

STORED CEREAL INSECTS

<i>Sitotroga cerealella</i> - Angoumois grain moth		Description	Life cycle	Biology	
		<p>Adult: Wings pale greyish brown with black spot towards tip (in fresh specimens) and is smaller in size than other storage moths. This moth is a pest of whole cereal grain and will attack grain before harvest, particularly maize. Damage to grain in storage only occurs in the surface layer since adults are unable to penetrate deeply.</p>	<p>Optimum: 30 days at 30°C, 75% r.h. Range: 16 - 35°C Maximum population growth rate per month: 50 times</p>	<p>Eggs: Laid on grain surface Larvae: Immobile, develop concealed within a single grain. Adult: On hatching pupal case often left protruding from grain. Adult moth short lived, does not feed, flies.</p>	
<i>Tribolium</i> species - flour beetles		General Information	Description	Life cycle	Biology
		<p>The flour beetles belong to a large family of beetles known as Tenebrionidae which contains a number of important pests of stored foodstuffs. The genus <i>Tribolium</i> includes almost 30 species but only two of these are pests in Australia. They are the rust-red flour beetle (<i>Tribolium castaneum</i>) and the confused flour beetle (<i>T. confusum</i>). Both these species are common pests of cereals and cereal products. They will also attack oilseeds and oilseed products and many other commodities. They are unable to attack whole grains however there is always sufficient damaged grains in a freshly harvested bulk to support their survival and breeding. The confused flour beetle prefers more finely divided</p>	<p>Adult: The rust-red flour beetle is between 3 to 4 mm long, flattened, reddish brown in colour and parallel sided. Eyes are crescent-shaped. The confused flour beetle is slightly larger, 4 to 4.5 mm long. Although similar in appearance, the confused flour beetle does not have a distinct club formed by the last three segments of each antenna, it has a distinct ridge above each eye, and the eyes are set further apart when viewed from underneath. Larvae are elongate, light brown. The beetle is a major pest of stored products, especially grain and milled cereal products.</p>	<p>(<i>T. castaneum</i>) Optimum: 20 days at 35°C, 75% r.h. Range: 22 - 40°C, survives very dry conditions Maximum population growth rate per month: 70 times</p>	<p>Eggs: Laid at random in the commodity and more than 1,000 may be produced by a female during its lifespan. Larvae: Light brown colour, found free living and mobile in stored products. The larva has a pair of legs on each of the three segments immediately behind the head. Their size varies widely with age. The larva passes through several stages or instars during which its size increases. The larval period is influenced by environmental conditions and can be very marked. Pupae: When fully grown the larva enters into an active pupal stage and gradually changes into the form of the adult beetle. Adult: The newly emerged adults of both species are a creamy white</p>



Adult beetle and larvae of the rust-red flour beetle *Tribolium castaneum*.

commodities than the rust-red flour beetle and is more common in temperate climates, replacing *T. castaneum* in cooler regions in mills and milled products.

colour but quickly darken to their typical red-brown to brown colour. Adults are long lived, actively feed, and heavy infestations often leave an unacceptable taint. Although both species possess wings, *T. castaneum* is the more active flier when conditions are hot and humid.

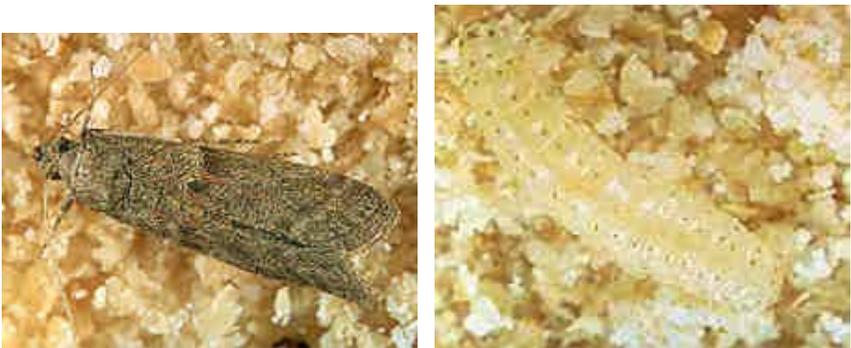
<i>Sitophilus</i> species - grain weevils	Additional Information	Description	Life cycle	Biology
	<p>Weevils are beetles that belong to the family Curculionidae. They have a characteristic snout or rostrum which projects from the front of the head. The beetles biting mouthparts are located at the tip of the rostrum, and a pair of elbowed, clubbed antennae are located at the base.</p>	<p>The three major <i>Sitophilus</i> species that are significant pests of stored grain are <i>S. oryzae</i> the rice weevil, <i>S. zeamais</i> the maize weevil, and <i>S. granarius</i> the granary weevil. In appearance <i>S. oryzae</i> and <i>S. zeamais</i> are identical with distinct yellow to orange coloured spots on their wing covers and need to be dissected to identify the species. <i>S. oryzae</i> however tends to occur more commonly under Australian storage conditions. <i>S. granarius</i> lack spots on its elytra and is a rich chocolate brown colour. Adult beetles are 2.5 to 3 mm long. <i>S. granarius</i> tends to be the larger of the three species, but there is quite a variation in size between localities. <i>S. zeamais</i> and <i>S. oryzae</i> have flight wings (under wing cases) and are strong fliers when conditions are conducive. <i>S. granarius</i> lacks wings.</p> <p>These three beetles are major pests of stored grain - <i>S. oryzae</i> and <i>S. granarius</i> may be found attacking all major cereals - <i>S. zeamais</i> is most often recorded in maize but is capable of infesting and developing on other cereals. All these beetle can also penetrate many types of packaging films and</p>	<p><i>Optimum</i>: 25 days at 30°C, 70% r.h.  <i>Range</i>: 14 - 35°C, minimum r.h. 40%  <i>Maximum population growth rate per month</i>: 25 times  <i>S. granarius</i> is more common in cooler temperate regions.</p>	<p><i>Eggs</i>: The adult female bores a hole in the grain surface using its biting mouthparts. One egg is laid in this hole which is then plugged with a jelly substance sealing the egg inside the grain. The number of eggs laid by a female during its lifespan may vary from 100 to 450.  <i>Larvae</i>: After hatching the small legless larva feeds on the endosperm of the grain. Larvae are relatively immobile and pass through a number of instar stages gradually increasing in size.  <i>Pupae</i>: When fully grown the larva passes into an inactive pupal stage and gradually assumes the shape and form of the adult.  <i>Adult</i>: Long lived, and active feeder and winged species are strong fliers. Infestations can cause considerable grain heating.</p>

		can develop on processed products such as pasta that provide a hard substrate to complete their life cycle. They have the same basic reproductive cycle and attack grain in a similar manner.		
<b><i>Rhyzopertha dominica</i> - Lesser grain borer</b>	<b>Additional Information</b>	<b>Description</b>	<b>Life cycle</b>	<b>Biology</b>
	<p>The lesser grain borer <i>Rhyzopertha dominica</i> belongs to the family of beetles known as Bostrychidae. Most of the members of this family are wood boring insects. The adult lesser grain borer has very powerful mandibles and is a voracious and destructive feeder. A characteristic feature of a heavy infestation in grain by this beetle is the presence of white flour amongst the commodity caused by its voracious feeding habit. Although hot, dry conditions favour the development of the lesser grain borer, the beetle is widespread throughout the world in tropical, sub-tropical and temperate climates, and is the most destructive beetle pest of stored grain in Australia.</p>	<p><b>Adults:</b> The adult beetle is small, between 2.5 to 3 mm long, has a distinctive cylindrical shape, and is dark brown to black. The head, tucked underneath the thorax, is invisible when viewed from above.</p>	<p><b>Optimum:</b> 25 days at 34°C, 70% r.h.  <b>Range:</b> 20 - 38°C, minimum relative humidity 30%  <b>Maximum population growth rate per month:</b> 20 times</p>	<p><b>Eggs:</b> Laid in clusters as females actively bore through grains. Eggs are laid outside the kernel and young larvae bore into the grain to complete their development. Under optimum conditions the female adult lays up to 500 during its lifespan. Eggs laid on stored commodities at moisture levels as low as 8% can still hatch.</p> <p><b>Larvae:</b> The cream coloured larvae have biting mouthparts and three pairs of legs. The young larvae are mobile but become immobile as they complete their development concealed within grain or flour. The larvae normally pass through four instar stages during which their size increases. All larvae have usually bored into grain (or a suitable hard substrate) by the third instar.</p> <p><b>Pupae:</b> The mature fourth instar enters into an inactive pupal stage within the grain and gradually assumes the form of the adult.</p> <p><b>Adult:</b> When the pupal stage is completed the newly formed adult emerges from the grain by chewing through the outer grain layers. The adult beetle is long lived and is a strong flier when conditions are warm. They are adept burrowers and produce large quantities of flour. They are also capable of chewing their way through many types of packaging materials including jute, waxed paper and some polyethylene films.</p>

PROCESSED CEREAL PRODUCTS INSECTS

<i>Gnathocerus cornutus</i> - Broadhorned flour beetle		Description	Life cycle	Biology
 <p>(L - R) Male and female adult beetles</p>		<p><b>Adults:</b> Flattened, light reddish brown, males with two distinct horns on front of head. Eyes crescent-shaped.</p> <p><b>Larvae:</b> Elongate, similar to <i>Tribolium</i>. Common pest of milled grain; frequently found in flour and feed mills.</p>	<p><b>Optimum:</b> 57 days at 24 - 30°C, 66-92% r.h.</p> <p><b>Range:</b> 15 - 32°C, minimum r.h. 40%</p> <p><b>Maximum population growth rate per month:</b> 15 times</p>	<p><b>Eggs:</b> Laid at random</p> <p><b>Larvae:</b> Mobile, not concealed</p> <p><b>Adult:</b> Long lived, feeds, flies.</p>
<i>Plodia interpunctella</i> - Indian meal moth		Description		
		<p>The adult insect has cream and brown wings when the insect is alive. Population can grow by up to 60 times under optimal conditions (30°C, 75% r.h.). Populations can continue to exist at temperatures between 18 and 35°C. The adult does not feed, is short lived and is usually active at dawn and dusk.</p> <p>The larvae (caterpillars) are creamy white with no small black spot at the base of each hair. They are important pests of flour mills, food processing plants and in dried fruit. Silk webbing produced by caterpillars can stop the product flowing freely and make it hard to handle.</p>		
<i>Latheticus oryzae</i> Long-headed flour beetle	Additional Information	Description	Life cycle	Biology
	<p>The long-headed flour beetle <i>Latheticus oryzae</i> is a member of the very large, cosmopolitan family of beetles Tenebrionidae and is a significant pest in tropical and sub-tropical regions of the world. In the temperate climatic zones in Australia, the beetle tends to inhabit heated premises.</p>	<p><b>Adult:</b> The adult beetle is relatively small (2.5 to 3 mm), compared to other members of the family Tenebrionidae, is slender, oval shaped, and has a distinctive yellowish-brown colour. The head protrudes well past the front the eyes, and the antennae are short and thickened, with a five segmented club.</p>	<p><b>Optimum:</b> 33°C and 70 to 80% r.h. Prefers high temperatures, up to 37°C, for its development. The minimum threshold temperature for development is 25°C.</p>	<p><b>Eggs:</b> The female adult lays about 300 eggs during her life span. The eggs which are sticky when laid are usually covered in flour particles.</p> <p><b>Larvae:</b> The free living cylindrical larvae are white in colour and pass through 6 to 7 instars.</p> <p><b>Pupae:</b> The pupae are white and are found naked amongst the foodstuff.</p> <p><b>Adults:</b> The slow moving adult is long-lived surviving up to 6 months.</p>

<i>Oryzaephilus surinamensis</i> Sawtoothed grain beetle	Additional Information	Description	Life cycle	Biology
	<p>The saw-toothed grain beetle belongs to the family of beetles known as Silvanidae. The adult saw-toothed beetle is 2.5 to 3 mm long and can be readily identified from other beetle pests of stored products by the distinctive shape of its thorax - the section between the head and the body. It has six jagged, saw-toothed projections along the outer edges of the thorax. The beetle is relatively cold hardy and will over-winter in unheated buildings and grain stores in temperate climates. The merchant grain beetle <i>O. mercator</i>, a less cold hardy species, is very similar in appearance to <i>O. surinamensis</i>. The merchant grain beetle does infest stored commodities in Australia, but it is not considered a major pest. The saw-toothed grain beetle is a common pest of cereals, cereal products, oilseeds and dried fruits. The merchant grain beetle is principally a pest of oilseeds and dried fruits.</p>	<p><i>Adults:</i>Very flattened, dark brown to gray, six tooth-like projections on each side of thorax. The beetle is a major pest of grain and milled grain products, and many other stored foods. They are very active and their habit of infesting cracks and crevices makes them difficult to detect when inspecting buildings for their presence.</p>	<p>(<i>O. surinamensis</i>)  <i>Optimum:</i> 20 days at 33°C, 80% r.h.  <i>Range:</i> 18 - 38°C, 10 - 90% r.h., survives very cold conditions  <i>Maximum population growth rate per month:</i> 50 times</p>	<p><i>Eggs:</i> Laid at loosely in crevices in the commodity. An average 375 eggs are laid during the life of an adult female.  <i>Larvae:</i> The larvae pass through four instars during their development. They are tolerant of dry conditions and development has been recorded at relative humidity as low as 10%. Larvae are mobile and not concealed.  <i>Pupa:</i> The pupal stage is formed within a cocoon spun by the mature larvae, and broken grains or other food particles may be used in its construction.  <i>Adult:</i> Long lived, feeds, flies, and will rapidly walk long distances. Can easily enter packaged food, and prefer to live in cracks and crevices.</p>

Palorus species Small-eyed flour beetles	Additional Information	Description	Life cycle	Biology
	<p>Small-eyed flour beetles <i>Palorus</i> species belong to the very large, cosmopolitan family of beetles Tenebrionidae. The unfortunately named depressed flour beetle <i>Palorus subdepressus</i> is found in Australia inhabiting damp and mouldy residues of stored commodities. It requires fine material on which to feed and is often present amongst other beetle pests that have broken the material down to a fine particle size. Its relatively high temperature requirement for development and restricted humidity range limit its distribution.</p>	<p>(<i>P. subdepressus</i>)  <b>Adult:</b> The adult beetle is relatively small (2 to 2.5 mm), compared to other members of the family Tenebrionidae, is slender, oblong shaped, and has a reddish-brown to brown in colour.</p>	<p><b>Optimum:</b> 30 to 33°C and 70 to 80% relative humidity.</p>	<p><b>Eggs:</b> The female adult lays about 650 eggs during her life span. The eggs which are sticky when laid are usually covered in flour particles and deposited randomly amongst the foodstuff.  <b>Larvae:</b> The cylindrical larvae which are transparent when young and brown when mature pass through 6 to 7 instars.  <b>Pupae:</b> The pupa is found within a cell within the substrate.  <b>Adults:</b> The adult is long-lived surviving up to 6 months.</p>
<b>Ephestia species - Warehouse moths</b>		<b>Description</b>		
 <p data-bbox="118 1094 439 1118"><i>Ephestia cautella</i> adult and larvae</p>		<p><b>Description and life cycle</b></p> <p>The Adults are short lived and do not feed. They fly well and are active at dawn and dusk. Wings grey with vague darker markings when alive. Population can grow by up to 60 times under optimal conditions (30°C, 75% r.h.). Populations can continue to exist at 17 to 37°C.</p> <p>The larvae (caterpillars) are light pink with a small black spot at the base of each hair. The black pigment at the base of each hair is a key feature in identifying <i>Ephestia</i> species from the other commonly occurring moth pest in Australia, the Indian meal moth, <i>Plodia interpunctella</i>. They are important pests of flour mills, food-processing plants and in dried fruit. Silk webbing produced by caterpillars can stop the product flowing freely and make it hard to handle.</p>		

STORED PULSES INSECTS

<b><i>Acanthoscelides obtectus</i> Bean weevil</b>	<b>Additional Information</b>	<b>Description</b>	<b>Life cycle</b>	<b>Biology</b>
	<p>The Centre for Legumes in Mediterranean Agriculture (CLIMA), Nedlands University, and Agriculture Western Australia, have produced a comprehensive account of Bruchid pest species and their potential to become significant pests of stored pulses in Australia. The report, titled "Bruchid - Secret Seed Eaters" is by N. Keals, D. Hardie and R. Emery. Link to <a href="http://www.agriculture.wa.gov.au">Agriculture Western Australia</a> web site and use the search function to locate information on <i>Acanthoscelides</i> species, using the insect common or scientific name.</p>	<p>Characteristic shape, covered in short hairs, wing cases short and patterned, antennae gray and reddish. Femur of hind leg has three, tooth-like spines in a row.</p> <p>Pest of dried kidney and haricot beans.</p>	<p><i>Optimum:</i> 27 days at 30°C, 80% r.h.  <i>Range:</i> 15 - 33°C  <i>Maximum population growth rate per month:</i> 25 times</p>	<p><i>Eggs:</i> Laid loosely or lodged in cracks in seed coat  <i>Larvae:</i> Bore into seed, make round translucent 'windows' in seed before pupation  <i>Adult:</i> Emerge through 'window' leaving neat round hole. Short lived, does not feed on seed, runs quickly and flies very well.</p>
<b><i>Callosobruchus</i> species - Cowpea weevils</b>	<b>Additional Information</b>	<b>Description</b>	<b>Life cycle</b>	<b>Biology</b>
	<p>The Centre for Legumes in Mediterranean Agriculture (CLIMA), Nedlands University, and Agriculture Western Australia, have produced a comprehensive account of Bruchid pest species and their potential to become significant pests of stored pulses in Australia. The report, titled "Bruchid - Secret Seed Eaters", is by N. Keals, D. Hardie and R. Emery. Link to <a href="http://www.agriculture.wa.gov.au">Agriculture Western Australia</a> web site and use the search function to locate information on <i>Callosobruchus</i> species, using the insect common or scientific name.</p>	<p><i>Adult:</i> Covered in short hairs, wing cases short and patterned, long antennae (slightly serrate or saw-like). Pest of dried cowpeas, mung beans, peas, soybeans and lentils. Does not attack kidney beans.</p>	<p><i>Optimum:</i> 21 days at 32°C, 90% r.h.  <i>Range:</i> 18 - 37°C, 20 - 90% r.h.  <i>Maximum population growth rate per month:</i> 50 times</p>	<p><i>Eggs:</i> Stuck, limpet-like, onto outside of bean.  <i>Larvae:</i> On hatching, bore into seed, making round, translucent 'windows' in seed before pupation.  <i>Adult:</i> Emerges through 'window' leaving neat round hole. Short lived, does not feed on seed, runs quickly and flies very well.</p>

<i>Bruchus pisorum</i> - Pea weevil	Description	Life cycle	Biology
	<p><i>Adult:</i> Hairy, wing cases short and patterned. Important pre-harvest pest of ripening peas. Does not breed in dry peas. Commonly found in peas contaminating wheat grown after a pea crop. Pupal stage highly tolerant of phosphine.</p>	<p>One generation a year.</p>	<p><i>Eggs:</i> Glued to outside of pod.  <i>Larvae:</i> On hatching, bore into seed directly below egg, develop concealed within a single seed.  <i>Adult:</i> After emerging from the seed leaving a neat round hole, adults overwinter, do not feed on beans, reappear in spring visiting flowers for nectar, fly well searching out new pea crop.</p>

GRAIN RESIDUES, DETERTUS AND WATER DAMAGE GRAIN INSECTS

<i>Attagenus</i> species Black carpet or fur beetles	Description	Life cycle	Biology
	<p><i>Adult:</i> oval, dark brown to black, <i>A. pello</i> with white spot on each wing case.  <i>Larvae:</i> elongate, without tufts of hairs found in <i>Trogoderma</i> and <i>Anthrenus</i>.  Scavenger in grain stores, mills, domestic premises. Pest in museums and of woollen goods, skins and hides.</p>	<p><i>Optimum:</i> 6 months, often longer at 27°C  <i>Range:</i> survives very dry conditions  Larvae develop between 15 and 30°C</p>	<p><i>Eggs:</i> Laid into fabric or in cracks or folds  <i>Larvae:</i> Mobile, cast skins left throughout infested material  <i>Adult:</i> Long lived, does not feed on stored material, flies well.</p>

<i>Mezium</i> species - Black Spider Beetles	Additional Information	Description



*Mezium* species belong to the family Ptinidae which contains beetles that are associated with the attack/infestation of stored foods, dead insects, excrement or dry vegetable matter. All members of this family have a spider like appearance due to their long antennae and long legs arising from a compact body. *Mezium* species (and other member of the family Ptinidae) are generally only found in stored cereals and oilseeds when hygiene is poor and/or where water damage and moulding has occurred. Adults and larvae generally shun daylight and are most active in damp, dark places.

(*M. americanum*)  
*Adult:* The adult is small (2 to 3 mm) in size, has a distinctly golden haired head and thorax, with a contrasting glabrous shining black abdomen.

<i>Lasioderma serricorne</i> Tobacco or Cigarette Beetle	Additional Information	Description	Life cycle	Biology
	<p>The tobacco or cigarette beetle attacks a wide range of stored products throughout tropical and sub-tropical climates and is particularly damaging to stored tobacco, cigars, cigarettes and cocoa beans.</p>	<p><i>Adult:</i> A small beetle 2 to 2.5 mm long, oval in shape and brown to dark brown in colour. It resembles the drug store beetle (<i>Stegobium paniceum</i>) however segments of each antenna are uniform in length and shape and the wing covers or elytra are not striated. <i>Larvae:</i> White in colour and short and stout in shape.</p>	<p><i>Optimum:</i> 32.5°C and 70% relative humidity, when development can be completed in 25 days. Higher or lower humidities slow development. It is reasonably tolerant of dry conditions and can still survive and breed at relative humidities as low as 30% when temperature is above 25°C.</p>	<p><i>Eggs:</i> The eggs are laid singularly in crevices or folds in the substrate. The adult female produces about 100 eggs in its short life-span of 25 to 30 days. <i>Larvae:</i> The white, fleshy larvae are distinctly hairy and pass through 4 to 6 instars. Newly hatched larvae cannot attack whole grain. The larvae are mobile and readily enter small opening of packaged foodstuffs in search of food. When mature, the larva pupate within a thin cocoon built amongst the substrate. The adult spends some days within the cocoon before emerging from and boring through packaged materials. <i>Adult:</i> In daylight, the adult beetle shuns light hiding in cracks and crevices. In warm conditions it flies readily at dusk and is attracted to artificial light. The species is not cold-hardy and can overwinter in temperate climates only in protected areas.</p>

Cryptolestes species - Flat grain beetles	Additional Information	Description	Life cycle	Biology
	<p>These beetles commonly known as flat grain beetles belong to the family Cucujidae. Most of the beetles in this family live beneath the bark of trees, but those belonging to the genus <i>Cryptolestes</i> have gained importance as pests of stored products. Several different species of <i>Cryptolestes</i> may be encountered infesting stored cereals and cereal products in Australia. Commodities stored in a dry condition are not attractive to infestation by flat grain beetles. Rather these beetles are found infesting commodities that have become damp as a result of poor storage or warehousing, or are stored at higher moisture contents. Flat grain beetles are commonly found in stockfood processing plants and flour mills where warm, humid conditions favour their development.</p>	<p><i>Adult:</i> Very flattened, light brown, antennae hair-like and sometimes very long. The adult is one of the smallest beetles which infest stored cereals and cereal products, being 1.5 to 2.5 mm long. Most common species in Australia is <i>C. ferrugineus</i>.</p>	<p><b>(<i>C. ferrugineus</i>)</b>  <i>Optimum:</i> 23 days at 33°C, 70% r.h.  <i>Range:</i> 18 - 42.5°C, 40 - 90% r.h., survives cold conditions  <i>Maximum population growth rate per month:</i> 55 times.</p>	<p><i>Eggs:</i> The adult female may lay between 200 to 400 eggs, laid at random either loosely or in crevices. <i>Larva:</i> The larva has a brown head, biting mouthparts, and three pairs of legs. It is capable of moving freely through loosely packed commodities such as grain and flour. There are four larval stages or instars and all of these, particularly the first, succumb quickly in dry conditions. <i>Pupa:</i> The fourth larval instar spins a cocoon which often has fragments of the food material incorporated into its outer surface. The pupal stage is formed within the cocoon. <i>Adult:</i> When the pupal stage is completed, the newly formed adult emerges by chewing through its cocoon. Long lived, surviving 6 to 9 months, feeds, flies, walks rapidly, able to enter packaged foods through very small cracks.</p>
Carpophilus species - Dried Fruit Beetles	Additional Information	Description	Life cycle	Biology
	<p><i>Carpophilus</i> species belong to the family Nitidulidae that contains more than 2,000 species which are extremely variable in form, structure and habit. The antennae are usually clubbed and the wing covers or elytra shorter than the abdomen (part of the abdomen is visible when viewed from above). Many species inhabit flowers and are also found in decaying vegetable matter. The genera <i>Carpophilus</i> contains species that have adapted to infesting dried or decaying fruits and mould affected grain and residues.</p>	<p><i>(C. hemipterus)</i>  <i>Adult:</i> Small in size (2.5 to 4 mm), oblong in shape, and black with distinct buff spots on the elytra. This beetle is a serious, cosmopolitan pest of stored dried fruits, and also infests fallen or decaying fruit.</p>	<p><i>(C. hemipterus)</i>  <i>Optimum:</i> 32°C and 70 to 80% relative humidity, when development can be completed within 20 days.</p>	<p><i>(C. hemipterus)</i>  <i>Eggs:</i> Laid randomly on or in stored dried fruits, decaying plant material, such as over-ripe fruit, or in mould affected grain and residues. Adult females lay about 1,000 over a 3 to 4 month lifespan. <i>Larvae:</i> The thin larvae pass through four instars and actively burrow into the soft and mould affected parts of fruit or other host materials. <i>Adult:</i> Strong fliers and at dusk often seen congregating in large numbers at suitable feeding and egg laying sites.</p>

Stegobium paniceum Drug Store Beetle	Additional Information	Description	Life cycle	Biology
	<p>The drug store beetle is a cosmopolitan pest that can infest almost any dry animal or plant material. It is particularly noted as a pest of pharmacies where it infests drugs, and domestic premises where it attacks breakfast foods, biscuits and herbs.</p>	<p><i>Adult:</i> A small beetle 2 to 3.5 mm long, cylindrical and light brown in colour. It resembles the cigarette beetle (<i>Lasioderma serricornis</i>) but is readily identified by the distinctive elongated shape of the last three segments at the end of each antenna, and the wing covers or elytra are striated. <i>Larvae:</i> White in colour and short and stout in shape.</p>	<p><i>Optimum:</i> 30°C and 70 to 90% relative humidity.  <i>Range:</i> life-cycle can be completed between 18 to 34°C but is sensitive to dry conditions, with 60% relative humidity being the lower limit for breeding. The drug store beetle is cold-hardy and can survive winter conditions in temperate regions.</p>	<p><i>Eggs:</i> The female lays about 75 eggs randomly amongst stored foodstuffs during its life-span of 40 to 90 days.  <i>Larvae:</i> The larva progresses through four to six instars, the last of which it constructs a cocoon within which it pupates.  <i>Adult:</i> The adult does not feed and cannot fly.</p>
Blaps polychresta - The Egyptian beetle		Description		
		<p>Large (25 - 35 mm in total length) and of quite characteristic shape with its tapering hind end, glossy black, with long legs and antennae. Scavenger, feeding on decaying grain residues and other organic waste materials. Frequently encountered in drier areas of South Australia, also recently recorded in western Victoria. Considered an incidental pest in grain stores and surrounds.</p> <p>A fascinating beetle, with an interesting past - further information on the arrival and history of <i>Blaps polychresta</i> can be obtained from the article <a href="#">The Egyptian beetle - a not so welcome immigrant</a>.</p>		
Ahasverus advena - Foreign grain beetle		Description	Life cycle	Biology
		<p><i>Adult:</i> Very flattened, light brown, thorax with blunt 'tooth' at front corners. Minor pest of a wide range of commodities, especially if they are warm and slightly damp.</p>	<p><i>Optimum:</i> 22 days at 27°C, 75% r.h.  <i>Range:</i> Minimum r.h. 65%  <i>Max. population growth rate per month:</i> Lower than <i>Oryzaephilus</i> species.</p>	<p><i>Eggs:</i> Laid at random  <i>Larvae:</i> Mobile, not concealed, presence of mould increases survival  <i>Adult:</i> Long lived, feeds, flies well, fast runner.</p>

<b><i>Typhaea stercorea</i> - hairy fungus beetle</b>	<b>Description</b>		
	<p><i>Adult:</i> Small size (2.2-3.0 mm), convex, oval-shaped, hairy, brown beetle that is common in a wide range of mouldy cereals, peanuts, tobacco, cocoa, and hay. Also commonly found in moist environment in structures such as food processing and warehousing premises, rail cars and domestic premises.</p>		
<b><i>Alphitobius</i> species - Lesser meal worms</b>	<b>Description</b>	<b>Life cycle</b>	<b>Biology</b>
	<p><i>Adult:</i> Flattened, black, broader than <i>Tribolium</i>, eyes crescent-shaped. Larvae dark brown, similar to <i>Tribolium</i>. <i>A. diaperinus</i> is a minor pest and scavenger in oilseeds, animal feed, damp grain and residues. It is a common inhabitant of litter in poultry houses.</p>	<p>(<i>A. diaperinus</i>)  <i>Optimum:</i> 46 days at 32°C, 90 - 100% r.h.  <i>Range:</i> Minimum 10°C, moisture content &gt;9%  <i>Maximum population growth rate per month:</i> Much lower than <i>Tribolium</i> species.</p>	<p><i>Eggs:</i> Laid in groups and stuck to surface or inserted into cracks  <i>Larvae:</i> Mobile, not concealed  <i>Adult:</i> Long lived, feeds, flies.</p>
<b><i>Corticaria</i> species - minute mould beetles</b>	<b>Description</b>	<b>Life cycle</b>	<b>Biology</b>
	<p><i>Adult:</i> Small size, brown, hairy. Mould feeder, often found during inloading of recently harvested grain. Does not survive in clean, dry grain.</p>	<p>(<i>C. fulva</i>)  <i>Optimum:</i> 40 days at 18°C, high humidity</p>	<p><i>Eggs:</i> Laid singly amongst mould  <i>Larvae:</i> Mobile, not concealed  <i>Adult:</i> Long lived, feeds, flies.</p>

Anthrenus species - Carpet or museum beetles		Description	Life cycle	Biology
 		<p><i>Adult</i>: oval, 'seed like' beetle, wing cases with multi-coloured, variegated pattern.</p> <p><i>Larvae</i>: oval, hairy, tufts of hairs at rear converge over back (unlike <i>Trogoderma</i>).</p> <p>Scavenger in grain stores, mills, domestic premises; important pest in museums and of woollen goods, skins and hides.</p>	<p>(<i>A. verbasci</i>)</p> <p><i>Optimum</i>: One generation a year</p> <p><i>Range</i>: Survives very dry conditions; larvae develop between 15-25°C.</p>	<p><i>Eggs</i>: Laid at random</p> <p><i>Larvae</i>: Mobile, numerous cast skins present around infested food.</p> <p><i>Adult</i>: Short lived, does not feed on stored material, flies well.</p>
Trogoderma variabile - warehouse beetle	Additional Information	Description	Life cycle	Biology
 	<p>Robert Emery from Agriculture Western Australia has produced a farm note on the "Warehouse beetle". The farm note contains information on the identification and habits of this pest species. Link to <a href="#">Agriculture Western Australia</a> web site and use the search function to locate information on <i>Trogoderma</i> species, using the insect common or scientific name.</p> <p>Agriculture Western Australia have produced a report on the "Biology and identification of native and pest <i>Trogoderma</i> species". This extensive review was produced as a final report to the Grains Research and Development Corporation (GRDC) and includes a risk assessment on the potential of pest <i>Trogoderma</i> species inhabiting bushlands, and premises associated with grain storage and processing in that state. Link to <a href="#">Agriculture Western Australia</a> web site and use the search function to locate information on <i>Trogoderma</i> species, using the insect common</p>	<p><i>Adult</i>: oval, brown to dark brown, hairy, wing covers with irregular pale markings.</p> <p><i>Larvae</i>: Hairy, tufts of hairs at rear sides of insect do not meet over pack (unlike <i>Anthrenus</i> species).</p> <p>Established in Australia in 1970's, now widely distributed. Feeds on almost any dried plant or animal material.</p>	<p><i>Optimum</i>: 27 days at 32°C, 70% relative humidity</p> <p><i>Range</i>: 18 - 40°C, survives very dry conditions</p> <p><i>Maximum population growth rate per month</i>: 8 times</p>	<p><i>Eggs</i>: Laid at random</p> <p><i>Larvae</i>: Mobile, often concealed in cracks and crevices. Cast skins left throughout infested material. Can survive unfavourable conditions for several years.</p> <p><i>Adult</i>: Short lived, does not feed, flies well.</p>

	<p>or scientific name.</p> <p>Agriculture Western Australia have also produced a survey protocol "Khapra and warehouse beetle - surveillance manual" that is designed to verify the absence or existence of the two major <i>Trogoderma</i> pest species, khapra beetle (<i>T. granarium</i>) and warehouse beetle (<i>T. variabile</i>). The protocol contained descriptive notes on both pest species. Link to <a href="#">Agriculture Western Australia</a> web site and use the search function to locate information on <i>Trogoderma</i> species, using the insect common or scientific name.</p> <p>For detailed taxonomic identification of the major <i>Trogoderma</i> pest species, the illustrated guide by Dr Jonathan Banks (CSIRO Entomology) - Illustrated identification keys for <i>Trogoderma granarium</i>, <i>T. glabrum</i>, <i>T. inclusum</i> and <i>T. variabile</i> (Coleoptera: Dermestidae) and other <i>Trogoderma</i> associated with stored products: CSIRO Entomology Technical Paper No. 32; 66 pages; 1994 - is recommended. This is an excellent reference both for taxonomists and staff being trained in the identification of <i>Trogoderma</i> pest species.</p>			
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