunch boxes, clothing, bagged onions and potatoes, in bottle cases, cartons and food packages, so closely inspect all (non-personal) in - coming merchandise especially returning cans and bottles. Over 10% of the adult roaches will explore new areas each week, infesting new apartments or areas, so be sure to seal off adjoining or common walls, especially those with plumbing or electrical openings. Any use of synthetic pesticide poisons will scatter these pests throughout your building **and** the neighbors! Most common roach in most parts of U. S. In addition to being a nuisance, it has been implicated in outbreaks of illness, the transmission of a variety of pathogenic organisms including at least one parasitic protozoan, and allergic reactions in many people. A single German roach can spawn over 400,000 descendants in a single year! **Now think of what numbers all of her descendants can spawn!**

REMARKS - In Germany it is called "Russen" (Russian) roach. In Russia it is called the "Preussenchabe" (Prussian) roach. It is a native of central Europe where it is often found in the woods there.

INTELLIGENT PEST MANAGEMENT® CONTROL - Practice proper sanitation and properly install fans (leave on, especially at night); then if survivors still persist after 2 weeks follow the standard IPM control procedures but remember more frequent control service may be required because of the German cockroach's rapid reproductive rate. Historically, pest control people have said that at least 95% of the population must be eliminated on your initial or clean-out service, or the typical maintenance program will usually fail. Boric acid and/or baits containing avermectin are particularly effective and you can use IGR's, but be sure to follow directions and notify all occupants before beginning any chemical control. Suspend pheromone strips over diluted enzyme cleaner to quickly and inexpensively kill large numbers of roaches - or use the commercial traps with small sticky pads if you are only dealing with a few *survivors* or stick the pheromone attractant and/or trap on a large rat glue trap or mats or tapes if you are dealing with large numbers. Steam clean the entire area or at least mop the floors with diluted Safe Solutions Enzyme Cleaners, <http://www.safesolutionsinc.com> and/or CB Mop Up® <http://www.cbproproducts.com/products.php4?color=C44C04&title=Dusts&conditional=category%3D%27Dusts%27> and/or 1 cup of borax or disodium octoborate tetrahydrate per gallon of water, (Be careful not to contaminate anything.) German cockroaches are not likely to leave favorable harborage unless population pressure or other negative changes occur. Such "other" changes can be caused by:

- Controlling water sources is more important than controlling food sources.
- Caulk every crack into which you can put a business card.
- Properly store all food and garbage.
- Duct tape placed sticky-side up and held in place with making tape. Place this wherever you see roaches.
- Place sodium borate or boric acid or borax 1% - 5% baits with ground-up roaches and/or excrement (another 5-10%) in their favorite food or drink and place these baits in open red packing slips secured in out-of-the-way places at a 45° angle near the core of the German roach population/aggregations and/or in all available cracks and crevices and voids and up high; **be careful not to allow people or pets access to these poison baits.**
- Safe Solutions Enzyme Cleaner with Peppermint sprays, washes or baits and/or desiccating dusts, e.g., talcum or baking soda or food-grade DE or aspartame baits.
- Intensive cleaning (especially with diluted enzyme cleaners with peppermint) and caulking, especially around the plumbing - simply direct air (especially heated air) into their harborage. Use a hair dryer or heat gun and/or spray with Not Nice to Bugs®.
- Vacuuming removes food, roaches and egg cases- this should be done at night with red or yellow lights - every 7 days one hour after dark until all activity ceases.
- Reduction of temperature or humidity with dehumidifiers, fans and other repairs of moisture problems. Any air movement flushes, repels or desiccates them, so leave fans on 24/7 for at least several weeks.
- Create escape-proof barriers with double-sided carpet tape, petroleum jelly or duct tape (sticky-side up).
- Increase the heat to 120° F. for several hours or decrease to 0° F. for 60 minutes or 32° F. for several hours.
- Remove all paper, paper bags, cardboard, fiberglass insulation, newspaper and magazines.

If cockroaches find new locations with favorable conditions, they can migrate from one harborage to another, or develop new infestations. In areas of great infestation, German cockroaches can build up outside heavily infested apartment units in the summer. Most often, outdoor infestations are found only outside the structures from which

steady roach migrations occur and near dumpsters and garbage cans. Remember you can not control German cockroaches with vacuums in one night. Nymphs in the last 3 days of their instars and gravid or pregnant roaches all virtually remain in harborage at least 90% - 95% of the time. **Repeat vacuuming weekly.**

Inspection - You can flush them with any canned air duster or aerosol. Be very thorough!

With Flashlights - An active flashlight (with only a yellow or red light) inspection one hour after dark is the most intensive method of locating roaches. You can search dark, undisturbed, or remote places of roach harborage that an occupant may have thought too inaccessible. Be sure to look everywhere; use a mirror and an aerosol can of air. Vacuum up all visible pests and then caulk all *active* cracks and crevices.

With Traps. Passive use of sticky traps or tapes is a common inspection or monitoring method used for roach detection. Correct trap placement depends upon the applicator's understanding of roach foraging habits: for instance, jars and traps baited with fermenting materials such as beer, bread, potatoes or softened raisins indicate population size, but are not especially helpful for finding harborage. Hand mirrors, magnifying hand lens, or other small tools may be helpful to you. **See Boric Acid or Aspartame Baits** - You can actually control roaches with pheromone or duct tape (sticky-side up) traps if you use enough of them and replace them as often as needed and caulk.

With Baits - Make your own toxic baits with any preferred food or drink, e.g., light Karo Syrup and 1% - 5% boric acid or sodium borate or borax or 3% food-grade DE or aspartame in beer or wine; be sure to add a couple of ground-up roaches and/or excrement to your baits and keep them out of the reach of wildlife, kids and pets!

Habitat Alteration - Speak to occupants in a friendly, knowledgeable way. You should explain that changes can be made that will alter or eradicate the insect problem. These recommendations should include how occupants can eliminate or restrict material that supports roach populations themselves. Properly install and maintain dehumidifiers, air conditioners, fans, air curtains or use desiccating dusts, e.g., talcum powder or food-grade DE.

TEMPERATURE CONTROLS - Temperatures of 120° F. or greater for several hours or 0° F. for 60 minutes or 32° F. for several hours will control German cockroaches in buses, homes, appliances, etc. Place small infested items in a sealed garbage bag and freeze them overnight or put in a black bag in the sun for a few hours!

Nocturnal Active IPM Control for German Cockroaches- One hour after dark - turn on **only** a red or yellow light that does not excite the roaches - you can see them, but they can not see you - and simply vacuum them up. Put talcum powder (1 teaspoon) in dry vacuums or soapy water in rinse and vacs to kill the roaches you vacuum up. You will remove 90% the first night, redo this a week later to get 6% more and then redo the procedure another week later to get the remaining 4%. Vacuuming prevents you from breathing dead cockroaches - 6,000 U.S. citizens die each year from breathing dead cockroaches and/or their excrement. Many more are affected negatively, especially asthmatics. Routinely lower the temperature and cool the building as often as possible, correct any plumbing problems, routinely practice proper sanitation, prevention and habitat reduction, spray visible roaches and drains with diluted enzyme cleaner that contain protease enzymes, properly install negative ion plates, pheromone or sticky traps or tapes, fans and dehumidifiers and practice proper sanitation. If roach problems still continue to exist, power wash the infested area with protease-based enzyme cleaners or dust infested areas with talcum powder, freeze infested refrigerators and/or appliances in walk in freezers and/or use a red or yellow light and re-vacuum again at night and caulk or fill in with aerosol foam **all** areas where you **still** see any activity.

Sanitation and inspection are your most important tools. German roaches have such a short life cycle, once a population becomes established, monthly *control* simply will not work. The reproductive capacity is so great they can (as a population) tolerate a 90% death rate monthly and still increase in gross numbers. The German roach is usually found near a source of water, warmth and food, so carefully inspect all places such as cracks and crevices, under the tops of tables, behind sinks, inside cabinets, the motor compartments of refrigerators, underneath kitchen equipment, inside switch boxes and fuses boxes, underneath counters and behind drapes and pictures, inside and under vegetable bins, around meat cutting blocks and almost anywhere else conditions are favorable. It is, obviously, impossible to list all the potential places where the German cockroach may live, so you must investigate (look) thoroughly everywhere to be sure to find all of the roaches' secret hiding places that are similar to those mentioned previously. Cockroaches are omnivorous and can survive by eating virtually

everything, including one another and their own cast skins. They pre-taste their food (for toxins) with mouthpart appendages, but will feed upon Avert, Maxforce, 1% protease enzymes and/or 4% - 5% Safe Solutions, Inc. food-grade DE and/or enzyme cleaners and boric acid baits. Just the grease left on a plate or spoon can feed hundreds of nymphal cockroaches, so clean everything daily. Do not be afraid to simply vacuum and properly dispose of any roaches you see. You can freeze the bag overnight before discarding in the trash. Routinely and thoroughly clean the infested areas by steam cleaning (or at least spray) with diluted enzyme cleaners or soaps. Later, and only after trying all non-toxic controls if absolutely necessary, you can make crack and crevice spot applications of sodium borate and/or desiccating dusts. Use a fine pin stream nozzle or a nozzle equipped with an extension tube for this application, carefully aiming the insecticide as directly and far as possible into all the cracks and crevices to facilitate deep penetration. Or as an alternative, bait or dust all of the cracks and crevices of these areas exactly as the bait dust labels direct. If you must apply poison near dishes, glassware or cooking utensils, first remove them all and cover them with a clean cloth or plastic sheeting before treating and take great care not to contaminate any of them with any insecticide poison. Then cover (thoroughly dry) the storage areas with clean liner paper and replace the items you removed. **Be sure all occupants are properly notified.** If you bait with hydramethylon gels, e.g., Max Force, remember roaches run to eat this bait and you may find it quickly depleted - so until you rebait you will not get any further control. **Do not use any volatile, synthetic poison until all alternatives have failed. If you must spray, spray with Not Nice to Bugs® or diluted enzyme cleaner.**

FOLLOW-UP SERVICE - Accomplished by regularly inspecting, dusting and or baiting and then caulking any/all visible cracks and crevices and/or areas that were treated or baited on the clean-out. Be sure proper sanitation and source reduction procedures are continually followed. If necessary, steam clean or, as a last resort, apply spot applications of IGR's AND/OR PROPERLY PLACE BAITS; maintain the negative ion plates; vacuum up and properly dispose of any *survivors*. **Routinely mop with diluted Safe Solutions Enzyme Cleaner with Peppermint soap and/or with borax.**

You should record all the data collected with each inspection. Such information is not only helpful in understanding the problem over time, but with providing clear solutions to solving any spot reinfestations; monitor negative ion plates and practice proper sanitation, exclusion and habitat reduction techniques and routinely and thoroughly clean with Safe Solutions Enzyme Cleaner with Peppermint and/or borax. Spray Not Nice to Bugs® as needed .

SUMMARY

Four factors explain the success of the German cockroach as a pest in human habitations: They

- flourish in the human tropical environment, especially in pallets or unpainted wood, paper bags, cardboard, newspapers and/or fiberglass insulation
- can utilize human clutter and interior building design for their harborage
- feed on a wide range of food and are, therefore, not subject to periodic scarcities, and
- develop in a short period of time allowing them to quickly adapt and overcome environmental (and pesticidal) stresses.

German cockroaches in particular live on the same wide range of food that humans eat, and have no strict preferences that would limit them to periodic scarcities that might endanger their numbers. Accepting many different foods shortens not only foraging time, but foraging distance as well. German cockroaches build large (local) populations quickly. They produce a large number of eggs per capsule and have a shorter developmental period than other domestic cockroaches. Urban cockroaches are adaptable. Generally, their increasingly rapid population growth allows for increased variation in each generation. In terms of volatile, synthetic pesticide poisons, this means that some individuals can chemically break apart a "registered" pesticide in their body rendering it ineffective and **they survive the toxic assault and become a resistant species. Nothing will ever survive Safe Solutions (protease) Enzyme Cleaner with Peppermint and surfactant sprays and/or Not Nice to Bugs®.**

When these roaches mate, some pass this ability or immunity or resistance to the toxin on to some of their offspring, resulting in a population with increasingly larger numbers resistant to the pesticide poison. Because of this and the inherent danger of using organophosphates and/or carbamates to people and animals, we **never**

recommend nor use these toxic and volatile poisons. **Caution:** Recent studies of low-income children with asthma note the leading antigen (the substance that causes wheezing) comes from German cockroach droppings and carcasses - **so trap, vacuum, repel or prevent roaches - never kill them and create more antigens, especially where you have asthma or allergies!**

BROWN-BANDED COCKROACH

Supella longipalpa (Serville)

Previously called *Supella supellectilium* (Serville)

Family Blattellidae

A/K/A “ tropical roach, spotted roach, furniture roach”



DESCRIPTION - One of the smaller roaches; they are oval-shaped with spiny legs and long filamentous antennae. Named for the two light, pale brown or yellow traverse bands which run across the base of the wings and abdomen of the adults and across the body of the nymphs. The bands may be somewhat irregular or broken and are more visible on the young and females than on the males. Active at night, the nymphs and adults run rapidly when disturbed by breezes or regular light. Brown-banded cockroaches are not generally as widespread as the German cockroach, but where they find favorable harborage, such as warm apartments and overheated office buildings, they build up infestations rivaling the German cockroach. They prefer warm, dry environments, e.g., closet shelves and upper stories of buildings. Originally of African origin, they now can be found across the United States.

Adult - Usually only 3/8” to 1/2” long, golden to chestnut brown. Females secrete a sexual pheromone. Both sexes have a light band behind the pronotum at the base of the wings, and another or partial band about one-third of the way back from the pronotum. The pronotum is dark brown with very light side margins and never shows two stripes as the German cockroach does. The female is usually a little longer than the male and broad with a tear-drop shaped body with her reddish-brown to dark brown wings barely reaching the end of her body. The male is narrow and long with wings that are dark brown at the base but light brown at the tips, extending beyond the end of his tapering abdomen. Pronotum 1/3 wider than long. Males fly readily when disturbed, or are attracted to lights, but females do not. They may live 6 - 10 months.

Nymph - Dark with two pale or very light bands separated by a dark bank just behind the pronotum, the rear portion of abdomen is pale in color, similar in general appearance to adults, except wings are absent and nymphal markings are more obvious. Under normal room temperatures they will mature (after 6 - 8 molts) in about 150 - 180 days; at higher temperatures, the nymphal period is nearly halved.

Egg - Light tan to brown in color, about 1/8” -1/4” long, the egg capsule or ootheca is oval, bean or purse-shaped, and is only carried by adult female for 24 - 36 hours, then dropped or cemented in clumps to a hidden vertical undersurface in the harborage site. Most oothecae are deposited on the upper third of walls in the summer. Eggs are often hidden in furniture and appliances and corrugated cardboard. Each female will produce about 14 egg capsules in her life with each consisting of approximately 16 - 18 eggs. About 50 - 95 days required for incubation; takes longer at cooler temperatures, e.g., 95 days at 72° F. Note: A tiny parasitic mini wasp, *Comperia merceti* (Compere), is reared and released in research laboratories on the University of California at Berkeley campus to control brown-banded roaches. The tiny parasitoids lay their eggs in the roaches’ egg cases and the hungry wasp larvae feed on the roach embryos, then emerge from the capsules, fly to windows where the sexes meet and mate - and the cycle begins again.

LENGTH OF LIFE CYCLE - Adults live about 6 - 10 months, possibly two generations per year; females produce about 14 capsules during her life span.

HABITAT - Probably African in origin. Shipped to Cuba and then first found in U. S. in 1903. By 1920 still was only found in Miami and Key West. Now found all over the U. S. and found in any room in the building, shows preference for kitchens and high places, often on or in ceilings, high on walls, near motors and around furniture, among books, wall moldings, behind pictures, light fixtures, etc. Prefer high temperatures over 80° F. and drier areas than German cockroaches, e.g., computers, electric clocks, light timers, refrigerators, radios, t.v.’s and appliance motors. Also inspect light switches, closets, furniture and drawers, pet care areas and kitchens. German cockroaches will become the predominate species within 9 months if introduced into the same area. When inspecting look for roaches, egg cases and tiny black droppings or cast-off skins where they may have

fallen from above onto shelves, furniture or ledges below. Often called T.V. or computer roaches because they are often found there - so install sticky pheromone traps or lightly sprinkle baking soda or Comet® or talcum powder or Safe Solutions, Inc. food-grade DE in these areas.

NATURE OF INJURY - Eats or disfigures foods, bookbinding's, nylons, fabric, etc., repulsive in appearance, gives off bad odor, pollutes food, and is a possible carrier of disease.

HARBORAGE POINTS - Beneath tables and chairs, chests, hospital rooms, in rough plaster walls and ceilings, pantries, light switches, closet shelves, near refrigerator motors, high on walls, and in or behind picture frames, furniture, ceiling lights, dresser drawers and ceiling moldings. Prefers areas that are 80° F. or warmer. They are usually found in drier areas. If in kitchens they usually are found in or behind a clock, appliance motor, light switch or similar area. They are often found behind and in dresser drawers. Look for tiny black droppings, cast skins and/or egg cases that may have fallen down onto dishes, shelves or ledges from their harborages above. They are frequently transported in furniture and can rapidly spread throughout the building. Inspect non-personal goods outside thoroughly before letting them inside. They are found as far north as Canada, especially in the warmer parts of buildings.

FAVORITE FOODS - Starchy materials including wallpaper paste and non-food items, e.g., nylon stockings. Remember you must learn all of their hiding places; there is no substitute control for a thorough inspection. Remember starchy foods when you make boric acid or food-grade DE or aspartame or sodium borate baits or plan to trap this roach.

Habitat Alteration - Apply caulk around pipes and other wall penetrations. Wherever possible, suggest that the occupants routinely clean with diluted Safe Solutions Enzyme Cleaner with Peppermint and replace shelf paper and drawer liners, reduce clutter and consistently remove garbage before nightfall. Eating in non-dining areas should be discouraged.

INTELLIGENT PEST MANAGEMENT® CONTROL - After your thorough inspection and installation of negative ion plates, thorough cleaning with diluted enzyme cleaner, lower temperatures and humidity, e.g., air conditioning; correct any other conditions conducive to infestation. Wait 2 weeks, reinspect and steam clean and only then carefully spot treat, dust or bait any **still** active areas found with talcum powder, boric acid, food-grade diatomaceous earth, silica gel and/or sodium borate. Caulk all visible cracks and crevices and clean thoroughly and routinely with diluted enzyme cleaner. If all else fails treat areas mentioned as harborage points using an adequate number of baits or traps and/or bait stations. Follow the labels **very** carefully. Recaulk and replaster. **Be sure you notify all occupants before making any chemical application.**

Follow-up - You should record all the data collected with each inspection. Such information is not only helpful in understanding the problem over time, but with providing clear solutions to solving any spot reinfestations; monitor negative ion plates and practice proper sanitation, exclusion and habitat reduction techniques and routinely and thoroughly clean with Safe Solutions Enzyme Cleaner with Peppermint and/or borax. Use some pheromone traps or double-sided carpet tape and/or Not Nice to Bugs®.

AMERICAN COCKROACH

Periplaneta americana (Linnaeus)

Family Blattidae

Also known as "Water Bug, Palmetto Bug, Flying Water Bug, Shad Bug, Bombay Canary".



The American cockroach is cosmopolitan and is often cited in historical accounts. Its worldwide distribution has been aided by its ability to thrive aboard ships - it loves the seafaring life. They fly at temperatures above 85° F. The American cockroach is the largest pest roach in the USA. The American cockroach and the German cockroach are the only two pest roach species to be found in every state of the Continental USA.

DESCRIPTION

Adult - 1-1/2" - 2-1/8" long, light brown body with reddish-brown wings. The pronotum is ringed by an irregular light color that is almost yellow. Often this margin is bright and wide, darkening toward the center of the pronotum.

In other cases the lighter margin is barely discernible, but it is always present on the rear margin of the pronotum. Both are fully winged, but only the male's wings extend slightly beyond the end or the tip of the abdomen. Poor to moderately good fliers. American cockroaches are found to glide short distances in the North but have been found flying in southern United States. Females secrete a volatile sex pheromone. Adults (especially the males) can travel up to 600 feet nightly to a food source. They are strong foragers.

Nymph - Smaller than adult, often grayish brown but similar in appearance, except wings are absent. They will molt 9 - 13 times before reaching maturity in 160 - 971 days, depending on the temperature. When they first hatch, nymphs are gray, and they all wiggle out of the ootheca together. After their first molt, they are reddish-brown in color like the adults. Mature American and Oriental nymphs can be difficult to tell apart. Their body weight doubles between molts. When a roach molts, it immediately eats its shed "skin".

Egg - A female may create one oothecae a week. Normally a lifetime of effort means 15 - 90 egg capsules are produced that are colored dark reddish or blackish brown, about 5/16" - 3/8" long and 3/16" wide; the bean-shaped ootheca or egg capsule is either simply dropped, hidden or often glued by the adult female within a few hours or up to 4 days after it is formed rather than carried. There are 12 - 16 eggs per capsule. Usually found carefully hidden in cracks or crevices, or especially in high areas with high a relative humidity near a food source. Sometimes the eggs are covered with dust, paint or other building materials, blending in with the surroundings. (Egg capsules that are clean, dark and often dropped in the open are an indication of a very high population.) Where climate allows American cockroaches to spend most of their lives outdoors, egg capsules can be found high in moist wood. Although females produce egg capsules throughout the year, they produce more of them in the summer. An egg capsule can form in about one week, so from 12 to 24 capsules can be produced in the warm months. An average of 14 eggs per capsule hatch in 30 to 50+ days. A female only needs to mate once to produce more than one ootheca or egg capsule!

LENGTH OF LIFE CYCLE - One to two years (average 20 - 21 months) at normal room temperatures; loses about half its life span, when you raise the temperature to 84° F.

HABITAT - Commonly found on ships but can be found anywhere in, around or beneath the building, or outdoors. Prefer dark, damp, warm places. Common around and in boiler rooms, bathtubs, clothes hampers, food storage and handling areas, food drains, water meter boxes, zoos, pipe chases and sewers, block walls, elevator shafts, sump pumps, basements, crawls and steam heat tunnels - they are found particularly around broken sewer pipes. In summer look in hollow trees, palm trees, wood piles, bricks, lumber and debris located outside in yards and alleys. Fill hollow trees with an aerosol foam insulation. Look underneath sump pump covers, in boiler rooms, attics, shingles, around foundations, swimming pools and automatic sprinkler systems. Routinely cool these areas and properly install and maintain air conditioners, lights, fans and dehumidifiers. All stages of American cockroaches are repelled by air moving at speeds of one meter per second or more. Use desiccating dusts, e.g., talcum powder or food-grade DE, and/or use diluted Safe Solutions Enzyme Cleaner with Peppermint to clean.

Behavior - Large populations of American cockroaches live in warm, moist habitats. They require high, stable humidity in their harborage. They communicate very well chemically. They can be found outdoors in the southern United States in alleyways, dumps, stacked firewood and rotting wood, and in tree canopies as far north as Maryland where they winter in landfills of decaying trees. In the North they can also be found in boiler rooms or other harborage with water heaters, floor drains, water sumps and warm, moist basements. Routinely fog/spray/mist these areas with enzyme cleaners or soaps. Increased populations are often seen in basements after heavy rains. They may cannibalize one another or smokeybrown cockroaches, but are repelled by intact or ruptured members of their own species. They truly are born inebriates - remember this when you make your own baits and/or traps. They will often fill partially empty beer bottles! Put masking tape or a dark man's sock over the exterior of the bottle to help them climb up. **If you use duct tape or sticky traps against American cockroaches, you may need to lure them with food material.**

Control and Management Inspection - Search areas that provide warmth and high humidity. Don't forget to inspect the roof; in void pipes, roof flanges and in roof cracks and in roof debris.

NATURE OF INJURY - Eat or disfigure dirty clothing, glossy paper, food, bookbinding's, wallpaper, fabrics, etc., repulsive in appearance, gives off a disagreeable odor, which penetrates and pollutes food and they are a pos-

sible disease carrier. Recently, the Pasteur Institute indicated that proviral DNA homologous to components of human immunodeficiency virus (HIV) the causative agent of acquired immune deficiency syndrome (AIDS) has been isolated from the genome of American cockroaches in central Africa where the AIDS disease is rampant.

HARBORAGE POINTS - Prefers dark, damp, warm areas. Be particularly careful to check crawl areas, boiler rooms, palm trees, crawls, basements, sewers, grease traps, air vents, plumbing and floor furnaces, steam heat tunnels, and floor drains. Usually found in basements, crawls, near broken sewer lines, or on the first or ground floors of a building or any where on board a ship.

INFESTATION ENTRANCE - They are carried in, enter via the sewer drains or can migrate into your building from other structures, dumps and alleys. They are known to glide considerable distances and are known to fly and are attracted to street lights at night.

FAVORITE FOODS - American roaches are born inebriates (drunks) and are easily attracted to beer and other fermenting materials, but they will feed on all foods, including decayed organic matter, paper, paste, starch, sizing, Light Karo Syrup and sweets. Adults can survive two to three months without food but only one month without water. They prefer rotting and/or fermenting foods. They have been known to eat bed bugs. Remember the above when preparing boric acid, aspartame, food-grade DE or roach traps. Adults do not like bait stations unless you use red packing slips (stuck open) secured in out-of-the-reach places at a 45° angle.

Habitat Alteration

- Soda drinks are very acidic and will eat through cast iron drains, creating excellent breeding areas for this roach.
- Properly install air conditioning and/or dehumidifiers. Properly vent attics, crawls and/or basements.
- Temperatures of 15 - 20° F will kill them. Leave a fan on 24/7 for several weeks.
- Caulk around plumbing and other penetrations in walls, screen equipment drains, floor drains; keep drain traps full or capped and/or routinely flooded with diluted enzyme cleaner. Put down traps or tapes.
- Remove firewood stacked in attached garages, porches, patios etc.
- Replace mulch near doors and window wells with plastic non-absorptive ground cover and/or gravel and/or ground up tires.
- Ventilate humid places or routinely clean and/or fog/spray with diluted Safe Solutions enzyme cleaners or natural soaps. Install and properly maintain fans and dehumidifiers and/or lights and/or air conditioners. Use desiccating dusts. Add foaming drain cleaner to the drains as needed.

INITIAL CONTROL - Since the American cockroach is often found outdoors, in tree holes, under the building, in crawls or in basements and/or in poorly vented attics, start in these areas. Caulk all visible cracks and crevices. Do not forget to flood the drains with diluted enzyme cleaner. Carefully steam clean or treat all infested areas with diluted enzyme cleaner baits, bait stations, double-sided carpet tape, traps and/or dusts, e.g., boric acid, silica gel and/or diatomaceous earth very carefully and very thoroughly. Use IGR sprays only as a very last resort. A sex pheromone is available to attract males to traps. Only exposure to temperatures of 15° F. - 20° F. or lower will kill them. Spray all visible roaches with Not Nice to Bugs®.

FOLLOW-UP SERVICE - **Routinely flood all drains with Safe Solutions, Inc. enzyme cleaners or drain cleaners weekly until all activity stops.** Routinely reinspect all areas mentioned, paying particular attention to those areas found infested originally, sewer manhole covers, water meters, wood or brick piles, crawls and basements. Treat, redust and/or rebait only when needed. Ongoing monitoring is important due to the long life span of this roach. You should record all the data collected with each inspection. Such information is not only helpful in understanding the problem over time, but with providing clear solutions to solving any spot reinfestations; monitor negative ion plates and practice proper sanitation, exclusion and habitat reduction techniques and routinely and thoroughly clean with Safe Solutions Enzyme Cleaner with Peppermint and/or borax. **Do not spray borax on food, dishes, toys or tables.** You can use a duster that imparts a negative, electrical charge and blast all the sewers and sewer pipes with food-grade DE. Spray Not Nice to Bugs® or diluted enzyme cleaner as needed.

ORIENTAL COCKROACH

Blatta orientalis (Linnaeus)

Family Blattidae

Also known as “cricket, black beetle, beetle, water bug, shag bug or roach, common roach or sewer roach”.



“Blatta” means an insect that shuns the light. Like its close relative the American cockroach, this short-winged, large, shiny, dark brown to black cockroach hides during the day in dark, damp recesses of basements and sewer lines, emerging at night to feed on refuse or any other available food; it also leaves behind a disagreeable, penetrating odor. It is found in all parts of the United States and it lives about one year. It is the most common urban roach in England. This roach often travels through sewer pipes and garbage chutes and lives on filth. Clean these areas with diluted Safe Solutions, Inc. enzyme cleaners. They are usually subterranean and love moisture.

DESCRIPTION

Adult - Large, about 1” - 1-1/2” long, usually shiny, very dark brown to black but occasionally dark reddish-brown; has spiny legs and long filament-like antennae; female larger and longer; almost wingless, she produced only short triangular wing pads; male wings are short and broad and only cover about 2/3 - 3/4 of his abdomen; neither can fly and they lack a cushion-like pad between the claws on their feet; therefore, they are unable to climb up smooth surfaces and are frequently found in porcelain bowls, tubs, pots, pans, etc. In early spring, only adult Oriental cockroaches are found. Both sexes produce sexual pheromones. By late spring, nymphs are abundant. As nymphal numbers increase, the adults die off and by August all adults are new ones. By fall, almost the entire population is adult. 60% of matings occur within the first 2 weeks.

Nymph - Smaller than adult, similar in appearance except wings are absent and, except in the first stage when they are pale tan or yellow in color, they are shiny reddish-brown to black in color. They molt 6 - 10 times over about a 1-year period. Their development cycle appears to be seasonal. They are most active from about March through much of the summer. The nymphs escape when the egg capsule splits along the dorsal ridge - usually 10 - 15 hatch. They molt almost immediately, so after a few hours they darken in color. More are evident during the summer months and unseasonably warm fall/winter months.

Egg - The irregularly-shaped ootheca or egg capsule is carried by adult female for about 30 hours, then simply dropped or deposited in a warm, protected spot where food is available. 12 to 16 (average 14) eggs per capsule. 1 to 18 capsules produced per female - average 8 from spring to midsummer. Incubation period 42 - 81 days - average 60. Reddish brown when first deposited; becomes black, about 3/8” long and 1/4” wide. Only one generation per year where temperatures are cool in winter.

ADULT LENGTH OF LIFE CYCLE - One - three years. Peak numbers found in late spring and early summer. Breeding takes place soon after the final molt, but the first egg capsule is not ready for deposit for 10 - 14 days. Actual length of life varies greatly, depending upon food, temperature and humidity, but basically the warmer, the shorter the life span.

HABITAT - Live in colonies in moist, decaying organic matter, mulch, dumps, drains, manure piles, grease traps, water control boxes, pits, sewers, leaf and wood piles, garbage chutes, damp areas, e.g., basements, crawl spaces, trash cans, pet areas. More commonly found in the north and ranges clear up to Canada. Most commonly found in dark, damp basements or crawl areas, but will on occasion will ascend to rooms above. Often live outside in debris, such as leaves, garbage, sod and vegetation around foundations, and in sewers. In times of drought there is a mass migration into homes, especially into moist basement areas. Often they are found trapped in porcelain tubs and sinks and around leaks in the basement and/or crawl spaces. Has been known to survive outside in freezing weather. Both the adults and nymphs are sluggish and are usually located at or below ground level. Prefer temperatures of 68° - 84° F. **Lower or raise the temperature and dry out the area.**

NATURE OF INJURY - Eat or disfigure food, bookbinding's, fabrics, etc., repulsive in appearance, give off a disagreeable, penetrating, bad “roachy” odor, feed on filth and are known to carry diseases. Roach odor (mainly saliva) persists for a long time. They feed on all kinds of filth, rubbish, decaying organic matter, garbage and the contents of discarded tin cans. They can live for a month without food if water is available, but die within

two weeks without water.

REMARKS - Actually thought to be North African in origin. Oriental roaches are also carnivorous and will wipe out bed bugs. This cockroach will be found primarily in the spring. During mating seasons they are often seen coming up through sewers. Mainly found in big cities, zoos, rarely in woods, or small towns. Also known as shad bugs because they swarm at same time the shad run.

FAVORITE HARBORAGE AND HIDING PLACES - To help you find pockets of Oriental roach infestation, install double-sided carpet tape or blunder traps or parallel strips of duct tape sticky-side up, or look closely at all spider webs. When they live indoors, Oriental roaches prefer dark, moist environments with temperatures under 84° F., and are often found under porches, in crawl spaces, basements and floor drains. When they live outdoors, they can be found in abandoned cisterns, garbage and sewer pits and in garbage and trash dumps. Look for accumulations of decaying organic matter and other debris and especially for high moisture situations. Look very closely in your basements, crawl spaces, especially around drains or sewers and other areas of dampness. Outside they will be found beneath leaves, mulch, in and around garbage, compost piles, discarded tin cans, cisterns, pits, trash or other areas of filth. Also found in holes in foundation walls of buildings, so patch thoroughly all holes, cracks and crevices. They usually enter buildings through sewer pipes, via door thresholds, under sliding glass doors, along utility pipes and air ducts, through unscreened ventilators and through floor drains. Indoors, they are typically found in crawl spaces, cellars, basements and on the first floor, but at times on higher floors, especially around old water pipes which they can climb. **Do not forget to screen (or tennis ball) your drains and routinely flood them with diluted Safe Solutions, Inc. enzyme cleaners or drain cleaners.** Properly install and maintain vents, HEPA air filters, dehumidifiers and fans and/or air conditioners.

FAVORITE FOODS - They can live a month without food if they have water - cut off their moisture supply and they die within two weeks. They will eat all filth, garbage, manure and decayed organic matter but prefer starchy foods. Remember this when you make boric acid, borax, sodium borate, aspartame or food-grade DE baits.

Behavior - Oriental cockroaches favor crawl spaces, spaces between the soil and building foundations, the undersides of stoops and sidewalks, landscaping mulches, water meters, basements and their floor drains, and other such moist places. These cockroaches frequently live in floor drains that drain directly outside; these drains are also used as entrances to homes. The Oriental cockroach prefers starchy food, and builds up populations around garbage cans. They tolerate lower temperature ranges than other roaches and may winter in rock walls or such protected sites. These cockroaches are more sensitive to lack of water than other roaches. Oriental cockroaches can survive for 3 months outdoors in almost continuous freezing weather.

Control and Intelligent Pest Management® Inspection - Search out all areas of high humidity and clean with enzyme cleaners or soaps and install and properly maintain fans and/or dehumidifiers. **Routinely add/flood diluted Safe Solutions, Inc. enzyme cleaners or foaming drain openers to all drains or spray them with Not Nice to Bugs®.**

Habitat Alteration

- Routinely flood all drains and garbage areas/chutes with diluted Safe Solutions, Inc. enzyme cleaners or use steam, very hot water or drain openers.
- Caulk all penetrations through ground level walls. Use desiccating dusts, e.g., food-grade DE.
- Stop water leaks, screen equipment overflow drains, and take overflow water away from buildings; keep drain traps full or capped and treat/clean with or Safe Solutions. Enzyme Cleaner with Peppermint or Not Nice to Bugs®. Install double-sided carpet tape or duct tape (sticky-side up).
- Remove rotting leaves and vegetation, especially from window wells and around ventilators.
- Move garbage cans out of preferred moist habitat.
- Stop erosion that causes soil voids.
- Ventilate moist spaces, use a dehumidifier or air conditioner and fans and/or fog with diluted enzyme cleaner. **You may have to call the sanitation department to treat the sewer lines.**
- Create escape-proof barriers with double-sided sticky tape, duct tape (sticky-side up) or Vaseline®.

CONTROL - Properly install vents, an air conditioner or dehumidifier and fans, screen and/or clean all drains at least monthly with Safe Solutions, Inc. enzyme cleaners or drain openers and routinely and thoroughly inspect and pay particular attention to damp basements, crawl areas, drains and places of extreme dampness. Outside, search around wood piles, garbage cans and mulch beds. Vacuum and/or place baits where needed. Clean up and remove all debris away from and around the structure. To help you find pockets of Oriental roach infestation look closely at all spider webs. When they live indoors, Oriental roaches prefer dark, moist environments and are often found under porches, in crawl spaces, basements and floor drains. Routinely spray these areas with diluted Safe Solutions, Inc. peppermint soap and/or their enzyme cleaners. When they live outdoors, they can be found in abandoned cisterns, pits and in garbage and trash dumps. The same controls and baits used for the American roach will control Oriental roaches; however, the moist areas in which this roach is normally found may cause the application, whether it is a bait or otherwise, to become useless in a much shorter time. Properly install sticky traps or tapes. **Monthly (or more often if needed) spray or flood all drains with Not Nice to Bugs® or diluted enzyme cleaner and mop all floors daily with or diluted Safe Solutions Enzyme Cleaner with Peppermint and/or, if necessary, with borax or Mop Up® once a week.**

FOLLOW-UP SERVICE - Carefully inspect and if necessary vacuum up and/or spot retreat any survivors. You should record all the data collected with each inspection. Such information is not only helpful in understanding the problem over time, but with providing clear solutions to solving any spot reinfestations; monitor negative ion plates and practice proper sanitation, exclusion and habitat reduction techniques. If necessary dust with talcum powder, Comet® or medicated body powder. **Routinely add Safe Solutions, Inc. enzyme cleaners to all drains and/or flood them with foaming drain openers as needed.**

WOOD COCKROACHES

Parcoblatta Spp., Family Blattellidae

DESCRIPTION - The term “wood roach” is used to cover a group of at least 12 different roaches, usually of the same genus and having similar habits. The Florida Woods cockroach, *Eurycotis floridana* (Walker) is found in Florida. One of the more common species is the Pennsylvania wood roach, *Parcoblatta pennsylvanica* (DeGeer). They are usually found in hollow trees, wood piles, under shingles and loose bark and in crevices in rural buildings. Adults are trim, pretty roaches, usually colored chestnut/dark brown with thorax and wing pads edged in white or yellow with extremely long antennae. In the male, the wings are longer than the body, while those of the female cover only 1/3 to 2/3 of the abdomen. This roach can be found in the eastern, southern and Midwestern states all the way up to Canada, especially in rural homes in, near or surrounded by a woods. The following description is of the Pennsylvania Wood Roach.



Adult - Light to dark to chestnut brown in color, about 7/8” - 1-1/8” long with relatively narrow wings (edged in white) which extend beyond end of the body in the male. Short wings cover 2/3 of the body in the female. The female is usually 3/4” long; she can not fly. The male wood cockroach is 1” long or longer and has richly-colored, dark brown wings that extend well over the tip of his abdomen. The wood cockroach is slender (three times longer than wide). The pronotum and fore-part of the wings of both sexes are margined with light yellow or white, but the pronotum is very dark between these margins. Pretty and trim, it does not have the repulsive odor of many other roaches.

Nymph - Overall reddish brown in color.

Egg - Produced during warm months. Yellowish-brown in color. Ootheca deposited outside in loose bark, stumps, logs, wood piles, etc. - the egg case is about two times longer than it is wide.

LENGTH OF LIFE CYCLE - About 1 year. Usually only one generation per year.

EGGS PER CAPSULE - Egg capsule or ootheca about 1/2" long and yellowish brown in color with a maximum of 32 - 36 eggs; incubation period for an average of 26 hatching nymphs is 34 days. Usually only produced during the warmest months and then deposited loosely in the bark of dead trees, wood piles, fallen logs or stumps outside.

REMARKS - The males are good fliers and can fly considerable distances in large numbers and will enter your home or building during mating season, especially if a female is carried or crawls into your building, many males will fly inside attracted by the odor of the female. Also, they are attracted to lights and may also enter homes and buildings this way. They may also be brought into homes on firewood, so inspect carefully. Move or change your lights to yellow bulbs or sodium vapor lamps. Tightly screen your windows and doors; caulk thoroughly all exterior cracks. Put a light over a 5-gallon container of soapy water and leave on all night.

NATURE OF INJURY - Visual annoyance to occupants; rarely survives or breeds inside; usually only seen during the May - June mating season.

HARBORAGE POINTS - Usually found in wood piles under bark, cedar shake shingles and siding, in crevices, gutters and occasionally in attics and crawl spaces areas, but may fly into other areas in during the spring (mating) season or are carried in with infested firewood. Inspect wood thoroughly before bringing any inside.

FAVORITE FOODS - It prefers sweets. Can be found in abandoned beehives outdoors. Remember their sweet tooth when you make 5% or less boric acid, borax, food-grade DE, aspartame or sodium borate baits and honey.

Behavior - Wood cockroaches live in rotted logs, tree stumps, hollow trees, stopped-up rain gutters, under loose bark of trees, and in piles of firewood. The males fly to lights, landing on windows and door screens. They then make their way indoors or fly into the house. Sometimes they are brought in with firewood. However, once indoors, wood cockroaches soon die; human habitats do not provide the moisture of their normally shaded woodland. Even with sufficient moisture they would not live long without females. Wood cockroaches range across the southern, Midwestern, and eastern United States into Canada.

Management - Vacuum up or spray with Safe Solutions Enzyme Cleaner with Peppermint any visible pests. Male wood roaches can be excluded by caulking and tightening around screens in rooms that face woods habitat. Outside lights that attract flying roaches can be regulated. Nearby windows and doors where light-attracted roaches may enter should be tightly screened. Spray Not Nice to Bugs® as needed. **No volatile, "registered" pesticide poison applications are ever needed.**

INTELLIGENT PEST MANAGEMENT® CONTROL - Control is seldom required indoors because this species usually does not survive inside. Because males are strong fliers and come from considerable distances control is also not desired outside. Preventative pest control is what is usually required. This consists of sealing all visible exterior and interior cracks and crevices with silicone caulk, making sure all windows have tight fitting screens in good repair, all doors have door sweeps and self-closing screen doors which are tight fitting and in good repair, and all exterior vents or vent openings are screened with screening no larger than 1/8" wire hardware cloth and screening in good repair. These maintenance *controls* will stop these pests before they enter. Changing white incandescent bulbs to yellow bulbs or sodium vapor lights around entrance doors may also help. As these roaches are common in wood piles outside, do not store firewood or debris in your yard - this will greatly reduce their numbers. If absolutely necessary, use a vacuum or fly swatter to control any successful invaders or spray them with diluted Safe Solutions, Inc. enzyme cleaners or their peppermint soap and/or sprinkle the areas they are entering with baking soda, talcum powder or medicated body powder, food-grade DE or Comet® and/or mop with Mop Up® or borax. Spray with Not Nice to Bugs® as needed.

FIELD OR VEGA COCKROACH
***Blatella vaga* (Hebard)**
Family Blattellidae

Common in irrigated sections of southern Arizona, California, New Mexico and Texas.



DESCRIPTION

Adult - Very similar to the German roach but slightly smaller and more olive brown with a black stripe or area on the front of head extending from the mouthparts to between the eyes; about ½" long. Not repelled by the light and can be seen during the day.

Nymph - Resembles German roach nymph, but dark area on the abdomen is only on sides.

Egg - Capsule is carried by female until almost ready to hatch; normally dropped outdoors.

LENGTH OF LIFE CYCLE - About 6 weeks.

HABITAT - Normally lives in grass next to foundation of building.

NATURE OF INJURY - When these roaches invade a building they wander around in broad daylight and make no attempt to hide like *normal* roaches do.

HARBORAGE POINTS - Normally lives outside under stones, wood, clumps of dirt, grass or leaves. May come inside searching for moisture in the drier parts of the year.

REMARKS - Very sensitive to moisture changes. Enters buildings only when their outside area is too wet or too dry. So install dehumidifiers and fans inside and properly maintain them. Use desiccating dusts, e.g., food-grade DE.

FAVORITE FOODS - Decaying vegetation; especially common in irrigated areas. Unlike many cockroaches, they are repelled by their own droppings.

INTELLIGENT PEST MANAGEMENT® CONTROL - Remove all decomposing plant materials and at least four inches of grass around perimeter of the building and install a dehumidifier and fans and traps. Spray copiously all infested areas with diluted Safe Solutions Enzyme Cleaner with Peppermint and/or simply vacuum. Spray with Not Nice to Bugs® as needed.

SMOKYBROWN COCKROACH

Periplaneta fuliginosa (Serville), Family Blattidae

DESCRIPTION - They are a striking, shiny dark brown to mahogany or black in color; uniform, with no lighter distinguishing marks on the pronotum or wings. About 1" - 1-1/2" in length for adult. Wings in both sexes extend beyond their bodies and both are excellent fliers. They are closely related to the American cockroach and the same genus and resemble them in size and shape. Found in Florida over 150 years ago. They prefer temperatures of 59° - 95° F. They require liquid every 2-3 days.



Nymph - Dark brown, resembles adult but smaller and it has very long antennae which are white at the tip. Antenna tips of young nymphs are white and the base segments of the older nymphs' antennae are white. Nymphs hatched in summer, overwinter.

Ootheca or egg capsule - Contains 20 - 28 eggs (average 24) and is usually found camouflaged with debris and glued or attached to some object or surface in a secluded location in the harborage after carrying the ootheca for about one day. The egg capsule is dark brown to black in color and more than 3/8" long, they occasionally may be found lying loosely on the ground or floor. Each female can produce about 17 capsules and there an average of 17 eggs are in each capsule; as many as 24 eggs have been found. Nymphs hatch within 50 days.

LENGTH OF LIFE CYCLE - The new female adult produces eggs after 15 days. There will be an average of 17 - 20 eggs per capsule with a range of 4 - 32. Eggs hatch in approximately 34 - 45 days. The life cycle of a smokybrown cockroach is about one year. The time can range from 160 to 716 days with average of 320. A

large adult die-off occurs each fall. All stages of smokybrown cockroaches are repelled by air moving at speeds of one meter per second or greater, **so install fans and leave them on 24/7 for 3 to 4 weeks.**

NATURE OF INJURY - Very annoying visually to some people. Well developed wings and are attracted to lights at night. Use yellow bulbs or sodium vapor lights that are less attractive.

HARBORAGE POINTS - They prefer habitats that are protected, moist, dark, warm and relatively free from the desiccating effects of air flow. Common outdoors, especially in Central Texas and eastward to the East Coast; also found in the extreme South. In the North it is usually only found in greenhouses and other warm, moist areas. It prefers to live in tree holes, sewers, mulch, concrete block voids, moist soffits and rest on concrete, wood or plaster surfaces over other types of surfaces, but, only where the relative humidity is stable. Can fly onto roofs and gutters, then crawl into your home or building and are, therefore, often found in upper parts of your building, attics, roofs, gutters and downspouts, garages, decorative planters, wood piles, water meter boxes and municipal sewers. They are also found in crawl space areas and fireplaces. They may be carried in with firewood or anything that has been stored outside. They are excellent fliers and will come in through any opening, so caulk carefully from top to bottom, e.g., around windows, doors, vents, eaves, etc. They live in sewers, ivy, vines, trees, shrubs, other vegetation, loose mulch and under shingles and siding, especially near any moisture problems. In Houston, Texas Smokybrown cockroaches were found making a mass exodus from the drain system 1/2 hour before a storm hit.

FAVORITE FOODS - Plants, apple, brown sugar, potatoes, dog food, and bread. Normally feeds on plant materials outside, but once inside they will feed on any organic matter of nutritive value. They have been found in roofs and gutters eating bird droppings and in sewers feeding on filth. Remember their favorite foods when you make boric acid, borax, food-grade DE, aspartame or sodium borate baits. **Keep all such baits out of the reach of children and animals.**

REMARKS - They move about very readily going in and out of buildings looking for food. Very visible pest that does not try to hide from the occupants. This roach is the most prolific of the big roaches. They can enter structures by being brought in but they usually enter at night via cracks and crevices through which light penetrates to the outside, light being an attractant to them. Because they are good fliers, they can easily enter any uncaulked attic openings and are commonly found around eaves and gutters. Inside they can be found anywhere, but tend to prefer warm and humid areas not exposed to air currents- so install fans where you do not want them to intrude. Cockroaches tend to follow guidelines in the environment, e.g., the intersection of walls with the soil - remember this if you want to effectively trap or bait them or install sticky tapes or traps.

Behavior - The smokybrown roach is found in the Gulf States from central Texas to Florida, in Georgia, South and North Carolina, southern California, and in some parts of the Midwest. It is a plant feeder, and occurs in greenhouses. While it is mainly an outdoor roach, it is often transported indoors. Populations build up outside homes and enter around doors, garages, and in the eaves of roofs [where they live in gutters and under roof shingles and easily find their way into attics]. This cockroach is very dependent on moisture. With the high humidity of coastal areas, populations can build up and infest every level of a structure, so install and properly maintain dehumidifiers, fans and air conditioners - use desiccating dusts, e.g., talcum powder or baking soda or food-grade DE.

Intelligent Pest Management® Control and Inspection - Search gutters and roof overhangs and attics and clean and/or spray Not Nice to Bugs® or diluted Safe Solutions, Inc. enzyme cleaners or soaps and/or sprinkle talcum or medicated body powders in these areas. Disodium octobate tetrahydrate, boric acid, borax, Comet®, baking soda or, as a last resort, food-grade diatomaceous earth in the insulation will help control these pests. **Baits are more effective than perimeter poison treatments.**

Habitat Alteration

- Practice proper sanitation and garbage and food storage.
- Tighten doors and window wells. Install doorsweeps.
- Eliminate overhanging tree limbs (especially pines).
- Keep gutters clean with power sprays containing diluted Safe Solutions Enzyme Cleaner with Peppermint or steam them or flush with hot water or use drain cleaners as needed.

- Install and properly maintain vents, fans, dehumidifiers and air conditioners.
- Plug all tree holes or voids - use an aerosol foam insulation.
- Properly vent attics and crawl spaces. Install fans and leave them on 24/7.
- Close all roach entry at the roof from the edge of eaves to house wall. Use care not to obstruct screened ventilation of soffits or attic areas.
- Attach lights away from the house, turn off or change to yellow "bug" lights.

INTELLIGENT PEST MANAGEMENT® CONTROL - This roach may be found anywhere in your building (with high relative humidity) so inspect everywhere and caulk all visible exterior and interior openings; correct all moisture problems, properly vent attics and/or crawl spaces and install dehumidifiers and fans and maintain good sanitation inside and outside. Remember, attics should be thoroughly caulked and inspected also. Check any crawl spaces beneath the structure and around the outside perimeter walls of the structure and routinely remove all leaf litter, trash piles, debris, garbage or firewood in your yard. Inspect and fill with aerosol foam insulation all nearby hollow trees and look behind and under all sheds, drapes and in drawers. Vacuuming and preventative pest control is usually all that is required. This consists of sealing exterior and interior cracks and crevices with silicone caulk, making sure all windows have tight-fitting screens in good repair, all doors have doorsweeps and self-closing screen doors which are tight fitting and in good repair, and all exterior vents or vent openings are screened with screening no larger than 1/8" wire hardware cloth and all other screening is in good repair. Changing white incandescent bulbs to yellow bulbs or sodium vapor lamps around entrance doors helps. Thoroughly inspect firewood or anything that has been stored outside before bringing it into your building. These roaches lose moisture more quickly than the others, so use a dehumidifier and a fan to create desiccating air currents, correct moisture problems and if absolutely necessary later, use baits or desiccating dusts per label instructions inside and bait outside, or simply vacuum up these pests that refuse to hide. **Routinely clean/spray with Safe Solutions Enzyme Cleaner with Peppermint or with Not Nice to Bugs®.**

FOLLOW-UP - Remember, smokybrown cockroaches are primarily an outdoor species. Thoroughly reinspect and spot retreat with talcum powder or, as a last resort, boric acid, silica gel and/or food-grade diatomaceous earth into any still visible cracks and crevices and then caulk and/or spot treat with sodium borate - be sure to follow all label directions very carefully. **Be sure the air conditioner, fans and dehumidifiers are working!** You should record all the data collected with each inspection. Such information is not only helpful in understanding the problem over time, but with providing clear solutions to solving any spot reinfestations; monitor negative ion plates and practice proper sanitation, exclusion and habitat reduction techniques.

Monitor - Use cockroach pheromone traps - especially in unoccupied vacation homes. Attics of all infested homes can be heavily infested, especially unoccupied homes. You can vacuum and/or fog/spray/mist these areas with diluted Safe Solutions, Inc. enzyme cleaner or peppermint soap and/or borax and/or baking soda and/or power dust or sprinkle talcum or medicated body powders or food-grade DE around those areas as needed.

BROWN COCKROACH

Periplaneta brunnea (Burmeister) [*periplaneta* - means wanderer]

Family Blattidae

DESCRIPTION

Adult - About 1¼" - 2" long. Females secrete a volatile sexual pheromone. Dark reddish-brown with irregular and/or faint yellow-brown markings. It is of the same genus as and closely resembles (and is often mistaken for) the American cockroach but it is slightly broader and darker. Sub-anal plate is not strongly notched. Long slender antenna. The brown cockroach lacks the light coloration on the margin of the pronotum. Its cerci (short appendages at the end of the abdomen) are wider and have blunt tips; the American roach has slender, pointed cerci. It is not as uniformly dark as the smoky brown cockroach. Normally they are transported in plant soil. Adults are normally associated with trees and feed on plant materials. This species has a somewhat yearly growth cycle. First found in Illinois in 1907.

Nymph - Reddish-brown to dark brown. Nymphs mature in little over nine months. The antennal segments of the first nymphal stage are white both at the base and tip.



Ootheca or egg capsule - Slightly larger than the American, is normally fastened in the open to a concrete or plaster wall near the ceiling or outdoors in the same areas the American roach deposits its eggs. Then covered with plaster dust to *conceal* it by the female. Brownish at first then turns black about ½" long or longer. Average 24 eggs deposited within a day after being formed. This cockroach is capable of producing offspring without mating, but the female is normally bred within a few hours after her final molt. Eggs average 35 days from deposition to hatching.

LENGTH OF LIFE CYCLE - One year. Can produce offspring without mating.

REMARKS - Is often mistaken for an American roach, but this is a strong flyer in comparison to the American roach, which basically is a poor flyer. Probably African in origin. Generally found in the South from Florida to Texas. They have been occasionally found in Pennsylvania and Ohio. In the South they are found under tree bark and in palm trees and they normally feed on plant materials outside.

NATURE OF INJURY - Eats any paper with starch on it. Very annoying visually.

HARBORAGE POINTS - The brown cockroach normally lives outdoors under the bark of trees, in vegetation and sewers, but readily flies into homes, crawl spaces and garages in search of food or shelter. The brown cockroach prefers hot and humid areas and is usually found in the same areas/sites one would expect to find American cockroaches. Such places include food-storage areas, basements, crawl spaces, schools, greenhouses, grocery stores and sewers. In the South, they survive quite well outdoors and are found in leaf litter, ground cover, especially in association with trees, especially palm trees, and around dumps. The brown cockroach normally feeds on plant material, decaying vegetation and starchy materials. They enter structures by being brought in, through cracks or holes in exterior walls, and through sewers.

FAVORITE FOODS - Decaying vegetation, starchy materials- use them to make your baits or traps more attractive.

Behavior and Harborage - The brown cockroach is found from eastern Texas to Florida. They build up large populations in some areas. They live outdoors, but enter homes on occasion, and they often are transported into new areas with the movement of plant soil. Brown cockroaches can be found on the trunks of palm trees and in places such as sewers, crawl spaces, and garages. **So regularly clean and spray with Safe Solutions, Inc. Enzyme Cleaners or their Not Nice to Bugs®.**

Control and Management Inspection - Pay careful attention to outdoor populations near buildings. In areas outside the Gulf Coastal region, inspect shrubs and trees that have been imported for indoor use.

Habitat Alteration - See American Cockroach.

INTELLIGENT PEST MANAGEMENT® CONTROL - Routinely mow the grass and remove excess vegetation and debris from around the outside of your building. Sweep down all egg capsules seen on the walls of the buildings. Bait, e.g., the garage, storage areas, attic and crawl space areas. Carefully caulk all crack and crevices. Use baits wherever possible inside, being sure they are carefully placed according to label directions. Routinely spray and/or clean infested and previously infested areas with diluted Safe Solutions Enzyme Cleaner with Peppermint and/or Mop Up® or borax. Try sprinkling Comet®, talcum or medicated body powders or food-grade DE where there are visible problems. Properly install sticky traps or tapes. Use Not Nice to Bugs® as needed.

FOLLOW-UP - Thoroughly reinspect and, if needed, simply vacuum or rebait reinfested inside areas. You should record all the data collected with each inspection. Such information is not only helpful in understanding the problem over time, but with providing clear solutions to solving any spot reinfestations; monitor negative ion plates and practice proper sanitation, exclusion and habitat reduction. Use Not Nice to Bugs® as needed.



AUSTRALIAN COCKROACH

Periplaneta australasiae (Fabricius), Family Blattidae

DESCRIPTION

Adult - Another relative (of the same genus) of the American cockroach, the Australian cockroach, is introduced (brought in from outside the continental United States) and rarely found out of doors in the United States except in the Gulf Coast states from Florida to Texas and in California. The Australian cockroach is similar to the American cockroach in appearance but is slightly shorter (about 1-1/4" - 1-3/8" long) and somewhat oval. Australian cockroach adults have conspicuous light yellow margins on the pronotum. The reddish-brown base color is slightly darker, and the outside edges of the wings just behind the pronotum are light yellow, sometimes nearly white.

Nymph - Changes from shiny black to very dark brown to reddish-brown to brown; late instar nymphs are strikingly marked with distinct splotches or streaks of yellow on the dorsal side of each thoracic and abdominal segment. They can be found moving about under decaying vegetation and loose bark.

Ootheca or egg capsule is dropped or hidden in cracks, crevices and other hidden areas shortly after it is formed and hatches about 30 days later. Colored brown to black about 1/2" long. Contains 24 - 28 eggs, but only about two-thirds actually hatch.

LENGTH OF LIFE CYCLE - About 1 year.

REMARKS - Both nymphs and adults move about under loose bark and in moist, decaying vegetation outside. The adults are strong fliers and will be an occasional invader of homes in summertime particularly when trees are being trimmed or sprayed nearby. This roach is more vegetarian than the other species and can be found in greenhouses.

NATURE OF INJURY - Seldom found inside except in the south; where they are basically only a visual annoyance but sometimes they do damage to dirty clothing, books, papers and plants, especially inside green houses and other artificially heated places.

HARBORAGE POINTS - In the South they are found in trees particularly palm trees. May be found in mulch, decaying vegetation, the top inch of soil, planter boxes and in holes in the trunk or under fronds of palm trees. It is an established pest of many greenhouses. In homes it may be found in basements, crawl spaces, attics, storerooms, or even in the living quarters. It is a strong flyer and may be found flying in anywhere occasionally, or can be carried into the building in potted plants. In the North it will probably increase in direct proportion to our increasing interest in tropical imported plants; they are also found in greenhouses and zoos.

FAVORITE FOODS - The tender parts of plants; starchy materials and decaying vegetation - use these items to make your traps or baits more attractive.

Behavior - The Australian cockroach is more commonly introduced with trees and other plants used inside shopping malls than the brown cockroach. It burrows into soil and is not easily detected. The Australian cockroach can build up in large numbers in buildings with high humidity.

Control and Management Inspection - Inspect the entire infested area. Concentrate on locating the plant soil in which they are burrowing. Flood or spray heavily or soak with Safe Solutions, Inc. Enzyme Cleaners or replace the dirt. **Remember this cockroach hates the cold.**

INTELLIGENT PEST MANAGEMENT® CONTROL - This roach especially hates the cold...lower the temperature, caulk all cracks and crevices. The American roach sex pheromone can be used to trap or bait males. Large bait stations can be placed in and around plants; limit water where possible to protect baits; maintain a high degree of sanitation to force the roaches to baits. Plants may have to be removed and treated elsewhere; simply throw out all infested plants. Roach proof the exterior. Infested plants which are rented or leased should be returned to the supplier. If the plants are owned by the you and cannot be thrown out or destroyed, remove any visible roaches, oothecae, mulch and top inch of the soil and then repot the plant and flood with diluted Safe Solutions Enzyme Cleaner with Peppermint (1 oz. per 1 qt. water). If reinfestation occurs, call a plant nursery, florist or

county extension office and follow the safest control procedure they advise. **Always follow label directions. Never apply boric acid to soils because it will kill the plants.** Try sprinkling baking soda, Comet®, talcum or medicated body powder or food-grade DE where you see activity - or install sticky traps and/or tapes.

Follow-up - Continue monitoring until the entire population is eradicated. You should record all the data collected with each inspection. Such information is not only helpful in understanding the problem over time, but with providing clear solutions to solving any spot reinfestations; monitor negative ion plates and practice proper sanitation, exclusion and habitat reduction techniques and routinely and thoroughly clean with diluted Safe Solutions, Inc. enzyme cleaners and/or boron-based cleaners, e.g., CB Mop Up®, a heat-treated form of boric acid which is more water soluble called disodium octoborate tetrahydrate - this is the same material that is found in Tim-bor® and PolyBor® or you could try borax at 1 c. per 1 gal. with or without diluted Safe Solutions Enzyme Cleaner with Peppermint or you could spray Not Nice to Bugs®.

TURKESTAN COCKROACH

***Blatta lateralis* (F. Walker) (or *Shelfordella tartara*), Family Blattidae**

This medium-sized cockroach can be found in the West Coast of the USA and in the arid regions of Texas, New Mexico and Arizona. Thought to live entirely outside, an IPM School Program in Phoenix caught some on sticky traps inside the school. The preferred foods are starchy material, sugary or sweetened substances and meat protein. Bait with food-grade DE or with aspartame in fruit juice or honey or corn syrup.



CUBAN COCKROACH

***Panchlora nivea* (Linnaeus), Family Blaberidae**

It is originally from Cuba, has limited distribution in the Gulf Coast states from Florida to Texas; it is a peridomestic species and is normally found outside our buildings and occasionally indoors.

Appearance - Adults are 7/8" to 1" long with fully developed wings; strong fliers and are uniformly pale green in color; nymphs are uniformly brown in color. When placed in alcohol, they quickly lose their distinctive pale green color.



Behavior and Harborage and Control - The ootheca (egg case) is retracted into the female's body where it hatches, giving the appearance of live birth. A female generally produces 3 ootheca, each containing an average of 46 dark brown nymphs; males take an average of 144 days and females 181 days to develop. They are basically tropical or sub-tropical roaches that live outdoors in palm trees, heavy vegetation, imported bananas and wood piles. They are strong fliers, attracted to lights (like the Asian cockroach), so change the lights to yellow incandescent or sodium vapor bulbs and/or move them away from building entrances. Properly screen windows and doors. Caulk all cracks and crevices and repair all door seals. Vacuum up any visible pests; spray with diluted Safe Solutions, Inc. peppermint soap and/or enzyme cleaners or make an electrocutor trap with a regular light bulb.

FLORIDA WOODS COCKROACH

***Eurycotis floridana* (Walker), Family Blattidae**

Often called the "woods" roach, it can be found outside in stacked lumber, under palmetto leaves and in debris. Oothecae can be produced parthenogenetically, but the hatch rate is low. When agitated, both sexes can eject posteriorly an oily, strong smelling spray with some degree of accuracy. The adults are large, dark brown or almost black, and 1-1/2" - 1-3/4" in length.



NICARAGUAN COCKROACH

Ischnoptera begrothi

The Nicaraguan cockroach is native to Central America, looks similar to a large German cockroach, but it normally lives outdoors. They, like Cuban and Asian roaches are attracted to and fly to lights. It has been found in the Gulf Coast states from Florida to Louisiana, usually in moist, grassy meadows. They are especially fond of ornamental plantings and seem to prefer to hide in leaf litter near the soil's surface during daylight. We suggest

the same controls be initiated for Nicaraguan roaches as you would for Cuban and Asian roaches.

SURINAM COCKROACH

***Pycnoscelus surinamensis* (Linnaeus), Family Blaberidae**

The Surinam cockroach is another burrowing insect hitchhiker in plant soil and infests plants used in building interiors and greenhouses.



Appearance - The adult female is about one inch long, and has a shiny-black head and pronotum, with uniformly dark-brown or sometimes lighter-brown wings. No males are found in the United States.

Behavior and Harborage - The species is established in southern Florida and Texas. It is extremely sensitive to cold temperatures.

Control and Management - Plants may need to be removed and treated elsewhere or soaked with diluted Safe Solutions, Inc. enzyme cleaner. Drop the temperature. Install sticky traps or tapes and bait stations.

The cockroach can be very difficult to control with synthetic pesticide poisons where they become established in areas that import tropical plants to simulate rain forests and other tropical ecosystems. This is particularly so when tropical birds and other animals are also part of the system because the typical synthetic *roach* poisons will kill them too - so use diluted Safe Solutions Enzyme Cleaner with Peppermint and spray and/or vacuum all visible roaches and/or drop the temperature or spray Not Nice to Bugs® as needed.

ASIAN COCKROACH

***Blattella asahinai* (Mizukubo), Family Blattellidae**

The Asian cockroach (*Blattella asahinai*) is new to the United States and originally established itself in Kathleen and Tampa, Florida. The infested area now includes Houston, TX, most counties in Florida and some Asian cockroaches even showed up in Michigan aboard a mobile home. Because this roach flies very readily and has a greater reproductive potential than the German roach, it may become a serious pest in other areas in the future. They are attracted to lights, so switch the black light to a regular light in an insect electrocutor and plug in outside and caulk all openings, cracks and crevices outside and tightly screen all windows and doors. The electrocutor trap now installed with a regular light should work best if it is the only light left on. Hang a light over a 5-gallon Container of soapy water and leave the light on all night. Spray with Safe Solutions Enzyme Cleaner with Peppermint. Sprinkle Comet®, baking soda, talcum or medicated body powder or food-grade DE or mop with borax where they are gaining entrance. Spray Not Nice to Bugs® as needed.

Appearance - The appearance of the Asian cockroach is virtually identical to the German cockroach especially when they are dead, but they are accomplished fliers and Germans do not fly and they are attracted to bright light and Germans are repelled by bright light. They have a different waxy layer of the exoskeleton. They will follow the light source from room to room. They will even mate with German cockroaches.

Behavior and Harborage - The Asian cockroach is essentially an outdoors roach but can establish itself indoors; its populations are seasonal. It is native to and widespread in southeast Asia and other parts of the Pacific, but it has successfully colonized several urban neighborhoods, especially in Florida, Georgia, Alabama, South Carolina and Texas. This roach lives outside and builds up under fallen leaves and ground cover and grassy areas. It favors grassy areas, especially in shady, moist areas, leaf litter and builds up rapidly under trees. Unlike most roaches, it is attracted to light, and adults fly to lighted windows, backyard barbecues, doors, yard lights, and parking lot lights at dusk. From these points they often crawl into buildings or fly to indoor room lights or television sets. There may be 30,000 to more than 250,000 per acre. They can fly 120 feet and are more active for the first half-hour after sunset.

The Asian cockroach begins building up its population in spring, and produces several generations through the summer. It is limited to warm and moist regions, and may become a serious problem in areas of the United States Gulf Coast where the climate permits it to begin a population increase earlier in the year. In the Tampa area, certain acres may have populations that contain over a quarter million Asian cockroaches.

Intelligent Pest Management® Control and Management Inspection

Inspect large yard trees and waste areas next to suburban yards. Locate favorable harborage and/or turn on some bright lights and then simply vacuum up all visible pests or trap them in pails of soapy water or spray them with diluted Safe Solutions Enzyme Cleaner with Peppermint.

Habitat Alteration

- Practice proper sanitation.
- Caulk or use other methods of exclusion on the sides of building the roach is most actively entering. Lightly sprinkle talcum powder, medicated body powder or food-grade DE in areas where you see activity.
- Minimize leaf litter and ground cover under large yard trees. Remove firewood and litter. Keep areas mowed. Keep vehicle windows closed.
- Attractive blue or cold lights should be located away from buildings and directed so they do not shine on the building walls. Change your lighting to one that does not attract roaches or routinely vacuum around the lights that do.
- Power wash rain gutters monthly or as needed with diluted Safe Solutions, Inc. enzyme cleaner.

Intelligent Pest Management® Control

1. Is very simple; properly install sticky traps or tapes. Use vacuums to remove any food sources, survivors and thus reduce large populations indoors and/or even outside. Spray heavily infested yards with diluted enzyme cleaners - do not fertilize before or after an enzyme application for at least two weeks.
2. The use of an "improved" electrocutor trap or 5-gallon container of soapy water under a bright light to attract and kill them.
3. Closely mow grass and eliminate ground litter and mulch or replace with ground-up tires.
4. Change exterior lighting to yellow "bug" lights or sodium vapor lighting or turn off at night.
5. Prepare some aspartame or food-grade DE baits.
6. Vacuum up all cockroaches around lights and t.v. screens; put talcum powder or cornstarch in the vacuum bag first. Spray all visible roaches with diluted Safe Solutions Enzyme Cleaner with Peppermint.
7. It may be necessary to power dust floor drain cleanouts with food-grade DE for Oriental roaches.

Follow-up - Vacuum if needed. You should record all the data collected with each inspection. Such information is not only helpful in understanding the problem over time, but with providing clear solutions to solving any spot reinfestations; monitor negative ion plates and practice proper sanitation, exclusion and habitat reduction techniques and routinely and thoroughly clean with diluted Safe Solutions Enzyme Cleaner with Peppermint.

Parasitic Hymenoptera

There are several, small (1-3 mm), hymenopterous wasps that parasitize cockroach oothecae. *Aprostocetus hagenowii* attacks the egg cases of American, Smokybrown, Australian and Oriental cockroaches. *Comperia merceti* and *Anastatus tenuipes* both will attack the egg cases of Brownbanded cockroaches.

Some old time Roach Control recipes - Add red food coloring to your baits to note if they are considered toxic or poisonous. Don't forget to add some roach droppings to your baits!

- Make a roach dough by mixing ½ c. flour and ¼ cup shortening or bacon drippings, ½ c. onions and 8 oz. baking soda with enough water to make dough balls. Place out of the reach of children and pets.
- Steep 1 clove of garlic, 1 onion, 1 tablespoon of cayenne pepper and 1 quart of water for one hour, strain add 1 tablespoon of liquid soap and spray where you see roaches.
- Treat all roach areas with a hair dryer or tile softener.
- Mix baking soda with powdered sugar and sprinkle in infested areas.
- Mix 1 part oatmeal flour and 1 part plaster of Paris or 1 part baking soda and 1 part powdered sugar or 1 part borax and 1 part brown sugar and put it in infested areas out of reach of children and pets.
- Place bay leaves in drawers, behind appliances and furniture and around cracks in the room or make a "tea" and spray it in infested areas.
- Mix 8 parts powdered rodent chow, 3 parts granulated sugar and 1 part boric acid or 2% food-grade DE

- with enough water to make dough balls - place in areas not accessible to children or pets.
- Put a piece of bread soaked with beer in an empty coffee can next to the wall - snap a lid on top of the can early in the A.M. and freeze or pour in hot soapy water.

Heat Guns or Even Hair Dryers - A heat gun (with a PVC collar to prevent burns) will drive roaches from their hiding places and will even kill them. Caulk every crack where you flush any roaches. A can of air will also flush cockroaches but it will not kill them.

COCKROACH INTELLIGENT PEST MANAGEMENT® CONTROL OVERVIEW - FIRST YOU MUST CORRECTLY IDENTIFY THE SPECIES — [HTTP://WWW.COCKROACH-PICTURES.COM/](http://www.cockroach-pictures.com/)

Cockroaches need food, moisture and harborage. They have been around for millions of years, but they still have not figured out a way to live on air. If they cannot find food they will die. If they cannot find moisture they will die even quicker, so properly install dehumidifiers and fans or feed and water them with baits made with boric acid or sodium borate. Most of the time they live very close to where they eat and drink, usually in dark, moist areas/cracks. If you do not find the “crumbs” in the drawers, closets, boxes, etc. and remove them and then seal all of the cracks/hiding places you are ensuring the roach population’s continued survival. There is an old story of a drunk searching for his lost wallet under a street light. When asked where he lost it the drunk replied, “a block away.” When asked why he was searching in this area, he replied, “The light is better here.” Look and treat, vacuum, clean, caulk (Remember if you can stick a business card into a crack or crevice or opening - you can stick a cockroach in there too!) and/or sprinkle baking soda, Comet®, talcum or medicated body powders or food-grade DE where the roaches are, not where you want them to be; drill and/or open hidden areas if needed. Use monitoring (pheromone) traps or duct tape (sticky-side up).

Carefully examine for roaches, droppings and food in coffee and snack areas, desks, file cabinets, drawers, trash cans, refrigerators, microwaves, computers, vending machines, refrigerators, stoves, freezers, lockers, closets, etc. Then remove the source of their food and moisture, e.g., use a dehumidifier and/or fans and/or hair dryer or heat gun, store foods in containers with tight fitting lids, rinse all cans with diluted enzyme cleaners, put plastic liners in **clean** trash cans and dispose of trash daily. Power wash or at least routinely clean with diluted Safe Solutions, Inc. enzyme cleaners or peppermint or natural soaps. Wipe up all spills immediately. Repair all leaking or sweating plumbing. Mops and buckets must be rinsed and stored away dry. Install dehumidifiers, dryers, and/or fans, vents, air conditioning and improve drainage; seal off all cracks, crevices and openings. Fit drains with screens or basket inserts or tennis balls. Learn to accurately predict when and where cockroach infestations may occur - then monitor these potential areas and change all conditions that are conducive to infestation.

Stacks of newspaper, paper bags and corrugated cardboard are our greatest gifts to the roach - do not store them inside your buildings. Paint or seal all unpainted wood surfaces. Remove all goods from their packages **outside** - then bring them inside and store them away properly. Routinely flood all drains with diluted enzyme cleaner. An inexpensive but very effective roach trap is a long-neck wine bottle with masking tape on the outside with 2” - 3” of wine or beer at the bottom; roaches are attracted to the wine or beer, fall in and drown. Another alternative is to lightly grease the inside neck of a bottle and put a little stale beer or raw potato in it and a dark (or red) man’s sock on the outside. Still another alternative is to suspend roach excrement or a pheromone impregnated bait or pad over a dish or container of diluted Safe Solutions, Inc. Enzyme Cleaner in water. Empty and “re-bait” as needed. Note: Bottle return laws have helped increase the spread of roaches; store empty cans and bottles in tightly sealed plastic bags.

Properly place boric acid baits and either mop with borax or lightly dust with borax- be careful not to contaminate food or water- be especially attentive to the refrigerator, freezer, stove and duct work. **5% or less** boric acid or some aspartame or food-grade DE mixed with peanut butter or light Karo Syrup or honey and then placed in cracks and crevices or in a secured red packing slip envelope at a 45° angle with the end propped open are a great cockroach baits. They or any other roach bait works even better if you grind up some roaches and/or roach droppings into the bait along with the boric acid or protease enzyme and/or food-grade DE. Take 1 gallon of light Karo Syrup (or honey); heat to about 100° F.; add 1/2# DOT (or less) to 1/8 - 1/4 cup hot water until the sodium borate mixture pours and mix into the gallon of heated light Karo Syrup by shaking; add about 1 oz. of the “boric acid” bait into a red packing label stuck open and secured behind cupboards, appliances, other out-of-the-way areas (where you have seen roaches) on a 45° angle - the red seems to attract them to the bait better

than the clear packing slips. It is a food attractant and moisture source. **Be careful** so that only roaches will eat your borax or sodium borate or boric acid baits. An extremely fast way to quickly and safely remove roaches is to vacuum them up at night using only a flashlight with a red or yellow lens. One final note: Be sure to regularly clean and daily empty any vacuum you use for roach/pest control. Be sure to paint all unfinished wood and the inside of all drawers and cupboards with enamel paint. If you bait or you clean with Safe Solutions, Inc. diluted enzyme cleaners, roaches will come out in the daylight to get to the material. If they eat it, or if you spray them with diluted Safe Solutions Enzyme Cleaner with Peppermint or Not Nice to Bugs®, they die quickly.

Bands of double-sided sticky or carpet tape, bands of petroleum jelly and/or oils of peppermint, eucalyptus and rosemary can be rubbed around to deter roaches from an area. Boric acid, food-grade DE, sodium borate or borax powders will kill roaches. You can mix 5% or less boric acid or borax or enzyme cleaner in any food source that roaches eat - add a little ground up roaches and excrement to *sweeten* the bait - if roaches are dying by the bait you have made it too strong. You can also mop with 1 cup borax or sodium borate per gallon of water and leave the residue on the floor but, only if there are no children, food or pets on the floor - if roaches eat any grease or food scraps treated with borax - they will die. Try mixing 50% Arm & Hammer® detergent or baking soda and 50% powdered sugar as an alternative bait. A mixture of flour, borax, cocoa and plaster of Paris is an old but effective home remedy bait, but be very careful people and pets and wildlife can not and do not get into the powders or baits. Cockroaches can survive without water and only when and if the relative humidity is over 90%; in low humidity areas and/or breezy environments, cockroaches quickly lose moisture through their ectoskeletons, even through the thin waxy/greasy-like outer coating, so use fans and dehumidifiers to help quickly and safely control roach populations. You can also carefully place 10% sucrose and 4% enzyme cleaner baits wherever you see roaches. Direct hot air from hair dryers of tile softeners into all cracks and crevices and voids to quickly and safely control cockroaches - be sure to wear a mask and goggles and not start a fire.

Cockroach Resistance - Dr. Gary Bennett and Mike Scharf from Purdue's Department of Entomology produced a table of cockroach resistance to major classes of insecticide poisons which appeared in the July 1995 issue of Pest Control magazine:

INSECTICIDE CLASS	DECADE OF INTRODUCTION	YEAR OF FIRST REPORTED RESISTANCE
chlorinated cyclodienes	1940's	1953
DDT	1940's	1959
natural pyrethrins	1940's	1956
organophosphate	1950's	1965
carbamate	1960's	1976
pyrethroid	1970's	1988
bait active ingredients: abermectin, hydramethylon and sulfuramid	1980's	1992-95

They then clearly noted "only after you have implemented non-chemical control strategies should you move ahead with the chemical control portion of a resistance IPM program. As we (Dr. Bennett and Mr. Scharf) stated earlier, a potential exists for resistance to any product (poison) on the market today." In the 1990s the newspapers reported that the U. S. House of Representatives has a strain of cockroaches resistant to most forms of chemical attack.

I wholeheartedly agree with this article, volatile, synthetic pesticide poisons quickly create resistant roach species that are virtually not controlled by any amount of more synthetic poisons. People and pets, obviously, live longer than the average 3-month life cycle of a German cockroach and do not, therefore, quickly develop a resistance to these same volatile poisons and are still poisoned/harmed by their application. Volatile, synthetic chemical poisons do not know the difference between a cockroach and a cocker spaniel and many volatile poisons actually repel cockroaches so the roaches do not contact them and die. You will find roaches will not and can not develop a resistance to sticky tapes and traps, vacuums, caulking, sanitation, diluted Safe Solutions, Inc. enzyme cleaners, hot air, fans, aspartame, air currents, talcum powder, boric acid and the other IPM non-volatile, alternative techniques we suggest, and if used properly are far superior in control results and safety. **Use common sense and not dangerous, "registered," volatile, synthetic pesticide poisons.**

Chemical or Poison Resistance - There can be physiological and/or behavioral resistance developments noted in pest populations. There are 3 methods commonly used for the detection synthetic insecticide poison resistance in the German cockroach. They are lethal dose, lethal concentration and lethal time methods. The detection results can greatly vary depending on the methodology chosen. Usually the lethal time or tarsal-contact method or jar test results in the lowest resistance ratios and the lethal dose method usually gives the highest ratios, e.g., chlorpyrifos (Milo et al. 1987.) The lethal time (jar test) probably can not adequately detect resistance in the field because the (trapped) insect can not leave or avoid the bait (behavioral resistance) or show that it is repelled by the poison. In addition it is possible to overwhelm the resistance mechanism with excessive or high doses used to overcome the physiological mechanisms or immunities to the synthetic insecticide poison in the jar. It is well known that repeated testing of the same strain of insects with the same insecticide will also produce results that can vary considerably. The Diamondback Moth, *Plutella xylostella*, Linnaeus, has evolved resistance to virtually all commercial insecticides, including *Bacillus thuringiensis*. Field strains of German cockroaches are capable of developing resistance to pyrethrins and pyrethroids relatively quickly. **Obviously, other insects will also quickly develop resistance to all volatile, "registered," synthetic poisons (faster than people or pets) and poisons are dangerous to other species, so why use poisons, especially when there are so many safer alternatives?**

Use nocturnal inspections (with only a red light), an aerosol can of air and monitoring traps to determine common locations or patterns for cockroaches in any particular building; then find all similar locations, e.g., holes in the wall, sink crevices, drains, ceiling openings, refrigerator motors, picture frames, fiberglass insulation, etc., and eliminate all of the similar sites or populations or conditions as quickly as possible. Ask everyone in the area what they specifically saw, the direction they were traveling, where they came out, how many, what size, condition, etc. Do not follow the same routine or direction when inspecting or questioning or treating. **By placing (pheromone) traps in various locations (vertically and horizontally) you can locate infestations or pest entry points.** A bunch of cockroaches on one side helps you determine the direction of the infestation. If you capture all sizes - you probably have a large, long-standing infestation. If you catch only adults and large nymphs it usually indicates a new invasion. If your trap mostly has small nymphs - there will be a pocket of infestation within a few feet. If all of the adults are dead - there has been no new activity for at least a week. If all the young nymphs are dead - there has been no new activity for at least 3-4 days. Conversely, if you find live roaches trapped in your traps - there is new activity. Different sized nymphs indicate several egg capsules have hatched in that area. Remember to place your traps at least several levels. Cockroaches are not resistant to IPM control techniques, diluted Safe Solutions Enzyme Cleaners with Peppermint, properly applied boron products, e.g., boric acid, borax and/or disodium tetrahydrate octoborate (DOT). You may wish to try baiting with NiBan FG® in a Snuffer™, http://xserve.bynum.com:8080/pdfs/nisus_9_27_pg_1_8.pdf, which has DOT in a disposable bellows pump or cleaning with other boron products, e.g., Mop Up®, sodium borate, borax, etc. or dusting with boric acid and/or DOT, but be sure to use all products carefully and follow all label directions and/or restrictions exactly. 20 Mule Team Borax® is labeled as a natural laundry booster - not a pesticide - and can be safely used in kitchens, litter boxes and on mattresses for deodorizing as long as you avoid contact with the eyes and do not take borax internally. Borax contains sodium tetraborate decahydrate and is labeled to clean cookware, walls and floors. Borax first appeared in history 4,000 years ago and is a naturally occurring mineral composed of sodium, boron, oxygen and water. Borax and other boron products are still used today because they are very effective and versatile. Boric acid has been tested over and over - while it works more slowly at first, it improves in effectiveness over time and consistently results in superior overall control to any product tested for comparison with this "old reliable", you can use it as a dust and/or a bait. *Metahizium anisopliae* fungus, *Steinernema carpocapsae* (Walker) nematodes, and a number of parasitoid wasps can be used to biologically control cockroaches. Crab spiders will eat German cockroaches, Gecko lizards, hedgehogs, tree frogs, Surinam toads, turtles, rats, and mice will also consume cockroaches, and give you biological control. All stages of cockroaches are killed at 115° F. (46° C.) for 45 minutes or 120° F. (49° C.) for 30 minutes. All stages of cockroaches are repelled by air flowing from air dusters, air curtains, or air heating ducts, even at velocities of only 1/2 mph and they are all quickly killed with hot air from heat guns or hair dryers. Flush them from their hiding places with those aerosol cans of air used for cleaning electronic equipment or even an empty bulb duster or blow through a straw into various cracks or misting or spraying with diluted Safe Solutions, Inc. enzyme cleaners. Safe Solutions, Inc. enzyme cleaners not only clean, they attract and kill cockroaches but the majority of "traditional" poison *professionals* still spray poisons that do not control cockroaches and poison people, pets and the environment, calling their control "IPM"; and attack those controls and companies that actually work and eliminate (safely) pest infestations as being "illegal" and/or "unregistered pesticides!" For the record, if you **clean**, especially with a power washer, using diluted Safe Solutions, Inc. enzyme cleaners you will **clean** (remove) all of the cockroaches, their food,

frass, droppings, allergens, pheromones, vomit, secretions and antigens safely! No volatile, synthetic pesticide poison will ever do so much control so quickly! **Cleaning or another Pestisafe® is simply sanitation, not a “pesticide”!** Carbon dioxide fumigation is done by enclosing or wrapping furniture, appliances, boxes, etc. in plastic, filling the bag with carbon dioxide and then sealing it. Roaches die by suffocation. Your most important intelligent pest management® control tool is your mind. Resolve to find and use whatever alternative techniques that provide safer control. **Remember, pestisafes® like fans, Not Nice to Bugs® and/or Safe Solutions Enzyme Cleaners are natural pest controls and will never create pest resistance.**



“Common sense is not so common.” — Voltaire.

A rose by any other name... The word for cockroach in the following languages is: Norwegian, kakerlakk; Swedish, mort; Danish, kakerlak; Spanish, la cucaracha; German, kuchenschabe; French, blatte, cafard; Dutch, kakkerlak; Hungarian, svabogár or csotány; Latin, lucifunga; Italian, blatta; Portuguese, bicho de-conta; Polish, karaluch; Italian, blatta; Russian, tarakan amerikanski (American), tarakan turusak (German); Chinese, chang-lang; Japanese, abula mushi, and Hebrew, juke (jook).

Roaches - Typical First Strikes by Housekeeping & Maintenance (Think like a cockroach!)

1. Practice proper sanitation. The key to long-term roach control is to eliminate the food, water and shelter/harborage they need to survive. Change the conditions conducive to infestation. Be sure all visible cracks and crevices are caulked and fans are left on 24 hours a day in all active areas. Repair all leaks and keep things dry. Install and properly maintain fans or air conditioners and/or dehumidifier(s). Lower the humidity to 50% or less and you will severely reduce the hatching of cockroach eggs. Properly store food and garbage. **Fans, e.g., carpet drying fans, must be left on continuously 24 hours a day for several weeks to control cockroach infestations. Use a blast of pressurized air to flush them out of hiding.**
2. Routinely clean or spray with Safe Solutions, Inc. Enzyme Cleaners (1 oz. per gal. water), all garbage cans (inside and outside) and flood all garbage disposals, grease pits and all drains with enzymes (2 oz. per qt. water) daily. Daily drain all sinks and remove any food debris. Thoroughly clean all items you plan on recycling. Maintain routine and thorough sanitation and proper food and garbage storage. Spray, clean and completely drain all steamers or steam tables. **Do not leave garbage or any food out at night! Eliminate plumbing leaks and condensation problems and put screens or stoppers (or tennis balls) in all drains.**
3. Lightly dust (“If you see white, it ain’t right.”) with baking powder, talcum powder or medicated powder or Comet® or food-grade DE along the edges of the room and in any remaining cracks and crevices - or spray them with Not Nice to Bugs® or diluted enzyme cleaner (1 oz. per qt. water) or blow hot air from a hair dryer or heat gun into the cracks.
4. Mix baking soda (or food-grade DE) and powdered sugar and place as a bait mix. Make some 10% sucrose (or use fermenting molasses) and aspartame or 4% orax or boric acid liquid baits and place them out of reach of children and pets. Place pheromone traps wherever you see roaches. **Date the traps and place them in corners and against edges. Even an inch away can reduce effectiveness. Remove all paper bags, cardboard and fiberglass insulation!**
5. Spray or mist roaches with diluted Safe Solutions Enzyme Cleaner with Peppermint (1 oz. per qt. water). Give a sprayer filled with 1 oz. per qt. water of Safe Solutions, Inc. Enzyme Cleaner with Peppermint to each teacher or member of your staff so that they can quickly and safely control all visible pest problems they encounter. Try spraying diluted Safe Solutions, Inc. enzyme cleaner in a power washer or steam clean. **If you control the harborage you control the roaches, so dust and then caulk and seal!**
6. Mop the floors and clean garbage containers inside and outside with 1-1½ cups of borax, or Mop up® per the label per gallon of hot water. **Keep crawling children off the floor!**
7. One hour after dark, enter the room/home/building with a red/yellow light (A piece of Roscolux #10: Medium Yellow theatrical lighting gel, <http://www.rosco.com/us/filters/roscolux.asp>, can be used to cover

a good flashlight and give you a yellow light “they” can not see.) and a vacuum. Vacuum up all visible roaches before turning on the regular lights. If you are using a dry vac, add 1 teaspoon of cornstarch or talcum powder to the bag to kill the roaches. If you are using a rinse-and-vac, have some soapy or diluted Safe Solutions, Inc. enzyme water in the container to kill the roaches. Repeat once a week for several weeks or until all activity ceases. **Peak roach activity occurs 2 hours before and 2 hours after midnight. Remove (or seal in plastic) all recycling materials daily. This technique not only removes the roaches, it also prevents them from decomposing into the ambient air. Caulk all cracks, especially where you saw activity!**

8. Make some roach traps out of carpet or duct tape (sticky-side up) or by using a mason jar or by cutting the top off of a 2-liter soda pop bottle, cut in a straight line where the bottle begins to curve, cover the exterior with a sock or nylon, put a little Vaseline® (or a mix of 3 parts petroleum jelly and 1 part mineral oil) around the inside edge of the bottle and invert the top and put it back inside the bottle (like a funnel), then duct tape the edges to keep the top from falling inside and the roaches from escaping. Put some masking tape on the outside from the bottom to the top, so the roaches can climb up and into your trap. Put 2” - 3” of beer or wine or a piece of white bread soaked in beer or a banana dipped in beer, some sweet cinnamon roll, bacon grease, bran, a small boiled potato or a commercial pheromone attractant (or some roach droppings) in the bottom and place under sinks, in corners, and wherever you see roaches. You can take some roach droppings and mix them in acetone and spray the mix into your traps and make several “paths” to the traps. (Be sure to wear the proper protection to protect you from the acetone.) You can use this trap to monitor or control. If you leave a small strip or one side open, you can visually inspect your roach trap. You can either freeze the contents or pour in diluted Safe Solutions, Inc. enzyme cleaners or hot soapy water. Empty out and reset, or throw away and make some more. Spray the inside of a brown paper bag (or some plain paper or a piece of wood or cardboard) with 3M® Super 77 Spray Adhesive, <http://www.3MSuper77.com>, (add some roach droppings or pieces of sliced onion or potato or some dog kibble or a small piece of beer soaked bread and leave it on the floor, under the sink, behind the stove or refrigerator, etc. wherever you see roach activity. Replace as needed. **But, remember, the more you catch the more you attract.**
9. Create escape-proof barriers and/or traps with Tanglefoot®, <http://www.tanglefoot.com>, or double-sided (e.g., Mr. Sticky®, <http://www.mrsticky.com>) or, better yet, carpet sticky tape or Vaseline®. Even masking tape can be used to trap roaches, but it dries out quickly and the roaches escape, so use duct tape (sticky-side up). Draw a line of defense with Safe Solutions, Inc. Chalk De-Fence™.
10. **Note:** Quite often a health inspector will assume you have a serious roach infestation if they see one dead cockroach in a trap, so replace traps as needed with (empty) pheromone traps.
11. Dissolve the roach feces in methylene chloride; then mix the solution in water. The water will contain the roach pheromone attractant and the offensive color and odor will stay in the methylene chloride. Use the water to attract roaches to your traps and/or baits. You can make several lines like the sun’s rays for them to follow to a large sticky mouse trap sprayed with the (pheromone) water or into some other trap, e.g., a 2-liter trap.
12. You can use biological controls, e.g., gecko lizards, hedgehogs and/or parasitoid or predatory wasps. Note: Ants and rats and mice will also eat roaches.
13. You can flame roaches with a propane torch **if you are extremely careful!** When you hit the cracks for the roaches, the roaches die instantly. This can be a viable alternative in areas where you can not vacuum, e.g., concrete cages. **115° F. heat will kill all stages of cockroaches in 30 minutes.**
14. Oriental or sewer roaches: Routinely add diluted Safe Solutions, Inc. enzyme cleaners to the drains. You can also add Drano® Dual Force Foamer, <http://www.drano.com/> or Liquid Plumber® Foaming Pipe Snake, <http://www.liquidplumr.com/products/index.html>, to the infested drains. Still have a problem or have some infested drains that you can not foam? Put a box of baking soda and a quart of apple cider vinegar down the sewer vents on the roof, or dust food-grade DE through the cleanouts with a powder duster.
15. Vacuums - A strong vacuum with a crevice attachment will pull roaches from their hiding places. Put a teaspoon of food-grade DE in the bag to suffocate them. Use a red light at night (1 hour after dark) to really find and then eliminate them. Keep the exhaust air away from the roaches you want to vacuum.
16. **If you are still seeing roaches, read the entire chapter - there are many other controls available. Remember: You must have variety in your control programs or you will run into control problems.**

Alternative Controls

1. Make a roach dough by combining ½ c. powdered sugar and ¼ c. shortening or bacon drippings. Add ½ c. onions, ½ c. flour and 8 oz. baking soda. (Don't forget to add some roach droppings.) Add enough water to make a dough-like consistency. Make balls of bait and put them wherever you see roaches.
2. Mix one clove garlic, one onion, one tablespoon of cayenne pepper and a quart of water. Steep for one hour, strain, add a tablespoon of liquid soap and spray it around the house for ant and/or roach control.
3. Place bay leaves or talcum powder or baking soda around cracks in rooms or spray with diluted Safe Solutions, Inc. Enzyme Cleaners.
4. If you find a roach infestation in a computer, radio, t.v., etc., simply place the entire item/appliance in a sealed plastic bag for 1 month. The roaches will die from dehydration. Or simply put in a black bag in the sun on a 70° F. day for a few hours.
5. Mix 1 c. borax and ¼ c. black pepper and ¼ c. shredded bay leaves; sprinkle to repel roaches. **Keep this mix off all food and/or dishes.**

Roach Bait Comment: Virtually any roach bait will continue to secondarily kill cockroaches as they cannibalize those that have died, eating the poisoned baits. This chain can continue for some time, so one properly placed (boric acid) bait can kill several dozen roaches.

Contact Get Set, Inc., @ 1-616-677-1261 or Safe Solutions, Inc. @ 1-888-443-8738.

Trends Noted in “Registered” Pesticide Poisons Being Banned. The first city to ban “registered” pesticide poisons of note was San Francisco in 1997, where the City Council moved to phase out pest control that used pesticide poisons. Since then the San Francisco and Los Angeles school boards have banned “registered” pesticide poisons. In Spring of 1998 Albany, NY joined that enlightened group and will also phase out pesticide poison use in City-owned buildings and Buffalo and Erie Counties are considering similar ordinances. Massachusetts Governor Argeo Paul Cellucci has issued Executive Order No. 403 that clearly states “Chemical pesticides (poisons) may pose a threat to public health and the environment” and, therefore, calls for IPM programs for all facilities owned or managed by the Commonwealth. The use of “registered” pesticides (poisons) classified as “toxic” (**which poisons are not toxic?**) would be outlawed in California schools and day care centers under introduced legislation UPI, Feb. 16, 1998.

Indoor Air Quality: The cover of the April '98 issue of Engineered Systems features a classroom of students with filter masks on. In his editorial, Mark Skaer introduces the issue with these words: “Indoor air is often five to 100 times more polluted than outdoor air. Air contaminated with mold, dust mites, and chemical fumes can trigger allergic reactions, asthma, and respiratory infections. The EPA even ranks indoor air pollution among the five environmental threats to public health...A growing number of doctors and educators say that 'bad indoor air' is partly responsible for the mysterious rise in Attention Deficit Disorder (ADD) and asthma. They fear that sick schools are robbing children of their health and destroying teacher's careers.”

Growth Regulator Warning: Some liquid growth regulators have xylene derivatives that will irritate many sensitive people.

Baiting Caution: If you are trying to eradicate roaches with baits, remember the roaches will eventually become resistant to any synthetic toxin (so use 1% - 4% borax or boric acid or sodium borate or aspartame or food-grade DE). **Keep the bait out of the reach of children and/or pets.** Remember, cockroaches normally will not come more than a few inches to find your toxic baits. The bait has to be put where they live; the problem is “sometimes” this is within the reach of children and/or pets and/or non-target species. That is why the Author only uses 5% food-grade DE or aspartame in his baits.

Cockroach Allergens: R. J. Brenner (USDA-ARSCMAVE, Gainesville, FL) has noted that asthma affects 20 - 30 million people per year in the U. S., or roughly 8% - 12% of the population, with 4000 deaths per year, half under 18. Asthma is 5-fold higher in children. Brenner has noted that 10,000 roaches, *Blatella germanica*, in a 4-foot square chamber produce 700 mg of allergens (a series of proteins) per ml of dust in 48 hours or 1,000 mg/ml in 96 hours. You will want to clean with Safe Solutions, Inc. Enzyme Cleaners or Spic and Span®. If you clean with Spic and Span®, make sure the rinse water is removed each time (Rinse cleaning rags in fresh water before reuse.). Jerome Goddard, Ph.D. in the May 2000 issue of Pest Control Technology noted, “As

cockroaches die in a building, their decomposing body parts become part of the environmental dust. In areas heavily infested with cockroaches, constant breathing of this dust contaminated with cockroach allergens is unavoidable. Accordingly, many people become sensitized and develop cockroach allergy.” **So why kill the cockroaches? Either trap them or vacuum them up!**

Cockroach Poop: Since most roaches eat each other’s feces, the poison (e.g., aspartame, borax, boric acid, food-grade DE or sodium borate) they consume eventually helps kill the entire colony.

Cockroaches as a Food Source: The Author had a dear friend in Florida, George Campbell, who caught cockroaches in live traps, killed them with hot water and then fed them to his ducks and poultry. Research by Francis Marks in 1978 determined the nutritional value of a German cockroach was an unbelievable 62% protein and 25% fat. Cockroaches are also rich in minerals.

Safe Solutions, Inc. food-grade diatomaceous earth can be used in baits, sewers and/or as a dust to control roach problems. Puff some in cracks and crevices and into void areas to give long-term control. Power dusters impart an electrical charge to make this product incredibly effective.

Inspection: Keep the lights off before entering a room that is dark. Search with a red-lensed flashlight or red light bulb. Then turn on the regular lights and see where the cockroaches run or simply vacuum them all up. Cockroaches are the most important pest to control in schools. The most important tools in an IPM program are continued inspections or monitoring. Records carefully written and filed away are the memory of your IPM program.

Heat and Boric Acid: The combination of heat at 110° F. for 2 hours with boric acid will increase the speed of mortality. **115° F. heat will kill all stages of cockroaches in 30 minutes.**

Not Nice to Bugs®: Is an EPA exempt pesticide that kills pests faster and safer than volatile “registered” pesticide poisons. http://www.safesolutionsinc.com/Non-Toxic_Pest_Control.htm

Note: The name cockroach comes from the Spanish word “cucaracha” which basically means “crazy bug”.

Never give up trying: Thomas Edison’s daughter spoke at a festival of lights in Fort Meyers, Florida. She noted she was happy her Father never believed in “3 strikes and you’re out.” He had, by her recollection, 9,999 failures as he tried to create an electric light bulb; only on the 10,000th try did Tom “light up the world.”

But, give up “registered” poisons! It is estimated that over \$500 million is spent on “registered” insecticide poisons to try to control cockroaches in the U. S. If you bother to read the label of the “safest” over-the-counter poison, you will see these are not “safe”. If still in doubt, read the MSDS; then try it my way. You really don’t want to kill the roaches and then breathe them - so trap them or vacuum them or safely solve them away!

The proper way to install double-sided carpet tape: The proper way to install double-sided carpet tape is to first cover the area with masking tape; then install the double-sided carpet tape on the masking tape.

Car Fumigation: Put 10 pounds of dry ice in the car and close it up for the night. Leave the doors open for a few minutes before physically entering.

Remember, the cockroach is a living fossil that has endured on earth unchanged for about 350 million years or over 300 million years longer than the earliest primate. Cockroaches have been found in every human habitat, even on the Apollo XII spacecraft; There are an estimated 10 cockroaches for every human in the average city. They are immune or resistant to virtually every pesticide invented by man and can survive an atomic bomb, but they can not survive this chapter’s tools.



*Safe Solutions products may be purchased online at:

<http://www.safesolutionsinc.com>

or by telephone at:

1-888-443-8738.