

# IPRL Offshoots

USDA-ARS Invasive Plant Research Laboratory  
3205 College Ave., Fort Lauderdale, FL 33314



May 2004

## Upcoming Events

2nd Latin-American Short  
Course on Biological Control of  
Weeds

June 7-10, 2004

Barcelo Hotel

Montelimar, Nicaragua

[http://biocontrol.ifas.ufl.edu/  
materials/nicaragua.htm](http://biocontrol.ifas.ufl.edu/materials/nicaragua.htm)

44th Annual Meeting of the  
Aquatic Plant Management  
Society

July 11-14, 2004

Tampa, Florida

[www.apms.org](http://www.apms.org)

89th Annual Meeting of the  
Ecological Society of America  
August 1-6, 2004

Portland, Oregon

[www.esa.org/portland/](http://www.esa.org/portland/)

22th International Congress of  
Entomology

Brisbane, Queensland, Australia

August 15-21, 2004

[www.ccm.com.au/icoe/home/  
default.htm](http://www.ccm.com.au/icoe/home/default.htm)

More upcoming events on page 7

This report focuses on two rust fungus pathogens (called “rust” because of their color) that affect three invasive plants in Florida: melaleuca (*Melaleuca quinquenervia*), Japanese climbing fern (*Lygodium japonicum*) and old-world climbing fern (*Lygodium microphyllum*). When most of us think of biological control agents we think of insects, but there are other organisms quietly doing their work. Pathogens have been successfully used to control invasive plants of natural areas in many countries. Scientists at the IPRL are conducting research on both rust fungi to determine their effectiveness as natural biological control agents. To find out more, read the following article.

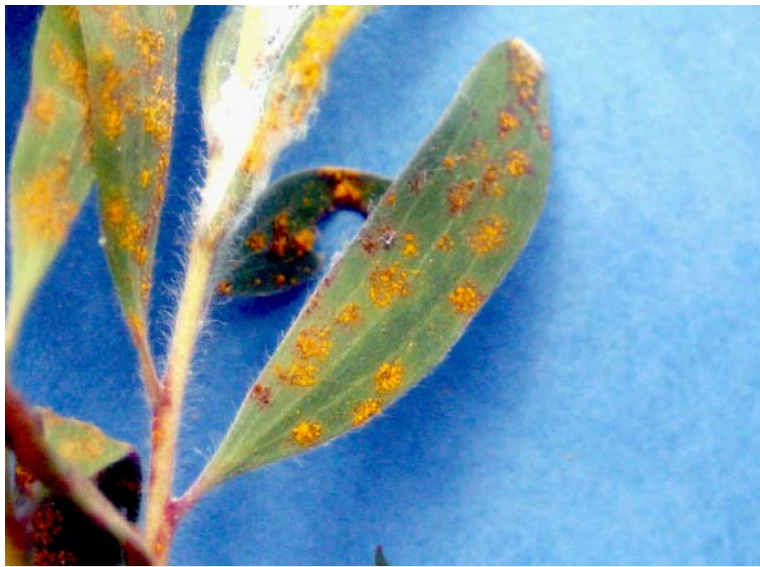
John Scoles - Editor

## **The Use of Pathogens in Biological Control**

Weed biological control is the deliberate use of an invasive plant's natural enemies to reduce the population of the plant. There are two main biological control approaches, classical (inoculative) and inundative. The classical approach involves controlling plants through introduction of enemies from the plants natural range while the inundative approach involves mass production and release of endemic natural enemies.

Plant pathogens are being deployed in weed biological control programs using both classical and inundative approaches. Plant pathogens not only stress and kill plants but also reduce a plant's further spread in natural areas through overall reduction of reproductive capability.

The rust fungus, *Puccinia psidii*, is of Brazilian origin and was discovered attacking Florida's melaleuca populations in 1996. Since then, this rust has spread naturally to most melaleuca infested regions in Florida. The fungus attacks a narrow range of plants in the Myrtaceae family, most of which are exotic to Florida. Wind, rain, and insects disperse spores of the fungus. The spores land on expanding melaleuca tips, infecting healthy



**Rust fungus (*Puccinia psidii*) on melaleuca**

Photo by Dr. Min Rayamajhi

leaves within 72 hours and producing leaf pustules within 2 weeks. Such infection cycles reduce growth and recruitment of melaleuca trees through repeated defoliation, stem deformation, and dieback of twigs which would otherwise elongate or produce flowers.



**Damage to melaleuca caused by weevils, psyllids and rust fungus**

Photo by Dr. Min Rayamajhi.

growth produced in response to various stresses whenever they might occur. Thus, rust-spore production and disease levels in melaleuca forests fluctuate with the amount of healthy branch-tips available on melaleuca

#### **Aquatic and wetland weeds on the Florida EPPC List of Invasive Species**

- air-potato  
(*Dioscorea bulbifera*)
- arrowhead vine  
(*Syngonium podophyllum*)
- Asian sword fern  
(*Nephrolepis multiflora*)
- asparagus-fern  
(*Asparagus densiflorus*)
- Australian pine  
(*Casuarina equisetifolia*)
- beach naupaka  
(*Scaevola sericea*)
- bischofia  
(*Bischofia javanica*)
- Brazilian jasmine  
(*Jasminum fluminense*)
- Brazilian pepper  
(*Schinus terebinthifolius*)
- Burma reed  
(*Neyraudia reynaudiana*)
- camphor tree  
(*Cinnamomum camphora*)
- carrotwood  
(*Cupaniopsis anacardioides*)
- catclaw mimosa  
(*Mimosa pigra*)
- cat's-claw vine  
(*Macfadyena unguis-cati*)
- Chinaberry  
(*Melia azedarach*)
- Chinese privet  
(*Ligustrum sinense*)

Chinese tallow  
(*Sapium sebiferum*)

Christmas senna  
(*Senna pendula*)

cogon grass  
(*Imperata cylindrical*)

coral ardisia  
(*Ardisia crenata*)

downy rose-myrtle  
(*Rhodomyrtus tomentosa*)

earleaf acacia  
(*Acacia auriculiformis*)

glossy privet  
(*Ligustrum lucidum*)

Gold Coast jasmine  
(*Jasminum dichotomum*)

green hygro  
(*Hygrophila polysperma*)

guava  
(*Psidium guajava*)

heavenly bamboo  
(*Nandina domestica*)

hydrilla  
(*Hydrilla verticillata*)

incised halberd fern  
(*Tectaria incise*)

Japanese climbing fern  
(*Lygodium japonicum*)

Japanese honeysuckle  
(*Lonicera japonica*)

Java plum  
(*Syzygium cumini*)

kudzu vine  
(*Pueraria montana*)

lantana  
(*Lantana camara*)

trees and the associated microenvironment in the area. Overall, melaleuca rust contributes to reduced health, flowering, seed production, and seedling recruiting potential of melaleuca trees in Florida.

Preliminary results on 9-month old stump regrowth showed reduced functional leaf surface available for photosynthesis compared to healthy regrowth. Additionally, rust infected leaves act as a sink for nutrients and hence drain resources which would normally be allocated for growth and reproduction. All these will negatively impact plant health and cause stump mortality following mechanical harvest of melaleuca trees. Preliminary data have shown significant regrowth and stump mortality when the rust was combined with herbivorous insects (melaleuca psyllids and weevils).

Another fungus is playing an important role in invasive plant suppression. *Puccinia lygodii*, causes severe rust disease on Japanese climbing fern in Florida. This rust infects foliage and produces large numbers of pustules on the leaves' lower surface. Each pustule contains a large number of spores that can infect and cause disease on other healthy foliage. Field observations show that the rust recurs every year and causes vine decline towards the end of the growing season.



Old-world climbing fern  
(*Lygodium microphyllum*)

Photo by Dr. Paul Pratt



Rust fungus (*Puccinia lygodii*) on *Lygodium*

Photo by Dr. Min Rayamajhi

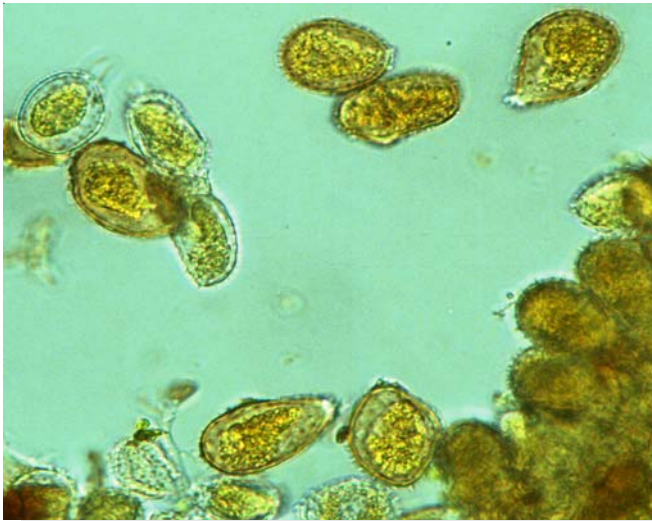


*Rust fungus on lygodium*

Photo by Dr. Min Rayamajhi

Thus, the fungus appears to reduce aerial biomass annually. The rust may also be affecting Japanese climbing fern spore production and its spread to other locations. Distributing the rust in new fern infestations may reduce aerial biomass of the fern. Sustained impact of this rust might occur by manually dispersing it throughout the Japanese climbing fern's distribution range in the southeastern United States.

Tests for the effectiveness of these fungi as pathogens and biological control agents are still in progress. Pathogens determined to be effective can be developed into fungus-based herbicidal agents for use in an inundative biological control approach.



*Lygodium rust fungus spores*

Photo by Dr. Min Rayamajhi

latherleaf  
(*Colubrina asiatica*)

laurel fig  
(*Ficus microcarpa*)

melaleuca  
(*Melaleuca quinquenervia*)

Mexican petunia  
(*Ruellia brittoniana*)

mimosa, silk tree  
(*Albizia julibrissin*)

Napier grass  
(*Pennisetum purpureum*)

Old World climbing fern  
(*Lygodium microphyllum*)

orchid-tree  
(*Bauhinia variegata*)

oyster plant  
(*Tradescantia spathacea*)

Pará grass  
(*Urochloa mutica*)

rosary pea  
(*Abrus precatorius*)

santa maria  
(*Calophyllum antillanum*)

sapodilla  
(*Manilkara zapota*)

schefflera  
(*Schefflera actinophylla*)

seaside mahoe  
(*Thespesia populnea*)

sewer vine  
(*Paederia cruddasiana*)

shoebutton ardisia  
(*Ardisia elliptica*)

skunk vine  
(*Paederia foetida*)

strawberry guava  
(*Psidium cattleianum*)

suckering Australian  
pine  
(*Casuarina glauca*)

Surinam-cherry  
(*Eugenia uniflora*)

sword fern  
(*Nephrolepis  
cordifolia*)

taro, wild taro  
(*Colocasia esculenta*)

torpedo grass  
(*Panicum repens*)

tropical soda apple  
(*Solanum viarum*)

water-hyacinth  
(*Eichhornia crassipes*)

water-lettuce  
(*Pistia stratiotes*)

water-spinach  
(*Ipomoea aquatica*)

West Indian marsh  
grass  
(*Hymenachne  
alexicaulis*)

wetland nightshade  
(*Solanum tampicense*)

white-flowered  
wandering Jew  
(*Tradescantia  
fluminensis*)

winged yam  
(*Dioscorea alata*)

woman's tongue  
(*Albizia lebeck*)

## The FLEPPC Invasive Plant List

If you have gotten this far in this report you have undoubtedly seen the list of invasive plants in the side bar on each page. The purpose of the list is to acquaint you with the sheer volume of invasive plants found in Florida. In looking for a list of invasive plants I was at first confused when I found three authoritative lists that don't agree with each other, but then I realized that each of these lists had its own specific purpose.

I chose to publish a list produced by the Florida Exotic Pest Plant Council. You can see the complete list at their web site, [www.fleppc.org](http://www.fleppc.org). This list, as it appears on their web site, not as it appears here, actually contains information from all the lists I found compiled into a tabular format, along with indicators of regional distribution for each plant. The list contains two categories based on how dangerous the plants are to the environment.

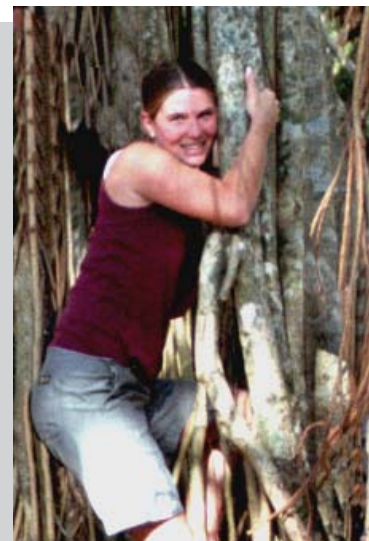
Category I, which contains the names listed in this report, consists of plants that are causing ecological damage to the state. The biological control work being done by the IPRL focuses on several of the plants in this category.

Category II consists of plants that are troublesome because they are increasing in abundance. However, these plants have not been shown to cause the ecosystem changes as have the plants in category I.

The Florida Exotic Pest Plant Council has a committee that manages this list. The committee consists of members from a variety of public and private organizations, agencies, and institutions. I encourage you to visit the FLEPPC web site and examine their list.

## IPRL says farewell to Karen Bussey

This month the IPRL said goodbye to another fine Student Conservation Association (SCA) intern. Karen Bussey spent 16 months at the lab researching how psyllid feeding affects non-structural carbohydrates in melaleuca saplings. She has a bachelors of science degree in Biology and is leaving us to attend graduate school at Clemson University where she will pursue a masters degree in Plant Science. Everyone at the lab wishes her a fond farewell. Good Luck, Karen!



## Web Sites You May Want to Visit

To learn more about invasive plants and what various organizations are doing about them, visit the following sites on the internet.

Agricultural Research Service  
[www.ars.usda.gov/](http://www.ars.usda.gov/)

Center for Exotic and Invasive Plants  
[plants.ifas.ufl.edu](http://plants.ifas.ufl.edu)

Federal Noxious Weed Program  
[www.aphis.usda.gov/ppq/weeds](http://www.aphis.usda.gov/ppq/weeds)

Florida Department of Agriculture,  
Department of Plant Industry  
[www.doacs.state.fl.us/~pi/index.html](http://www.doacs.state.fl.us/~pi/index.html)

Florida Department of Environmental Protection,  
Bureau of Invasive Plant Management  
[www.dep.state.fl.us/lands/invaspec/](http://www.dep.state.fl.us/lands/invaspec/)

Florida Exotic Pest Plant Council  
[www.fleppc.org](http://www.fleppc.org)

Invasive Plant Research Laboratory  
[www.weedbiocontrol.org/](http://www.weedbiocontrol.org/)

The National Agricultural Library's Invasive  
Species website  
[www.invasivespecies.gov](http://www.invasivespecies.gov)

National Noxious Weed Program  
<http://dogwood.itc.nrcs.usda.gov/weeds>

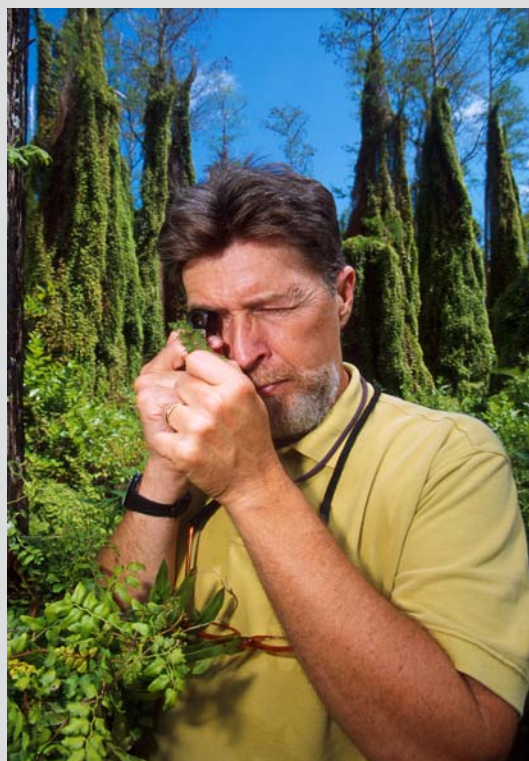
South Florida Water Management District  
[www.sfwmd.gov](http://www.sfwmd.gov)

Southwest Florida Water Management District  
[www.swfwmd.state.fl.us/](http://www.swfwmd.state.fl.us/)

TAME Melaleuca Project  
<http://tame.ifas.ufl.edu>

The Nature Conservancy  
<http://nature.org/>

IPRL Offshoots



### Picture of the Month

*Dr. Bob Permberton, research entomologist at the IPRL, examines old-world climbing fern*

*Photo by Peggy Greb, USDA*

## Thank You Student Conservation Association

The IPRL relies heavily on interns from the Student Conservation Association. These young men and women perform many hours of service, often under challenging conditions in South Florida's heat and humidity. Their tireless efforts make it possible for the lab to accomplish its mission. The IPRL currently has six SCA interns working on a variety of projects.



### SCA Mission Statement

*To build the next generation of conservation leaders and inspire **lifelong stewardship** of our environment and communities by engaging young people in hands-on service to the land.*

If you would like to find out more about the SCA, check out their web site at [www.thesca.org](http://www.thesca.org).

**Dr. Ted Center**  
**Research Leader**  
[tcenter@saa.ars.usda.gov](mailto:tcenter@saa.ars.usda.gov)

### ***Scientists***

Dr. Ted Center  
[tcenter@saa.ars.usda.gov](mailto:tcenter@saa.ars.usda.gov)

Dr. Steve Franks  
[sfranks@saa.ars.usda.gov](mailto:sfranks@saa.ars.usda.gov)

Dr. Robert Pemberton  
[bobpem@saa.ars.usda.gov](mailto:bobpem@saa.ars.usda.gov)

Dr. Paul Pratt  
[prattp@saa.ars.usda.gov](mailto:prattp@saa.ars.usda.gov)

Dr. Min Rayamajhi  
[minray@saa.ars.usda.gov](mailto:minray@saa.ars.usda.gov)

Dr. Philip Tipping  
[ptipping@saa.ars.usda.gov](mailto:ptipping@saa.ars.usda.gov)

Dr. Thai Van  
[thaivan@saa.ars.usda.gov](mailto:thaivan@saa.ars.usda.gov)

Dr. Greg Wheeler  
[wheelerg@saa.ars.usda.gov](mailto:wheelerg@saa.ars.usda.gov)

### ***Support Scientists***

Dr. F. Allen Dray  
[fadray@saa.ars.usda.gov](mailto:fadray@saa.ars.usda.gov)

Paul Madeira  
[ptmadeira@saa.ars.usda.gov](mailto:ptmadeira@saa.ars.usda.gov)

Cressida Silvers  
[csilvers@saa.ars.usda.gov](mailto:csilvers@saa.ars.usda.gov)

Chris Bennet  
[caben@gnv.ifas.ufl.edu](mailto:caben@gnv.ifas.ufl.edu)

Susan Wineriter  
[tmozart@nersp.nerdc.ufl.edu](mailto:tmozart@nersp.nerdc.ufl.edu)

### ***IPRL Offshoots Editor***

John Scoles  
[jscoles@saa.ars.usda.gov](mailto:jscoles@saa.ars.usda.gov)

### ***Technicians***

Carl Belnavis  
Robyn Chiarelli  
Willey Durden  
Luke Kasarjian  
Jorge Leidi  
Rosa Leidi-Ferrer  
Kelly MacDonald  
Reynaldo Moscat  
Eileen Pokorny  
Jenna Scheidegger

### ***Administrative Staff***

Geri Barber  
[gbarber@saa.ars.usda.gov](mailto:gbarber@saa.ars.usda.gov)

Sue Keusch  
[skeusch@saa.ars.usda.gov](mailto:skeusch@saa.ars.usda.gov)

### ***Student Conservation Association (SCA) Interns***

Lisa Brutcher  
Karen Bussey  
Chris Greishop  
Melissa Martin  
Shannon Morath  
Scott Wiggers

### ***Student Temporary Employment Program (STEP)***

Donna Ban  
Sigfredo Gonzalez  
Jennifer Palacio

### ***More upcoming events***

#### **31st Annual Natural Areas Conference**

October 13-16, 2004

Holiday Inn Mart Plaza

Chicago, IL

[http://www.conferences.uiuc.edu/  
conferences/  
conference.asp?ID=303](http://www.conferences.uiuc.edu/conferences/conference.asp?ID=303)

#### **28TH Annual Florida Aquatic Plant Management Society Training Conference**

Oct 17-20, 2004

Deerfield Beach, FL 33441

[www.homestead.com/fapms/  
meeting.html](http://www.homestead.com/fapms/meeting.html)

#### **31st Annual Conference on Ecosystems Restoration and Creation**

October 28-29, 2004

Crowne Plaza Hotel

Tampa, Florida

[http://www.hccfl.edu/depts/detp/  
ecoconf.html](http://www.hccfl.edu/depts/detp/ecoconf.html)

#### **24th International Symposium of the North American Lake Management Society**

November 3-5, 2004

Victoria Conference Centre

Victoria, British Columbia

[http://www.nalms.org/symposia/  
symposia.htm](http://www.nalms.org/symposia/symposia.htm)

**USDA-ARS/IPRL**  
**3205 College Ave.,**  
**Fort Lauderdale, FL 33314**  
**Tel: 954-475-0541**  
**Fax: 954-476-9169**





The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

Previous reports are available online at:  
<http://tame.ifas.ufl.edu/html/publications.htm>

#### **IPRL Offshoots**

**USDA-ARS/IPRL**  
**3205 College Ave.,**  
**Fort Lauderdale, FL 33314**  
**Tel: 954-475-0541**  
**Fax: 954-476-9169**

