

# Flies

and their control



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If you have never done “the Australian wave,” then you haven’t lived in Australia for very long.

Flies are synonymous with Australian rural and urban landscapes and can be a major pest in commercial premises especially those which practise a less than perfect standard of sanitation. You are no doubt aware that, unfortunately, this is a description of many food manufacturing or handling enterprises in the world. Whether you are in a café, a supermarket, a fish shop or at an outdoor barbecue, you are more than likely to encounter one or more species of fly. These flies are not just a nuisance though, as many of the flies which harass us can be carriers of disease, even some which are potentially fatal. No matter which species we are dealing with, pest managers must always utilise the principles of Integrated Pest Management in order to succeed.



# BIOLOGY

Flies of all species belong to the order Diptera, one of the largest orders in the world. There are probably 150,000 described and undescribed species in the order, with over 6,000 species found in Australia. Only around 25% are described and have proper scientific names. They inhabit most regions of Australia, the greatest diversity being found in forests and near sources of fresh water.

Despite some diversity in structure, the overwhelming majority of adult flies are easily recognisable by the presence of only one pair of functional wings. The hind wings have evolved to become small, club-like structures known as "halteres" which vibrate rapidly during flight. They perform the role of gyroscopic sense organs of balance during flight.

The head bears a pair of rather large compound eyes and short, simple antennae. Flies' mouthparts are adapted for sucking and form a more or less elongate "proboscis" or "rostrum." These types of mouthparts are used for sucking or mopping up nectar. In some species e.g. mosquitoes, the mouthparts are modified into biting types which can be used for piercing skin and sucking blood.

Flies undergo complete metamorphosis during their life

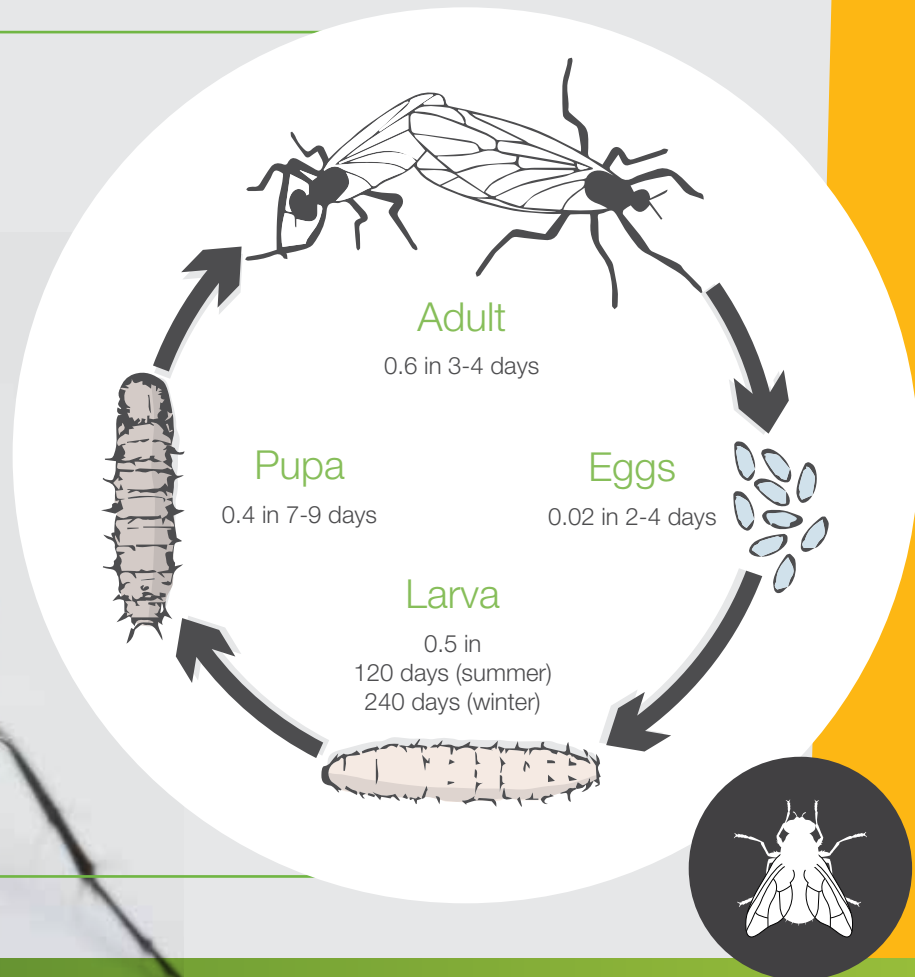
cycle. The majority of adult females are oviparous and lay their eggs on or near a suitable food source. Some species e.g. those belonging to the family Sarcophagidae (Flesh flies), are viviparous, depositing live larvae on some type of decomposing matter. Sometimes, they deposit their young on your windscreen when your car and their flight path coincide! Using your windscreen washer seems to only make the matter worse. The emerging larvae primarily feed upon decomposing vegetable matter or carrion, whilst some are predatory or parasitic. Some larvae e.g. mosquitoes, are aquatic and feed upon food particles in the water.

After reaching the "fully fed" stage, all larvae pupate and shortly thereafter, a full adult emerges.

Flies are almost a perennial sight in Australia, whether in the bush or the city or the seaside.

Although a few flies may be of benefit to nature, more often than not, flies are a nuisance pest affecting human lifestyles. Diseases such as typhoid, cholera, diarrhoea, amoebic dysentery, giardiasis and worms (pin and tape) are spread mechanically by flies.

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# WHAT?

Of course, not all species of flies are a major problem but there are a number of species which are noteworthy. Not all of these species can be treated by pest managers and some e.g. vinegar flies and mosquitoes, are notoriously difficult to control.

## The major species with which we come in contact are:



**Family Muscidae** – this is a large family with many species which have economic and medical importance. The best known species is the house fly (*Musca domestica*) which varies in size from 5-8 mm long with a dull grey thorax and abdomen. The adult fly is known to carry many kinds of pathogenic bacteria which can adversely affect man and domestic animals. Adult house flies are commonly found in domestic dwellings and are often seen trying to land on your dinner plate. The larvae can be found in the excrement of animals and also in decomposing organic matter e.g. compost heaps. They are altogether “yucky!”

Another well known species is the lesser house fly (*Fannia canicularis*) which is often distinguished by its erratic flight path rather than its appearance. The adult is 3-6 mm long and thorax and abdomen are dull grey with indistinct stripes on the thorax. Adults can be found in domestic dwellings or animal houses and the larvae feed on organic refuse.

A less common species is the stable fly (*Stomoxys calcitrans*) which is rarely found in houses but can be found in animal production facilities. The fly is about 5-7mm long with distinctive piercing and sucking mouthparts. When at rest, the wings are held widely apart. The larvae feed on a wide range of organic material and the adults feed on the blood of animals.



**Blow flies or Bluebottles (Family Calliphoridae)** – this too is a large family and members are of a stouter build than Muscidae spp. They are 11- 13 mm long or larger and vary in colour from black, blue, green and bronze. The adults are strongly attracted to moisture and feed mainly on nectar, honeydew and other sweet liquids. Although they can be found in massive numbers at times, blow flies are not significant domestic nuisances or disease vectors. The larvae of some species can cause “blow fly strike” in sheep, a condition which causes millions of dollars of damages annually to the industry.



**Mosquitoes (Family Culicidae)** Adult mosquitoes both have a long proboscis which the males use to feed on nectar. The female, however, feeds on blood which leads to the transmission of disease. In Australia, instances of mosquito related disease are mostly isolated to the northern tropical regions but various species can act as carriers for serious diseases such as malaria, dengue fever and filariasis and the Ross River virus in humans as well encephalitis in horses and heartworm in dogs. Mosquito borne malaria is one of the world's major infectious diseases, killing around two to three million people each year.

Australia is host to over 300 species of ‘mossies’ which start their lifecycle as aquatic larvae until the adults emerge as little as one week later, in optimum conditions. The mosquito can exploit a range of fresh and salt water sources – natural or artificial - for breeding habitats. There have been many, many scholarly books written on mosquitoes and the risks they pose. For a wealth of information on Australian mosquitoes and their disease potential, consult the Fact Sheets on the website of the Westmead Hospital Medical Entomology Dept. – [www.medent.usyd.edu.au](http://www.medent.usyd.edu.au).



**Fruit flies (family Tephritidae)** are always found around ripening fruit whereas the Vinegar fly is found primarily around decaying fruit. Fruit flies (*Dacus* spp.) are important pests to commercial industries and can cause much economic damage if unchecked. The adults feed on sap, nectar, honeydew and droppings. Vinegar (Fermentation, Bar or Beer) flies may become a nuisance in homes, restaurants, fruit markets, etc., especially when associated with decaying or rotting fruit and vegetables. Adult vinegar flies are about 3-5mm long, dull brownish-yellow to brownish-black with red eyes in some species. The head and thorax are tan-coloured, while the abdomen is black and grey underneath. Indoors, these flies may be seen hovering around overripe fruit and vegetables, baked goods containing yeast, garbage cans and beverages/ empty beverage containers, such as fruit juices, cider, soft drinks, beer, wine and vinegar. They can breed alarmingly quickly and may be seen in hundreds alighting on surfaces near food sources. When spotted around the breakfast buffet of a five star hotel, they are less than popular! They can prove extremely difficult to control as many clients are hard to convince that an underlying hygiene issue is the reason why they have a continuing problem with these flies.



**Drain (Moth) flies** (*family Psychodidae*) are most often seen in toilets, bathrooms and sewerage works. Adult flies may become very numerous at times indoors especially around drains, in urinals, on toilet/bathroom walls and around showers and bathtubs. They are invariably a result of drainage problems – blocked or broken drains under the floor or accumulation of organic matter around drain holes. Like the Vinegar fly, they are a consequence of poor hygiene. Adult drain flies are tiny (4-5mm long), fuzzy, dark or greyish insects with the body and wings densely covered with hairs. They have long antennae. Wings, appearing too large for the body, are held roof-like over the body when at rest, giving a moth like appearance. They are weak fliers and make irregular, hesitating flights covering only a metre or so in short, jerky lines.



**Flesh flies** (*family Sarcophagidae*) are 11-13 mm long with a striped thorax, a patterned abdomen with or without a red/brown tip. They are usually found in the vicinity of carcasses e.g. dead rats or possums. If you see these flies sitting on a ceiling or wall, you can be almost certain that there is a dead animal behind the surface. If you can detect a horrendous smell, your suspicions are confirmed!



**Sciarid** (*family Sciaridae*) are an extremely widespread family of small flies. The larvae of some species are commonly found in large numbers in rotting vegetable matter or highly organic soils. Pest managers may encounter them in situations where the occupants of the premises have pot plants or gardens in which the larvae are breeding. The adult flies may annoy the occupants and make them believe that they are being bitten by the flies. Such situations can be difficult to treat.



**Phorid (Hunchback) flies** (*family Phoridae*) are similar in habit to Sciarid flies but their larval habits vary greatly, some living in decomposing organic matter and some scavenging in carrion. The adults are small to minute in size with a relatively large thorax, hence the common name of “Hunchback” flies. They too can be found in premises where pot plants or gardens are found and can give rise to the illusion that they are biting the occupants.



**Biting flies** – these include such species as March (Horse) flies, Biting midges (or Sand flies), Stable flies and Black flies. Pest managers rarely treat these pests or, if they try, have limited success. Details on these flies can also be found on the Westmead Hospital Medical Entomology website.

Pest managers may encounter a wide range of other fly species but the foregoing are the most economically significant. If you find a fly (or any other specimen for that matter) which you can't identify, make sure that you have it identified before deciding upon a treatment programme. It's no good treating for flies if you have thrips, alate termites, native bees or something else which just looks like a fly!



# CONTROL MEASURES

It's not how many flies you kill, it's how many you leave behind!



## SITE EVALUATION

To successfully control a fly problem is a task which requires knowledge, resources, co-operation from the client and often, a degree of imagination. You can't just walk onto a site and start spraying whatever you have in your compressed air sprayer or bulk tank. You need to carefully examine the client's premises before embarking upon any action. To simply apply a chemical without addressing the underlying reasons for the fly infestation will not make a happy client. Remember, it's not how many flies you kill, it's how many you leave behind!

As with all pest management contracts, you will need to carry out a Risk Assessment before undertaking any work. While you're doing that, you can also look at the following factors:

- **Geographic location** – Facilities in rural areas may be located near to endless reservoirs of arthropods. If there

are water sources nearby, you may have trouble with midges, mosquitoes, water beetles etc.

- **Site orientation** – Where sites are free standing, prevailing winds and the location of entry doors may have a decided influence upon the number of insects which enter a building. If there is a "high risk" operation e.g. abattoirs, in the vicinity, you may have ongoing issues.
- **Structure** – The age, nature of construction, state of repair, design etc. of buildings will influence the site's susceptibility to pests of any description.
- **Site culture** – The degree of success of any pest management programme depends strongly upon co-operation from management and staff. Leaving doors and windows open, throwing food scraps on the ground and leaving garbage bins open are practices which will severely hamper your control efforts.



# THREE CONTROL PARAMETERS

The three following parameters can be successfully applied to any pest management programme. The first one is:

## EXCLUSION

Obviously, if you can prevent flying insects from entering a building, your worries are almost over. Some exclusion measures are:

- **Flyscreens** – these are placed on doors and windows and are effective if maintained properly. Poorly fitted screens, holes in screens or doors/windows left open negate their value.
- **Airlocks** – if these are properly designed, located and maintained, they are an effective method of preventing the entry of flying insects, especially if used in conjunction with aerosol dispensers or electronic control units.
- **Air curtains** – these systems are not in widespread use due to cost and varying degrees of efficiency. One could write a whole bulletin just on their use. If the systems are not adequate in power or not sited correctly, they do not provide the degree of protection that might be expected. Flies may simply drop to the ground and walk inside the premises or be carried in on the backs of forklift drivers. Consult with a reputable supplier before recommending such a device.
- **Strip curtains** – these units are usually made of plastic of varying design and thickness. Smaller designs are used in domestic premises. There is often a gap at floor level allowing insect entry and when used in loading docks etc. flies can still enter on the backs of staff members or on goods. Sometimes, their value is completely negated when the strips are used as “garlands,” tied back to door handles, fire extinguishers etc.

## RESTRICTION

“Restriction” means basically reducing the breeding potential of the pests by eliminating food sources or potential breeding sites. Some of the elements of an effective “Restriction” programme are:

- **Waste disposal** – obviously where you have waste disposal, you have, by definition, food wastes, liquids and other items such as packaging material. What else could any pest ask for? On large sites, dumpsters

and bins should be located on a raised platform which is, in turn, on a sloping concrete pavement, allowing for effective drainage and washing down. Containers should be closed when not in use but, all too often, you see dumpsters or skips uncovered and attracting flies, cockroaches, ants, rodents and birds. All waste bins etc. should be situated a distance from the building itself and not in an area where the prevailing winds will carry odours into interior areas. They should be emptied on a strict schedule and not be allowed to overflow. Let me know if you ever see a site where all these rules are obeyed!

- **Breeding site removal** – this applies especially to mosquito control where it is an important factor in a control programme. This could involve disposing of old tins, tyres, buckets and similar containers, ensuring that there is no free standing water and changing water in such things as bird baths and wading pools. It is also very important in the control of vinegar flies where the larvae may be feeding in the locations previously mentioned as well as less obvious places as used tablecloths, table napkins, aprons, bar mats, rubber floor mats, soft drink dispensers, rarely cleaned drains and walls. Without the proper and regular cleaning of such items, control is virtually impossible.
- **External lighting** – this is an aspect which is often overlooked by clients and pest managers. It is essential to have exterior lighting for safety and where facilities operate on a 24 hour basis. Mercury vapour lamps, fluorescent tubes and incandescent bulbs are all more attractive to flying insects than high pressure sodium vapour lamps. Specially coloured “insect” bulbs can be used to reduce the attraction factor and external lights should be placed 5-6m away from doorways. Ideally, high pressure sodium vapour lamps should be used exclusively in external areas. Lights should be placed on poles some distance away from the building rather than being attached to the building itself. There have been instances where crates of bread rolls placed in loading docks before business hours have been riddled by Black African Lawn Beetles which had been attracted to the lights, fallen down onto the bread rolls and started to chew their way through. Neither the food outlet staff nor their customers were particularly impressed!





## DESTRUCTION

Now, this is where most pest managers start to get interested. We get to “kill something!”

There are a wide range of chemical and non-chemical control measures with new insecticide formulations being introduced fairly regularly. It would be fair to say that any insecticide will kill flies but that doesn't mean that you can just pick up any insecticide container from your vehicle, mix up a batch and start spraying. The first aspect to consider of course, is whether or not the product is registered for the particular fly species you're treating. You need to read the label of any product before you use it as I'm sure you already know. If you don't have a suitable product already, consult your Globe sales personnel for advice. Some of the insecticidal formulations you might use include:

- **Fly bait** – there are a few options available. They are usually a granular formulation and one very effective product can be applied as a dry granule scattered around, placed in purpose built bait stations or just in trays, or mixed into a paste and applied to vertical surfaces such as timber poles or to pieces of timber mounted on platforms or suspended in the air. You can kill up to a thousand flies per hour with such a formulation!
- **Residual insecticidal application** – the use of Synthetic Pyrethroids to fly alighting surfaces e.g. around entry doors, windows and waste bins, will repel and also kill flies. The addition of sugar will help attract house flies to the treated surface. Some insecticides are mixed with water and painted on to an appropriate surface. As well as the active ingredient these products also contain sugar and a sex attractant. If food doesn't turn them on, then the prospect of a night out with a good looking female fly will certainly do the trick!
- **Insect growth regulators** – these are used to control mosquito and black fly larvae in aquatic environments. They are available in a range of formulations and are very effective when used according to label rates. Don't be like the technician who didn't read the label (!) and applied nearly 7 litres of concentrate into a large puddle on a worksite. It's doubtful how many mosquitoes were in the puddle to start with but it is certain that the cost of the chemical far outweighed the profit on the job.
- **Drain cleaners** – these are not your everyday cleaners but specially formulated products used to clean drains and pipes of organic matter, thus removing potential food sources for vinegar flies. They are available in a number of formulations including a foaming variety which is most effective.
- **Metered aerosol dispensers** – these are a salesperson's best friend! They have been sold for the control of nearly every pest (except rats) for spaces as large as the Sydney Cricket Ground! Needless to say, they are only effective against flying insects in limited spaces e.g. store room, cleaner's room and garbage room. They should not be sold to control vinegar flies in bars etc. They should definitely not be set up to spray every 15 minutes of the day when staff and customers are in the area and most definitely not installed at eye level! Believe me; the practice does not endear your services to management, staff or clients! Many units have the ability to be set to operate within certain hours e.g. after close of trading until just before opening. For insect control these dispensers use a pyrethrin based insecticidal spray and they can also be used with aerosol cans which dispense an aromatic fragrance. If you have one of each spraying, the flies die happy!
- **Space treatments** – the metered aerosol dispensers are a “mini space treatment” for small spaces. Sometimes,





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you may need to treat large spaces for flying insects, either a species of fly or stored product moths e.g. Indian meal moth. In this case, you can use an electric or petrol powered misting/fogging device or a high pressure aerosol e.g. BOC's "Pestigas." This product uses synergised pyrethrin as its active ingredient and is effective against flying insects but not against crawling insects. When carrying out space treatments, ensure that you follow all standard operating procedures and wear all the relevant PPE. You should never carry out such treatments without receiving training from a more experienced person as you are almost certainly destined for failure and possible damage claims. Petrol powered foggers or misters have been responsible for burning down several factories and shops and the operator had all sorts of trouble explaining the situation to his boss. If you use a fogger, mister or hand held low pressure aerosol for a "space treatment," make sure that all sources of ignition e.g. pilot lights, are switched off as you can turn your applicator into a flame thrower. Very spectacular and deadly to insects but potentially disastrous to people in the vicinity and to the oven itself. It's difficult to explain to the client how it is that the oven's insulation is scorched and I speak from bitter experience!

- **Electronic fly killers** – these are the units you see in the local take-away food shop or even in the deli dept. of a major supermarket chain, one globe flickering, one globe a very pale shade of blue and one globe dead a long time ago! Even worse, these units may be hanging above a food preparation surface or storage area. Why is this not an acceptable situation? We'll discuss that later.

First of all, let's agree that these units are often mis-sold by overzealous sales people and badly located by untrained technicians. When not used according to common sense and makers' specifications, these units are only good as "night lights" for the night watchman. These devices are not cheap so should be used in the best possible way. Let's look at some points which must be considered before installation:

- During your site assessment, look at entry points and critical areas with particular reference to any areas where flies are seen in large numbers. Where is there a chance of product contamination? Look at potential "flight paths" which might be followed by flies as they follow odour trails. Where are doors continually left open? Where are garbage bins left open next to doors or windows? Where are there dark passageways? These might be ideal locations for the units.
- Electronic fly killers do not act like vacuum cleaners, sucking all flies in the vicinity into its jaws. There are many factors to consider such as the knowledge that flies will not respond to UV tubes at distances greater

than 30-40 metres and do not actively respond until some 10 metres away but can show a distinct positive response when the distance is 4 metres or less.

- Flies vary in their degrees of responsiveness to fly killers during a given period. They will go through phases of attraction to complete disinterest but, tests show that around 90% of flies contained in a given volume will be caught within 24 hours.
- The height of units is critical to effective operation. Forget putting them up out of the way of fork lifts, they work best when located 1 metre above ground level although they may need to be placed 2 metres high to avoid causing obstruction. The number of units required depends upon many circumstances and may need to be evaluated as time goes by. Avoid the temptation to use them as "wallpaper" like that overzealous salesperson!
- Units should be located near all potential entry points and, if possible, at right angles to the nearest window or light source. They should not be visible from outside the premises otherwise they may attract more flies inside than were there previously!
- Suspended units should be preferably at least 2 metres from light coloured walls as UV light reflected from these surfaces tends to reduce effectiveness.
- Do not place electronic grid type units above product/preparation areas. There are specified distances which they must be located from foodstuffs and packaging. These distances are usually 8-10 metres from foodstuffs and 3-4 metres from packaging. Consult your local authorities, site auditor or AQIS Inspector for guidance. Glue board or revolving adhesive film type units can be used above product/preparation areas. The problem with electronic grid units is that insects falling into the catch tray may spin wildly and catapult bacteria laden "Dipteran shrapnel" many metres from the unit. This situation is exacerbated when the catch trays are allowed to become over full when dead insects may simply just fall out of the trays.
- It is essential that all UV tubes are changed according to their makers' specifications. Their efficacy drops off sharply after their scheduled life which may be 6 or 12 months according to the specification. You are charging the client for unit maintenance so it is only right that you change all tubes and starters as required.

Don't panic when faced with all these considerations, simply speak to your local Globe representatives who will be able to give you all the assistance required.



# SUMMARY

Flies can be a “flaming nuisance.” (Some people use even less polite language.) They can simply annoy you or, more importantly, they can spread a wide range of debilitating diseases some of them deadly. They normally breed quickly and in vast numbers, their breeding sites and preferred foods may vary greatly and they can be especially difficult to get rid of! When embarking upon a contract for fly control, you need to ensure that:

- You have identified the target species correctly,
- You have carried out a thorough site assessment,
- You have evaluated all possible control measures,
- You have used the most appropriate insecticides (according to the label) or devices and, very importantly,
- You have not promised more than you can deliver!

Flies, as the name suggests, can move around swiftly and over relatively vast distances. They can be killed quite easily and they can also “bounce back” when their populations are decreased. You need to be “on your game” when you try to outwit them. Remember that your friendly Globe team is always there to help you with advice, insecticides, equipment and the latest design electronic fly killers. Happy hunting!

# REFERENCES

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- “The Service Technician’s Field Manual” by William H. Robinson, 2011, GIE Media Inc.
- “The insects of Australia: a textbook for students and research workers” CSIRO Division of Entomology, 2nd Edition, 2000, Melbourne University Press, Carlton, Victoria.

## Websites

- Westmead Hospital Medical Entomology [www.medent.usyd.edu.au](http://www.medent.usyd.edu.au) - Fact sheets.
- Australian Museum [www.australianmuseum.net.au/Flies-and-mosquitoes](http://www.australianmuseum.net.au/Flies-and-mosquitoes)
- Queensland Museum [www.qm.qld.gov.au](http://www.qm.qld.gov.au)
- CSIRO [www.csiro.au/en](http://www.csiro.au/en) - ANIC fact sheets

# NOTES

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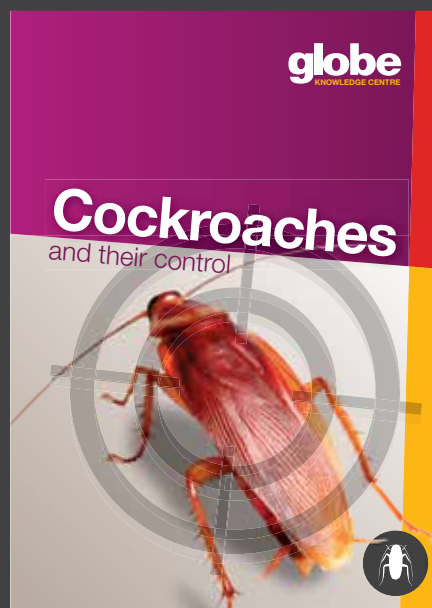
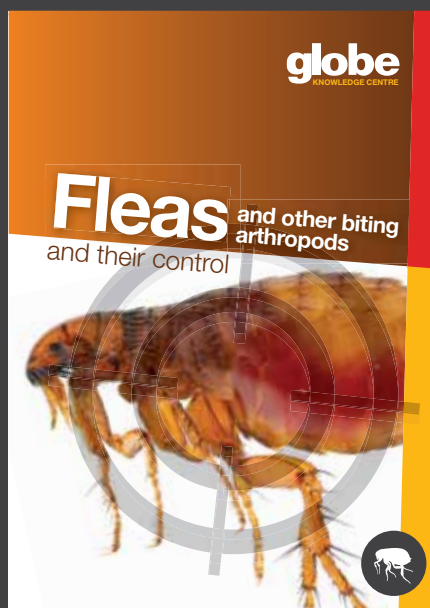
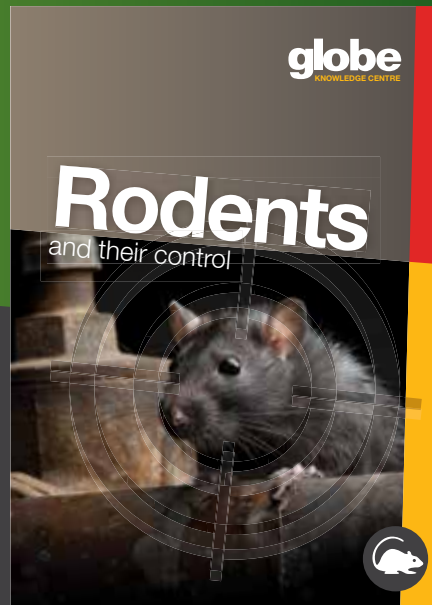
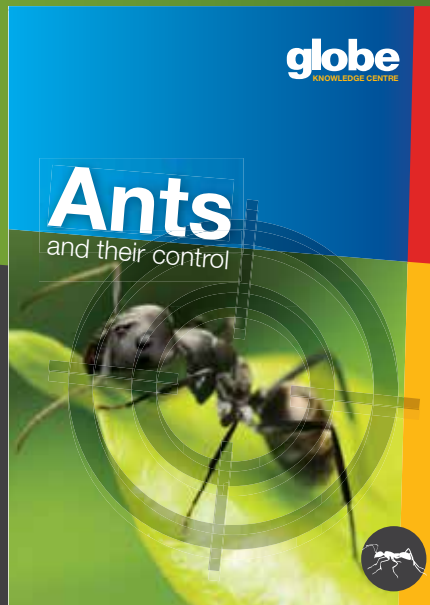
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