

DELIVERING HIGH
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COCKROACHES


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COCKROACHES

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Cockroaches

INTRODUCTION

Undoubtedly amongst the most noxious of pests, cockroaches have lived alongside man for hundreds of years.

There are over 4000 different species of cockroaches worldwide.

Those species which are now classed as pests originated in tropical climates but have now become cosmopolitan, being distributed by commerce.

NATURE OF THE PROBLEM

Cockroaches foul their environment with faeces or castings, and regurgitated food. They taint materials with their characteristic smell and the air in infested premises may contain fragments of their exoskeletons and cockroach excrement.

They move from filth to food indiscriminately and are therefore implicated in the mechanical transmission of pathogens such as those causing food poisoning and wound infections.

Susceptible individuals may respond to exposure to allergens in cockroach excrement and cast skins, developing an allergic response such as allergic rhinitis or dermatitis.

They cause great distress to people occupying infested premises.

GENERAL BIOLOGY AND BEHAVIOUR

Cockroaches have long whip-like antennae which are carried reflexed along their bodies. Their heads are hinged under the pronotum (a shield-like covering) and their legs are large and bristly.

Cockroaches are omnivorous. In addition to conventional foodstuffs, they will feed on paper, vomit, sputum, human and animal faeces, nail parings and other cockroaches. Their activity peaks during the hours of darkness, that is they are crepuscular insects.

They exhibit incomplete metamorphosis; the juvenile stages or nymphs resemble the adults. Each cockroach moults several times in its life cycle producing a larger nymph and eventually moulting to the adult stage. Some species are fully winged in the adults, others may have reduced wings or wing buds. When wings are present they are leathery and veined.

The females of those cockroaches classed as pests all produce egg cases or oothecae. The eggs hatch inside the case and nymphal cockroaches emerge from them.

During the daytime, cockroaches spend most of their time in harbourages, grouped together. This behaviour is influenced by them finding the same suitable harbourage and also by them producing an aggregation pheromone which is a chemical messenger to other cockroaches of the same species, who respond by being attracted to the source of the pheromone. As this pheromone is present in cockroach faeces, cockroaches will also be attracted to areas previously contaminated by cockroaches.

It should be noted that the development of cockroaches is affected by food quality, humidity, temperature and day length. Therefore the figures quoted in the following pages, under Control Methods, should only be used as a guide.



Spread of pathogens by cockroaches

Like the flies mentioned in the previous section, cockroaches too have been implicated in the mechanical transmission of enteric disease. Fewer species of cockroach are involved as the vast majority are found free-living in forests and grasslands and are of no medical or public health importance. Only the peridomestic species that have successfully adapted to the human environment are considered here.

Fewer studies have been conducted with cockroaches to establish their role as vectors. Nevertheless, their role as mechanical vectors is great.

The reasons for this are as follows:

1. Cockroaches do not have a seasonal incidence, therefore their ability to transmit disease remains undiminished throughout the year.
2. Their preference for a warm, humid and temperature-controlled environment, such as a kitchen or hospital, enhances their contact with pathogenic micro-organisms.
3. The immature stages of cockroaches share the same habitat, behaviour and food requirements as the adult and are of equal status as efficient vectors, whereas only adult flies have been implicated.
4. Being an indoor pest, cockroaches seldom venture outside and so share a close association with humans.
5. Cockroaches are long-lived insects. The period from first-stage nymph to adult may be in excess of twenty months, depending on the species involved.
6. The pest species involved are largely nocturnal and their presence often goes unnoticed.
7. In temperate climates cockroaches tend to crawl more than fly. Their contact time with contaminated material is then increased.

Studies using cockroaches have clearly established their ability to come into contact with and eat human faecal matter and infected material. Comparative studies on the micro-organisms found in the environment from which they were taken, the external surfaces of the insect and its gut contents have shown a marked similarity. Essentially, the cockroach gut contains precisely the same organisms as are found in its environment.

As with flies, the cockroach gut provides a hospitable and stable environment for the maintenance of pathogens, allowing transmission over a longer period as well as rapid multiplication. Bacteria isolated from the gut of cockroaches include *Staphylococcus* spp, *E. coli*, *Shigella* spp, *Salmonella* spp.

Cockroaches are extremely mobile animals and their proven ability to crawl from sewers and drains through broken traps into kitchen and hospital environments illustrates their massive potential as spreaders of pathogens. Numerous studies have shown that the incidence of gastro-enteric disease has been curtailed or reduced by control of the cockroach population.



Oriental cockroach

Blatta orientalis

KEY FEATURES

The male cockroaches are approximately 25mm long with females 32mm long.

Both sexes are shiny and very dark brown, nearly black, in appearance. However, the early instar nymphs may be reddish-brown.

The distinctive shape of the wings is noticeable in this species. In the males they cover approximately two thirds of the abdomen, whereas those of the female are vestigial.

BIOLOGY

The female Oriental cockroach carries the oothecae for about 30 hours, after which time she deposits them, dropping or attaching them near to a food source.

Oothecae hatch in approximately six weeks, but this period may be greatly extended in cool conditions. In this situation the egg case represents a biological time bomb waiting to hatch and continue an infestation. For this reason repeated use of insecticides may be needed.

Adult size:	20 - 24 mm
Number of moults:	7 - 10
Development time: (Egg to adult)	6 months - 2 years
Length of adult stage:	3 - 6 months
No of oothecae produced in female lifetime:	Average 11 Range 1 - 18
No of eggs produced per ootheca:	16 - 18

SIGNIFICANCE

This is the most common cockroach in the United Kingdom.

It is found throughout the world although its status as a pest varies, for example in the USA, it is considered to be a pest of gardens primarily, from where it wanders into property.

Oriental cockroaches are poor climbers on smooth surfaces, which may limit their distribution within a building.

They appear to be cold tolerant in that they are often found outside buildings, in drains, gardens, sewers, external brickwork etc, a factor which should be remembered when attempting to control them.

Illustration:

Top: *Blatta orientalis* nymph.

Bottom left: *Blatta orientalis* adult male.

Bottom right: *Blatta orientalis* adult female.





German cockroach

Blattella germanica

KEY FEATURES

The adult is light brown in colour with two dark almost parallel longitudinal stripes on the pronotal shield.

The female is darker than the male and with a broader abdomen.

Both male and female adults are fully winged.

Early instar nymphs have a pale area centrally on the dorsal thorax.

Later instars have two dark longitudinal stripes on the pronotum.

BIOLOGY

The ootheca is carried by the female until it is within 1 - 2 days of hatching.

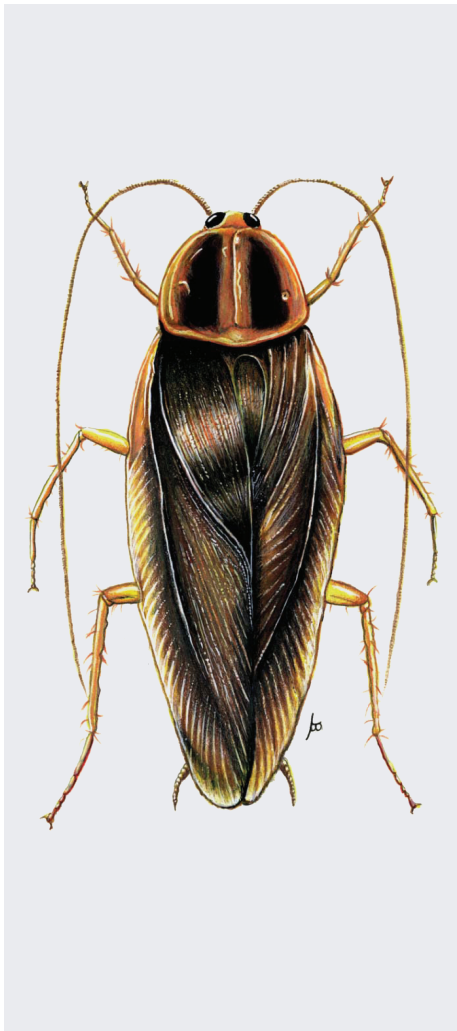
Small 1st instar nymphs emerge from the ootheca and easily infest tiny cracks and crevices in the immediate area.

All the nymphal stages and the adults feed on the same type of food, making the establishment of an infestation extremely easy.

Prior to moulting, nymphs become immobile, remaining in harbourages.

SIGNIFICANCE

German cockroaches are found throughout buildings but show a preference for warm humid areas.



Adult size:	13 - 16 mm
Number of moults:	5 - 7
Development time: (Egg to adult)	1 - 3 months
Length of adult stage:	3 - 6 months
No of oothecae produced: in female lifetime:	Average 5 Range 4 - 8
No of eggs produced: per ootheca:	Average 30 - 40 Range 18 - 50

They are good climbers, being able to climb vertical glass or tiled surfaces.

An infestation of these cockroaches can be quickly established once they have entered any premises.

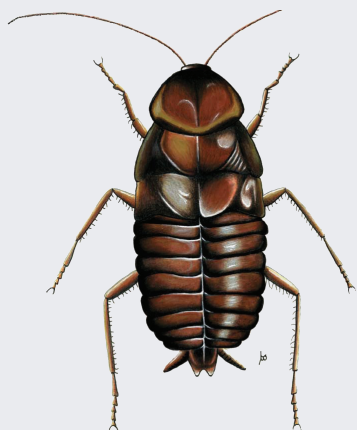
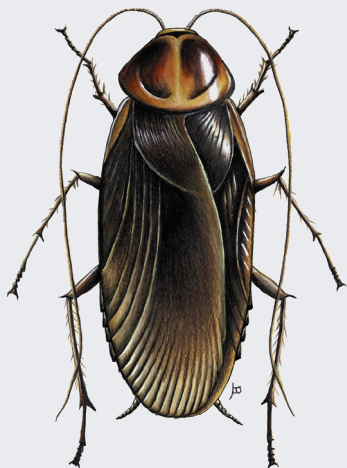
This species is an extremely serious pest in many different types of premises ranging from hospitals to domestic houses.



Illustrations:

Top: *Blattella germanica* adult male.

Bottom: *Blattella germanica* nymph.



Top: *Periplaneta americana* adult female.
Bottom: *Periplaneta americana* nymph.

American cockroach

Periplaneta americana

KEY FEATURES

The adult American cockroach is reddish brown in colour and is fully winged.

Male wings extend beyond the tip of the abdomen; female wings do not.

There is a pale brown to yellowish band around the edges of the pronotum.

BIOLOGY

The female deposits oothecae a few hours or up to 4 days before the 1st instars emerge.

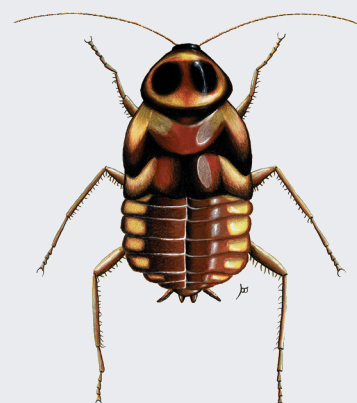
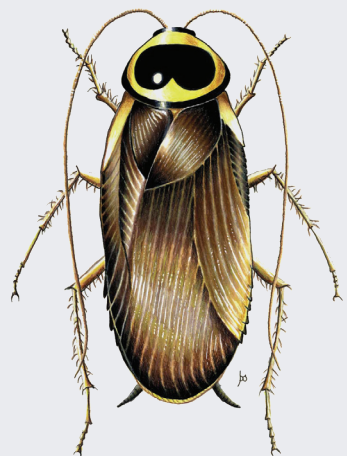
The ootheca is dropped or glued to a suitable surface, usually in a pocket of high humidity near a food source.

The young nymphs emerge from the egg case and feed on a wide variety of foodstuffs, eating the same materials as the older nymphs and adults.

Adult size:	34 - 53 mm
Number of moults:	10 - 13
Development time (Egg to adult):	Over 1 year
Length of adult stage:	6 months - 1 year
No of oothecae produced in female lifetime:	Average 40
No of eggs produced per ootheca:	14 - 16

SIGNIFICANCE

This species is not well-established in Britain yet. It is not as cold tolerant as *Blatta orientalis* and *Blattella germanica*. Typical infestations in the United Kingdom are port areas, where it is introduced via ships. Infestation areas include greenhouses, zoos, large centrally heated humid environments, etc.



Top: *Periplaneta australasiae* adult female.
Bottom: *Periplaneta australasiae* nymph.

Australian cockroach

Periplaneta australasiae

KEY FEATURES

Adults are reddish brown, fully winged with a yellow to pale brown band around the pronotum and a yellow streak on the outer edge of the base of the front wings.

Late instar nymphs have pale yellow markings on the lateral margins of the thorax and abdomen.

This species closely resembles *Periplaneta americana*.

BIOLOGY

The female cockroach deposits the egg case containing around 15 nymphs which emerge after a period of approximately 80 days.

The young nymphs eat a wide variety of foodstuffs including cereals and fruit.

All the nymphal stages and the adult consume the same type of food and a large population can quickly develop.

Adult size:	25 - 35 mm
Number of moults:	10+
Development time:	Approx. 1 year (Egg to adult)
Length of adult stage:	4 - 6 months
No of oothecae produced in female lifetime:	20 - 30
No of eggs produced per ootheca:	Average 16

SIGNIFICANCE

Not yet widely established in the United Kingdom. It requires hot, moist conditions. It is found in greenhouses, therefore potted plants may be a source of infestation. Pet shops, particularly those with large numbers of heated fish tanks, can also be a source of infestation for this species.



Brown-banded cockroach

Supella longipalpa

KEY FEATURES

This cockroach is small, light brown to brown in colour and is often mistaken for *Blattella germanica*.

Females are much darker than males and their abdomens are rounder and broader.

Females' wings do not cover the whole abdomen, males' wings do.

Wings have pale markings across the upper third.

Nymphs have pale brown bands across the body.

BIOLOGY

The female usually fastens the egg cases to furniture, walls and ceilings.

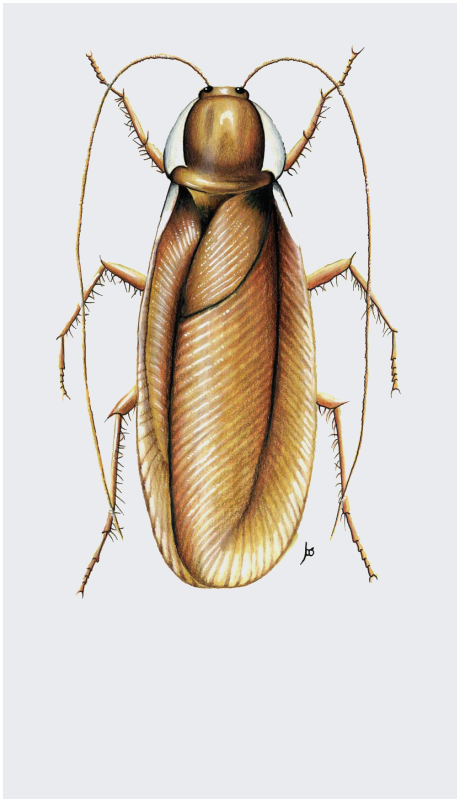
From the egg cases emerge the 1st instar nymphs.

Like all cockroaches, all stages of the lifecycle feed on a wide variety of foodstuffs.

SIGNIFICANCE

This cockroach needs hot conditions to survive; it prefers 27°C and over but it is becoming more common as a pest in the UK.

It is typically found in light switches, electrical appliances, motor housings, etc.

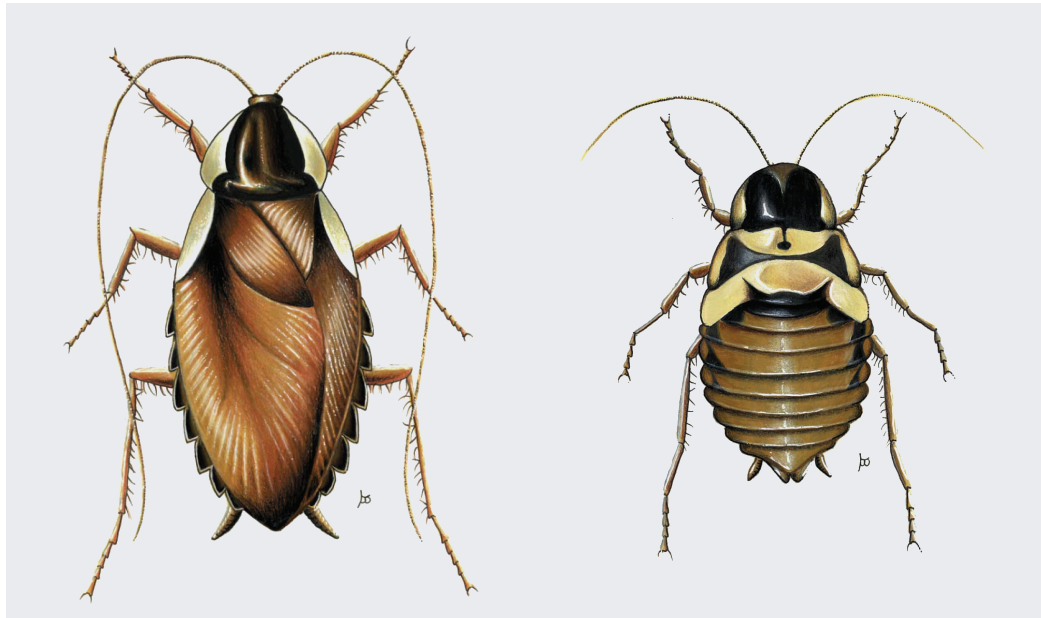


Illustrations:

Top: *Supella longipalpa* adult male.

Bottom left: *Supella longipalpa* adult female.

Bottom right: *Supella longipalpa* nymph.



Control methods

An established cockroach infestation is likely to be difficult to control. This is because the cockroaches will be distributed throughout the building in difficult to reach harbourages. Furthermore the phenomenal breeding potential and production of many egg cases by each female cockroach means that unless a very high proportion of the population is eliminated, numbers will continue to increase.

An integrated programmed approach is essential. Spot treatments will be completely ineffective for all but a small, localised infestation.

Before a treatment is carried out, it is important to identify correctly the cockroach species. This will provide details of the biology, life cycle and habits of the pest, which can be exploited in the control programme. Monitoring the extent of the infestation by visual inspection of voids, potential harbourages and by the use of traps will help identify hotspots of infestation. Inspections are best carried out at night when the cockroaches are most active. A torch fitted with a red filter should be used, as cockroaches do not respond to red light. Aerosols may aid in flushing out insects from their harbourages.

When using sticky traps, suitable placement sites would be underneath equipment, behind counters, in roof spaces and in ducting and electrical trunking.

As cockroaches become trapped, the trap becomes more attractive to other cockroaches because of the effects of aggregation pheromones exuded by the trapped cockroaches. Adjoining buildings and areas sharing services should be included in this monitoring.

Non-chemical control methods, such as removal of food and water residues, proofing, improving hygiene and creating access to difficult-to-reach areas, will all aid a successful cockroach control programme. If chemical control is needed, a combination of different formulations for different areas will give the most effective treatment.

Care should be taken to select only those insecticides which are approved for use against cockroaches and that the area of approval covers the type of building to be treated.

Insect growth regulators, baits, residual insecticidal sprays, insecticidal dusts and ULV formulations may all be considered and most usually a combination of all or some of them will be selected. Use of one type of formulation alone in a complex building is unlikely to achieve a sufficiently high level of control. Re-treatment of all or some areas will almost certainly be needed. A thorough treatment is needed.

After insecticidal application, post-treatment monitoring should be carried out and steps should be taken to prevent re-infestation, by attempting to determine the source of the original infestation. For instance, are oothecae or cockroaches being introduced on incoming goods, laundry, potted plants or via drains?

Continued use of sticky traps as a permanent early warning system may also be useful.



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