CBC Newsletter

RHODES UNIVERSITY
Where leaders learn

ISSUE 1, JANUARY 2019

INSIDE THIS ISSUE:

The fly has flown

A highlight in the past year for the Centre for Biological Control was the release of a biological control agent against a submerged water weed.

This historic event took place on Friday, 12th October 2018 at the Nahoon River in East London. Mr Ahmed Khan, Director of Operational Support and Planning in the Department of Environmental Affairs (DEA) assisted Rosali Smith (CBC PhD student) with the release of the agent into the river, witnessed by a number of invited guests from a range of environmental sectors, as well as CBC staff and students.

The insect released was a fly, *Hydrellia egeriae*, and the target weed is *Egeria densa*—known as Brazilian waterweed.

This release is a momentous occasion for the CBC, and the biological control community at large for a number of reasons: it is the first release of a control agent against Brazilian waterweed - a significant weed elsewhere in the world, and emerging as one of the worst in South Africa; it is also the first release against a submerged aquatic weed in South Africa; and lastly it is the first >

Rosali Smith and Ahmed Kahn just before the moment of release (Photo: Michael Pinyana, Daily Dispatch)

From the Editors

Welcome to the inaugural edition of the Centre for Biological Control (CBC) Newsletter. On the 2nd November 2018, we celebrated our first 'birthday'. Since the official launch of the CBC in 2017, a wide range of research, field work, conferences and other activities have taken place. This newsletter will provide some insights into these events and activities.

Some highlights include ten CBC students graduating in April 2018, Prof. Martin Hill being awarded a Distinguished Professorship and a SARChI Chair, and the release of the first biological control agent on a submerged weed in South Africa—the fly *Hydrellia egeriae*, on Brazilian water weed. Also included in the newsletter are highlights from our community engagement activities, our various research programmes and mass rearing facilities, as well as what to look forward to in the year ahead.

We hope you enjoy the read.

- Kim Weaver & Esther Mostert

release of a control agent developed by the CBC, which was established in November 2017

Brazilian waterweed (*Egeria densa*), is a submerged plant, native to South America. It was first recorded in South Africa in 1963 and has since become established in freshwater bodies in the Western Cape, Eastern Cape and KwaZulu-Natal. The plant reproduces vegetatively, any plant fragment, even as small as 1cm, can develop into a new plant. This makes hitchhiking on equipment, such as boats, easy. The rapid growth rate of the plant allows it to form dense monocultures that choke freshwater bodies, change ecosystem functioning and reduce recreational activities such as boating, fishing and swimming.

The fly that was released is a leaf mining fly in the family Ephydridae. Adults live on the water surface and females lay eggs on protruding leaves. The fully aquatic larvae mine and feed on the photosynthetic tissue of the leaves, which reduces the plant's photosynthetic capacity and induces secondary infection – this damage impacts the plant and reduces its biomass and invasive impact in a water body.

You might be asking; how can one know that that insect won't start eating something else? 70% of herbivorous insects are specific to their host plant, which means that they can only feed, survive and reproduce on one species of plant, or a group of closely related plants. These potential control agents are extensively tested in quarantine to make sure that 1) they are host specific, meaning they only feed on the target weed, and 2) they are sufficiently damaging to reduce the vigour of the plant

The CBC started working on Brazilian waterweed in 2014 when Emily Strange (CBC PhD student) imported this fly into quarantine from California. Rosali Smith, current CBC PhD student, did all of the testing of the fly *Hydrellia egeriae* for her Masters and after satisfying those conditions, applied for release in October 2017, and permission was granted in June this year. Rosali Smith has had many mentors along the way: Dr Willie Cabrera Walsh from FUEDEi in Argentina who first collected this fly and sent it to California; Dr Rosie Mangan, an Irish postdoctoral fellow who was based in the CBC lab and gave Rosali incredible support for this project, and colleagues from the USA who provided advice and troubleshooting along the way - a truly international collaborative programme, which is inherent in weed biological control.

Regular monitoring will determine whether the fly has established at this site and what the levels of damage are on the plants.

The aim of the release of the fly is to reduce the density of this weed allowing for the recovery of indigenous flora and fauna, to create a functioning aquatic ecosystem. Further releases will be made around the country, including the Kouga river near Patensie, the Liesbeeck River in Cape Town and a number of systems in KZN, including Midmar dam.

Update: the fly is spreading its wings

Good news about the fly release is that when Rosali Smith (PhD candidate) and Matthew Paper (Research assistant) visited the Nahoon River site again on 8 November (27 days after the release of the fly) they found evidence that the fly has established and spread - there is evidence of leaf damage by the fly larvae 100m upstream and 20m downstream from the release site!

Rosali and Matthew found that more than half of the shoots they inspected contained either larval damage, larvae or pupariae. Adults were also abundant on the water surface.

These findings suggest a promising future for *Egeria densa* biocontrol in South Africa. Rosali will be conducting monthly surveys at this site to monitor the agent's population as well as changes in the *Egeria densa* infestation. As mentioned, she also plans to release the fly at other sites in South Africa where *Egeria densa* is currently found.

Adult female flies lay eggs on protruding leaf tips. Larvae are fully aquatic and mine leaf tissue (Photo: Esther Mostert)

Scenes from the release of the fly on the Nahoon River

Boxes with *Hydrellia egeriae* larvae waiting for a new home in the Nahoon River (Photo: Ben Miller)

Samella Ngxande-Koza facilitating the proceedings (Photo: Kim Weaver)

Invited guests at the release (Photo: Kim Weaver)

Above: Parts of the Nahoon River had 100% cover of *Egeria densa* (Photo Rosali Smith)

Left: The site of the first release of *Hydrellia egeriae*, Nahoon River, East London (Photo: Ben Miller)

Graduation 2018

The Rhodes University graduation ceremonies in April 2018, produced 10 graduates from the Centre for Biological Control - eight MScs and two PhDs.

Both PhD graduates were within the Agricultural Entomology field - Michael Jukes, worked on Baculovirus synergism in the False Codling Moth, *Thaumatotibia leucotreta* (supervised by Prof. Caroline Knox, Dr Sean Moore and Prof. Martin Hill) and Sonnica Albertyn looked at the population ecology of False Codling moths in citrus orchards as influenced by the orchard age (supervised by Prof. Martin Hill and Dr Sean Moore).

Four of the eight MSc graduates were also within the Agricultural Entomology field – Francois Joubert, Marcel van der Merwe (with distinction), Megan Mulcahy and Melissa Lloyd.

Waterweeds and their biological control agents were the focus of three of the MSc graduates - Sisanda Mvandaba studied red water fern (*Azolla filliculoides*) and water lettuce (*Pistia stratiotes*) and the thermal physiology of their respective biological control agents; Nomvume Petela focused on the interactions between three biological control agents of water hyacinth (*Eichhornia crassipes*); and Tamzin Griffith investigated thermal physiology as a tool to improve the release efficacy of insect biological control agents (awarded with distinction).

The focus of Lumka Mdodana's MSc was on the potential impact and host range of a new candidate biological control agent for the control of *Pereskia aculeata*, an invasive cactus in South Africa.

Congratulations to all the graduates on these excellent achievements after your many hours of dedicated research.

Nomvume Petela with her parents-in-law at graduation

PhD graduates Michael Jukes and Sonnica Albertyn with their supervisors

CBC 2018 MSc gradation squad (Left to Right): Dr Iain Paterson, Lumka Mdodana, Sisanda Mvadaba, Dr Candice Owen, Nomvume Petela, Prof. Martin Hill, Megan Mulchay, Marcel van der Merwe, Francois Joubert, Dr Sean Moore, Prof. Julie Coetzee (Absent: Tamzin Griffith)

Lumka Mdodana managed to snap a photo with Rhodes University Vice Chancellor, Dr Sizwe Mabizela

SARChI chair awarded to Prof. Martin Hill

Distinguished Professor Martin Hill

Congratulations are due to Distinguished Professor Martin Hill for being awarded the South African Research Chairs Initiative (SARChI) Chair—in Insects in Sustainable Agricultural Ecosystems.

SARChI was established by the Department of Science and Technology (DST) and the National Research Foundation (NRF) as a strategic intervention of the South African government designed to attract and retain excellence in research and innovation at South African universities.

In particular, the programme is aimed at increasing national research capacity, both through the creation of the chairs themselves and through the development of postgraduate students, the generation of new knowledge makers. It is also intended to support the realisation of South Africa's transformation into a knowledge economy in which the generation of knowledge translates into socio-economic benefits. Prof Hill's work has been mainly focused on alternatives to controlling insect pests, and more sustainable ways of controlling invasive species of plants.

Congratulations Prof—may you continue to lead and grow this science in this important area of applied research.

Consortium established for three year project

South Africa has a long track record of weed biological control dating back to 1913 and with this there are many experienced scientists working in the field of biological control.

The Centre for Biological Control has received funding from the Department of Environmental Affairs, Natural Resources Management Programme (DEA: NRM) for a number of years, and each year submit two reports documenting their progress and outputs.

For the next DEA: NRM funding cycle, the CBC wanted to join resources with other universities to strengthen the group and team working on biological control. The CBC have entered a three year project (1st April 2018 to 31st March 2021) to conduct research towards the biological control of several species of invasive alien plant in South Africa with a consortium of universities and inputs from the Agricultural Research Council.

The CBC at Rhodes University will lead the consortium, made up of the University of Cape Town (UCT), the University of the Witwatersrand (Wits) the University of KwaZulu-Natal (UKZN), and the Agricultural Research Council (ARC). This contract compliments the newly established Centre for Biological Control at Rhodes University that significantly increases the capacity of biological control in South Africa and seeks to consolidate research and implementation efforts.

All of the members of the consortium are experienced in the discipline of weed biological control with collectively some 280 years of experience amongst the senior researchers. This contract supports the employment of 42 people on fixed three year contracts from research officers to technicians working in the mass-rearing and research facilities. The projects aim to target some 54 weed species, using nearly 80 species of biological control agents. The research will cover the most important groups of weeds in South Africa, including waterweeds, cacti, woody invaders (Australian *Acacia* species) and some invasive species from the higher elevation areas of the country that have not yet been targeted for biological control. The work that these universities will undertake covers pre-release studies on new agents, post-release evaluation on existing biological control agents, including cost/benefit analyses, and implementation of biological control through to mass-rearing and releases.

The projects will also make significant contributions to capacity building in South Africa through the supervision and mentorship of students, and knowledge transfer through collaborations, conference presentations, social media releases and peer-reviewed articles.

Local and International Partnerships

The field of biological control is by its nature a collaborative one. The CBC has a number of important local and international partnerships, both formal and informal, which all contribute towards producing quality research.

International partnerships

Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia

FuEDEI, Argentina

Heinrich-Heine-Universitat Dusseldorf, Germany

IMT Mines Ales, France

Landcare Research, New Zealand

La Trobe University, Bundoora, Australia

Louisiana State University, USA

Texas A&M University , USA

The National Scientific and Technical Research Council (CONICET), Argentina

University of Florida, USA

University of Gdansk, Poland

Vrije University, Belgium

Local partnerships

Agricultural Research Council (ARC)

Citrus Research International (CRI)

Department of Environmental Affairs (DEA)

Ezemvelo KZN Wildlife

National Research Foundation (NRF)

River Bioscience

South African Agricultural Industry Association (AgriSA)

South African National Parks (SANParks)

Stellenbosch University (SU)

University of Free State (UFS)

Community Engagement update

The past year has been a productive one for the Community Engagement Programme at the CBC. The Programme is run by Kim Weaver who has steadily expanded the number of initiatives and engagements over the past few years.

The key activities which happen each year are the Science Internship Programme, High School Mass-Rearing Programme, participation in SciFest Africa, and participation in Trading Live for Mandela Day. In addition to these, there are numerous other community engagement activities which take place, such as school visits, public lectures and talks.

Science Internship Programme

In 2009, the then Biological Control Research Group (now CBC) embarked on a collaborative effort with Victoria Girl's High School (VGHS) with the support of the high school science teacher Mr. David Stoloff and a then Rhodes Postdoctoral Fellow, Dr Francesca Porri. In 2009, five promising Grade 10 and 11 students were chosen to participate in the Science Internship Programme in the Dept. of Zoology and Entomology, working alongside researchers on biological control projects during their holidays. Since the programme's inception, it has grown to include not just VGHS, but also Graeme College, Ntsika Secondary School, Nombulelo Secondary School and Mary Water's High School, with the CBC now hosting up to 15 interns.

The Science Internship Programme partners with other science departments and disciplines to welcome more learners onto Rhodes Univeristy campus. The Geology Department and the Pharmacy Faculty are among those that have joined the programme in the last few years. The programme is growing each year with other science faculty departments joining.

"The programme aims to generate a passion and interest in science and encourages the pursuit of tertiary education"

School interns work a maximum of 20 hours per week while getting hands-on experience in scientific research. This programme has been very well received with growing numbers of applicants each year.

A number of past interns have come to Rhodes University to pursue their studies in the sciences—Ntsikelelo Charles and Ekhona Zozo (both past interns) have completed their Honours in Physics and Entomology respectively, in 2018.

Each internship week is followed by an end-of-the-day discussion, to try and generate discourse and critical thinking about the scientific research currently happening at Rhodes University. The programme aims to generate a passion and interest in science and encourages the pursuit of tertiary education. It also builds capacity in weed biological control and promotes public awareness about the threats posed by invasive weeds to South Africa's ecosystems. Additionally, this programme helps to ensure a strong tradition of science in South African public schools and to instill a sense of environmental stewardship in the Grahamstown school community.

Interns sampling a river (Photo: Kim Weaver)

CBC takes part in 'Trading Live: Mandela Day'

For the past six years, Rhodes University's Community Engagement Division has been running an annual event called 'Trading Live for Mandela Week'. This initiative aims to honour the legacy of Nelson Mandela. It involves a week of activities that pairs up a range of different actors and organisations in the town through the sharing of time, skills and other assets.

Nelson Mandela's Centenary in 2018 meant that the annual Community Engagement Division's Trading Live for Mandela week was due to be bigger than previous years, and it was – with over 142 events taking place in Grahamstown over six days. As part of these events, the CBC hosted the University of the Third Age (U3A) and the Wildlife and Environment Society of South Africa (WESSA) members for a tour of the Waainek Mass Rearing Facility where participants got to see and interact with our research facility staff and gain some first hand insight into the work done by the CBC. Honours student taking the 'Cultural Entomology module' also took part in Trading Live through engaging with four schools around insects and their uses—the students designing fun interactive activities to do with the learners.

The CBC plans to continue its involvement in this creative initiative next year and hopefully increase the 'trade' offered.

Honours students showing learners some insects close at hand (Photo: Kim Weaver)

SciFest Africa 2018

Scifest Africa is the largest science festival in Africa and was established in 1996 to promote the public awareness, understanding and appreciation of science, technology and innovation. It is held annually in Grahamstown and is supported by South Africa's National Department of Science and Technology and various other sponsors.

For the past six years, the CBC has had an exhibition at 'Waterworld' - a SciFest satellite venue hosted by the South African Institute for Aquatic Biodiversity (SAIAB). The focus of the CBC exhibition is on introducing South Africa's worst aquatic invaders, as well as a few terrestrial invasive species, with their biological control agents. Biological control is presented as an effective management technique for controlling invasive plants and many of the biological control agents are present to show the school learners.

Postgrad student Brett Mason explaining the intricacies of biological control to potential future researchers at the CBC exhibition (Photo: Kim Weaver)

Each year, the CBC erects a large clear plastic pool with living examples of South Africa's worst invasive weeds and their effects on water quality. The "spot the invader" wheel game helps learners and the general public identify problematic weeds and link them to their biological control agents. The time and passion of CBC postgraduate students, interns and staff all contributed to help make this years exhibition the success that it was.

SciFest Africa 2018 had a total of 7410 learners visiting the WaterWorld exhibitions over the course of the week. There are some changes that will take place at SciFest Africa 2019 and the CBC exhibition will ensure that it keeps up with the new exciting surroundings.

Community Engagement Calendar Highlights from 2018

MBA class MiniSASS
29 January
CBC team took the 2018 Rhodes University Masters of Business Administration (MBA) class to two sites in Belmont Valley to conduct a MiniSASS

Science Internship Programme (SIP)
April, June & October
Fifteen students took part in the SIP Programme at the CBC

Exhibition at Waterworld - SciFest Africa
7 – 13 March
CBC had an exhibition at SciFest Africa: 'Innovative control of invasive species'

Yebo Gogga Science outreach
9 – 18 May
Prof. Marcus Byrne and his lab members' educated learners and the public on weeds and biocontrol at the annual Yebo Gogga science outreach exhibition at Wits University, Johannesburg

Argentina visit
25 May
Prof. Martin Hill & Dr Iain Paterson visited schools and gave a talk about biological control to the public

Visit to Carnarvon & Uitenhage
28 – 29 July
CBC staff presented a talk to members of the public in Carnarvon and Uitenhage, about biological control

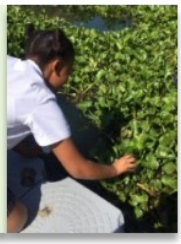
Holy Cross School Visit
7 August
Four CBC staff presented an interactive talk and activities on an introduction to Entomology to Grade 1 – 3 learners at Holy Cross School, Grahamstown

Young Academic Lecture Series
29 October
Clarke van Steenderen and Ben Kirkaldy presented their entomology research to learners at Victoria Girls High School, Grahamstown

Regional Eskom Expo for young scientists
4 August
CBC members mentored learners from Nathanial Nyaluza School, Grahamstown, with their expo projects. At the expo the school received an award for the most improved school some of the learners walked away with silver & bronze awards.

Cape Nature engagement
10 October
Fiona Impson from UCT gave some biocontrol training to Cape Nature Managers and field rangers in Stellenbosch

Hartbeespoort Dam
Throughout the year
CBC team partnered with various Hartbeespoort Dam community stakeholders on increasing biological control activities on the dam



Namibian cactus engagement
12 November
Dr Iain Paterson was present at the Environmental Impact Assessment public engagement meeting for the release of agents in Namibia

City of Cape Town
3 December
Prof. Julie Coetzee assisted with training with the City of Cape Town team to monitor and assess damage of agents on water hyacinth at Strandfontein, Cape Town

Madagascar visit
21 – 29 October
Prof. Martin Hill visited collaborators in Antananarivo, Madagascar, and gave a public talk on water hyacinth

High School Mass-Rearing Programme

One of the key Community Engagement Programmes at the CBC is the High School Mass-Rearing Programme. This programme aims to work with high schools to promote awareness of the threats posed by water hyacinth to water security of South Africa's rivers. Additionally, it aims to provide hands on experience dealing with a plant-insect interaction, which can be incorporated into the school curriculum. This is achieved by working with and supporting a high school to set up pools to mass rear insects for the control of water hyacinth.

The first mass-rearing school facility was established at Warrenvale Hoërskool in Warrenton, Northern Cape, in 2010 in collaboration with the University of Witwatersrand (Wits) and the Northern Cape Department of Education. The most recent High School Mass-Rearing Programme was established in May 2018 in relation to the infestation of water hyacinth at Hartbeespoort Dam—more details below.

The CBC aims to expand this concept to more schools around the country. Providing practical leadership opportunities to local school children ensures community involvement in environmental stewardship. Furthermore, a mass-rearing facility can be used to teach a number of different skills to the scholars, for example, numeracy, and written and oral communication.

CBC researcher Dr Grant Martin engaging with learners at Mountain Cambridge School (Photo: Kim Weaver)

Hartbeespoort Dam

Hartbeespoort Dam is often highlighted in the media as being covered with water hyacinth, and due to the high effluent and poor management—it is often more than 20% covered water hyacinth.

Earlier in 2018 the CBC was asked to attend a meeting held by the Department of Water and Sanitation (DWS) and the Department of Environmental Affairs (DEA) to try come up with a solution to the problem at Hartbeespoort. Since this meeting in March, the CBC has been engaging with the local community about an engaged integrated management plan for the dam's hyacinth issue.

Two schools are involved in rearing biological control agents for the dam and various stakeholders are onboard and doing mechanical removal. The schools are using the rearing facilities as teaching tools for biology projects at different school levels.

Keneilwe Sebola (CBC PhD candidate) is incorporating this social engagement process into her PhD research.

Latest news:

Learners from Mountain Cambridge School have been hard at work rearing insects for the control of water hyacinth. On 4 December 2018, they released about 10 000 *Megamelus scutellaris* insects (which they had reared) on Hartbeespoort Dam

Collection

Up close

The tally

Release!

Argentinian collaboration

The Agricultural School mass rearing facility in San Vicente, Argentina (Photo: Kim Weaver)

The CBC has a long standing partnership with Argentinian bio-control scientists dating back to the 90s. FuEDEI is the leading biological control research institute in Argentina. In October 2018, Kim Weaver and Prof. Julie Coetzee visited an Agricultural school in Argentina to share our experience of setting up and maintaining mass rearing facilities in a High School context.

It was a very successful visit, the school is well on their way to setting up a productive mass rearing facility with the support of FuEDEI. The school is focusing on rearing the weevils, *Neochetina bruchi* and *Neochetina eichhornia*, for the biological control of water hyacinth as well as *Neohydronomus affinis* for the biological control of water lettuce, both of which are problematic plants in the area. Although water hyacinth and water lettuce are native to South America, they are spreading south and invading areas where they were not found before. FuEDEI in collaboration with this school hope to combat water hyacinth and water lettuce in the San Vicente area through this project.

The Argentinian-CBC Iris collaboration team—Paula Gervazoni, Prof. Julie Coetzee, Dr Celeste Franceschini and Dr Alejandro Sosa, (Photo: Kim Weaver)

Another important project that the CBC is collaborating with FuEDEI on involves the shared invasive *Iris pseudacorus* (yellow flag iris). This European plant has heavily invaded wetlands in Argentina and is also very prolific in South Africa. Paula Gervazoni, a PhD student based in Argentina is being co-supervised by Prof. Julie Coetzee, and is using social media to map out the distribution of *Iris pseudacorus*. Facebook and Twitter have proved to be very useful tools in communicating with the public and getting information in return.

Samella Ngxande-Koza from the CBC is also working on creating a distribution map of *Iris pseudacorus* in South Africa using social media and hopes to have just as much success as Paula has had with her work. Paula will be visiting South Africa later this year so further updates on this project will be highlighted in next edition of the newsletter.

Dr Alejandro Sosa, researcher at FuEDEI, almost hidden in field of Iris (left); Large yellow flowers have brown markings on upper surface (middle); The thick fleshy rhizomes can form dense mats (Right) (Photos: Kim Weaver)

Fact Check

Here are a range of facts which provide some insights into what the CBC at Rhodes University is all about. These numbers are from the official launch of the CBC in November 2017, until December 2018.

10	Students graduated
42	Staff employed
20	Peer-reviewed papers published
10	Local partnerships
12	International partnerships
14	Current Masters students
13	Current Doctoral students
4	Postdocs
150 000	Waterweed insects released
30 000	Cactus cladodes with cochineal released
40	Conference presentations
12	Public talks
12	School visits
1	New biological control agents released

Weed Biological Control Short course

The Training Programme for the Biological Control of Weeds is an annual fully accredited short course which is run through Rhodes University's Centre for Biological Control in Grahamstown. The course was designed and implemented for the first time in 2005. It is generously funded by the Working for Water Programme (WfW), under the Expanded Public Works Programme within Natural Resource Management, Department of Environmental Affairs.

The 21st short course was held in October 2018 and was attended by 25 participants — including two international participants from Madagascar and Nigeria. The course was taught over five intensive days and included instruction by biological control experts with different backgrounds. This course aims to help facilitate the understanding and application of the concepts of biological control within the context of South African ecosystems.

Since its inception, the short course has certified approximately 280 participants in 14 years. This course introduces both the theory and practice of weed biological control. Familiarizing those new to the science with the theory that underpins host specificity and thus the safety of biological control and provides information on how and why it works. Course participants are introduced to the ecological theory and practical application of biological control of invasive weeds, legal regulations, how to monitor and conduct post release evaluations and the concept of host specificity testing. Practical seminars on basic statistics and data analysis are presented and based on data collected during fieldwork exercises at Table Farm, just outside Grahamstown. Participants are then required to present a seminar on their findings to peers and colleagues and submit a written report the following month. These are then all graded to assess whether the participant has achieved competency to be awarded a certificate.

Battling jointed cactus during data collection along a transect on Table Farm (Photo: Kim Weaver)

Attendance is open to any interested persons—from management and implementation officers to concerned members of the public or new students in applied entomology. The 2019 course will take place from 26-30 August.

The 2018 Weed Short Course participants and lecturers (Photo: Kim Weaver)

CBC Globetrotters

International conferences workshops all contribute towards strengthening networks and collaboration between researchers ultimately leading to better quality research and results for biological control on a global scale. Here is the footprint of the CBC's, and some consortium partners, international travels for 2018.

Fiona Impson & Carien Kleinjan, UCT

Collaborative work on acacias
2nd – 7th September
Coimbra, Portugal

Sam Motitsoe, PhD candidate

Hosted by Centre for Ecology and Hydrology (CEH)
21st June - 2nd August
Edinburgh, Scotland

Prof. Caroline Knox

Hosted by Prof. Miguel Lopez-Ferber at IMT Mines Ales
11th – 19th September
Ales, France

Dr Danica Marlin, Wits University

Survey and collection of agents for biocontrol of Tamarix
20th – 24th September
Sicily, Italy

Megan Reid, MSc candidate

Survey for potential agents for *Nymphaea mexicana*
August - October
Florida, USA

Dr Iain Paterson

First International Congress of Biological Control
14th - 16th May
Beijing, China

Prof Martin Hill

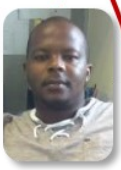
Collaboration on Water hyacinth
21st – 28th October
Antananarivo, Madagascar

Prof Julie Coetzee, Dr Grant Martin, Sam Motitsoe (Lecturer and PhD candidate), Rosali Smith (PhD candidate)

Evans Mauda, PhD candidate

LabEx COTE Summer School
11th – 15th June
Cadillac, France

Rosali Smith & Sam Motitsoe, PhD candidates



9th International Congress of Dipterology
25th – 30 November
Windhoek, Namibia

Dr Iain Paterson

Meetings to help facilitate the process for the release of cochineal on cactus species in Namibia
January & November
Windhoek, Namibia

Dr Sean Moore, Tammy Marsberg (Postdoc), Michael Jukes (Postdoc), Marcel van der Merwe (PhD Candidate)

Symposium on Invertebrate Pathology (SIP)
12th – 16th August
Gold Coast, Australia

15th International Symposium on Aquatic Plants (ISAP)
8th – 23rd February
Queenstown, New Zealand

Prof Martin Hill & Dr Iain Paterson

10th Conference of the Argentine Entomological Society
21st – 24th May
Mendoza, Argentina

Prof Julie Coetzee and Kim Weaver

School Community Engagement on Water hyacinth & Yellow flag iris surveys
22nd October – 5th November
Buenos Aires, Argentina

XVth International Symposium on Biological Control of Weeds (ISBCW)
26th – 31st August
Engelberg, Switzerland

Attended by:

Nine Staff and Students from the CBC, Rhodes University: Prof. Martin Hill, Prof. Julie Coetzee, Dr Iain Paterson, Dr Grant Martin, Kim Weaver, Philip Ivey, Candice Owen, Evans Mauda and Guy Sutton

Seven Staff and Students from Wits University: Prof. Marcus Byrne, Dr Danica Marlin, Dr Solomon Newete, Dr Guelor Mayonde, Ms Jeaan D'Arc Mukarugwiro, Mr Nic Venter, Mr Blair Cowie

Three Staff from UCT: Prof. John Hoffmann, Fiona Impson & Carien Kleinjan

Research Programme Highlights

There are five research programmes within the CBC at Rhodes University, which focus on various aspects of biological control. The three University research consortium partners, each have their own research programmes focusing on biological control.

Each programme a number of students researching various topics within the programmes. The wide range of species focused on in each programme cannot all be captured in this Newsletter so here we aim highlight some of the latest developments. More detailed reports will be available in the CBC annual report.

Aquatic Weeds Programme: Manager—Prof. Julie Coetzee

Agricultural Research Programme: Manager—Dr Sean Moore

Cactaceae Programme: Manager—Dr Iain Paterson

Highland Weeds Programme: Manager—Dr Grant Martin

Indigenous Plants Invasive Elsewhere Programme: Manager—Dr Grant Martin

UCT: Biological Control of Invasive Tree Species—Prof. John Hoffmann, Fiona Impson, Carien Kleinjan

Wits: Biocontrol lab —Prof. Marcus Byrne

UKZN: Biocontrol research—Prof. Colleen Downs, SARChI Research Chari in Ecosystem Health & Biodiversity

Tackling the thistle cactus

IAIN PATERSON

"This new agent will hopefully stop an emerging weed from ever become a serious pest to farmers and conservationist in Southern Africa. "

Thistle cactus in Australia (Photo: Andrew McConachie)

The thistle cactus, *Cylindropuntia pallida,* is an emerging weed in South Africa and Namibia. It is an extremely spiny plant that makes veld unsuitable for grazing and is harmful to wildlife and livestock. Infestations in South Africa were targeted for eradication, but it is now clear that complete eradication from the country will be impossible, so biological control is being considered.

Cylindropuntia pallida has also become very problematic in Australia and biological control researchers in that country have recently released a cochineal insect for the control of the weed. Within one year, the cochineal insect has completely covered all the plants at infestations in Australia and complete control in a few years appears to be inevitable.

The cochineal insect, a lineage of *Dactylopius tomentosus* that is particularly damaging to thistle cactus, was imported from Australia into the CBCs quarantine facility on 25th September 2018.

Very little host specificity testing will be required in South Africa because Australian researchers have provided the CBC with all the host specificity data from their testing, so the agent is well known to be host specific. There are two other *Dactylopius tomentosus* lineages that are used for the control of other *Cylinropuntia* species in South Africa and it is possible that the new agent will interbreed with those that are already in the field. Before releasing the new agent, the CBC will use genetics to characterize the cochineal insect so that we are certain that we are dealing with the correct insect after release, and hybridization trails need to be conducted to see if the new agent will interbreed with the agents we already have and what the consequences of this to the control of *Cylindropuntia* weeds will be.

This new agent will hopefully stop an emerging weed from ever become a serious pest to farmers and conservationist in southern Africa. By implementing biological control at an early stage of the invasion process there is a possibility to have a much greater chance of success and avoid all the negative consequences that the weed would have been responsible for in future. The CBC will also be reciprocating the help of the Australian biological control community by sending them another cactus agent in return for the cochineal that they have sent to South Africa. The stem-wilter, *Catorhintha scahffneri,* will be sent to Australia. This is the biological control agent for the creeping cactus weed, *Pereskia aculeata*, which is a widespread invasive weed in South Africa but an emerging weed in Australia.

Its time for tea!

CANDICE COOMBES

Honeybush tea

The CBC has recently embarked on a new adventure with the honeybush tea industry and community of South Africa. Honeybush (*Cyclopia* spp.) is endemic to the fynbos area of our country and although wild-harvesting of this plant has been ongoing, an increase in demand for this sought-after health product by foreign markets has encouraged its farming on a larger scale. This is no easy task as there are numerous challenges that need to be overcome to ensure the success of the industry. One of these challenges, are the insects that enjoy feeding on honeybush.

A key pest which has surfaced for the honeybush tea industry is the Keurboom moth, *Leto venus*. Although a magnificent moth, with wingspans reaching up to 150mm, the larvae have been recorded boring in to the stems and branches of farmed honeybush, eventually causing the death of the plant.

Gillian McGregor, from Rhodes University's Geography Department, has been involved with the Honeybush industry for a few years, through her work focusing on community engagement for sustainable wild honeybush harvesting. It was through Gillian's contacts that the CBC was approached by SAHTA (South African Honeybush Tea Association) to help develop a management plan for the control of this pest. This is rather exciting given that what is known about the biology of this moth, its association with honeybush and its natural enemies, is extremely limited. During this year, research, in the form of a MSc project, will be undertaken to better understand this insect as a pest and work towards possible organic management solutions. But there is more. *Leto venus* is not the only pest which has cropped up on growers' radars. Other potential insect pests include leafhoppers, galling midges, aphids and scale insects. As with *L. venus*, information on the biology, association with the crop and natural enemies (in some cases, even the species identity), of these insects is limited. Watch this space for more endeavors in this new and exciting area of research!

The striking Keurboom moth (Photo: Colin Ralston)

The large moth larvae leaves 'sawdust' evidence when boring into honeybush stems (Photos: Candice Coombes)

Fields of tea—Honeybush (*Cyclopia* spp.) (Photo: Candice Coombes)

Top: Leafhopper—potential pest; Bottom: Galls caused by midge larvae. Both species unknown (Photos: Candice Coombes)

Aliens in the grass

KIM CANAVAN

Lenin and Guy tackling the intricacies of grass keys

Three CBC members, Kim Canavan (post-doctoral fellow), Lenin Chari (post-doctoral fellow), and Guy Sutton (PhD candidate) are part of the Alien Grass Working Group. This group was jointly initiated by the South African Biodiversity Institute (SANBI) and the Centre for Excellence in Invasion Biology (CIB) in August 2013, with the aim of bringing researchers and managers together with a shared interest in alien invasive grasses in the country.

The focus of the CBC grass team is on assessing the potential for biological control on invasive grasses. To date, grasses have been poorly researched with regard to biological control with only one grass (*Arundo donax*) being a target worldwide. Guy Sutton's PhD research explores whether or not invasive grasses will make suitable targets for biological control with a focus on invasive rat's tail grasses (*Sporobolus* spp.) as models. Lenin Chari's work has involved surveying for herbivores on Gamba grass, *Andropogon gayanus* in the native range in South Africa. Both projects hope to find promising biological control agents to send to Australia where these grasses have become invasive. Their work will make a huge contribution to our understanding of herbivory on grasses with the hope of helping to pave the way to more projects being initiated on invasive alien grasses.

Rat's tail grass— *Sporobolus natalensis* (Photo: Sheldon Navie)

Gamba grass—*Andropogon gayanus* (Photo: Guy Sutton)

The Alien Grass Working Group meets annually. In 2018 the meeting took place at the University of Cape Town, from 24 – 25 September. The CBC will be hosting the upcoming gathering in June 2019.

The Alien Grass team braving the weather for a field visit to Tokai Forest, Cape Town (Photo: Lindokuhle Dlamaini)

Update: the mighty mite on the Cook Islands

Excellent news is that the eriophyid mite, *Colomerus spathodea*, imported for the control of African Tulip Tree (*Spathodea campanulata*), has successfully established on the Cook Islands! It was released in January 2017 and the latest report is that almost every tree where the mite was released in Rarotonga is infected.

The CBC has been involved with the development of biological control for the African Tulip Tree—listed as one of the world's 100 worst invasive species—since 2006 and has been working in collaboration with LandCare Research New Zealand on this project since 2014. The mite, which was sourced from Ghana by CBC researcher, Dr Iain Paterson—was imported into quarantine at Rhodes University in early 2014. The mite attacks new foliage, and forms hairy galls on the leaves and shoots of the plant resulting in deformations and stunts the growth of the tree. The Spathodea mite was cleared for release in the Cook Islands by both the Cook Island and New Zealand authorities in 2016.

In January 2017, Dr Iain Paterson from the CBC was present when releases were made at 10 sites on the island of Rarotonga after being imported via quarantine in New Zealand.

The eriophyid mite, *Colomerus spathodea*, has successfully established on the Cook Islands (Photo: Quentin Paynter)

Waterweed Adventures in America

MEGAN REID

For just under three months (August - October 2018), I was granted the incredible opportunity to travel to the southeast states of the USA, including Florida, Louisiana, and Texas. This trip was part of my MSc project and involved conducting surveys for natural enemies and potential biological control agents of *Nymphaea mexicana* (Mexican waterlily), which has become an invasive species in South Africa. This research builds on the work done by CBC MSc student, Prinivan Naidu.

After months of planning and a journey that lasted over 24 hours, suddenly I was in Fort Lauderdale, Florida, preparing to begin an incredibly busy, educational, and wonderful three-month journey. With the help of the employees of Dr Lyn Gettys' aquatic plant research lab (Ian Markovich, Kyle Thayer, and especially Joseph Sigmon), as well as Dr James Cuda from the University of Florida, and Dr Phillip Tipping from the US Department of Agriculture, I travelled around Florida seeking natural populations of *N. mexicana* in the US waterbodies.

"I felt the excitement and joy as if I had already found it, and the next day, in the middle of a vast population of N. mexicana in the harsh heat and humidity, I unrolled a leaf and found a weevil."

I haven't seen many of the natural waterbodies in South Africa, but the ones I have seen are miniscule in comparison to the great Florida lakes. The first lake I visited was Lake Okeechobee, which is the ninth largest natural freshwater lake in the United States. When I was planning these surveys, I had it in mind that I would just need to get a boat onto the water and that it would be easy to spot *N. mexicana* using binoculars. How very wrong I was! Lake Okeechobee showed me very quickly that I would need the exact coordinates of the plants, because it was like being in the middle of the ocean! Even after half a day spent searching, I did not find a single *N. mexicana* plant. Not only that, but with the hurricanes and changing water levels it was important to speak to people who knew exactly where the populations were. This was where help from various biologists who work for the Florida Fish and Wildlife Conservation Commission was vital, and as soon as I changed my strategy and turned to them for assistance, my surveys were much more successful!

I spent most of my time in Florida, but also spent a few days in Weslaco, Texas, working with Ken King and I was hosted by Dr John da Graca's lab at Texas A&M University. I was finding lots of really cool critters that were causing damage to *N. mexicana*: Donacia beetles that lay their eggs on the underside of the leaves, and whose larvae have little posterior hooks to help them tap into the oxygen in the roots; Notophila flies that pupate on the roots and float to the surface when they emerge; and Synclita/Elophila and Paraponyx moths that feed on the leaves and pupate in the stems. However, all these insects seemed to have broad host ranges, and I was starting to worry that I was not going to have enough time to find an agent that had high potential to be a host specific biological control agent.

The weevil, *Bagous americanus* (Photo: Nathan Lord)

Then I went to Baton Rouge, Louisiana, where I was hosted and helped by Dr Chris Reid, and Dr Rodrigo Diaz and his student workers. I had the vision in my mind of finding a good agent, I felt the excitement and joy as if I had already found it, and the next day, in the middle of a vast population of *N. mexicana* in the harsh heat and humidity, I unrolled a leaf and found a weevil. "Maybe it's just a weevil from the water hyacinth plants next to the *N. mexicana*," I thought. But then I found another, and another, and larvae and pupae in the stems, and that's when I let myself get excited that maybe this was the one! We soon determined that the weevil had a name: *Bagous americanus*.

A lake full of lilies - Dr Cuda with Megan Reid (Photo: James Harris)

The adults of this species feed on the leaves and oviposit in a feeding scar. Once hatched, the larvae mine the leaf towards the petiole, and from there they mine into the stem and pupate before emerging as adults again. *B. americanus* has been recorded on another plant species, *Nymphaea odorata* (white water lily) which is also exotic, and one paper by Greg Cronin and his colleagues in 1998 suggests that at the very least, *B. americanus* seems to be specific to the genus Nymphaea. Although I can't yet be sure that this 'beast' (as Dr. Diaz called it) is a fussy enough eater to be used as a biocontrol agent for *N. mexicana*, host specificity tests in quarantine will soon determine whether *B. americanus* is indeed 'the one'.

Success at last (Photo: Chris Reid)

This trip was a phenomenal adventure. I have grown enormously as a person, I have made many new friends to cherish, I have learned so much and have realised how much I still have to learn. I am incredibly grateful to Prof. Julie Coetzee and Prof. Martin Hill for trusting me enough to take on this exciting project, and I am so thankful to the numerous people who helped me during my surveys. It has been such an exciting time, but I am certainly glad to be back in South Africa; being away has shown me how much I love this place! Now I am looking forward to continuing my Masters project and continuing the steps towards initiating biological control for *N. mexicana*.

Small but significant— *Bagous americanus* at home on a lily leaf (Photo: Megan Reid)

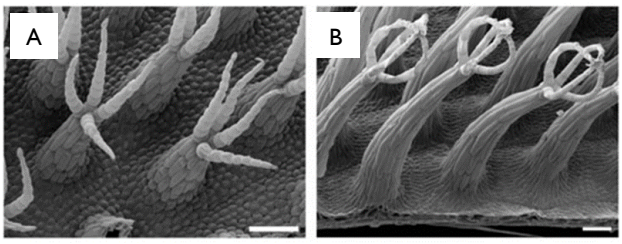
Salvinia minima invasion

In May 2018, CBC staff, Dr Grant Martin and Kim Weaver were visiting the Hartbeespoort area and went to one of the smaller dams close by which was 100% covered with a waterweed. The land manager thought it was *Salvinia molesta*, also known as Kariba weed or giant salvinia, and a number of management strategies have been attempted to manage the population at the estate.

However, on close inspection, it was established that the weed was actually *Salvinia minima* – very similar in appearance to *Salvinia molesta* but in fact a different species. *Salvinia minima* has previously only been recorded from a single site in South Africa where it is not able to form a large continuous mat.

Salvinia minima can be distinguished from *Salvinia molesta* by the structure of the tiny water-repellent hairs (trichomes) on the leaf surface. Trichomes of *Salvinia minima* have an open structure, in comparison to the closed cage-like 'egg beater' structure of *Salvinia molesta* trichomes (see image below).

The agent, *Cyrtobagous salviniae*, released for the control of *Salvinia molesta* in South Africa (in the 1960s), is not effective for the control of *Salvinia minima*. The Florida biotype - a smaller variety of the weevil (*Cyrtobagous salviniae*) used to control *Salvinia molesta* - was imported into the CBC quarantine facility in early November 2018. Due to the extended life cycle of the weevil, host specificity testing will be started when there are a large enough number of weevils in the culture in quarantine. However, *Cyrtobagous salviniae* has already been approved and released for the control of *Salvinina minima* in the USA, so it is envisaged that the process of host specificity testing in South Africa will not be a lengthy one.



Scanning electron micrograph of *Salvinia minima* (A) and *Salvinia molesta* (B) trichomes. Scale bar 200µm (Barthlott et al 2009)

A dam in the North West 100% covered by *Salvinia minima* (Photo: Grant Martin)

Yellow flag iris in South Africa

The work on yellow flag iris — *Iris pseudacorus* – is another example of the collaborative nature of the field of biological control work. yellow flag iris is an attractive plant with a large yellow flower, native to Europe, western Asia and northwest Africa. It was identified as an invasive species in early 2016 in South Africa and listed on Alien and Invasive Species Lists in 2016. It was also listed as a NEMBA Category 1a species in 2016, preventing its cultivation or sale. It grows in wetlands, and the rootstock forms dense mats.

Dr Iris Stiers, a researcher at the Vrije University in Belgium, and her MSc student, Gianmarco Minuti, in collaboration with the CBC are looking for a potential biological control agent for yellow flag iris. In April 2018, Gianmarco arrived in South Africa, bringing with him a culture of the flea beetle, *Aphthona nonstriata*, a potential agent. The flea beetles were placed into the CBC quarantine facility where CBC researcher, Samella Ngxande-Koza, under the guidance of Prof. Julie Coetzee, has started host-specificity testing to determine the suitability of this beetle. Samella is also in the process of mapping the current populations and distribution of yellow flag iris in South Africa using social media and conducting field visits to sites across South Africa. Reports so far indicate that yellow flag iris it is more widespread than was initially thought, so work on *A. nonstriata* is of high priority.

Collaborators in Argentina are also interested in the results of this host-specificity testing. yellow flag iris is highly invasive in Argentina, covering large wetland areas (see earlier article in Newsletter 'Argentinian collaboration' - Page 11) and researchers at FuEDEI in Argentina are urgently seeking a solution to this invasion. Emma Sandenbergh from Rhodes University will also be joining the Iris research team as a Masters student in 2019. She will focus on the dispersal mechanism of *Iris pseudacorus*, and will also look at some genetic aspects of this species.

Beautiful but hazardous — yellow flag iris in a garden in Hogsback, Eastern Cape (Photo: Samella Ngxande–Koza)

Weeds in high places

GRANT MARTIN

The high elevation grasslands of South Africa are under threat from invasive alien plants. These alien plants compromise the integrity of this valuable ecosystem, reduce the amount of available water, and have a direct impact on the livelihoods of those living in these areas.

One of the key research groups investigating these threats is the Afromontane Research Unit (ARU) located at the Qwaqwa Campus of the University of the Free State (UFS). The ARU is perfectly situated at the foothills of the Maloti-Drakensberg Mountains to be at the forefront of research being conducted on high elevation species. It is for this reason that the CBC-High Elevation Weeds Programme is developing a strong relationship and collaboration with the ARU. The first project to be developed from this relationship is an investigation into the invasive *Pyracantha angustifolia* (firethorn). In the highland areas firethorn bushes can be seen from far away as bushes are covered in brightly coloured red/orange fruits in an otherwise drab -coloured winter landscape. The species is spreading rapidly, forms dense monocultures and is difficult to manage because of its growth form and protective thorns.

The project is led by Dr Sandy-Lynn Steenhuisen, an associated researcher of the ARU, and the majority of the field work is being conducted by MSc student, Lehlohonolo Donald Adams—co-supervised by Dr Grant Martin from the CBC. Donald completed his undergraduate at the University of the Free State, Bloemfontein campus. He has made significant progress during 2018 on a wide range of aspects from seed dispersal mechanisms to population demographics. This project should provide valuable information on how to manage this aggressive invasive, and has laid the groundwork for a number of future projects and collaboration between the CBC and ARU.

Lehlohonolo Donald Adams and Dr Sandy-Lynn Steenhuisen and from the Afromontane Research Unit (ARU) measuring tree size and counting seeds on the invasive *Pyracantha angustifolia* (firethorn)

Update from consortium partners

The CBC entered into an agreement with a number of consortium partners for a three year research plan in April 2018. Three of these partners are university institutions, namely the University of Witwatersrand (Wits), the University of Cape Town (UCT) and the University of KwaZulu-Natal (UKZN). Here are some updates about the work and research done at these research institutions.

Wits Consortium research

The University of Witwatersrand (Wits) biocontrol lab is led by Prof. Marcus Byrne, assisted by Guelor Mayonde, Nic Venter and a variety of postgraduate students, who work in around the Wits Insectary and Quarantine Facility. Their research includes finding new agents, conducting host-specificity testing, modelling agents and weed populations and post-release evaluation. The biocontrol lab works on a range of species including bugweed, pompom, *Parthenium*, *Tamarix*, Cactaceae and waterweeds.

UCT Consortium research

Emeritus A/Prof. John Hoffmann, Fiona Impson and Carien Kleinjan comprise the biocontrol research programme at the University of Cape Town (UCT). This research programme falls within the Plant Conservation Unit at UCT. The main focus of the programme is the biological control of invasive perennial trees. Particular emphasis is placed on long term monitoring of the efficacy of the introduced biological control agents as well as disseminating information to stakeholders to ensure that informed management decisions are put in place..

UKZN Consortium research

Prof. Colleen Downs has the SARChI Research Chair in Ecosystem Health and Biodiversity at the School of Life Sciences at the University of KwaZulu-Natal (UKZN). Her work extends into investigating how biological control can improve ecosystem health. One of Prof. Down's main reasons for the biocontrol collaboration is for capacity development at the undergraduate level so that students pursue postgraduate opportunities in this and related biological fields. In addition to the skills that students learn during their studies, they also see what work and research opportunities there are in this field.

Undergraduate vacation apprenticeship at UKZN

This project is unique among DEA (Department of Environmental Affairs) funded projects in that it is not research based but was proposed as an extension of a previous programme inaugurated at the University of KwaZulu-Natal (UKZN) to build capacity in the field of biological control by giving undergraduate students laboratory experience during their vacations.

In particular, the aim is to provide vacation experience for a minimum of eight undergraduate UKZN students per annum in various biological control laboratories in KwaZulu-Natal and at UKZN. In January 2018 and June-July 2018 vacations, twelve undergraduate students participated in the apprenticeship programme. Students highlighted the value of the work experience in assisting them with career decisions and with their studies.

2018 apprenticeship student learning about biological control (Photo: Colleen Downs)

Acacia biological control at UCT

FIONA IMPSON

***Trichilogaster* galls on long leaved wattle in Portugal (Photo Elizabeth Marchante)**

As part of the UCT component of the CBC consortium, research staff are mainly involved in the biological control of invasive Australian *Acacias*. Much of the biological control of this group of weeds has focused on seed-reducing agents and has been active in South Africa for some thirty years.

The main focus of the group is on post release evaluation, and in particular, looking at the impacts of the biocontrol agents on seed dynamics of their host plants. However, attention is also given to new potential agents and there is also strong involvement in training and mentorship of biocontrol implementation teams in the Western Cape.

Over the years, the group has developed good collaboration with Australian colleagues, who have assisted with different aspects of the project, and more recently, they have been involved with development of biological control measures against *Acacias* in both Portugal and Israel. A real highlight of this collaboration was in Portugal, where after a lengthy process of host testing and risk assessment measures for a bud-galling wasp (*Trichilogaster acaciae-longifoliae*), against Long-leaved wattle (*Acacia longifolia*), permission was finally granted for release, making this insect the third agent to be intentionally released for biocontrol measures against an invasive plant in Europe. Importantly, this release has now paved the way for future introductions in Portugal, where colleagues there are now investigating the suitability of seed feeding weevils (*Melanterius* species) for Silver wattle (*Acacia dealbata*) and Blackwood (*Acacia melanoxylon*).

During September 2018, Fiona Impson and Carien Kleinjan visited Coimbra, Portugal, where they were hosted by colleagues from the Department of Life Sciences, University of Coimbra. One of the challenges for this biocontrol programme had been to collect and introduce an agent from the southern hemisphere, into the northern hemisphere, where both reproductive phenology of the plant and climatic conditions were reversed. Fortunately, the insect is able to lay its eggs into both reproductive and vegetative growth buds of the host plant and this probably assisted its move across the continents. During their five day trip, Carien and Fiona had the opportunity to gain some insights into the problems and challenges being faced by colleagues in Portugal. They were also fortunate to visit several sites where the bud-galling wasp has become successfully established, in addition to being taken to see infestations of numerous weeds species that South Africa and Portugal share in common.

Elizabeth Marchante (University of Coimbra) Fiona Impson (UCT), Carien Kleinjan (UCT) and Helia Marchante (University of Coimbra) at Lousa, Portugal with backdrop of *Acacia dealbata* infestation (Photo: Helia Marchante)

Tamarix biological control at Wits

NIC VENTER

The genus *Tamarix* (tamarisk, salt cedar) is made up of about 50–60 species of flowering plants in the family Tamaricaceae. They are evergreen or deciduous shrubs or trees which can grow to a height of 18m and can form dense thickets. Within South Africa there are two invasive *Tamarix* species and one indigenous *Tamarix* species. In addition there are hybrid combinations of all three species. The first attempt at finding a suitable biocontrol agent for the invasive *Tamarix* was unsuccessful. The leaf beetle *Diorhabda carinulata* from Asia via the USA, was tested in quarantine and found to not be host specific, because it is able to feed and complete its lifecycle on the indigenous *Tamarix usneoides*. This is possibly due to the fact that the indigenous species is similar, both morphologically and genetically, to the invasive species, and therefore the beetle does not discriminate between them.

To increase our chances of finding a suitable agent, Dr Danica Marlin from Wits University convened an international group of biocontrol scientists with expertise or interest in controlling invasive *Tamarix*. This group met at the International Symposium on Biological Control of Weeds (ISBCW) meeting in Switzerland in August 2018. As a result of the collaborations initiated at that get-together, Dr Marlin travelled with Dr Massimo Cristofaro of the Italian National Academy of Entomology, to Sicily in September 2018, where they collected several arthropod species on different *Tamarix* spp. Of these, the scale insect *Trabutina mannipara* and two unnamed weevil species *Coniatus* spp. and *Corimalia* spp. were imported into South Africa for host-specificity testing in the Wits quarantine. The scale insects have established a self-sustaining colony in quarantine (the weevils are proving more difficult to establish). This colony will be used to run host specificity tests on the scale insect to determine its suitability as a biological control agent of Tamarix in South Africa.

Locally, Dr Danica Marlin and Prof. Stefan Neser, formerly of the Agricultural Research Council (ARC), collected eriophyoid mite galls on *Tamarix* spp. at a site in Noorspoort, Eastern Cape in September 2018. It is hoped that these newly discovered mites may also be candidate agents for controlling invasive *Tamarix* in South Africa. Attempts to establish a laboratory colony of these mites is underway in the Wits quarantine.

***Tamarix* mite galls from Steytlerville, Eastern Cape (Photo: Stefan Neser)**

In addition to searching for *Tamarix* biocontrol agents, the Wits biocontrol lab is exploring the insect fauna already occurring on *Tamarix* spp in South Africa. Apart from informing us of which insect species are already here and possibly attacking the plant (for example we have the leaf hopper *Opsius stactogalus* which appears to be a cosmopolitan species on *Tamarix*), such information will help determine if our local *Tamarix* species *T. usneoides* really is indigenous, or is an ancient human introduction, which is suggested by its disjunct distribution from all other *Tamarix* species in the world.

To this end, Ms Lyriche Drude is sampling insects by fogging trees of all the *Tamarix* species and their hybrids at many localities and in different seasons. Lyriche has compiled a reference collection of these insects with the help of entomologists at the ARC, which is turning up some new and surprising species on the trees. In conjunction with the faunal sampling, Dr Guelor Mayonde (who just graduated with a PhD from Wits for his work on *Tamarix*), is developing a molecular clock to estimate how long *T. usneoides* has been in South Africa. It could turn out to be a species from biblical times which has been moved down the African coast through ancient trading routes.

Danica collecting arthropods on Tamarix in Sicily, Italy (Photo: Danica Marlin)

Stefan collecting mite galls at Noorspoort, Eastern Cape (Photo: Danica Marlin)

Mass-Rearing update

There are two mass-rearing facilities as part of the Centre for Biological Control. The Waainek Research Facility in Grahamstown, is focused on rearing agents for water weeds. The other mass-rearing facility is in Uitenhage and is focused on rearing agents for the control of a number of Cactaceae species.

At the mass-rearing facilities, invasive alien plants are cultivated in controlled environments. These plants are then in turn used to culture (on a large scale) the biological control agent specifically approved for control of that particular plant and eventually released at monitored invasive plant populations across South Africa.

All these biological control agents are available for free to researchers, implementation officers, reserve and water quality managers, farmers and concerned members of the public who want to get involved in preserving biodiversity and controlling invasive species in their local natural environments.

In 2018 a total of almost 150 000 waterweed insects were collected and released on water bodies across South Africa and approximately 30 000 cladodes with insects for cactus control were distributed on areas battling with a cactus infestations. Detailed records are kept of all agents that are requested and released. Further details of agents which are reared for biological control at Waainek and Uitenhage can be found on the CBC website.

Within the Waainek Research Facility, the employees form part of the Sisonke Programme. This was established in 2008 when the first people living with disabilities were employed at the facility. This has grown over the years and the team chose the name 'Sisonke' isiXhosa for 'all together' for the programme. The Sisonke team work together on rearing and distributing biological control agents and assisting students with their projects.

Latest at Uitenhage

The number of cactus agents released by the CBC cactus rearing facility has increased year by year. There have been constant requests from farmers and other land owners for the release of agents on various species of cactus. Regular post-release monitoring is also conducted at most sites. Results are promising—showing a drastic reduction in infestation of cactus.

Uitenhage team:
Top: Ruth Scholtz, Ronel Roman, Karin Goliath, Carmen Peters, Byron Soetland,
Bottom: Arthur Scholtz, Gugulethu Mkile, Lubabalo Malinga (Photo: Iain Paterson)

Waainek team (Left to Right): Lunga Ngeju, Siya Ntamo, Odwa Rala, Vujani Ntyinkala (Majeke), Vusumzi Sukula (Suks), Landile Booi, Lulama Poni, Maretha Boschoff, Mlamli Mbangi. Insert: Lyle Titus (Photo: Esther Mostert)

Waainek developments

A new quarantine facility is currently being constructed at Waainek by converting an old building previously used for storage and controlled environment rooms. It is envisioned that this facility will be opened in early 2019. It will allow the total CBC quarantine space to more than double in size and greatly contribute towards expanding the amount of host specificity testing that can be done on potential biological control agents by CBC staff and students.

Five new earth pools have been dug at Waainek. They will increase the capacity for mass rearing insects at Waainek. Each pool is lined with thick plastic and has a capacity of approximately 35 000 litres.

The latest addition at Waainek is a shipping container. This container was used to transports components for the CO_2 open topped chambers. It will increase storage capacity at Waainek.

Quarantine facility construction well under way

Latest Waainek addition—shipping container

Five new earth pools are now in place at Waainek

CBC Awards & Achievements

Congratulations to CBC staff and students for flying the flag for high quality research and presentations.

Nompumelelo Baso with Rhodes VC Dr Sizwe Mabizela at an awards dinner

Distinguished Prof. Martin Hill

Awarded Distinguished Professor in November 2017 in recognition of his outstanding scholarly reputation and productivity.

Prof. Julie Coetzee

Awarded best poster presentation at the XV International Symposium on Biological Control of Weeds (ISBCW) in Engelberg, Switzerland from 26—31 August, for her collaborative work on *Iris pseudacorus*.

Nompumelelo Baso

Best speed talk award at the 45th Invasive Species Management Symposium from 3—6 July at Thohoyandou, University of Venda in Limpopo, for a presentation on her Masters work.

Best Publication

Distinguished Prof. Martin Hill was a co-author on a paper which was awarded the 'Best publication in a professional Journal or Book' by the Agricultural Economics Association of South Africa.

Citation:

Arp, R., Fraser, G.C.G. and Hill, M.P. 2017. Quantifying the economic water savings benefit of water hyacinth (*Eichhornia crassipes*) control in the Vaalharts Irrigation Scheme. *Water SA* 43: 58-66.

CBC in the news

The CBC is committed to demystifying the science behind biological control of invasive weeds. Here are some highlights of CBC media features over the past year.

Radio Interviews

Julie Coetzee interviewed on 21 October 2018 on SAFm 'The Jet Set Breakfast' by Michelle Constant, about the release of the fly, *Hydrellia egeriae.*

Rosali Smith interviewed on 26 October 2018 on SAFm 'Sunrise' by Stephen Grootes about the release of the fly, *Hydrellia egeriae.*

TV feature

Ruth Scholtz appeared on a documentary on Bay TV on 23 October 2018, which focused on woman who play important roles in the community—her important work as the Uitenhage Mass Rearing Facility manager was featured.

Newspaper/popular journal articles

'The New Centre for Biological Control at Rhodes University'. *South African Fruit Journal.* February/March 2018, article by K Weaver.

'Centre for Biological Control awarded R68m contract to help control alien plants'. June 2018. Creamer Media's Engineering News, article by M Arnoldi

'Goggas is agente in geveg teen indringers', 20 July 2018, *Die Burger* article by J Bonthuys.

'Fly to head off the weed invasion', Saturday, 13 October 2018, *Daily Dispatch* article by Tyler Riddin.

'Humble fly takes on Brazilian invader', Sunday 14 October 2018, *Sunday Times* article by Claire Keeton.

Some CBC scenes from the past year

CBC end of year function—Caribbean Island style

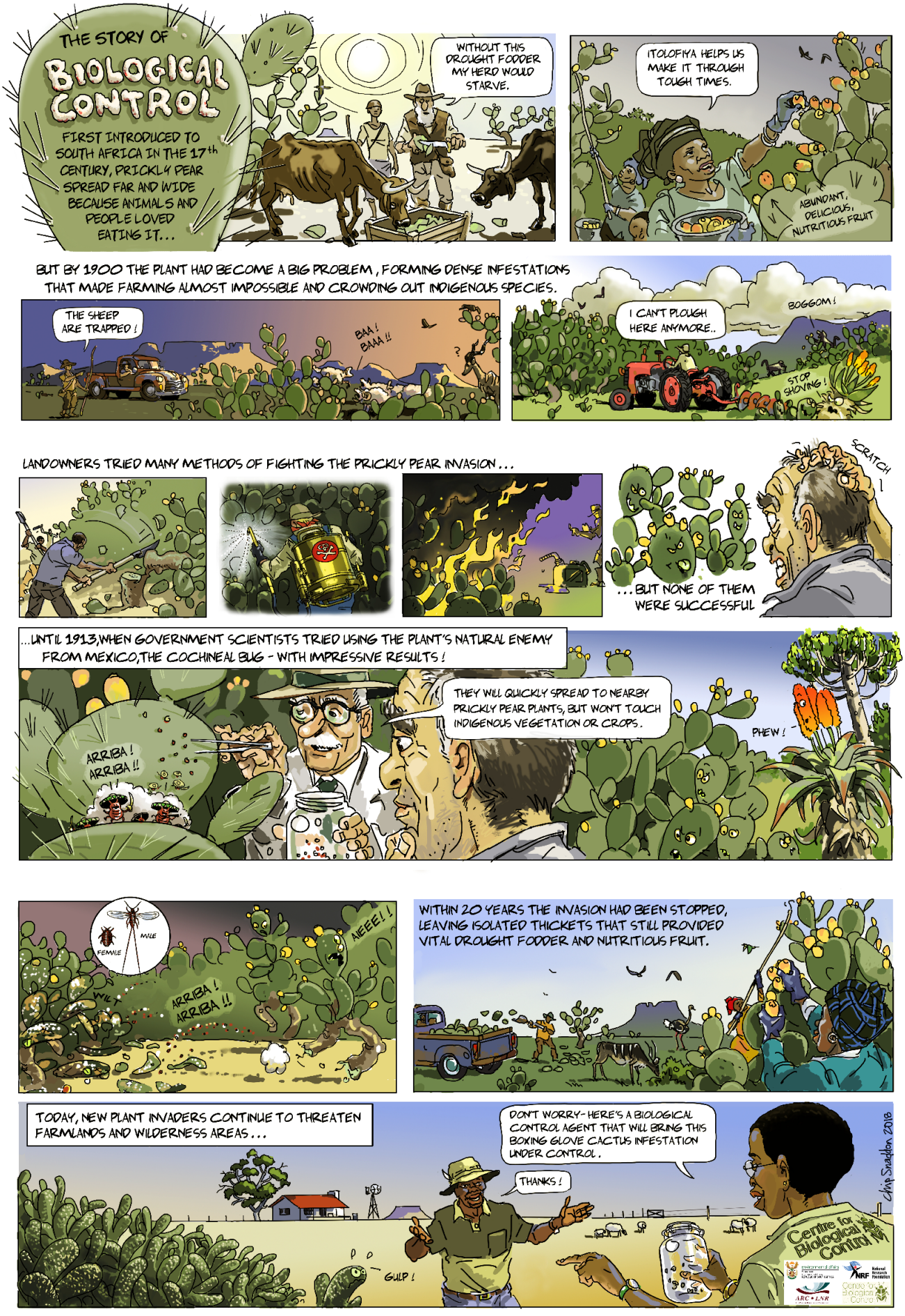
A stop at Kruger National Park after attending the 45th Invasive Species Management Symposium in Thoyandou, Limpopo.

CBC delegation at the International Symposium on Biological Control of Weeds (ISBCW), Engelberg, Switzerland

Sam Motitsoe in the field in Scotland

A gathering of entomologists at the launch of Centre for Biological Control (CBC) on 2 November 2017

CBC delegates in Queenstown, New Zealand at the 15th International Symposium on Aquatic Plants (ISAP)


THE STORY OF
BIOLOGICAL CONTROL
FIRST INTRODUCED TO SOUTH AFRICA IN THE 17th CENTURY, PRICKLY PEAR SPREAD FAR AND WIDE BECAUSE ANIMALS AND PEOPLE LOVED EATING IT...
WITHOUT THIS DROUGHT FODDER MY HERD WOULD STARVE.
ITOLOFIYA HELPS US MAKE IT THROUGH TOUGH TIMES.
ABUNDANT, DELICIOUS, NUTRITIOUS FRUIT
BUT BY 1900 THE PLANT HAD BECOME A BIG PROBLEM, FORMING DENSE INFESTATIONS THAT MADE FARMING ALMOST IMPOSSIBLE AND CROWDING OUT INDIGENOUS SPECIES.
THE SHEEP ARE TRAPPED!
BAA! BAAA!!
?
I CAN'T PLOUGH HERE ANYMORE..
BOGGOM!
STOP SHOVING!
LANDOWNERS TRIED MANY METHODS OF FIGHTING THE PRICKLY PEAR INVASION...
SCRATCH
...BUT NONE OF THEM WERE SUCCESSFUL
...UNTIL 1913, WHEN GOVERNMENT SCIENTISTS TRIED USING THE PLANT'S NATURAL ENEMY FROM MEXICO, THE COCHINEAL BUG - WITH IMPRESSIVE RESULTS!
ARRIBA! ARRIBA!!
THEY WILL QUICKLY SPREAD TO NEARBY PRICKLY PEAR PLANTS, BUT WON'T TOUCH INDIGENOUS VEGETATION OR CROPS.
PHEW!
FEMALE
MALE
WILX
ARRIBA! ARRIBA!!
AIEEE!!
WITHIN 20 YEARS THE INVASION HAD BEEN STOPPED, LEAVING ISOLATED THICKETS THAT STILL PROVIDED VITAL DROUGHT FODDER AND NUTRITIOUS FRUIT.
TODAY, NEW PLANT INVADERS CONTINUE TO THREATEN FARMLANDS AND WILDERNESS AREAS...
DON'T WORRY - HERE'S A BIOLOGICAL CONTROL AGENT THAT WILL BRING THIS BOXING GLOVE CACTUS INFESTATION UNDER CONTROL.
THANKS!
GULP!
Chris Snadden 2018
Centre for Biological Control

The year ahead

The year ahead holds some interesting research opportunities. The CBC will be represented at a number of events in 2019.

ESSA 2019

21st Entomological Society of Southern Africa (ESSA) Congress,

8—11 July 2019

Umhlanga, KwaZulu-Natal

SIP 2019

Symposium on Invertebrate Pathology (SIP)

28 July—1 August

Velencia, Spain

Weeds Biological Control Short Course

The CBC will hold the annual waterweeds short course from 26—30 August 2019. Applications will open early in the new year.

There will also be a number of new MSc and PhD students joining the CBC research group in 2019. Bursary opportunities are available—see details below.

Bursaries available

Funding is available for both MSc and PhD studies on various research projects. If you are interested in joining the CBC team, please contact us on

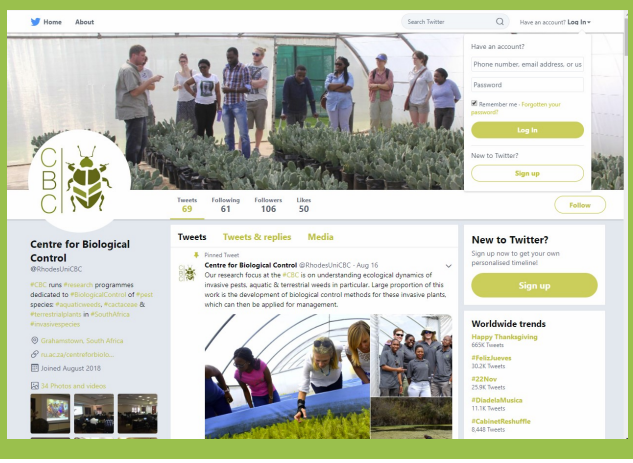
cbcinfo@ru.ac.za

046 603 8763

CBC on social media

https://www.facebook.com/RhodesUniCBC/

https://twitter.com/RhodesUniCBC



The CBC worked with Chip Snaddon—Illustrator, cartoonist and storyboard artist, to develop this storyboard panel depicting the story of the biological control of a cactus (*Opuntia ficus-indica*). More cartoons are in the pipeline. They will be used for school engagement and other community engagements activities.

RHODES UNIVERSITY
Where leaders learn

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CBC Vision

The CBC seeks to:
(i) Sustainably control environmental and agricultural pests for the protection of ecosystems and the societies that depend on them, and
(i) Ensure that the maximum benefits of biological control are realised through excellence in research, implementation and community engagement.

CBC Mission

The CBC's Mission is to make the Rhodes University Centre for Biological Control an internationally recognised research institute and a leading research Centre.