Scarab Beetle Larvae

Scarab beetle larvae are soil-based pests of southeastern Australia. They can cause damage to blueberries, strawberries, and Rubus by feeding on their roots and new growth. They can be difficult to control as they spend the majority of their lifecycle in the soil beyond the reach of insecticides. The three species examined here are Redheaded Pasture Cockchafer *(Adoryphorus coulonii)*, Blackheaded Pasture Cockchafer *(Acrossidius tasmaniae)*, and African Black Beetle *(Heteronychus arator)*.

Identification

All scarab beetle larvae share the following characteristics. There are three larval stages, of which the 3rd instar is the most damaging. All larvae are C-shaped, with six short legs and a hardened head capsule with mandibular. Their stomach content of decaying organic matter, humus, and plant roots can often be seen through the external covering in medium to larger larvae. See Table 1 for a comparison of common differentiating characteristics.

Redheaded Pasture Cockchafer	Blackheaded Pasture Cockchafer	African Black Beetle
		
Distribution: Southeastern Australia (except WA)	**Distribution:** Southeastern Australia (except WA)	**Distribution:** Throughout Australia (except TAS)
Head Capsule Colour: red to red-brown	**Head Capsule Colour:** dark brown to black	**Head Capsule Colour:** brown or tan
Head Capsule Texture: rough or matted	**Head Capsule Texture:** smooth and shiny	**Head Capsule Texture:** smooth and shiny
Body Colour: white-grey to cream	**Body Colour:** white to white-grey	**Body Colour:** grey when young, transitioning to creamy white when older
Size: 4mm-30mm	**Size:** 4mm-20mm	**Size:** 5mm-25mm

Table 1. Differentiating characteristics of the scarab beetle larvae discussed in this article
Photos credit: South Australian Research and Development Institute (SARDI)

Lifecycle

African black beetles have a one-year life cycle.

Adults lay their eggs in the soil in spring and larvae hatch 2–5 weeks later and begin to feed.

Larvae develop throughout the summer and reach their full maturity between mid-January and March.

Larvae then pupate in the soil between February and early April.

Once they emerge as adults they continue to live in and just above the soil, feeding on plant material throughout the rest of the year until starting the cycle all over again the following spring.

Redheaded pasture cockchafers have a two-year life cycle.

In year one, redheaded cockchafer adults pupate from late summer to mid-autumn but remain underground. They emerge from the soil from August to October, when they proceed to lay their eggs.

Eggs are laid singly or in loosely dispersed groups 10-50 mm underneath the soil. The eggs hatch 6-8 weeks after being laid. Once hatched, larvae will develop for almost a full year, progressing rapidly through 1st and 2nd instars and reaching the 3rd instar by early autumn of the second year. Most damage is caused from the 3rd instars feeding from March to June until winter temperatures hinder larval activity. Larvae resume feeding the following spring and summer until pupation starts in November. Except for a very limited period as adults, the lifecycle takes place underground.

Blackheaded pasture cockchafers have a one-year lifecycle.

Adults lay their eggs about 10cm deep in the soil in groups of 2-3 dozen in summer.

These hatch approximately three weeks later. Their head capsules are pale at birth but turn to shiny dark brown to black after a few hours.

Larvae feed on humus in soil and mature throughout autumn and winter, changing from a light grey colour to a creamy-yellow colour.

As they grow, so does the damage. They leave the soil to harvest green material as well as feeding underground.

They continue to feed until they reach full maturity in late winter/ early spring, at which point they cease feeding and wait to pupate.

They pupate in late spring and early summer and emerge as adults in late summer.

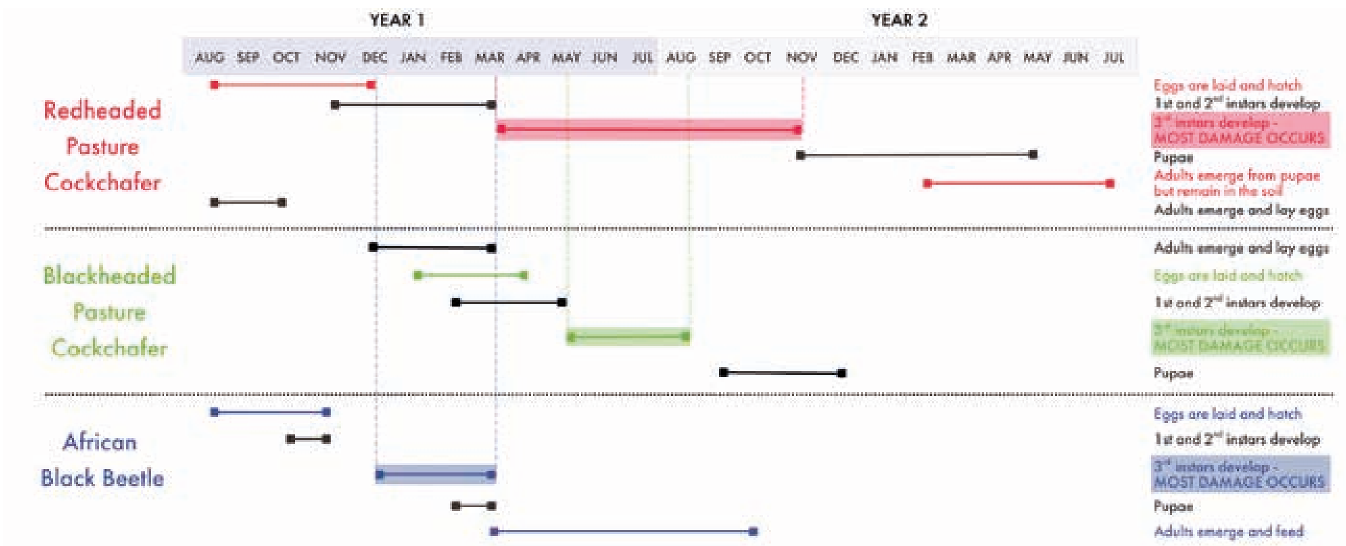

Table 2. Lifecycle of the three scarab beetle species discussed in this article

Damage

Scarab beetle larvae are subterranean feeders who consume plant roots and new growth, causing structural damage to root systems. Larvae, particularly the larger 3rd instar larvae, prune or completely sever root systems. It can be difficult to identify the pest as the source of plant stress, as scarab beetle larvae damage is to the root systems.

- Affected plants when uprooted have few or no fibrous roots, and larvae can usually be found residing in or near the plant
- Larger roots may have scarring and calluses from feeding damage
- Damaged plants may exhibit symptoms such as poor vigour, leaf reddening, reduced fruit production, and death

The African black beetle differs from the other scarab pests noted in this article in that it also causes feeding damage as an adult. African black beetle adults damage young stems of newly established plants either underground or just above the surface, causing central shoots to wither and dead-hearting the plants. If adult beetles are found with accompanying stem damage below or just above the soil surface, African black beetle is likely to be the culprit.

Monitoring

There is no standard monitoring procedure for scarab beetle larvae in berries.

Pasture and grains sources recommend that monitoring can be done by digging to a depth of 10-20 cm with a spade and counting the number of larvae present.

This should be repeated 10-20 times to get an estimate of larval numbers.

Four larvae per spade square is roughly equivalent to 100 larvae per m2 in a pasture context.

As species-level identification of scarab beetle larvae is difficult, it's suggested this process be carried out by a qualified specialist or that larvae samples found be sent to an entomology or diagnostics service for accurate identification.

Scarab beetle damage to blackberry
Photo credit: NSW DPIRD

Scarab beetle damage to blueberry
Photo credit: NSW DPIRD

Management Options

Cultural

Opportunities for cultural control can mainly be found when cultivating ground. This is easier for strawberries, where the ground is worked every 2-3 years.

Ground disturbance during cultivation can help control larvae. Larvae can be directly mechanically killed by the ground preparation process, and turning over the soil also exposes larvae to predation from birds and other predators.

Biological

Redheaded Pasture Cockchafers and African black beetles can be controlled by the application of the beneficial nematode species *Heterorhabditis zealandica*, available for commercial application via the company Ecogrow (ecogrow.com.au). These nematodes work best when applied to active populations of 3rd instars.

Soil temperature should be above 15°C and below 25°C at the time of application. Ensure that the area to be treated has been irrigated and that the soil is moist. Applications should be made at dusk to avoid high UV light. Irrigate well immediately after treatment and maintain moist soil conditions for the next 7 to 10 days.

Chemical

Research has shown that soil fumigation products, such as Strike 80/Tri-Form 80 (chloropicrin, 1,3-dichloroproprene), Metham Sodium, and EDN (ethanedinitrile), control scarab beetle larvae as a byproduct of their applied uses.

Non-fumigant chemical control is limited for scarab beetle larvae. Foliar application of insecticides is only effective on young blackheaded pasture cockchafers as they are the only scarab larvae to spend a portion of their time feeding on the surface. **However, no insecticides are registered for this purpose in berry crops**. Standard foliar insecticide applications are ineffective at controlling other scarab beetle larvae as they never emerge from the soil.

Currently two permits are available for scarab beetle larvae: one for pre-plant application in strawberry (Queensland only) and one for post-harvest application in blueberry. Both can be viewed at any time in the APVMA Permits Database (portal.apvma.gov.au/pubcris)

Permit 81745 allows for a pre-planting soil application of chlorpyrifos via granular application during strawberry bed formation in Queensland only.

Permit 12534 allows for postharvest soil application of Imidacloprid via subsurface trickle irrigation to target 1st and 2nd instar larvae in blueberries. Imidacloprid application for soil-grown blueberries must take place post-harvest but pre-flowering to ensure that pollinators are not affected.

References

Berg, Gordon, et al. “Biology and Management of the Redheaded Pasture *CockchaferAdoryphorus* Couloni(Burmeister) (Scarabaeidae: Dynastinae) in Australia: A Review of Current Knowledge.” *Austral Entomology*, vol. 53, no. 2, 21 Oct. 2013, pp. 144–158, https://doi.org/10.1111/aen.12062. Accessed 8 Mar. 2023

Department of Jobs, Precincts and Regions. “Redheaded Pasture Cockchafer - Agriculture.” *Agriculture Victoria*, 21 Oct. 2022, agriculture.vic.gov.au/biosecurity/pest-insects-and-mites/priority-pest-insects-and-mites/redheaded-pasture-cockchafer

Ford, Phillip, et al. *Biological Control of African Black Beetle (Heteronychus Arator) in Turf Using Entomopathogenic Nematodes.* 2001.

SARDI, and DPIRD. *Insects of Southern Australian Broadacre Farming Systems Identification Manual and Education Resource 2nd Edition.* National Invertebrate Pest Initiative, 27 Mar. 2018.

Simpson, Melinda, and Gaius Leong. *Berry Plant Protection Guide.* NSW DPI, 2025.

Umina, Paul, and Bill Kimber. “Blackheaded Pasture Cockchafer – Cesar Australia.” *Caesar Australia*, Jan. 2015, cesaraustralia.com/pestnotes/beetles/blackheaded-pasture-cockchafer

“Redheaded Pasture Cockchafer – *Cesar Australia.*” Cesaraustralia.com, 2012, cesaraustralia.com/pestnotes/beetles/redheaded-pasture-cockchafer

Further research

WADPIRD and the Grains Research and Development Corporation (GRDC) have recently (May 2025) begun a three-year research project aimed at developing management strategies for the control of cockchafers.

The research is ongoing but may result in more management options. Updates, learnings, and communications from the study can be found on the website here https://grdc.com.au/grdc-investments/investments/investment?code=DAW2505-006RTX

Why is identification so important?

Differentiating between scarab beetle larvae can be tricky. Identification is often based on small morphological characteristics that are only visible under a microscope and are difficult to distinguish by anyone but a professional entomologist.

There are almost 30,000 beetle species in Australia and over 2,000 in the *Scarabaeidae* family. Some of these species, such as the three described, cause damage to berry crops. Others are harmless and to attempt to eliminate them is a waste of time and money.

Treatments should be targeted during the larval stage when the pests are most vulnerable. Each species has their own development cycle at which they are most vulnerable to predation, so it's important to identify the species and therefore the specific lifecycle moment to target. Misidentification of harmless larvae will result in unnecessary treatments, while misidentification of one damaging larva for another may result in ineffective treatment.

This Pest Spotlight has been prepared by Sandy Shaw and Gaius Leong, Berry Industry Development Officers.