



MESSAGE FROM THE DIRECTOR

CEBRA is growing!

In August, we welcomed John Baumgartner. John is a computational ecologist with a research background exploring the potential impacts of climate change on biodiversity. His research involves developing software tools and applying quantitative methods to support conservation and biosecurity decision-making. More about John in this newsletter.

In September, Natasha Page joined us. Natasha is a data scientist with a Masters in Science (Computing) from Imperial College, London, and a background in optimisation. Natasha has worked in a broad range of industries, applying her skills to a variety of problems. Her interests lie in applying optimisation, data analysis and machine learning to complex, real-world problems.

In the past months, our researchers have attended and hosted many meetings, conferences and workshops, both in Australia and internationally. In June, Anca Hanea and James Camac facilitated a bonamia risk expert elicitation workshop at the Cawthron Institute in Nelson, New Zealand. In September, I travelled to Poznań, Poland, for the 13th Annual Meeting

of the International Pest Risk Research Group (IPRRG), together with Edith Arndt and Raphael Trouvé. More about IPRRG in this newsletter.

Also in September, Aaron Dodd and Richard Bradhurst attended the Queensland Biosecurity Partners Forum and National Roundtable in Brisbane. Aaron gave a keynote, while Richard presented his work on the Australian Plant Pest and Disease model. In October, Susie Hester gave a guest lecture on biosecurity and resource management here at the University of Melbourne. Earlier in November, Nathaniel Bloomfield gave a biosecurity research seminar at the Department of Agriculture, on the development of Australia's ballast water risk management system.

CEBRA connects biosecurity researchers, stakeholders and practitioners. In October, CEBRA hosted a research meeting of international biosecurity risk researchers, regulators, and practitioners. The meeting comprised a week of workshops, talks, discussions, and networking. Attendees included delegates from the University of Melbourne, NZ MPI, the USDA Forest Service, Resources for the Future, and Scion.

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Andrew Robinson

Managing Director,

Centre of Excellence for Biosecurity Risk Analysis

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Researcher profile: Dr John Baumgartner

As a child, John Baumgartner spent hours playing with his parents' computers, inevitably breaking and having to fix them before anyone noticed. This early tinkering with computers led to an interest in programming, which, combined with a keen appreciation for nature, carried John down the path of computational ecology and data science.

During his PhD at the University of Melbourne, John developed expertise in R and applied spatial analysis techniques to predict the impacts of climate change on biodiversity and pest dynamics. His thesis explored the role of predictive modelling techniques such as habitat suitability models and metapopulation models in guiding effective management of biodiversity in the context of uncertain climate change.

After finishing his PhD, John took a postdoc position at Macquarie University, Sydney, where he worked on two key projects. The first, co-funded by the NSW Office of Environment and Heritage, sought to estimate the impacts of climate change on key threatened plant and animal species, and the location and value of climate change refugia (areas within which suitable climatic conditions will persist despite regional climate change) for plant communities in south-eastern Australia. His second project, involving a large, multidisciplinary team, explored the potential consequences of climate change for the future distribution of economically important fruit flies such as Queensland fruit fly.

'Climate change is likely to present key challenges for biosecurity in the coming decades, with altered rainfall and temperature patterns providing new opportunities for invasive pests and pathogens to establish, thrive and spread. This will place additional stress on the biosecurity system, exacerbating impacts that will already be

experienced due to increases in human population density, trade, and movement,' John says. 'In the context of human health in Australia, the southward spread of tropical mosquitoes, and the diseases they carry, could be particularly problematic.'

John decided to join CEBRA because it presented a fantastic opportunity to apply his technical skillset to real world problems, developing tools and solutions that directly influence biosecurity processes.

At CEBRA, John is currently supporting two key projects: 170607: *Developing scientifically robust risk maps for priority plant pests* and 1607A/170813: *Simulating multiple pests simultaneously across space and time*, both nearing completion. The first, led by James Camac, combines datasets describing pest arrival rates, their dispersal upon arrival, climatic conditions and the distribution of their hosts to produce a framework for estimating the likelihood of establishment across space. This framework will be used by the Department of Agriculture (DA) to guide post-border biosecurity processes such as the spatial arrangement of surveillance networks. John has been debugging, optimising and packaging R code used to generate establishment likelihood maps for a set of case study species, which will be applied to additional species by DA.

The second project, led by Aaron Dodd, seeks to establish the economic value of Australia's biosecurity system. It achieves this by estimating the various values (such as agricultural, recreational and ecosystem services) of discrete land units, and using computer simulations to determine the corresponding cost of damage caused by arrival and spread of pests, both with and without a biosecurity system in place.



John's role in this project has been to carefully audit and optimise R code, and to facilitate rapid application of the method to a large suite of pest species.

Additionally, John is contributing software solutions to support a project that presents an overview of all ACERA/CEBRA projects undertaken to date. This involves developing searchable web-based databases of these projects.

In his three months with CEBRA, John has enjoyed being exposed to the various facets of biosecurity, the diversity of programming challenges that have come his way, and the collegiality of the workplace.

In his spare time, John is an amateur 'code golfer'. Code golf involves challenges that require writing code to produce a predetermined output, using as few characters as possible. 'This typically produces code that is rather unintelligible and sometimes inefficient, and so has limited value beyond intellectual stimulation and bragging rights!'

The rest of John's time is spent with his all-absorbing two-year-old daughter, Olivia, who brings out his inner child. Together with his wife Courtney he treasures his weekend family time and loves rediscovering the world through Olivia's experiences, including picking flowers, following ants, or singing songs from Frozen.

13th Annual Meeting of the International Pest Risk Research Group

Andrew Robinson, Edith Arndt and Raphael Trouvé attended the 2019 IPRRG conference in Poznań, Poland, 3–6 September. The event was hosted by the Institute of Plant Protection, National Research Institute Poland. Three CEBRA talks were presented at the conference:

- Andrew Robinson: 'A matter of survival: a simple model for the detection of an invasive species under surveillance' (awarded best talk)
- Edith Arndt: 'Is biosecurity doing a good job in keeping invasive pests out?'
- Raphael Trouvé: 'Predictive propagule pressure reduction from biosecurity inspection'



Attendees were a mix of regulators and researchers from Australia, the US, Taiwan, France, Spain, the UK, New Zealand, Poland, Canada, Finland, Mexico, China, India, Italy, the Netherlands and Sweden, with a strong turnout from the European and Mediterranean Plant Protection Organization and the European Food Safety Authority.

'It was an excellent event for networking and gave me a better insight about biosecurity work being done in Europe, and specific pests that are high priority in different parts of the world,' Edith reports. 'A talk that I found particularly captivating was by Yu Takeuchi from North Carolina State University, who talked about predicting spotted lanternfly dispersal in the United States. He presented a novel approach of integrating a spread forecast model with "tangible landscape" technology, which allows projecting the spread of a pest onto a 3D topographic platform surface.'

Edith and Raphael also visited the Research Centre of Quarantine, Invasive and Genetically Modified Organisms to view the laboratories and glasshouse. Here, researchers investigate quarantine and invasive organisms, as well as genetically modified organisms under the highest phytosanitary conditions.



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