



Newsletter of the Plant Protection Research Institute (PPRI), an institute in the Natural Resources and Engineering Division of the Agricultural Research Council (ARC)

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**Alien invasive predator spreading in South Africa -this harlequin is no jester!**

A dreaded invasive insect, the harlequin lady beetle, has become established in South Africa, and it is rapidly spreading through the country. It carries the scientific name *Harmonia axyridis* and several common names. Here it is suggested that in South Africa it be called 'harlequin lady beetle' or, for short, 'the harlequin'. This insect, originally from central and eastern Asia, has in recent years become one of the world's worst invasive, harmful animals.

Dr Goddy Prinsloo of the ARC-Small Grain Institute discovered the first South African colony of the harlequin outside Riviersonderend in the Western Cape. He initially noticed these beetles in the spring of 2004, but only in the summer of 2006 specimens were sent to the South African National Collection of Insects in Pretoria, where they were conclusively identified as *Harmonia axyridis*. Field observations lead to the conclusion that the harlequin was established and reproducing at Riviersonderend. The die was cast.

Lady beetles (= ladybird beetles) (family Coccinellidae) are widely considered beneficial insects and a symbol of good luck. Few insects are treasured so much by so many cultures. The harlequin, however, has some very nasty habits. Like many lady beetles, the harlequin preys voraciously on aphids and other soft-bodied arthropod pests. It was for this reason considered a valuable biological control agent for a long time, and there was significant trade in these beetles in some countries (not South Africa). They were repeatedly released as biocontrol agents in the USA and Western Europe.

The harlequin's appetite is, however, not satisfied by pests alone. They willingly feed on immatures of various non-pest arthropods, including beneficial kinds. They even feed on other lady beetle species, including indigenous and beneficial ones. They even feed on each other. They are very effective in their voraciousness, outcompeting resident lady beetle species, which may decline, leading to ecosystem disruption. Then the harlequin may move on to feed on pollen and fruit. Harlequin individuals present among harvested grapes may taint the vintage with an exotic bouquet of rancid peanut butter, rotting spinach, blue cheese or sawdust!

Then the harlequin moves into your house, forming large, unwanted overwintering aggregations.



Adult harlequin feeding on an aphid



Late-instar larva of the harlequin lady beetle

Handling them may lead to them secreting a noxious fluid which may stain walls and fabric. And—injury upon insult—the harlequin can be bad for your health!

These untoward habits have not realised in South Africa yet, but there is every reason to expect the harlequin to display its bad manners also here. The harlequin is spreading at an alarming pace throughout many parts of the World, mostly unaided by deliberate human action. Also in South Africa it is spreading rapidly. Within months of the first consignment in 2006, the SANC received harlequins from the vicinity of Grahamstown in the Eastern Cape.

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## *Alien invasive predator spreading*

Reports of its presence in the eastern Free State started in May 2007; in November 2007 it was found in numbers in the KwaZulu-Natal Midlands; and in Gauteng the first specimens were discovered in January 2008. It is anticipated that this beetle will invade much of South Africa and beyond, in a short space of time.

It appears if the local populations of the harlequin are mostly still small, and at some collecting localities the species might not yet actually have established ... yet.

There is international interest in this phenomenon, and the harlequin is seen as a 'model species' of invasion biology and of biocontrol that went crooked. At the forthcoming International Congress of Entomology (Durban, July 2008) a whole symposium will be dedicated to this nasty beast.



The extremes of colour variation in adult harlequin lady beetles

**Recognising the harlequin:** The harlequin lady beetle is extremely variable in colouration, but it can readily be distinguished from other lady beetles in South Africa. Adults (Figs 1, 2) 5–8 mm long and 4–6.5 mm wide. The body is strongly convex, subcircular in outline, glossy and hairless. The ground colour of the upper side ranges from yellow through orange to red, with zero to 19 black spots (Figs 1, 2). The lateral surfaces of the pronotum bear yellowish-white oval areas (top arrows on Figs 1, 2). A transverse ridge is usually present above the elytral apices (bottom arrows on Figs 1, 2). This combination of characters does not occur in other South African lady beetles. Black forms of the harlequin are known from other parts of the World, but these have not yet been seen in South Africa.

## How YOU can help

The arrival of the harlequin in South Africa presents an uncommon opportunity to study the pattern of a biological invasion virtually from the start. Ideally, a structured survey of the spread of the harlequin through South Africa should be launched, but a pervasive lack of manpower rules that out. Instead, citizen science can be mobilised: anybody finding, anywhere in Africa, any number of harlequin lady beetles—or lady beetles suspected to be the harlequin—is urged to collect the beetles and contact Riaan Stals at the South African National Collection of Insects [contact details below]. Just collect the beetles in a clean vial and pop them into the freezer. Arrangements will be made when you contact Riaan Stals. Clear photographs are also very welcome.

## FUTHER READING

**KOCH R.L.** 2003. The multicolored Asian lady beetle, *Harmonia axyridis*: a review of its biology, uses in biological control, and non-target impacts. *Journal of Insect Science* 3:32: 1–16.

**STALS R & PRINSLOO G.L.** 2007. Discovery of an alien invasive, predatory insect in South Africa: the multicoloured Asian ladybird beetle, *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae). *South African Journal of Science* 103(3-4): 123–126.

**Contact: Riaan Stals at [StalsR@arc.agric.za](mailto:StalsR@arc.agric.za)**

## *The African Arachnida Database (AFRAD) live!*

The final stage of the African Arachnida Database is now live on the ARC web site. This on-line database will eventually contain information on >6000 arachnid species of Africa. Factsheets on each family, genus and species will be available containing information on morphology, behaviour, distribution, genera and species. Different levels are richly illustrated with photographs and drawings. We hope this database will help to alleviate taxonomic shortcomings. Researchers and students would be able to sit in their offices and have images of families, genera and species immediately on hand. This database is coordinated by the Spider Unit at ARC-PPRI and Dr Rudy Jocqué of the Koninklijk Museum voor Midden-Afrika in Tervuren, Belgium.

This database will eventually contain information on all the spiders, scorpions, solifugae, opiliones, amblypygi, pseudoscorpiones, palpigradi and schizomids. Presently the Acari (mites and ticks) are not included. The main focus is currently on the spiders and scorpions.

The database was developed by the ICT system development team at Central Office. The main role players were Jenny Keytel and Louise Helberg. ARC-PPRI has a 19 year relationship with this team which is responsible for numerous databases at ARC-PPRI. Visit the ARC website at [www.arc.agric.za](http://www.arc.agric.za) click on quick link AFRAD—factsheets.

**Contact: Ansie Dippenaar-Schoeman at [DippenaarA@arc.agric.za](mailto:DippenaarA@arc.agric.za)**



The AFRAD team: Louise Helberg (back) Ansie Dippenaar-Schoeman (left) and Jenny Keytel (in front)

## BEST WISHES

Jenny Keytel is taking early retirement and leaving ARC at the end of March. Louise and she have been involved in developing database systems at PPRI for 19 years. Jenny was instrumental in the whole AFRAD database going live so soon. She is also Ms RIS. PPRI wishes her well!

## *Biosystematics Division*

### *Undertaking taxonomic research in Europe on bees*

During February 2008, Dr. Connal Eardley visited several museums in Europe (the Royal Belgian Institute for Natural Sciences, Brussels; Royal Museum for Central Africa, Tervuren; The Natural History Museum, London; and the Museum National d'Histoire Naturelle, Paris). The purpose of the trip was to facilitate a taxonomic revision of the southern African leaf cutter bees. These bees are particularly important in the pollination of crops, mostly performing their services without farmers being aware of their good deeds. Some leaf cutter bees are successfully managed abroad for pollination of crops. Bees, in general, are very sensitive to disturbance of their habitat, and some land use changes lead directly to their local extinctions. Thus bee biodiversity conservation has become a global concern. Taxonomy is essential for proper bee conservation and management.

Visits to museums are essential for taxonomic research, because they enable:

- the study of the correct type material. Specimens received on loans are often not the best material for research.
- the study of material of southern African species that occur in other countries, to facilitate accurate descriptions.
- the study of material of southern African species found in other countries, to determine the valid name of each species.
- the study of material of related species that do not occur in southern Africa, to facilitate accurate description and naming.
- greatly increase productivity. Museums will normally lend only about six types per consignment, and much more material than this can be studied in one day at the museum.

Visiting the museums will result in this revision being published more than a year earlier than it would have been without the visit. The trip was paid for by the Belgian Focal Point of the Global Taxonomy Initiative, and they are thanked for their support.

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A leaf cutter bee that cannot be identified, because the taxonomic revision is not yet complete

### *Molecular research in solitary bees*

The bee genus *Fidelia* (Megachilidae: Fideliinae: Fideliini) is endemic to Africa and its closest relative, *Neofidelia*, is endemic to South America. Twelve species of *Fidelia* occur in southern Africa (South Africa, Namibia and Botswana) and one occurs in Morocco. *Neofidelia* has two species.

Professor Bryan Danforth and his student, Jessica Litman, both from Cornell University, U.S.A., were recently awarded a National Geographic Society grant to study the molecular taxonomy of this tribe of bees, which is closely related to the leaf cutter bees, and has a relictual distribution, to give us a better understanding of their: identity; higher classification and evolution.

Dr Connal Eardley will help them with field work in South Africa. Bryan Danforth and Connal have a fairly long record of scientific collaboration.

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After a long day in the field, work does not stop for Professor Bryan Danforth

### *Southern African Invertebrate Art Exhibition*

An art exhibition with a difference was recently opened at "Little Brenthurst" in Johannesburg, home of Nicky and Strilli Oppenheimer. The idea of a 'Southern African Invertebrate Art Exhibition' was conceived by Mrs Oppenheimer. She saw it as a prelude to the International Congress of Entomology 2008, being held in Durban in July, entertaining the hope that it would generate interest amongst the general public regarding the threat to the diversity, uniqueness and beauty of invertebrate life in South Africa. The exhibition will also be on show at the International Congress of Entomology.

Gerhard Prinsloo, Elmé Breytenbach, Riaan Stals, Elizabeth Kassimatis and Beth Grobbelaar attended the opening, at which a talk on 'The effects of electromagnetic devices on insects' was presented by Dr Max Clarke. This was based on research conducted for Mrs Oppenheimer by himself and Mr Peter Hawkes.

## Biosystematics Division (continued)

### Southern African Invertebrate Art Exhibition (cont.)

Other evening talks linked to the exhibition included: **Dung Beetles** (Prof. Clarke Scholtz); **Spiders** (Prof. Ansie Dippenaar-Schoeman); **Dragonflies and Damselflies** (Dr Warwick Tarboton); **Butterflies** (Mr Peter Roos & Mr Graham Henning, 10<sup>th</sup> April 2008); and **African Story Telling** (24<sup>th</sup> April 2008).

A large number of original insect and spider illustrations from the ARC-Plant Protection Research Institute's Biosystematics Division are currently on exhibit. These include works by Victor Branco, Gowan Creswell Coningsby Clark, Beth Grobbelaar, Marita Johnson, J. Loedolff, D. Ogilvie, Carla A. Schoeman, Susan Schwartz (Thomson), Elsa van Niekerk, and Anthony J. Watsham, many of whom were employed as graphic artists by the ARC-PPRI over the years. Ceramics, carvings, beaded wire work and sculptures are also on exhibit, as well as two of Walter Oltmann's exceptional wire creations.

The exhibition has already drawn considerable media coverage, thereby promoting insect awareness, illustrative art and conservation. It runs until the end of April and bookings to visit the exhibition or attend the remaining evening talks can be made through the Brenthurst office:

Tel: +27 (0)11 646 4122, Fax: +27 (0)11 646 1529, e-mail: [the-garden@brenthurstgardens.co.za](mailto:the-garden@brenthurstgardens.co.za)

**Contact: Beth Grobbelaar at [GrobbelaarB@arc.agric.za](mailto:GrobbelaarB@arc.agric.za)**



Mrs Strilli Oppenheimer and Beth Grobbelaar



Mrs Elmé Breytenbach with some of the art



Insect spiral from ARC-PPRI

### Oppenheimer's supporting spider research

Dr Ansie Dippenaar-Schoeman presented one of the specialist talks at "Little Brenthurst". The talk "Why are spiders so unique" or "Why are spiders more intelligent than insects" was very well received and attended by >60 people. The Spider Unit at ARC-PPRI has a long research relationship with the Oppenheimers. Support includes permission for SANSA surveys in their reserves such as Tswalu and Enzemvelo Game Reserves. The unit has participated in previous specialist talks that were presented at Enzemvelo Nature reserve over weekends. Other support includes sponsoring a new book on the "Spiders of the Kalahari" that is in preparation and will be in printed later this year.

At the talk at "Little Brenthurst" a new poster was launched "the magnificent eight spiders of Africa." The production costs of this poster will be provided by the Oppenheimer's to enable the Spider Educare programme of ARC-PPRI to distribute it to schools and other interested parties.

This beautiful poster designed by Elsa van Niekerk and Ansie Dippenaar-Schoeman, will be available in April 2008.



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## *Biosystematics Division (continued)*

### *9th African Arachnological Colloquium*

ARC-PPRI and the University of Venda organized the 9th African Arachnological Colloquium held from 2-8 February at Lajuma in the Soutpansberg. At this meetings research on arachnids (non-acari) in Africa was presented. This year's meeting was attended by >30 people from Africa as well as visitors from Belgium, USA, South America, Germany and Switzerland.

The ARC-PPRI contingent comprised: Ansie Dippenaar-Schoeman, Elizabeth Kassimatis, Sma Mathebula and Petro Marais. Between the four of them 13 papers and posters were presented (see page18). Two of the posters designed by Elsa van Niekerk won the first and second prize for best poster at the meeting.

At the meeting the second workshop of the South African National Survey of Arachnida (SANSA) was also held. Research results were discussed as well as future plans.

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Delegates of the 9th African Arachnological Colloquium

A demonstration of canopy-fogging was also given by the Belgium team under leadership of Dr Rudy Jocqué.

## *ARC-PPRI taxonomists attend workshop presented by two giants of phylogenetic systematics*

Riaan Stals and Charnie Craemer, beetle and plant-feeding mite specialists respectively of the ARC-PPRI Biosystematics Division, attended a workshop on the theory and practice of phylogenetics in February 2008. This workshop was held at the University of Cape Town and convened by Prof. Tim Crowe, well-known South African phylogenetics researcher and bird specialist. The workshop was presented by two incontestable giants of phylogenetics research, Drs Steve Farris (Sweden) and Pablo Goloboff (Argentina).

Taxonomy, or systematics, has in recent times grown to be a vibrant and dynamic scientific field that combines intimate knowledge of study organisms with high-tech research techniques. Cutting-edge taxonomic research very much revolves around what is called phylogenetic systematics (= phylogenetics), also called cladistics. The rationale behind phylogenetics is the grouping of organisms strictly based on their real genealogical and evolutionary relationships, which are then summarised in what is called a phylogeny. Phylogenies, which loosely can be considered classifications based upon cladistic analysis, are testable hypotheses that approach the "true" classification of organisms. Since evolution happened only once, there is only one classification scheme which is "correct". Before the advent of phylogenetics there was no objective and testable way to construct classifications, and very many pre-cladistic classifications have in recent years been shown to be woefully erroneous. Classifications, at whatever level, are one of the essential products of taxonomic research, and underlies biological investigations of any kind. One of many additional benefits of phylogenies is that they allow predictions about organism traits as yet unknown.

Phylogenetic analysis requires some serious mathe-

atics, which is—fortunately—packaged in a number of computer programmes. Recently an exciting new cladistics programme called TNT (Tree Analysis Using New Technology) was created by Drs Goloboff, Farris and Kevin Nixon (USA). TNT includes several new inventions, including very fast algorithms that make the analysis of large and complex data sets possible, providing optimal hypotheses in reasonable time. With TNT it has now also become possible to analyse continuous characters (like measurements) together with more traditional morphological information and molecular data.

Riaan and Charnie agree that this was one of the most intensive and educational—exhausting but enjoyable—workshops they ever attended. It was a privilege to be tutored by two of the world's foremost experts in this field. The workshop was in large part funded by the South African Biodiversity Initiative (SABI).

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Pablo Goloboff, Riaan Stals, Steve Farris, Charnie Craemer and Tim Crowe in lighter mood after the phylogenetics workshop in Cape Town

## Biosystematics Division (continued)

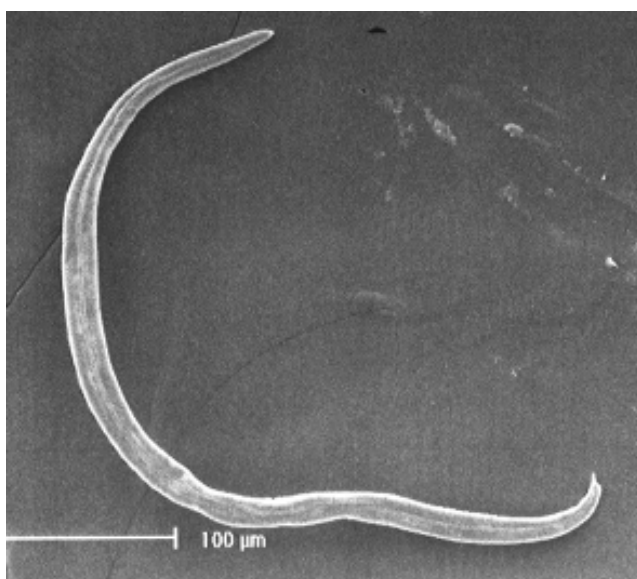
### *Helicotylenchus a nematode genus to be reckoned with*

*Helicotylenchus* is a cosmopolitan genus of nematodes that can survive in a variety of habitats. During a nematode study of wetlands in the midlands of KwaZulu-Natal, six *Helicotylenchus* species were identified, i.e. *H. crenacauda*, *H. dihystra*, *H. indicus*, *H. imperialis*, *H. paraplatyurus* and *H. pseudorobustus*. In other parts of the world, *Helicotylenchus stylocercus* was recovered from soil found on the branches of trees in a rainforest in Costa Rica, while the first tylenchid reported from continental Antarctica was a *Helicotylenchus* species. *H. pseudorobustus* was reported from freshwater and *H. hydrophilus* has only been found in or near wet environments. A number of *Helicotylenchus* spp., i.e. *H. cavenessi*, *H. crenacauda*, *H. dihystra*, *H. erythrinae*, *H. microcephalus*, *H. mucronatus* and *H. multicinctus* have been reported from aquatic vascular plants. In contrast with these reports, *Helicotylenchus* spp. have also been found in areas with a mean annual rainfall of less than 100 mm (South African Plant-Parasitic Nematode Survey database). *Helicotylenchus* is capable of anhydrobiosis and can survive up to eight months in this dormant state. No particular soil type is preferred and species have been found in soils with pH-values of 3.3 to 10.6 and with clay and sand percentages of up to 66 % and 100 % respectively (South African Plant-Parasitic Nematode Survey database).

Several *Helicotylenchus* spp. are of economic importance. Plant-parasitic nematodes, particularly the genera *Helicotylenchus*, *Paratrichodorus* and probably also *Hemicycliophora* and *Xiphinema*, could be a problem in bent grass on golf course putting greens in South Africa. *Helicotylenchus* causes poor growth, yellowing and thinning of turf, poorly developed roots and premature sloughing of cortical tissues. Infestations of *H. dihystra* are linked with poor quality bowling greens in Australia, and reduction of leaf size and plant height of guava seedlings in South Africa.

High population numbers of *H. indicus* cause stunting of sugarcane under experimental conditions. *H. multicinctus* affects banana growth and yield because of damage to the root system and rhizome and this nematode is a serious pest of banana worldwide. Secondary infection by fungi enhances the process of root necrosis and aggravates root decay

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*Helicotylenchus stylocercus* female habitus

### *Virtual Museum a great success*

The virtual museum is growing rapidly and the images produced by 58 photographers have already been entered into the database totalling **250 entries (about 500 images)**, while **>100 are still waiting to be entered.**

Visit the site [www.arc.agric.za](http://www.arc.agric.za) (quick link SANSA, virtual museum). Presently you will be able to search by photographer or common name and species name of spider. We hope to improve the website's capabilities in 2008 so that a search can be undertaken on the families and genera as well.

Not all spiders can be identified to species level due to the importance of the genitalia in species identification, but with the more common species a specific identification can be given.

Many photographers capture the spider specimens in order to confirm the species identification, especially when it is a rare specimen. We make use of a team of experts to help with the identifications, and frequently we receive the answer "possibly new genus and species" from the specialists, so those specimens will be very important to collect for descriptive purposes.

**For more information or sending your photographs, contact Ansie Dippenaar-Schoeman at [DippenaarA@arc.agric.za](mailto:DippenaarA@arc.agric.za)**



*Araneus legonensis* was originally described from Ghana in West Africa, but as part of SANSA surveys was collected on the Soutpansberg in the Limpopo Province, and at Helsing and Hilton in KwaZulu-Natal



John Roff photographed this interesting spider at Hilton in KwaZulu-Natal. The markings on the abdomen are very unusual, and when the spider is in its retreat it resembles the eye patterns of certain salticid genera (e.g. *Thyene*)

## Pesticide Science Division

### Impact of Redbilled Quelea control operations on wetlands in South Africa

#### Redbilled Quelea – an agriculturally important migratory bird pest

For those who are not familiar with Redbilled Quelea (*Quelea quelea* sp.) (Fig. 1), this bird species is an agriculturally important migratory pest to small grain crop-producing farmers of southern Africa comprising South Africa, Zimbabwe, Botswana, Mozambique and other neighbouring Southern African Development Community (SADC) countries. Redbilled quelea are highly nomadic, with complex migration patterns in southern Africa that are dictated by changes in seed availability which, in turn, are driven by changes in rainfall patterns. They are extremely sociable birds, and feed, drink, roost, and breed in large flocks. The quelea found in southern Africa reach plague proportions in agricultural crop areas<sup>1</sup> at certain seasons and can have severe economic impacts by causing extensive damage to food crops such as wheat, sorghum, manna, and millet. The feeding behaviour of the large flocks of Redbilled Quelea birds can result in significant crop losses to commercial and subsistence small grain farmers and severely affect food security.



Redbilled Quelea, ♂ (Photo: South African Department of Agriculture)

#### South African legislation

The policy for managing the Redbilled Quelea problem was established in 1994 under Act 36 of 1983. The South African Department of Agriculture, via its Directorate: Land Use and Soil Management (DoA: DLUSM) enforces this Act, and is therefore responsible for providing the required infrastructure and expertise to manage quelea control operations efficiently, implement monitoring systems, collect, collate, and store data, and facilitate and fund research. Quelea control in South Africa is only undertaken against those population densities identified as posing an imminent and substantial threat to crops. Special measures must be taken to ensure that quelea control has a minimal impact on sensitive ecosystems e.g. wetlands, as well as the number of non-target species at risk during control operations.

#### Redbilled Quelea control operations

Habitats preferred by quelea, whether for breeding or roosting, include natural areas such as reeds, shrubs, and thorny acacia trees. Such areas thus provide a relatively stationary concentration of Quelea, presenting the best opportunity for control, which is usually undertaken after sunset.

Quelea control is undertaken for crop protection. Although various alternative methods of quelea control have been investigated in South Africa, the most successful methods remain (a) chemical control by aerial application of an organophosphate avicide (terrestrial habitat), and (b) ground-based fuel-air explosion control (terrestrial and aquatic habitat).



Layout for ground-based fuel-air explosion control in a wetland area: 20-litre plastic drums containing fuel are spaced at 7–10 m intervals depending on the density of the foliage of the roosting and/or breeding site. Individual drums are connected with detonation cord, and the fuel is detonated using boosters and detonation fuses (Photo: Riaan Robbeson)

#### Why make such a big fuss about Redbilled Quelea control in wetlands?

Current research results indicate that quelea explosion control operations in wetland habitats should be treated with circumspection and should not only be performed in accordance with Act 36 of 1983, but also in accordance with the relevant sections of the South African National Water Act (NWA, Act no. 36 of 1998). The NWA mandates the control of land-based activities which may pollute water sources. It governs the protection of aquatic and associated ecosystems and their biodiversity in reducing and preventing pollution (defined as any alteration that renders the water less fit for use, or harmful, or potentially harmful), and degradation of water sources.

## *Pesticide Science Division*

### *Impact of Redbilled Quelea control (cont.)*

#### **Why make such a big fuss about Redbilled Quelea control in wetlands? (cont)**

In South Africa, many wetlands are only temporary seasonal features of the landscape, and may undergo change, and eventually disappear. Other wetlands may become significant at certain times of the year for migratory birds which exploit these seasonally available resources. The building of farm dams and the location of cultivated land in close proximity to rivers and environmentally sensitive areas, such as wetlands, has not only increased the number of drinking points, but also provided ideal quelea roosting and breeding sites. The Redbilled Quelea, which breeds and roosts in reedbeds in wetland areas, annually causes extensive damage to the small grain crops cultivated nearby. Although control of Redbilled Quelea using ground-based fuel-air explosions in wetlands is the standard method used by the Department of Agriculture in South Africa, ongoing research is being undertaken to monitor the impact and recovery of wetlands following fuel-air explosions of wetland systems.

A multi-disciplinary task team was established to investigate the possible biological and ecological impacts to amphibians, birds, terrestrial and aquatic invertebrates, small mammals, and vegetation, and to assess the impact on, and recovery of, the wetland system following ground-based fuel-air explosion control.

#### **Impact of fuel-air explosions on wetlands and non-target organisms**

The results obtained from the pre- and post-quelea explosion control impact assessments, indicate that species which are closely associated with the water habitat and surrounding areas are likely to suffer the highest impact from these explosion control activities.

Although incidental mortality of non-target animals may occur as a result of the explosion operation, results of the long-term effects indicate that the wetland ecosystems were still productive after the explosion control operations. This was evidenced by increased butterfly species richness and abundance that occurred three months after the control operations took place. Results also suggest that long-term effects of explosion control actions on anuran and butterfly populations were insignificant.

#### **Good news for future explosion control operations in wetlands**

The good news is that the Pesticide Science Division of the Agricultural Research Council, in collaboration with the Department of Agriculture and various other Governmental organizations, are designing a Wetland Geo-processing model. This model will be a Geographic Information System (GIS)-based decision information support system which incorporates various variables such as the climatological conditions (seasonal effects), the potential destruction of the wetland vegetation, wetland delineation, legislation, management and rehabilitation, the pollution of the water and soil, the presence of Red Data Book species, the utilization of the wetland by Palaearctic and intra-African migratory birds and waterfowl species, the value of the wetland for feeding, roosting, breeding and refugia, and the value of the wetland as faunal habitat. These are all factors that need to be considered when undertaking a quelea explosion control operation in wetland areas, and the model will assist the user to make informed decisions about pending explosion quelea control actions in wetland ecosystems.

Environmentally acceptable alternative control measures, e.g. relocating the quelea and non-target bird species, or mechanical control of the

reedbeds will also be considered as part of wetland quelea control operations.

#### **Acknowledgments**

We gratefully acknowledge the financial support provided by the Agricultural Research Council and Department of Agriculture. Special thanks go to the Principal Investigators and Team Members for their dedication and commitment to this research project, and to the Quelea Resource Conservation Officers for assisting with site access and collaboration on quelea information.

References:<sup>1</sup> Maclean, G.L. (1993) *Roberts' Birds of Southern Africa*. John Voelcker Bird Book Fund, Cape Town.

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### *Workshop in Swaziland*

A training workshop on radio telemetry and spooling was held on 3 and 4 March 2008 at the University of Swaziland in Mbabane. The workshop was attended by Phaniel Malebana (ARC-PPRI), two members from Namibia and five from Swaziland. These three countries together with Tanzania, are collaborators in an ICART/CRAFT-funded project "ECORAT", with the aim to develop ecologically-based rodent management for the Southern African region.

The purpose of the radio tracking study is to establish the degree to which pest rodent species come into contact with areas of human settlement, with the objectives to:

- Determine whether rats change their movement patterns in relation to food availability (in particular crops), thereby assessing habitat utilization and overlapping resource uses between rodents and humans. Tracking is therefore done at three stages i.e. before planting, at pre-harvest and at post-harvest.
- Determine the dynamics between sylvatic (wild) and commensal rodent species in small-scale agricultural communities

Training started with a demonstration on the calibration and operation of the tracking instrument (receiver and transmitter). The radio-tracking equipment needs to be calibrated so that the recorder can estimate correctly the distance to the transmitter that is attached to the rat. Since distances are usually short when tracking rodents, triangulation is neither necessary nor accurate.



Transmitter



## Pesticide Science Division

### Workshop in Swaziland (cont.)

Calibration involves placing the transmitter at a specific location and measuring the strength of the signal. This is accomplished by placing the transmitter in the open on the ground, which is where the rat will be most of the time. The gain on the receiver is set to maximum (99 on the Biotrack "Sika") and then the individual walks away exactly 10 m and records the strength of the signal (with the "yagi" antenna attached). The procedure is repeated at 20 m, 30 m, 50 m and 100 m. Then the gain is set to 75 and the exercise repeated, and finally the same is done at a gain of 60 m. If this process is followed properly, the distance from the individual to the rat can be estimated correctly just by measuring the strength of the signal at a known gain.



Receiver

Transmitters were made available for the study and each was tested for its unique frequency, before fitting it to the rodent. The transmitter looks like a collar (cable tie) that is tightened around the neck. This collar must be tight enough so that it cannot slide off over the ears, but not too tight that it affects the rat's respiration. If the transmitter has an antenna, it must face towards the tail of the animal.

Over a period of two nights, 6 multimammate rats (*Mastomys natalensis*) were caught in maize fields close to human dwellings, and each were fitted with a transmitter collar and released at the capture site. During the first 24 hr, the movement of tagged rodents ranged between 20 m and 100 m, and 2 rats were only 5 m away from human dwellings.

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Antenna



Part of the rodent team in the field

## Newsflashes

### ***E Sandmann re-appointed to UN FAO/WHO Expert Panel for Joint Meeting on Pesticide Specifications (JMPS)***

#### **According to the FAO:**

"The Director-General of the Food and Agriculture Organization of the United Nations" has finalized "the composition of the FAO/WHO Joint Meeting on Pesticide Specifications (JMPS), which was established by the Director-General following the Memorandum of Understanding of 5 December 2000 between FAO and WHO."

Dr E Sandmann was re-appointed as part of the membership of this Panel. The FAO continues: "These experts have been selected on the basis of their specialized knowledge for the purpose of giving independent scientific advice on all matters pertaining to pesticide specifications. They will serve in their personal capacities, and not as representatives of their governments or organization, for a four year term of office up to 31 December 2011."

### ***Appointment of staff to the Pesticide Analytical Laboratory***

The Laboratory has been given the green light to proceed with obtaining a pesticide analyst to replace Refilwe Mnisi who left PPRI for the greener pastures at the SABS. The Laboratory is faced with a high demand of analytical work, and staff are currently stretched at maximum capacity, with much work from potential clients having to be turned away.

Application for the appointment of a Laboratory Manager will soon be submitted to Senior ARC Management for their consideration.

## Weeds Research Division

### *New weed biocontrol quarantine facility opens at Cedara*

Early in 2005, an Invasive Alien Species Programme (IASP) was initiated within the KZN Department of Agriculture and Environmental Affairs (DAEA), based at the Department's head office at Cedara outside Pietermaritzburg. One of the initiatives undertaken by the new unit was to fund the building of a quarantine facility on Cedara, to house insects and pathogens from other countries under consideration as potential biocontrol agents of invasive alien plant species being researched by the Agricultural Research Council. Although the ARC already had some quarantine laboratory space at its Cedara unit, this was small and inadequate.

The ARC unit at Cedara found itself in the privileged position of being able to design its own ideal laboratory and having the budget to translate it into reality. In consultation with weed biocontrollers from other parts of South Africa, as well as those in other parts of the world with recent experience of building weed quarantine facilities, the Cedara weed biocontrollers came up with a draft design. We were also fortunate to make contact with a talented and committed architect and other building experts, who converted our ideas into a building plan and bill of quantities. Departmental permission was obtained during 2006 for erecting the designed building.

Work started late in 2006 and was largely completed by late 2007. The Directorate: Plant Health of the Department of Agriculture inspected the building and granted ARC a quarantine permit early in 2008. The building was equipped and the first insects were moved in during late February 2008. The final cost of the entire building project has been around R8.4 million.



Cedara quarantine facility under construction

The building has a total floor area of 20 x 30 m, most of which falls within quarantine. The quarantine area consists of four north-facing glasshouse rooms, two of 8 x 8 m and two of 8 x 4 m, for culturing and testing insects within cages, on potted plants. Within the glasshouse space there is also a small room for spraying plants with pesticides, and a holding room for keeping these plants until the pesticides have taken effect. The entire glasshouse area is protected by double glazed (to minimize the chances of escape of insects, as well as for better insulation), non-laminated (to minimize the exclusion of any wavelengths of light which might be needed by plants and insects for growth and development or mating cues respectively) glass in a steel and aluminium frame. Humidity is increased to around 70% RH in the glasshouse rooms via high-pressure nozzles mounted in the glasshouse, which introduce atomized, de-ionized water. The temperature of each glasshouse can be individually set, and varies on a 24 hour day-night cycle between 20 and 30°C.



The new, state-of-the-art quarantine facility at Cedara

Each glasshouse room leads onto a small service laboratory for processing material. A common passage links these laboratories to the quarantine exit and other service rooms.

These consist of: (i) a large storage and washing area, (ii) a controlled environment (CE) room for keeping insects during those developmental stages (eggs, pupae) in which they do not require food, in Petri dishes and containers on shelves under growth lights and (iii) a walk-in cold room for storage of live plant and insect material on a short-term basis. Although the external walls of the building are standard brick-and-mortar, internal walls and the ceiling are constructed using Rudnev™ paneling, which consists of expanded polystyrene sandwiched between two sheets of aluminium. This system allows for good sealing (for quarantine purposes), is well insulated, and surfaces are easy to clean. Temperature and humidity in the glasshouse rooms and CE room, and temperature in the service areas, are controlled through a central computerized system which is accessed through a central personal computer.

A number of features, as well as procedures, ensure that the chance of insects escaping quarantine is acceptably small. Physical design features include (i) two sequential black baffles with blue trap lights at the entrance to quarantine, (ii) a negative air pressure system, with a net air flow into the facility, and all air removed from the system flowing through a triple filter which includes a HEPA filter, (iii) physical and chlorine traps through which all grey water from the facility flows and (iv) a service area for many of the systems (lighting, air conditioning) in the ceiling of the facility, allowing access for maintenance without entering quarantine.

In order for quarantine to be effective, procedures for personnel and materials moving into and out of the facility are just as important as design features. Personnel entering quarantine are required to remove their outer clothing and don a quarantine suit, in changing rooms which lead from the inner baffle room. On exiting quarantine, personnel remove the quarantine suit and shower, before putting on their non-quarantine clothes again. All plant material enters quarantine through the double baffle. Before any materials or equipment leave quarantine however, they are subjected to one or more of several methods to kill any insects that may be on them: freezing, autoclaving and pesticides. All material then leaves through an exit chamber in the holding room.

The building has five offices outside the quarantine area, to accommodate personnel working in the quarantine section. These include some of the four new staff members whose salaries the IASP is funding, in order to increase research capacity for weed biocontrol. Finally, a large generator and water tank ensure a constant supply of power and water to the facility, critically important for glasshouses which rapidly overheat to lethal temperatures in the ab-

## Weeds Research Division (continued)

sence of cooling, and containing large numbers of potted plants.

Current biocontrol projects at ARC Cedara include those on chromolaena (*Chromolaena odorata*), parthenium (*Parthenium hysterophorus*) and pompom weed (*Campuloclinium macrocephalum*). Much of this work will be transferred to the new facility within the next two months. However, certain low-risk species, or species that have already been tested and approved for release, will remain in the old glasshouse and laboratory facilities.

With the completion of this state-of-the-art quarantine facility and the appointment of several young, motivated personnel, the research output on weed biocontrol at Cedara is set to increase substantially.

We thank Dr Guy Preston (*Working for Water* programme) and Dr Jabulani Mjwara, the late Tony Poulter, and Ms Nonhlanhla Mkhize (all KZN DAEA), for initiating and funding this initiative over the past three years. We hope that in years to come, the KZN DAEA will consider that they have made a worthwhile investment in biocontrol research in the province.

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Ayanda Nzimande examining a chromolaena plant in quarantine, wearing the obligatory quarantine suit

### *Climbing asparagus* (*Asparagus scandens*)

#### **Consultancy for New Zealand: Survey for pathogens of climbing asparagus as potential biological control agents**

*Asparagus scandens* (family Asparagaceae), indigenous to South Africa, has become an invasive weed in New Zealand. It is a scrambling or climbing perennial with small, white, tuberous roots. It is easily recognised by its bright green leaves and stems 2-4 m long. Instead of true leaves the plant has tiny, flat cladodes that are very leaf-like. Small, white, inconspicuous flowers usually appear from September to December. Between October and February, depending on the climate, lots of small round fruits ripen.

*Asparagus scandens* inhabits the floor or sub-canopy of forests. In New Zealand, once it has established, it smothers areas of native vegetation by preventing their growth and regeneration. With its climbing ability it can wrap itself around trunks of shrubs and trees and can even strangle and kill soft-barked shrubs. Characteristics that contribute to this plant's weedy nature are its fruit, which birds eat and widely disperse, and long-lived, resprouting tubers. Tubers or fragments of tubers, remaining in the ground, will often resprout, even if the rest of the plant is removed.

Current control methods in New Zealand consist of manual and chemical control. Manual control involves digging up the whole plant, including the tubers, which makes it very labour intensive and also very difficult, as it is virtually impossible to avoid leaving some tuber fragments in the ground avoid herbicide application on non-target plants, as well as the inaccessibility of areas, especially dense forests, and the need for follow-up treatments. Chemical control is therefore labour intensive, costly and time consuming.



Long stems and leaf-like cladodes of *Asparagus scandens* (above), and *A. scandens* invading a forest in New Zealand (below)



The PPRI weed pathology unit is currently undertaking a consultancy for Landcare Research New Zealand Ltd., aimed at assisting with surveys for potential pathogens of climbing asparagus in South Africa. This survey is being done in collaboration with C.A. Kleinjan, Zoology Department, University of Cape Town, who has conducted a survey for potential insect agents.

Various sites were visited where diseased cladodes, stems and branchlets were collected. Disease symptoms included purple discoloration of cladodes associated with stem lesions, black to brown stem lesions, cladodes with veinal necrosis, rusty stippling on clad-

## *Weeds Research Division (continued)*

odes, tip and edge dieback of cladodes and brown necrosis at the base of the cladodes.

Several fungi were isolated from the diseased material, and a *Colletotrichum* sp. was consistently isolated from all the sites. *Colletotrichum* species are well known pathogens and several forms have been used as weed biocontrol agents. Future studies will involve conducting Koch's Postulate in order to determine which of the fungi isolated are potential natural enemies. Preliminary host specificity studies will also be conducted to ensure that any potential biocontrol candidate is not a pathogen of commercial Asparagus in New Zealand.

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Disease symptoms including purple discoloration of cladodes, black to brown stem lesions, cladodes with veinal necrosis, rusty stippling on cladodes, tip and edge dieback of cladodes and brown necrosis at the base of the cladodes



### *Gall Rust for the Biological Control of Yellow Bells*

Yellow bells (*Tecoma stans*) is a medium sized tree from Central and South America. It is fast growing and produces large sprays of attractive yellow flowers, and was therefore a favoured garden plant in South Africa. It has now naturalized throughout much of South Africa and has emerged as an invasive alien weed in areas such as the Lowveld and the KwaZulu-Natal coast.

Host specificity testing of the yellow bells gall rust fungus (*Prosopidium transformans*) was completed during 2007,

and an application to the Department of Agriculture for permission to release this agent has been submitted. Currently an application to the Department of Environment Affairs and Tourism is also being prepared. This gall rust species proved to be highly host specific, which was an expected result as it was not observed on any of the close relatives of the target weed in its natural range.

The gall rust fungus infects young growing tissue (leaves, stems, flowers and seed pods), causing growth distortions on which the fungus produces large quantities of spores. This fungus does not occur throughout the natural range of the weed, but is limited to Mexico and the Caribbean. In this range it is very common on various biotypes of the plant and frequently appears to be destructive.

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Yellow bells, with its yellow, trumpet-shaped flowers and long seed pods



Yellow bells, invading between Lydenburg and Burgersfort in Mpumalanga



The symptoms caused by the gall rust

## Weeds Research Division (continued)

### Survey for natural enemies of Australian myrtle in Australia

There is always a possibility that if an alien invasive plant is successfully controlled it may simply open up a niche for other undesirable plants to fill. In areas in South Africa where Port Jackson (*Acacia saligna*) is being brought under control by an introduced gall-forming rust fungus, another alien plant, Australian myrtle (*Leptospermum laevigatum*), is rapidly replacing Port Jackson where the weeds occur together.

Australian myrtle is a shrub or small tree that dominates coastal heathlands and occasionally dry sclerophyll forest on sand dunes and coastal cliffs in Australia. The plant is one of several woody species introduced into South Africa in the early 1800s to stabilize drift sand on the Cape Flats in the Western Cape Province. This plant has subsequently become a serious environmental weed and is particularly invasive in the unique and endangered Cape Floristic Kingdom (fynbos).

The biological control programme against Australian myrtle in South Africa has largely been opportunistic and to date two agents have been released against this weed. The two agents were selected because of their relative abundance in the area surveyed and are a leaf-mining moth, *Parectopa thalassias*, and a bud-galling midge, *Dasineura* sp. Although the agents are contributing to the control of the weed, additional agents are required to bring the weed under successful biological control.

In February 2008 a survey trip to Australia was undertaken by Tony Gordon and Liesl Smith to look for new potential biological control agents for Australian myrtle. Australian myrtle infestations along the coast were sampled for potential biocontrol agents from Toukley (approximately 100km north of Sydney) to Appollo Bay (approximately 180km west of Melbourne).

An exciting observation was that plants growing on the sand dunes at Brighton-Le-Sands near Sydney were heavily damaged by a gall-forming scale insect, tentatively identified as *Callococcus leptospermi* (Hemiptera: Eriococcidae). The galling results in spectacular die-back of stems, branches and, in extreme cases, the whole tree. First-instar females feed on maternal gall tissue and disperse from the gall as newly moulted second-instar nymphs which migrate to new galling sites on the branch. A total of 395 galls were collected and shipped to South Africa for rearing in quarantine. Any nymphs emerging from the galls will be collected and transferred to potted Australian myrtle plants in the quarantine glasshouse. This insect may be a potential biological control agent as all gallicolous coccoid species that induce covering galls, like *C. leptospermi*, are restricted to one host family and, typically, a single host genus.

A cecidomyiid midge that galls buds, forming large round galls, was also collected. The distribution of the midge is not continuous, but it was found at most of the sites visited. A total of 112 galls were collected and emerging adults will be placed on to potted plants in the quarantine glasshouse to start a lab culture. Specimens will also be sent to Australia for identification.

Another insect found at a number of sites was a scale insect, *Eriococcus leptospermi*, which is usually associated with black smut fungus causing an unsightly blackening of the foliage. From a distance, attacked trees look as if they have been blackened by a fire. This insect was not collected, as similar symptoms have been found on Australian myrtle trees and ornamental tea trees (*Leptospermum* sp.) in South Africa. This *E. leptospermi* was apparently described from insects ex *L. laevigatum* in Victoria. However, *E. leptospermi* in South Africa may be genetically variable and may not be the same as the one from *L. laevigatum* in Victoria.

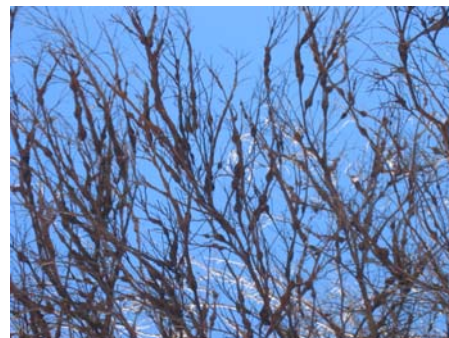
Although a gall-forming fly, *Fergusonina* sp., which is associated with a nematode, *Fergusobia* sp., was also found at a number of sites this insect was not collected due to the difficulties that may be experienced in culturing it in quarantine. A leaf-mining lepidopteran (moth) causing a blotch mine was also found at most sites but was very scarce and not damaging.

This project is funded by the Working for Water Programme and the Drakenstein Trust.

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Liesl Smith collecting galls on Australian myrtle in Australia



Tree heavily damaged by the gall-forming scale, *Callococcus leptospermi*



Large cecidomyiid galls on Australian myrtle

## Weeds Research Division (continued)

### SAPIA surveys and a nightmare of *Rubus* taxonomy

In January and February 2008, Lesley Henderson and Hildegard Klein undertook roadside surveys for the Southern African Plant Invaders Atlas (SAPIA) project in Mpumalanga. *Rubus* spp. are invasive in this region but closer inspection to determine the species proves to be very challenging and requiring an in-depth study all of its own.

Morphological and cytogenetic studies by taxonomists of the former Botanical Research Institute in the 1980s revealed that the genus *Rubus* in South Africa is a taxonomist's nightmare (Spies *et al* 1987). There are approximately five indigenous and seven alien *Rubus* spp., as well as several natural hybrids between indigenous species and between indigenous and alien species.

The natural hybrid between the American *Rubus cuneifolius* (Mpumalanga form) and indigenous *R. longepedunculatus* was named as *R. xproteus* by C.H. Stirton in the 1980s but it has never formally been described. The parent species are clearly separated morphologically, with a continuous bridge of morphological characters spanning the gap between them in the form of the very variable hybrid species *R. xproteus*. Subsequent backcrosses and intercrosses between the hybrid and the parent species has resulted in a continuously variable hybrid swarm which is centred in the Gras-kop/Sabie area of Mpumalanga.

The parent species of *R. xproteus* can be separated mainly on inflorescence length, petal length and colour, and whether the leaves on the primocane (first-year cane of vegetative growth/non-flowering) are pinnate or pinnate/palmate. Another alien species that may be mistaken for the hybrid is *R. fruticosus*, which usually can be distinguished by the combination of large petals and much-branched, very prickly inflorescences up to 200 mm long situated terminally (at the stem tips) (pers. comm. C.H. Stirton).



*Rubus xproteus* — an infestation between Machadodorp and Badplaas (above); pinnate/palmate leaves indicate that it is alien; short pink petals and non-prickly inflorescence distinguish it from *R. fruticosus*. These photos show just one combination of features exhibited by *R. xproteus*.



*R. fruticosus* - pink petals much longer than the sepals



Character	<i>R. cuneifolius</i>	<i>R. longepedunculatus</i>	<i>R. xproteus</i>	<i>R. fruticosus</i>
inflorescence length	short to medium	medium to long	short to long (variously prickly)	Long (much-branched, very prickly, terminal)
petal length	much longer than the sepals	± same length or shorter than sepals	longer than sepals to shorter than sepals	much longer than sepals
petal colour	usually white, rarely pink	pink	deep or pale pink or white	pink or white
primocane leaves	*pinnate/palmate (5 leaflets)	#pinnate (usually 7 leaflets)	pinnate/palmate (5–7–9 leaflets)	pinnate/palmate (5 leaflets)

\* pinnate/palmate: lower leaflets re-divided; # pinnate: leaflets in opposite pairs

#### Reference:

Spies, J.J., Stirton, C.H. & Du Plessis, H. 1987. The genus *Rubus* (Rosaceae) in South Africa. IV. Natural hybridization. *Bothalia* 17: 105–119.

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## Plant Pathology and Microbiology

### *Fumonisin, the hidden danger in stored grain*

Researchers from the ARC, Plant Research International, The Netherlands and collaborators from the South African Department of Agriculture, combined efforts and developed a tool for the quantitative detection of fumonisin-producing fungi in food and feed commodities. This work was recently published in the World Mycotoxin Journal under the title *Quantitative detection of Fusarium spp and its correlation with fumonisin content in maize from South African subsistence farmers.*

The quantitative PCR (TaqMan) technique, targets a conserved region in the polyketide synthase gene *fum1*, which is involved in the biosynthesis of fumonisin. Hence, this method specifically detected isolates from the fumonisin-producing species *Fusarium verticillioides*, *F. proliferatum*, *F. nygamai* and *F. globosum* whereas isolates of the fumonisin non-producing species *F. equiseti*, *F. graminearum*, *F. oxysporum*, *F. semitectum* and *F. subglutinans* that commonly occur on maize were not detected. Moreover, a few fumonisin non-producing *F. verticillioides* isolates did not generate any fluorescent signals and were therefore not detected. The correlation between quantitative PCR and mycotoxin content was determined using field samples collected at homestead farms in South Africa. Among 40 samples from the Eastern Cape collected in 2005 a good correlation ( $R^2=0.8303$ ) was found between pg fungal DNA and fumonisin content. A similar correlation ( $R^2=0.8658$ ) was found among 126 samples collected from four provinces in South Africa in 2007. These observations indicate that samples containing  $\geq 40$  pg fungal DNA/mg sample are suspected of also exceeding the 1 mg/kg total fumonisin level and therefore do not comply with the European Commission limit for fumonisins B<sub>1</sub>+B<sub>2</sub> for maize intended for direct human consumption that applies from 1 October 2007. Combined with the very high maize intake, our results indicate that fumonisin levels in maize from South African homesteads regularly exceed the tolerable daily intake for fumonisins.

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### *Oyster Mushroom Production takes-off in Greater Giyani Municipality*

As part of the Greater Giyani Natural Resource Development Programme, ARC-PPRI conducted advance training in oyster mushroom production to participants from Nhlankeni, Dzumeri, Homu and Section A falling under the Greater Giyani Municipality. Thirty three people aged between 18 and 70 participated in the training.

At the start of the 3-day training session a participatory rural appraisal (PRA) for each village was undertaken. Training in oyster mushroom production was both practical and theoretical. A full colour training manual was used which will be available to the general public early next year. The participants were also instructed on how to start a small business using training material developed by the International Labour Organization. Students from CIDA Universities conducted this training as part of their outreach programme. Each participant was also asked to draw-up a business plan.

From the PRA and the business plans submitted during training, a selection of potential oyster mushroom farmers was made. This process really helps the programme in selecting people and villages worthy for future investment.

Hygiene plays an important part in successful mushrooms production and the participants enjoyed the hygiene test which each had to conduct as part of the course. The proper cleaning of hands and working

surfaces was clearly illustrated.

The training session ended with certificate ceremony, as well as a singing composition between the villages which furthered cohesion between community members.

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### *New bacterial species identified*

Bacteria from the genus *Pantoea* have become increasingly important plant pathogens worldwide. In South Africa, they have been reported to cause diseases of three economically important crops, *Eucalyptus*, maize and onion. *Pantoea* strains inducing center rot of onion, which is a destructive disease in the USA, have only been found in onion seed in this country, and have not yet been associated with any disease outbreak. The taxonomic position of *Pantoea* isolates from onion has not been fully determined. Thirty strains isolated from onions in South Africa and the USA was subjected to a polyphasic examination that included phenotypic characterisation, analysis of the F-AFLP patterns, 16S rDNA and *gyrB* B genes sequences and DNA-DNA hybridisation.

Strains representing all *Pantoea* species namely *P. agglomerans*, *P. dispersa*, *P. citrea*, *P. punctata*, *P. terrea*, *P. ananatis* and *P. stewartii* were included in the study. The results revealed that the onion isolates belong to three different species within the genus. Majority of strains were identified as *P. ananatis*. The strain isolated in 1981 in South Africa, causing leaf and seed stalk necrosis was *P. agglomerans*. Nine strains from onion, however, generated genomic fingerprints that did not resemble that produced by any described *Pantoea* species, and formed a separate cluster in the F-AFLP dendrogram. The DNA-DNA hybridisation values among three strains of this cluster were between 90 and 100%, confirming that they belong to a single species. The most closely related type strain was *P. ananatis* with 44 to 57% DNA reassociation, below the 70% threshold allowed for species delineation. The name *Pantoea allii* sp. nov. is proposed for this species.

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Colonies of a new bacterial species, *Pantoea allii*, on a semi-selective medium PA20.

## Plant Pathology and Microbiology (continued)

### *Fusarium spp. associated with maize in Lusikisiki*

**Mudzuli Mavhunga** recently obtained her Bsc (Agric) Honours in Plant Pathology from the University of the Free State under the leadership of Prof N.W. McLaren and Dr. Susan H. Koch. In her study she addressed some etiological aspects regarding *Fusarium* spp. associated with maize in Lusikisiki.

The incidence of seed-borne *Fusarium* spp. and contamination of homegrown maize by their respective mycotoxins were determined in maize sampled from Hombe and Tshonya villages in the Lusikisiki district of the Eastern Cape Province. The most dominant species was *F. subglutinans*, followed by *F. verticillioides*. Very few *Aspergillus* spp., *Penicillium* spp. and *Alternaria* spp. were recorded. Under glasshouse conditions *F. subglutinans* caused severe disease symptoms whilst *F. verticillioides* induced leaf yellowing without severely damaging the seedlings.

Samples analyzed not only contained high levels of fumonisin B<sub>1</sub> (FB<sub>1</sub>), but also deoxynivalenol, zearalenone, aflatoxin B<sub>1</sub> and aflatoxin B<sub>2</sub>. In culture, on potato dextrose agar, *F. verticillioides* was the only species tested to produce high levels of FB<sub>1</sub>. On the other hand, *F. sp. cf equiseti*, *F. subglutinans*, *F. sp. 25622*, *F. verticillioides* and *F. nelsonii* produced significant levels of zearalenone and deoxynivalenol.

From this study it became apparent that more than one mycotoxin is often present in the same maize sample. Therefore, the effect of mycotoxin combinations on human and animal health must be evaluated.

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### *South Africa and Argentina bi-lateral agreement*

In May 2006 South Africa and Argentina signed a bi-lateral agreement to establish scientific collaboration between the two countries. Responding to this agreement scientists from the ARC and their counterpart in the *Instituto Nacional de Tecnología Agropecuaria* (INTA) from Argentina, held two workshops to develop cooperative projects between the two organizations. A number of delegates for INTA, an organization with 40 research stations, 260 extension units and number of experimental farms across Argentina visited various ARC Institutes.

The Plant Pathology and Microbiology group PPM had the privilege of hosting Dr Daniel A Ducasse, a virologist from INTA's *Institute of* a specialist in plant virology and plant / pathogen interaction at molecular level. Based on research and available expertise at the two Institutes, a number of broad collaborative areas were identified. INTA indicated an interest in PPM's knowledge on the characterization and detection of species of *Pantoea* and *Erwinia* both genera of important plant pathogenic bacteria.

INTA can benefit from these skills particularly for the control of diseases of vegetables. PPM also has extensive experience with the detection of Fire blight, a bacterial disease of apple and pear trees. Severe infection of *Erwinia amylovora* the causal agent of Fire blight might prove fatal to these plants. The disease has not yet been reported in Argentina but effective isolation and identification techniques will facilitate early detection and subsequent control. Dr Ducasse further expressed his interest in the very effective biological control agent *Agrobacterium tumefaciens* strain F2/5 for the control of Crown gall in vine that has been developed at PPRI. PPRI expressed an interest in Argentina's knowledge of phytoplasmas, pathogens of important crops such as sugarcane, fruit trees, ornamental plants and vegetables. Little is known about the prevalence of these pathogens in South Africa. The

two research organizations have similar objectives in the use of nitrogen fixing bacteria, detection of mycotoxins in stored grains, soil microbiology and the genomics of plant pathogenic viruses providing numerous opportunities for collaboration.

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Dr Simelane, Dr Price, Dr Kfir, Dr Nesor and Dr Ducasse during his visit to Rietondale.

### *New Student at Plant Pathology and Microbiology*

Wendy Maphefo Sekgota is a new participant in the Transformation Capacity Building Programme of the ARC and has become the most recent member of the Division of Plant Pathology and Microbiology at Roodeplaat. While waiting for approval to be taken up in this programme Wendy spent some time at the Mycology Unit, Biosystematics at Vredenhuis in Pretoria concentrating on the preservation of yeast cultures. She was given an opportunity to familiarize herself with the research environment within PPRI and to develop skills on managing culture collections.

Wendy was accepted to the Biotechnology Honours programme at the University of the Western Cape to start her studies in 2008.

Students in this programme attend various basic laboratory courses during an introductory week. These short courses include biological waste disposal, experimental design and scientific writing



Amongst various other subject choices Wendy will concentrate on plant diseases and pests (fungi, virus, bacteria and insects), organisms living in extreme environmental conditions, food microbiology, bio-fuels as well as ethics and regulations in biotechnology, the Cartagena Protocol, regulation of Genetically Modified Organisms and relevant South African Laws. On completion of her studies she should also be familiar with molecular biology techniques such as PCR, cloning and restriction analysis. We wish Wendy all the best and look forward to her bringing this knowledge to the division.

**Contact: Dr Isabel Rong at RongI@arc.agric.za**



## Refereed publications

BASSET Y., MISSA O., ALFONSO A., MILLER S.E., CURLETTI G., DE MEYER M., **EARDLEY C.D.**, LEWIS O.T., MANSELL M.W., NOVOTNY V. & WAGNER T., 2008.

Choice of metrics for studying arthropod responses to habitat disturbance: one example from Gabon. *Insect Conservation and Diversity* 1: 55-66

DE MORAES G.J., ZANNOU I.D., **UECKERMANN E.A.**, OLIVEIRA A.R., HANNA R. & YAIANEK J.S 2008. Phyto-seiid mites of the tribe Paraseiulini Wainstein (Acari: Phytoseiidae) from sub-Saharan Africa. *Zootaxa* 1687: 1-34.

LEMAIRE D.C., RUG R.M., HOFFMANN J.H., **GORDON J.A.** & MGIDI T.N., 2008. *Hakea sericea*: Development of a model of the impacts of biological control on population dynamics and rates of spread of an invasive species. *Ecological Modelling* 212: 342-358.

MICHEZ D. & **EARDLEY C.D.**, 2008. Monographic revision of the bee genus *Melitta* Kirby 1802 (Hymenoptera: Apoidea: Melittidae). *Annales de la Société de France* 43: 379-440.

MIDEGA C.A.O., KHAN Z.R., VAN DEN BERG J., OGOL C.K.P.O., **DIPPENAAR-SCHOEMAN A.S.**, PICKETT J.A. & WADHAMS L.J., 2008. Response of ground-dwelling arthropods to a 'push-pull' habitat management system: spiders as an indicator group. *Journal of Applied Entomology* 132: 248-254.

MISSA O., BASSET Y., ALONSO A., MILLER S.E., CURLETTI G., DE MEYER M., **EARDLEY C.D.**, MANSELL M.W. & WAGNER T., 2008. Monitoring arthropods in a tropical landscape: relative effects of sampling methods and habitat types on trap catches. *Journal of Insect Conservation* DOI 10: 1-16.

## New Book

**STALS, R.** & DE MOOR, I.J. (Eds). 2007(2008). *Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa. xii + 263 pp. WRC Report No. TT320/07. ISBN 978-1-77005-629-9.

### CONTRIBUTIONS BY RESEARCHERS OF ARC-PPRI

ENDRÖDY-YOUNGA, S. & **STALS, R.** 2007(2008)a. Halipidae. pp. 59–62. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

ENDRÖDY-YOUNGA, S. & **STALS, R.** 2007(2008)b. Noteriidae. pp. 63–68. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

ENDRÖDY-YOUNGA, S. & **STALS, R.** 2007(2008)c. Hydrochidae. pp. 93–95. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

ENDRÖDY-YOUNGA, S. & **STALS, R.** 2007(2008)d. Scirtidae. pp. 133–137. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

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**GROBBELAAR, E.** 2007(2008). Chrysomelidae: Donaciinae. pp. 177–182. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

**STALS, R.** 2007(2008)a. Introduction to aquatic Coleoptera. pp. 1–43. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

**STALS, R.** 2007(2008)b. Gyrinidae. pp. 53–58. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

**STALS, R.** 2007(2008)c. Helophoridae. pp. 113–116. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

**STALS, R.** 2007(2008)d. Heteroceridae. pp. 163–166. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

**STALS, R.** 2007(2008)e. Curculionidae. pp. 183–191. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

**STALS, R.** 2007(2008)f. Checklists of the known southern African taxa of aquatic Coleoptera. pp. 205–229. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa. ISBN 978-1-77005-629-9.

**STALS, R.** 2007(2008)g. Glossary of terms. pp. 231–245. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

**STALS, R.** 2007(2008)h. Glossary of place names. pp. 247–249. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

**STALS, R.** & ENDRÖDY-YOUNGA, S. 2007(2008). Hydrophilidae: Hydrophilinae. pp. 101–112. *In: Stals, R. & De Moor, I.J. (Eds). Guides to the Freshwater Invertebrates of Southern Africa. Volume 10: Coleoptera*. Water Research Commission, Gezina, Pretoria, South Africa.

## Chapters in books

**UECKERMANN, E.A.** 2008. Order Prostigmata, family Calligonellidae: 33-38. *In: Arthropod Fauna of the UAE. (ED.) A. van Harten. Dar Al Ummah Printing, Publishing, Distribution & Advertising, Abu Dhabi, UAE.*

## Other publications

DIPPENAAR-SCHOEMAN A.S. 2007. South African National Survey of Arachnida (SANSA) – how CREW volunteers can help. *CREW News* 4: 14-15.

DIPPENAAR-SCHOEMAN A.S. & VAN DEN BERG, A.M. 2007. Spiders in cotton. *Science in Africa* online journal.

## Congresses

The 9th African Arachnological colloquium was held at Lajuma in the Soutpansberg 3-7 February 2008. The second SANSA workshop was held during this meeting

**DIPPENAAR-SCHOEMAN A.S. & MYBURGH J.**, 2008. [PAPER] Present status of the spiders from caves in South Africa (Arachnida: Araneae).

**DIPPENAAR-SCHOEMAN A.S., PRENDINI L. & VAN DEN BERG A.**, 2008. [PAPER] SANSA surveys of the Savanna Biome: the rich arachnid fauna of the Nylsvley Nature Reserve (Arachnida: Araneae: Scorpiones).

**DIPPENAAR-SCHOEMAN A.S. & HADDAD C.R.**, 2008. [PAPER] Spiders can help the African farmer to combat pests.

**DIPPENAAR-SCHOEMAN A.S. & HADDAD C.R.**, 2008. [PAPER] The South African National Survey of Arachnida (SANSA): the way forward.

**DIPPENAAR-SCHOEMAN A.S., GONZÁLEZ REYES A.X. & HARVEY M.S.**, 2008. [POSTER] Present status of the Solifugae (sun-spiders) of South Africa (Arachnida, Solifugae). 9th African Arachnological Colloquium, Lajuma South Africa.

**DIPPENAAR-SCHOEMAN A.S., JONES A. & HADDAD C.R.**, 2008 [POSTER] Spiders in citrus orchards in South Africa (Arachnida: Araneae).

FOORD S., MAFADZA M.M., VAN RENSBURG B.J. & **DIPPENAAR-SCHOEMAN A.S.**, 2008. [PAPER] Small-scale heterogeneity of spider (Arachnida: Araneae) species composition and assemblage structure in the Soutpansberg, South Africa: implications for conservation.

HADDAD C.R. & **DIPPENAAR-SCHOEMAN A.S.**, 2008. [PAPER] Termitophily and termitophagy in spiders: an African phenomenon?

**KASSIMATIS E.J. & DIPPENAAR-SCHOEMAN A.S.** 2008. An overview of the distribution patterns of the spider family Araneidae (Araneae) in the Afrotropical Region. 9th African Arachnological Colloquium, Lajuma South Africa. University of Venda & ARC -PPRI.

**KASSIMATIS, E.J. , LEROY, A. & LEROY, J.** 2008. [PAPER] Spider surveys in the National Botanical Gardens.

**MARAIS, P., VAN DEN BERG A.M. & DIPPENAAR-SCHOEMAN, A.S.** 2008 [POSTER] Spiders in *Bt* maize in South Africa (Arachnida, Araneae).

**MATHEBULA S. & DIPPENAAR-SCHOEMAN, A.S.** 2008. [POSTER] First arachnid survey from the North West Province: the Rustenburg Nature Reserve.

VAN NIEKERK P. & **DIPPENAAR-SCHOEMAN A.S.**, 2008. [PAPER] A revision of the spider genus *Simorcus* Simon 1895 (Araneae: Thomisidae) of Africa.

## Courses

The following lectures as well as two practicals were presented to the second year students at the University of Pretoria (Zoology/ Entomology).

**DIPPENAAR-SCHOEMAN A.S.**, 2008. Acari of medical, veterinary and agricultural importance.

**DIPPENAAR-SCHOEMAN A.S.**, 2008. Scorpions of medical importance.

**DIPPENAAR-SCHOEMAN A.S.**, 2008. Spiders of medical and agricultural importance.

## Other talks

**VAN DEN BERG ANNETTE**, 2008. Why are spiders so unique. Rietondale Primary School (70 learners)

**VAN DEN BERG ANNETTE**, 2008. Why are spiders so unique. Hatfield Christian School (50 learners)

**DIPPENAAR-SCHOEMAN A.S.**, 2008. invited to present talk on spiders as part of the Oppenheimer & Son Art exhibition and specialist talk series presented at Brenthurst.

## Media

### Radio

A.S. Dippenaar presented a total of 12 radio talks over Radio Laeveld dealing with arachnids.

### TV

AS Dippenaar gave four presentations on TV2's Semaka (50/50) on "Spiders associated with water", "Trapdoor spiders and their behaviour", "Wandering and web dwellers" and "Colour change in spiders".

## Crop pest lists

ARC-PPRI has been contracted to compile pest lists for the Department of Agriculture in accordance with international phytosanitary obligations. The list pertaining to sweetcorn (*Zea mays*) has been completed and submitted. This list comprises all insect, mite, nematode, fungal and microorganism pests and diseases associated with this commodity in South Africa.

**Contact: Almie van den Berg at [vdbergam@arc.agric.za](mailto:vdbergam@arc.agric.za)**

## *Personnel News*

### *Farewell to Jack Mehlape*

On the 31 March 2008 Jack Mehlape retired after a career spanning 41 years. During the 1960s as a young man, Jack gained valuable horticultural skills by firstly working at Paul Keisies Nursery and later at the Government Nursery. These skills became invaluable to the ARC when he took on a position at the PPRI Rietondale Experimental farm in 1967.

In 1990 he moved to the Virology unit at Roodeplaats then becoming responsible for the care of plant hosts essential for various research projects, the development of the Institute's virus collection and the smooth running of the virus diagnostic services. Mr Mehlape was responsible for the preparation of soil mixtures and the continual task of caring for grapevine, propagation and care of herbaceous plants used for virus indexing, seed harvesting and the maintenance of a seedbank.

We wish him a very enjoyable retirement.

**By Kassie Kasdorf.**



Isabel and Jack in a lighter mood



The Virology group



Kassie & Jack