Integrated Pest Management in Avocado Orchards

Note: Eddy's changes to this presentation are in **red**

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Program

- What is IPM?
- Insect classification
- Avocado insects - pests and beneficials
- Monitoring insects in orchards

Integrated Pest Management

What is IPM?

- **Management strategy for insect pests**
  - Not control
- **Key features**
  - Regular monitoring
  - Combination of control methods
  - Minimising harm to beneficials & environment
  - Pesticide use based on monitoring results and historical data

IPM - What does it involve?

- Correct identification
- Understanding life cycles & seasonal occurrences
- Monitoring orchards regularly
- What to look for, when
- Know your enemies & your friends

IPM - Key themes

- Low pest numbers may be tolerated
- Determine pest threshold levels
- Provide refugia for beneficial insects
- Targeted chemical spray when required but not necessarily the last resort
- Avoid blanket spraying whole farm
- Healthy well managed trees are less prone to attack

IPM - Control

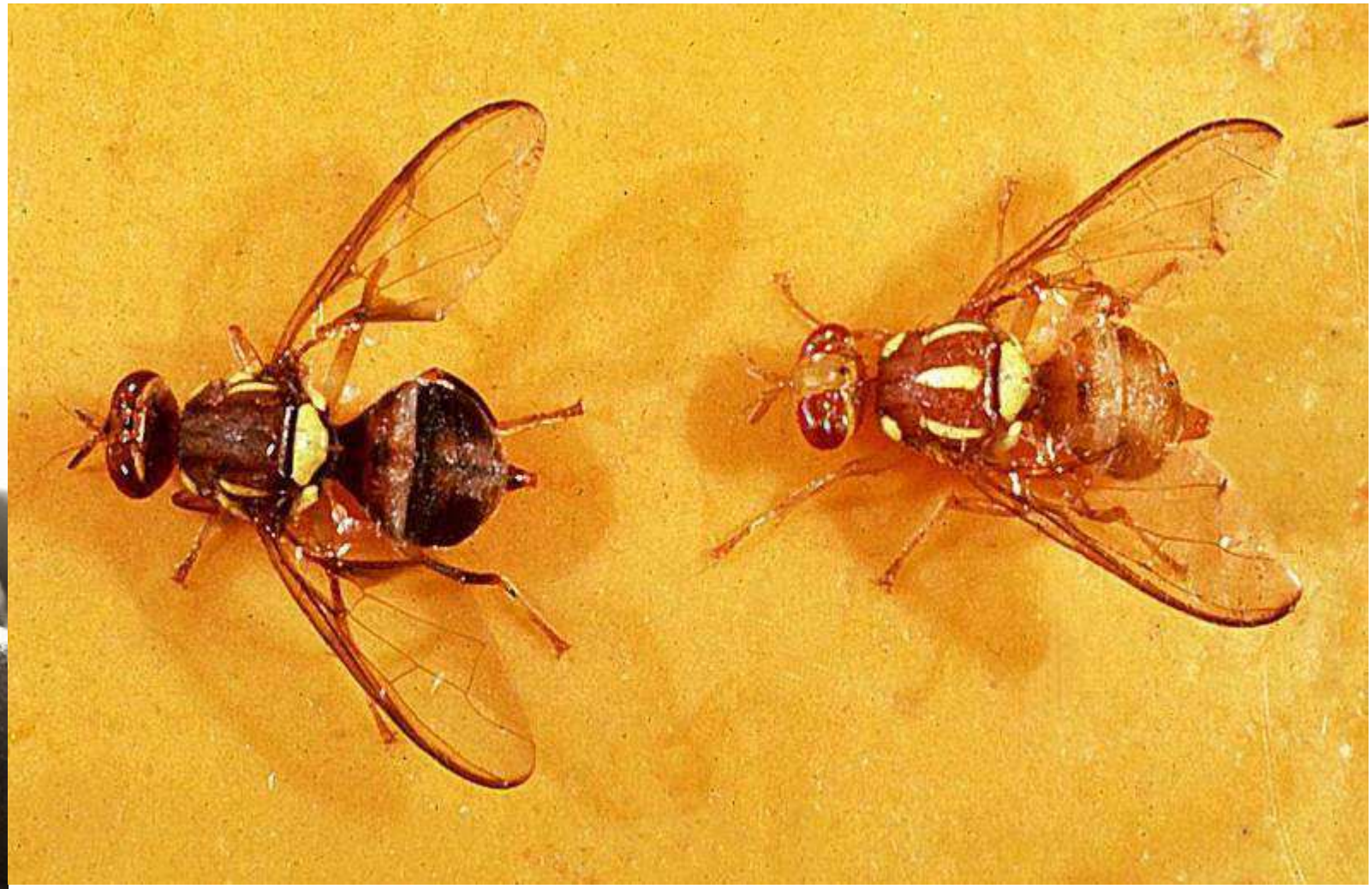
- **Insecticide choice**
  - Persistent, broad spectrum insecticides reduce beneficials
  - Use biological & physical control where possible
  - Choose more specific, less harmful insecticides e.g. Mimic for loopers / caterpillars
- **Provide refugia for beneficials**
  - Non sprayed shady trees and crops
  - Species that don't host pests
  - To find suitable food to persist

Why IPM?

- Few new chemicals for pest management being developed
- Many older chemicals have a short lifespan
- Consumer resistance to old chemicals
- May improve profitability by reducing inputs

A Short Quiz

1. In which group of insects would you place this insect [eg. fly, grub, wasp, beetle etc.]
2. Is this insect:
    a. a pest?
    b. a beneficial insect?
    c. neither - it is just sitting there.

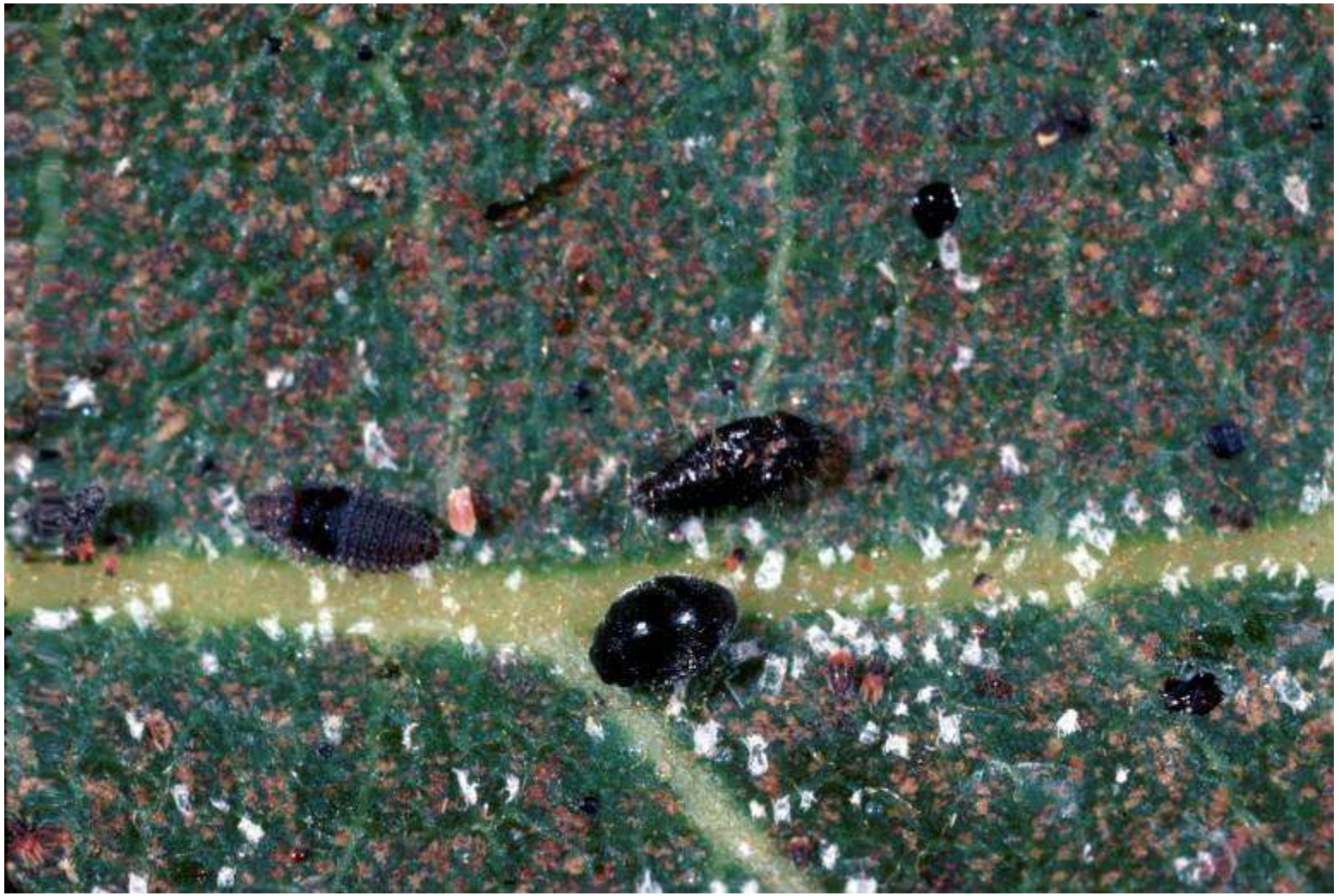


Fruit fly

Spotting bug

Chilean predatory mite (left hand side) attacking Two-spotted mite

Monolepta



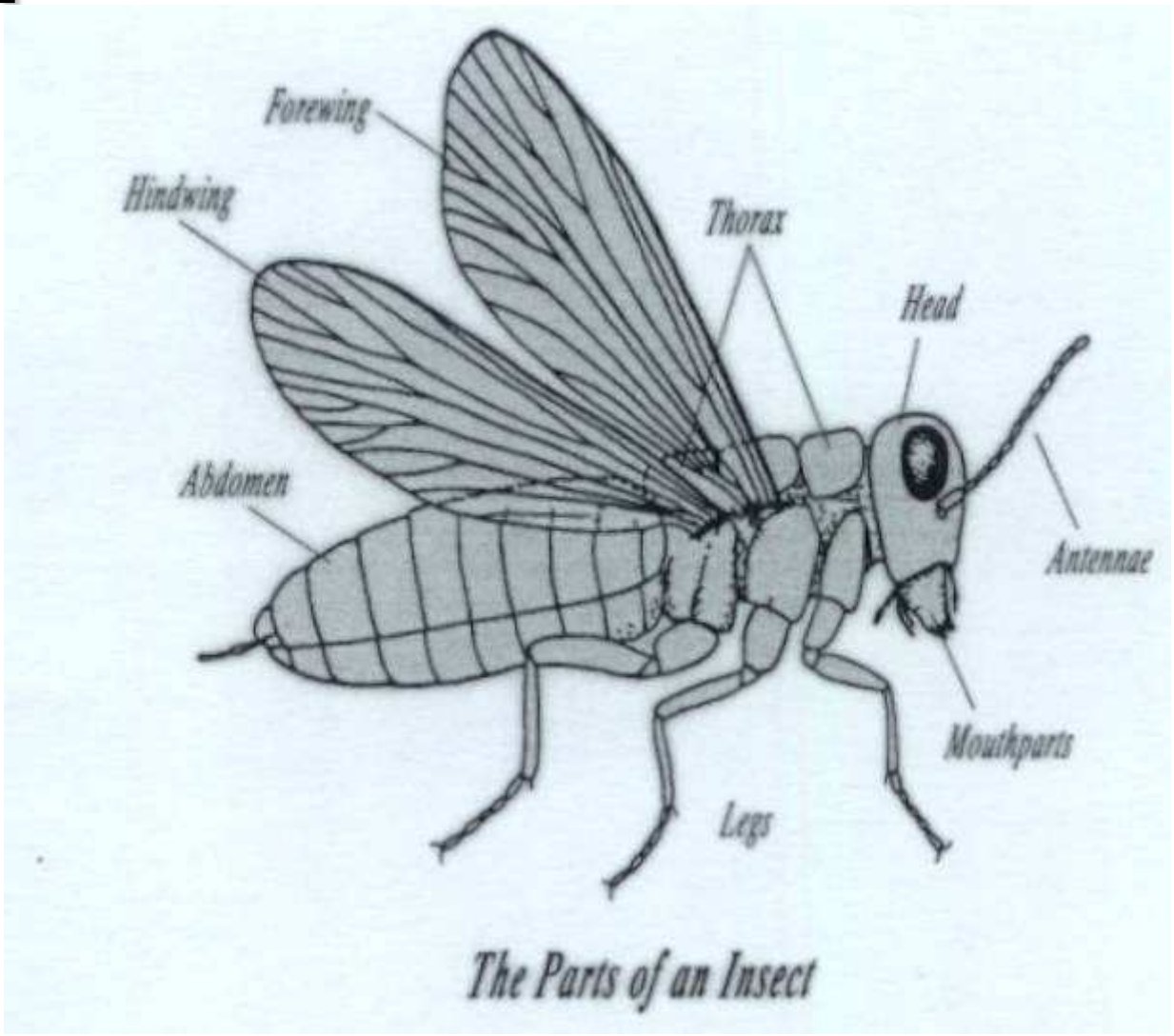
The beneficial insect Stethorus eating Tea red spider mite

Insect Classification and Biology

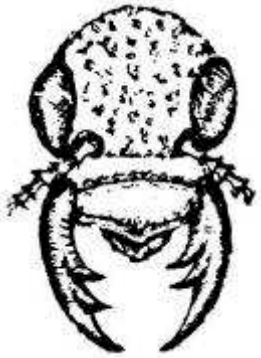
Why is classification important?

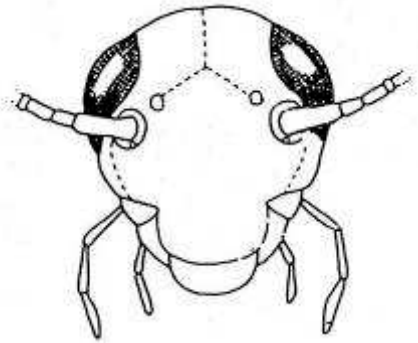
- Better target your control options
- Use non chemical controls
- Use softer chemicals
- Specific chemical groups work on specific insect groups
- Chemical effectiveness is related to feeding or lifecycle patterns of pest

The parts of an insect



Insect mouthparts

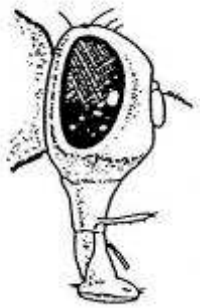




Coiled sucking mouthpart

Chewing mouthparts

Piercing mouthpart

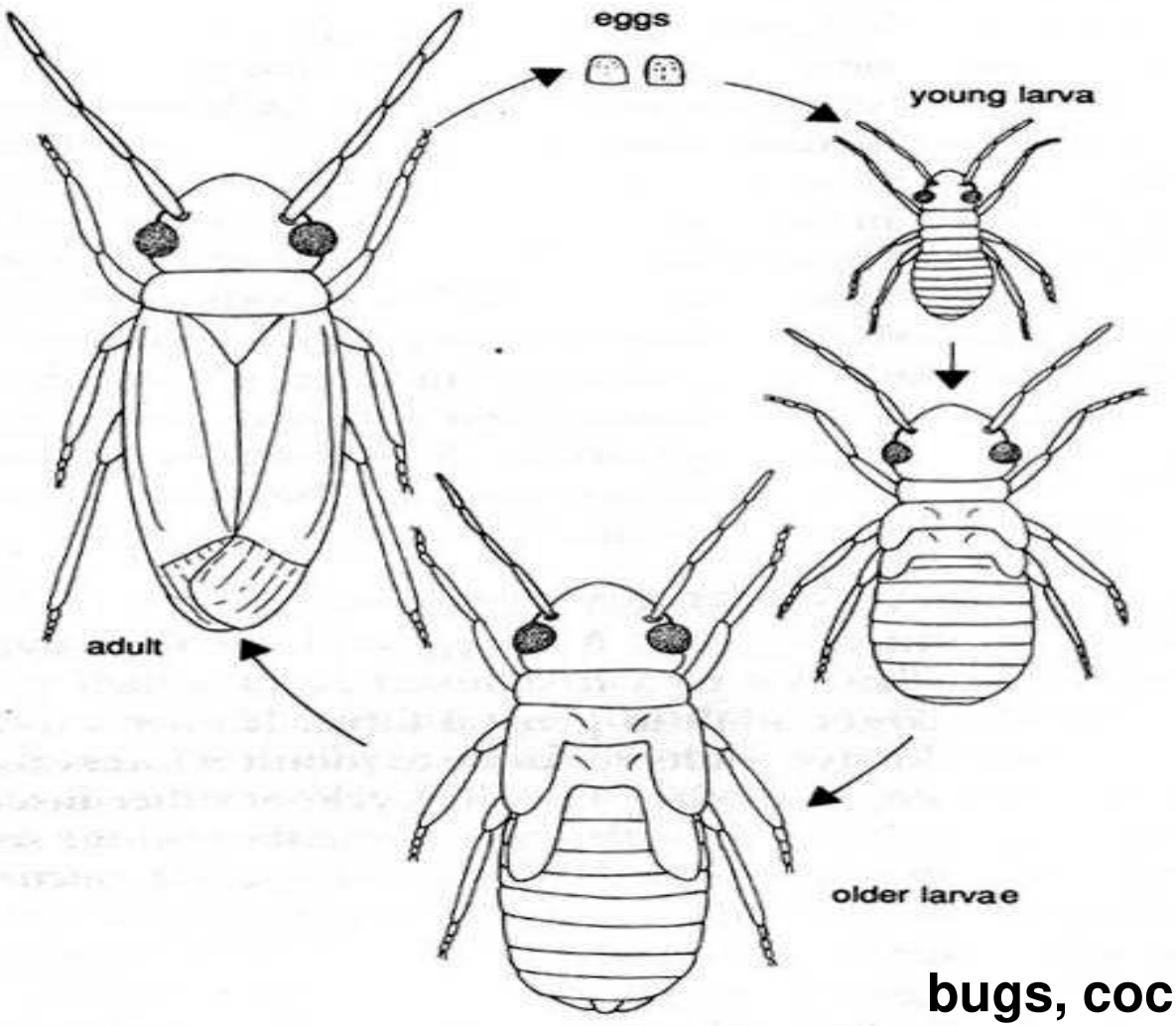


Sponging mouthpart

Incomplete (gradual) lifecycle

- **3 stage lifecycle**
  - Immature insect resemble adults
  - No pupal stage
  - Immatures referred to as nymphs
- **Feeding: Adults & nymphs**
  - Same mouthparts
  - Eat the same food and resources
  - Occur in the same habitat
- **Management**
  - All life stages susceptible

Incomplete lifecycle

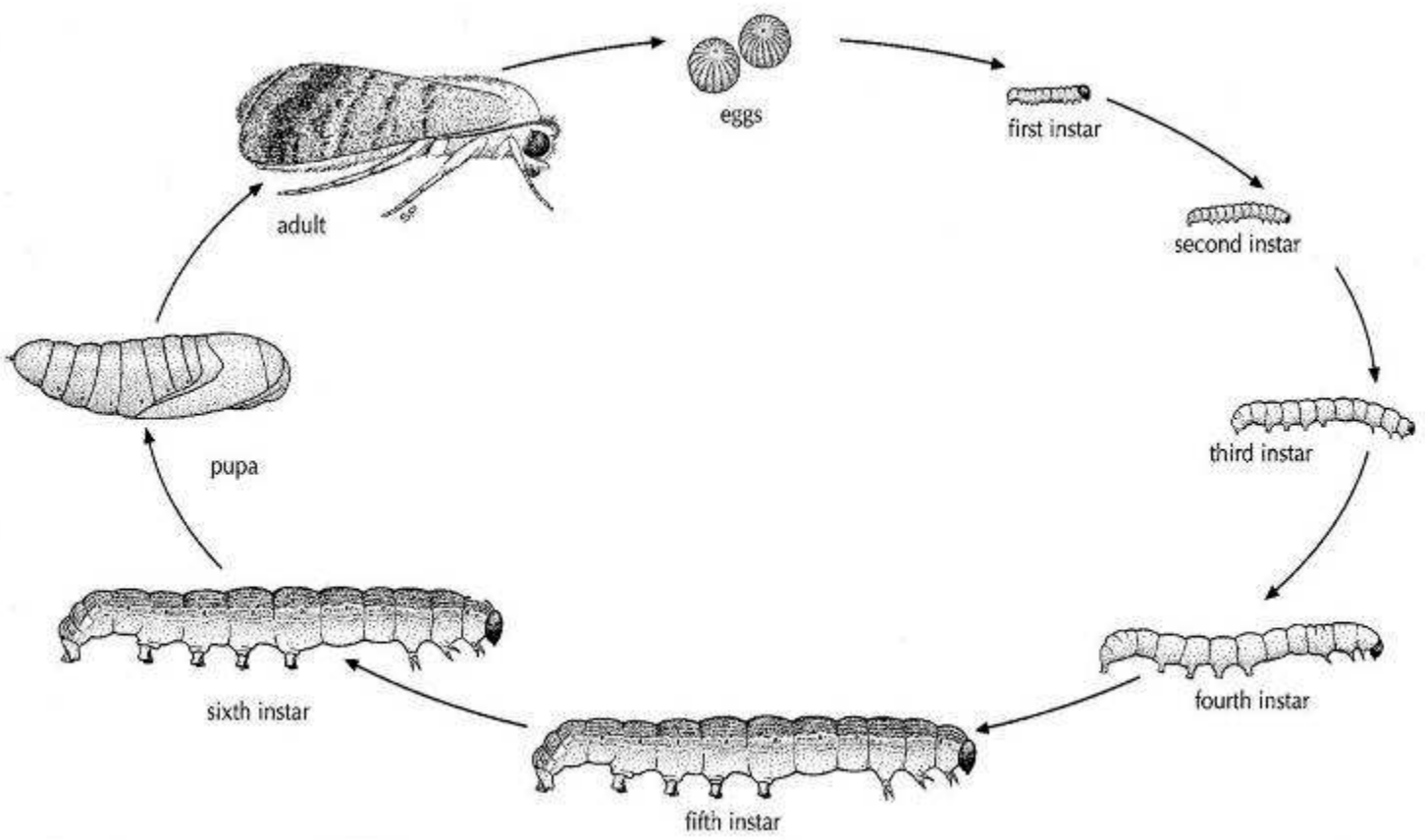


bugs, cockroaches

Complete lifecycle

- **4 stage lifecycle (egg, larva, pupa, adult)**
  - Adults & immature stages are different
  - Pupal stage: larva changes to adult form
- **Feeding: Adults & immatures**
  - Have different mouthparts
  - May feed on different food sources
  - Avoids competition between different growth stages
- **Control**
  - Larval stage is the most susceptible to control

Complete lifecycle



butterflies, moths, beetles

Bugs, scales, aphids (Hemiptera)

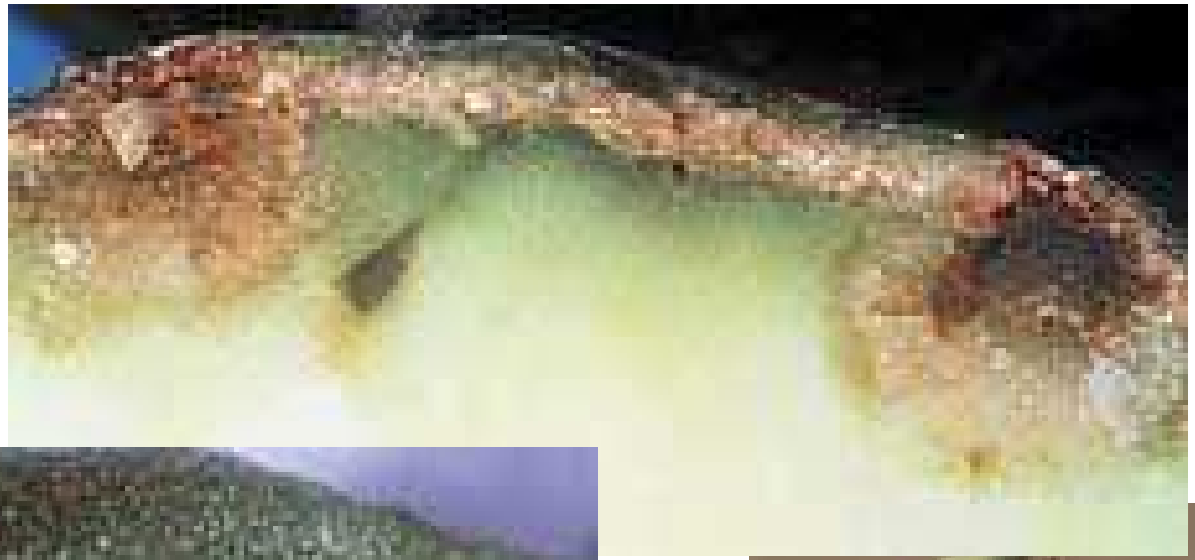
- Incomplete or 3 stage life cycle
- Sucking or piercing mouthparts
- Pests & beneficials

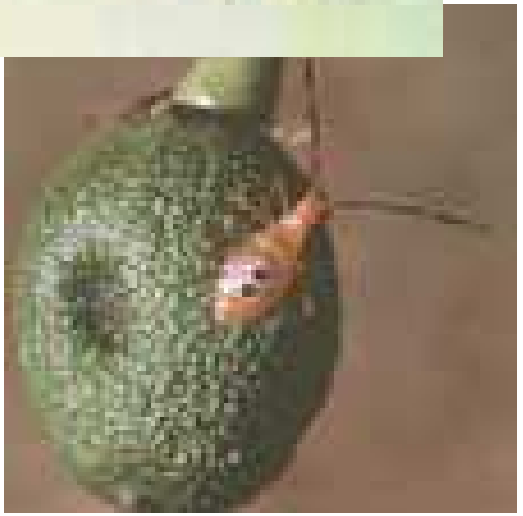
Fruit spotting bug

- Feed by piercing, excreting enzymes and sucking
- Attracted to fruit
- Fruit develops dark stain at puncture
- Young damaged fruit may drop

Spotting bug damage

Spotting bug damage





Spotting bug monitoring

- Monitor for bug damage, bugs are elusive
- Monitor from fruit set
- Fruit in tree tops generally worst affected
- Monitor near bushland or hotspots known from previous years
- Remove damaged fruit each time you monitor
- Spread a sheet or canvas under hotspot trees before spraying to monitor for dead bugs

Tea mosquito bug (Helopeltis)

- Adults and nymphs feed on new growth, leaves and young fruit,
- Feeding causes small black spots
- More superficial than spotting bug
- Rarely affects older fruit
- Sporadic pest

Tea mosquito bug (Helopeltis)

Taylorilygus sp.

Similar species in Australia

Apple dimpling bug

Campylomma liebknechti

Brokenbacked bug

Taylorilygus apicalis

Taylorilygus sp.

- Pest species as yet unnamed
- 4 named species in Australia
- *Taylorilygus apicalis* - predatory and phytophagous in cotton and vegetables
- *Taylorilygus nebulosus* - widespread but may be several species
- Only known from Walkamin south
- Don’t slash grass during early fruit development

Taylorilygus feeding damage

Exudate

Developing

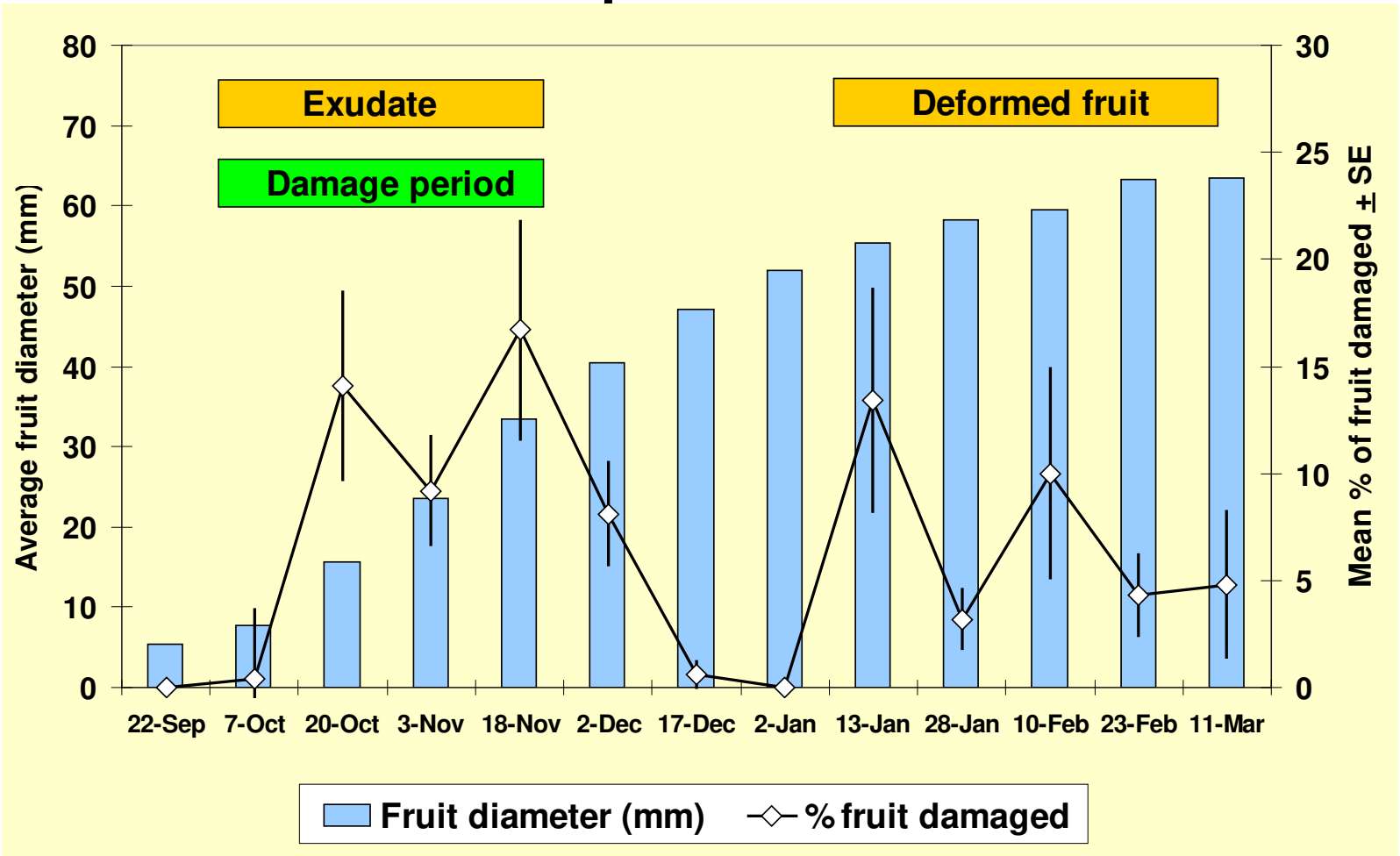
Pimples

Developing

Irregular shape

Mature

Taylorilygus damage vs. fruit development



Assassin bugs

- Effective predators of most insects

Predatory shield bug

- Predator of loopers & caterpillars

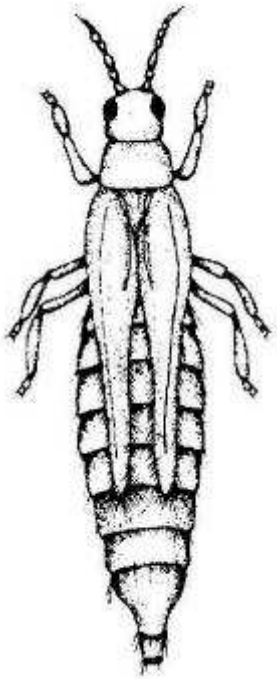
Latania scale

- Affects leaves, shoots & fruit
- More serious in later fruit
- Infestation downgrades fruit
- Broad spectrum insecticides and Surround® may increase incidence

Planthopper

- Suck sap from shoots, flowers and fruit
- Sooty mould on leaves, branches & downgrades fruit

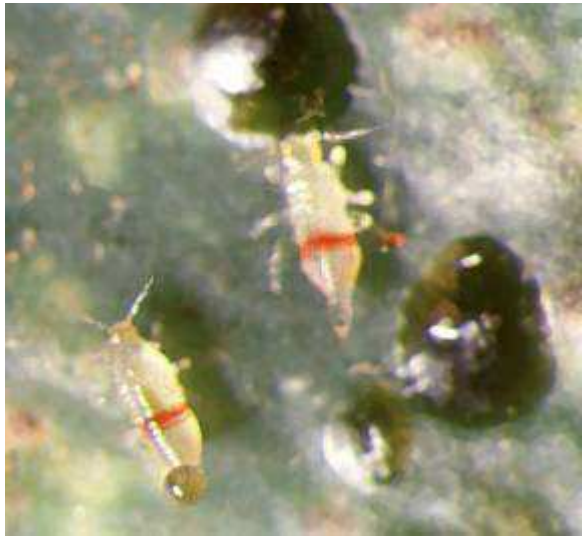
Thrips (Thysanoptera)



- Incomplete lifecycle
- 0.5-15mm in length
- Cylindrical elongated body
- 2 pairs of wings that are long and slender
- Mouthparts can both rasp and suck
- Pollinator, beneficial & pest

Red banded thrips

- Minor damage may be confused with wind rub



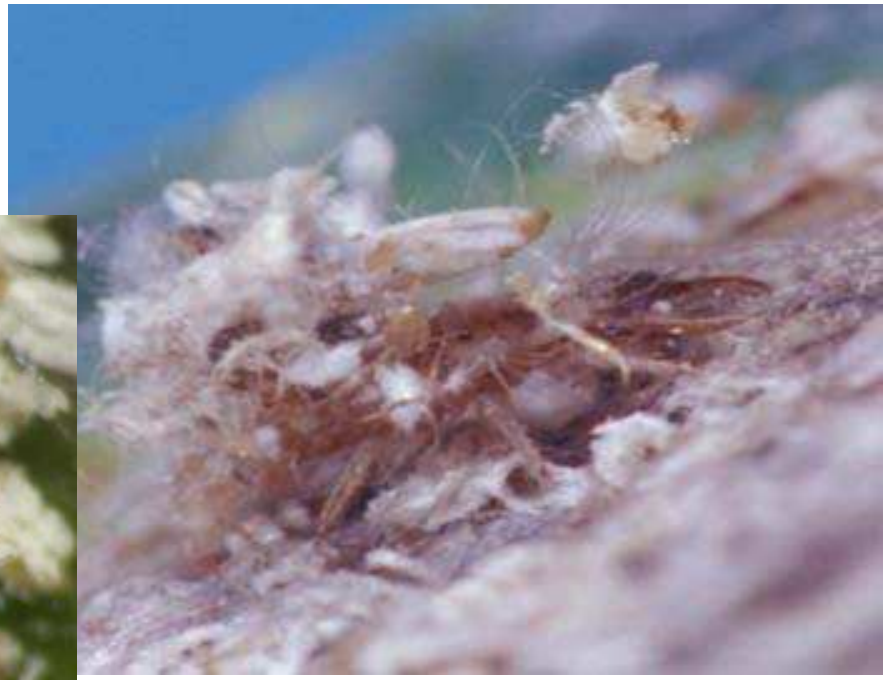
Preying mantids (Mantodea)

- Incomplete lifecycle
- Chewing mouth parts, carnivores
- Triangular shaped head
- Raptorial fore legs
- Predators

Lacewings & Antlions (Neuroptera)

- Complete lifecycle
- All stages predators
- Larvae have piercing mouth parts
- Adults have chewing mouth parts

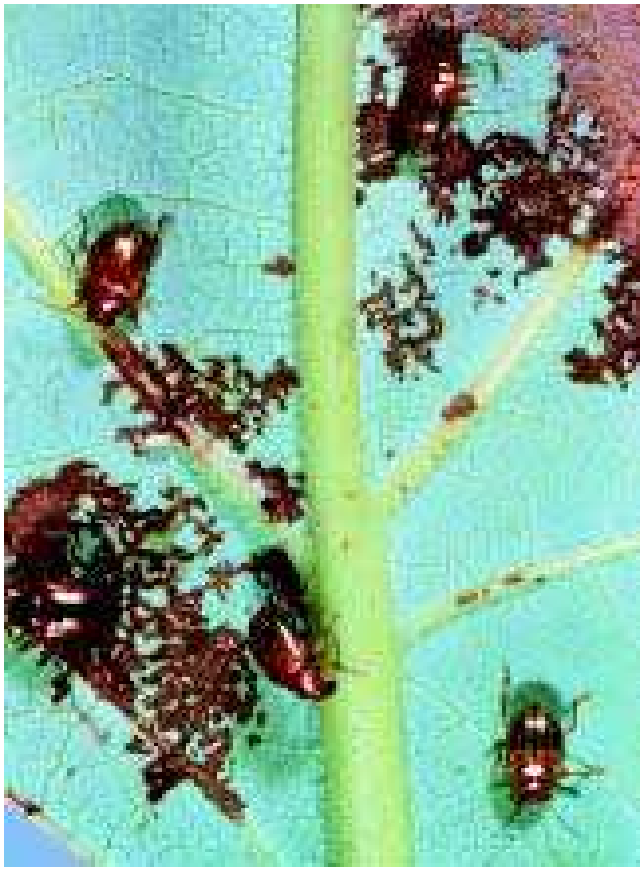
Lacewing larvae



Beetles (Coleoptera)

- Complete lifecycle
- Chewing mouth parts
- Fore wings hardened to form protective cover – elytra
- Pests & beneficials

Leaf eating beetles



Rhyparida

Red Shouldered

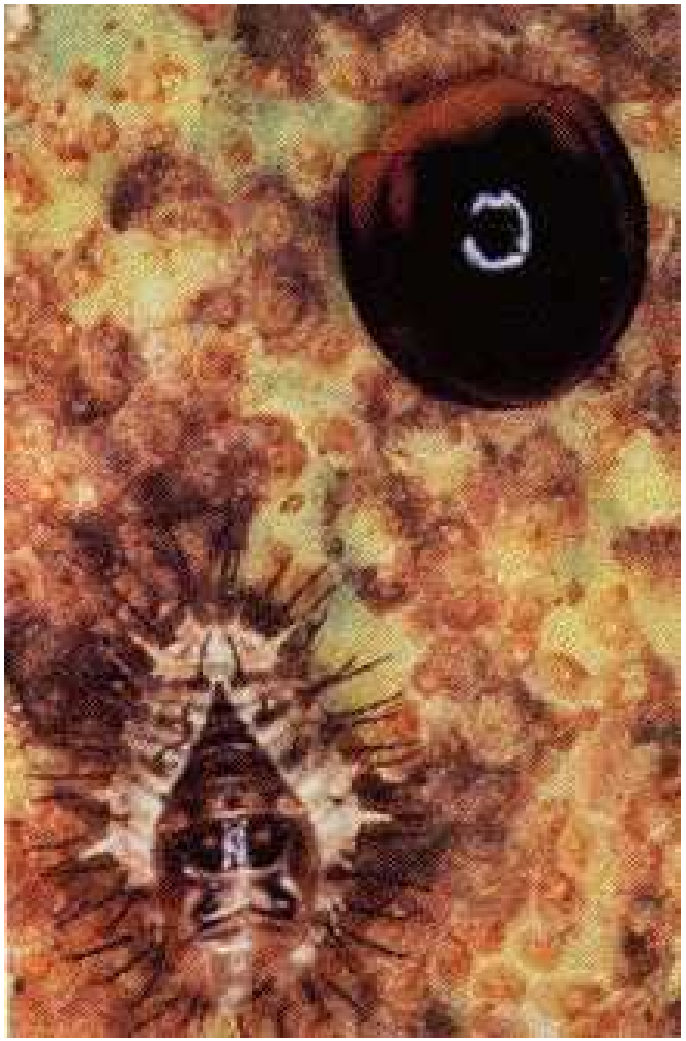
Leaf eating beetle damage

- Feed on fruit and leaves

Predatory Ladybirds

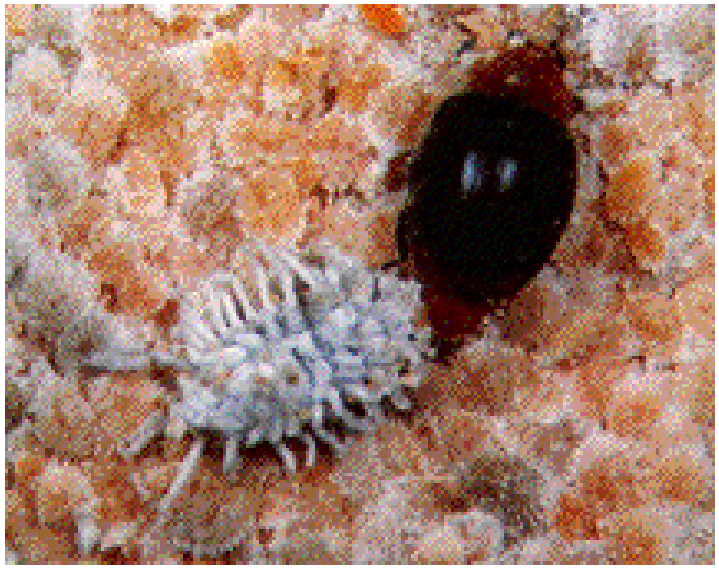
- General predator of aphids, mites, scales & mealybugs
- Adults and larvae feed on mites, scale etc.

Blue Chilocorus ladybird



- General scale predator
- Adults and larvae feed on all stages of scale

Cryptolaemus ladybird



- Adults & larvae feed on:
  - Mealybugs
  - Fluted scales
  - Soft green scales
  - Planthopper eggs
  - Other insect eggs and immobile immature stages
- Can be purchased commercially

Stethorus

- Mite predator
- Very small – 2mm
- Larvae suck mites don’t chew

Butterflies & moths (Lepidoptera)

- Complete life cycle
- Mouthparts
  - Larvae: chewing
  - Adults: coiled sucking or piercing
- Pests & beneficials

Loopers

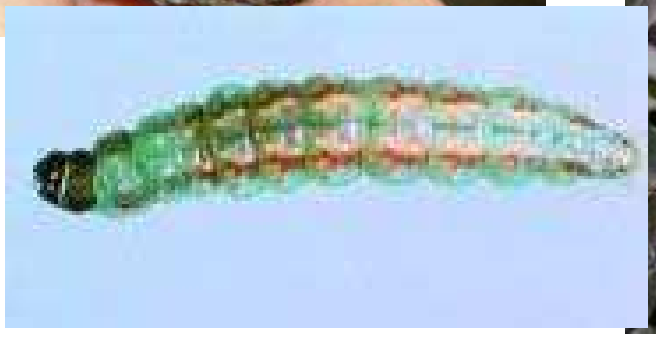
- 4 species with 2 main species in FNQ
  - Grey and Ectropis
- Damage leaves and fruit
- Can defoliate trees leading to sunburn
- More of a problem during wet season

Loopers

- Several wasp species parasitize loopers
- pathogens
- Softer control options include insect growth regulators

Avocado fruit borer

- No specific pesticides registered



Leaf Rollers

- Wide range of host plants
- Larvae roll and web leaves together
- Feed on fruit and leaves

Flies (Diptera)

- Complete life cycle
- Sponging or piercing mouth parts
- Only 1 pair of wings, hind wings reduced to halteres
- Pests, beneficials & pollinators
- Major quarantine pests

Fruit flies

- Larvae feed inside ripening fruit
- Stung fruit is unsaleable
- Late varieties more prone to damage
- Populations build throughout season
- Quarantine pest domestic & export

Wasps, ants and bees (Hymenoptera)

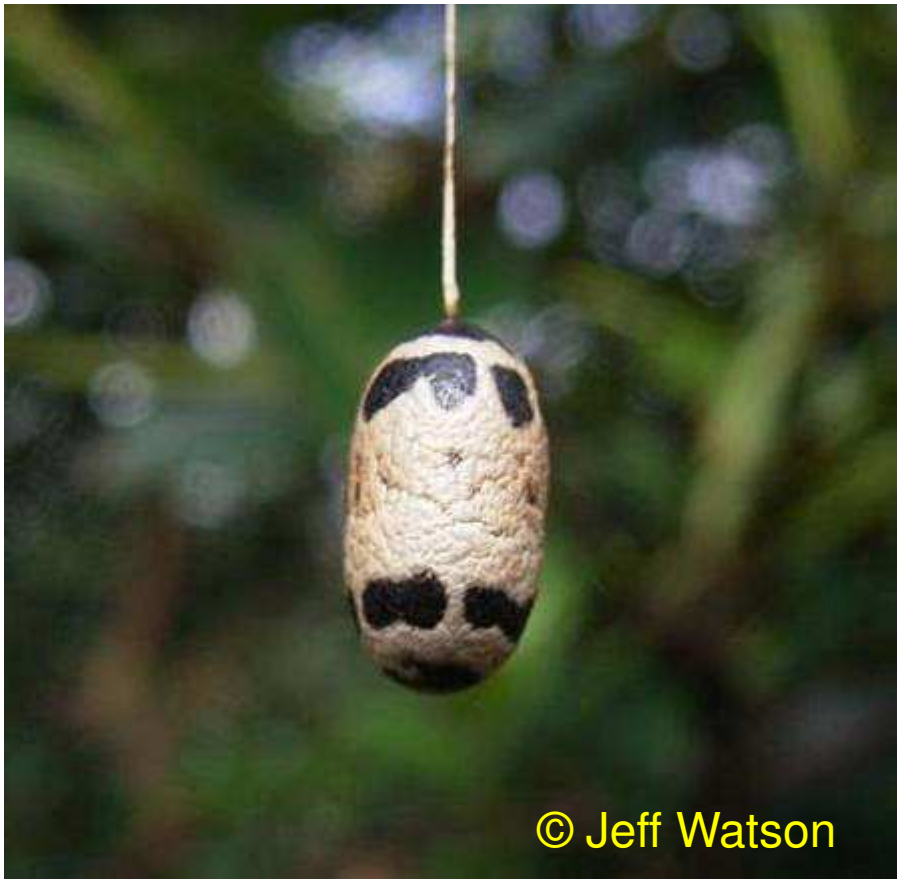
- Complete life cycle
- Chewing mouth parts
- 2 pair of wings
- Many parasitic & some social species
- Beneficials, pollinators & pests

Leafroller parasite

Apanteles sp.

- Looper parasite

Looper parasite



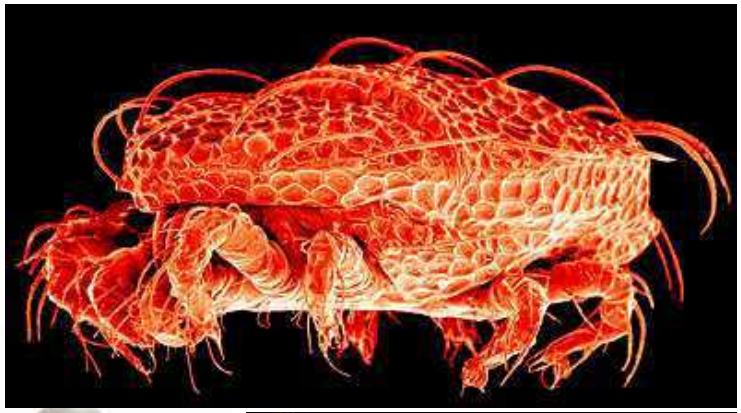
Wax scale parasite (*Anicetus beneficus*)

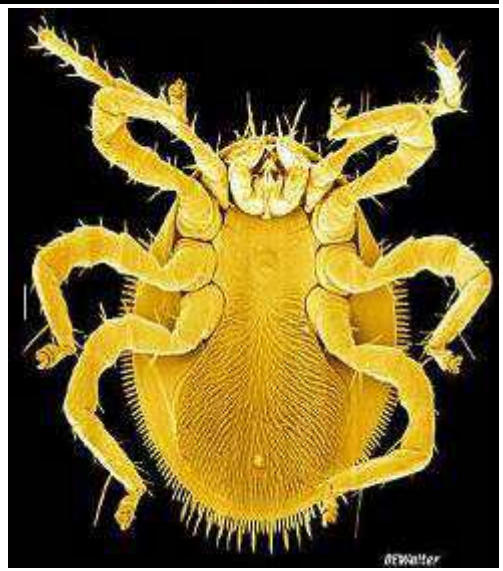
- Introduced parasite
- Wax scale now a sporadic pest

Planthopper parasite

- Parasite of nymphs and adults

Mites (Arachnida)





- Includes spiders, mites, ticks & scorpions
- 2 body sections
- 4 pair of walking legs
- No antennae
- Sucking, rasping mouthparts
- Pests & beneficials

Tea red spider mite

- Destroy green tissue on upper leaf surface
- Leaves turn reddish-brown (bronzing)
- Hass and Sharwil most susceptible
- Reduces tree vigour
- Usually a result of overuse of pesticide

Predatory mites

- Predators of tea red spider mite
- Feed on all stages
- Introduced Chilean & native species

Why monitor pests?

- To see what is in the orchard
- Accurately identify pests & beneficials
- Monitor changes in pest levels
- Develop an historical record
- Identify problem areas or ‘hot spots’
- Apply management in the right place at the right time for the right reasons

Benefits of regular monitoring

- Familiarity with the fauna of the orchard
  - Their lifecycles & relation to tree growth stage
- First record of potential pest outbreaks
- Seasonal trends for pests in your orchard
- To observe the effectiveness of predators & parasites
- Form the basis of management decisions

Monitoring requirements

- Know how to identify pests & beneficials
- Learn how to sample and record
- Know how frequently to sample
- Know where to sample
  - Insects and mites are generally attracted to the new growth
  - Concentrate on these sample points when monitoring

Steps to successful monitoring

- Develop a monitoring plan
- Record your findings in a monitoring chart
- Monitor regularly

What to look for when

At flowering

- Leafroller
- Fruit spotting bug
- Scale
- Thrips

Fruit set

- Fruit spotting bugs
- Tea mosquito bugs
- Planthoppers
- Leaf-feeding beetles
- Scale
- Thrips
- Loopers
- Leafroller

What to look for when

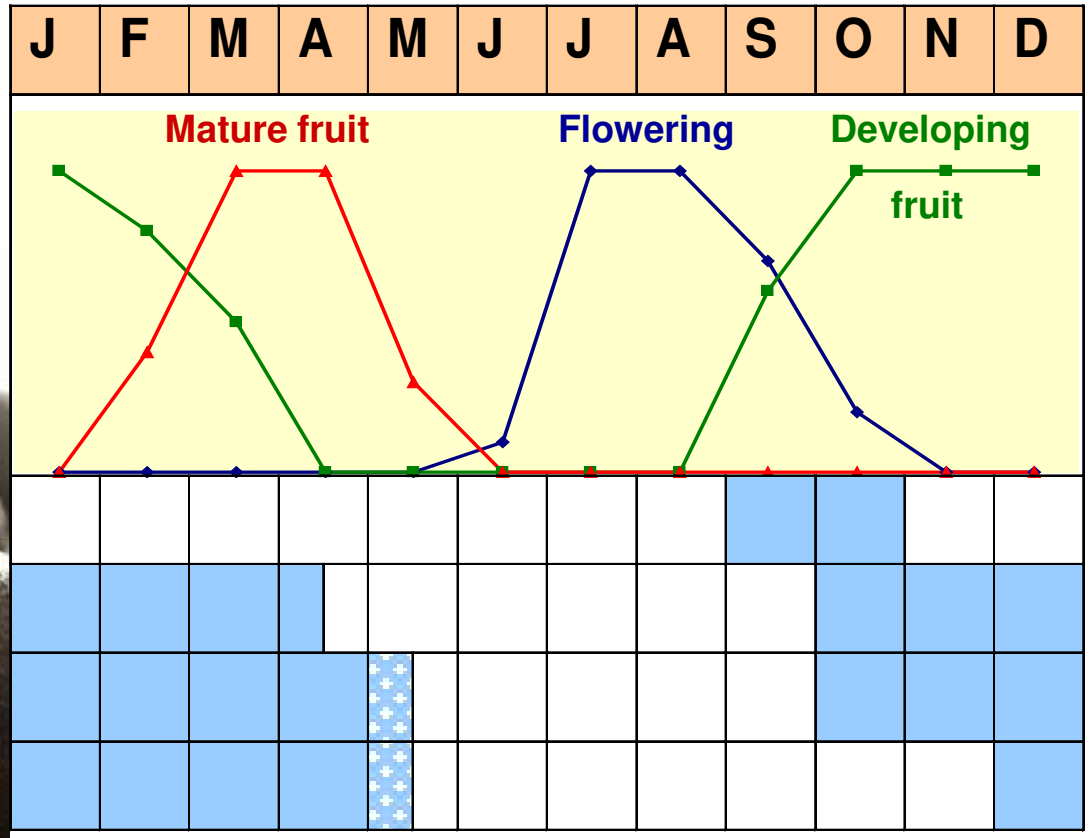
Fruit development

- Planthoppers
- Scales (crawlers) on leaves and fruit
- Fruit spotting bugs
- Tea mosquito bug
- Fruit flies
- Leafroller
- Fruit borer
- Taylorilygus
- Thrips
- Mites

All year round

- Tea red spider mite
- Leaf-feeding beetles
- Loopers
- Scale
- Thrips

Fruit pest activity in avocados in north Queensland



Tea mosquito bug

Fruitspotting bug

Fruitborer

Fruit fly

Fruit fly or Spotting bug?

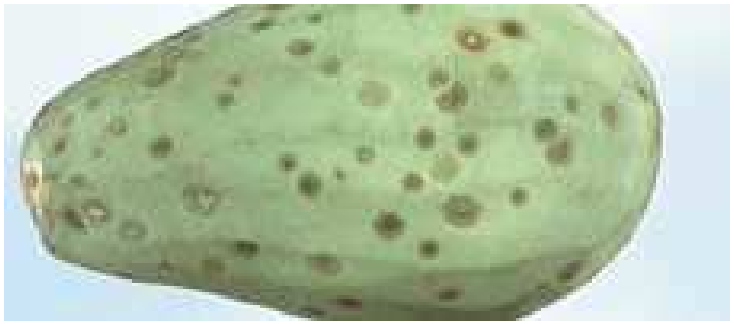
Fruit Fly vs Spotting Bug

Fruit Fly

- 3mm deep or less
- Mainly fat end
- Later in season
- May contain eggs

Spotting bug

- > than 5mm deep
- From fruit set to harvest
- Mainly stem end
- Dark green areas under skin



Predator or pest?