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# Armyworms

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## Importance

Armyworms are caterpillar pests of grass pastures and cereal crops. They are the only caterpillars that growers are likely to encounter in cereal crops, although occasionally native budworm will also attack grain when underlying weed hosts dry out. Armyworms mostly feed on leaves, but under certain circumstances will feed on the seed stem, resulting in head loss. The change in feeding habit is caused by depletion of green leaf material or crowding. In the unusual event of extreme food depletion and crowding, they will "march" out of crops and pastures in search of food, which gives them the name "armyworm".

## Description

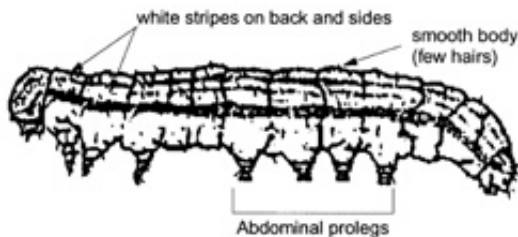


Figure 1 All armyworm larvae are smooth bodied and have white strips running down their back and sides

There are three common species of armyworm found in southern Australia:

- Common armyworm (*Mythimna convecta*)
- Southern armyworm (*Persectania ewingii*)
- Inland armyworm (*Persectania dyscrita*)

## Larvae

Caterpillars of the three species are similar in appearance. They grow from about 2 to 40 mm in length. They have three prominent white or cream stripes running down the back and sides of their bodies. These are most obvious where they start on the thoracic segment ("collar") immediately behind the head. These become particularly apparent in larvae that are >10mm. They have no obvious hairs, are smooth to touch and curl-up when disturbed. Armyworms have four abdominal prolegs (Figure 1).

Mature caterpillars are 30-40 mm long. For an accurate identification, they must be reared through to the adult (moth) stage.

Armyworms can be distinguished from other caterpillar pests that may be found in the same place by three pale stripes running the length of the body; these stay constant no matter what variation in the colour of the body.

Other species of caterpillar which may be confused with armyworms include:

- loopers (tobacco looper or brown pasture looper) which walk with a distinct looping action and have 1 or 2 pairs of abdominal prolegs; armyworms have 4 pairs, and when >10 mm do not walk with a looping action.
- budworm larvae which have prominent but sparse hairs and bumps on their skin, or antherid larvae which are covered in hairs; armyworms are smooth bodied with no obvious hairs.
- cabbage moth larvae which wriggle vigorously when disturbed; armyworms curl up into a tight "C".
- cutworm (brown or common cutworm) larvae which have no obvious stripes or markings and are uniformly brown, pink or black.

## Adults

Moths are often seen flying on warm, humid nights. They are medium-sized, with a wingspan of 30-40 mm.

Each species has a characteristic colour and wing markings.

- **Southern armyworm:** grey-brown to red-brown forewings with white zig-zag markings on the outer tips and a pointed white "dagger" in the middle of the forewing. The hind wings are dark grey (Figure 2).
- **Inland armyworm:** similar to the southern armyworm except the white "dagger" in the centre of the forewing is divided into two discrete light ellipses which almost touch. The hind wings are pale grey.
- **Common armyworm:** the forewings are dull yellow to red-brown, speckled with tiny black dots, and a small white dot near the centre.

Pupae of all three species are about 20 mm long, shiny brown and are found under clods or within cracks in the soil.

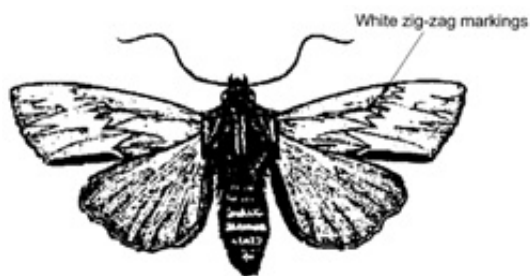


Figure 2 The southern armyworm and inland armyworm moths are distinguished from the common armyworm moth through the zig-zag markings on the front wings

## Biology

Moths are most active on warm humid evenings during

spring and autumn. Armyworm eggs are laid in batches of about 5-30, glued together in the hidden, twisted crevices of dried grasses, straw and stubble or sometimes in seed heads. The eggs may take 6-20 days to hatch, depending on local temperatures. The young larvae, which are about 2-3 mm in length, may disperse away from the egg laying sites on fine silken threads. These are used to allow wind dispersal within a few metres of the egg-laying site.

There are usually six stages (instars) of caterpillar growth, and the skin is shed after each. Older caterpillars crawl around at night and may move up and down plants regularly. They spend the day curled up at the base of the plant under clods of soil or in the plant crown. It is the older and larger larvae that cause all the damage to crops.

The larvae do not remain at this voracious stage for many weeks; they soon commence tunnelling into the soil to pupate. The mature caterpillars pupate in the surface of the soil at the base of the plant. The adult moth finally emerges at least 4 to 6 weeks (possibly many more) after pupation, and migrates away from the region.

*NB: It is most unusual for crops to be reinvaded twice in succession; a heavy infestation in one year rarely results in a further problem in the following season.*

## Seasonal activity

### Common armyworm

The common armyworm is the more usual pest in spring and early summer. This species appears to spend its winter in the warmer regions of northern Australia, and the subsequent generation of moths migrate south in early spring. As crops and pastures commence drying, the larvae are usually large enough to lop off tillers and stems bearing the seed heads: this accounts for most economic loss incurred by armyworms. The moths that emerge from the spring generation migrate to other areas where green pastures or crops permit a new generation of egg-laying.

### Southern and inland armyworm

Southern and inland armyworm caterpillars can be found in autumn and winter, often in relatively high densities, throughout the grasslands and crops of south eastern Australia. There are two generations per year. Most eggs are either laid in autumn, often immediately after rain, or in late winter. The hatch of the autumn generation is synchronised with the emergence of autumn pastures and crops. The young caterpillars cause little damage while feeding on leaf surfaces. The older larvae can defoliate the plant.

Moths of the southern and inland armyworm appear not to lay eggs after a spring emergence. There has been little research on the biology of these two species, but field observations suggest they have a winter habit, and that larvae do not usually survive the warmer temperatures of the late spring and summer periods. The moths

re-appear in the autumn, particularly at about the time of the first autumn rains. It is at this stage that they start laying eggs in the dry grass and stubble from the previous pasture or cereal crop.

## Damage

The young larvae feed initially from the leaf surface of pasture grasses and cereals. As the winter and spring progress and the larvae grow, they chew 'scallop' marks from the leaf edges. This becomes increasingly evident by mid to late winter. By the end of winter or early spring, the larvae are reaching full growth and maximum food consumption. It is this stage that farmers most frequently notice as complete leaves and tillers may be consumed or removed from the plant.

Damaging infestations or outbreaks occur in 3 situations:

**In winter** when young tillering cereals are attacked and can be completely defoliated. The caterpillars may come from:

- the standing stubble from the previous year's cereal crop, in which the eggs are laid;
- neighbouring pastures which dry out, resulting in the resident armyworms being forced to march into the crop.

**In spring / early summer** when crops commence ripening and seed heads may be lopped;

**In early summer** when grass pastures are cut for hay, particularly in Gippsland.

Leaves of cereal plants or grasses appear chewed ("leaf scalloping") along the edges. The most damage, however, is caused in ripening crops when the foliage dries off. The armyworms then begin to eat any green areas remaining. In cereals, the last section of the stem to dry out is usually just below the seed head. Armyworms, particularly the older ones, that chew at this vulnerable spot cause lopping of the heads and can devastate a crop nearing maturity in one or two nights. Generally, the larger the armyworm, the greater the damage. In wheat and barley whole heads are severed, while in oats individual grains are bitten off below the glumes.

The crops affected include all Gramineae crops including cereals, grassy pastures, corn and maize.

## Outbreaks

Major outbreaks occasionally occur across Victoria, particularly after periods of drought. There are many factors which may lead to an outbreak. They may arise from large invasions of moths which have bred in arid regions of New South Wales, South Australia or western Queensland. Alternatively, they may arise because of significantly less mortality of eggs and young caterpillars. Droughts appear to trigger outbreaks because of the adverse effects they have on the natural enemies of armyworms; these predators and parasites are much slower in recovering from a drought than are armyworms.

The role of stubble retention

Winter outbreaks are most common in crops under conditions of stubble retention and minimum cultivation. Most eggs would not be laid in a crop in the absence of stubble. It should be emphasised that stubble and undisturbed soil also provides a continuous habitat for a range of natural enemies which help to control many pest problems. Further, the direct and indirect benefits of these conservation tillage practices far outweigh their costs, including the occasional outbreak of armyworm.

## Sampling and detection

Signs of the presence of armyworms include:

- Chewing/leaf scalloping along the leaf margins.
- Caterpillar excreta or "frass" which collects on leaves or at the base of the plant. These appear as green or yellow cylindrical pellets 1-2 mm long.
- Cereal heads or oat grains on the ground. Oat grains may be attached to a small piece of stalk (1-2 mm), whereas wind removed grains are not. Barley heads may be severed completely, or hang from the plant by a small piece of stalk.

Early detection is essential, particularly when cereals and pasture seed or hay crops are at the late ripening stage. Although accurate estimates of caterpillar densities require considerable effort, the cost saving is worthwhile.

Sampling can be achieved by using a sweep-net/bucket, or visually ground or crop searching for either caterpillars or damage symptoms.

The sweep-net/bucket method provides a rapid and approximate estimate of infestation size. The net or bucket should be swept across the crop in 180° arcs several times, preferably 100 times, at different sites within the crop to give an indication of density and spread. Armyworms are most active at night, so sweeping will be most effective at dusk. Average catches of more than 5-10 per 100 sweeps suggest that further searches on the ground are warranted to determine approximate densities.

When ground sampling, it is necessary to do at least ten "spot checks" in the crop, counting the number of caterpillars within a square metre.

Most farmers fail to detect armyworms until the larvae are almost fully grown and 10-20% damage may result. The earlier the detection, the less the damage. The young larvae (up to 8 mm) cause very little damage, and are more difficult to find. The critical time to look for armyworms is the last 3 - 4 weeks before harvest.

## Control

There are a number of chemicals registered for control of armyworms. For winter outbreaks (during tillering), economic thresholds of 8 to 10 larvae per m<sup>2</sup> provide a guide for spray decisions. For spring outbreaks (during crop ripening) spraying is recommended when the density of larvae exceeds 1 to 3 larvae per m<sup>2</sup> although this figure must be interpreted in the light of:

- timing of harvest,
- green matter available in the crop,
- expected return on the crop, and
- larval development stage (if most are greater than 35-40 mm or pupating, it may not be worth spraying).

If spraying is necessary, it is highly recommended that this be carried out in late afternoon or early evening for maximum effect, as armyworms are nocturnal feeders.

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