SHORT, NON-REFEREED PAPER

CACOSCELES (*ZELOGENES*) *NEWMANNII* (THOMSON) (CERAMBYCIDAE: PRIONINAE), A NEW PEST IN THE SOUTH AFRICAN SUGARCANE INDUSTRY

WAY MJ[1], CONLONG DE[1,2], RUTHERFORD RS[1,2], SWEBY DL[1], GILLESPIE DY[1], STRANACK RA[1], LAGERWALL G[1], GROBBELAAR E[3] AND PERISSINOTTO R[2,4]

[1]South African Sugarcane Research Institute, P/Bag X02, Mount Edgecombe, 4300, South Africa
[2]School of Life Sciences, University of KwaZulu-Natal, P/Bag X01, Scottsville, 3209, South Africa
[3]South African National Collection of Insects, Plant Protection Research Institute, Agricultural Research Council, P/Bag X134, Queenswood, Pretoria, 0121, South Africa.
[4]Nelson Mandela Metropolitan University, PO Box 77000, Port Elizabeth, 6031, South Africa

[1]mike.way@sugar.org.za [1,2]des.conlong@sugar.org.za [1]stuart.rutherford@sugar.org.za [1]deborah.sweby@sugar.org.za [1]rowan.stranack@sugar.org.za [1]gary.lagerwall@sugar.org.za; [3]grobbelaarb@arc.agric.za [2,4]renzo.perissinotto@nmmu.ac.za

Abstract

In October 2015, larvae of *Cacosceles* (*Zelogenes*) *newmannii* (Thomson) (Coleoptera: Cerambycidae: Prioninae: Cacoscelini) were found for the first time feeding in the stools and stalk bases of commercial sugarcane in the Entumeni District of KwaZulu-Natal. Damage symptoms were lodged stalks in patches of stunted sugarcane with basal borings and an associated red colouration around the feeding tunnels. Plant and ratoon crops of varieties N21, N39, N48, N47, N12 and N41, ranging in age from one to 22 months old, were attacked. There was only one larva per stalk. Tunnels made by this pest were visible in stubble of recently harvested crops, and in stalks stacked in loading zones. Larvae ranging in size from 2 to 9 cm in length were found in the same field. Larvae were yellowish to creamy whitish in colour. The body was distinctly segmented, elongate sub-cylindrical and relatively smooth and thick skinned. As in all cerambycids, larvae had enlarged thoracic segments behind the head. The tan to reddish-brown head capsule was extremely hard, bearing stout mandibles. From January to March 2017 adult activity was observed on multiple occasions during the daytime. Adults were tan coloured, elongate and characteristically with long antennae. Males had enlarged mandibles. The white pupa was soft-bodied. Yellow singly laid eggs were slender and elongate. In response to this new incursion into sugarcane, a two-pronged intervention approach is being considered. This involves an immediate short-term containment strategy, comprising possible combinations of mechanical and chemical measures in an attempt to restrict and suppress infestations. A longer-term sustainable integrated management plan will be based on knowledge gained about the pest through monitoring, field observations and formal research.

Keywords: cerambycid, pest incursion, biology, cultural control, pathogens

New incursion

On 28 October 2015, *Cacosceles* (*Zelogenes*) *newmannii* (Thomson, 1877) (Coleoptera: Cerambycidae: Prioninae; Cacoscelini) larvae were recorded feeding in stalk bases (Figure 1a) and stools of 22 month old sugarcane (*Saccharum officinarum* L.) of variety N21 in the Entumeni District (28°55'S 31°19'E) near Eshowe, KwaZulu-Natal, South Africa. Adults were identified by the South African National Collection of Insects (SANC), ARC-PPRI: Biosystematics Division, Pretoria, South Africa, where voucher specimens of all life stages are lodged (accession number Sex 2785), and duplicates of the same material are stored at the

South Africa Sugarcane Research Institute, Mount Edgecombe, South Africa (Sex 2784: larvae and Sex 2778: adult). The identity of this species was verified by Karl Adlbauer of Graz, Austria, and Anders Bjørnstad of Skien, Norway (personal communication[1]).

Cerambycids attacking sugarcane in other parts of the world can become serious pests. In North East Thailand *Dorysthenes buqueti* Guerin (Coleoptera: Cerambycidae) populations increased ten-fold within a year, subsequent to its detection in 2003 (Pliansinchali *et al*., 2007). In plant sugarcane, this pest causes 13-43% loss in yield and 11-46% in sugar loss, whilst in ratoons these figures increase to 54% and 57% respectively. In Indonesia, *Dorysthenes* sp. infestations, detected in 1995, spread from 100 to 6000 ha by 1999 (Charernsom and Suasa-Ard, 1994; Sallam, 2009). The sugarcane stool borer, *Migdolus fryanus,* Westwood, 1863 (Cerambycidae: Anoplodermatinae) is also known to cause severe damage to crops in Brazil (Ferrer, 1994).

Historical records show that *C. newmannii* were recorded in the early 1900's in Mozambique, South Africa (Limpopo, Mpumalanga, Gauteng and KwaZulu-Natal Provinces) and Swaziland (Ferreira, 1980). More recently, a single adult was caught in a light trap operated in 2007 at Entumeni in the Scarp Forest (R Perissinotto, personal observation). In 2014, an adult was caught around a security light operating at St Lucia, while in the same year, RH Taylor observed a large male adult at Sordwana Bay (personal communication).

At the time of writing, four farms have been infested with *C. newmannii* larvae. Larvae were yellowish to white to cream in colour (Figure 1b). In one of the most heavily infested fields 55% of stools were infested with larvae. Larvae have been found in the following other varieties: N39, N48, N47, N12 and N41. Infestations occur in plant and ratoon crops, and in crops from one to 22 months old. In January 2017, while digging up a stool, a single white soft-bodied pupa was found in the soil in an earthen cocoon immediately below the roots. No eggs have been found in the field. However, they are laid in the laboratory, and are yellow and elongate; 2.34±0.1 mm length, 0.84±0.11 mm width (n=10).

Cacosceles newmannii larval damage consisted of hollow tunnels into the below ground section of the sugarcane stool and upwards from 8 to 20 cm into the bottom section of the stalk. Areas with stunted and lodged stalks, or brown leaves or 'dead-hearts' often indicated larval infestations. Infested stalks were easily pulled from the ground by hand, indicating a weakened root system, and cutting the stalk into pieces usually revealed the presence of a larva. The body was distinctly segmented, elongate sub-cylindrical and relatively smooth and thick skinned. The tan to reddish-brown head capsule was extremely hard, and bore stout mandibles. Only a single larva was found in each stalk. Feeding activity hollowed out the inner stalk tissue, leaving the outer stalk rind intact. An associated secondary fungal infection caused reddening of the plant tissue around the borings. The tunnels caused by this pest were evident on the cut surface of sugarcane stubble in harvested fields, and at the bottom end of harvested stalks (Figure 1c). Borings caused by *C. newmannii* are larger in diameter than those made by larvae of *Eldana saccharina* Walker (Lepidoptera: Pyralidae), which is currently a major pest in the South African sugarcane industry.

From January to March 2017, adults were observed flying in sugarcane fields from about 09h00 to 11h00, especially under hot (30°C) and humid conditions. On one occasion, and in one sugarcane field, 588 adults were collected, comprising 398 males and 190 females. Males were observed coming out of dense (12 cm high) mown grass on the road between panels of sugarcane, where they remained motionless for some time before flying. The distance at which males fly is unknown; however, they were observed flying many metres above the sugarcane canopy. Females appeared more sedentary, and were observed walking along the ground. From August 2016 to March 2017, a modified Robinson insect light trap using a 200 Watt

[1]R Perissinotto, Renzo.perissinotto@nmmu.ac.za

incandescent bulb was operated continuously near the sugarcane where the adults were observed, but no beetles were caught. Feeding by adults has not been observed in the field.

Cacosceles newmannii beetles are tan to light or dark brown in colour. There is a large variation in body size among and between genders. Males average 47.3±5.2 mm (n=10) (Figure 1d) and females average 35.2±2.9 mm (n=10) in length, from the anterior tip of the mandible to the posterior tip of the elytra, excluding the ovipositor (Figure 1e). The mandibles of males are greatly enlarged, and smooth on the inner surface. The right mandible has a single sharply pointed apex, whereas the tip of the left mandible is divided into two parts, with the lower tooth shorter than the upper one. Mandibles of females have a series of ridges on the inside margins and they are stout. The outer margins of the thorax of both males and females are flattened, and have one or two laterally projected spines.

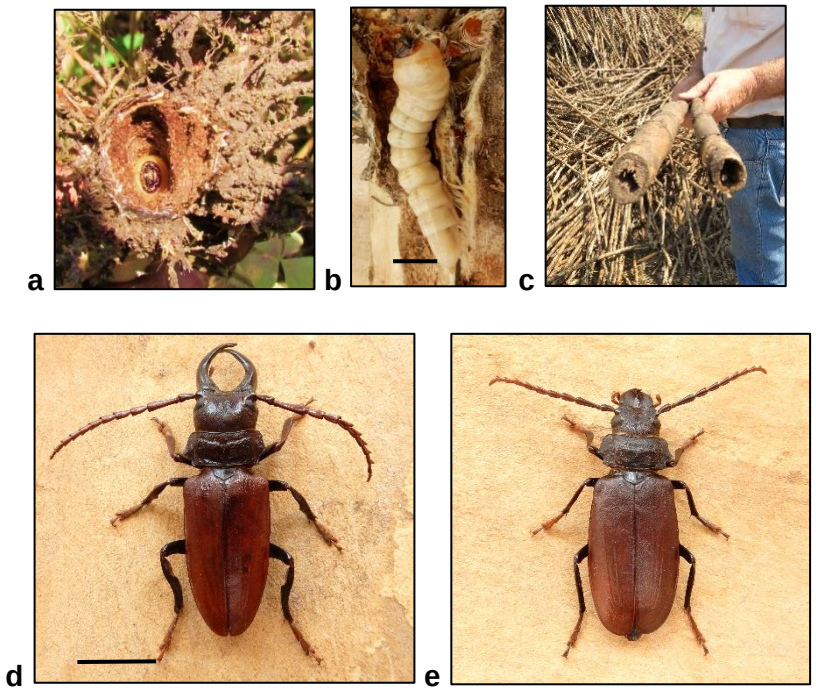

Figure 1. a: Sugarcane stool dug out of the ground showing the head of a larva in its boring in the stalk base; b: Large *C. newmannii* larva; c: *C. newmannii* borings in the bases of cut stalks stacked at a loading zone on a sugarcane farm; d: Male *C. newmannii* with enlarged mandibles; f: Female *C. newmannii.* Scale bar = 10 mm. (Photo credits for b,d,e: Lynette Clennell).

Containment and management

It is too soon after its discovery (16 months) for containment and control options to have been developed for *C. newmannii*. However, short-term containment will investigate immediate plough-out and fallow, which is recommended to control white grub pests (various Scarabaeidae) in sugarcane in South Africa (Carnegie, 1988). Alternative mechanical control options will be explored, based on suppression of *Idaecamenta eugeniae* Arrow (Coleoptera: Scarabaeidae: Melolonthinae) in Uganda over a three year period (2003 to 2005), following repeated plough runs and harrowing (Mugalula *et al*., 2006). In addition, configurations of farming implements such as stool lifters, stool shears and rotavators (Dicks *et al.*, 1971), will be tested in an attempt to lift and destroy the stools and the larvae inside them at replant.

A sustainable integrated management plan will be developed, based on knowledge gathered about the pest from field observations and dedicated research. Possible use of local entomopathogenic fungi may hold potential, given that for example *Metarhizium flaviridae* Sorokin in Indonesia caused significant mortality of *Dorysthenes* sp. (Cerambycidae: Prioninae) larvae in field trials (Pramono *et al.,* 2001). Regular scouting of *C. newmannii* will provide data on seasonal numbers. Physiological studies investigating respiration, heat and water stress, thermal tolerances and food web approach research using stable isotopes, will contribute towards understanding the potential range expansion of this species. Pheromone trap development will be researched as a population monitoring tool, for adult trapping out, as employed for *Dorysthenes granulosus* (Cerambycidae: Prioninae) (Thomson) (Wickham *et al*., 2016), and also as a pathogen dispensing walk through trap (Goble, 2012), and/or mating disruption (Mangan, 2005). Laboratory colonies are being established in quarantine at SASRI to better understand the biology of *C. newmannii,* and to produce material for research purposes.

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