

Natural enemies

Natural enemies of citrus pests

Citrus pests attacked

Natural enemies, or beneficial insects, are natural pest controllers, reducing the need for chemicals. Beneficials such as parasitic wasps, predatory ladybird beetles and lacewings target and control harmful pests in the orchard. These good bugs can get into parts of the tree where achieving chemical coverage is difficult.

Lacewings

Lacewings are generalist predators that feed on red scale, soft scale and mealybugs, Kelly's citrus thrips, light brown apple moth, aphids, Australian citrus whitefly and two-spotted mite.



Fun fact
Green lacewing larvae carry the remains of prey on their backs to use as camouflage.

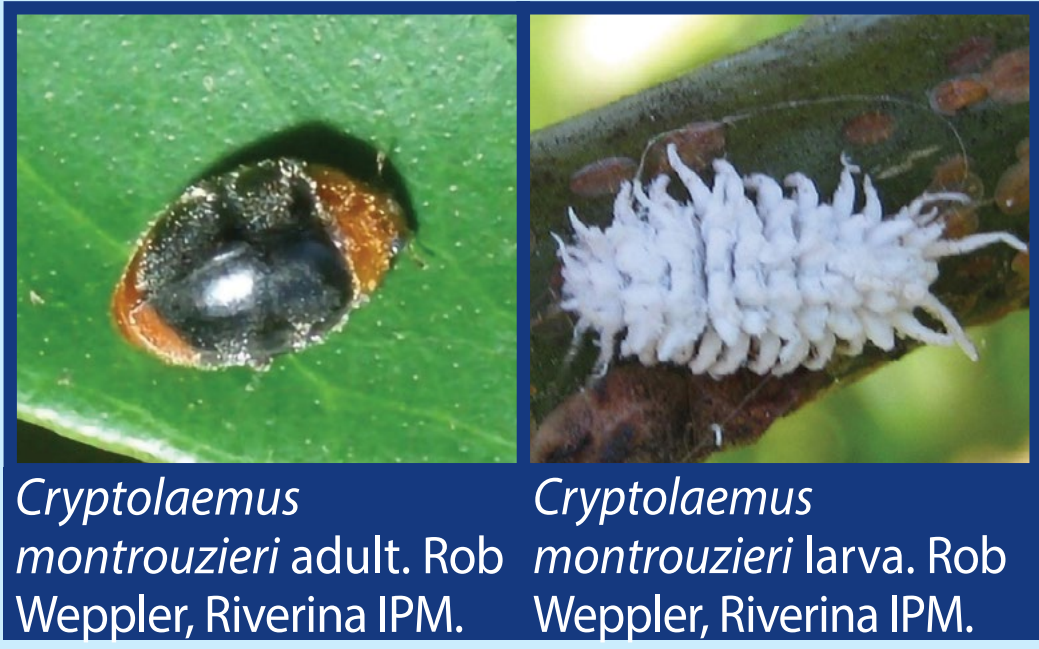
Ladybird beetles

Ladybird beetle adults and larvae are common generalist predators that eat a range of insect pests including soft scale, red scale, mealybugs, aphids, Kelly's citrus thrips and two-spotted mites.



Praying mantises

Praying mantises are generalist predators. They feed on larger insects as they develop. Their diet includes katyids, aphids, light brown apple moth (larvae and adults) and bugs.



Cryptolaemus montrouzieri adult. Rob Weppler, Riverina IPM. Cryptolaemus montrouzieri larva. Rob Weppler, Riverina IPM.

Fun fact
Cryptolaemus larvae resemble mealybugs and can be confused with their mealybug prey, a form of camouflage.

Predatory bugs

Predatory bugs are generalist predators whose diet contains various pests including caterpillars, insect eggs, thrips, mealybugs and aphids.



Fun fact
Some predatory bugs can survive on nectar, pollen, honeydew, or even cannibalise each other when prey is scarce.

Spiders

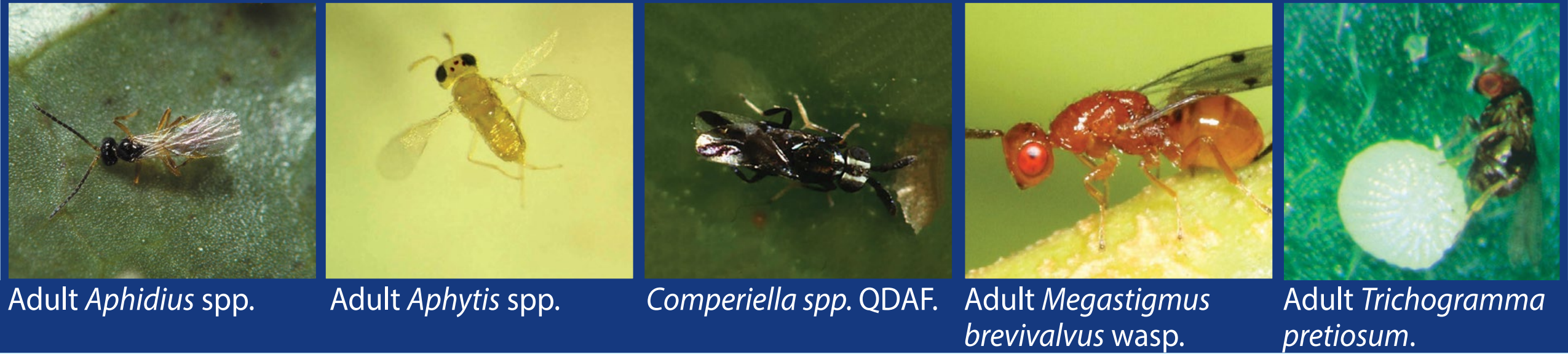
Spiders are generalist predators commonly found in orchards with IPM strategies. Spiders prey on pests such as light brown apple moth (larvae and adults), katydid, citrus gall wasp and Kelly's citrus thrips.



Fun fact
Different spiders use different hunting methods. Some actively hunt, some wait for prey to arrive, while others catch prey in their webs.

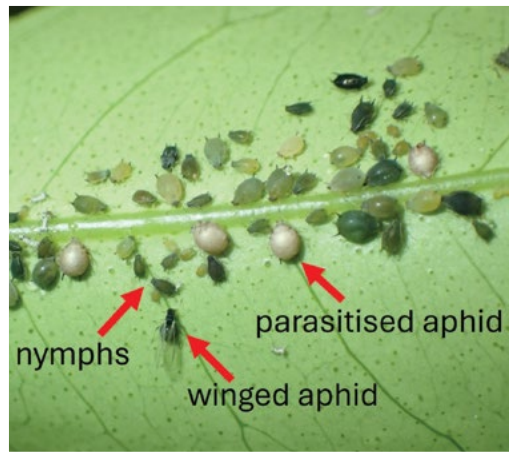
Wasps

Many parasitoid wasps are specialist predators only targeting a single group of insect pests. Their target pests include aphids, red scale, soft scale, mealybug, citrus gall wasp, light brown apple moth and Australian citrus whitefly.



Aphids (Aphis spp. and Toxoptera spp.)

Parasitoids: wasps (*Aphidius* spp.)
Predators: ladybird beetles (*Coccinella transversalis*, *Diomus notescens*, *Hippodamia variegata*), lacewings (*Mallada* spp., *Micromus* spp.)
Aphidius spp. wasps are natural parasitoids. The larvae and pupa develop inside aphids, swelling their bodies. The adult chews exit holes, leaving a silver, brittle mummy. *Coccinella* spp. ladybird beetle (larvae and adults) and lacewing larvae are important natural aphid predators.



Australian citrus whitefly (ACW; Orchemoplatus citri)

Parasitoids: wasps (*Encarsia* spp.)
Predators: ladybird beetles (*Serangium maculigerum*) and lacewings (*Mallada* spp., *Micromus* spp.)
Encarsia spp. wasps are natural parasitoids that develop and feed inside whitefly nymphs, killing them. Adult wasps also consume nymphs but not adults. *Serangium maculigerum* ladybird beetles (larvae and adults) and lacewing larvae are active predators feeding on Australian citrus whitefly nymphs.



Citrus gall wasp (CGW; Bruchophagus fellis)

Parasitoids: wasps (*Megastigmus brevivalvus*, *Megastigmus trisulcus*)
Predators: spiders
Megastigmus spp. wasps lay eggs inside gall wasp eggs. The parasitised larva develops inside the CGW larva, destroying it. The density and size of galls are reduced but not eliminated.



Katydid (Caedicia spp.)

Predators: bugs (*Pristhesancus* spp.), praying mantises (*Mantidae* spp.), spiders and birds
Assassin bugs, praying mantises, spiders and birds feed on katydids but do not significantly reduce numbers.



Kelly's citrus thrips (KCT; Pezothrips kellyanus)

Predators: thrips (*Haplothrips victoriensis*, *Aelothrips* spp.), mites (*Euseius* spp., *Anystis* spp.), lacewings (*Mallada* spp.), and ladybird beetles (*Diomus notescens*)
Predatory thrips, lacewing larvae and spiders are natural enemies. *Euseius* and *Anystis* soil mites are important predators of KCT pupae in the soil.



Light brown apple moth (LBAM; Epiphyas postvittana)

Parasitoids: wasps (*Trichogramma* spp., *Dolichogenidea* spp., *Xanthopimpla* spp.)
Predators: bugs (*Oechalia schellenbergii*, *Nabus* spp.), lacewings (*Mallada* spp., *Micromus* spp., *Nabus* spp.) and spiders
Trichogramma spp. wasps parasitise LBAM moth eggs, while *Dolichogenidea* spp. and *Xanthopimpla* spp. wasps parasitise larvae. Shield bugs, damsel bugs, lacewings and spiders are natural predators of the larval stage.



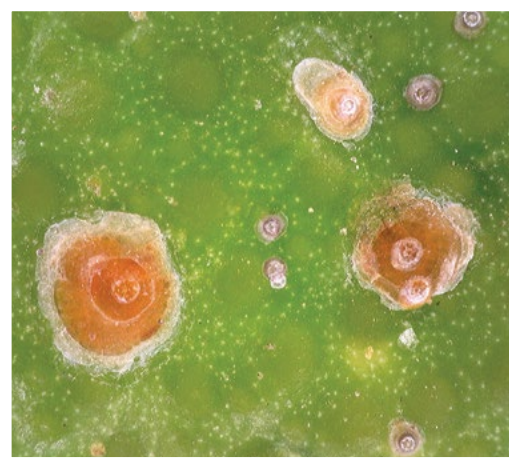
Mealybugs (Pseudococcus spp.)

Parasitoids: wasps (*Coccophagus* spp., *Tetracnemoidea* spp.)
Predators: lacewings (*Mallada* spp.), ladybird beetles (*Cryptolaemus montrouzieri*, *Diomus notescens*)
Coccophagus spp. and *Tetracnemoidea* spp. wasps are important natural parasitoids that lay eggs inside mealybugs and transform them into brittle 'mummies'. Green lacewing larvae, *Cryptolaemus* spp. and *Diomus* spp. ladybird beetles (adults and larvae) are natural predators that feed on mealybugs.



Red scale (Aonidella aurantia)

Parasitoids: wasps (*Aphytis* spp., *Comperiella bifasciata*)
Predators: ladybird beetles (*Rhyzobius lophanthae*) and lacewings (*Mallada* spp.)
Aphytis spp. wasps are the most important natural parasitoids for red scale. They lay eggs under the scale cover onto scale body. *Comperiella* spp. wasps lay eggs inside the scale body. *Rhyzobius* ladybird beetles (larvae and adults) and green lacewing larvae feed on red scale.



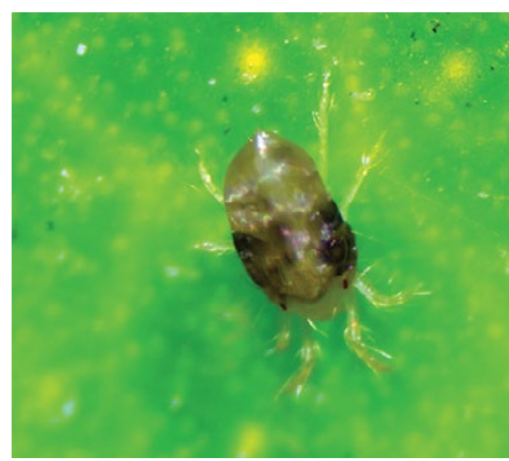
Soft scales (Coccus spp. and Icerya spp.)

Parasitoids: wasps (*Coccophagus* spp., *Metaphycus* spp.)
Predators: ladybird beetles (*Cryptolaemus montrouzieri*, *Rhyzobius lophanthae*, *Diomus notescens*), lacewings (*Mallada* spp. and *Micromus* spp.)
Coccophagus spp. wasps are important natural parasites, laying eggs inside the scale body. Ladybird beetle (larvae and adults) and lacewing larvae feed on soft scale.



Two-spotted mite (Tetranychus urticae)

Predators: ladybird beetles (*Stethorus* spp.), lacewings (*Mallada* spp., *Micromus* spp.) and mites (*Euseius* spp.)
Stethorus spp. ladybird beetle adults and larvae are the main enemies feeding on egg and moulting stages of two-spotted mites. Lacewing larvae are active predators of two-spotted mite. *Euseius* spp. mites are native to Australia and are active predators, feeding on the mite.



Having flowering grasses in the inter-row will provide shelter and pollen for natural enemies in the orchard.



Scan the code for more citrus IPDM extension program resources.



By slashing alternate rows and only spraying the blocks that need it, the population and range of natural enemies in the orchard will increase.

Reference: Smith D, Beattie GA and Broadley R (1997) *Citrus pests and their natural enemies*, Queensland Department of Primary Industries.

IPDM for the citrus industry

Hort Innovation CITRUS FUND NSW GOVERNMENT Queensland Government

This project has been funded by Hort Innovation, using the citrus research and development levy, contributions from the Australian Government and co-investment from New South Wales Department of Primary Industries, Queensland Department of Agriculture and Fisheries and the Agricultural Produce Commission. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Authors: Alison Fattore and Dr Meena Thakur, NSW DPIRD, October 2024.