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IOBC - NRS Newsletter

International Organization for Biological Control
Nearctic Regional Section

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CONTENTS

Biocontrol of Hemlock Woolly Adelgid

The hemlock woolly adelgid, *Adelges tsugae* (HWA), has become the most devastating insect pest of hemlock forests in the eastern USA. Native to Asia, HWA was first reported in Oregon in 1924 and in eastern North America near Richmond, Virginia in 1951. For decades it was considered a minor pest of ornamental hemlocks. It was not known to cause damage on western hemlocks (*Tsuga heterophylla* and *T. mertensianna*) and it was easily controlled in the ornamental landscape using a variety of insecticides. By the mid 1980s, it was found in hemlock forests in Virginia, New Jersey, Connecticut and eastern Pennsylvania. In the forest environment, adelgid populations rapidly increased and tree mortality soon became extensive. Hemlock mortality at the Shenandoah National Park in Virginia averaged 50% in 2000, with 99% of the remaining hemlocks in a severe state of decline. In New Jersey, hemlock mortality currently exceeds 90% in areas where HWA has been established the longest and less than 13% of the remaining stands are considered healthy. HWA is now established in 16 states from southeastern Maine to northeastern Georgia and westward into eastern Tennessee. Its recent establishment in the Great Smoky Mountain region threatens some of the oldest and largest specimens of eastern hemlock (*T. canadensis*) in North America. Also at risk is the rare Carolina hemlock (*T. caroliniana*), a species with limited distribution in the southern Appalachians.

There are no known parasites of Adelgidae and existing natural enemies are not effective in controlling HWA in eastern North America. Furthermore, there are no chemical control options suitable for management in the forest environment. As such, classical biocontrol has become the keystone in the race to save eastern hemlock forests. In the mid 1990s, the USDA (US Department of Agriculture) Forest Service and its state, federal and university cooperators initiated a coordinated effort to locate, evaluate and establish a complex of host specific natural enemies. To date, these efforts have led to the investigation and introduction of a number of biocontrol agents of diverse geographical origin.

- *Sasajiscymnus tsugae* [formerly *Pseudoscymnus tsugae*]. Building on the discovery of a tiny coccinellid predator in Japan by Mark McClure of the Connecticut Agricultural Experiment Station, *S. tsugae* became the first natural enemy to be established in this biological war on HWA. Rearing methodologies developed by Dan Palmer of the New Jersey Department of Agriculture has led to mass production of this important predator and additional facilities have been established with North Carolina Department of Agriculture, Clemson University, University of Tennessee and, in the private sector, EcoScientific Solutions LLC. By the end of 2003, more than a million *S. tsugae* beetles had been released in hundreds of infested hemlock stands throughout 15 states.
- *Laricobius nigrinus*. As a predator of HWA in western North America, this derodontid beetle has been found to be highly host specific and active in the fall and winter months. Both research and rearing of *L. nigrinus* is being conducted at the Virginia Polytechnic Institute and State University under the direction of Scott Salom. Establishment of this predator began in the fall of 2003 at locations in six states. Further releases are planned in 2004.
- *Scymnus sinuandodulus*. Mike Montgomery of the USDA Forest Service Northeastern Research Station discovered that numerous predators of HWA existed in China including several species of *Scymnus* beetles. The focus thus far has been on *S. sinuandodulus*, as it shows the most promise as a predator of HWA and its life history makes it more suitable for mass rearing. The first release of this coccinellid predator is planned for 2004 and the release programme is expected to be expanded in the coming years.
- Entomopathogens. Research efforts led by Bruce Parker at the University of Vermont hold hope

— continued on page 5

FROM the PRESIDENT

Hunter's Farewell

Well, this is it then, my last letter as IOBC-NRS President. Many thanks to the Governing Board and the membership for their support over the past couple of years. It's been a great honor to serve in this position.

In this letter I'd like to convey my excitement about our new Governing Board. Here in NRS, Rob Wiedenmann will take over as President. Rob has been involved with IOBC-NRS for many years, and brings both a broad perspective of weed and arthropod biological control issues as well as formidable administrative skills to the position. (Perhaps if you're in arrears with your dues, you ought to just confess and pay up now…).

We are also welcoming Marshall Johnson as President-Elect. Marshall has over 30 years of biological control of arthropod experience both at the University of Hawaii, and now at UC Riverside, and has long been active in IOBC NRS. George Heimpel, from the University of Minnesota, will take over as Vice-President. George's interests range from nutritional ecology of parasitoids and predators, to parasitoid sex determination, and I know he will organize great symposia for the IOBC NRS Informal Conferences in 2005 and 2006. We also have three new members at large: Doug Landis, Megha Parajulee and Les Shipp.

We owe a large debt of gratitude to those rotating off the Governing Board this year as well. Nick Mills did a great job organizing interesting symposia as Vice-President. This year's symposium on aphid biological control looks especially good – mark it on your Entomology Society Meeting calendars – the symposium will be on Tuesday night after the business meeting. Sujaya Rao and Jacques Brodeur are also rotating off – Sujaya after one term and Jacques after two terms as Members-at-Large. Their contributions will be missed.

Lastly, I would like to thank Maurice and Kady Tauber for their generous support of the Outstanding Graduate Student award again this year. The student award recognizes the new generation of biological control ecologists, and will help keep our society vibrant.

— Molly Hunter

NEWS

2004 Midwest Institute for Biological Control Shortcourse Focused on Insect Pathology

The Midwest Institute for Biological Control, under the auspices of NCR-125, North Central Region Committee on the Biological Control of Arthropods, sponsored a one-week intensive Insect Pathology course on the campus of the University of Illinois, Urbana-Champaign, June 28-July 1, 2004. The course was organized by Leellen Solter, Illinois Natural History Survey, Center for Ecological Entomology. Solter, Dr. Lawrence Lacey (USDA-ARS, Yakima, WA) and Dr. Richard Humber (USDA-ARS, Ithaca, NY) were instructors for 21 participants including ten graduate students from universities in six states, nine USDA-ARS research scientists from six states and two state agricultural dept. research scientists.

The course consisted of lecture, laboratory and discussion sessions, as well as a collecting trip in prairie and woodlot habitats. Instruction was given on the proper handling, storage and transportation of terrestrial and aquatic insects to protect pathogens they might harbor.

Each major pathogen group was addressed in a lecture and a laboratory session. Participants dissected living infected host insects and observed DNA and RNA viruses, and several species each of entomopathogenic bacteria, nematodes, fungi and microsporidia. Staining procedures and bioassays were also demonstrated.

During informal evening sessions, the use of entomopathogens in biological control was addressed. Instructors and participants shared information and experiences from their own research and questions were entertained on all aspects of insect pathology.

The NE Region Sustainable Agriculture Research and Education Program contributed a nematode poster and CD video on use of nematodes in biological control for each participant.

Trichoderma in Biological Control: A Taxonomist Reports

***Trichoderma* species** are effective in biological control of fungus-induced plant disease. A search of the Internet will show literally hundreds of examples. New species will be found as different niches are explored and also as the phylogenetic species concept comes into greater use, which is certain to happen as more people utilize DNA sequences and the incredible GenBank database. The study of endophytic fungi in stems and leaves from a biological control perspective, especially when combined with exploration in areas of diversity of hosts and their pathogens, holds the promise of finding new or more effective biocontrol agents and not just in the genus *Trichoderma*. The study of the interaction between host plants and their endophytes, especially at a molecular level, will certainly give new insights into the resistance of plants to diseases causing fungi. It's all very exciting at this point!

This is the conclusion (verbatim) of an article by Gary J. Samuels, USDA-ARS, Systematic Botany and Mycology Lab, Beltsville, MD. For the complete, in-depth article see http://pest.cabweb.org/Journals/BNI/Bni25_1/Gennews.htm

Tiny Weevil Beats Back Giant Salvinia

Giant salvinia, *Salvinia molesta*, is a free-floating fern that thrives in slow-moving, quiet freshwater systems. In ponds and lakes in sections of Texas and Louisiana, mats of giant salvinia block out sunlight and use up oxygen, making it hard for some forms of aquatic life to survive beneath them. The mats snag fishing lines and propellers, making boating, swimming, and other recreational uses impossible. The weed also clogs irrigation systems and turbines at hydroelectric plants.

Researchers at the ARS Invasive Plant Research Laboratory in Fort Lauderdale, Florida, have found that the weevil *Cyrtobagous salviniae* is an extremely effective biocontrol agent for giant salvinia. The weevil's native range includes parts of Brazil, Bolivia, Paraguay, and northern Argentina. A second weevil population exists in Florida, where it may have been introduced as early as 1930 along with common salvinia, *Salvinia minima*. It feeds only on salvinia species from South America, rejecting closely related species from Africa and Europe. Adult females lay their eggs in cavities they create by chewing into the plants' rhizomes and petioles. The larvae that hatch feed on buds before tunneling into the rhizomes, where the most serious damage to the plant is inflicted. The weevil can greatly reduce large infestations of giant salvinia and maintain low plant population levels indefinitely.

The first releases of the insects—in 1999 against giant salvinia in Texas—were conducted with weevils collected from common salvinia in Florida. These initial releases were not successful, because all the plots were destroyed by herbicides, floods, or droughts.

A second series of releases was started in October 2001 using weevils from the Brazil population at four sites in Texas and Louisiana. There has been a steady, sometimes spectacular, reduction in giant salvinia. By September 2003, giant salvinia covered just 1 percent of the water's surface at sites where weevils were released, but it covered 100 percent of the surface at the control sites. At two sites the mats of giant salvinia have almost completely collapsed.

Now a project is underway to evaluate the effectiveness of weevils from the Florida population against common salvinia. Early indications are that the weevils will be able to suppress common salvinia in Louisiana like they do in Florida.

— From the September 2004 issue of Agricultural Research *magazine by Alfredo Flores at http://www.ars.usda.gov/is/AR/archive/sep04/weevil0904.htm.*

Bacterium Toxic to Colorado Potato Beetle and Other Insect Pests

Strain PRAA4-1T, a Gram-negative purple bacterium, was isolated from forest soil and found to be toxic to Colorado potato beetle larvae and other insects. This purple bacterium is similar to *Chromobacterium violaceum* in that it produces a purple pigment, but it grows at lower temperatures.

On the basis of phenotypic, genotypic, and phylogenetic analyses, strain PRAA4-1T was proposed as a new species. Because it was found under a hemlock tree, *Tsuga canadensis*, it was named *Chromobacterium suttsuga* sp. nov. (= NRRL B30655).

In lab tests, *C. suttsuga* produces multiple toxins that deliver a lethal blow to Colorado potato beetle, corn rootworms, diamondback moth, silverleaf whitefly and green stinkbugs. Preliminary results from field tests have confirmed lab results, and more field tests are planned. A patent application for the discovery has been filed.

The bacterium's toxins can be combined with chemical compounds and then applied to soil, plants or seeds. Because *C. suttsuga* is stable in the environment and insects readily ingest it, rice grains can be treated with the toxins and applied to the soil, where soil-dwelling pests will feed on the treated grains.

— From a December 24, 2003 ARS Press Release by Sharon Durham at http://www.ars.usda.gov/is/pr/2003/031224.htm and other sources.

Predators Supress Soybean Aphid

The ability of the existing predator community (primarily *Harmonia axyridis*, *Orius insidiosus*, and *Leucopis* spp.) in soybean to suppress soybean aphid, *Aphis glycines*, was studied in the field during June-August 2002. Using predator exclusion and sham cages or no-cage controls, predator communities and aphid populations were strongly affected by cage treatments. Foliar-foraging predators effectively prevented *A. glycines* population growth, while populations soared in exclusion cages. After cages were switched after 2 weeks, the high *A. glycines* populations in the former exclusion cages were rapidly colonized and reduced by nearly an order of magnitude within 2 weeks by a combination of generalist and specialist predators.

With apparently strong *A. glycines* suppression by existing predators already in place, introduction of additional biological control agents should be carefully considered.

— Fox, T. B., D. A. Landis, F. F. Cardoso, and C. D. Difonzo. 2004. Predators Suppress Aphis glycines *Matsumura Population Growth in Soybean. Environ. Entomol. 33(3): 608-618.*

Control of European Corn Borer Using Mating Disruption

The European corn borer, *Ostrinia nubilalis*, is one of the most damaging insects in field corn, causing more than $100 million in crop losses each year. Larvae feed on the leaves and tunnel into the stalk, ear shank, and ear of corn plants. Depending on the stage of the corn plant, there is a 6% yield reduction for each of the first six European corn borer larvae that bore into the stalk. The combined losses due to first and second generation European corn borer averages 15 bushels an acre in Iowa corn. Although European corn borer larvae are intimately associated with the cornfields, once they turn into adults, they migrate from cornfields to the tall grassy areas in the edges of the fields, where they aggregate. It is in these aggregation sites that virgin European corn borer females release sex pheromone to attract males for copulation. The mated female moths leave the aggregation sites to lay egg masses on susceptible corn plants in the vicinity.

Research funded since the mid 1990s by the USDA Competitive Grants Program and by Iowa's Leopold Center for Sustainable Agriculture in Iowa has resulted in MSTRS ECB-2, a new commercially available, EPA-registered mating disruption product for use against the European corn borer. Experiments over the years have shown that larval damage is consistently reduced by 50% in first generation corn borer due to suppression of mating by the adults.

In the first few years of research by Iowa State University entomologists on this novel approach to mating disruption, the MSTRS (metered semiochemical timed release system) dispensers consisted of machines that sprayed pheromone onto adsorbent pads. Then the researchers began testing a new pheromone dispensing formulation that emitted pheromone from small plastic dispensers ("baggies") at the same rates as the machine pads. The bags are deployed on bamboo gardening stakes at a density of 1 baggie per acre in the grassy waterways, terraces, and perimeters that are characteristic of Iowa corn fields and where the corn borers go to mate. The baggies work to disrupt the ability of the adult male moths to locate females and thus to suppress mating through the entire growing season.

After showing during the first few years that pheromone source location by males is suppressed by over 97% and that mating by females is impeded, the researchers in 1999 and 2001 showed that the MSTRS dispensers placed in grassy areas reduced the number of damaged plants by over 50% (Table 1). In 2003 samples from over 500 acres of corn treated with commercially available MSTRS ECB-2 again showed a 50% reduction of damaged plants by first-generation corn borer larvae (Figure 1). This amount of damage reduction should translate into a yield increase of from 5 to 10 bushels per acre in Iowa, on average. MSTRS Technologies, Inc., which manufactures these products, recommends that the bags (Figure 2) be deployed at the first pheromone trap capture of male ECB, or

	% Damaged Plants
Check Field # 1	24.1%
MSTRS ECB-2 #1	8.8%
Check Field #2	34.0%
MSTRS ECB-2 #2	19.6%
Check Field #3	23.4%
MSTRS ECB-2 #3	15.6%
OVERALL MEAN: CHECK	27.2%
MSTRS	**14.7%**

Table 1. Percentage of non-Bt variety corn plants showing shot-holes in leaves or stalk-boring by first-generation European corn borer larvae in MSTRS-ECB-2-treated mating disruption fields compared with untreated check fields in three locations in central Iowa. Fields were 80 acres in size and 800 plants per field were examined individually for damage. Plants were sampled using 50 successive plants at a time in a row, the row locations selected randomly throughout the field. If one shot-hole or instance of frass at the base of the leaves were found anywhere on the entire plant, the plant was counted as 'damaged'. MSTRS "baggie" dispensers were deployed at an average density of 1 dispenser per acre of corn in all 3 treated fields.

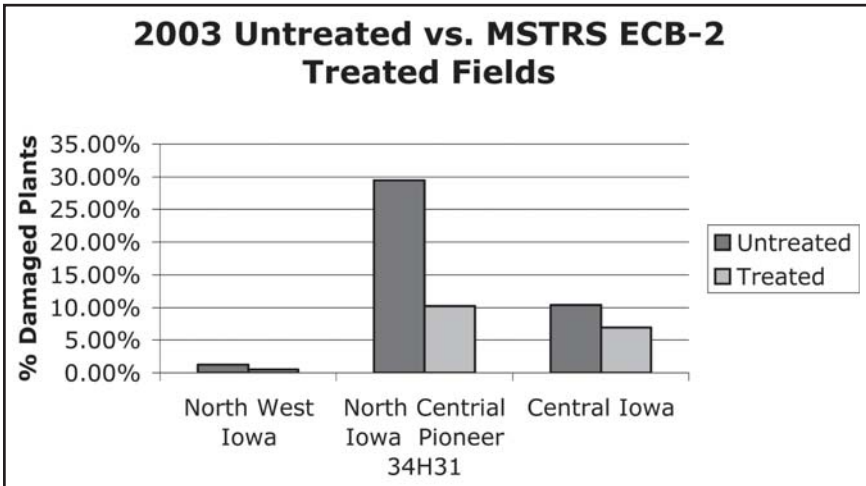

Figure 1. Data from approximately 500 acres of corn in three locations in Iowa in 2003 treated with OMRI-listed commercially available MSTRS ECB-2 that shows an average 50% reduction in the number of damaged corn plants compared to nearby untreated fields. Plants were sampled 800 plants per field, 50 plants at a time from 16 different rows randomly selected from various locations in the fields.

European Corn Borer Mating Disruption — Continued from page 1

ideally just *before* the first flight (usually during the first week of June in Iowa).

An overlooked, potential added advantage of the area-wide use of mating in the context of increasing use of transgenic corn by growers is that pheromone disruption should differentially reduce mating of any rare, low density, Bt-resistant individuals in grassy areas compared with that of susceptible individuals emerging at higher densities from non-Bt corn fields. Indeed, the delaying of the onset of resistance by using pheromone mating disruption where possible in all transgenic crops may be a general integrated pest management benefit beyond crop damage reduction.

AgBio Inc. markets the MSTRS line of products. Cost of treatment is less than $10/acre in field corn. Field trials are underway in other crops in which ECB is a major pest. MSTRS mating disruption products are also available for control of Oriental fruit moth, blackheaded fireworm, and Sparganothis fruitworm. All are listed by the Organic Materials Review Institute (OMRI) for use in organic production. Other innovative mating disruption and semiochemical products are in development.

***Figure 2**. Deployment of the MSTRS ECB-2 baggies in the grassy areas around one of the corn fields in 2001. Inset shows close-up of one of the baggies.*

For further information contact AgBio at www.agbio-inc.com.

— submitted by Jan Meneley [agbio@agbio-inc.com]

Hemlock Wooly Adelgid — Continued from page 1

that pathogens may play a role in regulating HWA populations. Several promising fungal isolates have been identified and tests are currently underway to develop effective formulations and delivery systems.

Laboratory and field tests show promising results with each of these natural enemies but it will probably be several years before any are established in sufficient numbers to have an impact on HWA at the forest stand level. Because of this lag, areas selected for release are primarily along the leading edge of the infested region, where hemlock trees are healthy and infestation levels are at low to moderate densities. High-value natural areas like the Great Smoky Mountains are receiving the highest priority.

Reprinted from CABI International's Biocontrol News and Information, June 2004, Volume 25 No. 2 by Brad Onken, HWA Program Coordinator,USDA Forest Service, Northeastern Area State & Private Forestry, 180 Canfield Street, Morgantown,WV 26505 at http://pest.cabweb.org/Journals/BNI/Bni25_2/Gennews.htm.

NEWSLETTER INFO

Please Submit Articles!

Submission of news items from the membership is what makes this newsletter of value to all. Anything related to biological control will be considered for publication: interesting research findings, proposed projects, theses or dissertation abstracts, publication reviews, awards, short review articles, and more.

Get your name in print the easy way — just send me your articles (preferably by email). Although a deadline is set for the editor's sake, you may submit at any time for future newsletters (my address is on the back page).

Items for the Winter Newsletter are due by 15 January 2005

***If you move**, please send your new address to the Secretary/Treasurer or Corresponding Secretary so this newsletter will continue to reach you.*

MEETING CALENDAR

Weed Science Society of America Annual Meeting

February 7-10, 2005
Honolulu, Hawaii

Everything about weeds, including some biological control. For more information contact:

WSSA Mtg. Manager
PO Box 7050,
Lawrence, KS 66044-7050
E-mail: WSSA@allenpress.com

Integrated Control in Glasshouses and Outdoor Nursery Stocks

April 10-14, 2005
Turku, Finland

The joint meeting of the NRS and WPRS greenhouse IPM working groups will feature four days of presentations and workshop discussions on integrated pest and disease management in glasshouses, and will include a research tour of the glasshouse industry in the Turku region. In addition, one day will be dedicated to "IPM in outdoor nursery stocks."

For more information, visit the conference website at www.agrsci.dk/plb/iobc/meet2005.htm. To be placed on the mailing list to receive further details, please contact:

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Canadian Phytopathological Society Annual Meeting

June 14-18, 2005
Edmonton, ALB, Canada

This will be a joint meeting with Plant Canada, a coalition of six Canadian scientific societies. For more information see the website at www.cps-scp.ca/meetings.htm

American Phytopathological Society Annual Meeting

July 30 - August 4, 2005
Austin, Texas

For more information see the APS website at http://www.apsnet.org or contact:

APS
3340 Pilot Knob Road
St. Paul, MN 55121-2097
E-mail: aps@apsnet.org

International Conference on Biological and Pro-Ecological Methods for Control of Diseases, Pests and Weeds in Orchards and Small Fruit Plantations

August, 2005
Warsaw, Poland

Topics will include modern methods of pathogen detection; biopreparates for control of pathogenic fungi and bacteria; the use of predators in pest control; and integrated pest management in fruit production. For more information see the PomoCentre website at www.pomocentre.insad.pl or contact:

P. Sobiczewski
Resch. Inst. of Pomo. and Flor.
Pomologiczna 18, 96-100
Skierniewice, Poland
Phone: 48-46-833-2021
E-mail: Psobicz@insad.pl

2nd International Symposium on Biological Control of Arthropods

September 12-16, 2005
Davos, Switzerland

This is a continuation of the first international symposium on the biological control of arthropods in Hawaii in January 2002. The intent of these symposia is to create a meeting for practitioners, a forum for information exchange, an event to build cohesion among the research community and to foster discussions of issues affecting biological control work, particularly pertaining to the use of parasitoids and predators as biological control agents. Approximate costs of $300 registration, $120/night. For more information contact the ISBCA Symposium Secretary in Switzerland (ISBCA@bluewin.ch).

Aphid and Coccid Biocontrol

September 25-29, 2005
Tsuroka, Japan

An IOBC International Symposium is being organized by Yamagata University with support from several Japanese scientific societies. The aim of the symposium is to explore differences and similarities in the ecology of aphidophagous and coccidophagous insects and their interactions with their hosts. Sessions will be held on natural enemy augmentation in protected cultures; conservation and promotion of natural enemies; environmental risks of natural enemy introductions; interactions of ants, homopterans and natural enemies; intraguild predation; and information acquisition and foraging in insect parasitoids and predators. For more information contact:

Dr Hinori Yasuda, Professor of Animal Ecology
Department of Agriculture
Yamagata University, 1-23
Tsuruoka, Yamagata, 997-8555, Japan
E-mail: hyasuda@tds1.tr.yamagata-u.ac.jp
Web: www.bf.jcu.cz/tix/strita/aphidophaga/main.html

Application For Membership
in

INTERNATIONAL ORGANIZATION FOR BIOLOGICAL CONTROL OF NOXIOUS ANIMALS AND PLANTS (IOBC) NEARCTIC REGIONAL SECTION (NRS)

Membership (check one): NEW ___ RENEWAL ___

Category of Membership:

- Individual (in Canada, U.S. or Bermuda; U.S. $25) ___ (elsewhere, U.S. $30) ___
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  Of these funds $10 will be forwarded to the Global Body for each member. Members receive both Global and NRS newsletters, and publication privileges in *BioControl*.
- Individual, with subscription to *BioControl* (U.S. $115) ___
  Includes subscription fee and $10 forwarded to Global Body
- Institutional member (U.S. $300) ___
  Includes 2 copies of Global and NRS newsletters, *BioControl*, and $150 forwarded to Global Body
- Supporting member (U.S. $1000) ___
  Includes 2 copies of Global and NRS newsletters, *BioControl*, $900 for support of Global organization, and $100 to support NRS

U.S. $_____ enclosed for annual membership for the year 200__ (January to December)

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Please add on the reverse of this form comments concerning any services or assistance that IOBC/NRS could/should provide that would be helpful to you.

Send application form and payment to:

Stefan Jaronski
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P.O. Box 232
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http://www.entomology.wisc.edu/iobc/nrs.htm
IOBC website: <www.iobc.agropolis.fr>

Send items for the
Winter 2005 IOBC-NRS Newsletter
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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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