

# I SPY

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## SECTION 3

# Important Insect Groups and Identification Keys

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# Introduction

The key features to use when identifying invertebrates to order level are presented in this section. The simplified classification of the invertebrate groups is given to assist in the understanding and identification of the major orders and families. This section also covers the importance of particular mouthpart types and associated damage symptoms.

Less than 1% of the 86,000+ insect species described in Australia (and more yet to be named or discovered), are considered economic pests. The taxonomy of invertebrates is a specialised job that takes years of experience. While we can't recognise all invertebrates seen in a crop, the aim is to recognise the most important ones in broadacre systems.

**Table 3.2** (p. 7 in this section) is a quick reference guide to the main economically-important insect orders (plus a few non-insect arthropods) that are likely to be found in broadacre field crops. Insects are very diverse and the general information presented in this table may not hold true for all members of an order.

Further identification keys to insect orders, families and key species can be found in this section. Additional keys are widely available via an internet search.

## Useful characters

General body shape and appearance can be useful in distinguishing invertebrate species, e.g. flattened or elongated body. Colour and size are useful for some adult insects e.g. beetles, but immature stages will vary in size and colour.

The characteristics described below mainly relate to the adult form and not the immature or larval stages.

## Head

- Mouthparts – the type of mouthpart can be important (e.g. chewing or piercing/sucking).
- Antennae – size (relative to the body) and shape can be useful.
- Alignment – whether the front of the head is angled down (vertical), slanted forward, exposed or hidden can also be important.

## Thorax

- Number and appearance of wings - absence of wings may indicate an immature insect stage or a wingless species. Wings have a distinctive appearance, particularly at the order level. For example, beetle forewings are hardened and called elytra while fly hindwings are absent and modified into small balance structures called halteres.
- Legs – some insects may be quite mobile with strongly developed legs for running and grasping (e.g. predatory beetles and praying mantids), while others will have shorter functional legs indicating slower movement (e.g. cockchafer). In some cases, insects may have greatly reduced or no legs, indicating sedentary behaviour (e.g. mealybugs and most scale insects).

## Abdomen

- Special appendages – such as the pincers on the end of an earwig's abdomen.
- Additional legs (prolegs) on larvae – the number of abdominal prolegs can be used to differentiate between some pest moth larvae.
- Join between abdomen and thorax – a key characteristic of most ants, wasps and bees (Hymenoptera) is that the thorax and abdomen are joined either by a broad or narrow waist (constriction).



## Other clues

**Frass** (faeces) can indicate the kind of insect that may be associated with damage (e.g. square, mini hay-bale deposits at the plant base are a tell-tale sign of armyworm caterpillars).

Characteristic **soil burrows** can also provide some indication (e.g. grass or cereal leaves protruding from small holes next to damaged plants are characteristic of pasture webworm).

**Plant damage** can be the first indication of a problem and symptoms can be key indicators for the presence of certain pest species. Various damage symptoms are created by insects and the appearance of these is mainly determined by the insect's mouthpart type (e.g. chewing, piercing/sucking). This helps to identify the potential culprit causing damage. Further clues can be provided by knowing which plants and plant parts different pests prefer to feed on.

Mouth parts are not always easily seen and the type of mouth parts can also vary between different insect orders, as well as lifecycle stages (i.e. between larvae and adult).

The main mouthpart types are shown in **Table 3.1** (p. 4), as well as associated damage symptoms and possible pest species.

This section contains **crop damage pest identification keys** (pp. 18-25) based on plant damage for various crop types. When using plant damage as an identification aid it is also valuable to note the plant growth stage and the parts of the plant that are damaged (e.g. leaves, flowers or terminal growing points).

Caution is needed when using plant damage symptoms to help identify pests, as other factors (e.g. disease, physiological and nutritional disorders) can often be mistaken as insect damage.

Plant damage symptoms should be used as an aid in pest identification but the actual invertebrate should be observed before making control decisions. Several types of plant damage may be seen which indicates that more than one pest could be involved.

**Table 3.1 Mouthpart types and associated damage symptoms**

# CHEWING mouthparts

Pest species generally have mouthparts directed downward, while predatory species generally have enlarged mouthparts that are directed forward so that they can catch prey.

## Main mouthpart components

Hardened jaw structures (mandibles and maxilla), upper lip (labrum), lower lip (labium) and segmented sensory extensions (maxillary and labial palps).

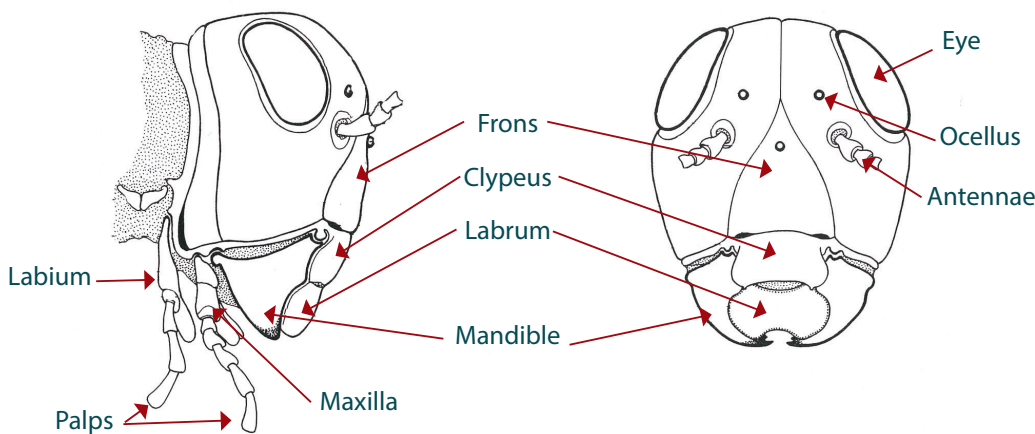
## Insects with chewing mouthparts

Moths and butterflies (Lepidoptera) - the larval stages.

Beetles (Coleoptera) - both adults and larvae.

Locusts (Orthoptera) - both adults and nymphs.

**General damage symptoms include** chew marks, portions of leaves missing, scalloped leaf edges and upper leaf surfaces removed, lopped stems.



Source: Modified from CSIRO (1991)

## Specific chewing damage symptoms

### Above ground

Green tissue removed from leaves giving an irregular window appearance to remaining leaf surface.

Chew marks – scalloped edges, plant tissue removed.

Seedlings chewed off at ground level leaving stumps.

Portions of grass and cereal leaves protruding from holes in the ground.

Chewed portions of heads, pods or maturing seeds lopped off.

Internal tunneling or ‘mining’ through a leaf, stem or pod.

### Under ground

Chewing of roots - above ground leaves stunted, pale or dying.

Internal chewing of roots in legumes - above ground leaves stunted, pale or dying.

## Likely pest(s)

Lucerne flea or very small moth larvae

Weevils (adults and larvae) or moth larvae

Cutworms, weevils

Webworms

Budworms or armyworms

Moth or fly larvae

Weevils (larvae)

Cockchafer

False/true wireworms

Sandgropers (WA only)

Onion maggot fly larvae



**Table 3.1 Mouthpart types and associated damage symptoms** *continued*

## PIERCING and SUCKING mouthparts

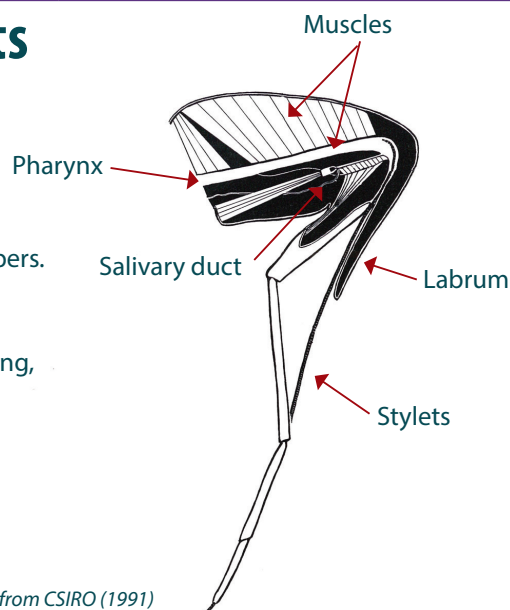
### Main mouthpart components

Tough, long, needle-like tube (stylet).

### Insects with piercing and sucking mouthparts

True bugs (Hemiptera) e.g. shield bugs, predatory bugs and leafhoppers.  
Mites (Acarina) have scissor-like stylets.

**General damage symptoms include** bleaching and chlorotic marking, distortion, wilting and stunted growth.



Source: Modified from CSIRO (1991)

### Specific piercing and sucking damage symptoms

Silvering and distorted leaves.

Distortion and wilting of growing points, sticky exudates and stunted growth.

Bleaching and chlorotic marks or dotting of leaves in lined patterns (distinct trails).

### Likely pest(s)

Mites

Aphids

Leaf hoppers or *Bryobia* (clover) mites

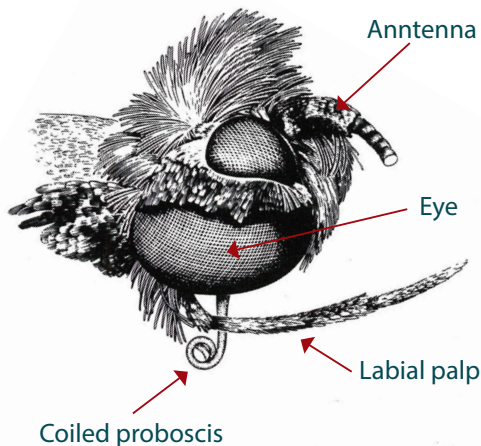
## LIQUID feeders (modified sucking mouthparts)

### Coiled proboscis:

**Adult moths and butterflies (Lepidoptera)** uncoil their proboscis (mouthpart) to feed in flowers and suck liquid foods. Most lepidopteran adults are liquid feeders and don't cause plant damage.

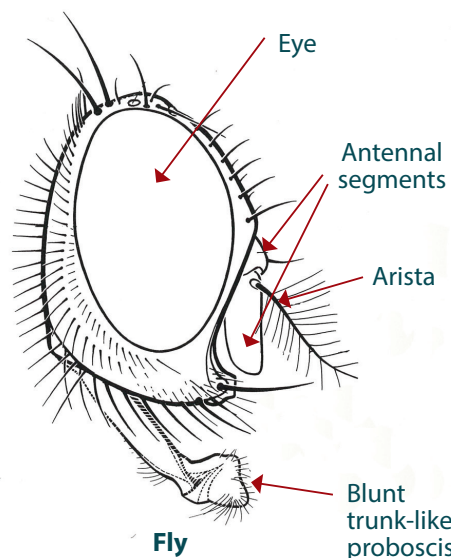
### Blunt trunk-like proboscis:

**Adult flies (Diptera)** have this mouthpart structure to suck liquid or soft foods. The mouthparts of biting flies (e.g. stable flies, *Stomoxys calcitrans*) and mosquitoes are modified for piercing and sucking.



**Butterfly/moth**

Source: Modified from CSIRO (1991)

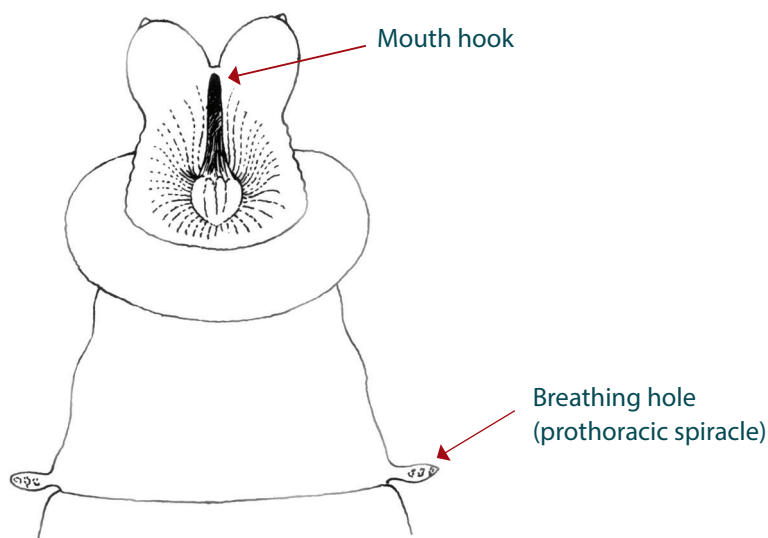


**Fly**

**Table 3.1 Mouthpart types and associated damage symptoms** *continued*

## MOUTH HOOKS

Many juvenile **flies (Diptera)** or **maggots** have modified mouthparts called **mouth hooks**.  
 Predatory flies use this specialised mouthpart to capture (hook) their prey e.g. the larval stage of the hoverfly.  
 Leaf mining flies use the mouth hook to tunnel or 'mine' under the surface of a leaf, stem or pod.

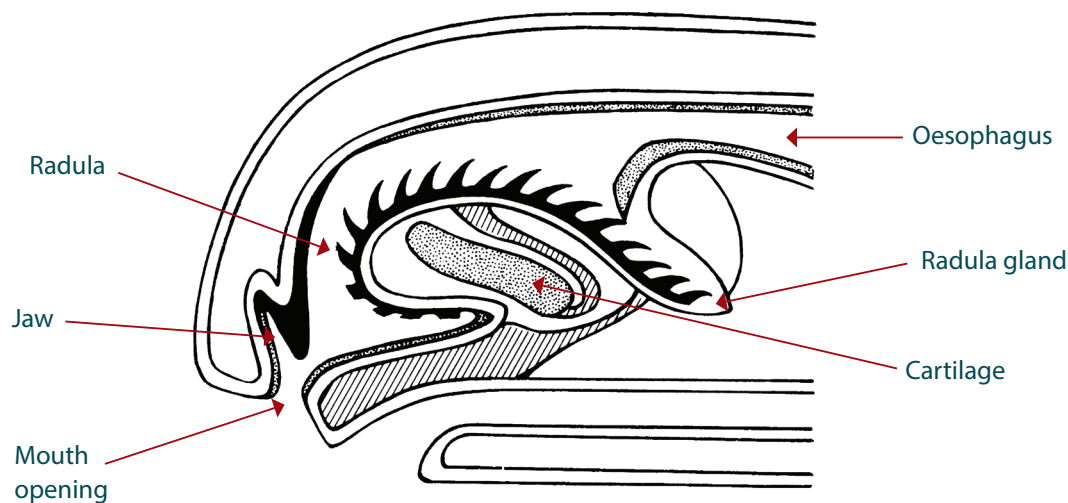


*Source: Modified from Peterson (1960)*

## RADULA (rasping mouthparts)

**Confined to molluscs (snails and slugs).**




**General damage symptoms include** shredded edges or strips removed (cereals) and chewing (pulses).  
 Seedlings can often be eaten to ground level.



*Source: Modified from Smith & Kershaw (1979)*



**Table 3.2 Key characters of invertebrates of agricultural importance – ADULT FORMS**



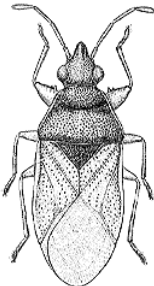
Insect type Order (O)	Body region features					Lifecycle General shape &/or other useful features	Page number			
	Head	Antennae	Thorax		Wing appearance		I SPY Section 4	Ute Guide *		
			No. of legs	No. of wing pairs				SA	WA	
Adult Forms										
<b>Beetles</b> O: Coleoptera 	Chewing	Variable	6	2 (usually)	Transparent hindwings concealed underneath hardened forewings (elytra).	Lifecycle: complete metamorphosis. Usually hard, rounded body shape.	17	47 - 64	37 - 48	
<b>Moths &amp; butterflies</b> O: Lepidoptera 	Coiled sucking tube (proboscis/haustellum)	Often filamentous, multi-segmented in females or feathery and comb-like in males.	6	2	Wings covered with scales in regular overlapping rows.	Lifecycle: complete metamorphosis. Butterflies have clubbed antennae and are mostly active during daylight. Moths are usually active at night. Ocelli present above each eye.	2	18 - 46	17 - 36	
<b>Wasps, bees &amp; ants</b> O: Hymenoptera 	Chewing	Prominent, generally with nine segments or more.	6	2 or none	Transparent wings. Forewings always slightly longer than hindwings. Forewings and hindwings are hooked together.	Lifecycle: complete metamorphosis. Body usually has a narrow waist (constriction) between the first two abdominal segments. Female has a hardened ovipositor (egg laying organ) which can be modified for stinging.	83	119 - 129	95 - 103	

\* Crop Insects the Ute Guide, Southern (S.A.) or Western (W.A.) edition



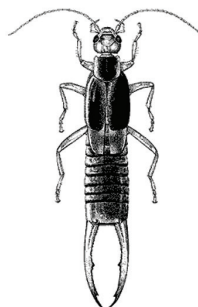
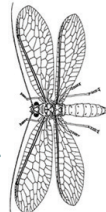




Table 3.2 Key characters of invertebrates of agricultural importance – ADULT FORMS *continued*

Insect type Order (O)	Body region features					Lifecycle General shape &/or other useful features	Page number		
	Head	Thorax			I SPY Section 4		Ute Guide *		
		Mouthparts	Antennae	No. of legs			No. of wing pairs	Wing appearance	SA
<b>Flies</b> O: Diptera 	Sponging, sucking or much reduced mouthparts. Biting (piercing) species have mouth hooks.	Typically short and simple, frilled or brush-like (in mosquitoes)	6	1	Forewings transparent. Hindwings replaced with knobs (halteres).	Lifecycle: complete metamorphosis. One set of wings (key diagnostic feature).	52	81, 130, 140, 169, 179	62, 104, 116, 136, 146
<b>True bugs</b> (e.g. aphids & whiteflies) O: Hemiptera Sub-O: Sternorrhyncha 	Piercing & sucking (needle-like stylet)	Usually short.	6	0 - 2	Many species have wingless adults. Sometimes immobile.	Lifecycle: incomplete metamorphosis. Aphid adults can be winged or wingless. Aphids have a pair of cornicles at the base of body. Scale insects are often sedentary (stuck to plant surface).	35	70 - 79	52 - 60
<b>True bugs</b> (e.g. mirids, leafhoppers & stink bugs) O: Hemiptera Sub-O: Heteroptera 	Piercing & sucking (needle-like stylet or rostrum beak-like). Sometimes folded under the body.	Clearly segmented or short and bristle-like.	6	2	Variable. Half leathery/half membranous forewings (hemelytra). Transparent and veined. Waxy in appearance.	Lifecycle: incomplete metamorphosis. Wing buds present in late nymphs.	35	65 - 69, 80, 142 - 144	49 - 51, 61

\* Crop Insects the Ute Guide, Southern (S.A.) or Western (W.A.) edition

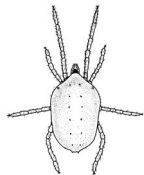

**Table 3.2 Key characters of invertebrates of agricultural importance – ADULT FORMS** *continued*

Insect type Order (O)	Body region features						Lifecycle General shape &/or other useful features	Page number		
	Head	Thorax			Wing appearance			I SPY Section 4	SA	Ute Guide * WA
	Mouthparts	Antennae	No. of legs	No. of wing pairs						
<b>Earwigs</b> O: Dermaptera 	Chewing	Filamentous, simple and slender.	6	2 or none	Large membranous wings folded underneath short-leathery forewings, which meet in the mid-line and reach only a short way down the body.		Lifecycle: incomplete metamorphosis. Forceps (caliper-like cerci) at the end of abdomen. Body often flattened and elongated. Many species are wingless as adults. Legs are thin and long (adapted for running).	61	88	69
<b>Lacewings</b> O: Neuroptera 	Chewing (sickle-shaped)	Filamentous and long relative to body length.	6	2	Prominent, finely-veined wings with lots of cross veins. Fore and hindwings approx. same size.		Lifecycle: complete metamorphosis. Slender body. Wings held roof-like over the body when at rest.	92	137 - 138	113 - 114
<b>Grasshoppers, crickets &amp; locusts</b> O: Orthoptera 	Chewing	Filamentous. Long in crickets and locusts, but short in grasshoppers.	6	2	Leathery straight forewing, transparent fan-like hindwing.		Lifecycle: incomplete metamorphosis. Sturdy body, large head and the pronotum (region behind head) is saddle-shaped. Hind legs large and adapted for jumping. Female with a well developed ovipositor (egg-laying organ), usually protruding from the tip of the abdomen.	-	83 - 87	64 - 68
<b>Spiders</b> Class: Arachnida O: Araneae 	Chewing/sucking chelicerae	None. Use forelegs or specialised mouthparts (palps) in a similar way to antennae.	8	none	Wingless		Lifecycle: incomplete metamorphosis. Two segmented body, cephalothorax (fused head & thorax) and abdomen.	94	134	108 - 110

\* *Crop Insects the Ute Guide, Southern (S.A.) or Western (W.A.) edition*

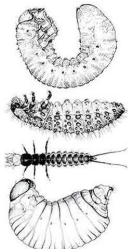


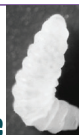



Table 3.2 Key characters of invertebrates of agricultural importance – ADULT FORMS *continued*

Insect type Order (O)	Body region features					Page number		
	Head		Thorax		Lifestyle General shape &/or other useful features	I SPY Section 4	Ute Guide *	
	Mouthparts	Antennae	No. of legs	No. of wing pairs			SA	WA
<b>Mites</b> Class: Arachnida O: Acarina 	Chewing/ sucking chelicerae. Scissor-like set of stylets.	None. Often use forelegs as sensory tools.	8 (6 in nymphs)	none	Wingless	74	97 - 103	75 - 78
<b>Springtails</b> Class: Collembola 	Chewing (hidden by oral folds or cheeks).	Short and segmented (never more than 6 segments).	6	none	Wingless	65	89	70

\* Crop Insects the Ute Guide, Southern (S.A.) or Western (W.A.) edition

**Table 3.2 Key characters of invertebrates of agricultural importance – LARVAL FORMS**

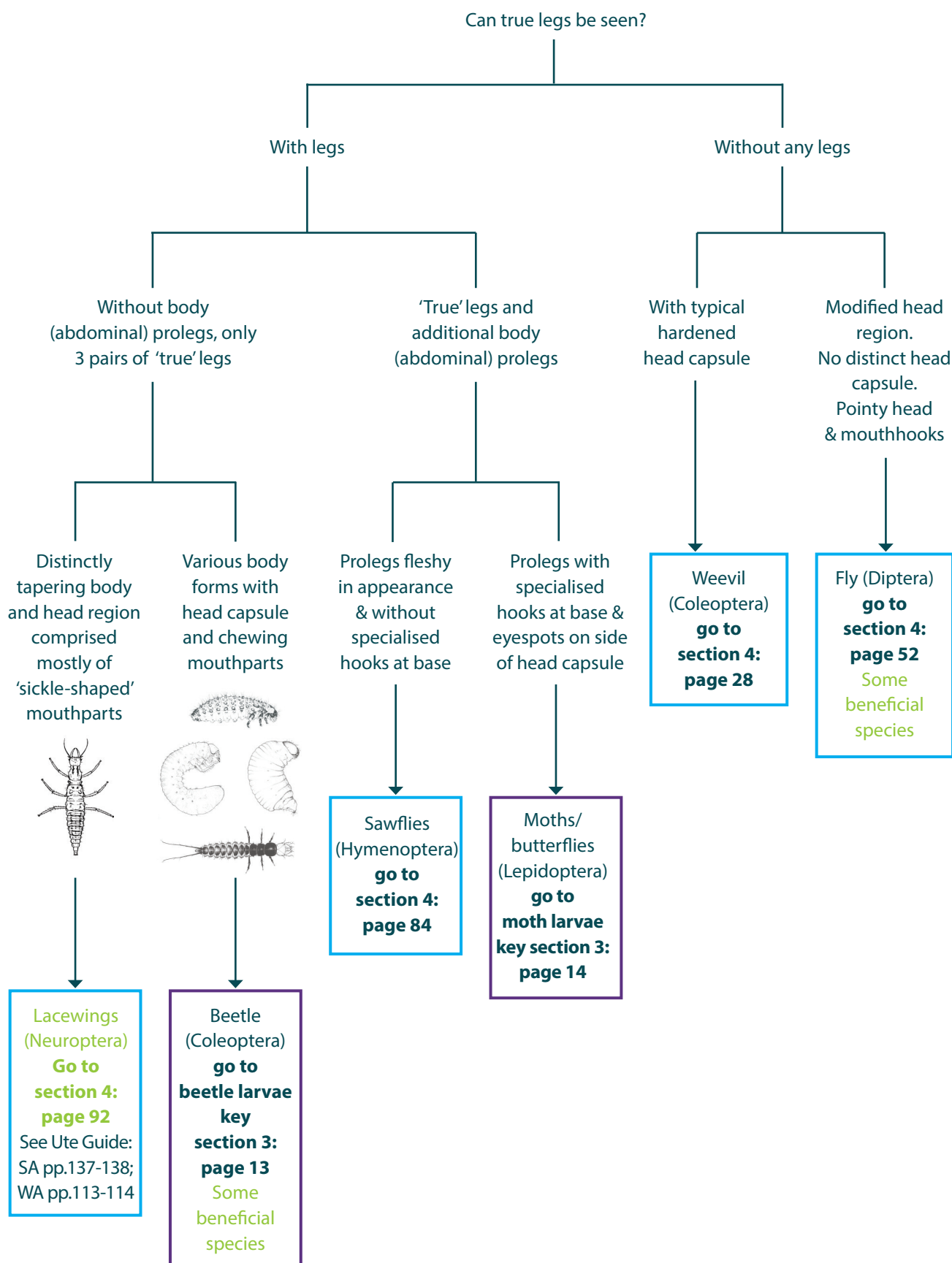
Larval Forms									
Insect type Order (O)	Body region features					Lifecycle  General shape &/or other useful features	Page number		
	Head		Thorax				ISPY Section 4	Ute Guide *	
	Mouthparts	Antennae / Head Capsule	No. of legs	No. of proleg pairs	Abdominal appearance			SA	WA
<b>Beetles</b> O: Coleoptera 	Chewing	Typically short. Well-defined and hardened head capsule.	6  (none in weevils)	none	Anal proleg rare (e.g. Elateridae).	Lifecycle: complete metamorphosis. Typically 4 distinct larval shapes. Some very mobile, others less so. Can often see the shape of legs and other features in pupae.	17	47 - 64	37 - 48
<b>Moths &amp; butterflies</b> O: Lepidoptera 	Chewing	Short antennae. Well-developed and hardened head capsule, usually darker in colour.	6	1 - 4 pairs.  Anal proleg.	All prolegs with crochets (hooks at base).	Lifecycle: complete metamorphosis. Eye spots on side of head. 'V'-shaped suture (groove) on front of head.	2	18 - 46	17 - 36
<b>Flies</b> O: Diptera 	Mouth hooks (piercing and sucking) located at the pointed end of larva.	Modified head region. Reduced and poorly formed head, often retracted into the body.	none	none	Maggot-like. Typically legless, thin and elongate.	Lifecycle: complete metamorphosis. Pupae often simple, relatively featureless.	52	81, 130, 140, 169, 179	62, 104, 116, 136, 146
<b>Wasps, bees &amp; ants</b> O: Hymenoptera 	Variable mouthparts (difficult to see).	Developed head capsule.	Typically legless	Variable	Sawfly larvae have prolegs but no crochets.	Lifecycle: complete metamorphosis. Most are maggot-like.	83	119 - 129	95 - 103
<b>Lacewings</b> O: Neuroptera 	Grasping, sucking.  Large sickle- shaped mandibles pointing forward.	Filamentous antennae.	6	none	Tapering abdomen.	Lifecycle: complete metamorphosis. Predatory with well-developed legs and large mouthparts relative to body size (head region comprised mostly of mouthparts).	92	137 - 138	113 - 114

\* Crop Insects the Ute Guide, Southern (S.A.) or Western (W.A.) edition



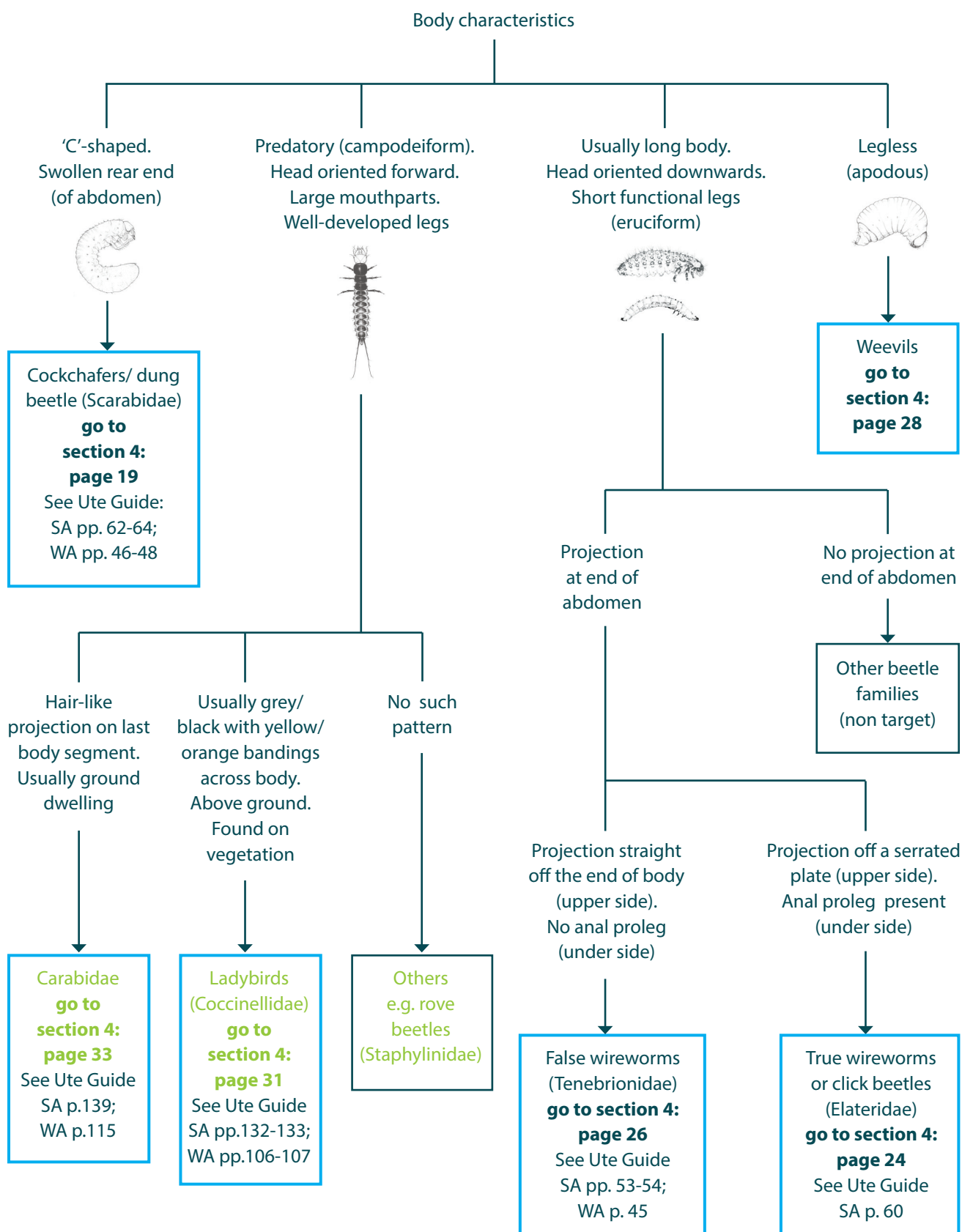
# Identification Keys

## Larval forms to main orders/families



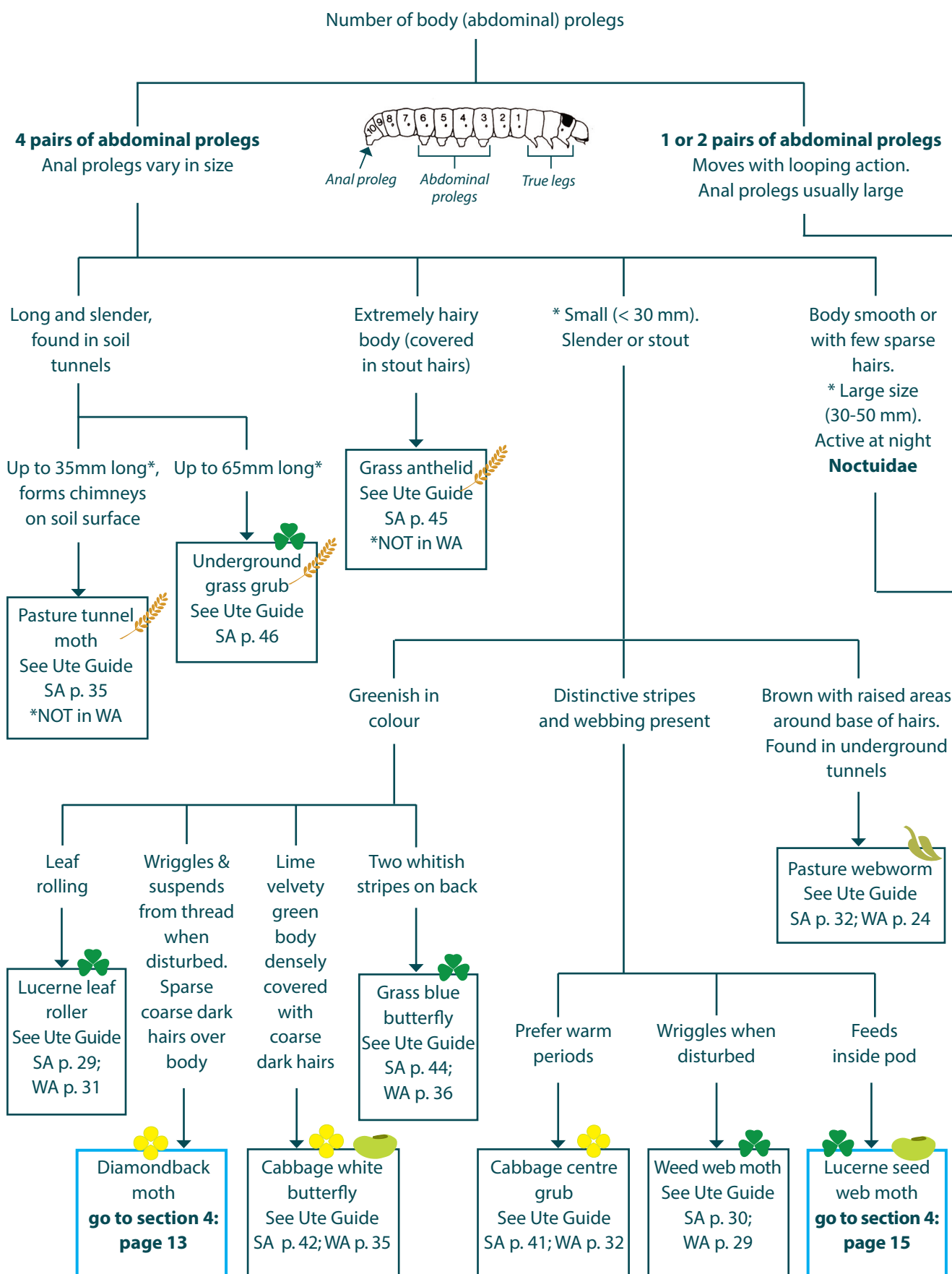


## Beetle larvae to main families

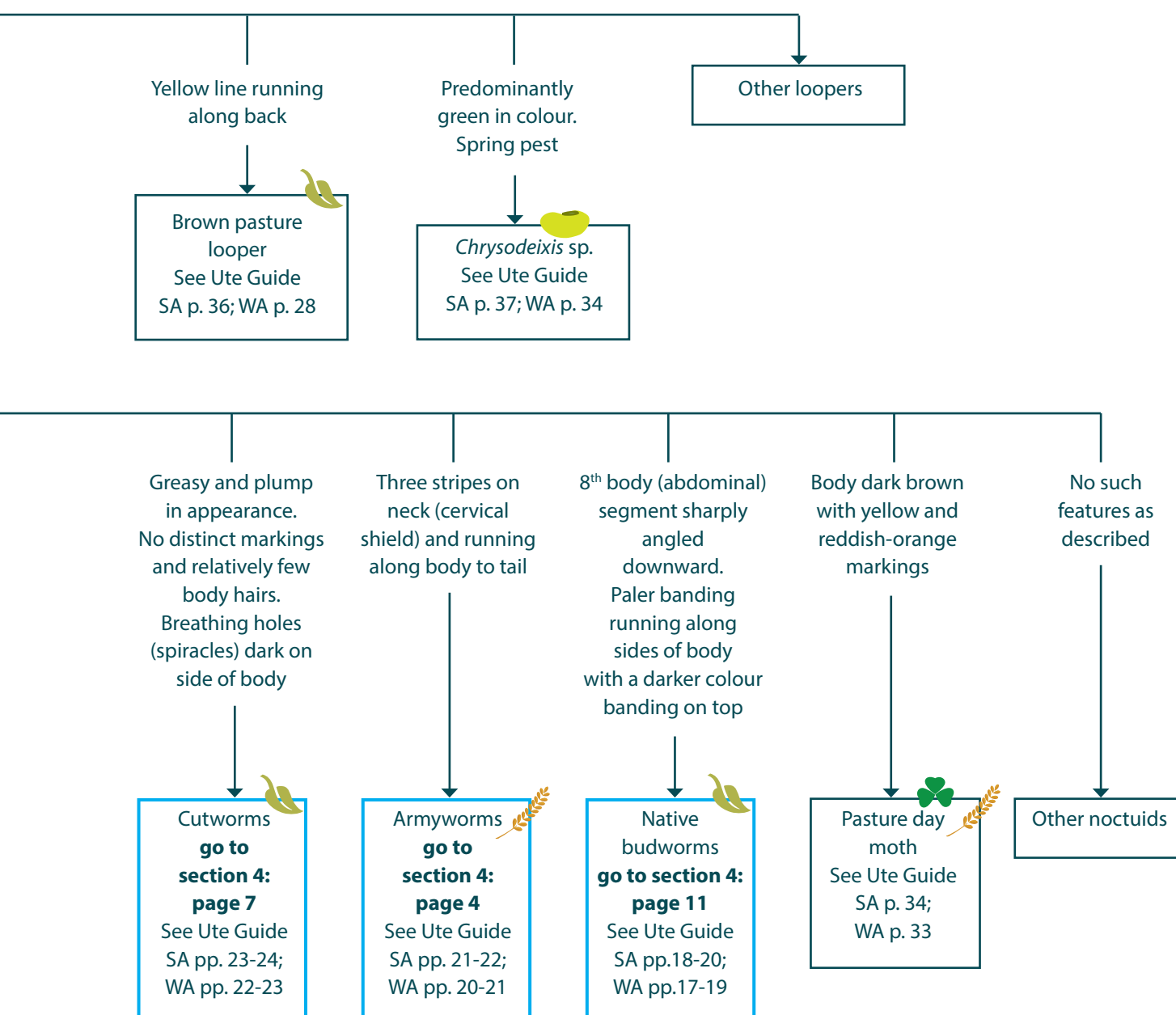
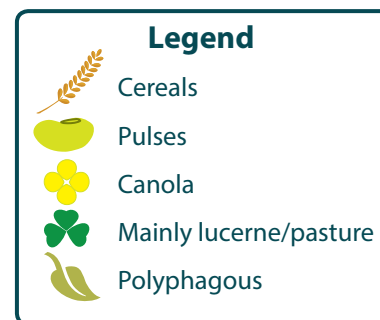


## Moth/butterfly larvae to main families/species

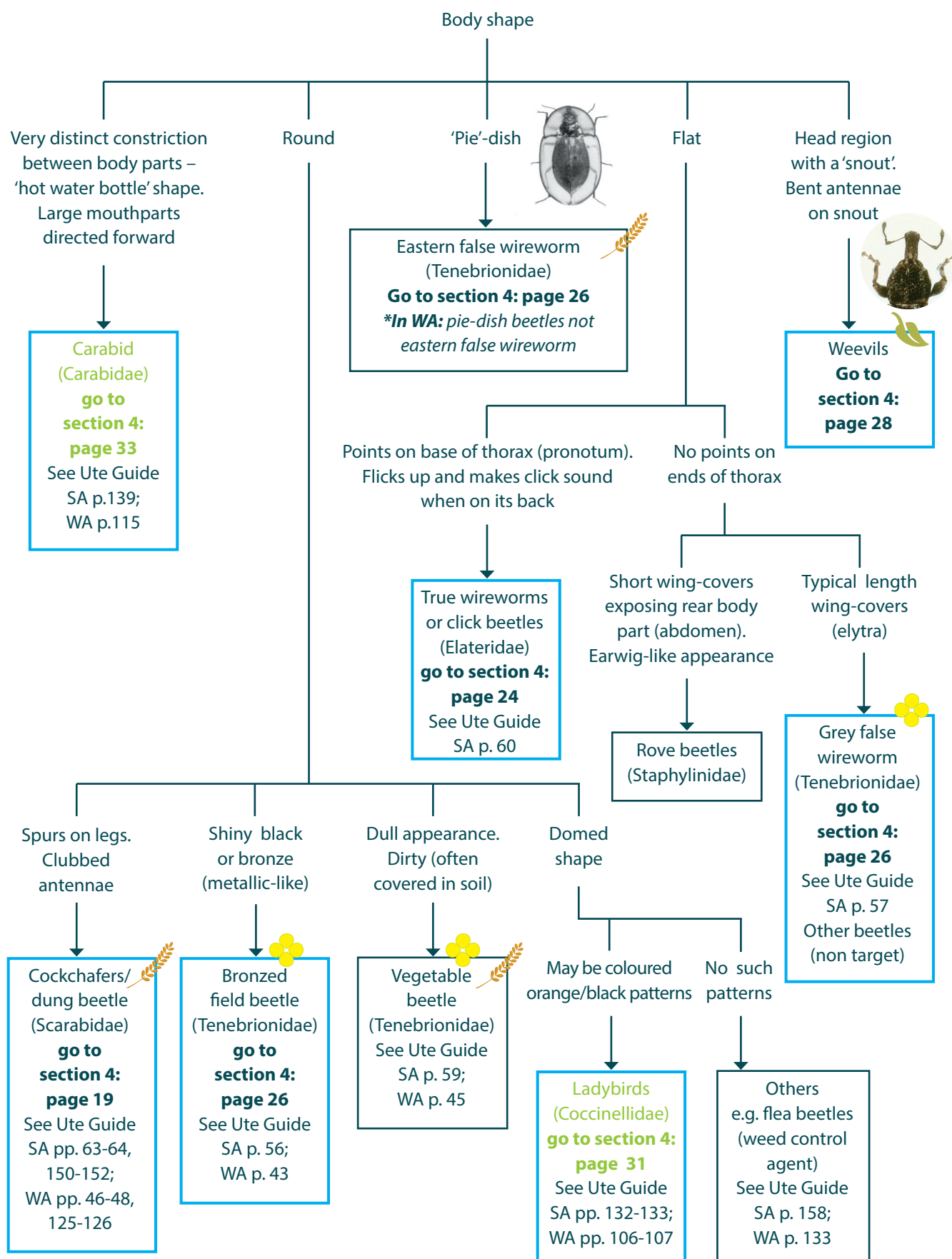
\* size relates to mature larvae





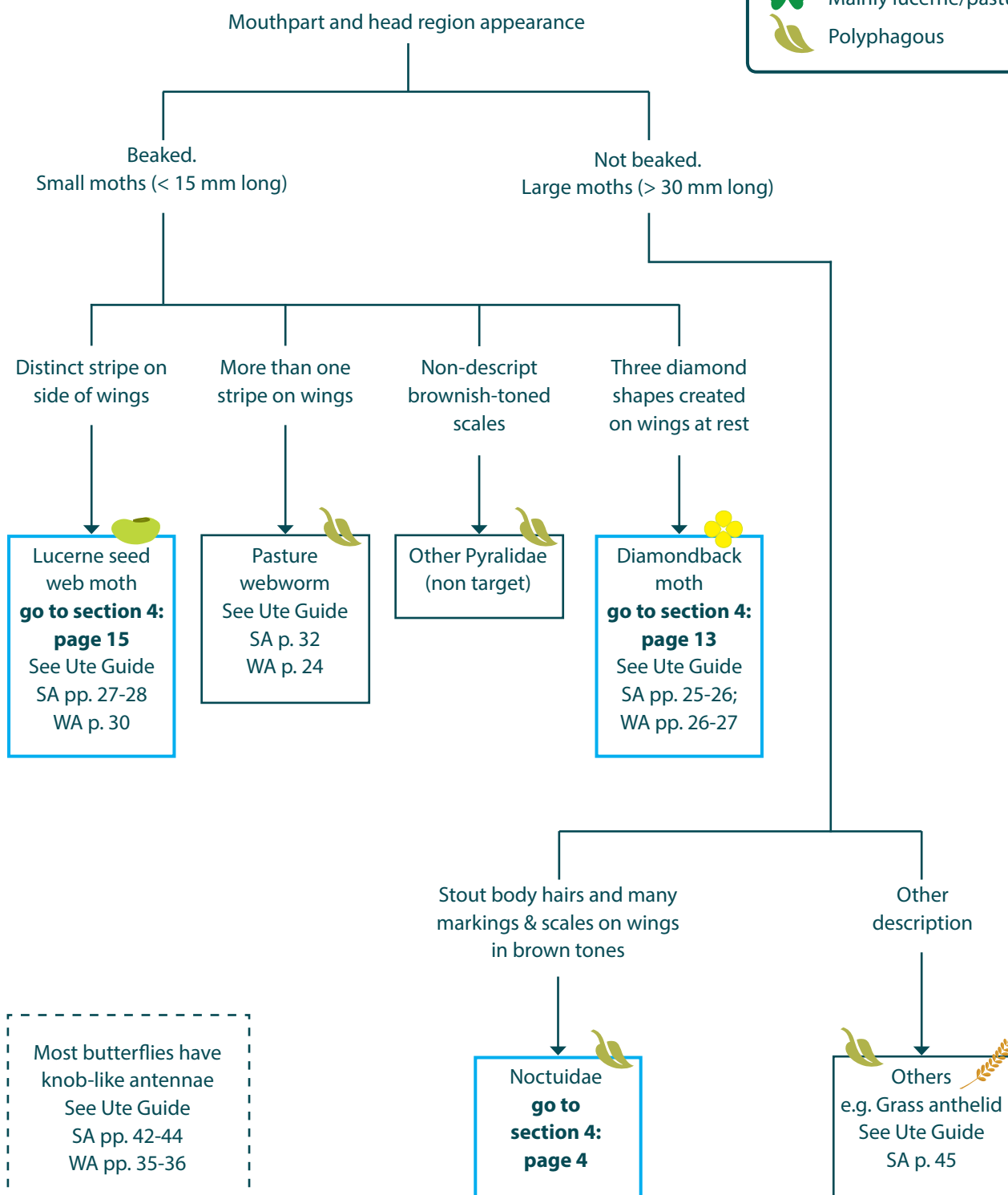
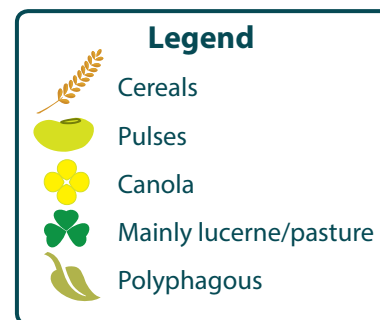


## Beetles (adults) to main families/species





## Moths (adults) to main families/species



# Crop Damage

## Pest Identification Key – CEREALS



Southern – Southern Ute Guide

Western – Western Ute Guide

**\* Relevant in S.E. Australia only**

**\*\* Relevant in WA only**

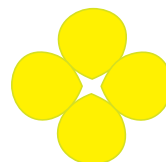
	Damage to seedlings and young plants.	<b>1</b>
	Damage to advanced or ripening crop.	<b>8</b>
1.	Plants chewed above ground.	<b>2</b>
	No chewing evident above ground.	<b>3</b>
2.	Plants cut off leaving stumps close to the ground and/or large portions of leaves missing.	<b>4</b>
	Chewing but plants generally not cut off.	<b>5</b>
3.	Leaves bleached especially near tips.	<b>6</b>
	Plants yellowing, withering, stunted or dying.	<b>7</b>
4.	Leaves or plants cut off and lying on the ground or protruding from small holes next to plants; brown caterpillars (up to 15 mm long) with black heads, present in web-lined tunnels; wheat or barley seeded into grassy pasture paddocks.	<b>Webworm</b> Western p. 24 Southern p. 32
	Leaves or plants cut off and lying on the ground or protruding from small holes next to plants. Slender larvae, up to 35 mm long, construct silk-lined tunnels that protrude above ground to form chimneys.	<b>Pasture tunnel moth*</b> Southern p. 35
	Leaves or plants cut off and lying on the ground or protruding from small holes next to plants. Larvae are brown with black and yellow marking, covered in tufts of stout hairs and can grow up to 50 mm in length.	<b>Grass antherid*</b> Southern p. 45
	Leaves of young seedlings fed upon or damaged; in severe cases seedlings are ring-barked at ground level causing them to drop. Adults are 3-5 mm long, round and dull brown resembling small clods of dirt.	<b>Mandalotus weevil*</b> Southern p. 52
	Plants eaten close to or below ground level causing plant death and bare patches within the crop.	<b>Polyphrades weevil*</b> Southern p. 53
	Larvae emerge from tunnels with rain events to feed on foliage. Can cause bare patches in crops during late autumn and early winter. 'C' shaped larvae with six legs and a black to brown head capsule.	<b>Blackheaded pasture cockchafers*</b> Southern p. 61
	Large portions of plants eaten and some leaves or plants cut off. Smooth, fat caterpillars up to 40 mm long usually found just under the soil surface and may curl up when disturbed.	<b>Cutworms</b> Western p. 22 Southern p. 23
5.	Green material removed in irregular patches from one surface of the leaf leaving white window-like areas; paddocks may appear white; presence of dumpy, wingless, greenish yellow insects, which spring off plants when disturbed.	<b>Lucerne flea</b> Western p. 70 Southern p. 89
	Leaves shredded or chewed, slimy trails.	<b>Slugs and snails</b> Western pp. 71-74 Southern pp. 90-95
	Smooth, shiny brown animals with curved pincers at the end of the body. Damage irregular, often similar to slug damage, mostly in patches, when sown in heavy stubble.	<b>Earwigs</b> Western p. 69 Southern p. 88
	Grasshoppers and locusts.	<b>Grasshoppers and locusts</b> Western pp. 64-67 Southern pp. 83-87
	Minor leaf chewing; presence of dark brown to black caterpillars up to 60 mm long with two yellow spots near posterior end.	<b>Pasture day moth</b> Western p. 33 Southern p. 34



6.	Presence of tiny 8-legged (nymphs have 6 legs) velvety black or brown crawling creatures with orange-red legs, found on plants or on soil surface at the base of plants.	<b>Redlegged earth mite</b> Western p. 75 Southern p. 97  <b>Blue oat mite</b> Western p. 76 Southern p. 99  <b>Balaustium mite</b> Western p. 78 Southern p. 101
7.	Plants stunted and dying at emergence and up to tillering; chewing of seed and stem below ground; white legless larvae up to 7 mm long present near point of attack.	<b>Spotted vegetable weevil or <i>Desiantha weevil</i></b> Western p. 38 Southern p. 48
	Larvae attack swelling seeds just after sowing. They can bore into underground stems of seedlings causing them to wither into base of the plant tillers. Larvae are white and legless with a yellow head capsule and grow to 8 mm long.	<b>Spinetailed weevil or cereal <i>curculio</i>*</b> Southern p. 49
	Plants stunted or dying; roots eaten; slow-moving, soft bodied insects usually in a 'C' shape, cream-coloured apart from head and visible gut contents; found near roots.	<b>Cockchafers</b> Western p. 46 Southern pp. 61, 63  <b>African black beetle</b> Western p. 48 Southern p. 64
	Plants yellowing and withering; on light soils mostly on coastal plain; stems underground shredded; presence of elongated, cylindrical insects up to 75 mm long, first pair of legs adapted for digging.	<b>Sandgropers**</b> Western p. 68
	Larvae may attack germinating seeds below ground and germinating seedlings, causing plants to wither and die and bare patches in crops. Larvae grow up to 15-40 mm; soft bodies and flattened in cross section with yellow-brown heads.	<b>Wireworms or click beetles*</b> Southern p. 60
8.	Green and straw-coloured insect droppings like miniature square hay bales on ground; cereal heads on ground; some chewing of leaves and seed heads of weeds such as ryegrass. Smooth, fat caterpillars up to 40 mm long, with three stripes on collar behind head; found at base of plants or climbing plants.	<b>Armyworm</b> Western p. 20 Southern p. 21
	Seeds chewed but heads not severed; caterpillars up to 40 mm long, sparsely covered with small bumps and bristles, may be various shades of green, yellow, orange or brown; found on seed heads.	<b>Native budworm and related species</b> Western pp. 17-19 Southern pp. 18-20
	Presence of many grey- green insects approx. 2 mm long, with or without wings, on upper portions of stem. If heavy infestations, plants stunted; sticky with secretions, possibly black mould growing on secretions;	<b>Aphids</b> Western pp. 52-53 Southern pp. 70-72
	Damage in fine pale dots in wriggly or zigzag lines. Yellow to green, 3 mm long wedge-shaped sucking insects that jump sideways when disturbed.	<b>Leafhoppers</b> Western p. 61 Southern p. 80

# Crop Damage

## Pest Identification Key - CANOLA



Southern – Southern Ute Guide

Western – Western Ute Guide

**\* Relevant in S.E. Australia only**

**\*\*Relevant in WA only**

	Damage to seedlings.	<b>1</b>
	Damage to flowering and podding canola.	<b>2</b>
	Insects contaminating harvested grain.	<b>7</b>
1.	Transparent windows and holes chewed in leaves. Dumpy, wingless, greenish-yellow insect-like creatures which spring off plants when disturbed.	<b>Lucerne flea</b> Western p. 70 Southern p. 89
	Leaf surface silvered or sucked.	<b>3</b>
	Cotyledons and young leaves chewed; seedlings or leaves cut off.	<b>4</b>
	Plants stunted or dying; roots eaten; slow-moving, soft bodied insects usually in a 'C' shape, cream coloured apart from head; found near roots.	<b>WA cockchafer**</b> Western p. 46
2.	Flower heads attacked.	<b>5</b>
	Leaves or pods attacked.	<b>6</b>
3.	Surface tissue of leaves rasped by small mites with black or brown bodies and eight orange-red legs (tiny nymphs have 6 legs), giving leaves a silvered appearance.	<b>Redlegged earth mite</b> Western p. 75 Southern p. 97  <b>Blue oat mite</b> Western p. 76 Southern p. 99  <b>Bryobia mite</b> Western p. 77 Southern p. 100  <b>Balaustium mite</b> Western p. 78 Southern p.101
	Pear-shaped insects sucking leaves, usually come from summer weeds.	<b>Rutherglen bug</b> Western p. 49 Southern p. 65
	2 mm long cigar-shaped with and without wings – rarely cause damage.	<b>Thrips</b> Western p. 63 Southern p. 82
4.	Presence of smooth, fat caterpillars up to 40 mm long just under soil surface.	<b>Cutworms</b> Western p. 22 Southern p. 23
	Large sections of leaves chewed. In severe cases plants eaten down to ground level. Presence of dull grey-brown weevils (adults), 10 mm long or yellow-green larvae up to 15 mm long with flattened slug-like bodies. Larvae usually found in winter.	<b>Vegetable weevil adult and larvae</b> Western p. 37 Southern p. 47
	Large sections of leaves chewed. In severe cases plants eaten down to ground level. Adult weevils chew cotyledons, leaves and stems and may eat plants down to ground level.	<b>Spotted vegetable or Desiantha weevil</b> Western p. 38 Southern p. 48  <b>Small lucerne weevil</b> Western p. 39 <b>(WA &amp; NSW)</b>  <b>Fullers rose weevil</b> Western p. 42 Southern p. 54



	Feed on leaves of young seedlings; in severe cases seedlings are ring-barked at ground level causing them to drop. Adults are 3-5 mm long, round and dull brown resembling small clods of dirt.	<b>Mandalotus weevil*</b> Southern p. 52
	Areas of leaves chewed. Presence of black and cream striped caterpillars up to 30 mm long that may walk with looping motion.	<b>Brown pasture looper</b> Western p. 28 Southern p. 36
	Plants eaten at ground level. Shiny dark brown larvae (up to 20 mm) with spines or pincers at the tail end; mainly when canola is sown in heavy stubble.	<b>Bronzed field beetle</b> Western p. 43 Southern p. 56  <b>European earwigs</b> Western p. 69 Southern p. 88
	Seedlings can be defoliated and die. Caterpillars feeding on leaves under a fine web, skeletonising leaves. Mostly in seasons with early autumn rainfall and warm weather.	<b>Weed web moth</b> Western p. 29 Southern p. 30
	Minor leaf chewing; presence of dark brown to black caterpillars up to 60 mm long with two yellow spots near posterior end. Minor pest usually after pasture.	<b>Pasture day moth</b> Western p. 33 Southern p. 34
	Leaves shredded or chewed, slimy trails.	<b>Slugs and snails</b> Western pp. 71-74 Southern pp. 90-95
	Germinating seed or emerging seedlings are ring-barked and hypocotyl severed just below the surface. Large bare patches can be seen a few weeks after sowing. Larvae up to 9 mm long, shiny brown-grey on top with paler undersides and two distinct upturned spines on last body segment.	<b>Grey false wireworm*</b> Southern p. 57
	Seedlings chewed at or above ground level, ring-barking or completely cutting stems. Common adult species are 6-8 mm long, dark grey-black and often have a covering of soil.	<b>False wireworms or vegetable beetle adult</b> Western p. 45 Southern p. 59
5.	Flower stems covered with masses of small soft-bodied insects and black sticky mould.	<b>Aphids</b> Western pp. 54-56 Southern pp. 73-75
6.	Holes chewed in leaves, surface of pods attacked by small, thin, green caterpillars, up to 10 mm long, that wriggle rapidly when touched and hang down on a thread.	<b>Diamondback moth</b> Western p. 26 Southern p. 25
	Round holes in pods; seeds eaten by large (up to 40 mm long), sparsely haired and often brightly coloured caterpillars.	<b>Native budworm</b> Western p. 17 Southern pp. 18-20
	Leaves and flowers attacked, especially the basal leaves. Leaves can be combined together with webbing. Small creamish caterpillars with dark heads that may tunnel into growing points.	<b>Cabbage centre grub</b> Western p. 32 Southern p. 41
	Large, irregular holes chewed in leaves. Velvety green caterpillars (up to 30 mm).	<b>Cabbage white butterfly</b> Western p. 35 Southern p. 42
	Pieces of leaves and stems chewed. Complete defoliation can occur in severe cases. Grasshoppers and locusts.	<b>Grasshoppers &amp; locusts</b> Western pp. 64-67 Southern pp. 83-87
7.	Plant growth stunted and in severe cases heads can be distorted. Large numbers of narrow bodied, greyish-brown, flying insects, 3-4 mm long, contaminating harvested grain.	<b>Rutherglen bug</b> Western p. 49 Southern p. 65



# Crop Damage

## Pest Identification Key - PULSES



Southern – Southern Ute Guide

Western – Western Ute Guide

\* **Relevant in S.E. Australia only**

\*\***Relevant in WA only**

FP=field peas, Lup=lupins, Len=lentils, F=faba beans, C=chickpeas. Not applicable for soybeans.

1.	Seedlings damaged.	<b>1</b>
	Areas of green tissue removed from leaves with surface tissue remaining like windows; presence of dumpy, green, wingless insects that spring off plants when disturbed. <b>FP, Lup, Len, F</b>	<b>Lucerne flea</b> Western p. 70 Southern p. 89
	Leaf surface silvered, sucked and withered.	<b>2</b>
	Plants dying without obvious above ground symptoms.	<b>3</b>
	Whole plants or parts of cotyledons and leaves eaten or cut off.	<b>4</b>
	Damage later to leaves, flowers or pods.	<b>5</b>
2.	Surface tissue of leaves rasped by small mites with black or brown bodies and eight orange-red legs (tiny nymphs have 6 legs), giving leaves a silvered appearance. <b>FP, Lup, Len, F</b>	<b>Redlegged earth mite</b> Western p. 75 Southern p. 97  <b>Blue oat mite</b> Western p. 76 Southern p. 99  <b>Bryobia mite</b> Western p. 77 Southern p. 100  <b>Balaustium mite</b> Western p. 78 Southern p. 101
	Plant growth stunted. Pear-shaped insects sucking leaves, usually come from summer weeds. <b>All pulses.</b>	<b>Rutherglen bug</b> Western p. 49 Southern p. 65
3.	Plants stunted or dying; roots eaten; slow-moving, soft bodied insects usually in a 'C' shape, cream coloured apart from head and visible gut contents; found near roots. <b>All pulses.</b>	<b>WA Cockchafers**</b> Western p. 46
	Plants yellowing and withering; on light soils mostly on coastal plain; stems underground shredded; presence of elongate, cylindrical insects up to 75 mm long, first pair of legs adapted for digging, head and front of thorax reddish brown and the remainder of the body a cream colour. <b>All pulses.</b>	<b>Sandgropers**</b> Western p. 68
	Roots rotting, cream grubs tunnelling in stem, worst in previous year's stubble. <b>FP, Lup</b>	<b>Onion maggot</b> Western p. 62 Southern p. 81
4.	Some plants cut off at ground level; cotyledons and leaves chewed; fat, smooth caterpillars up to 40 mm long under soil surface near plants. <b>All pulses.</b>	<b>Cutworms</b> Western p. 22 Southern p. 23
	Leaves chewed but mostly at edges of crop; 30 mm long caterpillars with dark stripe surrounded by lighter areas down the back. <b>All pulses.</b>	<b>Brown pasture looper</b> Western p. 28 Southern p. 36
	Caterpillars feed on leaves under a fine web, skeletonising leaves. Seedlings can be defoliated and die. Mostly in seasons with early autumn rainfall and warm weather. <b>All pulses.</b>	<b>Weed web moth</b> Western p. 29 Southern p. 30



	Leaves shredded or chewed, slimy trails. <b>All pulses.</b>	<b>Slugs and snails</b> Western pp. 71-74 Southern pp. 90-95
	Chewing on cotyledons, leaves and stems. Plants may be eaten down to ground level under high pest pressure. Presence of insects 3 - 12 mm long with prominent weevil snout, that may hide during day and be uncovered under rocks, soil clods or wood. <b>All pulses.</b>	<b>Vegetable weevil</b> Western p. 37 Southern p. 47  <b>Spotted vegetable or <i>Desiantha</i> weevil</b> Western p. 38 Southern p. 48  <b><i>Mandalotus</i> weevil*</b> Southern p. 52
	Smooth shiny brown animals with curved pincers at the end of the body. Mainly when sown in heavy stubble. <b>All pulses.</b>	<b>European earwigs</b> Western p. 69 Southern p. 88
5.	Flower stems covered with masses of small soft-bodied insects and black sticky mould. <b>All pulses, rarely seen on chickpeas.</b>	<b>Aphids</b> Western pp. 54-56 Southern pp. 73-79
	Some leaves and flowers chewed; holes in pods; caterpillars up to 40 mm long sparsely covered with bumps and hairs, often brightly coloured in greens, browns and shades of orange and usually with black stripes along dorsal surface. <b>All pulses.</b>	<b>Native budworm</b> Western p. 17 Southern pp. 18-20
	Cream to green caterpillars with red brown head and red stripes along the back feeding on plant with a web, or inside pods. <b>All pulses.</b>	<b>Lucerne seed web moth</b> Western p. 30 Southern p. 27
	No evidence of leaf damage to plants, the presence of small, bright orange oval eggs on developing pods. <b>FP</b>	<b>Pea weevil</b> Western p. 44 Southern p. 55
	Chewing evident. Grasshoppers and locusts. <b>All pulses.</b>	<b>Grasshoppers and locusts</b> Western pp. 64-67 Southern pp. 83-87



# Crop Damage

## Pest Identification Key - ANNUAL PASTURES AND LUCERNE

Southern – Southern Ute Guide

Western – Western Ute Guide

**\* Relevant in S.E. Australia only**

**\*\*Relevant in WA only**

	Seedlings or young plants damaged.	<b>1</b>
	Damage to leaves, flowers or seed formation.	<b>5</b>
1.	Areas of green tissue removed from leaves with surface tissue remaining like windows; dumpy, wingless, greenish-yellow insects that spring off plants when disturbed. Broad-leaved plants most commonly affected.	<b>Lucerne flea</b> Western p. 70 Southern p. 89
	Leaf surface silvered, sucked and withered.	<b>2</b>
	Plants dying without obvious symptoms.	<b>3</b>
	Whole plants or parts of cotyledons and leaves eaten or cut off.	<b>4</b>
2.	Surface tissue of leaves rasped by small mites with black or dark bodies and eight orange-red legs (tiny nymphs have 6 legs), giving leaves a silvered appearance.	<b>Redlegged earth mite</b> Western p. 75 Southern p. 97  <b>Blue oat mite</b> Western p. 76 Southern p. 99  <b>Bryobia mite</b> Western p. 77 Southern p. 100  <b>Balaustium mite</b> Western p. 78 Southern p. 101
	Plant growth stunted. In severe cases, stands flower poorly and buds are aborted. Pale green flying insects and pear-shaped larvae sucking leaves in spring and summer.	<b>Green mirid</b> Western p. 51 Southern p. 69
	Plant growth stunted. Pear-shaped (nymph) crawling insects or elongated dark winged insects (adults 4 mm long) sucking leaves. May be present in summer, autumn and or spring.	<b>Rutherglen bug</b> (nymphs) Western p. 49 Southern p. 65
3.	Plants stunted or dying; roots eaten; slow-moving, soft bodied insects usually in a 'C'-shape, cream coloured apart from head and visible gut contents; found near roots. Note, these cockchafers do not feed on foliage.	<b>Cockchafers</b> (Not including Blackheaded cockchafers) Western pp. 46-47 Southern pp. 62-63
4.	Some plants cut off at ground level; cotyledons and leaves chewed; fat, smooth night feeding caterpillars up to 40 mm long often found under soil surface near damaged plants. Or brown/black caterpillars that may be found feeding above ground during the day.	<b>Cutworms</b> Western p. 22 Southern p. 23
	Lucerne, medics, sub clovers and some other plants stunted or dying. May have yellow or reddened appearance. Nodules and roots eaten by pale or cream coloured legless weevil grubs, found near roots below ground. Weevil adults chew bits out of leaves leaving scalloped edges.	<b>Sitona weevil</b> Western p. 40 Southern p. 50  <b>Small lucerne weevil**</b> Western p. 39 (& NSW)  <b>White fringed weevil</b> Western p. 41 Southern p. 51  <b>Fullers rose weevil</b> Western p. 42 Southern p. 54



	Grass leaves or plants cut off and lying on the ground or leaves protruding from small holes next to plants; brown caterpillars, up to 15 mm long, with black heads present in web-lined tunnels.	<b>Pasture webworm</b> Western p. 24 Southern p. 32
	Leaves chewed but mostly at edges of crop; 30 mm long caterpillars with dark stripe surrounded by lighter areas down the back.	<b>Brown pasture looper</b> Western p. 28 Southern p. 36
	Leaves shredded or chewed, slimy trails may also be seen. Pest more often seen after rain with moist leaf surfaces.	<b>Slugs and snails</b> Western pp. 71-74 Southern pp. 90-95
	Minor leaf chewing; presence of dark brown to black caterpillars up to 60 mm long with two yellow spots near posterior end. Minor pest usually feeding on broad-leaved weeds e.g. capeweed.	<b>Pasture day moth</b> Western p. 33 Southern p. 34
	Leaves or plants cut off and lying on the ground or protruding from small holes next to plants; Slender larvae, up to 35 mm long, construct silk-lined tunnels that protrude above ground to form chimneys.	<b>Pasture tunnel moth*</b> Southern p. 35
	Larvae emerge from tunnels with rain events to feed on foliage. Can cause bare patches in crops during late autumn and early winter. 'C' shaped larvae with six legs and a black to brown head capsule.	<b>Blackheaded pasture cockchafer*</b> Southern p. 61
	Leaves or plants cut off and lying on the ground or protruding from small holes next to plants. Larvae are brown with black and yellow markings; covered in stout hairs and can grow up to 50 mm in length.	<b>Grass antherid*</b> Southern p. 45
5.	Flower stems covered with masses of small soft-bodied insects and sometimes black sticky mould. Susceptibility varies between legume species and medic varieties. Aphids may occasionally become a pest in early established pasture and lucerne stands with warm temperatures.	<b>Aphids</b> Western pp. 54-56 Southern pp. 73-79
	Some leaves and flowers chewed; holes in podding legumes; caterpillars up to 40 mm long sparsely covered with bumps and hairs, often brightly coloured in greens, browns and shades of orange and usually with black stripes along their backs. Serradellas are often affected.	<b>Native budworm</b> Western p. 17 Southern pp. 18-20
	Pods are chewed out resulting in reduced yield. Cream to green caterpillars with red-brown heads and red stripes along the back, feeding on plants or inside pods, often with fine silken webbing nearby.	<b>Lucerne seed web moth</b> Western p. 30 Southern p. 27
	Leaves at the tips of growing points are rolled and can be skeletonised. Pale to green caterpillars which may drop from plants on a silken thread.	<b>Lucerne leafroller</b> Western p. 31 Southern p. 29
	Pieces of leaves and stems chewed. Complete defoliation can occur in severe cases. Grasshoppers and locusts present.	<b>Grasshoppers &amp; locusts</b> Western pp. 64-67 Southern pp. 83-87
	Leaves and growing points are chewed. Ten millimetre green slug-like larvae with a white line down each side and a dense covering of short hairs; mostly attacks leaves with skeletonising type damage.	<b>Grass blue butterfly</b> Western p. 36 Southern p. 44

