



SUMMER 2003

# IOBC - NRS Newsletter

*International Organization for Biological Control  
Nearctic Regional Section*

Volume 25  
Number 2

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## Biocontrol at the National IPM Symposium

**The Fourth National IPM Symposium/Workshop, *Building Alliances for the Future of IPM***, was held April 8-10, 2003 in Indianapolis, IN. This was an exciting opportunity to learn about the latest developments in agricultural and urban IPM. The symposium included over 60 breakout sessions encompassing almost all aspects of IPM, as well as plenary speakers sharing their experiences in building alliances. The Biological Control and Bio-based IPM topic focused on biological control and bio-based strategies for the management of arthropods, weeds, and diseases. There were five sessions devoted to specific topics:

### *Barriers to the Adoption of Biocontrol Agents and Biological Pesticides*

Microbial pesticides, pheromones, and plant derived biochemicals have been around for a long time, but their adoption in IPM systems has lagged behind chemical solutions. Of the \$28 billion in pesticides used globally in agriculture and public health, approximately 1% are biologically-based or biological pesticides. Biological pesticides provide safe, environmentally friendly and effective solutions that can shine if given the chance to be incorporated into IPM systems. This workshop provided various perspectives on the barriers to adoption of new biological alternatives for pest management and developed specific action plans to overcoming these barriers to increase their adoption in IPM systems.

One of the perspectives came from the Biopesticide Industry Alliance (BPIA), whose mission is to improve the global market perception of biopesticides as effective products and to facilitate the successful registration of these products. Another voice was the Pesticide Program Dialogue Committee (PPDC), an advisory group that attempts to develop practical, protective approaches for addressing pesticide regulatory, policy, program implementation, environmental, technical, economic and science policy issues. The broad range of committee members are appointed every

2 years and include user growers, food processors, environmental and public interest groups, the biopesticide and chemical industry, academics, federal agencies such as USDA and regional EPA, and many more.

Another speaker presented the results of a telephone survey 198 growers, PCAs, distributors and golf course superintendents mainly in California and Florida, of their awareness of biopesticides. Awareness is highest at the PCA/distributor level and lowest at the grower level, and awareness in the golf course industry is lower than the agricultural industry. Current use of biopesticides in the golf course industry is very low, which could indicate a lack of satisfaction with the products. Even though the overall perception of biopesticide usefulness was generally positive by all groups, there was a lack of awareness and limited understanding of utility at the end-user level. The main reasons biopesticides were used were because they are environmentally safe, not because of efficacy, safety to beneficials or public perception.

The ensuing discussion with about 100 people in attendance developed a number of recommendations, including:

- With PCAs, conduct grower demos on a small scale to start adoption.
- Show profit of the program with the biopesticide to the grower and PCA.
- Improve image and efficacy of biopesticides by implementing the Biopesticide Industry Alliance's certification standards for efficacy, quality and registration.
- Public funding must be available for developing new kinds of monitoring for the pests. Look at the basic biology; research is needed at an ecological level.
- Promote biopesticides in resistance management programs, residue management programs (especially for exported produce) and IPM programs to preserve beneficials.

— continued on page 2



## FROM the PRESIDENT

### Thanks and More

**My father once told me** that the human brain is an amazing organ, active always, processing thousands of sensory inputs as well as synthesizing them, processing and forming thoughts and language, and never never empty, except when a person is asked to stand and “say a few words.” I’ve been asked to say a few words for my first President’s Column, but luckily have the benefit of a quiet office and no expectant faces.

The 2002 IOBC-NRS Informal Conference was a great success, thanks in large part to John Ruberson, who put together the program on “Biological Control in Florida.” We also had a chance to honor Kady and Maurice Tauber as Distinguished Scientists in Biological Control for their many contributions to biological control over their careers and into the future! And we granted our first Outstanding Graduate Student in Biological Control award to Jason Harmon, from the University of Minnesota. Jason gave a really stimulating talk on “*The ecological mechanisms of shared predation*” and I think Jason embodies the creativity of stu-

dents currently working in the field of biological control. As President, I would like to make sure that we continue to recruit and promote the excellent students that have chosen to work in biological control, and the student award is one way we can do that. One of our challenges is to pay for this award, and this year Maurice and Kady Tauber sent us a generous donation of \$300 for the Graduate Student award and mixer. I’m sure you will agree that this is great start towards raising enough money to keep this award going, and please join the Governing Board in thanking the Taubers when you see them.

More thanks are also in order. Several IOBC-NRS Governing Board members stepped down in this last year. Larry Charlet has finished his formal involvement with the Governing Board, having finished his six year stint, two years as President Elect, two as President, and two as Past President. Larry did a great job and displayed leadership and generosity throughout his tenure. Dan Mahr is now Past President, having finished his term as President. Dan had to learn this position early when Larry was unavoidably called away, and has left large shoes to fill. John Ruberson has finished two years of one of the hardest working

positions on the Board, the Vice President, and has organized two great meetings. Lastly, thanks to Peter Mason who is stepping down as Member at Large.

The new Governing Board includes some familiar faces in new roles. Rob Wiedenmann has stepped down as Secretary/Treasurer after many years of keeping absent-minded IOBC members paid up and the finances in great order, to become President Elect. And Stefan Jaronski has moved from Member at Large to Secretary/Treasurer.

Happily Jacques Brodeur is continuing as Member at Large, and Susan Mahr is continuing as Newsletter Editor and Corresponding Secretary. I want to welcome Nick Mills as Vice-President. Nick has organized a really interesting program on “Landscape Structure, Non-Crop Habitat and Biological Control” for our next annual meeting in Cincinnati (see page 3). Welcome also to new Members at Large: George Heimpel from the University of Minnesota and Sujaya Rao, from Oregon State University.

I would like to close by inviting you to let me know how you think IOBC-NRS can best represent the members’ interests and the biological control community. I’m a pretty good emailer and can be reached at [mhunter@ag.arizona.edu](mailto:mhunter@ag.arizona.edu).

— Molly Hunter

### National IPM Symposium —Continued from page 1

- Provide incentives for use of biopesticides through subsidies and ecolabels.
- Develop promotional and marketing agreements between biopesticide companies and large agrichemical companies, promoting resistance management.
- Through a consortium of USDA, SBIR, and EPA Fund turn key commercialization projects like they do in Europe, such as the project to commercialize *Beauveria brongniarti*.
- Find a champion outside of the industry to champion biopesticides.
- Decrease the reference to “biopesticides,” and promote them as solutions to pest problems. Biopesticide references may prevent a grower with bad experiences in the past from using them.

#### *Biological Control of Plant Pathogens*

This session focused on the incorporation of biologically-based tactics in disease management as well as impediments to expanded adoption of biopesticides. Three speakers discussed their perspectives on development and use of biologicals and composts to suppress plant diseases.

#### *Assessing the Impact of Inundatively-Released Biocontrol Fungi*

Fungi used for pest control in IPM settings, in most cases, have been released inundatively. This session reviewed research findings, addressed regulatory hurdles and identified future needs for evaluating the impact of inundatively applied fungi for control of pests – insects, plant pathogens and weeds.

#### *IPM and APHIS PPQ Regulatory Safeguarding Effort*

The presentations in this session highlighted the infrastructure within USDA-APHIS-PPQ and spotlighted a model program — biocontrol of the pink hibiscus mealybug — that illustrates the strategies, technologies, and processes and partnership opportunities with university and industry that are employed by APHIS-PPQ to protect US agriculture.

#### *For More Information*

This brief synopsis obviously cannot capture everything that was presented in these sessions. For more details, see the Proceedings from the 2003 National IPM Symposium Workshop that are now available online at <http://cipm.ncsu.edu/symposium/>.

— compiled from several proceedings of the Workshop, at the above URL.



## IOBC-NRS BUSINESS

### IOBC Symposium at Entomological Society Meeting

**Plan now to attend** the 2003 IOBC Symposium on *Landscape Structure, Non-Crop Habitat and Biological Control* at the Entomological Society of America meeting in Cincinnati October 24-29.

Habitat fragmentation as a threat to biodiversity is a well known phenomenon, but habitat fragmentation as a threat or impediment to the success of biological control has only more recently begun to be explored. Recent research has highlighted the influence of a vari-

ety of factors on the abundance of natural enemies, and the importance of non-crop habitat and intervening matrix vegetation on the movement and impact of natural enemies on insect pests and weeds. This exciting new direction in biological control research promises to provide valuable new insights for enhancing the activity of natural enemies in agricultural crops and natural environments and would be of broad interest to the entomological community.

This symposium will bring together a number of leading researchers in the field with the goal of presenting recent research findings, generating new ideas, fostering collaboration, and discussing future research directions.

The Symposium will be preceded by the Business Meeting of the IOBC-NRS, including presentation of the IOBC-NRS Distinguished Scientist Award and the IOBC-NRS Student Award, and will be followed by a reception and mixer.

#### 2003 IOBC SYMPOSIUM PROGRAM: *Landscape Structure, Non-Crop Habitat and Biological Control*

- Pollen feeding by the predator *Coleomegilla maculata* and transgenic insecticidal corn. **Jonathon Lundgren**, Univ. Illinois, IOBC-NRS Student Award winner
- The influence of landscape structure and farm management on biological control of aphids in cereals. **Barbara Ekbom**, Swedish University of Agricultural Sciences
- Influence of aphids, habitat, and landscape extent on coccinellid populations. **Norman Elliot**, USDA-ARS, Stillwater, OK
- Parasitoid communities and impacts in agricultural landscapes. **Douglas Landis**, Michigan State University
- Herbaceous crop fields, non-crop habitats, and invertebrate weed seed predation. **Fabian Menalled**, Iowa State Univ.
- Landscape effects: predation of leafrollers in pear orchards in California. **Nick Mills**, University of California-Berkeley

## AWARDS

### Ray Cloyd Receives Excellence in Extension Award

**Dr. Raymond Cloyd** was awarded the University of Illinois College of Agricultural, Consumer, and Environmental Sciences Faculty Award for Excellence in Extension 2003. This award recognizes his Extension and research programs that focus on discovering and implementing new methods to effectively manage greenhouse pests with minimal pesticide inputs.

His responsibilities at the University of Illinois include statewide extension and research in ornamental ento-

mology, covering greenhouse, nursery, landscape, turfgrass, and interiorscapes, as well as urban entomology.

Biological control has always been an important component of his programs, beginning during graduate school at Purdue University where he developed a greenhouse extension program. Current biological control projects are aimed at controlling fungus gnats using beneficial nematodes, soil-predatory mites, and rove beetles; control of western flower thrips using beneficial

nematodes; and compatibility of insecticides and fungicides with natural enemies such as *Leptomastix dactylopii* and *Hypoaspis miles*.

He has presented workshops for commercial growers and Extension agents on the use of biological control to manage greenhouse pests; published several papers in the area of biological control, and co-authored the regional Extension bulletin *Biological Control of Insects and Other Pests of Greenhouse Crops*.

### Illinois Purple Loosestrife Biocontrol Project Receives UCEA Excellence Award

The University Continuing Education Association (see <http://www.ucea.edu/> for more about this organization) selected a distance-education program entitled *Biodiversity, Wetlands and Biological Control-Purple Loosestrife: A Case Study* for a 2002 Celebration of Excellence award. The distance-education program, developed by Drs. Michael

Jeffords and Robert Wiedenmann of the Illinois Natural History Survey, shows teachers and environmentalists options for fighting invasive species using biological control agents rather than pesticides. The program gives middle and high school science teachers curriculum ideas and plans for incorporating environmental lessons into their classroom.

The course, a collaborative effort with the INHS, was offered online as a way to allow the widest possible audience to participate. Participants had weekly interactive chat sessions with the instructors and other students, to ask questions about the curriculum materials and share resources among educators and other participants.



## Nematode Distribution Applied Through Drip Irrigation Systems

The distribution patterns of entomopathogenic nematodes applied via drip irrigation lines is extremely important; the nematodes need to be distributed evenly throughout the system without suffering detrimental effects. This research evaluated the distribution of nematodes (*Steinernema carpocapsae*, *S. feltiae*, *S. glaseri*, *S. riobravis* and *Heterorhabditis bacteriophora*) along drip irrigation lines without investigating the impact on different target pests.

Distribution was evaluated by injecting small volumes of nematode suspensions using a syringe into drip irri-

gation lines and compared with results from a high volume of water using an injection pump.

Overall, the nematodes were evenly distributed along the drip lines. The total number of nematodes recovered from drip emitters was variable, ranging from 42 to 92%. Although statistically nematode distribution was uniform, the level of variation that can be tolerated remains a matter of discussion. A large variation in numbers of nematodes recovered may be acceptable because commercially recommended field application rates vary from 25 to 75 nematodes per cm<sup>2</sup> and experimental rates are often larger.

Drip irrigation lines have potential to deliver entomopathogenic nematodes efficiently into pest habitats, but uniform application is dependent upon a variety of factors, such as the length of the lines, number and distance between emitters, line pressure, and condition of emitters (for example, plugging by algae or debris could reduce the total output).

— Wennemann, L., W. W. Cone, L. C. Wright, J. Perez, and M. M. Conant. 2003. *Distribution Patterns of Entomopathogenic Nematodes Applied Through Drip Irrigation Systems*. *J. Econ. Entomol.* 96(2): 287-291.

## Nosema Infecting Southwestern Corn Borer

The southwestern corn borer (SWCB; *Diatraea grandiosella*) is the fifth most important corn insect pest in the US. Several entomopathogens, including isolates of an undescribed species of *Nosema*, have been isolated from this nonindigenous pest.

One isolate (506), originally collected from a diapausing larva extracted from the crown of a corn plant in Washington County, MS, was examined to determine the infectivity of spores ingested by SWCB larvae; to measure the impact

on SWCB egg hatch, and larval, pupal, and adult development; and to elucidate the mechanism and extent of vertical transmission.

*Nosema* 506 was highly infectious under laboratory conditions, but there was little mortality of SWCB larvae, pupae, or adults. However, the impact of this *Nosema* species under more variable field conditions is unknown.

This isolate did reduce adult fecundity and egg hatch in a controlled-environment study. The combination of

these effects could significantly affect population levels of SWCB in the field. *Nosema* 506 was transmitted vertically in SWCB, probably by transovarial transmission, but at very low frequencies.

— Inglis, G. D., A. M. Lawrence, and F. M. Davis. 2003. *Impact of a Novel Species of Nosema on the Southwestern Corn Borer (Lepidoptera: Crambidae)*. *J. Econ. Entomol.* 96(1): 12-20.

## Finding Better *Trichoderma* Species for Plant Disease Control

The mechanisms of biological control of plant diseases are many and complex, and vary with the kind of biocontrol agent, pathogen, and host plant involved in the interaction. Mechanisms are also influenced by the soil type, by the temperature, pH, and moisture of the plant and soil environment, and by other members of the microflora. The screening methods developed early on to isolate potential biocontrol agents — generally under lab conditions that rarely occur in nature — were, at best, only marginally effective.

Many of the mechanisms that have proven to be most important in biological control do not lend themselves to assay in a petri dish. Improved screen-

ing procedures will probably entail treatment of the seed, soil, or plant with the biocontrol agent, followed by culture of the treated host plant in a pathogen-infested environment until disease symptoms manifest themselves.

The results of many years of research with *Trichoderma* species as biocontrol agents has shown that not all the mechanisms and characteristics deemed necessary for optimum biocontrol are found in the same organism. Frequently the strains that produce enzymes and antibiotics that are associated with biocontrol do not have good storage qualities or function well at temperature and moisture levels where pathogens flourish. Therefore, hybrid-

ization of different strains or species will be required in order to combine these beneficial characteristics. The production of hybrid *Trichoderma* will entail the use of transformation or protoplast fusion in order to obtain strains with optimal sets of characteristics. Once produced and screened, hybrids may yield strains with expanded host, temperature, and moisture parameters, and they may yield strains with better storage qualities than those exhibited by the parents.

— Howell, C. R. 2003. *Mechanisms Employed by Trichoderma Species in the Biological Control of Plant Diseases: The History and Evolution of Current Concepts*. *Plant Disease* 87(1): 4-10.



## RESEARCH BRIEFS

### Better Parasitoids for Control of Black Scale on Citrus

**Augmentative annual releases** of the parasitoid *Metaphycus helvolus* have been found to be cost effective against black scale (*Saissetia olea*) in southern California citrus groves for members of a wasp-producing cooperative insectary. But at recommended release rates, standard insecticide treatments are more economical for non-members of the cooperative insectary that must purchase wasps at much higher cost. More growers could utilize biological control if other wasps could be found that are more cost-effective to produce,

Three encyrtid wasps — *Metaphycus luteolus*, *M. helvolus*, and *M. sp. nr. flavus* — were evaluated as potential biological control agents of black scale using sleeve cage releases. Scale survival and the percentage of scales parasitized were determined for three release timings. Only *M. sp. nr.*

*flavus* significantly reduced black scale survival and increased parasitism rates compared with background levels. *M. helvolus* showed a tendency to reduce scale survival, but no effect of *M. luteolus* was evident.

The best performer from this comparison was then evaluated in an open-field release experiment. More than 2,700 female *M. sp. nr. flavus* were released per tree over a period from January to April, resulting in significantly reduced black scale survival and increased parasitism.

Because *M. sp. nr. flavus* showed a slight advantage over *M. helvolus* in the sleeve cage study, and may also be easier to rear, it appears worthwhile to further evaluate *M. sp. nr. flavus* as a biological control agent of black scale. *M. sp. nr. flavus* can be reared on brown soft scale (*Coccus hesperidum*) which

is easier to rear than black scale (the required host for *M. helvolus*). Developing *M. sp. nr. flavus* as an augmentatively released biological control agent against black scale may result in more economic biological control than is the case with the currently released *M. helvolus*. Further evaluation of *M. sp. nr. flavus* as a black scale control agent should focus on the potential of *M. sp. nr. flavus* to procreate and to become established in the field; the costs of mass production; and whether this parasitoid will be superior to *M. helvolus* when released in an open-field situation.

— Schweizer, H., J. G. Morse, and R. F. Luck. 2003. Evaluation of *Metaphycus spp.* for Suppression of Black Scale (Homoptera: Coccidae) on Southern California Citrus. *Environ. Entomol.* 32(2): 377-396.

### Elm Leaf Beetle Egg Parasitoid Established in Midwest

The egg parasitoid *Oomyzus gallerucae* was first recorded from elm leaf beetle (*Xanthogaleruca luteola*) in Boone Co., MO in 1989, more than 50 years after the last known release, and approximately 500 and 1700 miles from its nearest known established sites in Ohio and California, respectively. It has since been recorded in 55 additional Missouri counties and 5 adjacent states. Annual parasitization of ELB egg masses by this palearctic eulophid at Columbia, MO ranged from 26.3% to 51.7%.

*O. gallerucae* was reared from egg masses on the first collection date each year as well as the last, indicating that the parasite successfully overwinters and is synchronized with the phenology of the beetle. The 38.0% overall mean rate of parasitization in addition to mortality resulting from host feeding of the eggs appeared to inhibit conspicuous leaf damage. The presence of *O. gallerucae* in Missouri has potentially contributed to the decline of the ELB as an urban pest in the state.

This delayed establishment and dispersal is similar to that of two other parasites released in the US, *Collyria calcitrator* for European wheat stem sawfly and *Bathyplectes tristis* for the clover leaf weevil.

— Puttler, B. and W. C. Bailey. 2003. Establishment of *Oomyzus gallerucae* (Hymenoptera: Eulophidae), an egg parasite of the elm leaf beetle (Coleoptera: Chrysomelidae), in Missouri and adjacent states. *Biol. Control* 27: 20-24.

### Potential Biocontrol for Sugar Beet Leaf Spot

USDA-ARS scientists have applied for a patent on their discovery of a fungal enzyme that may prevent leaf spot, a widespread disease of sugar beets caused by *Cercospora beticola* that reduces beet yields and sugar content. This discovery is especially timely because the disease fungus is beginning to develop resistance to some fungicides.

Among a few promising candidate biocontrol fungi was the basidiomycete *Laetisaria arvalis*. This fungus is a well

known wood- and leaf-decay fungus of forests, but it is also found in farm soils where sugar beets grow. In lab experiments, one enzyme produced by the fungus — laccase — worked very well in degrading and detoxifying the toxin, cercosporin, produced by the leaf spot fungus.

The enzyme will next be tested on potted sugar beet plants in a greenhouse. If the results are favorable, the next step will be testing the enzyme on sugar beets

growing in the field.

— Adapted from ARS News & Information, Possible Natural Cure for Sugar Beet Leaf Spot, May 21, 2003 by Don Comis; for the complete article see <<http://www.ars.usda.gov/is/pr/2003/030521.htm>> AND Spillman, A. 2003. Enzyme May Protect Sugar Beets From Leaf Spot Disease. *Agr. Res. Mag. Vol.* 51(5):14; at <<http://www.ars.usda.gov/is/AR/archive/may03/beet0503.pdf>>

## MEETING CALENDAR

### XIII International Entomophagous Insects Workshop

July 27-31, 2003

Tucson, Arizona

The workshop is a meeting dedicated to entomophagous arthropod biology, with special emphasis on parasitoids. This 4 day, single session meeting will have sections on behavioral ecology and life history, biological control, chemical ecology, physiology, systematics, population and community ecology, and genetics and symbionts. We are expecting between 100-150 researchers from 16 countries.

For more information see the website at <<http://www.wcrl.ars.usda.gov/events/entowkshp/index.htm>> or contact:

Molly Hunter  
Dept. of Entomology  
University of Arizona  
Tucson, Arizona USA  
e-mail: [mhunter@ag.arizona.edu](mailto:mhunter@ag.arizona.edu)

### The 10th Workshop of the IOBC Global Working Group on Arthropod Mass Rearing and Quality Control

Sept 21-25, 2003

Montpellier, France

The workshop will focus on all issues related to the rearing of entomophagous and phytophagous insects and mites, and to principles and practices of quality control. The program includes keynote addresses presenting an overview of selected topics and contributed papers on the different aspects of arthropod rearing as it relates to quality control.

For more information see the conference website at <<http://allserv.rug.ac.be/~padclerc/AMRQC/announcements.htm>>.

## NEWSLETTER INFO

### Improve This Newsletter by Submitting Articles

**Submission of news items** from the membership is what makes this newsletter of value to all.

Do you have a student finishing a M.S. or Ph.D.? Send in their abstract to publicize the work they've done.

Know of some biocontrol work done by your local county, state, or provincial government that will probably never be published? Submit excerpts from their report so others can hear about these success stories (or cautionary tales of biocontrol gone bad).

Although a deadline is set for the editor's sake, please submit at any time for future newsletters (my address is on the back page). Some suggested topics are:

- Items in the news affecting biological control
- Taxonomy (revisions or studies impacting biocontrol)
- Reports of Working Groups
- Announcements
- New research projects

### Association of Natural Biocontrol Producers (ANBP) Annual Meeting

October 16-18, 2003

Niagara Falls, Ontario, Canada

The conference, with the theme "Breaking Through the Glass Ceiling," will focus on the need for the commercial biocontrol industry to expand its markets beyond greenhouse vegetable production. The program includes sessions relevant to the wine industry, grower needs and concerns, invasive species and risk assessment, applied research, regulations and quality control.

For more information see the conference website at <<http://www.anbp.org/ANBP%20conf%202003.htm>>.

### Annual Meeting of the Entomological Society of America

October 26-29, 2003

Cincinnati, OH

Presented papers and posters on a variety of topics, including many on biological control. The IOBC meeting and symposium will be held in conjunction with this meeting (see page 3 of this newsletter for more on the IOBC symposium).

For more information see the conference website at <[http://www.entsoc.org/annual\\_meeting/2003/index.html](http://www.entsoc.org/annual_meeting/2003/index.html)>.

## NEW MEMBERS

Welcome to the following new members of IOBC-NRS.

**Sarah McCann** (Student)  
217 Glasgow St N Apt A  
Guelph ONT NiH 4X1

**William A. Overholt**  
Indian River REC  
2199 South Rock Rd.  
Ft. Pierce FL 34945

- Thesis or dissertation topics
- Open Forum type letters
- Biocontrol position announcements
- New appointments or people moving around
- Awards or honors received by members
- Meetings or workshops related to biological control
- New publications

**Items for the Fall Newsletter are due by 15 September 2003**

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) \_\_\_\_  
    Student (all locations, U.S. \$15) \_\_\_\_

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)

Date: \_\_\_\_\_ Signature: \_\_\_\_\_

Name and address (please print or type):

\_\_\_\_\_  
\_\_\_\_\_

Telephone, Telex or Cable Number and FAX: \_\_\_\_\_

E-mail address: \_\_\_\_\_

Brief description of specialty area: \_\_\_\_\_

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  
Secretary-Treasurer IOBC/NRS  
P.O. Box 232  
Sidney, MT 59270 USA

**MAKE CHECK PAYABLE TO IOBC/NRS**

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

**Organisation Internationale De Lutte Biologique Contre Les Animaux Et Les Plantes Nuisibles  
Section De La Region Nearctic**

<http://www.entomology.wisc.edu/iobc/nrs.htm>

IOBC website: <[www.iobc.agropolis.fr](http://www.iobc.agropolis.fr)>

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**Send items for the  
Fall 2003 IOBC-NRS Newsletter  
by 15 September to:  
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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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