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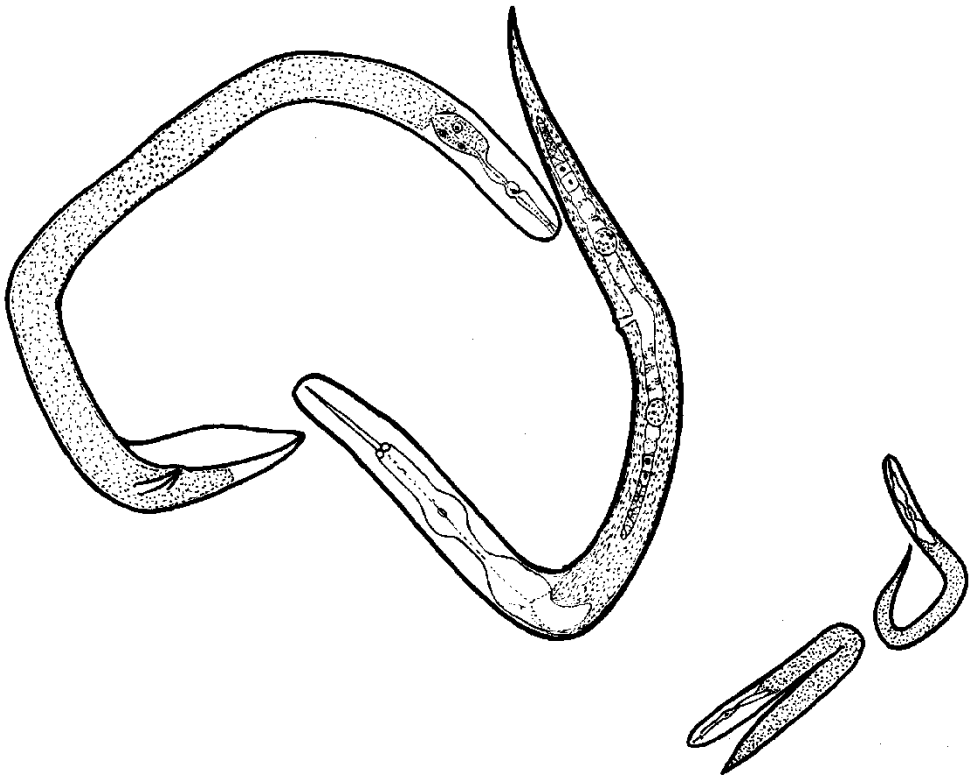
AUSTRALASIAN NEMATOLOGY NEWSLETTER



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From the Editor

Thank you to all those who made contributions to this newsletter.

July Issue

The deadline for the July issue will be the end of June. I will notify you a month in advance so please have your material ready once again.

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Association News

FROM THE PRESIDENT

You actually need to read this!!!

Membership lists As a result of some recent enquiries to the Secretary of ANN, the issue of publishing membership lists has come up. In this latest instance it concerned an overseas researcher wanting to know who to contact in Australasia about a particular area of nematology. I know that all the Executive of the AAN (myself, Sarah & Katherine), periodically receive such requests, and as wonderfully helpful, accommodating, nice and humble as we all are ☺ , for all of us time is increasingly limited for such things. Hence we have discussed making the list of members and their areas of interest more available. I am reliably informed that everyone now needs to be careful about publishing contact details. Hence this missive.

Do members object to publishing their contact details in the next edition of the newsletter? Although this is purely a document internal to the AAN, and hence not subject to privacy considerations, the newsletter does go on the web, and so is accessible more generally. This can be good (allows people with similar interests to find you easily) and bad (allows people whom you would really rather not know about you to find you more easily, too).

APPS has a directory of members with limited details available publicly. I suggest we do something similar and work with our web master to ensure that addresses cannot be "harvested", resulting in enormous amounts of spam. The result of all this is **that if you do NOT want name, professional address** (eg "National Research Collections Australia, CSIRO" for me or "University of Adelaide" for Kerrie), **then let me or Sarah know, and we will take your name off the list that will go out in the next issue and that will be put on the web site.**

A farewell The next item for me to write about is about a departure, fortunately not an obituary. But it is sad that Lila Nambiar, long-term nematologist at DEPI in Victoria, retired at the end of last year. On a personal level, Lila has been a delight to work with over many years. On a professional level, Lila's incredible knowledge of Australian nematodes and skill in identification will be missed by all with an interest in plant-parasitic nematodes. I am sure I speak for all of AAN in wishing Lila a happy—and well-deserved—retirement.

Capacity in Nematology This raises two other issues for nematology: capacity in Australasia and succession planning. Is there much of either? Before Lila's retirement, I had an interesting (euphemism) experience trying to get one of my recent students employed by CSIRO with a view to them being in a position to take over from me eventually. Although I hope it will be some time before my obituary, this had me thinking about Australasia's capacity in nematology. In addition to this, the Subcommittee for Plant Health Diagnostics (SPHD) is currently reviewing diagnostic capacity in Australasia for nematodes (and other less-interesting plant pathogens ☺). So with Lila's retirement coming on top of these other things, there seems to be a real loss of expertise.

I would be interested in other views, but I think this is a long-term issue. Training people to identify nematodes morphologically takes time. I reckon it took a couple of years of looking at lots of nematodes to really get my eye in—and that was looking at marine nematode which have (mostly) big mouths of different shapes with teeth in different places, setae that you can count, big amphids with different outlines and cuticular ornamentation, rather than terrestrial plant parasites with none of those things. Identification of nematodes takes time to learn, and there has to be somewhere to go once you have the skills.

I would suggest that we are yet some way off being able to identify any nematode using a genetic bar code. Although molecular data can be very useful, there are still two main issues: one is the coverage of the species that are known, and the flip side of this is the number of sequences that are completely different to anything in GenBank. This does not count the issue of which gene(s) or gene region(s) are being investigated.

The upshot of all this is that being able to identify nematodes morphologically will, I suggest, be necessary for at least a little while yet, and the number of people who can do it seems to be shrinking.

What to do about it? AAN was formed (some years ago) as a group to do something about the decline in support for nematology. It seems things still need doing in this regard. I suggest that people use the various reports on capability coming out soon, and try to use them to get support. And I would suggest being positive, despite the gloom: if each nematology group says the other ones need support (as well as their own group), then those with the purse strings might believe it rather than merely giving the message "we need more".

Mike Hodda

Regional News

NEWS FROM QUEENSLAND

News from University of Southern Queensland

The nematology team in Toowoomba has left the Department of Agriculture, Fisheries and Forestry Queensland and is now employed by the University of Southern Queensland (USQ). Our Crop Nematology team is led by Professor John Thompson within the Centre for Crop Health which is led by Prof. Mark Sutherland. We continue to do the same work and will remain in our offices at the Leslie Research Facility until new facilities have been built at USQ in approximately 12–18 months. Our email addresses have all changed–firstname.lastname@usq.edu.au and shortly our phone numbers will change too. Our team is looking forward to making the most of new opportunities offered by the University.

New publications from our team in 2014 are listed below:

Journal Articles:

Thompson JP, Clewett TG, O'Reilly MM (in press) Temperature response of root-lesion nematode (*Pratylenchus thornei*) reproduction on wheat cultivars has implications for resistance screening and wheat production. *Annals of Applied Biology*

Thompson JP, Clewett TG, O'Reilly MM (in press) Optimising initial population, growth time and nitrogen nutrition for assessing resistance of wheat cultivars to root-lesion nematode (*Pratylenchus thornei*). *Australasian Plant Pathology*

Sheedy JG, McKay AC, Lewis J, Vanstone VA, Fletcher S, Kelly A, Thompson JP (2014) Cereal cultivars can be ranked consistently for resistance to root-lesion nematodes (*Pratylenchus thornei* & *P. neglectus*) using diverse procedures. *Australasian Plant Pathology* DOI 10.1007/s13313-014-0333-4.

Reen RA, Thompson JP, Clewett TG, Sheedy JG, Bell K (2014) Yield response in chickpea cultivars and wheat following crop rotations affecting population densities of *Pratylenchus thornei* and arbuscular mycorrhizal fungi. *Crop and Pasture Science* **65**, 428-441.

Whish JPM, Thompson JP, Clewett, TG, Lawrence, JL, Wood J (2014) *Pratylenchus thornei* populations reduce water uptake in intolerant wheat cultivars. *Field Crops Research* **161**, 1-10.

Owen KJ, Clewett TG, Thompson JP (2014) Wheat biomass and yield increased when populations of the root-lesion nematode (*Pratylenchus thornei*) were reduced through sequential rotation of partially-resistance winter and summer crops. *Crop and Pasture Science* **65**, 227-241.

Conference papers:

Thompson JP, Clewett TG and O'Reilly MM (2014) Time of planting wheat can modify yield loss from root-lesion nematode (*Pratylenchus thornei*) in sub-tropical Australia. Proceedings of the Eighth Australasian Soil-borne Diseases Symposium, Hobart, Tas. (Australasian Plant Pathology Society, Hobart) p. 39.

Robinson NA, Sheedy JG, Clewett AM, Conway M, Thompson JP (2014) Occurrence of root-lesion nematodes in Central Queensland, Australia. Proceedings of the Eighth Australasian Soil-borne Diseases Symposium, Hobart, Tas. (Australasian Plant Pathology Society, Hobart) p. 17.

Owen KJ, Clewett TG, Thompson JP (2014) The cup is half full: successful management of root-lesion nematodes in the rainfed subtropical wheat region of Australia. Proceedings of the Eighth Australasian Soil-borne Diseases Symposium, Hobart, Tas. (Australasian Plant Pathology Society, Hobart) p 6.

Thompson JP, Reen RA, Kelly A (2014) Potential of wild chickpea species for improving the resistance of chickpea to root-lesion nematodes. Sixth International Food Legume Research Conference, and Seventh International Conference on Legume Genetics and Genomics, Saskatoon, Saskatchewan, Canada. July 7-11. P194

Kirsty Owen

NEWS FROM SOUTH AUSTRALIA

The University of Adelaide

In December, Kerrie Davies finally submitted the revision of '*Schistonchus*', splitting the genus into 3 based on morphological and molecular evidence. It is a huge manuscript, and she expects to have to do lots of slashing and burning when it is reviewed. She and her co-authors decided to submit it as it was, and to let the reviewers recommend which bits to cut.

In August, Kerrie and 'Fred' Bartholomaeus did a collecting trip from Sydney north to Bundaberg. This was supposed to sort out what was happening with '*Schistonchus*' on *Ficus macrophylla*, *F. rubiginosa* and *F. obliqua* – a group of figs on which we knew there was a lot of host-switching of the nematodes. Alas – instead of clearing the waters we muddied them further, finding at least 2 new species, also switching hosts. Our hopes of putting molecular tails on morphological donkeys were dashed … Kerrie won't go on with more bad metaphors but you get the picture (sorry).

In January, Kerrie visited family in the UK, and was able to spend a happy and stimulating day with retired nematologist Adrian Evans and his wife Pat.

John Sagun submitted his MSc thesis, and passed with flying colours. The abstract is included in this issue of the newsletter. John is currently considering his future, which is likely to be in teaching science.

Kerrie is seriously considering retirement and farewelling nematology. She has drawn up a 5 year plan, which includes curation of the Waite Nematode Collection – a daunting task in itself. Sadly, she has almost completed writing up 20 odd years work on *Fergusobia*, and will leave that fascinating genus behind. '*Schistonchus*' will occupy most of her research time, until mid-2019.

Kerrie Davies

SARDI

As part of the GRDC funded National Nematology Project, SARDI staff have been busy harvesting and soil sampling field trials analysing the tolerance and resistance of current and newly released cereal varieties to *P. neglectus and P. thornei*. Despite a dry finish in the Mallee and in the Adelaide Plains, all trials generated average or better yields and there were significant net yield responses in 15-30% of the varieties tested. There were some significant yield gains in the presence of high nematode numbers and we hope to further investigate these interesting responses with field experiments in 2015.

SARDI staff have also been investigating the effects of break crops on multiplication of *P. neglectus* and *P. thornei*, also as part of the GRDC National Nematology Project. In SA, 5 NVT trials were intensively sampled and changes in RLN levels were monitored using PreDictaB. For both species, data shows that there are varying degrees of resistance in the cultivars tested for faba beans, field peas and lentils.

The SARDI DNA tests for free living nematodes, developed as biological indicators of cereal cropped soil health, have recently been used in a number of viticulture and cherry orchard projects. The tests showed distinctly different free living nematode communities in soils from organic vineyards/orchards *vs* non-organic. As expected, the organic soils were dominated by fungivores, omnivores and predatory nematodes due to applications of organic matter and restricted use of chemicals.

SARDI/ACPFG PhD student Shefat Rahman has entered his final year of his project, fine mapping the *P. thornei* resistance loci, *QRlnt.sk-2B* and *QRlnt.sk-6D*. Shefat has also been investigating the biological resistance mechanisms using histochemical staining and microscopy. Using confocal microscopy, he has recently successfully used the lipophilic fluorescent dye PKH26 to track and image nematode invasion live within the wheat root.

Katherine Linsell and Paul Bogacki

NEWS FROM VICTORIA

Bundoora

At the end of 2014, Lila Nambiar entered retirement after a 25 year career as diagnostic nematologist of plant-parasitic nematodes with Crop Health Services (CHS) of the Victorian Department of Economic Development, Jobs, Transport and Resources (formerly the Department of Environment and Primary Industries). For the past five years I have been under Lila's skilled guidance in all matters related to nematode diagnosis, specimen preparation and curation, and collection preservation and maintenance. Thanks to Lila's painstaking work, our nematode collection has grown to over 9,500 microscope slides, most prepared with multiple specimens, covering an extensive collection of plant-parasitic nematode taxa from a broad range of host plants, as well as many free-living nematode species. Details of all specimens are captured in a computer database.

Since Lila's departure, I remain as the single nematologist at CHS, which is a plant pathogen and pest diagnostic service. Prior to my joining the nematology section of CHS, I functioned in the same unit for eight years as a diagnostic entomologist. Before I moved to Victorian agricultural entomology, I worked for about eight years on a variety of invertebrate biodiversity projects, particularly in natural ecosystems, with the Invertebrate Survey Department of the Museum of Victoria. During my post-graduate years I studied the field-ecology of some of Australia's native small marsupials and rodents.

John Wainer

Horsham

The field crops pathology team has been busy since the last report. Due to Grant Holloway's continued productivity, he was awarded the Victorian Wheat Foundation's Award for Excellence during 2014. During the last 6 months Grant and Joshua have hosted a national yield response curve meeting and hosted visits to our trial program from many researchers, including:
DAFFWA - Sarah Collins, Carla Wilkinson, Rob Loughman and Manisha Shankar
USQ (formally DAFFQ) - Kirsty Owen and Tim Clewett
DAFFQ – Alison Kelly, Clayton Forknall and Greg Platz
NSWDPI - Steven Simpfendorfer
SARDI – Alan McKay, Katherine Linsell and Paul Bogacki
GRDC – Sharyn Taylor and Alan Mayfield

In addition to hosting visitors, Grant toured nematode trials in Queensland, Western Australia and South Australia, and Joshua visited trials in South Australia. Both Grant and Joshua attended the Australasian Soilborne Diseases Symposium in Hobart presenting posters, and Joshua gave an oral presentation titled, "Pre-sowing *Pratylenchus thornei* density can be used to determine yield loss risk in cereal crops grown in Victoria". Prior to the conference Joshua and Grant participated in a field crop nematology discussion organised by Sarah Collins. Joshua also attended the free living nematode workshop presented by Graham Stirling in Hobart, learning about natural soil processes for nematode control.

All nematode field trials have been harvested and soil sampling is occurring to determine nematode multiplication. The 2014 growing season was not ideal with trials affected by both frosts and drought. Yields were significantly lower with most plots of wheat and barley averaging between 0.5 and 1.5 t/ha compared to average seasonal yields of 3 to 4 t/ha. Data analysis has been undertaken on our main trials with few yield responses observed, probably due to the water limited growing conditions.

Collaboration with South Australian researchers has continued with a large MET analysis completed on yield trials conducted over the last four years in both states. This analysis has increased the power of the results and allowed for more conclusions to be obtained from the results. Some of these results include significant yield losses caused by *P. thornei* and *P. neglectus* in Victoria of between 5-10% in intolerant varieties. To produce these results we were comparing the yields of high and low nematode density plots, but it is difficult to achieve very low nematode densities. In future trials we are focusing on crop rotations to reduce our initial nematode densities in our low plots to ensure we are capturing the full yield loss due to these nematodes.

The data analysis and interpretation that has occurred over the last year has also allowed for tolerance and resistance ratings for Victorian trials to be determined. These ratings will be published in the relevant field crop disease guides. A significant amount of work has also been undertaken to produce a Root Lesion Nematode fact sheet for the Southern Region of Australia. This fact sheet will be published by the GRDC and is due for release during early 2015.

Joshua Fanning, Mathew Rodda, Frank Henry and Grant Hollaway

Lila Nambiar retires

Lila began her career with the Victorian Department of Agriculture in 1990 after completing her tertiary training in Fiji and London. First located at the Plant Research Institute, Burnley and subsequently relocating with her workgroup, Crop Health Services, to Knoxfield and then to AGRIBIO, La Trobe University, Lila has made her mark in the field of Nematology and is recognised around the country and internationally for her expertise. She identified at least 6 nematode species for the first time in Australia.

In her 25 year career in Australia, Lila has specialised in the diagnosis of plant-parasitic nematodes, collaborated on a number of research projects on nematode biology and control and developed and curated a valuable reference collection. She is held in very high esteem by her nematological colleagues for her thoughtful and careful evaluation of evidence, and her diagnostic skills will be sorely missed. Lila was a quiet achiever getting on with her work with little fuss. Over the span of her career with the Victorian Government, Lila tested thousands of soil samples for the potato cyst nematode. Her contribution to industry was recognised with an "Achievement" award presented to her by the Victorian Certified Seed Potato Authority (ViCSPA) at the Australian Potato Industry Conference at Mt Gambier in August 2014.

Lila is looking forward to spending more time with family and friends and volunteering in her community. Congratulations, Lila, on leaving your mark in this vital field of science and especially for your service to Victoria's plant industries and the Victorian Government's Biosecurity responsibilities.

A selection of Lila's publications follows:

Nambiar LV, Wainer J (2011) Collecting Plant and Soil Samples for Nematode Analysis. Department of Primary Industries Agriculture Notes AG 1444.

Nambiar LV, Quader M, Nobbs JM (2010) *Morulaimus gigas* (Nematoda: Belonolaiminae) in southern and eastern Australia. *Australasian Plant Disease Notes* **5**, 39-41

Nambiar LV, Quader M, Nobbs JM, Coban JA, Campbell PR, Gulino LM (2008) First record of *Meloidogyne fallax* in Victoria, Australia. *Australasian Plant Disease Notes* **3**, 141-142

Nambiar LV, Quader M, Nobbs JM (2008) First record of *Hoplolaimus galeatus* in Australia. *Australasian Plant Disease Notes* **3**, 145-146

McLeish LJ, Berg GN, Hinch JM, **Nambiar LV**, Norton MR (1997) Plant parasitic nematodes in white clover and soil from white clover pastures in Australia. *Australian Journal of Experimental Agriculture* **37**, 75-82.

Hodda M, **Nambiar LV** (2005) *Neodolichodorus australis* n. sp. (Nematoda: Dolichodoridae) on carrot in Australia. *Australasian Plant Pathology* **34**, 1-9

Hodda M, Smith D, Smith I, **Nambiar LV**, Pascoe I (2008) Incursion management in the face of multiple uncertainties: A case study of an unidentified nematode associated with dying pines near Melbourne, Australia. In: *Pine Wilt Disease: A Worldwide Threat to Forest Ecosystems* 2008: pp15-40, Springer, The Netherlands

Smith DI, Hodda M, Smith IW, **Nambiar LV**, Pascoe I, Aldaoud R (2008) *Bursaphelenchus hunanensis* associated with the dying *Pinus* species in Victoria, Australia. *Australasian Plant Disease Notes* **3**, 93-95

Quader M, **Nambiar LV**, Cunnington J (2008) Conventional and real-time PCR based species identification and diversity of potato cyst nematodes (*Globodera* spp.) from Victoria, Australia. *Nematology* **10**, 417-478

Rudolf de Boer.

Reports on 6th ICN South Africa

In 2014, the Australasian Association of Nematologists provided support to three students to help them attend the 6th ICN in South Africa. Their reports on the Conference follow.

Natalie Banks (Murdoch University)

Imagine you could rub shoulders with the 'celebrity' nematologists in your area and meet the future leaders in your field, all while living it up in the lap of luxury. Well, too bad! Because that's what you missed when you were a no-show at the 6ICN in South Africa.

Around 300 nematologists, representing countries from every continent on Earth, were mingling in the foyers of two floors of the Cape Sun 5 star hotel in Cape Town from 4th -9th May, 2014. These scientists showcased their latest research in over 236 seminar and 191 poster presentations which covered everything from new genetic sequences for major pest species to advances in species delimitations to low tech but effective nematode control options, like orange juice!

Meetings of several nematology societies took place on the sidelines of the congress, as well as workshops on some of the most important issues nematologists are currently facing, such as host races in RKN's.

Our Australian representatives made up a concerted front, comprised of: Myself, Kylie Crampton, Katherine Linsell and Mike Hodda. We were joined (thanks to Mike's lobbying efforts and The Crawford Fund) by Sunil Singh (Fiji) and Nuchanart Tangchitsomkid (Thailand).

I talked about the most recent findings of my PhD research on nematode movement along trade networks in Australia and South East Asia. Kylie spoke about controlling *Pratylenchus* populations in cereal cropping systems using soil microbes. (She even managed to work a few jokes in; unusual in this setting and which were generally appreciated). Katherine presented the results of her research on the development of DNA tests measuring the diversity of nematode communities in cereal cropping systems under different management regimes and then using these measures as indicators of soil health. Mike displayed his usual level of showmanship and gave an entertaining talk on nematology communication and education, drawing from his experiences teaching varied audiences this multifaceted and complex subject, where there are ***so*** *many* exceptions to the rule, while avoiding information overload. Sunil presented some results from his PhD looking at range expansion in several important grain pests under different land management scenarios. Nuchanart's poster on the development of an ultrasonicator machine which can detect and dramatically reduce the numbers of PPN in live plant roots generated a lot of interest.

Several plenary speakers discussed the future of nematology including measures such as soil modification to reduce PPN losses and enhancing the function of beneficial nematodes in soils.

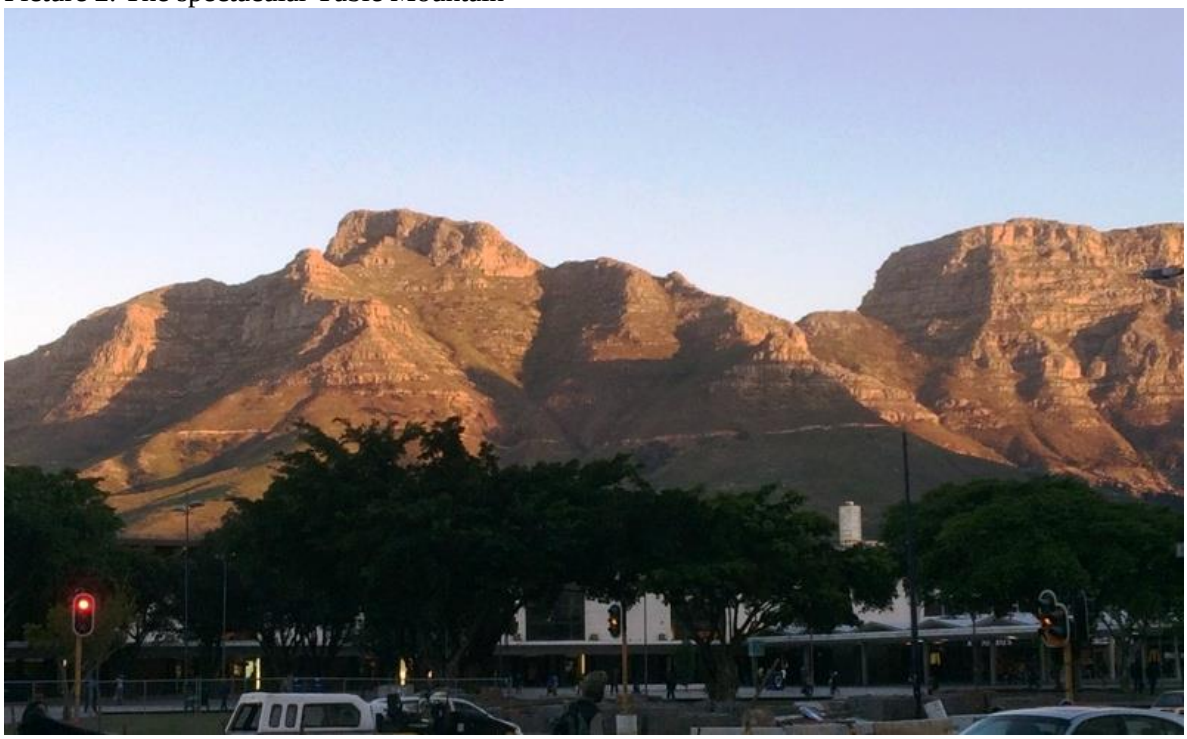
While some presentations made the usual assumption that to solve the global shortage in nematology expertise we must simply "train more students", one speaker actually addressed the crucial blind spot, advocating that "attracting interest in nematology" should be the key strategy to building capacity, thereby creating **jobs** for trained nematologists. This speaker also emphasised closer collaboration with other minority disciplines, together providing valuable insights and potential solutions to increasing agricultural productivity under current and future environmental pressures.

One of the many highlights of the congress was meeting other nematology students from all over the world, especially those from Africa who were attending the Ghent University in Belgium. They are enthusiastic, practical and driven to improve the state of agriculture in their countries.
The event organisers and managers were fantastic. I felt the congress was expertly organised and executed, amazing venue and food, incredible congressional dinner (I felt like I was at a Hollywood celebrity wedding), and truly amazing field excursion to The Cape. There was only one drawback. As this was the first conference I have ever attended, I am sure that every single conference I attend in the future will be a let-down in comparison. That said, it was a great experience and one I will never forget. I am most grateful to the AAN (as well as the 6ICN organisers) for sponsoring me to go.
The abstracts for all the talks at 6ICN have been published in the Journal of Nematology and are available from the following link: http://journals.fcla.edu/jon/article/view/83290.
The full proceedings are available from the following link: http://nematologia.com.br/wp-content/uploads/2014/05/6thproc.pdf.

Kylie Crampton (Charles Sturt University)
In May I travelled a LOOOONG way to attend and present at the 6th International Congress of Nematology in Cape Town, South Africa. And what a spectacular city Cape Town is with Table Mountain as a backdrop! Having arrived a day early, I took the opportunity to take in some views and meet some of the other delegates with a bike ride through the Constantia wine region. Despite experiencing miserable weather for the whole ride and being soaked right through, we all had a good time and tasted some great wines. The conference was well attended, and it was great to see so many people with an interest in nematodes all in the one place. I found the breadth and depth of research being discussed remarkable. Coming from a biocontrol background rather than a nematology background there was much for me to learn, and I have to admit that at times the sheer volume of knowledge was overwhelming. In addition to biological control methods; morphology, taxonomy, genomics, interactions, education and training were covered for a wide range of nematode species. My presentation (entitled "Prospecting in Established Cereal Cropping Ecosystems for Microbial Enemies of Root Lesion Nematodes") was well received by the nematology community. It stimulated good discussion both during and following the session, giving me some good pointers and ideas for future research. The social events held throughout the conference were a highlight, and proved invaluable for bringing young and old, established and up-and-coming scientists together. The 6th ICN committee did a fabulous job of organising everything for the delegates and making them feel welcome throughout the conference. It was a very supportive environment for students such as myself, and I'd like to take this opportunity to thank the AAN for assisting with funding which allowed me to attend this memorable event.

Picture 1. Cyclists who went through the Constantia wine region.

Picture 2. The spectacular Table Mountain



Picture 3 Table Mountain hiking group.

Abstract of paper presented at ICN: Prospecting in Established Cereal Cropping Ecosystems for Microbial Enemies of Root Lesion Nematodes

K. Crampton, E. Adorada, C. Lisle, and G. Ash

Root lesion nematodes are responsible for millions of dollars in losses to the Australian grains industry each year. Current management strategies are not always practical, so development of alternative control measures would be of significant benefit. Microbial-based pesticides are one such alternative undergoing a revival of interest. The aim of this study was to isolate selected microbial enemies of plant parasitic nematodes, and evaluate their potential to control root lesion nematodes. Twenty-one farms across the Riverina, a district with a long cereal cropping history and known presence of *Pratylenchus* spp., were sampled. Three hundred and thirty one isolates of *Paecilomyces*, *Trichoderma*, *Verticillium* and *Bacillus* were obtained following selective culturing, with *Trichoderma's* being the most abundant. From these isolates, 46 *Paecilomyces*, 12 *Verticillium*, 7 *Trichoderma*, and 10 *Bacillus*, plus 13 additional *Bacillus* isolates from the Charles Sturt University Plant Pathology collection, were selected for assay against *Pratylenchus thornei* in a greenhouse pot experiment. Seventy one treatments were able to reduce the number of nematodes compared to the untreated control, with a number of *Paecilomyces* isolates providing significant levels of control. Overall, our findings suggest that isolates obtained from established *Pratylenchus*-containing ecosystems are suitable for investigation as biocontrol agents.

Sunil Singh (Australian National University)

I attended the 6thICN in Cape Town, South Africa, sponsored by AAN, the Crawford Foundation and the 6thICN. My main presentation was an invited talk on Nematode Biosecurity, and there were several other talks and posters where I was a co-author, particularly the workshop on communicating nematology.

The session on nematode biosecurity was very useful and my talk was well received. My talk summarized the international spread of plant-parasitic nematode species over the last decade, which has caused greater damage to crop production worldwide. I described biosecurity measures, such as certification, targeted sampling, surveillance and early detection as the most cost effective and efficient means of minimising the impacts of invasive nematode species in new environments. However, due to their microscopic size, low probability of detection and diverse range of pathways, plant-parasitic nematodes represent a major challenge for early detection of incursions. The design of surveillance strategies for plant-parasitic nematodes was illustrated using examples. Methods for prioritizing exotic nematode species; spatial mapping of risks; and targeted sampling (taking into consideration seasonal cropping patterns and nematode population growth) were also discussed. Having a well-planned surveillance strategy for plant-parasitic nematodes can increase the chances of early detection and the success of eradication campaigns.

I also participated in the session on "Communicating nematology", where I learned about communication from Dr Smol (Postgraduate International Nematology Course and European Masters in Nematology Courses, University of Ghent), Professor Melakeberhan (Michigan State University & USAid) and Dr Coyne (IITA, Nigeria). They have taught many people in Africa, Europe and America. We particularly learned about communicating with farmers and others where there is little prior knowledge of nematodes, the farms are small-scale, and have limited access to technology. They had many ideas about improving our presentations and how to communicate, and who to communicate with. I appreciated being able to give a talk to the workshop because it made me think about what to present and how to present it, and encouraged other people to talk with us afterwards.

Conference participants included mainly people from Africa and west Asia (Egypt, Iran, India, Pakistan, Turkey and some others). We learnt a lot about their research, too. Often they are doing very basic research because that is what is needed most and is most valuable. We learned a lot about nematode species that are different from those causing problems in ASEAN, Fiji and Australia.

I now have a job as a lecturer at the University of the South Pacific, so the experience of this conference will greatly assist me.

Nematological 'Culture'

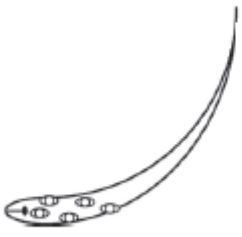
Background

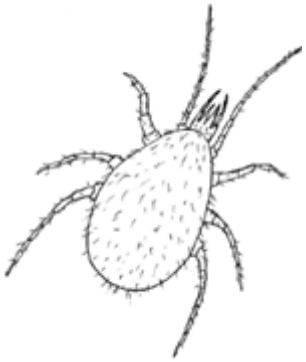
At the 'Workshop on Biocontrol of Nematodes' after the Australasian Soil-borne Diseases Symposium in Hobart, 2014, Dr Graham Stirling instructed participants about the web of life in the soil and the diversity of organisms that prey on nematodes. These include nematode-trapping fungi that snare nematodes with loops (some of which constrict) or sticky knobs before invading and digesting them (Verse 1). These organisms can live on organic matter and contribute to general suppression of many nematode species. Then there are the specific suppressors such as the bacterium *Pasteuria thornei* which produces resistant spores that cling only to root-lesion nematodes including *Pratylenchus thornei.* The spores germinate to infect the nematode and eventually produce thousands of spores in its body (Verse 2). Finally there are the predators of nematodes, such as microarthropods including mites, which also contribute to general suppression (Verse 3).

Life's a Jungle in the Soil

A fungus and a nematode were moving through the sand
Said the fungus to the nematode, 'Let me hold your hand'
Said the nematode to the fungus, 'No Sir, not I,
My mother warned me before she died
Be very aware of the fun guy
He will attract and sweet talk you in many ways
But he is quite loopy and will end your days
He will hold you tight so your heart throbs
But will kill you with his sticky knobs'

So moving right along
A bacterium, our nematode chanced upon
Said the bacterium to the nematode, 'I am a good guy
And we share the name *P. thornei*
I am meant for you and you are meant for me
Let me stick to you and we'll see what will be will be
Together we'll raise many progeny
Although they will all look like me'
Said the nematode to the bacterium
'No Sir, not I
My sister warned me before she died
Be very aware of the small guy
Ignore his infectious grin
And do not let him in
He may be small, but he is quite tough
And he will kill you soon enough
No Sir not me
You may be smooth, you may be meek
But a wheat root is what I seek
Inside that home, safe from wind and hail
I will prevail without need of male.'





Suddenly from under the stubble
Came a mite looking for trouble
He ate the nematode without a word
Then a second, and a third
And the farmer slept well that night
Thanks to his good friend, the mite.
John Thompson

Diagrams by M Stirling taken from Graham R Stirling (2014) Biological control of plant-parasitic nematodes: soil ecosystem management in sustainable agriculture, CABI, UK

Thesis Abstract

MORPHOLOGICAL AND PHYLOGENETIC ANALYSIS OF A *HETERORHABDITIS BACTERIOPHORA (*NEMATODA: HETERORHABDITIDAE), AN ENTOMOPATHOGENIC NEMATODE ISOLATED FROM THE NORTHERN TERRITORY OF AUSTRALIA

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Summary of thesis submitted in partial fulfillment of requirements for degree of Master of Science, 2014.

An entomopathogenic nematode, *Heterorhabditis* H39, was found in Darwin, Australia. Based on morphological and morphometric similarities, as well as molecular characterisation, it is an isolate of *Heterorhabditis bacteriophora,* first isolated from Brecon, South Australia. Paratypes of males, hermaphrodites, females and juveniles showed important similarities on most of the set parameters and characters that define *Heterorhabditis* at the species level. The morphometric values of the infective juvenile of *Heterorhabditis* H39's are similar to those of *H. bacteriophora*, including average body length (562 (537-587) *vs* 588 (512– 671) µm), maximum body width (21(19-22) *vs* 23(18-31) µm), distance from the anterior end to the EP (96 (87-104) vs 103 (87-110) µm), tail length (101(94-111) *vs* 98 (82-112) µm), D% (83 (73-88) *vs* 84 (79-90) µm) and E% (96 (87-105) vs 112 (103-130) µm). The morphology of the spicules and gubernaculum of *Heterorhabditis* H39 is indistinguishable from *H. bacteriophora*. The biology and life cycle of *Heterorhabditis* H39 are also similar to that of other *Heterorhabditis* species. DNA sequences of *Heterorhabditis* H39's showed that it is 100% identical to the GenBank sequences of *H. bacteriophora*. Whilst *Heterorhabditis* H39's range of 0.6%-3.8% in the Uncorrected (P) and GTR+I model of DNA substitution suggested that it is a distinct species from *H. bacteriophora* based on the 0.5% species delineation threshold, the accuracy of the threshold approach is still subject to the level of overlap between intra- and interspecific variations across a phylogeny. The level of overlap was not tested in this study. The Neighbour-Joining Tree, based on 475 nucleotides of the SSU rRNA gene using *Heterorhabditis* species obtained from GenBank, showed that *Heterorhabditis* H39 formed a monophyletic group with other *H. bacteriophora* isolates with a bootstrap value of 100. Thus, phylogenetic study of their SSU sequence data revealed that the two are not distinguishable using DNS data. There is thus strong evidence that *Heterorhabditis* H39 is an isolate *H. bacteriophora*, and not a new species. This is the first record of *H. bacteriophora* in northern Australia

Proposed Short-course on Plant and Soil Nematodes December 2015

NEMATODES IN CROPPING SYSTEMS - IDENTIFICATION AND TECHNIQUES

The next course is planned for the University of Southern Queensland in Toowoomba in December 2015. If you are interested, please submit a non-binding expression of interest to Mike Hodda at CSIRO National Research Collections Australia or Kerrie Davies at The University of Adelaide (addresses below).

As in previous presentations of this course, Kerrie Davies and Mike Hodda, the co-convenors, will try to tailor the course to suit the needs of participants.

The workshop will suit researchers and professionals who need to understand the principles and practice of handling soil, plant and insect nematodes, such as workers in agriculture, quarantine, green keeping and soil biology. It will provide hands-on experience in sampling, extraction, specimen preparation, culturing, diagnosis, and identification. There will be opportunity for interaction with experts in the field. Participants are encouraged to bring with them nematode material in which they are interested; but note that this should be preserved in 3% formalin for transport to the course.

Participants should have a degree which includes biology, agriculture, or soil science or have appropriate work experience to undertake the workshop. Less experienced participants can be supplied with recommended reading material prior to the workshop.

Nematodes to be considered include:

Meloidogyne Tylenchulus Heterodera Tylenchorhynchus

Pratylenchus Morulaimus Ditylenchus Radopholus

Anguina Bursaphelenchus Scutellonema Hemicycliophora

Paratrichodorus Filenchus Xiphinema Tylodorus

Aphelenchoides Heterorhabditis Helicotylenchus Steinernema

Rhabditida Mononchida Dorylaimida Areolaimida

Anticipated course cost is $2000 (including GST). This includes all materials and a printed course manual. A minimum of 8 participants is required for the course to run.

Details of course content can be varied to suit the interests of the participants. Please contact the co-ordinators to discuss any specific needs or topics desired for inclusion.

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