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IOBC-NRS NEWSLETTER

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Putting the weed seed predators to the test

Mounting public concern for the welfare of butterflies and other species imperiled by intense herbicide use in North America challenges us to consider weed management alternatives. There are many important ecological tools including tillage, rotations, and cover crops, as well as biological control services that improve weed suppression. For example, a significant percentage of weeds are killed naturally every year by animals that feed on weed seeds. Crickets, ground beetles and small rodents are ubiquitous residents of crop environments, and all contribute to weed seedbank reductions. Combined with other management tools, weed seed predation by insects and rodents may decrease weed pressure and reduce labor inputs in herbicide-free crop environments.

Harpalus pennsylvanicus. Good mandibles for feeding on seeds. Photo courtesy of Gayle Strickland.

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ESA Symposium: Practical Implementation of Conservation Biological Control

This member symposium will take place Tuesday afternoon before the IOBC meeting at the Annual ESA meeting in Portland.

ESA annual meeting

The goal of this symposium is to present practical concerns and solutions for implementing conservation biological control (CBC) on farms. This goal aligns with the meeting theme by addressing a major challenge in implementing ecologically based pest management. Specific objectives will be to discuss the current state of information and knowledge gaps regarding: the influence of soil management on CBC, diversifying plant communities on and near farms for CBC, interactions of CBC with current farm management practices, landscape level effects on CBC, economics of CBC, education and outreach opportunities involving CBC to increase adoption.

Organized by Jon Lundgren

Being part of the dialogue

MESSAGE FROM THE PRESIDENT: Looking at new RNAi-based pesticides

At the Entomological Society of America annual meeting last year a number of biological control scientists gathered together and discussed where we are at as a discipline. I talked about the dwindling base for biocontrol education in our last newsletter, so won't rehash that discussion now. But these hurdles that we face transcend education- practicing biological control in cropland is also challenged on a producer level.

Let's face it, most cropland in the U.S. is devoted to field crops, and it can be hard for farmers to recognize the importance of biocontrol on large monocultures of corn, soybeans, wheat, etc. With the industrialization of agriculture, modern crop production is prioritizing prophylactic use of pesticides (e.g., increasing herbicide and fungicide use, GM crops, neonicotinoid seed treatments, spraying insecticides based on what is happening at a neighbor's farm). These pesticides can have important implications for integrating natural enemies into cropland; either through disrupting plant communities in and around cropland through herbicides, direct effects of fungicides on entomopathogens, or direct or indirect effects of insecticides on predator and parasitoid communities. As a society, biocontrol scientists need to be sure that assessments of these pesticides can accurately predict their effects on ecosystem services provided by natural enemies. And interestingly, the folks most vocal regarding the safety assessment of pesticide use tend to be scientists that I would consider "biological control scientists" (I won't list names, but take a look at the usual suspects).

Enter in a new player: RNAi. Like it or not, RNAi-based pesticides are quickly approaching commercialization (in insecticidal baits and GM corn plants). And frankly this next generation of pesticides is probably going to occupy substantial space in future pest management programs. Seeing this, the EPA recently held a Scientific Advisory Panel to characterize the hazards of this new technology (the minutes of this discussion should be available on the web soon, or I can send you a PDF of the report upon request). The conclusion of the meeting is that there are still a lot of questions regarding how RNAi-based pesticides are going to work, what species will be affected, and how we can predict the hazards that might be posed. Biocontrol scientists need to be a part of the dialogue, identifying which new pesticides are nearing commercialization so that biocontrol services are not excluded by new technologies.

Jonathan Lundgren
IOBC-NRS President
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US EPA. 2014. RNAi technology: program formulation for human health and ecological risk assessment. SAP Minutes No. 2014-0

RESEARCH BRIEF

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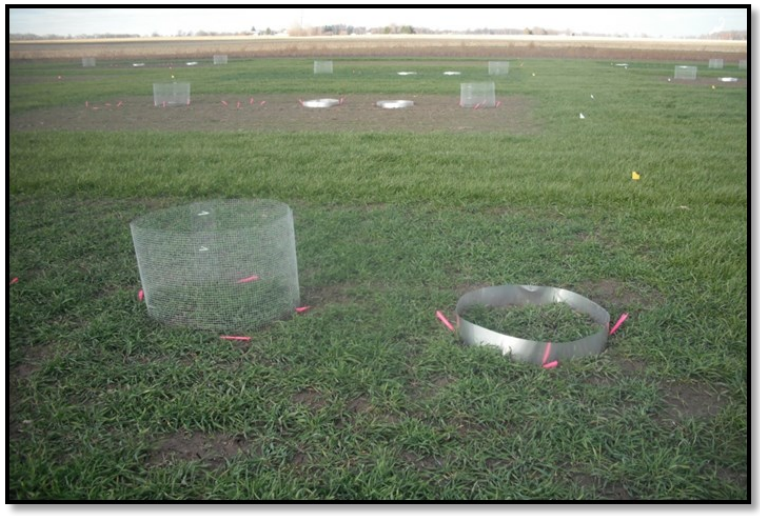
Putting the weed seed predators to the test

Still, summer annual weeds are extremely prolific, and a single common lambsquarters plant can produce as many as 170,000 seeds. Given this intense propagule pressure, it is possible that weeds are not seed-limited in agricultural systems. If that were the case, foraging activity by seed predators would not overcome any site limitation for weed germination, and granivores' impact on weed recruitment would be negligible. To investigate seed limitation and measure the ecosystem services that weed seed predators provide, we built small fences with two gauge sizes in tilled, fallow plots and monitored seedling emergence over the following growing season. We tracked growth of common lambsquarters in fenced plots with natural seedbanks, and also in plots where we simulated a heavy seed rain the previous fall. This experiment measured reductions in weed pressure that are specifically attributable to vertebrates and invertebrates separately.

Cute *Peromyscus* sp. Photo by Carmen Blubaugh

At separate sites in 2012 and 2013, seed predators overcame intense propagule pressure and substantially reduced germination rates following the simulated seed rain, demonstrating that granivores perform relevant services that improve weed control. **In plots with seed subsidies, lambsquarters counts were almost twice as high behind fences that excluded all seed predators compared with open plots.** There was no difference in seedling counts between open plots and vertebrate-exclusion plots, suggesting that small mammals contribute little to weed seed biological control in this system. In the ambient seedbank treatments, granivores did not reduce germination rates, suggesting that seed predation services may be most important immediately following senescence, when seeds are readily available on the soil surface.



Fenced plot to track seedbanks. Photo by Carmen Blubaugh

We also compared the impact of seed predators in fallow plots with rye/vetch cover crop plots, but found very few weeds across all rye/vetch treatments. Cover crops are critical ecological tools for weed suppression, and because rodents and granivorous insects both use vegetative cover as overwintering habitat and refuge from predation, the use of cover crops and living mulches may synergize with the weed control services provided by wildlife.

Carmen Blubaugh & Ian Kaplan
Purdue University

Musings—Biological Control in the Galapagos Islands

I'm writing this column from Puerto Ayora in the Galapagos Islands, where I'm on sabbatical leave from the University of Minnesota. My project is focused on exploring the potential for biological control of the invasive avian parasite *Philornis downsi* (Diptera: Muscidae), which is attacking Darwin's finches here. In case you're not aware however – this is not the first biological control project in the Galapagos. It comes on the heels of what looks to be a spectacularly successful release of the vedalia beetle against the cottony-cushion scale in 2002. This project put the Galapagos on the map as a site where biological control could be used to manage pests of conservation concern. Getting a release approved here was made possible by the construction of a first-ever quarantine lab on the islands, close collaboration with the Galapagos National Park Service, and public outreach. The result of the release has not only been the protection of endemic plant species from the ravages of the cottony-cushion scale, but also a generally positive attitude toward biological control as a means of combating particularly damaging invasive species. All of this has paved the way for other potential projects aimed at invasive species that have been impossible to manage successfully otherwise. The first of these (chronologically speaking) is the afore-mentioned effort against the fly parasite of Darwin's finches. It's early days yet, but we are preparing for risk assessment studies of *P. downsi* parasitoids from the native range. Hopefully I'll be able to report good results from this work in a future issue of this newsletter (although it's not exactly Nearctic I suppose). Beyond *Philornis* though, other potential targets of classical biological control have been identified – in particular a very nasty invasive blackberry that is taking over the highlands of some islands and threatening scores of endemic plant species. Also – biological control of imported fire ants here is being seriously considered. Aside from *Philornis*, invasive ants are currently the most serious insect threat to the islands.

More generally, biological control projects in the Galapagos are at the vanguard of a relatively new movement to use biological control introductions to manage invasive species of conservation concern. In other words, biological control is not just for agriculture anymore - it is expanding to make contributions in the conservation arena as well. It is high time for this expansion since control options against invaders of natural areas are often very limited and these pests can devastate native and endemic ecosystems just as agricultural pests can decimate crops and rangelands.

George Heimpel

University of Minnesota

Causton, C.E. (2009). Success in Biological Control: The Scale and the Ladybird. In T. De Roy [ed.], Galapagos: Preserving Darwin's legacy, 184-190.

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Van Driesche, R.G et al. 2010. Classical Biological Control for the Protection of Natural Ecosystems: Past Achievements and Current Efforts. Biological Control, 54, Supplement 1, S2-S33.

Darwin's finch. Photo by Mirella Rossi Heimpel.

Call for IOBC-NRS Awards!

IOBC Graduate Student Awards

The IOBC-NRS sponsors two Graduate Student Awards — The Robert O'Neil Award for Outstanding PhD Student in Biological Control, and a Master's-level award — to be awarded to students whose contributions are likely to shape the future of biological control. The recipients will be recognized at the IOBC-NRS Symposium held at the ESA Annual Meeting in November 2014, Portland, Oregon. Winners will receive cash awards ($300 for PhD, $200 for Master's), and the PhD winner will also give a research presentation during the IOBC Symposium and Meeting. 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.

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 two letters of recommendation. See IOBC NRS website for information on previous winners and specific criteria for assessment of nominations.

Please submit application materials by June 15, 2013 to Don.Weber@ars.usda.gov

Criteria for both Graduate Student Awards are : Contribution to Biological Control 30%; Publications 15%; Presentations 15%; Outreach 15%; Grants & Scholarships 15%; and Letters of Reference 10%.

Distinguished Scientist Award

Nominees must have spent most of their career in the Nearctic Region, and have made significant contributions to biological control., but need not be members of IOBC.

Early Career Scientist Award

Nominees should be no more than 10 years post PhD and have made significant contributions to the field of biological control through research, teaching, and/or extension/outreach. Nominees must have spent most of their career in the Nearctic Region and be a current IOBC member.

Application guidelines: Nomination narratives for the Distinguished and Early Career Award are restricted to one page in length and should contain a thorough but concise summary of the principal contributions of the nominee. The nominator should include the names and current contact information of both nominator and nominee on a separate page. A copy of the nominee's CV (no page limit) should also be included that provides the nominee's professional record (employment affiliations), prior awards, description of biological control related activities, publications lists, and extramural grant record.

Please submit nominations by June 15, 2013 to: Jonathan.Lundgren@ars.usda.gov

Criteria for both Scientist Awards are: Contribution to Biological Control 35%; Publications 25%; Grants 20%; Outreach 15%; and Letters of Reference 10%.

Education and Biological Control

At last year's ESA meeting in Austin, a symposium on teaching, outreach, and educational needs in biological control was held. From the presentations and discussion that followed data were presented which, among other things, documented a general decline in effort nationally with respect to educating end-users about biological control and the services that it provides. Much of the survey information pertained to classroom teaching. Thus, a current goal will be to develop a clearer picture of what the outreach (non-classroom) needs are for biological control. It was generally agreed that if short training modules could be developed and made easily accessible to anyone via the Internet, this would help remedy the problem. We are therefore interested in compiling a list of people who are willing to provide content in areas of expertise. We also intend to explore ways to finance this ambitious, but much-needed, endeavor. For more information, contact Jim Nechols (jnechols@ksu.edu).

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Visit our website: www.iobcnrs.com

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

Send items for the IOBC-NRS Newsletter to:

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Upcoming Events in 2014

15-18 June 2014: IOBC-WPRS Working Group "Biological control of fungal and bacterial plant pathogens" Uppsala, Sweden. Email: dan.jensen@slu.se

13-17 July 2014: Second IOBC-Global Working Group meeting "International Workshop on biological control and management of Parthenium" Addis Ababa, Ethiopia. Email: rmuni@vt.edu

20-25 July 2014: "8th International Congress of Hymenopterists" Cusco, Peru. Website: http://www.cebioperu.org/courses/hymenopterameeting.php

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

20-22 October 2014: "9th Annual Biocontrol Industry Meeting ABIM" Basel, Switzerland. Website: www.abim.ch

16-19 November 2014: Entomological Society of America Annual Meeting "Grand Challenges Beyond our Horizons" Portland, Oregon. Website: www.entsoc.org

Postdoctoral Position

The Ecosystem Sciences and Management and Plant Sciences Departments at The Pennsylvania State University invite applications for a Post-Doctoral Research Associate position assessing the agroecological benefits of cover cropping in the northeastern US. This position is part of a dynamic team of scientists assessing the ecosystem service benefits of cover cropping and the degree to which those benefits can be enhanced with multi-species mixtures. The position is particularly well suited for an individual with a strong ecology and agroecology background and experience working with plant polycultures. The individual in this position would deepen our team's capacity in one or several of the following areas: community assembly dynamics in mixed plant communities, quantifying the weed suppressive effects of cover crop cocktails, plant-soil interactions and quantitative approaches to ecosystem service assessment which could include crop simulation modeling. In addition to the opportunity to pursue their own research nested in our large study, the individual will help lead the data synthesis from a large systems study.

Interested applicants should send (a) a letter outlining their interest in and fit for the position, their (b) CV, and (c) contact information for three references to Dr. Dave Mortensen at: dmortensen@psu.edu. More information about the lab can be found at: http://www.weedecologypsu.com/index.html

Required qualifications include: (1) Ph.D. at the time of application in Ecology, Plant Science, Agronomy, Soil Science or a closely related discipline, (2) excellent writing skills and documented ability to serve as lead author in publishing papers, (3) strong quantitative ecology skills.