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IOBC-NRS NEWSLETTER

INSIDE THIS ISSUE:

2013 IOBC-NRS Award Winners

From left to right: Ian Kaplan, Tim Kring, and Megan Woltz.

Tim Kring Receives the Distinguished Scientist Award

Dr. Timothy Kring spent much of his career working on biological control of insects, mostly with coccinellid and anthocorid predators of aphids. Most of his 53 refereed papers are about predators and aphids, including an Annual Review paper he co-authored on the biology of coccinellids -- that article is the most-downloaded paper from Annual Review of Entomology since 1996. Most of the 18 graduate students he advised worked with predators to manage pests of annual crops.

The most important aspects of Tim's career, have been developing solutions to pest problems in annual row crops, and working with Extension faculty to implement and deliver these solutions to growers. Tim developed the use of a threshold and sampling regimen to assess population changes of aphids in cotton, and determine whether treatment was needed. That threshold was accepted by Extension faculty and is used by cotton growers -- resulting in significant savings to growers. The use of that threshold almost certainly enabled the success of the boll weevil eradication program in Arkansas, by avoiding unneeded insecticides and the induced pest problems from disrupting natural enemies. During that project, he and his students also quantified the indirect mortality that coccinellids have on aphids, by causing aphids to drop from the plants, exposing them to other kinds of mortality. Tim developed the use of

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Jon Lundgren sets the theme for 2013-2014

Message From the President: Rebranding Biological Control

A recent exploration led by several leaders in biological control and involving IOBC-NRS has revealed a disturbing trend. There is a diminishing number of biocontrol courses being taught in the university systems of the United States. This raises a few questions. Why is our discipline losing ground? With diminishing student numbers, who will be leading the future of biological control? What can IOBC-NRS do as a society to ensure a strong future for our discipline?

Biological control is probably more relevant today than ever, but we as scientists need to sell our strengths and where we fit into modern agriculture. When I talk to end-users about biological control, my experience is that they either have never heard of it or they only understand biocontrol from the importation perspective. Classical biological control is an important tool, particularly in perennial or natural systems, but it is only one aspect of what we do. And there is a movement in this country related to sustainable agriculture and soil health, and biocontrol scientists need to be sure that we are at the table explaining that biocontrol is one of the ecosystem services stemming from healthy biological communities associated with these farming initiatives. No new agent introductions necessary.

I can't say for sure, but it seems to me that part of the diminishment of biological control is probably related to devoted funding opportunities. There was a generation of new faculty in biological control that had an NRI program specifically devoted to their discipline. Funding for biocontrol research is now more diffuse and often has to be piggybacked onto multi-disciplinary farm or landscape management projects. This forces biocontrol scientists to remarket themselves as applied ecologists in order to score grants. Same discipline, different name.

Perhaps this is one future of our discipline. There is a whole generation of students and scientists that are focused on resource conservation and whole farm management. Biocontrol scientists need to be sure that there are strong biocontrol education modules in place to insert into broad-based courses so that future practitioners of sustainable agriculture understand the strengths of what biocontrol has to offer.

I think identity is important. And whether we call it biocontrol or applied ecology, I believe that the future of our discipline is a strong one. And with our education and working group initiatives, IOBC-NRS is fighting to preserve this identity and keep it relevant.

Jonathan Lundgren, President
USDA-ARS, Brookings SD
jgl.entomology@gmail.com

Megan Woltz Receives Robert J. O'Neil Outstanding PhD Award

Dr. Megan Woltz received her PhD from Michigan State University with Doug Landis. Her research focused on understanding the interactions of insect predators and agricultural landscape structure. She has conducted much of this work using the soybean aphid as a model system. Her research has unequivocally demonstrated that early-season predation results in strong SBA suppression in soybean. Her work has been published in a book chapter and four papers, plus two papers in review.

Megan has brought a variety of techniques to bear on answering her research questions including ARC GIS and statistical models. Megan also developed an experimental system of progressively selective barriers to predator flux and coupled this with a video surveillance system (with Dr. Matt Grieshop) to assess predator identity and response.

Megan developed her teaching skills during her PhD. Megan participated in the Teaching Certification Program with a mentored teaching experience. Later, she developed four interactive lessons over eight class periods in "Insect Physiology (with Dr. Walter Pett) as well as providing multiple guest lectures in "Fundaments of Entomology", and "Biological Control". Megan has also mentored three undergraduates, resulting in two undergraduate first-authored manuscripts near submission or in review.

Megan has a strong interest in outreach. An Extension talk she presented at the Great Lakes Fruit and Vegetable Expo was so well received that she was asked to reprise it via a remote conference call to the Minnesota Statewide High Tunnel Conference. In addition, Megan has co-authored two Extension Bulletins, and helped design a citizen science project aimed at buckthorn identification and control called "Buckthorn Watch." She has been a regular volunteer for five years in the MSU Bug House – our department's outreach center for the public.

Doug Landis
Michigan State University

Ian Kaplan Receives the Early Career Award

Dr. Ian Kaplan (right) received his PhD in 2007, and is currently an assistant professor at Purdue University. His research emphasizes the development of ecological approaches to combat insect herbivores based on: (a) use of natural enemies, and (b) enhancement of natural crop defenses (e.g., volatiles, toxins) to suppress insect outbreaks. His research into tritrophic crop-pest-biological control interactions can be broadly differentiated intro herbivore-induced plant volatiles, and non-volatile mechanisms. Ian also evaluates naturally occurring biological control as an 'ecosystem service' by assessing the effects of various fall planted covers as habitat for beneficial ground-foraging seed predators. Here he looks beyond simple effects of consumption on populations, to subtle shifts in prey foraging behavior under predation risk (i.e. hiding more, feeding less).

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RESEARCH BRIEFS

Lady beetles & soybean aphids

Large lady beetles have been shown to suppress soybean aphid (*A. glycines*) populations. Research has shown that in order to prevent economically damaging outbreaks, it is important for natural enemies to suppress soybean aphid populations while they are still at low densities. However, lady beetles typically aggregate at aphid colonies only when those colonies have reached high densities. This suggests that the predation critical to prevent soybean aphid outbreaks occurs primarily from lady beetles moving through soybean fields, stopping briefly to forage at infested plants. Therefore, the rate of lady beetle arrival at, or immigration to, infested patches should determine the degree of aphid suppression.

To test this, we manipulated lady beetle immigration rates with mesh barriers and measured resulting impacts on population growth of soybean aphid colonies. We found that naturally-occurring levels of lady beetle immigration to aphid patches were sufficient to suppress aphid population growth. Decreasing lady beetle immigration rates, on the other hand, resulted in large increases in soybean aphid populations within infested patches.

At broader scales, the amount of non-crop habitat in the landscape surrounding crop fields has been shown to be an important determinant of natural enemy communities and pest suppression. In the soybean aphid system, landscapes with more non-crop habitat supported greater abundance of lady beetles and had better suppression of soybean aphid. At local scales, floral plantings have been used to enhance natural enemy efficacy by providing alternative food and shelter resources in the vicinity of crop fields. The relative importance of resources at these two scales for biocontrol is unclear.

To determine the relative importance of local and landscape factors on lady beetle communities, we planted strips of flowering buckwheat adjacent to soybean fields situated in landscapes that varied in the amount of non-crop habitat. Lady beetles were attracted to buckwheat strips and were higher in these strips than in typical soybean field edges. However, the presence of buckwheat strips did not boost lady beetle captures in soybean field interiors. Instead, lady beetle captures in soybean fields were directly related to the amount of non-crop habitat in the landscape surrounding the field.

Ladybeetle feeding on aphids (right) and on buckwheat nectar (below)

This work indicates the importance of considering scale when developing management plans for pest species. For natural enemies like lady beetles capable of dispersing long distances, the provision of resources at a landscape scale is likely more important than local field conditions.

Megan Woltz & Doug Landis
Michigan State University

TOYS OF THE TRADE

Detecting Non-prey Foods

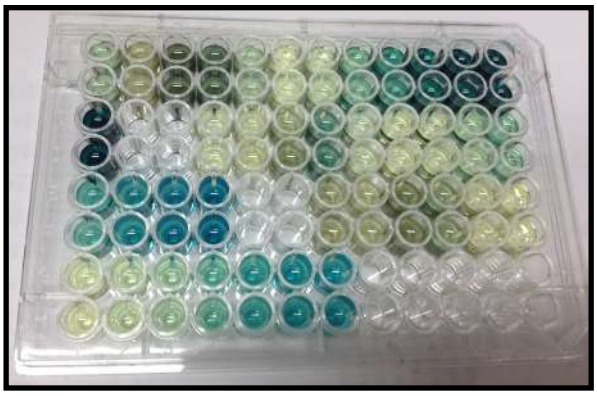
Non-prey food resources play an important role in the feeding ecology of many natural enemies[1]. Pollen - and nectar-feeding by predators and parasitoids can significantly affect behavior, movement, fecundity and longevity of these beneficials. Detection and quantification of non-prey foods in the guts of natural enemies can be achieved using a variety of methods, including HPLC, PCR, dissection and microscopy, anthrone, and acetolysis; this article will focus on the latter two techniques.

Anthrone tests are simple reactions that change color in the presence of sugars. At room temperature, this reaction only occurs with fructose, which is a sugar that is present in nectar, but not in insect hemolymph. At higher temperatures, anthrone reacts with a variety of sugars (including sucrose, glucose and trehalose) that can be found within an insect's body. The quantity of sugars in the gut or body of the insect can thus be measured using a spectrophotometer. Anthrone tests have been developed for use with several biological control agents, including parasitoids[2], lacewings[3], ladybird beetles[4], and hoverflies[5].

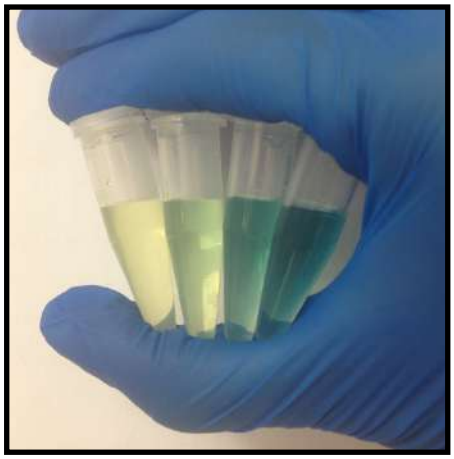
Acetolysis can be used to extract pollen from the gut-contents of insect natural enemies[6]. Strong acids break down the softer tissues in an insect's body, including the gut, while leaving pollen grains intact due to their tough outer coat. After the whole body of the insect is crushed and mostly dissolved, the remaining materials are stained and suspended in glycerin. This mixture is then examined microscopically and any pollen grains can be identified and quantified.

These tools can greatly aid biological control practitioners in their understanding of how non-prey resources are being utilized by natural enemies, with particular importance for understanding the role of floral resources in the feeding ecology of predators and parasitoids.

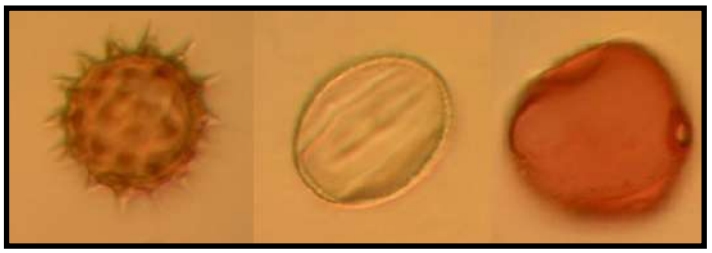
Julie A. Peterson
University of Minnesota



Anthrone test: 96-well plate showing field samples and standards of known concentration ready to be read on a spectrophotometer.



A range of fructose standards of known concentration used during anthrone assays.



Stereomicroscope images of stained pollen extracted by acetolysis; from L to R, Asteraceae, Fabaceae, Poaceae.

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Tim Kring

mortality from natural enemies to produce a better threshold and different management options for true armyworm in wheat. The use of the adjusted threshold led to annual savings of >$4 million to wheat growers in Arkansas.

Tim's recent projects include quantifying the effects of herbivores against spotted knapweed. Another project is to examine whether biofuel crop habitats are a source or sink for natural enemies in adjacent field crops .

Tim actively engages Extension and growers in his work, resulting in use of the biological control tactics he has delivered to them -- and changed behavior by the end-user is a very real demonstration of impact.

Robert Wiedenmann
University of Arkansas

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Ian Kaplan

Ian has published more than 30-peer reviewed articles cited more than 580 times (WOS). He serves as subject editor for Environmental Entomology and Applied Ecology. In 2012, he received the President Early Career Award in Science and Engineering from President Obama.

Ian is committed to teaching and mentoring the next generation of specialists in biological control. He has mentored eight outstanding graduate students (four on fellowships, two finished), and a postdoc supported on a three-year NSF postdoc fellowship. He also co-authored the most recent revision of "Insect Ecology" with Peter Price and other insect ecologists. His teaching has been recognized with the Outstanding Undergraduate Teaching Award.

Steve Yaninek
Purdue University

Musings—Boyle's Eye-view

T.C. Boyle is one of my favorite authors. He tackled the topic of invasive species in "When the Killing is Done", a novel that pits conservationists against animal-rights activists in the context of rat eradication in the Channel Islands off of the Southern California Coast. As far as I know, Boyle has not taken on the topic of biological control head-on, but a sentence in a short story from the collection "Wild Child"' struck me as encapsulating the sometimes-conflicting goals and outcomes of biological control. In this passage, the protagonist, Anita Nordgarden, is deciding whether to allow a feral cat near her home:

Every once in a while, she'd toss a handful of kibble out in the yard, feeling charitable, but the cat was a bird killer – more than once she'd come home to find feathers scattered round the steps – and she probably would have got rid of it if it weren't for the mice.

Thus, Anita is aware of the benefits as well as the risks of biological control. Feeding the cat could be seen as a form of conservation biological control and she opts to go forward with it despite risk to non-target organisms (birds) to obtain biological control of mice. To me, this illustrates the fact that biological control deliberations are relatively commonplace, and that they occur outside of the formalized processes of host-specificity testing, permit applications, and related activities.

Boyle, T. C. 2010. Wild Child and Other Stories. Penguin Books, New York, NY, USA.

Boyle, T. C. 2011. When the Killing's Done. Penguin Books, New York, NY, USA.

George Heimpel
University of Minnesota

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Upcoming Events in 2014

25-27 February 2014. IOBC Working Group "Pesticides and Beneficial Organisms", Namur, Belgium. Email: Labecotox@cra.wallonie.be

21-23 May 2014. IOBC Working Group "Landscape Management for Functional Biodiversity", Poznan, Poland. Email: A.Kwiatkowski@iorpib.poznan.pl

14-18 September 2014: IOBC-WPRS Working Group "Integrated Control in Protected Crops, Temperate Climate", Ghent, Belgium. Email: iobcghent2014@pcsierteelt.be

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Non-prey Foods

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The IOBC-WPRS General Assembly

met in 23-25 October 2013 in Zurich, Switzerland. The program is available online, link below.

Reports from working groups are available as a pdf:

- Integrated protection in viticulture
- Pheromones & other semiochemicals in integrated production
- Multitrophic interactions in soil
- Integrated protection of fruit crops
- Integrated protection of oilseed crops
- Integrated protection of field vegetables
- Integrated protection in oak forest
- Integrated protection of stored products
- Integrated protection of olive crops
- Integrated protection of citrus crops
- GMO's in integrated plant production
- Integrated control of mite pests
- Benefits and risks of exotic biocontrol agents

Also, a slide presentation on pdf is available for "Biological control – challenges, opportunities and visions" by Jacas Miret Josep, University Jaume I, Castello de la Plana, Spain.

http://www.iobc-wprs.org/pub/general_assembly_2013/index.html?utm_source=IOBC-WPRS+Members&utm_campaign=8cd1e140ce-IOBC-WPRS_Newsletter_2013-11&utm_medium=email&utm_term=0_9cc2c9be7f-8cd1e140ce-78361965