



Pests of Australian Sugarcane



Sugar Research
Australia

Field Guide

Peter Samson, Nader
Sallam, Keith Chandler



Contact:

Sugar Research Australia Limited

PO Box 86

Indooroopilly QLD 4068

Australia

www.sugarresearch.com.au | sra@sugarresearch.com.au

ISBN: 978-0-949678-08-9

633.6193094

Copyright © 2015 by Sugar Research Australia Limited

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the written permission of Sugar Research Australia Limited.

Warning: Our tests, inspections and recommendations should not be relied on without further, independent inquiries. They may not be accurate, complete or applicable for your particular needs for many reasons, including (for example) Sugar Research Australia Limited being unaware of other matters relevant to individual crops, the analysis of unrepresentative samples or the influence of environmental, managerial or other factors on production.

Disclaimer: Except as required by law and only to the extent so required, none of Sugar Research Australia Limited, its directors, officers or agents makes any representation or warranty, express or implied, as to, or shall in any way be liable (including liability in negligence) directly or indirectly for any loss, damages, costs, expenses or reliance arising out of or in connection with, the accuracy, currency, completeness or balance of (or otherwise), or any errors in or omissions from, any test results, recommendations, statements or other information provided to you.

Printed by: Westminster Printing.

Pests of Australian Sugarcane

Field Guide

Peter Samson, Nader Sallam, Keith Chandler

Sugar Research Australia Limited

2015



Contents

Page No.

Introduction	06
Key	07
Photo index	08
Layout	16
General information	17
Insect life cycles	18
<hr/>	
CANEGRUBS	20
<hr/>	
Canegrub life cycles and damage	20
Canegrub distribution	23
Canegrub identification	24
Bundaberg canegrub	25
Caudata canegrub	26
Childers canegrub	27
Consobrina canegrub	28
French's canegrub	29
Froggatt's canegrub	30
Grata canegrub	31
Greyback canegrub	32
Grisea canegrub	33
Nambour canegrub	34
Negatoria canegrub	35
Noxia canegrub	36
Picticollis canegrub	37
Planiceps canegrub	38

Contents

Page No.

Plectris canegrub	39
Rhopaea canegrub	40
Rothe's canegrub	41
Sororia canegrub	42
Southern one-year canegrub	43
Squamulata canegrub	44
Distinguishing similar cane beetles	45
OTHER WHITEGRUBS	46
Christmas beetles	46
Redheaded whitegrub	47
ROOT FEEDERS	48
Soldier flies	48
Ground pearls (Margarodids)	49
Cicadas	50
Funnel ant	51
Symphyla	52
SHOOT FEEDERS	53
Wireworms	53
Black beetles	54
Leaf beetles (Rhyparida)	55
Sugarcane butt weevil	56
Stenocorynus weevils, Whitefringed weevil	57
Large moth borer	58

Contents

Page No.

Sugarcane bud moth	59
Field crickets, Mole cricket	60
<hr/>	
STEM BORERS	61
<hr/>	
Sugarcane weevil borer	61
Termites	62
<hr/>	
LEAF AND STEM FEEDERS	63
<hr/>	
Locusts	63
Night-feeding armyworms	64
Night-feeding armyworm identification	65
Day-feeding armyworm	66
Sugarcane planthopper (<i>Perkinsiella</i>)	67
Island planthopper (<i>Eumetopina</i>)	68
Sugarcane froghopper	69
Linear bug	70
Pink sugarcane mealybug	71
Aphids	72
Spider mites	73
Sugarcane scale	74
<hr/>	
RARELY SEEN PESTS	75
<hr/>	
Ratoon shootborer, Looper, Wart-eye, Whitefly	75
Oriental rice thrips	76

Contents

Page No.

ANIMAL AND BIRD PESTS	77
Canefield or ground rat	77
Climbing rats	78
Other animals and birds	79
EXOTICS	80
Exotic insect pests	80
BENEFICIALS	81
Canegrub biocontrol agents	81
Biocontrol agents of other insect pests	82
Glossary	83
Index	86
Acknowledgments	96
Further information	97

Introduction

This guide has been designed for practical 'in-field' use and text has been kept to a minimum. To help you understand the layout, an individual pest page is illustrated on page 16.

To use the guide, follow the procedure below:

Symptoms

- Determine the main symptom you have seen on page 7
- Matching page numbers will lead you to the pest

Confirmation

- Specific comparison pages on where, when and how common the pests are will help confirm your diagnosis

Easy-to-read fact sheets which provide management information on a wide range of pests are available on the SRA website

www.sugarresearch.com.au

Key

Main symptom	Pest/Page number
Germination failure	Soldier flies (48), bud moth (59), wireworms (53), field crickets (60), mole cricket (60), wart-eye (75), termites (62), weevils (57)
Ratoon failure	Soldier flies (48), canegrubs (25-44), cicadas (50), ground pearls (49), wireworms (53), butt weevil (56), stenocorynus weevils (57)
Dead hearts leading to dead shoots	Wireworms (53), black beetles (54), Rhyparida (55), butt weevil (56), stenocorynus weevils (57), large moth borer (58), ratoon shootborer (75), bud moth (59, in plant cane only)
Yellowing, poor growth and shoot death in young cane	Canegrubs (2-year type, 25-44), ground pearls (49), cicadas (50), symphyla (52), weevils (57), funnel ant (51)
Yellowing and death of semi-mature or mature cane	Canegrubs (1-year type, 25-44), sugarcane scale (74), weevil borer (61)
Boring of large stalks	Weevil borer (61), large moth borer (58), termites (62)
Large animal chewing of shoots or stalks	Rodents (77-78), feral pig (79), wallaby (79), fox (79), eastern swamphen (79), cockatoo (79), bush turkey (79)
Chewing of large areas of leaf	Armyworms (64-66), looper (75), locusts and grasshoppers (63)
Sooty mould	Planthopper (67), mealybug (71), aphids (72), sugarcane scale (74)
Mottling or discolouration of leaves	Planthopper (67), froghopper (69), linear bug (70), aphids (72), spider mites (73)

Similar symptoms may be caused by more than one pest species or by other factors such as disease, nutrition, herbicides and physical damage.

Photo index



**Canegrubs and
other whitegrubs**

pp 25-47



Soldier flies

p 48



**Ground pearls
(Margarodids)**

p 49



Cicadas

p 50



Photo index



Funnel ant

p 51



Symphyla

p 52



Wireworms

p 53



Black beetles

p 54



Photo index



**Leaf beetles
(Rhyparida)**

p 55



Weevils

pp 56-57



Large moth borer

p 58



**Sugarcane bud
moth**

p 59



Photo index



Crickets

p 60



**Sugarcane weevil
borer**

p 61



Termites

p 62



Locusts

p 63



Photo index



Armyworms

pp 64-66



Planthoppers

pp 67-68



**Sugarcane
froghopper**

p 69



Linear bug

p 70



Photo index



**Pink sugarcane
mealybug**

p 71



Aphids

p 72



Spider mites

p 73



Photo index



Sugarcane scale

p 74



Rarely seen pests

pp 75-76



Rodents

pp 77-78



Photo index



Other animals and birds

p 79



Exotic insect pests

p 80

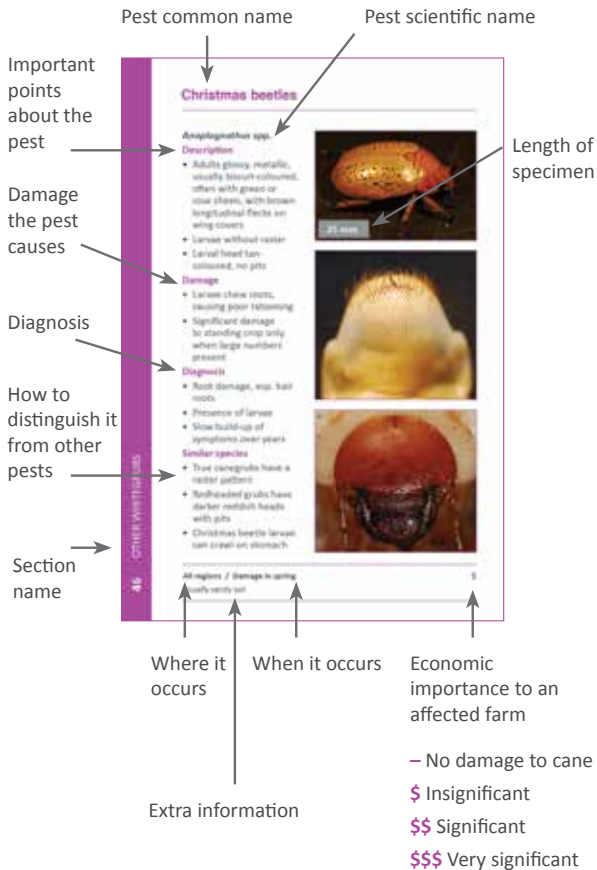


Biocontrol agents

pp 81-82



Layout



General information

This field guide is intended to assist in the identification of pests or pest damage likely to be encountered in sugarcane fields in Australia. Pests are grouped into 'Canegrubs', 'Other whitegrubs', 'Root feeders', 'Shoot feeders', 'Stem borers', 'Leaf and stem feeders' and 'Animal and bird pests', similar to the groupings in the books cited below, and there are also 'Rarely seen pests', 'Exotics' and 'Beneficials' sections. These groupings are somewhat arbitrary and some species may cause more than one type of damage.

The order of presentation of species follows that in *Pests of Australian Sugarcane* (1993; PG Allsopp, KJ Chandler, PR Samson and PG Story; Bureau of Sugar Experiment Stations, Indooroopilly) and *Australian Sugarcane Pests* (1997; ed. JR Agnew; Bureau of Sugar Experiment Stations, Indooroopilly). The former book contains additional technical details of the pests while the latter includes colour photographs. These books should be consulted for greater detail on pest identification, biology and management than is provided in this field guide.

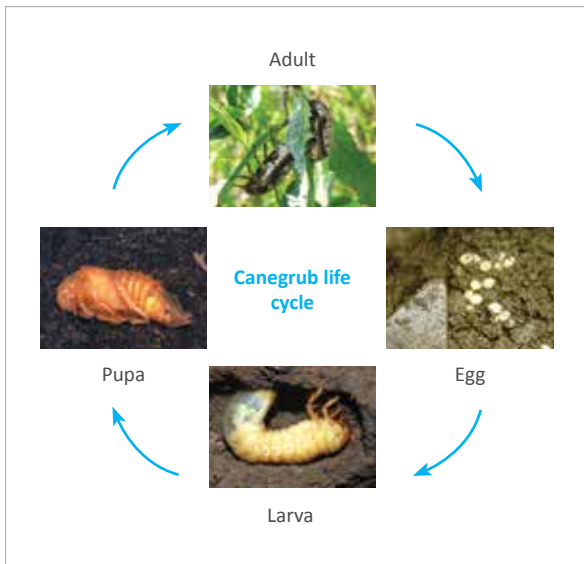
A dollar figure is attached to each pest. This is a subjective assessment of the possible impact of that pest on an individual farm in the absence of effective control measures, and is not indicative of the importance of each pest to the industry as a whole.

The measurement given in millimetres on each pest image is the length of the specimen, or the wingspan for the armyworm moths on page 65.

Insect life cycles

Complete metamorphosis (sudden change of form)

For example: canegrubs, weevil borers, soldier flies, armyworms.



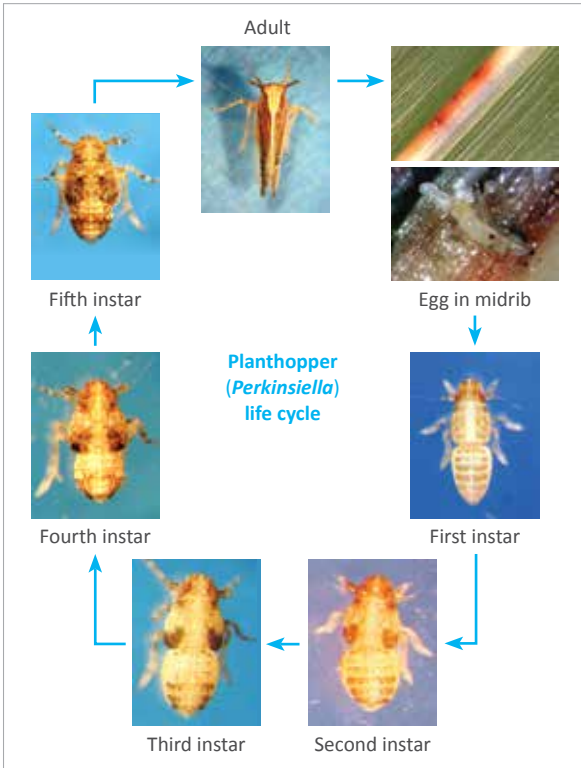
Head capsule size increases at each moult.

Canegrubs have three larval instars (stages between each moult); most insects have more than three.

Insect life cycles

Incomplete metamorphosis (gradual change of form)

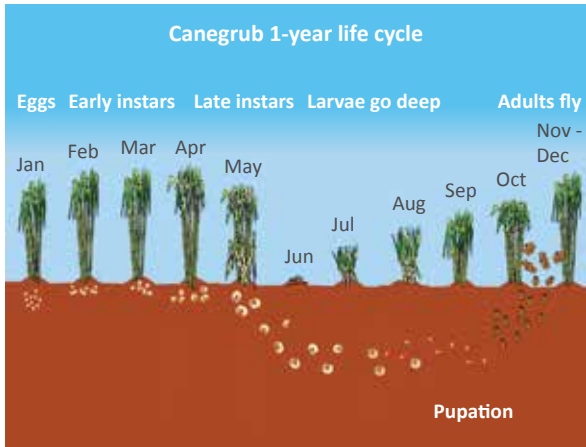
For example: planthoppers, locusts, cicadas, linear bugs.



Development of a planthopper through five nymphal stages (instars) to adult. Wing buds increase in size at each moult and there is no pupal stage.

Canegrub life cycles and damage

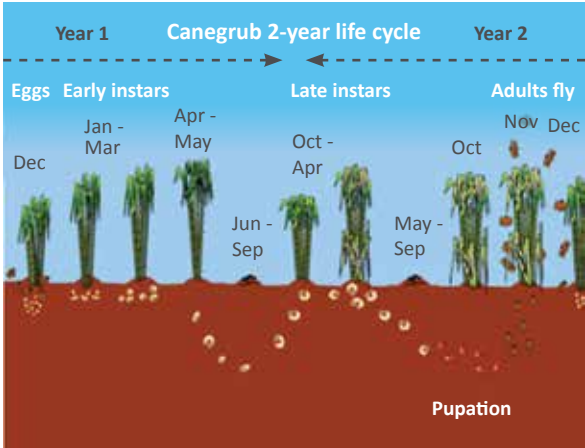
1-year life cycle and damage



1-year type damage to semi-mature cane in autumn-winter (greyback canegrub).

Canegrub life cycles and damage

2-year life cycle and damage



2-year type damage to young cane in spring-summer (French's canegrub).

Canegrub life cycles and damage

Root damage



Canegrub distribution

Canegrub	M-B	I-T	H	B	C	B-I	M	N-RP	NSW
Bundaberg						●			
Caudata	○	○							
Childers						●			
Consobrina	●								
French's	●	●	●	○	●	○			
Froggatt's		○							
Grata	○	○	○	○	○	○			
Greyback	●	●	●	●	●				
Grisea	○								
Nambour							○	●	○
Negatoria					○	●	●	●	○
Noxia						○	○	○	
Picticollis						○			
Planiceps									○
Plectris									○
Rhopaea								○	●
Rothe's	-	-	-	-					
Sororia	○		○						
Sthn 1-year						●	●		
Squamulata			○	○	○	○			

● Major pest ○ Minor pest – No recorded damage to cane

M-B Mossman-Babinda **I-T** Innisfail-Tully **H** Herbert

B Burdekin-Invicta **C** Central **B-I** Bundaberg-Isis **M** Maryborough

N-RP Nambour-Rocky Point **NSW** New South Wales

Canegrub identification

**Twenty species
(19 endemic, 1 introduced)**

Description

- Adults brown to black, white or grey scales
- Larvae white-cream, raster beneath end of abdomen

Damage

- Larvae chew roots of cane, causing poor growth, stool loss at harvest

Diagnosis

- Spring-summer damage (2-year type) – wilting, yellowing, death
- Autumn-winter damage (1-year type) – yellowing of large cane, lodging, death, gaps after harvest
- Root damage
- Gouging of stubble
- Grubs under stools

Similar symptoms or species

- Christmas beetles and redheaded grubs have no raster
- Pachymetra-affected roots are soft, rotten



Hair pattern (raster)

Hold a grub this way – between thumb and first two fingers. Point the section you need to see at the light.

Note the pattern of hairs beneath the end of its abdomen. (If it won't stay still or threatens to bite, hold it tighter or cool it down in a refrigerator.)

All districts

Bundaberg canegrub

Lepidiota crinita

Description

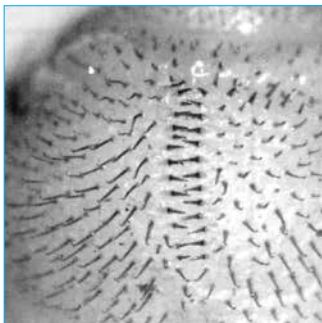
- Adults 20-25 mm long, bright red-brown, dorsal surface coarsely but evenly punctured, each puncture has a thin white scale as long as puncture
- Raster with two single parallel rows of about 15 short hairs, no clear gap between rows

Life cycle, damage

- 2-year life cycle

Similar species from the same district

- None for larvae
- Adults of southern one-year canegrub do not have small scales on back



Caudata canegrub

Lepidiota caudata

Description

- Adults 21-34 mm long, shining brown with small inconspicuous scales
- Beneath abdomen, dark circular area without scales near centre
- Raster pear-shaped, 27-44 hairs each side, hairs from each side overlap at front of raster

Life cycle, damage

- 2-year life cycle

Similar species from the same district

- French's and consobrina canegrubs have more hairs in raster and two sides of raster are separate with no overlap of hairs at anterior end



Childers canegrub

Antitrogus parvulus

Description

- Adults 18-23 mm long, shining yellow-brown to nearly black, no hairs or scales dorsally
- Raster almost oval, about 35 long hairs on each side, central naked area oval, blocked by overlapping hairs each end

Life cycle, damage

- 2-year life cycle

Similar species from the same district

- French's, negatoria and noxia canegrubs have more hairs in raster and two sides of raster are separate with no overlap of hairs at either end



Consobrina canegrub

Lepidiota consobrina

Description

- Adults 25-29 mm long, dark brown, oval white scales across dorsal surface
- Beneath abdomen, more than half length of each segment without scales (p 45)
- Raster pear-shaped, about 50 hairs each side, clear central path, raster tapers to point with two single rows of 5-8 hairs at front

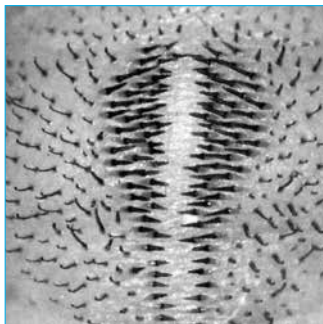


Life cycle, damage

- Different populations have either a 1-year or 2-year life cycle

Similar species from the same district

- French's and caudata canegrubs: raster doesn't taper to point



North QLD / Damage in spring-summer (2-year variant) or autumn-winter (1-year variant)

\$\$\$

Mossman-Gordonvale / Mostly in dark sandy loams

French's canegrub

Lepidiota frenchi

Description

- Adults 22-29 mm long, dark brown, round white scales on dorsal surface, scales on second last abdominal segment of differing size (p 45)
- Beneath abdomen, less than half length of each segment bare (p 45)
- Raster pear-shaped, about 50 long hairs each side, clear central path

Life cycle, damage

- 2-year life cycle

Similar species from the same district

- *Consobrina* canegrubs: raster tapers to point
- *Caudata* and *Childers* canegrubs: fewer hairs in raster
- *Negatoria*, *noxia* canegrubs: larvae indistinguishable with certainty, rear to adult or test DNA



QLD from Bundaberg north / Damage in spring-summer

\$\$\$

Uncommon at Bundaberg, widespread further north / Forest loams and red volcanic soils, often on sandy ridges

Froggatt's canegrub

Lepidiota froggatti

Description

- Adults very large, 30-38 mm long, felted brown colour due to covering of yellow-brown hairs
- Larvae large, shiny dark brown head
- Raster with 12-23 thick hairs each side, single row at front, pattern fans out at rear with a secondary inner row of smaller hairs

Life cycle, damage

- 2-year life cycle

Similar species from the same district

- None



Grata canegrub

Lepidiota grata

Description

- Adults small, 18-22 mm long, dark brown, uniformly covered with round white scales on dorsal surface
- Raster with two slightly curved single rows of 18-26 hairs

Life cycle, damage

- 1- and 2-year life cycles occur together depending on conditions

Similar species from the same district

- Small (second instar) greyback canegrubs are similar in size to third instar grata but greyback raster has thinner hairs further apart within each row



Greyback canegrub

Dermolepida albohirtum

Description

- Adults large, 24-33 mm long, coloured grey by coat of hairs, dark brown patches appear as hairs wear away
- Raster with two, almost straight, single rows of 20-28 short hairs

Life cycle, damage

- 1-year life cycle
- Affected stools often lodge or easily pulled from ground

Similar species from the same district

- Large grata canegrubs similar in size to small greybacks but grata raster has thicker hairs closer together within each row
- Squamulata canegrub has raster straighter, more and thicker hairs



QLD from Plane Creek north / Damage to maturing cane in autumn-winter \$\$\$

Most soil types / Beetles feed on leaves of trees and cane

Grisea canegrub

Lepidiota grisea

Description

- Adults small, 22-27 mm long, large white scales over dorsal surface
- Raster with two straight single rows of 26-34 short, thick, dark hairs

Life cycle, damage

- 1-year life cycle

Similar species from the same district

- Greyback canegrub is larger, and raster has thinner hairs further apart within each row



Burdekin north / Little damage recorded
Sands, Mossman (coastal) and Gordonvale (alluvial)

§

Nambour canegrub

Antitrogus rugulosus

Description

- Adults 20-25 mm long, bright red-brown, with short hairs over dorsal surface, no scales
- Raster with two convex single rows of 19-31 thick hairs

Life cycle, damage

- 1-year life cycle

Similar species from the same district

- Southern one-year canegrubs appear identical but distributions do not overlap



Negatoria canegrub

Lepidiota negatoria

Description

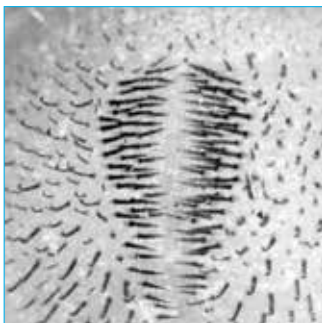
- Adults 21-28 mm long, dark red-brown, spotted with round white scales on dorsal surface, scales on rear angles of second last dorsal abdominal segment are same size as those towards centre (p 45)
- Raster pear-shaped, about 50 long hairs each side

Life cycle, damage

- 2-year life cycle

Similar species from the same district

- Childers canegrub has fewer hairs in raster
- French's and noxia canegrubs indistinguishable with certainty, rear to adult or conduct DNA test



Noxia canegrub

Lepidiota noxia

Description

- Adults 22-28 mm long, dark red-brown, sparse oval white scales on dorsal surface
- Raster pear-shaped, about 50 long hairs each side

Life cycle, damage

- 2-year life cycle
- Damage in first year of cycle

Similar species from the same district

- Childers canegrub has fewer hairs in raster, on heavier soil
- French's and negatoria canegrubs indistinguishable with certainty, rear to adult or conduct DNA test
- Head capsule width slightly less than French's/negatoria, probably noxia if less than 7.0 mm in final instar



South QLD / Damage in late summer and autumn (later than negatoria)

\$\$

Sandy loams (usually duplex)

Picticollis canegrub

Lepidiota picticollis

Description

- Adults large, 25-32 mm long, shiny yellow-brown to chestnut, dorsal surface bordered in dark brown or black
- Most have an orange-red patch each side of thorax behind head
- Raster with two parallel rows, each with 29-40 short thick hairs, sometimes with a short second row of a few hairs at posterior end

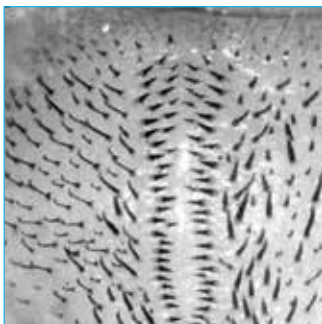


Life cycle, damage

- 2-year life cycle
- Damage in first year of cycle (similar to southern one-year canegrub)

Similar species from the same district

- None



Bundaberg-Isis / Damage in late summer and autumn

\$\$

Sandy soils / Damage rare but severe

Planiceps canegrub

Antitrogus planiceps

Description

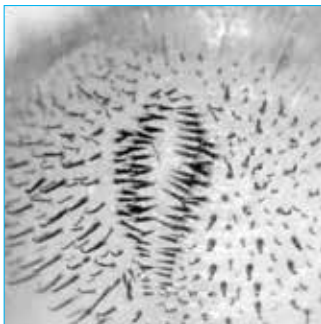
- Adults 18-21 mm long, tan to black, without scales
- Raster pear-shaped, 32-39 long thin hairs mostly in two rows each side but continuing forward as single lines
- Grubs with fewer hairs in raster lack part of the anterior portion of the rows

Life cycle, damage

- Life cycle unknown
- Large grubs in fields in early summer

Similar species from the same district

- None



Plectris canegrub

Plectris aliena

Description

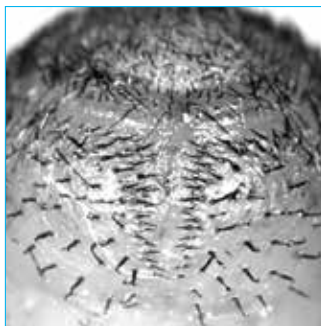
- Adult relatively small, 10-15 mm long, pale yellow-brown
- Raster vase-shaped, with multiple rows of hairs each side of the naked central area

Life cycle, damage

- Life cycle uncertain, possibly 2 years
- Large larvae present autumn-winter, possibly all year

Similar species from the same district

- None



NSW / No information available on time of damage

\$

Sandy soils / An introduced species

Rhopaea canegrub

Rhopaea magnicornis

Description

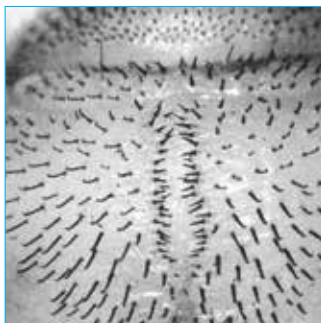
- Adults 21-30 mm long, dark brown, coated with short, fine, semi-erect hairs
- Raster with two parallel single rows of about 20 short hairs

Life cycle, damage

- 1- or 2-year life cycle depending on weather
- Damage in autumn-winter (1-year type) or in spring-summer (2-year type) after a cool autumn

Similar species from the same district

- None



Rothe's canegrub

Lepidiota rothei

Description

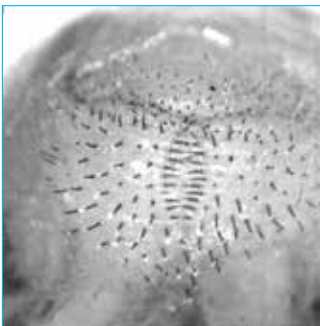
- Adults small, 15-19 mm long, darker than adults of French's canegrub, no hairs beneath thorax
- Raster with two slightly curved rows of 10-12 elongate hairs, hairs from each side almost meet in centre

Life cycle, damage

- 1-year life cycle, overwintering as second instar larvae

Similar species from the same district

- May be mixed and confused with damaging species
- *Grata*, greyback and *squamulata* canegrubs have more hairs in raster and shorter/stouter hairs



Burdekin north / No cane damage recorded

Often in grassy fields and fallows

Sororia canegrub

Lepidiota sororia

Description

- Adults relatively small, 19-22 mm long, light brown with white markings on abdomen due to densely packed body scales
- Raster almost circular, with about 45 long hairs each side, hairs almost meet at front end

Life cycle, damage

- Probably a 1-year life cycle

Similar species from the same district

- None



Ingham north / Damage in autumn-winter

Light duplex soils, often waterlogged in wet season

§

Southern one-year canegrub

Antitrogus consanguineus

Description

- Adults 20-25 mm long, bright red-brown, with short hairs over dorsal surface, no scales
- Raster with two convex single rows of 19-31 thick hairs

Life cycle, damage

- 1-year life cycle

Similar species from the same district

- Nambour canegrubs appear identical but their distributions do not overlap



Squamulata canegrub

Lepidiota squamulata

Description

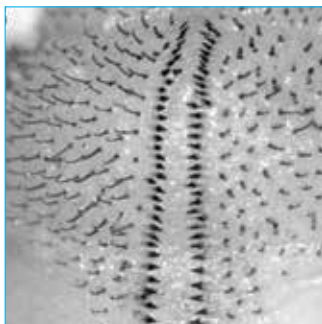
- Adults 22-32 mm long, dark-coloured with oval white scales, esp. along sides and underneath
- Raster with two straight single rows of 28-40 short, thick hairs, hair lines diverge slightly at front end

Life cycle, damage

- 1-year life cycle

Similar species from the same district

- Greyback canegrub has raster usually more curved with fewer and thinner hairs



All regions QLD / Damage in autumn-winter

Sandy soils

\$\$

Distinguishing similar cane beetles



Consobrina

Broad bare band beneath each segment



Negatoria

Scales on second-last dorsal abdominal segment (behind wing covers) small, uniform in size and well-separated



French's

Narrow bare band beneath each segment



French's

Scales along posterior margin of second-last dorsal abdominal segment much larger and more crowded than those in front of them

Christmas beetles

Anoplognathus spp.

Description

- Adults glossy, metallic, usually biscuit-coloured, often with green or rose sheen, with brown longitudinal flecks on wing covers
- Larvae without raster
- Larval head tan-coloured, no pits

Damage

- Larvae chew roots, causing poor ratooning
- Significant damage to standing crop only when large numbers present

Diagnosis

- Root damage, esp. hair roots
- Presence of larvae
- Slow build-up of symptoms over years

Similar species

- True canegrubs have a raster pattern
- Redheaded grubs have darker reddish heads with pits
- Christmas beetle larvae can crawl on stomach



All regions / Damage in spring

Usually sandy soil

§

Redheaded whitegrub

Dasygnathus dejeani

Description

- Adults broad with short horn on head, glossy, reddish brown
- Larvae without raster
- Head of larva dark reddish brown, with many small pits

Damage

- Larvae feed on organic matter in soil
- Larvae burrow into old setts and stubble
- No effect on crop growth

Diagnosis

- Often occurs with true canegrubs

Similar species

- True canegrubs have a raster pattern
- Christmas beetle larvae have tan-coloured heads without pits
- Redheaded grubs feel firm, maintain C-shape, rarely bite



All regions / No damage

Most soil types including heavy soil

Soldier flies

Sugarcane soldier fly,
Inopus rubriceps

Yellow soldier fly, *I. flavus*

Description

- Adults to 12 mm long; male: grey to black; female: black body with orange-red head (Sugarcane SF), or orange-yellow body (Yellow SF)
- Larvae to 14 mm, legless, tough ribbed skin, bristly hairs, white to brown, tiny dark head
- Pupae same as larvae

Damage

- Larvae suck juice from roots, perhaps inject toxin

Diagnosis

- Gappy ratoons, outside stools often healthy
- Larvae under stools
- Pupal cases under trash after May
- Pits in roots

Similar symptoms or species

- None



Sugarcane soldier fly male (left) and female (right).



NSW, QLD (all regions, esp. south and central) / Damage mostly seen soon after harvest / Larvae all year, esp. September-April / Adults autumn \$\$\$

Wide range of soils

Ground pearls (Margarodids)

Pink ground pearl,
Eumargarodes laingi

White ground pearl,
Promargarodes australis

Description

- Adults pink or white, soft, wingless, with stout hooked forelegs
- Nymphs in soil enclosed in cysts (pearls) – hard, glossy white-yellow (White GP) or tough, matte cream-brown (Pink GP)

Damage

- Nymphs suck from roots
- Pink GP is the more-damaging species

Diagnosis

- Poor growth patches, stunted cane, yellow leaves, poor ratoons
- Large numbers (100s) of cysts in soil

Similar symptoms or species

- Adult mealybugs have powdery coating, simple forelegs



Adult pink (left) and white (right) ground pearls.



Ground pearl cysts.



Pink GP south QLD and NSW; White GP all regions / Cysts all year
Adults on top of soil spring-summer

\$\$

Pink GP in red volcanic soils and sands / White GP most soils

Cicadas

Brown sugarcane cicada,
Cicadetta crucifera

Green cicada, *C. multifascia*

Yellow sugarcane cicada,
Parnkalla muelleri

Description

- Adults to 18 mm long (body only)
- Yellow cicada with Z-mark on forewings
- Nymphs whitish with large digging forelegs, in soil

Damage

- Nymphs suck juice from roots

Diagnosis

- Poor/failed ratoons
- Nymphs and/or tunnels among roots
- Empty skins on cane after adults emerge

Similar symptoms or species

- None



Cicada nymph in tunnel in soil.



All regions (brown and yellow), Gin Gin (green) / Adults Nov-Feb
Nymphs May-Nov

\$\$

Loam and clay soils

Funnel ant

Aphaenogaster pythia

Description

- Ants honey-coloured, with pair of dorsal spines at rear of thorax; workers to 5 mm long; sexual forms larger
- Form mounds to 25 cm wide and 20 cm high with funnel-shaped opening at top

Damage

- Weakened growth via loosened soil, moisture stress
- Stool removal due to reduced anchorage
- Poor cane growth due to other causes may encourage funnel ants

Diagnosis

- Gappy ratoons
- Presence of mounds and ants

Similar symptoms or species

- Other ants may differ in colour/size or lack the spines on the thorax



Sexual forms and worker (far right).



Mostly in wet tropics / Present all year

\$

Mainly gravel loams and sandy clay loams, esp. former blady grass country

Symphyla

Hanseniella spp.

Description

- Small, to 10 mm long, centipede-like, white or cream
- Long slender antennae, 6 pairs of legs when young increasing to 12 pairs at maturity



Damage

- Round holes eaten into primordia at root tip and along root



Root shortening and coraloid branching, pit at bottom right.

Diagnosis

- Poor stooling, wilting of tops
- Poor root system with coraloid branching
- Small (0.5-1.0 mm diameter) cylindrical pits in roots
- Symphyla in soil (shake onto black plastic)



Similar symptoms or species

- Pits from soldier fly more conical

All regions / In young plant and ratoon crops

\$\$

Loose or cracking soils

Wireworms

Heteroderes spp.

Conoderus spp.

Sugarcane wireworm,

Agrypnus variabilis

Description

- Adults are click beetles, variable size to 15 mm long
- Larvae to 20 mm long, slightly flattened, creamy-white, orange head, hard flattened or dished tail plate with rear-pointing spines

Damage

- Larvae bore into buds or base of young shoots

Diagnosis

- Poor/patchy germination, dead hearts
- Small (< 2.5 mm) circular holes in buds or shoots below ground

Similar symptoms or species

- Moth borer entry holes are above ground, with tunnels in shoots



All regions / Larvae all year, damage mainly in autumn-plant cane

\$\$

All soil types, esp. poorly drained parts of fields

Black beetles

African black beetle,
Heteronychus arator

Black beetle, *Metanastes*
vulgivagus

Description

- Adults shiny black above, wing cases ribbed
- Black beetle larger, about 15 mm long, with pair of knobs behind head
- Larvae to 30 mm, grey-white, head rough-surfaced and dark red-brown, no raster

Damage

- Beetles chew deep ragged holes at base of young shoots

Diagnosis

- Dead hearts
- Characteristic feeding damage

Similar symptoms or species

- Most other pests make small neat holes in shoots



Black beetle head/thorax, with African species on left.



Native BB all regions, introduced African BB from Maryborough south \$\$
Adults active in autumn and spring, damage mainly in spring

Most soils / African BB often in caneland newly planted into former grassland

Leaf beetles (Rhyparida)

Black leaf beetle,
Rhyparida nitida

Sugarcane leaf beetle,
R. dimidiata

Description

- Adults to 7 mm long, *R. nitida* shiny black, *R. dimidiata* brown
- Larvae to 9 mm long, yellow-grey body, shiny red-brown head

Damage

- Larvae bore into base of young shoots
- Beetles eat small holes in leaves (cane growth unaffected)

Diagnosis

- Dead hearts
- Larvae in soil
- Characteristic adult feeding marks

Similar symptoms or species

- Damage similar to moth borer and wireworm but larvae distinctive



Rhyparida dimidiata.



Rhyparida nitida.



QLD, damage mostly in south / Larval damage in young ratoons in spring, adults in summer (1-year life cycle) \$\$

Damage more common in grassy fields

Sugarcane butt weevil

Leptopius maleficus

Description

- Weevil adults 16-21 mm long, grey or reddish, with many rounded lumps
- Larvae legless, slightly curled, small head, taper to rear, cream-yellow with pale head and black mouthparts

Damage

- Larvae gouge setts and base of young shoots and older stalks
- Adults eat leaves of rattlepod, causing a tattered appearance

Diagnosis

- Dead hearts in young shoots
- Weakened semi-mature stalks
- Larvae in soil

Similar symptoms or species

- Weevil borer larvae have red-brown head, enlarged abdomen



Stenocorynus weevils, Whitefringed weevil

Stenocorynus spp.

Whitefringed weevil, *Naupactus leucoloma*

Description

- Adults about 10 mm long
- Stenocorynus adults light brown with darker brown stripes
- Whitefringed weevil adults light brown with white line on outer edge of wing covers
- Larvae of both species stout, up to 15 mm long, legless, white to pale yellow with pale yellow heads, black mouthparts

Damage

- Larvae chew roots, root bands and buds

Diagnosis

- Poor germination and/or ratooning, weak cane growth

Similar symptoms or species

- None



Adult *Stenocorynus* weevil.



Adult whitefringed weevil.

Widespread / At planting or ratooning

\$

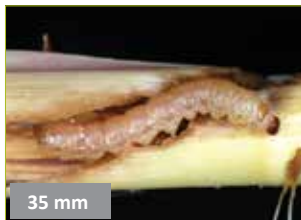
Damage from whitefringed weevil often follows legume cover crops

Large moth borer

Bathytricha truncata

Description

- Moths dull-coloured, with small dots in lines inside edge and near centre of forewings
- Larvae to 40 mm long, purple-pink tint when mature, small black spots



Damage

- Larvae tunnel inside shoots or young internodes of stalks

Diagnosis

- Dead hearts
- Vertical tunnels
- Wet frass
- Larvae (if present) in shoots, esp. in shoots where inner leaves just starting to wilt



Similar symptoms or species

- Wireworms – no vertical tunnels
- Weevil borers – tunnels contain fibrous material
- Black beetles – rough gouging



All regions / Most common in spring or early summer in young shoots

\$

Damage more common on field edges, esp. near couch or crowsfoot grass

Sugarcane bud moth

Opogona glycyphaga

Description

- Adult moths 8 mm long, shiny purple head and thorax, wings yellow with purple tips
- Larvae to 16 mm long, dull yellow with dark blotches, dark red-brown head, body with long hairs

Damage

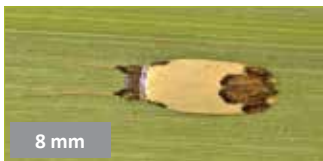
- Larvae attack buds on standing cane
- Can attack buds and/or shoots if planted with setts

Diagnosis

- Germination failure and/or dead hearts
- Hollow buds
- Root band eaten out around node
- Larvae and pupal cases beneath leaf sheaths

Similar symptoms or species

- None



Pupal case.



All regions, esp. central and north QLD / Damage to standing cane in autumn \$
Some varieties more prone to damage

Field crickets, Mole cricket

Oceanic field cricket,
Teleogryllus oceanicus

Black field cricket,
T. commodus

Mole cricket, *Gryllotalpa* sp.

Description

- Field cricket shiny black or brown, long antennae, jumping hindlegs
- Mole cricket strong-bodied, 25-30 mm long, velvety dark brown short hairs, short forewings, long cerci, broad digging forelegs

Damage

- Adults and nymphs eat eyes and young shoots

Diagnosis

- Gappy stands in plant cane
- Swelling eyes scooped out cleanly (field cricket)
- Holes bored in setts (mole cricket)
- Ragged holes in shoots

Similar symptoms or species

- Shoot damage similar to black beetle



Black field cricket.



Mole cricket.



Mole cricket damage.

All regions, esp. Burdekin / Mostly seen during planting season

\$

Common in wet, cracking clays

Sugarcane weevil borer

Rhabdoscelus obscurus

Description

- Adults 12-15 mm long, curved snout, tan and dark brown wing-covers
- Larvae legless, swollen in middle and tapering to rear, cream-coloured, red-brown head



Damage

- Larvae tunnel in mature stalks with reddening of internal tissues, causing reduction in stalk weight/CCS, stalk breakage



Diagnosis

- Large tunnels, esp. at stalk base
- Round holes in rind
- Coarse frass packed in tunnels
- Fibrous cocoons

Similar symptoms or species

- Moth borers (caterpillars) have legs, wet frass, no cocoons



Central and north QLD / Adults most active in summer and autumn
Weevils attracted to stressed/damaged cane

\$\$

Termites

Giant termite,
Mastotermes darwiniensis

Minor species

Description

- Giant termite: workers 10-12 mm long; soldiers slightly longer with larger head; winged reproductives to 18 mm, white

Damage

- Adults eat inside of setts/standing cane

Diagnosis

- Hollowed setts/stalks
- Presence of 'white ants'

Similar symptoms or species

- None



Giant termite in Burdekin, other species all regions / All year

\$

Damage to cane most common when timber is nearby

Locusts

Australian plague locust,
Chortoicetes terminifera

Migratory locust, *Locusta migratoria*

Spur-throated locust,
Nomadacris guttulosa

Yellow-winged locust,
Gastrimargus musicus

Description

- Swarming grasshoppers of variable colour and size, nymphs (hoppers) lack wings

Damage

- All stages eat leaves, causing reduced cane growth, poor canopy closure/weeds

Diagnosis

- Raggedly eaten leaves
- Presence of nymphs or adults
- Adult colour/form/size identifies species

Similar symptoms or species

- Armyworm damage similar – identify causal pest



Spur-throated locust.



All regions, species vary region to region / Damage in summer

\$\$

Damage in plant and ratoon cane, occurrence very sporadic

Night-feeding armyworms

Sugarcane armyworm,
Leucania stenographa,
L. loreyi, *L. abdominalis*

Common armyworm,
Mythimna convecta

Northern armyworm,
M. separata

Description

- Adults grey-brown moths, difficult to separate species (p 65)
- Larvae greenish or brownish with faint to defined stripes

Damage

- Larvae eat leaves, causing reduced growth in severe infestations

Diagnosis

- Eaten leaves, often with only midrib left
- Larvae in spindle or under trash during day, curl up when disturbed, pupae in trash or soil

Similar symptoms or species

- Day-feeding armyworms more striped, with Y-mark on head, on plants during day
- Locust damage – identify causal pest



All regions / Damage in late winter to early summer

\$

Usually on small ratoons with trash / Larvae often heavily parasitised/diseased

Night-feeding armyworm identification

L. stenographa



35 mm wingspan

Dark line along forewing well defined.



40 mm

Dark line along body well defined. General colour dark brown.

L. loreyi



35 mm wingspan

Line along forewing faint – not well defined.



35 mm

Lines along body not well defined. General colour pinkish olive green.

L. abdominalis



30 mm wingspan

No clear pattern on forewing. Ground colour pale bronze. Forewing has distinctive sheen.



35 mm

Dark lines along body dotted, with a white mottled pattern along body.

M. separata



35 mm wingspan

Ground colour rose gold. Hindwing with wide brown edge.

Day-feeding armyworm

Spodoptera exempta

Description

- Adult forewings dark with small white lines centrally, hindwings pale with dark border
- Larvae green with dark green, almost black, stripes, pale inverted Y-mark on front of head

Damage

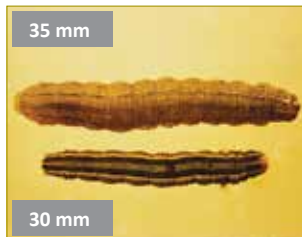
- Larvae eat leaves, causing reduced growth in severe infestations
- Often on larger plants than night-feeders

Diagnosis

- Eaten leaves, often with only midrib left
- Larvae on leaves during day

Similar symptoms or species

- Night-feeding armyworms less striped, without Y-mark on head, under trash during day
- Locust damage – identify causal pest



Day-feeding armyworm (bottom) compared with night-feeding armyworm (top).

All regions, more common in central-north / Damage mainly in summer

\$

Occurs less frequently than night-feeding armyworms, often on larger cane

Sugarcane planthopper

Perkinsiella saccharicida

Description

- Adults 5 mm long, brown-black, taper to rear from broad head
- Often move sideways ('sidewinders')
- Juveniles similar, plump, wingless

Damage

- Direct sucking injury – minor
- Vector of Fiji leaf gall

Diagnosis

- Presence of adults in leaf whorl, beneath young leaf sheaths or under leaves
- Red egg punctures in mid-ribs or in sheathing leaf bases, wax cap over punctures

Similar symptoms or species

- Island planthoppers (*Eumetopina*) smaller, thinner, black



All regions / Most abundant in summer-autumn

\$

Economically significant only as disease vector / Numbers differ among cane varieties

Island planthopper

Eumetopina flavipes

Description

- Adults 4-5 mm long, black
- Juveniles wingless, pale colour
- In Australia, known only from northern Cape York Peninsula and Torres Strait islands

Damage

- Suck from leaves, causing yellowing at high numbers
- Vector for Ramu stunt disease in PNG (virus not recorded in northern Australia)

Diagnosis

- Adults and nymphs in leaf whorl
- Multiple red egg punctures in midribs

Similar symptoms or species

- Sugarcane planthoppers (*Perkinsiella*) larger, broader, more grey than black



Egg punctures in midrib.

Far north only / Most abundant in wet season

\$

Not in commercial cane in Australia

Sugarcane froghopper

Euryaulax carnifex

Description

- Adults 8 mm long, orange and purple-black markings
- Nymphs yellow or pink within mass of foam ('spittle'), on stilt roots above ground and roots below ground



Damage

- Adults suck sap from leaves, causing leaf streaks in vascular bundles, initially yellow, then redden as tissue dies
- Scorching usually extends to margin, leading to dead leaf tips



Diagnosis

- Leaf symptoms
- Adults on upper leaf surfaces

Similar symptoms or species

- None

North QLD, esp. Tully and Herbert / Mainly in summer and autumn

\$

Mainly on cracking clay or loose-structured soils / Also on cotton and kenaf

Linear bug

Phaenacantha australiae

Description

- Adults slender, to 9 mm long, orange-brown to dark green-brown
- Nymphs similar, wingless, orange-yellow

Damage

- Feeding punctures, causing yellow leaves with dry tips and dead margins
- Purpling of leaves with sun exposure

Diagnosis

- Leaf symptoms (may be confused with nutrient deficiency)
- Long thin adults

Similar symptoms or species

- None



Sarina north / Most abundant in spring, under dry conditions

§

Often in grassy fields

Pink sugarcane mealybug

Saccharicoccus sacchari

Description

- Adults to 5 mm long, soft, oval, pink, wingless
- Covered with white powder
- All legs similar

Damage

- Sucking damage may weaken cane
- Sooty mould often present

Diagnosis

- Colonies behind leaf sheath and on stubble underground

Similar symptoms or species

- Scale insects also behind sheaths but are hard, not pink
- Adults of pink ground pearl have forelegs strongly hooked and different from other legs



All regions / Occurs all year, persists on stubble between crop cycles \$
Little direct economic significance / May contribute to sugar quality problems

Aphids

Sugarcane aphid,
Melanaphis sacchari

Corn aphid, *Rhopalosiphum maidis*

Oriental grassroot aphid,
Tetraneura nigriabdominalis

Description

- Sugarcane and corn aphids tiny, yellow or black, with pair of tubes (siphunculi) near rear end
- Oriental grassroot aphids colonise roots

Damage

- Sugarcane aphids suck from leaves, causing yellow patches, dried leaves
- Excrete honeydew, causing sooty mould
- Corn aphids vector sugarcane mosaic, rarely colonise cane

Diagnosis

- Colonies beneath leaves, attending ants, honeydew, sooty mould

Similar symptoms or species

- Mite symptoms: mites smaller, 8 legs, no siphunculi



Cane with sooty mould.

All regions / More common in summer under dry conditions

§

Many parasitoids and predators (e.g. ladybirds) keep numbers in check

Spider mites

Oligonychus zanclopes

Possibly other species

Description

- Pale green, dark spots either side of body, 8 legs

Damage

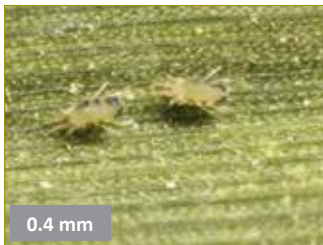
- Feeding scars, cause leaf discolouration
- Mites and symptoms usually disappear during wet season

Diagnosis

- Rusty bands along leaves
- Mites beneath leaves (not always present)
- Cast skins, webbing

Similar symptoms or species

- Damage resembles orange rust, distinguished by mites, webbing or cast skins
- Aphids larger, have 6 legs, no webbing or rusty symptoms
- Silicon-deficiency symptoms similar on top of leaves ('sunny-side up', 'orange freckle')



Mite webbing.



All regions / Common mid-summer, numbers crash by February

\$

Populations controlled by biological control from predators and disease

Sugarcane scale

Aulacaspis madiunensis

Description

- Adult insects hidden below flat, circular, pale-green to grey scale to 3 mm diameter, not mobile
- Newly hatched crawlers difficult to see



Damage

- Insects suck sap, causing weakened growth, shrivelled stalk tissues

Diagnosis

- Presence of scales on stalk

Similar symptoms or species

- Pink sugarcane mealybugs also infest stalks but have a white powdery coating, not a hard scale



All regions, pest only in south / Occur all year

§

Colonies most prominent on mature cane

Rarely seen pests



5 mm

Ratoon shootborer *Ephysteris promptella*

Larvae bore into base of young ratoon shoots, causing dead hearts, pinhole entry holes under basal sheaths.

Central and north QLD.



30 mm

Sugarcane looper *Mocis frugalis*

Larvae with only 2 pairs of prolegs, move with looping motion.

Feed on leaves during day.

All regions.



Wart-eye mite (unidentified species)

Not visible to the naked eye. Buds swell beneath scale, become rough, causing poor germination.



1-2 mm

Sugarcane whitefly *Neomaskellia bergii*

Winged adults.

Colonies beneath leaves.

Oriental rice thrips

Stenchaetothrips biformis

Description

- Insects tiny, slender, black
- Antennal segments 4-7, dark

Damage

- Curling and drying of the leaf tips of very young plants
- Young leaves not unfurling properly

Diagnosis

- Leaf symptoms (may be confused with nutrient deficiency or water stress)
- Tiny black insects in whorl

Similar species

- Oriental sugarcane thrips (*Fulmekiola serrata*), an exotic species not present in Australia: antennal segments 3-5 and base of 6 are pale



Antennae of Oriental rice thrips (on left) and Oriental sugarcane thrips (on right).

So far known only from near Gordonvale / Easily confused with the exotic pest species Oriental sugarcane thrips

Watch should be kept on possible expansion of range or pest status

Canefield or ground rat

Rattus sordidus

Description

- Coarse spiny coat grizzled dark brown to black
- Tail dark brown to black, usually shorter than body and with pronounced scale rings

Damage

- Chewing of stalks usually within 20 cm of ground, causing broken stalks, reduced tonnage, reduced sugar content, rotting of stalks

Diagnosis

- Bitten stalks near ground level, stalk breakage and sprawling
- Burrows in ground

Similar symptoms or species

- Climbing rats cause damage higher on stalks, appear thick-necked with mosaic-scaled tail



Mostly central and north regions / Damage greatest in autumn-winter

\$\$

Grass is preferred food / Rely on cane when other food is unavailable

Climbing rats

Grassland melomys,
Melomys burtoni

Fawn-footed melomys,
Melomys cervinipes

Description

- Grey to red-brown, belly white, grey or cream, juveniles often grey
- Tail dark grey, brown or black, slender and tapering, with mosaic pattern of scales

Damage

- Chewing of stalks, often at height of about 1.5 m, causing broken stalks, reduced tonnage, reduced sugar content, rotting of stalks

Diagnosis

- Bitten stalks near growing point, often bent at bite mark
- Nests in canopy

Similar symptoms or species

- Ground rats have scale rings on tail



Melomys burtoni.



Melomys cervinipes.



Mostly north and some central regions / Damage mostly late autumn \$\$

Damage often around perimeter of fields near grass/forested riverine harbourage

Other animals and birds



Cockatoo: Large stalks bitten off, all at same height, on edge of field.



Eastern swamphen: Pith scooped out.



Bush turkey: Stalk hollowed out leaving 'canoe-shaped' hole in rind.

Wallaby: Eaten shoots or dug-up setts.

Feral pig: Broken and chewed stalks, flattened cane, uprooted stools, damage often not visible from headland.

Fox: Chewed stalks.

Exotic insect pests

Australia is free of many insect pests that damage sugarcane in other countries. Chief among these are the moth borers, which are major pests in most countries except Australia. Some exotic pests from Papua New Guinea are illustrated below. These pose a biosecurity risk to Australia, a risk minimised through quarantine, research and efficient incursion management plans.



Young internodes infested with *Sesamia griseocens* – a stalk borer.



Cane top killed by *Scirpophaga excerptalis* – a top borer.



Chilo terrenellus – a stalk borer.



Woolly aphid – a leaf-sucking pest.

Canegrub biocontrol agents



Canegrub affected by *Metarhizium* fungus.



Canegrub (on right) affected by *Adelina* (protozoan), healthy grub on left.



(Above) Canegrub on the right affected by milky disease (bacterium), healthy grub on left.



(Left) *Campsomeris* (adult and cocoon), a burrowing wasp – a parasitoid of canegrubs.

Biocontrol agents of other insect pests

Many insect pests of sugarcane are kept under control by a range of naturally occurring biological control agents: predators, parasitoids and pathogens. A few of these are illustrated below but there are many more, including ants and even wireworms. Biocontrol can be disrupted by indiscriminant use of broad-spectrum pesticides.



Cordyceps – a fungal disease of cicadas.



Cocoons of the parasitoid *Cotesia nonagriae* emerged from a larva of large moth borer.



Ladybird beetle (above) and larva (above right), and hover fly larva (right) – predators of aphids, other sucking insects, and mites.



Glossary

Abdomen	In insects, the rear-most part of the body, behind the thorax
Antennae	Sensory structures at the front of the insect's head (= 'feelers')
Biocontrol	(= biological control) Control of pest populations that is exerted by natural enemies, the complex of predators, parasitoids and pathogens that attack the pest
Caterpillar	The larva of a moth or butterfly
Cerci	Paired appendages on the rear-most segment of many insects
Convex	Curved like the outside of a sphere
Coralloid	Branching in a shape resembling coral
Dead heart	Dead juvenile or spindle leaves in the central portion of the cane shoot or stalk, caused by death of the growing point
Dorsal	Upper or top, as in dorsal surface
Frass	Solid debris or excrement produced by feeding insects
Germination	Sprouting, here used to describe the initial production of shoots from buds on planting sets or ratoon stubble
Growing point	The part of a plant where cells divide to produce new growth
Honeydew	Sugary liquid waste produced by some sucking insects, e.g. aphids
Instar	Developmental stage of insect larvae or nymphs between each moult; the stage hatching from the egg is the first instar

Glossary

- Invertebrate** An animal without a backbone, e.g. insects and mites
- Larva** (Plural = larvae) The immature stage of an insect that goes through complete metamorphosis after hatching from the egg and so is very different from the adult, e.g. caterpillar, grub, maggot
- Metamorphosis** Change in form from egg to adult, can be either complete (egg – larva – pupa – adult, e.g. canegrubs) or incomplete (egg – nymph – adult, e.g. grasshoppers)
- Mite** Small 8-legged invertebrate, not an insect
- Nymph** The immature stage of an insect that goes through incomplete metamorphosis after hatching from the egg and so is similar to the adult but lacks wings, e.g. young locusts (hoppers)
- Parasitoid** An insect which lives on or in another host insect and eventually kills it (unlike a parasite which does not usually kill its host)
- Pathogen** A micro-organism that causes disease, e.g. bacteria and fungi
- Predator** An animal that eats others; it consumes a number of prey individuals to complete its life cycle (unlike a parasitoid)
- Pupa** (Plural = pupae) The resting phase between the larval and adult stages of an insect that goes through complete metamorphosis
- Raster** The pattern of hairs in front of the anus of canegrubs that can be used to distinguish species

Glossary

Ratoon	The cane crop that regrows after harvest
Rodent	Animals in the order Rodentia, which includes native sugarcane pests such as canefield and ground rats as well as introduced rats and mice
Sett	Planting piece of sugarcane stalk (billet)
Siphunculus	(Plural = siphunculi) Small cone-shaped tube on the dorsal surface near the rear of an aphid's abdomen
Sooty mould	A black fungus that grows on plants where honeydew has been deposited by sucking insects such as aphids
Species	A group of similar individuals that are able to interbreed; the basic unit in the classification of plants and animals
Spindle	The central folded leaves at the top of the cane stalk
Stool	A single cane plant
Stubble	The basal portions of the cane plant left in the ground after harvest
Thorax	In insects, the middle (chest) part of the body, between the head and abdomen, and to which the wings and legs are attached
Vector	In insect-plant systems, an insect that transmits disease from one plant to another

Index

Page numbers in bold indicate the main references.

A

Acknowledgments	96
<i>Adelina</i>	81
African black beetle	54
<i>Agrypnus variabilis</i>	53
Animals	79
<i>Anoplognathus</i> spp.	46
<i>Antitrogus consanguineus</i>	43
<i>Antitrogus parvulus</i>	27
<i>Antitrogus planiceps</i>	38
<i>Antitrogus rugulosus</i>	34
<i>Aphaenogaster pythia</i>	51
Aphids	13, 72 , 73, 82
Armyworms	12, 18, 63, 64-66
<i>Aulacaspis madiunensis</i>	74
Australian plague locust	63

B

<i>Bathytricha truncata</i>	58
Beneficials	81-82
Biological agents	15, 81-82
Biological control	81-82
Biosecurity	80
Birds	15, 79
Black beetle	54
Black beetles	9, 54, 58, 60
Black field cricket	60

Index

Black leaf beetle	55
Brown sugarcane cicada	50
Bud moth	10, 59
Bundaberg canegrub	25
Bush turkey	79
Butt weevil	56

C

<i>Campsomeris</i>	81
Cane beetles – distinguishing similar species	45
Canefield rat	77, 78
Canegrub damage, 1-year type	20, 24
Canegrub damage, 2-year type	21, 24
Canegrub distribution	23
Canegrub identification	24
Canegrub life cycles	18, 20-21
Canegrub root damage	22
Caudata canegrub	26, 28, 29
Childers canegrub	27, 29, 35, 36
<i>Chilo terrenellus</i>	80
<i>Chortoicetes terminifera</i>	63
Christmas beetles	24, 46, 47
Cicadas	8, 19, 50, 82
<i>Cicadetta crucifera</i>	50
<i>Cicadetta multifascia</i>	50
Climbing rats	77, 78
Cockatoo	79
Common armyworm	64
Complete metamorphosis	18

Index

<i>Conoderus</i> spp.	53
Consobrina canegrub	26, 28, 29, 45
Coralloid branching	52
<i>Cordyceps</i>	82
Corn aphid	72
<i>Cotesia nonagriae</i>	82
Crickets	11, 60

D

<i>Dasygnathus dejeani</i>	47
Day-feeding armyworm	64, 66
<i>Dermolepida albohirtum</i>	32

E

Eastern swamphen	79
<i>Ephysteris promptella</i>	75
<i>Eumargarodes laingi</i>	49
<i>Eumetopina flavipes</i>	67, 68
<i>Euryaulax carnifex</i>	69
Exotic insect pests	15, 80

F

Fawn-footed melomys	78
Feral pig	79
Field cricket	60
Fiji leaf gall	67
Fox	79
French's canegrub	26, 27, 28, 29, 35, 36, 45
Frogatt's canegrub	30

Index

Froghopper	12, 69
<i>Fulmekiola serrata</i>	76
Funnel ant	9, 51

G

<i>Gastrimargus musicus</i>	63
Giant termite	62
Grasshoppers	63
Grassland melomys	78
Grata canegrub	31, 41
Green cicada	50
Greyback canegrub	31, 32, 33, 41, 44
Grisea canegrub	33
Ground pearls	8, 49
Ground rat	77, 78
<i>Gryllotalpa</i> sp.	60

H

<i>Hanseniella</i> spp.	52
<i>Heteroderes</i> spp.	53
<i>Heteronychus arator</i>	54
Honeydew	72
Hover fly	82

I

Incomplete metamorphosis	19
Incursion management plans	80
<i>Inopus flavus</i>	48
<i>Inopus rubriceps</i>	48

Index

Insect life cycles	18-19
Instars	18
Island planthopper	67, 68

L

Ladybird	82
Large moth borer	10, 53, 55, 58, 61, 82
Leaf beetles	10, 55
<i>Lepidiota caudata</i>	26
<i>Lepidiota consobrina</i>	28
<i>Lepidiota crinita</i>	25
<i>Lepidiota frenchi</i>	29
<i>Lepidiota froggatti</i>	30
<i>Lepidiota grata</i>	31
<i>Lepidiota grisea</i>	33
<i>Lepidiota negatoria</i>	35
<i>Lepidiota noxia</i>	36
<i>Lepidiota picticollis</i>	37
<i>Lepidiota rothei</i>	41
<i>Lepidiota sororia</i>	42
<i>Lepidiota squamulata</i>	44
<i>Leptopius maleficus</i>	56
<i>Leucania abdominalis</i>	64-65
<i>Leucania loreyi</i>	64-65
Linear bug	12, 19, 70
<i>Locusta migratoria</i>	63
Locusts	11, 19, 63, 64, 66
Looper	75

Index

M

Margarodids	8, 49
<i>Mastotermes darwiniensis</i>	62
Mealybug	13, 49, 71, 74
<i>Melanaphis sacchari</i>	72
<i>Melomys burtoni</i>	78
<i>Melomys cervinipes</i>	78
Metamorphosis	18-19
<i>Metanastes vulgivagus</i>	54
<i>Metarhizium</i>	81
Migratory locust	63
Milky disease	81
Mites	13, 72, 73, 82
<i>Mocis frugalis</i>	75
Mole cricket	60
Moth borer	10, 53, 55, 58, 61, 82
<i>Mythimna convecta</i>	64
<i>Mythimna separata</i>	64-65

N

Nambour canegrub	34, 43
<i>Naupactus leucoloma</i>	57
Negatoria canegrub	27, 29, 35, 36, 45
<i>Neomaskellia bergii</i>	75
Night-feeding armyworms	64-65, 66
<i>Nomadacris guttulosa</i>	63
Northern armyworm	64-65
Noxia canegrub	27, 29, 35, 36

Index

O

Oceanic field cricket	60
<i>Oligonychus zanclopes</i>	73
<i>Opogona glycyphaga</i>	59
Oriental grassroot aphid	72
Oriental rice thrips	76
Oriental sugarcane thrips	76

P

Papua New Guinea	80
<i>Parnkalla muelleri</i>	50
<i>Perkinsiella saccharicida</i>	19, 67, 68
<i>Phaenacantha australiae</i>	70
Picticollis canegrub	37
Pig	79
Pink ground pearl	49, 71
Pink sugarcane mealybug	13, 49, 71, 74
Planiceps canegrub	38
Planthoppers	12, 19, 67-68
<i>Plectris aliena</i>	39
<i>Plectris canegrub</i>	39
<i>Promargarodes australis</i>	49

Q

Quarantine	80
------------------	----

R

Ramu stunt	68
------------------	----

Index

Rarely seen pests	14, 75-76
Raster	24
Ratoon shootborer	75
Rats	77-78
<i>Rattus sordidus</i>	77
Redheaded whitegrub	24, 46, 47
<i>Rhabdoscelus obscurus</i>	61
Rhopaea canegrub	40
<i>Rhopaea magnicornis</i>	40
<i>Rhopalosiphum maidis</i>	72
Rhyparida	10, 55
<i>Rhyparida dimidiata</i>	55
<i>Rhyparida nitida</i>	55
Rodents	14, 77-78
Rothe's canegrub	41

S

<i>Saccharicoccus sacchari</i>	49, 71
Scale insect	14, 71, 74
<i>Scirpophaga excerptalis</i>	80
<i>Sesamia griseascens</i>	80
Sidewinder	67
Siphunculi	72
Soldier flies	8, 18, 48, 52
Sooty mould	71-72
Sororia canegrub	42
Southern one-year canegrub	34, 43
Spider mites	13, 72, 73, 82

Index

<i>Spodoptera exempta</i>	66
Spur-throated locust	63
Squamulata canegrub	32, 41, 44
Stalk borers	80
<i>Stenchaetothrips biformis</i>	76
<i>Stenocorynus</i> spp.	57
Stenocorynus weevils	57
Sugarcane and maize stemborer	58
Sugarcane aphid	72
Sugarcane armyworm	64-65
Sugarcane bud moth	10, 59
Sugarcane butt weevil	56
Sugarcane froghopper	12, 69
Sugarcane leaf beetle	55
Sugarcane looper	75
Sugarcane planthopper	19, 67, 68
Sugarcane scale	14, 71, 74
Sugarcane soldier fly	48
Sugarcane weevil borer	11, 61
Sugarcane whitefly	75
Sugarcane wireworm	53
Swamphen	79
Symphyla	9, 52

T

<i>Teleogryllus commodus</i>	60
<i>Teleogryllus oceanicus</i>	60
Termites	11, 62

Index

<i>Tetraneura nigriabdominalis</i>	72
Thrips	76
Top borer	80

W

Wallaby	79
Wart-eye mite	75
Weevil borer	11, 18, 56, 58, 61
Weevils	10
White ants	62
White ground pearl	49
Whitefly	75
Whitefringed weevil	57
Wireworms	9, 53, 55, 58
Woolly aphid	80

Y

Yellow soldier fly	48
Yellow sugarcane cicada	50
Yellow-winged locust	63

Acknowledgments

SRA would like to thank the following people for use of photographs from their collection:

Contributor	Country	Pest
Phillip Harpootlian	USA	Plectris canegrub
PaDIL	Australia	Whitefringed weevil

We thank the Queensland Government for their support of RD&E into endemic and exotic sugarcane pests.

Further information

Pests of Australian Sugarcane (PG Allsopp, KJ Chandler, PR Samson, PG Story). Published by BSES, Brisbane, 1993. ISBN 0 7242 5179 0.

Australian Sugarcane Pests (edited by JR Agnew). Published by BSES, Brisbane, 1997. ISBN 0 646 33981 8.

Recording Pest and Disease Data in the Australian Sugar Industry (JK Stringer, RC Magarey, PR Samson, DE Webster). Published by BSES, Brisbane, 1999. ISBN 0 949678 01 5.

Website

Sugar Research Australia

www.sugarresearch.com.au

Easy-to-read fact sheets which provide management information on a wide range of pests are available on the SRA website www.sugarresearch.com.au

The *Pests of Australian Sugarcane Field Guide* contains simply presented information and photos covering the sugarcane pests in Australia. All Australian pests of importance are included, along with examples of exotic pests in Papua New Guinea and biological control agents of native species.

The guide is designed for researchers, extension and quarantine staff, as well as farmers, harvester operators, consultants, private contractors and agribusiness personnel.
