International Organization for Biological Control of Noxious Animals and Plants. Nearctic Regional Section

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IOBC-NRS NEWSLETTER

INSIDE THIS ISSUE:

"Biocontrol in the Americas: Past, Present, and Future"

Joint IOBC – Nearctic and Neotropic Regional Sections Conference

May 11-13, 2010. Niagara Falls, Canada

The objective of the meeting is to promote awareness and networking of biocontrol issues of common interest among the Americas. We often face similar pest problems and share common approaches to developing biological control programs. Especially with the current controversy over accessing and benefit sharing of biological resources in other countries, it is important to better understand what biological control programs are present elsewhere and how we can share our technology to the mutual benefit of all parties. The keynote speaker for the meeting will be Dr. Jacques Brodeur, President of IOBC Global, who will provide an update on the IOBC Commission on "Biological Control and Access and Benefit Sharing". Symposia topics range from current major classical biocontrol programs in the Americas, invasive pests, risks and benefits of exploration for biocontrol agents in the Americas, ecosystem landscapes and habitat management for IPM, challenges and successes for commercialization and implementation of biocontrol agents, microbial biological control, weed biocontrol, biological control with egg parasitoids and more. Poster presentations are welcomed. Details of the scientific program, registration and accommodation will be posted on our new website over the next couple of months. If you are in biological control, this is a must meeting for 2010. So mark your calendar and look for future updates!

Les Shipp
Agriculture, Agri-food Canada
Harrow, Canada

Overhauling the IOBC-NRS website: *www.iobc-nrs.com*

Our website is in the process of being overhauled to better serve the society. Together with Willis Design Studio, we are creating a professional website that will help us to better communicate news and events related to biological control, interact with current and prospective members, and raise the profile of our society. We envision this website to be a significant tool for extending the reach of IOBC-NRS, and it will hopefully be used by members in their research and outreach endeavors.

We envision that a first iteration of the site will be available in the next few weeks.

Jonathan Lundgren
USDA-ARS
Brookings, SD

IOBC Prioritizes Education in Biological Control

MESSAGE FROM THE PRESIDENT:

Busy times at IOBC Global and NRS

By the time that you read this newsletter, it will soon be summer and everyone will be busy with their field season. Things are also happening at IOBC Global and NRS. You should have received your IOBC Global May Newsletter and read how the IOBC Commission on "Biological Control and Access and Benefit Sharing" is making excellent progress and has just finished a draft report for FAO. IOBC has a key role to play in developing a protocol for the sharing of biological resources among countries to the mutual benefit of all parties concerned. Global is also developing a training course on biocontrol and IPM that can be delivered to countries around the world. NRS already has an "Education Development Curriculum Committee" which partners with existing and future biocontrol courses to advance the knowledge and practice of biological control in North America. In this newsletter, you will see that NRS is co-supporting a course in July on "Basic and Applied Ecology of the Coccinellidae".

We are also revamping our outdated website. Jon Lundgren is coordinating the development of the new website which should be up and running shortly. The website will be very informative about all the activities of NRS, provide links to other biocontrol working groups/ associations and to IOBC Global, and be an informative and useful site providing information about biocontrol agents currently being used in North America. With respect to our 2009 Outstanding Ph.D. and Master Student Awards, we are still soliciting applications. So supervisors encourage your students to send their applications as soon as possible (see this newsletter for extended deadline). Lastly, we are presently organizing the scientific program for the joint NRS and NTRS meeting "*Biocontrol in the Americas – Past, Present and Future* " to be held in May 2009 at Niagara Falls, Canada. This meeting will focus on timely issues in biocontrol and give you an opportunity to network with our colleagues from Mexico, Central and South America. There are numerous active programs in biocontrol in Latin America and they face many of the same issues as we do in North America. Look for future announcements on the NRS web page.

Les Shipp
Agriculture, Agri-Food Canada
Harrow, Ontario

Dark side of predation: Blind side in biocontrol research

Predation occurs around the clock. Yet little effort has been made to characterize the diel pattern of predation on insect pests in the field, particularly events that occur nocturnally. Over 30 years later, the 1975 sentiment of Vickerman & Sunderland still rings true, that "the nocturnal activity of terrestrial invertebrates seems to have been largely overlooked in crop ecosystems."

The few round-the-clock observations in various ecosystems have shown that predator communities differ greatly around the diel cycle. This means that diurnal appraisals, which are the norm, are at best biased. And worse, predators causing significant mortality to target pests may be completely overlooked. Depending on the system, cursorial spiders, carabid and other predatory beetles, cockroaches, ants, and earwigs, are disproportionately important after dark.

In recent experiments in Maryland, Zsofia Szendrei (now at Rutgers University) and I deployed sentinel egg masses of Colorado potato beetle (CPB) in potato crops, and monitored them every three hours day and night to determine predator occurrence and egg consumption. The natural enemy complex is dominated by beetles and true bugs. The majority of predation events occurred after dark, and the fewest during the afternoon.

The diel pattern of occurrence of predators on sentinel egg masses was mostly unique for different predator species. Also important, *Chauliognathus* sp. had not previously been recorded as a predator of CPB, probably because it was active only at night.

***Lebia grandis*, predator of CPB.**

Our results in potato are consistent with those of Pfannenstiel and co-workers in field crops, in that nocturnal predation was at least equal to diurnal predation, and often involved predator taxa that foraged primarily at night. Remedying the serious nocturnal deficiency in agroecology will take much more observational effort, possibly some of it aided by technology such as video cameras and rotating pitfall traps. We ignore the scotophase at our peril. For instance, Pfannenstiel's recent discovery of the Asian cockroach, *Blattella asahinai* (Dictyoptera: Blattellidae) as an important predator in soybean and possibly other crops in southern USA was only by virtue of ongoing nocturnal ecological research.

Don Weber
USDA-ARS

Beyond the 5% solution: Modeling and marginal values

Assigning a realistic value to the outcomes of a natural enemy release is an increasingly important problem for biological control scientists submitting grant proposals, and petitions for release. At one time it was acceptable to simply declare a percentage of the crop yield to be the projected economic benefit from a release, just as it was acceptable to ignore potential environmental risks stemming from releases. As budgets for science become increasingly constrained and funding agencies insist on cost-benefit projections as a part of their decision-making processes, we will have to make reasonably accurate estimates of the value of our research and releases in order to justify funding.

Assigning a monetary benefit to a biological control release initially appears to be an intractable problem. Even in agriculture, where the value of commodities are fairly well known, overlapping sources of loss and commodity price and crop acreage fluctuations make estimation of yield losses a complicated undertaking. Projecting this loss estimation to the per capita value of the activity of a natural enemy adds another layer of complexity. Add to this, for example, costs to the health care system from acute and chronic exposure to pesticides, costs of losses of ecosystem services resulting from applications of pesticides, and losses of markets due to contamination of product, and most will simply throw up their hands and go with 5% of the crop value as the estimated benefit of the biological control program.

The cabbage seedpod weevil, *Ceutorhynchus obstrictus*, a classical biocontrol agent in Canada

In some high-value crops, such as greenhouse vegetable crops, estimating the value of biological control can be a fairly simple process, if one considers only crop losses. The pest losses must be reduced to a per-capita cost – how much crop productivity does one pest remove, and what is that worth? This then becomes the value of a single predation or parasitism event. For inundative releases in high-value crops, simple Lotka-Volterra models can then be used to determine the value of pests that have removed by natural enemies (Gillespie 2008). This works reasonably well over the short-term, and with indirect damage from pests such as aphids. Extending this approach to classical releases, or to crops with direct or aesthetic damage will require a great deal more sophistication and expertise from fields such as health care and insurance industries, environmental toxicologists, environmentalists, but most importantly, with economists who can help us put it all together.

Dave Gillespie
Agriculture, Agri-Food Canada
Agassiz, British Colombia Canada

Gillespie, D.R. 2008. Pp. 291 – 300 In Proceedings of the Third International Symposium on the Biological Control of Arthropods, Christchurch, New Zealand

2nd course in the IOBC-NRS Education Curriculum: Basic and applied ecology of the Coccinellidae.

Lady beetles are one of the most widely recognized beneficial insects, and their broad distribution and amenability to research have made them model organisms that advance our understanding of the inner workings of biological control. A team of six scientists (Jonathan Lundgren, John Obrycki, Ted Evans, Yukie Kajita, Michael Seagraves, and Natalia Vandenberg) have organized a week-long short course designed to highlight many aspects of the basic ecology of lady beetles, and how it influences pest management. Combining hands-on experiments with lecture-style presentations, we will tackle the current phylogeny and diversity of the group, feeding ecology of lady beetles with highlights on their polyphagous nature, intraguild predation, and reproductive ecology and physiology. The course will be held at Richardson Wildlife Foundation in Amboy IL, from July 7-10, 2009. Cost (including meals and lodging) is $350 for IOBC members. The course is nearly full, so please contact Jonathan Lundgren immediately if you'd like to attend.

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Lady beetle larva foraging on a corn tassel.

Announcements

IOBC-NRS Graduate Student Awards for 2009

The IOBC-NRS is sponsoring two Graduate Student Awards (The Robert O'Neil Award for Outstanding PhD Student in Biological Control, and a Master's-level award), to be bestowed on students whose contributions are likely to shape the future of biological control. The recipients will be recognized at the IOBC-NRS Informal conference held at the ESA Annual Meeting. Winners will receive cash awards ($300 for PhD, $200 for Masters), and the PhD winner will also give a research presentation during the IOBC business meeting. See IOBC-NRS website for information on previous winners.

Eligibility: All students enrolled in a graduate program in Bermuda, Canada, or the U.S., and who are members of the IOBC at the time of the application deadline are eligible. Please indicate that you plan to attend the Annual meeting of the ESA–preference will be given to students planning to attend.

Application Guidelines: Students should send: a letter that details the significance of their research and its relevance to biological control; a CV that includes contact information; and the names of two referees who will provide letters of support. Criteria (and relative ranking) to be assessed are: publications (15 pts), presentations (15 pts), outreach activities (15 pts), teaching (15 pts), grantsmanship (15 pts), current and future contributions to biological control (15 pts), and letters of support (10 pts). Application materials and questions should be sent electronically to Doug Landis *landisd@msu.edu*. Application deadline has been extended to June 26, 2009.

Your membership is crucial to our society!
If you have not renewed your membership for 2009, please take a moment to do so! Contact Stefan Jaronski (bug@midrivers.com) with questions.

IOBC-NRS Symposium: ESA National Meeting

James Hagler and Jonathan Lundgren have organized the symposium titled "*Advances in the Application of Molecular and Biochemical Methods for Biological Control Research*" for the ESA National Meeting in Indianapolis, IN (the evening of December 15, 2009). Please join us for this symposium, and don't forget to stay for the mixer after the presentations.

Poor *Rhinocyllus*

The seed-head weevil *Rhinocyllus conicus* is best known as a case of biological control gone terribly awry. It was released to control European thistles in North America and, although it was doing a pretty good job, was also found munching on innocent native thistles. Well, this caused quite an outcry (and rightly so in my opinion), leading among other things to Don Strong's witty editorial title, 'Fear no weevil?'. But poor reviled *Rhinocyllus* can't catch a break, even in New Zealand, where it was also released against European thistles, and where there are no native thistles for it to abuse. You'd think it would be free to do good things in NZ. This does seem to be the case, but in NZ, *Rhinocyllus* is also the *victim* of non-target biological control impact from one trophic level up. The European weevil parasitoid, *Microctonus aethiopoides*, which is doing a good job suppressing a pestiferous European forage weevil, has been found attacking *Rhinocyllus* as it feeds on European thistles. Its as if *Microctonus* is serving out justice to *Rhinocyllus* for its crimes against North American thistles. The justice is misplaced though – I've never heard of *Microctonus* attacking *Rhinocyllus* in North America.

George Heimpel
University of Minnesota
St. Paul, MN

***Rhinocyllus conicus*, busy at work. Photo by Bob Lund.**

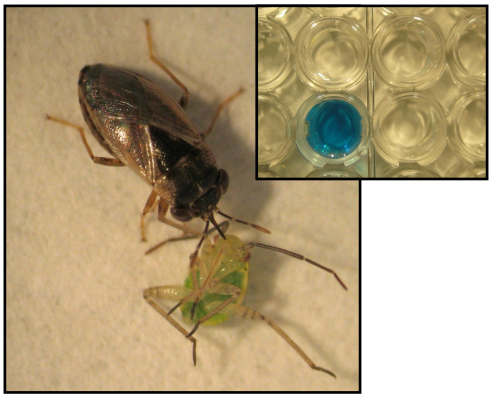
Barratt et al. 2006. Pp. 166-186, In: Environmental Impact of Invertebrates for Biological Control of Arthropods, CABI Press.
Strong. 1997. Fear no weevil? Science, 277: 1058-1059.

RESEARCH BRIEFS

Pinpointing Predation Events using Field Cages and Gut Content Analysis

Identifying the feeding choices by generalist predators is difficult because predators and prey are often small, elusive, and cryptic. Moreover, predators rarely leave evidence of a predation event. The USDA-ARS Arid-Land Agricultural Research Center (ALARC) in Maricopa, Arizona has developed a method to pinpoint predation by combining prey marking and field cage methodologies. Targeted prey items can be marked individually with a foreign protein. Additional prey species can be monitored simultaneously by using additional marker proteins. These marked prey are introduced into field cages containing a naturally occurring arthropod assemblage. The predators exposed to marked prey are collected, and their gut contents assayed by a series of protein-specific ELISAs.

This methodology was used in field cage studies to qualify the degree of interguild and intraguild predation occurring among a complex arthropod assemblage during four separate photoperiods. The field cages contained an assemblage of 11 or 12 species of predators and three pest species. The three pests introduced in the cages included cabbage looper larvae marked with rabbit IgG, lygus nymphs marked with chicken IgG, and sentinel pink bollworm egg masses. Inclusion cages allowed foraging fire ants to enter the cages while exclusion cages contained barriers that prevented ant entry. The conventional cage methodology revealed that there was substantial interguild and intraguild predation occurring on the arthropods in the assemblage, particularly in those cages that included ants. Predators of the three targeted pests were identified by conducting post-mortem gut content analyses on each predator in the assemblage (n = 1,503). Pink bollworm egg predation events were detected using a pink bollworm egg-specific ELISA, and cabbage looper and lygus predation events were detected using rabbit-IgG and chicken IgG specific ELISAs, respectively. Results revealed that *Collops* was the main predator of pink bollworm eggs; damsel bugs, assassin bugs and spiders readily preyed on marked lygus; and spiders and damsel bugs readily preyed on cabbage looper larvae. Furthermore, the cage methods and post-mortem gut ELISAs revealed very few distinctive patterns of predation with regard to photoperiod.



A big-eyed bug feeding on a chicken IgG-marked lygus bug (Left Panel). The big-eyed bug was assayed 3 hours after feeding by a chicken IgG specific ELISA (Right Panel). The blue dot represents a positive ELISA reaction, which indicates that the big-eyed bug had ingested the marked prey item (insect photo by Eric Hoffmann).

In summary, the prey marking technique can be used to compliment inclusion/exclusion field cage methodology to study various aspects of arthropod predation. The details of this research are presented in Hagler, 2006 (Ann. Appl. Biol. 149: 153).

James R. Hagler
USDA-ARS
Maricopa, AZ

NEWSLETTER WRAP-UP

In research, deciding what population characteristics to measure when testing a hypothesis is sometimes a dilemma. For biological control scientists (and entomologists in general), counting insects and correlating how numbers of pests and beneficials respond to a treatment is often an important metric to record. But too often, this is where the research stops, and these days numerous stakeholders (from farmers to funding agencies) want to see more.

Arthropod numbers do not give an idea of trophic interactions, or how the behavior and function of organisms are affected by a given treatment. For example, if populations are only assessed during the day, then potentially important nocturnal arthropod populations will be entirely overlooked (as pointed out earlier by Weber).

Marking prey, and applying gut content analysis to predators to measure how trophic interactions are affected by a treatment may give a much different perception than simply measuring relative abundances of predators and prey (see Hagler's contribution).

And of course, as Gillespie pointed out, end users are reluctant to adopt biological control until we can clearly show its economic efficacy.

All of these tenets (ways to get beyond diurnal-focused "squirt and count" entomology) are featured in the education curriculum promoted by IOBC-NRS. These courses give students tools and contacts that they need to expand research projects to expand understanding of how natural enemies function.

Recognizing previous shortcomings of our discipline, and capitalizing on our strengths will ensure that biological control is a growing and vibrant science that continues to have a place in modern IPM systems.

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Organisation Internationale de Lutte Biologique Contre Les Animaux et Les Plantes Nuisbiles: Section de la Region Nearctic

The International Organization for Biological Control—Nearctic Regional Section Newsletter is published 3 times a year in February, June, and October to provide information and further communication among members of the Region (Bermuda, Canada, and the United States).

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