A Q U A P H Y T E

A Newsletter about Aquatic, Wetland and Invasive Plants

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A Look Inside

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The 12th EWRS International Symposium on Aquatic Weeds

by Seppo Hellsten and Arnold Pieterse

After an interval of seven years, the European Weed Research Society (EWRS), in cooperation with the International Society of Limnology (SIL), the Finnish Environment Institute (SYKE) and the University of Jyväskylä, organized the 12th International Symposium on Aquatic Weeds in Jyväskylä, Finland. This city, situated in the middle of the Finnish Lake District, and the Agora building, located on the shore of Lake Jyväsjärvi at the University campus, provided an ideal venue. The SIL Working Groups on Macrophytes and Wetlands assisted in drafting the scientific programme and support was obtained from the Federation of the Finnish Learned Societies and the Waterpraxis Project of the Baltic Sea Programme of the European Union.

After an introductory speech by the chairman of the Organizing Committee, Dr. Seppo Hellsten, the Symposium was formally opened by Dr. Roger Jones of the University of Jyväskylä. Two invited lectures were delivered by Dr. Brij Gopal (chairman of the SIL Working Group on Wetlands) and Dr. Ricardo Labrada (formerly with FAO), respectively, on *Impact of Invasive Species on Ecosystem Goods and Services of Wetlands*, and on *Management of Aquatic Weeds in the Tropics and Subtropics*.

In his introductory presentation of Aquatic Weed Management, the conference coordinator, Dr. Arnold Pieterse, emphasized that a variety of anthropogenic disturbances, such as the nutrient enrichment of water bodies, result in excessive growth of various macrophyte species. These are considered to be "weeds" because they interfere with irrigation, navigation, recreation and fisheries, or are detrimental to human interests in various other ways. Moreover, many aquatic plants have been introduced, largely through human activities, into non-native habitats where they have caused extensive degradation of the natural habitats and altered the native plant and animal communities drastically.

In recent years, the interest in aquatic macrophytes has grown further for their role in monitoring water quality, treatment of waste waters, and also in climate change. There has been a shift in focus from the "control" of "weeds" to their management in a larger ecosystem perspective. Numerous papers presented at

The participants of the aquatic weeds symposium during the field excursion. (Photo by Anne-Mari Rytkönen).

See **EWRS Symposium,** *continued on page 16.*

At the Center in 2009

By William T. Haller, Acting Director

The UF/IFAS Center for Aquatic and Invasive Plants (CAIP) faculty and staff have certainly been busy this year with research, training and pesticide certification courses, in-service training for Florida teachers, and many other programs. There is no doubt that budget reductions and the faculty hiring freeze as a result of the economy have made the remaining staff assume additional responsibilities. Nevertheless, the CAIP has continued to fulfill its research, teaching and extension responsibilities.

The annual **Aquatic Weed Control Short Course** in south Florida was held May 4-7, 2009 and over 400 professionals attended. More than 250 pesticide certification exams were taken and licensed applicators earned up to 20 Continuing Education Units (CEUs) each. The 2010 Short Course (http://conference.ifas.ufl.edu/aw) will be held May 3-6 in south Florida at the Coral Springs Marriott.

The **Florida Invasive Plant Education Initiative** is the first of its kind to provide in-service training for Florida teachers (*i.e.*, upper elementary, middle and high school levels) on the subject of aquatic and upland invasive plants. The annual "PLANT CAMP" workshop, held for 4.5 days in mid-June, includes field trips and rigorous hands-on plant identification activities as a way of generating excitement about the curriculum and providing greater background knowledge on Florida's native, non-native and invasive plants. So far, 130 teachers have attended the workshops. The workshops and curricula are part of a partnership between CAIP and the Invasive Plant Management Section of the Florida Fish and Wildlife Conservation Commission. This year's (4th) PLANT CAMP will be held June 13-17, 2010. For more information, visit: http://plants.ifas.ufl.edu/education.

Drs. Jay Ferrell, Fred Fishel and Ken Langeland coordinated the biennial **Southeast Herbicide Applicators Conference** in the northern location of Panama City, Florida in September 2009. Nearly 200 applicators from several states received CEUs in Right-of-Way, Natural Areas and Aquatic categories. This course will be offered again in the fall of 2011.

CAIP members have also been active in the teaching arena this year. Dr. Colette Jacono, post-doctoral associate working with Dr. Langeland, taught "*Biological Invaders*," an undergraduate course that focuses on the study of invasive plants and animals. Dr. Lyn Gettys, research assistant scientist, taught "*Seeds of Change*," an undergraduate course that explores the practical applications of genetic engineering in plants.

Research by CAIP-affiliated faculty and graduate students is tackling many of the major invasive weed biology and management issues faced by Florida. Dr. Atul Puri is developing best management practices for *Rotala rotundifolia*, with field trials planned for this spring, while Dr. Gettys continues to collect, grow and evaluate different biotypes of *Vallisneria* to determine ideal growth conditions and identify types adapted to specific environmental parameters. Drs. Langeland and Jacono are studying the biology of *Luziola subintegra*, another exotic invasive species that has invaded Lake Okeechobee and surrounding areas in the last few years. Graduate student Courtney Stokes (MS) is working with Dr. Greg MacDonald on natalgrass *(Melinis repens)*, and Brett Bultemeier (PhD) is working with Dr. Bill Haller to study herbicide release from granular formulations and root uptake of herbicides by submersed aquatic species. Abishek Mukherjee (PhD) is concluding his research on biocontrol of *Hygrophila* with entomologist Dr. Jim Cuda, and Sushila Chaudhari (MS) is just beginning research on control of paragrass (*Brachiaria* sp.) with Dr. Brent Sellers at the Ona Cattle Research Station in south-central Florida. Sarah Berger (MS) began her work in the Agronomy Department in summer 2009 and will be studying herbicide physiology and biochemistry with Dr. Greg MacDonald. Jeff Hutchinson (PhD) is completing his dissertation on the biology and control of Old World climbing fern (*Lygodium microphyllum*) with Dr. Langeland and is scheduled to graduate in May 2010.

Dr. Mike Netherland, courtesy professor at the University of Florida, is based at the CAIP and works for the US Army Corps of Engineers Environmental Research and Development Center (ERDC) – Environmental Laboratory. Dr. Netherland has worked extensively on the Osceola County Hydrilla and Hygrophila Demonstration Project with county biologist Dean Jones and is involved in other research as well. The Osceola County project includes monitoring herbicide residues in large-scale hydrilla control operations on the Kissimmee Chain of Lakes and evaluating the impact of these herbicide treatments on native plants, with a particular focus on *Vallisneria* spp. Jeremy Slade, biologist at the CAIP, assists Dr. Netherland with these projects and is responsible for monitoring lakes outside Osceola County. The Osceola County project has been in progress for several years and includes research and demonstration projects on biological control (led by Drs. Cuda and Overholt), evaluation of herbicides, and an extensive educational program that is a collaborative effort between the CAIP and Osceola County. More information about the Osceola County project is available at http://plants.ifas.ufl.edu/osceola/.

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Angie Huebner, a US Army Corps of Engineers biologist, recently established a presence at the CAIP and splits her work week between the Center and the Corps' Jacksonville District office. Angie has conducted research on conditions that foster growth of alligatorweed *(Alternanthera philoxeroides)* and coordinates a number of Corps projects in Florida and other states.

As you can see, personnel at the Center for Aquatic and Invasive Plants have truly had a busy year. Despite budget reductions and the faculty hiring freeze, we have all assumed additional responsibilities to ensure that the CAIP continues to produce quality research, teaching and extension programs that benefit the citizens of Florida.

Be sure to check out the CAIP website at http://plants.ifas.ufl.edu and let us know if you have any comments or suggestions for additional content or improvements.

Workshop Held on Hydrilla Management Tools and Herbicide Strategies in Florida

Review and Discussion of Operational Use of Current EPA-Registered Herbicide Compounds for Managing Hydrilla in Florida Public Lakes and Rivers, November 9-10, 2009, Crystal River, Florida

by Mike Netherland and Jeff Schardt

In spite of more than fifty years of hydrilla management efforts, this tenacious aquatic weed continues to be a major problem in Florida waters. Those involved in management efforts know of the plant's evolved resistance to fluridone, the most successful herbicide in the toolbox from the mid-1980s through the 1990s. Fluridone resistance was confirmed in 2000 at several sites in Florida. Since then, researchers and managers have scrambled to develop new management tools and strategies, and to prevent future herbicide resistance issues.

In November 2009, a workshop was held to review and discuss the operational use of currently registered herbicide compounds, which include diquat, endothall, and fluridone, and recently registered products including penoxsulam (2007) and imazamox (2008). The workshop was attended by 60 Florida Fish and Wildlife Conservation Commission (FWC) field biologists, contractors, researchers and industry representatives who are responsible for developing or implementing large-scale hydrilla control programs using herbicides. The workshop was led by Dr. Mike Netherland (US Army Engineer Research and Development Center and University of Florida (UF) Courtesy Associate Professor), Dr. William Haller (Director, UF-IFAS Center for Aquatic and Invasive Plants), and Mr. Jeff Schardt (Environmental Administrator, FWC, Invasive Plant Management Section).

The agenda included:

Workshops

- Hydrilla Physiology, Growth, and Reproduction – Why we manage hydrilla and how it resists or persists through management efforts;
- Defining Aquatic Herbicide Selectivity – Perceptions and reality;
- Herbicide Degradation and Dispersion – How factors such as flow, photolysis, microbial degradation, and scale impact herbicide efficacy;
- A Cautionary Tale: Enhanced degradation of fluridone;
- Search for New Hydrilla Management Tools – Results from screening existing herbicide compounds and updates on five potential candidates not yet registered for operational use;
- Rates, Timing, Application Strategies, and Efficacy for Fluridone, Diquat, Endothall and the Newly Registered Compounds, Penoxsulam and Imazamox.

Observations and Strategies for Applying EPA-Registered Herbicides

- Combinations of penoxsulam, imazamox, endothal, and diquat;
- The rationale and limitations of the rotation of herbicides and of growth regulation as management strategies.

Open Discussions

- Expenses and Logistics Associated with Large-scale Hydrilla Management;
- Selectivity and Efficacy Resistance Management / Product Stewardship;
- Growth Regulation vs. Herbicide Control; Coordinating Large-scale Hydrilla Control among Management Agencies;
- NPDES Permitting Impacts on Future Herbicide Use;
- Additional Research Needs.

In addition to the numerous open discussion topics, each attendee was asked to submit two written questions on material covered in the workshop. This tool will help assess the existing knowledge of participants, and provide a forum for attendees to pose more detailed questions. All questions will ultimately be addressed by experts and posted to all workshop participants.

This workshop was the sixth in a series of summits and workshops to search for, develop, and implement alternative hydrilla management tools and strategies in Florida waters since the confirmation of fluridone resistance in 2000. As part of the ongoing efforts to disseminate rapidly developing hydrilla management technologies, the Aquatic Plant Management Society (APMS) is contemplating a special session on this topic at the 50th annual APMS conference to be held in Bonita Springs, Florida in July 2010. Visit http://www.apms.org/ for up-to-date information.

References on herbicide resistance in *Hydrilla verticillata* from the APIRS Database

(beginning with the first published reference to this topic in 2001)

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CITATION: AQUATICS 23(3):4,7-8

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See **References,** *continued on page 4.*

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DATE: 2003
CITATION: IN: WSSA ABSTRACTS, 2003 MEETING, WEED SCI. SOC. OF AMERICA, VOL.43, ED. R.J. KREMER, JACKSONVILLE, FL, P. 89-90 (ABSTRACT)

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Citation: MOL. ECOL. 13:3229-3237

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Citation: FLORIDA LAKEWATCH, DEPT. OF FISHERIES AQUAT. SCI., UNIV. FL./IFAS, GAINESVILLE, FL., 68 PP.

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Author: ARIAS, R.S., NETHERLAND, M.D., SCHEFFLER, B.E., PURI, A., ET AL
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Citation: IN: 46TH ANN. MEETING, AQUATIC PLANT MANAGEMENT SOCIETY, JULY 16-19, PORTLAND, OR., P. 40 (ABSTRACT)

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Author: PURI, A., MACDONALD, G.E., HALLER, W.T., SINGH,M.
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Citation: IN: SOUTHEAST HERBICIDE APPLICATOR CONFERENCE, SEP. 22-24, UNIV. FL., IFAS, PANAMA CITY, FL., PP. 91-98 (POWER POINT PRESENTATION)

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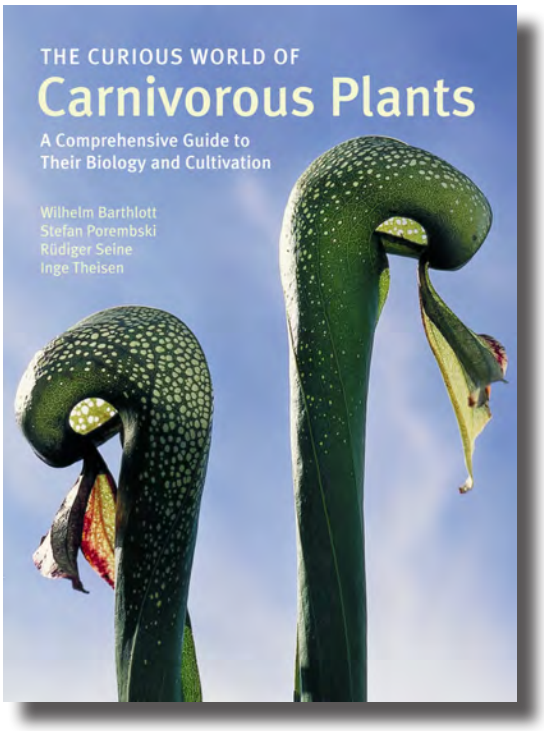
Author: BULTEMEIER, B., NETHERLAND, M.D., FERRELL, J., HALLER, W.T.
Date: 2010
Citation: INVASIVE PLANT SCIENCE AND MANAGEMENT 2(4): IN PRESS

BOOKS/REPORTS, ETC.

Biology and Control of Aquatic Plants – A Best Management Practices Handbook

By L.A. Gettys, W.T. Haller and M. Bellaud, editors. 2008. 200 pp. ISBN 978-0-615-32646-7. Aquatic Ecosystem Restoration Foundation, Marietta, Georgia. www.aquatics.org

This is the second edition of the handbook produced by the Aquatic Ecosystem Restoration Foundation (AERF). It includes contributions from more than 20 experts in the field of aquatic weed biology and control. AERF supports research and development to provide strategies and techniques for the environmentally and scientifically sound management, conservation and restoration of aquatic ecosystems. The goal in preparing the handbook was to guide riparian homeowners and others interested in aquatic plants and to provide basic, scientifically sound information to assist decision-makers with water management questions. The handbook is available as a PDF file at http://plants.ifas.ufl.edu. Printed copies are available by contacting AERF, www.aquatics.org.



The Curious World of Carnivorous Plants – A Comprehensive Guide to their Biology and Cultivation

By W. Barthlott, S. Porembski, R. Seine, and I. Theisen. Translated by M. Ashdown. 2007. 224 pp. ISBN 978-88192-792-4. Timber Press, Inc. www.timberpress.com

This amazing book provides detailed descriptions – including trapping mechanisms, digestion, and prey – and cultivation information for key species in 17 genera and 10 families. Most notably, it includes the first comprehensive listing of some 630 known carnivorous plant species, with identification history and geographic distribution for each one. The book also covers animal-trapping mosses and fungi. Advice is provided for growing and buying carnivorous plants. The book is copiously illustrated with excellent color photographs and some scanning electron microscopic photos.

Assessing the Conservation Value of Fresh Waters – An International Perspective

By P.J. Boon and C.M. Pringle, editors. 2009. 293 pp. ISBN 978-0-521-61322-4. Cambridge University Press, New York. www.cambridge.org

"Aimed at academic researchers, graduate students and professionals, chapters are written by pairs of UK and US authors, who compare methods used for evaluating rivers and lakes for conservation in these countries that share a long history of freshwater science, but approach nature conservation very differently. Sweden, Australia and South Africa are also examined, and there is a chapter on developing countries, allowing discussion of the role of social and economic conditions in conservation ethics."

Weedy and Invasive Plant Genomics

By C.N. Stewart. 2009. 253 pp. ISBN 978-0-8138-2288-4. Wiley-Blackwell, Ames, Iowa. www.wiley.com

"While I and many others have been interested in genes and proteins that confer interesting traits to weeds and invasive plants, there has been surprisingly little research at the genome or proteome levels. Molecular biology of weeds has progressed very slowly, which I think is mainly due to three interrelated factors. First, the weed science research community and culture is vastly different from that of plant genomics and evolutionary biology.... Second, the sources of research funding are also quite different in each of these two areas.... Third, and related to the second point, there is little information on the genomes of any weedy and invasive plant species. Being neither models nor crops, their genomes have fallen through the funding cracks. With little basal genomic information, meager funding, and a lack of collaboration between weed scientists and genomicists, the field has not yet blossomed. The situation is about to change as these two cultures have been slowly converging on the field of weed genomics, with the promise of more research to come in the near future."

The Reed – *Phragmites australis* (Cav.) Trin. ex Steud.

By S.M. Haslam. Updated 2009. 28 pp. British Reed Growers Association.

This booklet updates the 1969 original version written for the then-Norfolk Reed Growers Association. British commercial reedbeds have been concentrated in East Anglia for centuries, supplying much of the reed thatch for thatched roofs. The booklet remains local, although the general principles apply elsewhere. It is a thorough review of the use of reed, its growth characteristics and the management of reedbeds for harvesting. The booklet also contains numerous figures and tables for detailed information. Interesting historical background is provided, as well.

Mathematical Ecology of Populations And Ecosystems

By J. Pastor. 2008. ISBN 978-1-4051-7795-5. 329 pp. Wiley-Blackwell. www.wiley.com/wiley-blackwell

"It is often easy to make a 'plausible' argument that some hypothesized relationship between populations, species, and ecosystems must be true, only to find on more rigorous examination that it is not necessarily true, true only under certain restrictions, or simply not true at all. Framing the plausibility argument in mathematical terms and using the rules of mathematics to examine its logical structure is often the best way to uncover the sense in which it might be true." An advanced undergraduate/graduate level textbook bridging the subdisciplines of population ecology and ecosystem ecology.

Iconografia - Comentada de Plantas Aquáticas do Parque Nacional da Restinga de Jurubatiba

Serie Livros 36, Rio de Janeiro Museu Nacional. Text by Claudia P. Bove; illustrated by Cristina Siqueira Ferreira. 2009. ISBN 978-85-7427-031-9. (In Portuguese.)

This is a lovely collection of water colors, or *aquarelas*, of thirty aquatic plants of the Parque Nacional da Restinga de Jurubatiba, each measuring 8-3/4" x 11-1/4". It is accompanied by a similarly illustrated but smaller format booklet of non-scientific text describing each species (32 pp.) Both are presented in a handsome, color-illustrated portfolio.

Guia de Campo das Plantas Aquáticas do Parque Nacional da Restinga de Jurubatiba, Rio de Janeiro – Brazil

By C.P. Bove and J. Paz. 2009. 176 pp. ISBN 978-85-7427-030-2. Museu Nacional, Serie Livros 35, Rio de Janeiro. (In Portuguese.)

This is a very attractive field guide for identifying the aquatic plants of the lakes of the Parque Nacional da Restinga de Jurubatiba, located in the coastal zone of the state of Rio de Janeiro, Brazil. However, the guide could be useful for the identification of aquatic plants in many regions of the world. Numerous photographs aid in the identification of approximately 100 aquatic species. Plants are grouped by their growth form: fixed submersed, free submersed, free floating, fixed floating, emergent, and amphibious, and by taxonomic family. In addition to species descriptions and information on geographic distribution and habitat, the text offers etymological information, potential economic uses, and other commentary. This book will be useful to both the scientific and non-scientific communities. The guide is in Portuguese. It is spiral-bound, with water-resistant color-coded pages. The layout and graphic design of this field guide are exceptional. A small sample of the species covered: *Sagittaria lancifolia, Eclipta prostrata, Cyperus giganteus, Fuirena robusta, Rhynchospora tenuis, Utricularia poconensis, Nymphaea lingulata, Hymenachne amplexicaulis, Eichhornia azurea, Salvinia biloba, Burmannia capitata, Eleocharis minima, Rhynchospora hirta, Scleria soronia, Najas marina, Utricularia foliosa, Nymphoides indica, Paspalidium geminatum, Potamogeton montevidensis, Typha domingensis.*

Guia de Campo Para Plantas Aquaticas e Palustres do Estado de Sao Paulo (Field Guide for Aquatic and Marsh Plants from the State of Sao Paulo)

By M.C.E. Amaral, V. Bittrich, A.D. Faria, L.O. Anderson, L.Y.S. Aona. 2008. 452 pp. ISBN 978-85-86699-64-1. Serie Manuais Práticos em Biologia 4, Holos, Editora Ltda-ME, Ribeirão Preto, Sao Paulo, Brazil (In Portuguese.)

This field guide identifies aquatic and marsh plants that occur in the State of Sao Paulo and bordering regions. It is a product of more than ten years of collections, photographs, species identifications and descriptions by University of Campinas (UNICAMP) scientists and students. To facilitate species identification by non-experts, plants are organized by flower color. There is a separate section for grasses and similar plants, and another one for plants without flowers or with very tiny flowers. Within each grouping, species were grouped according to morphological similarities of the flowers so that plants within the same botanical families are generally close together. Although the text is in Portuguese, the book is very user-friendly and will be useful to anyone studying aquatic and marsh plants in South America. A small sample of the species covered: *Nymphaea amazonum, Myriophyllum aquaticum, Sagittaria montevidensis, Eichhornia crassipes, Thalia geniculata, Nymphaea mexicana, Hydrocleys nymphoides, Utricularia triloba, Xyris capensis, Limnocharis flava, Hygrophila costata, Lobelia aquatica, Bacopa lanigera, Eichhornia azurea, Cabomba furcata, Drosera montana, Mayaca fluviatilis, Ceratophyllum demersum, Leersia hexandra, Triglochin striata.*

Aquatic Ecosystems – Trends and Global Perspectives

By N.V.C. Polunin. 2008. 482 pp. ISBN 978-0-521-83327-1. Cambridge University Press, New York. www.cambridge.org

"This book divides the aquatic realm into 21 ecosystems, from those on land (both saline and fresh water) to those of the open and deep oceans. It draws on the understanding of leading ecologists to summarize the state and likely condition by the year 2025 of each of the ecosystems. Written for academic researchers and professionals, the aim is to put the climate change debate into a broader context as a basis for conservation science."

Metal Contamination in Aquatic Environments – Science and Lateral Management

By S.N. Luoma and P.S. Rainbow. 2008. 573 pp. ISBN 978-0-521-86057-4. Cambridge University Press. www.cambridge.org

"The first 11 chapters of the book present the fundamentals of the science that underlie metal policies and issues.... The next seven chapters more directly address the interaction between science and policy in specific circumstances.... In the conclusions we address constructive dialogue between the scientific and the policy communities."

MARY'S PICKS

Items of special interest from APIRS reader/cataloger, Mary Langeland ~

The consumption of *Typha domingensis* Pers. (Typhaceae) pollen among the ethnic groups of the Gran Chaco, South America. Arenas, P., Scarpa, G.F. 2003. Economic Botany 57(2):181-188.

Arenas and Scarpa report that this survey is the result of extensive research on the use of plants by the Gran Chaco's ethnic groups. They consider a detailed study of the uses of *T. domingensis* pollen to be relevant because of both the original data found and the information rescued from oblivion in the Chaco's ethnographic literature.

Predicting risks of invasion of macroalgae in the genus *Caulerpa* in Florida. Glardon, C.G., Walters, L.J., Quintana-Ascencio, P.F., McCauley, L.A., et al. 2008. Biological Invasions 10(7):1147-1157.

Glardon, et al state that their "goal was to evaluate potential invasion of *C. taxifolia* to Florida's coastal waters. We looked for evidence of *C. taxifolia*—aquarium strain, as well as the present distribution of all species of *Caulerpa*, in Florida's near-shore waters." They conclude the following: Our data indicate that latitude, presence of seagrass, human population density, and proximity to marinas successfully predict the occurrence of *Caulerpa* species along the Florida coastline and can be a useful tool to select zones for survey that would be more likely to be invaded by *Caulerpa*.

Cobbania corrugata *gen. et comb. nov., being inspected by an* Ornithomimus *dinosaur. The* Cobbania *quarry from Dinosaur Provincial Park, Alberta, Canada produced numerous whole plants and the most complete skeleton of this dinosaur ever recovered. Image by Marjorie Leggitt (http://www.science-art.com/leggitt). Used with permission.*

***Cobbania corrugata* gen. et comb. nov. (Araceae): a floating aquatic monocot from the Upper Cretaceous of western North America. 2007. Stockey, R.A., Rothwell, G.W., Johnson, K.R. Amer. J. Bot. 94(4):609-624. 2007.**

Stockey, Rothwell and Johnson introduce this paper stating it "describes a floating aquatic monocot from 71 whole plants and several isolated leaf fragments from Upper Cretaceous oxbow lake sediments in the Dinosaur Park Formation, Alberta, Canada." They conclude, "The reconstruction of *C. corrugata* increases our understanding of unrooted floating aquatic plants in the Upper Cretaceous and reveals a previously underappreciated food source for herbivorous dinosaurs and other large reptiles of the late Mesozoic. As a result of the growing phylogenetic resolution of Araceae, *Cobbania*, *Limnobiophyllum*, and *Pistia* reveal that there have been at least three separate origins of free-floating aquatic plants within the family, with true *Pistia* as perhaps the most recently derived of these taxa."

Taxonomy of the American *Azolla* species (Azollaceae): a critical review. 2004. Evrard, C., van Hove, C. Syst. Geogr. Pl. 74:301-318.

The taxonomy of the New World species of Azolla has been controversial with most authors, primarily Americans, recognizing four species: *A. caroliniana*, *A. filiculoides*, *A. mexicana* and *A. microphylla*. This study, comprehensively reviewing the literature and making original observations, confirms the opinion of some authors that *A. caroliniana* and *A. microphylla* are synonyms of the previously described *A. filiculoides*. Evrard and van Hove found that the ferns named *A. caroliniana* and *A. microphylla* by most authors, including the American taxonomists in their recent works, are different from their type specimens. They conclude, "The study also shows that the Mettenius conception, proposed as early as 1867, has to be rehabilitated: two species only exist in America. According to the priority rule they must be named *A. cristata* and *A. filiculoides*."

Foreign exploration for natural enemies of *Hydrilla verticillata* in East Africa. 2009. Overholt, W.A., Copeland, R., Williams, D., Cuda, J., et al. Final Report, St. Johns River Water Manage. Dist., Palatka, FL, 33 pp.

In this report by Overholt et al, there were some surprising findings about the native origin of *Hydrilla verticillata* and about its role as a host plant for insects and fish. The molecular genetic research indicates that hydrilla is not native to Africa, but rather originates from China. None of the insects sampled from lakes in Uganda and Burundi were herbivorous. However, four species of fish feed on hydrilla, but their level of herbivory has not yet been determined. The Florida populations of hydrilla are from one introduction, and the high genetic variation that is found is due to somatic mutations.

Handbook of utilization of aquatic plants – a review of world literature. 1979. Little, E.C.S. FAO Fisheries Technical Paper No. 187, 176 pp. [Now online at http://www.fao.org/DOCREP/003/X6862E/X6862E00.HTM]

In this work from 1979, Little compiled over 250 available sources addressing the utilization of aquatic plants, summarizing the published material and also reviewing it. Little quotes Sculthorpe (see next page) to underline his own hopes for this handbook: "Sculthorpe writes (p.503): 'In India, China and Japan several decorative water plants have been held in the highest esteem

since the earliest times. The immense admiration of the beautiful flowers of lotuses and waterlilies, above all others, is reflected in their frequent portrayal on fabrics and tapestries, pottery and metalwork, monuments and tombs, temples and public buildings, and in their adoration in prose and verse.' This admiration spread to the western world where water gardens were developed to a high form of art. A consequence of this has been the distribution round the world of many water plants, some, like the water hyacinth – the most notorious of all – spreading prolifically and dangerously. Now it seems the circle may have almost completely turned. Pampered and admired plants became pests and now, with greater insight, are again seen (but for different reasons) as valued and potential assets to mankind."

***Hydrilla verticillata* (L.f.) Royle (Hydrocharitaceae), "The perfect aquatic weed." 1996. Langeland, K.A. Castanea 61(3):293-304.**

Langeland offers an overview of *Hydrilla verticillata* since its introduction into the United States ca. 1960, after which it spread rapidly and offered major management challenges. The effects of hydrilla are discussed, including economic hardships, interference with water uses, displacement of native aquatic plant communities, and adverse affects on freshwater habitats. Because of its aggressive growth, the author says, "Hydrilla could easily be called the perfect aquatic plant because of the extensive adaptive attributes it possesses to survive in the aquatic habitat." He reports that management programs have been developed, but there is a lack of sufficient funding and a need for educational efforts to raise public awareness.

Aquatic weeds: the ecology and management of nuisance aquatic vegetation. 1990. Pieterse, A.H., Murphy, K.J. Oxford Sci. Publ., Oxford Univ. Press, New York, NY, 593 pp.

This classic textbook, edited by Pieterse and Murphy, is based on contributions from the EWRS (European Weed Research Society) Working Group on Aquatic Weeds and scientists from all over the world – a veritable "who's who" of aquatic weed researchers and managers. In the preface, the editors describe the book as follows:

> "The book is divided into three main parts. The first part is concerned with concepts, ecology, and characteristics of aquatic weeds and also includes chapters on flow resistance and the relation between aquatic weeds and public health. The second part covers the management of aquatic weeds, with chapters on various control methods, surveying and modeling of aquatic weed vegetation, utilization of aquatic weeds, and the relation between plant survival strategies and control measure. The third part deals with the present status of aquatic weed problems in the various continents."

The biology of aquatic vascular plants. 1985. Sculthorpe, C.D. Edward Arnold (Publ.) Ltd., London. Reprint by Koeltz Scientific Books, Konigstein, West Germany, 610 pp.

Sculthorpe's work "The Biology of Aquatic Vascular Plants," first published in 1967 and republished in 1985, is still recognized today as the foremost authoritative book on vascular aquatic plants and their biology. First editions are collector's items with prices starting at $170 (US).

In the preface to his book, Sculthorpe explains his purpose:

> "There seems to have been no attempt whatsoever to provide a reasonably up-to-date monograph treating all aspects of the comparative biology of freshwater and marine vascular plants. Such is my principal aim in writing this book.…Data lie scattered throughout journals of agriculture, hydrobiology, medicine, geology and even engineering.…My subsidiary aim has therefore been to review the research literature as thoroughly as possible and provide a reasonably comprehensive bibliography."

Comparison of cell and tissue differences in good and unusable clarinet reeds. Veselack, M.S.W. 1979. Ph.D. D.A. Thesis, Ball State Univ., Muncie, IN, 136 pp.

Veselack reports that there has been increasing difficulty in finding good reed material for the musical woodwind instrument, the clarinet. Professional clarinetists were invited to provide reeds in pairs, one good and one unusable for performance. In her dissertation, the author investigated "the cell structure and tissue arrangements in clarinet reeds made from the plant, *Arundo donax* L., and to identify possible relationships which may exist between anatomical structure and playability of reeds."

Water plants: A study of aquatic angiosperms. Arber, A. Reprint 1972. J. Cramer, New York, 436 pp.

First published in 1920, Agnes Arber's "Water Plants: A Study of Aquatic Angiosperms" has been described as "a standard compendium of information on aquatics" and "a very extensive record of observation, experiment and research." Written in a simple and graceful style, the book is interesting to serious students of water plants and the weekend hobbyist, with numerous illustrations by the author. The book was reprinted in 1963 and again in 1972. Though some nomenclatural alterations have been made in the reprinted 1972 edition, along with several additions and corrections to the text and bibliography, Arber's "Water Plants" remains a useful and informative study. The following is a short excerpt describing the effects of water hyacinth (*Eichhornia crassipes*), introduced to the St. Johns River in Florida:

> "About the year 1890, this plant was accidentally introduced into the St. John's (sic) River in Florida, which being a sluggish stream, was particularly well-suited to serve as its home. After seven years, two hundred miles of the river bank had become fringed with a zone of Eichhornia from twenty-five to two hundred feet in width. In the summer of 1896, a strong north wind drove the plants up stream from Lake George, forming a solid mass entirely covering the river for nearly twenty-five miles. The growth was so dense that small boats with screw propellers could not get through the mass. Formerly, when the stream was clear, logs used to be rafted down the river, and it is estimated that, at the time when the Water Hyacinth was at its maximum, the lumber industry of the region suffered an approximate annual loss of $55,000 from the difficulty of rafting." (p. 213)

FROM THE DATABASE

According to Google™ Analytics, the APIRS database had more than 5,000 hits from almost 4,000 visitors during 2009. The database is used world-wide, with visitors from 116 countries during the past year. Approximately 2,500 new citations were added to the database in 2009 and a small sample is provided here. References cited include peer-reviewed research articles, government reports, books and book chapters, dissertations and theses, and gray literature such as abstracts from proceedings. To obtain full-text of citations, contact your nearest academic library or search online. http://plants.ifas.ufl.edu/APIRS/

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The 12th European Weed Research Society International Symposium on Aquatic Weeds—An American Perspective

by Jeffrey T. Hutchinson, University of Florida, Center for Aquatic and Invasive Plants

While international in scope, the 12th European Weed Research Society International Symposium on Aquatic Weeds had a local, friendly and sociable atmosphere. Upon arrival, I was warmly greeted by the symposium chairman, Seppo Hellsten of the Finnish Environment Institute, Arnold Pieterse, other symposium organizers and many of the participants. All participants I encountered were eager to hear about aquatic plant problems in the United States and excited to discuss their country's research and management problems. All shared a mutual interest and enthusiasm towards aquatic plants regardless of latitude or longitude.

Over the past decade, European ecologists have been working with aquatic plants and their management more than weed scientists. This was noted by the limited number of presentations on control of aquatic weeds using herbicides. Presentations were very broad but focused primarily on aquatic macrophyte ecology. Sessions were broken into 1) biology, ecology, and distribution, 2) indicator value of aquatic plants, 3) management of aquatic vegetation and side effects, 4) invasive plants and their ecological effects, 5) aquatic vegetation and environmental relationships, and 6) practical uses of aquatic plants. Some of the main themes presented throughout the meeting were the increase in invasive aquatic macrophytes even in colder climates such as Northern Europe, the need for environmental monitoring of lake and river ecosystems, the increased rates of eutrophication in lakes, and the impacts of littoral macrophytes on lakes.

Ricardo Labrada from Italy noted that most of the invasive aquatic plants were introduced by humans and stated there is a need for more regulation and control of introduced plants by botanical gardens and other sources. Throughout the symposium, it was emphasized that, while warmer regions of the World have the most management problems with invasive aquatic plants, colder climates also have their share of invasive aquatic plant problems. For example, introduced aquatic macrophyte species such as *Cabomba caroliniana* (Hungary), *Egeria densa* (France, Germany), *Elodea canadensis* (Finland, Germany, Hungary, Serbia, Croatia, Slovenia), *Hydrocotyle ranunculoides* (Germany), *Lagarosiphon major* (Ireland), *Lemna minuta* (Belgium), *Ludwigia grandiflora* (France), and *Myriophyllum sibiricum* (Finland) have become problematic or pose future threats in various European countries. In Germany, the number of invasive aquatic plants increased from one in 1869 to 24 in 2008.

Field trip participants visited lakes and rivers in central Finland.

An all day (and half of the night) field trip visiting lakes and rivers of central Finland occurred on Thursday from 9:00 AM – 11:30 PM. Finland has over 187,888 lakes with about 30% of them larger than three acres. Many of the lakes are located in the area around Jyväskylä. Participants were transported 125 miles around the Finnish Lake District with stops made at clear water lakes, eutrophic lakes, regulated lakes, rapids, small and large rivers. At each stop, indicator plants were identified and the status of the lake or river was discussed. A traditional Finnish lunch was served at Holiday Farm Salvia. In the afternoon, participants took a two hour boat tour of Lake Päijänne, the second largest (275,796 acres) and the deepest lake (313 feet) in Finland. The evening ended with the symposium dinner at Savutuvan Apaja, an old traditional style Finnish farmhouse and cottage. The EWRS recognized five students who were awarded 4000 Euros ($5900) to attend the symposium. Contingents from Finland, Russia, Poland, and England serenaded the crowd with songs from their country land.

After walking around multiple lake edges and wetlands near Jyväskylä during the week and those on the Thursday field trip, I was surprised to find only a single clump of purple loosestrife (*Lythrum salicaria*) (see photo, p. 16), native to Finland and Europe, but a highly invasive wetland plant in the Midwestern United States. This event tied together many of the ideas presented and discussed at the symposium, that the introduction of non-native aquatic plants, land use patterns, increased nutrient loading, and eutrophication have greatly altered water bodies throughout the world.

Lake Jyväsjärvi and symposium site at the University of Jyväskylä.

Overall, the symposium was extremely well organized and beneficial to the participants, thanks to the efforts of EWRS, the International Society of Limnology, the Finnish Environment Institute, the University of Jyväskylä, and Waterpraxis. The local organizing committee of Seppo Hellsten, Timo Huttula, Raimo Ihme, Arnold Pieterse, Jukka Salonen, Juha Karjalainen, Pirjo-Leena Pitkänen, Kati Martinmäki, and Anne-Mari Rytkönen went well beyond the call of duty in their efforts to arrange and organize the symposium and they are highly commended for their efforts. Christian Bohren, representing the EWRS, closed the symposium on Friday thanking the Finnish organizers for their hospitality, entertainment, and sponsorship of the symposium, and participants for their scientific presentations. The symposium was a hyvää matkaa for me.

APIRS Funding Reduced

by Karen Brown and Mary Langeland

The most recent fiscal year funding for the Aquatic Plant Information Retrieval System (APIRS) has been reduced by approximately thirty percent due to the extreme shortfalls in Florida's state revenues. APIRS is funded primarily by the Florida Fish and Wildlife Conservation Commission (FWC) in conjunction with the University of Florida - Institute of Food and Agricultural Sciences (UF-IFAS). Already running on a skeleton staff, APIRS continues to maintain a comprehensive collection of the scientific literature related to aquatic and wetland plants published world-wide. In addition, references on invasive upland species in Florida have been collected since 2001. The 74,000+ references currently cited include abstracts and presentations from relevant symposia, government and NGO reports, dissertations and theses, book chapters, peer-reviewed journal articles, CDs and DVDs, and more.

Although the electronic age has reduced operating costs and accelerated the speed of acquisitions and data entry, the Internet now provides lightning fast service and full-text expectations for those seeking information. Personal and academic websites, online publishing, Google™ Scholar and other sources now provide much of the information that is referenced in the APIRS collection. An APIRS strength is that the database has been continuously in service since the mid 1980s and cites research throughout the 1900s and even into the 1800s. A weakness is that most people expect full-text, or active links to full-text, to be available within the database, something that APIRS has never provided due to copyright restrictions then and now, the much higher costs to provide such a service, and, previously, to the technology not yet being readily accessible or affordable to a small system such as APIRS. Although Google™ Scholar has the vast resources to upgrade their services regularly, APIRS is still a contender for researchers in need of complete scholarly literature searches on our topics. In a recent comparison between the two, sardonically referred to as APIRS vs Goliath, we made the following observations:

APIRS Pros/Cons:

- APIRS is readily available to all and is free.
- APIRS is a database, self-contained and targeted, with focused and subject-specific content.
- APIRS contains historical sources, letter, and grey literature and reports.
- APIRS allows truncation, Boolean searches, etc. for query words.
- APIRS categories, keywords and plant lists enhance subject access.
- APIRS does not search or link to any other databases.
- APIRS search methods are not user-friendly.

Google™ Scholar Pros/Cons:

- GS is readily available to all and is free.
- GS has access to a variety of academic publishers, professional societies, preprint repositories, universities, and, of course, what is found with a regular Google Search.
- GS has links to digital documents.
- GS often offers the abstract as part of the search results.
- GS advanced searches are user-friendly.
- GS hits are sometimes irrelevant and/or non-scholarly.
- GS depends on pdf files so only documents in pdf format are indexed.
- GS does not search some of the most academically-esteemed databases, i.e. Elsevier publications which alone has a whopping 1,700 publications.
- GS searches have redundant results, with frequent duplicates and overlap.

Peter Jacso, professor and chair of the Library and Information Science Program in the Department of Information and Computer Sciences at the University of Hawai'i at Manoa, has long reported on GS pitfalls and had the following observation (Jacso, 2009): "many of the publications, randomly scattered in the detailed result lists, are just variant formats of the same paper, and the citations are mismatched... While GS developers have fixed some of the most egregious problems... — such as the 910,000 papers attributed to an author named "Password"—other large-scale nonsense remains and new absurdities are produced every day."

In comparison, APIRS provides clear-cut categories which can be further refined with keyword and plant species names. Irrelevant sources have already been filtered out so that every citation is about aquatic plants or Florida upland invasive plants. Duplicate hits are not a problem.

"An APIRS strength is that the database has been continuously in service since the mid 1980s..."

We hope to continue to provide the comprehensive database which is APIRS. We appreciate the continued spirit of cooperation demonstrated by the many researchers and others who supply their publications for our citation purposes. We welcome constructive criticism and hope to upgrade our search methods in the near future. This goal is uncertain due to budget constraints but we have long thrived during stressed economic periods. We also greatly appreciate the long-time financial support of the FWC Invasive Plant Management Section and the University of Florida-IFAS.

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Jacso, P. (2009, Sept. 24). Google™ Scholar's Ghost Authors, Lost Authors, and Other Problems. Library Journal [Online serial], Retrieved 11/20/2009: http://www.libraryjournal.com/article/CA6698580.html

NOTES OF INTEREST

The *Journal of Aquatic Plant Management*, published by the Aquatic Plant Management Society (U.S.), is now online at: http://www.apms.org/japm/japmindex.htm

Aquatics magazine, published by the Florida Aquatic Plant Management Society, is now online at: http://www.fapms.org/aquatics/issues.htm

Wildland Weeds, published by the Southeast Exotic Pest Plant Council, is now online at: www.se-eppc.org

EWRS Symposium, *continued from page 1.*

the symposium cited the European Water Framework Directive (WFD) and the role of macrophytes for monitoring the status of water bodies, as well as meeting the goals of the WFD.

The Symposium was attended by 106 participants from 30 different countries: Australia, Austria, Belgium, Canada, Croatia, Egypt, Estonia, France, Finland, Germany, Greece, Hungary, India, Ireland, Italy, Japan, Kenya, Latvia, Netherlands, New Zealand, Poland, Portugal, Russian Federation, Slovenia, Sri Lanka, Serbia, Sweden, Switzerland, United Kingdom and United States. Both oral and poster presentations were given at the symposium. The abstracts of the presentations (in total 105) were included in a symposium proceedings, which was presented to participants and is available online as Reports of the Finnish Environment Institute 15/2009: http://www.environment.fi/default.asp?contentid=332257&lan=en

Selected papers from the symposium will be published in a special volume of the journal, *Hydrobiologia*.

The Scientific Committee of the Symposium decided to organize the next (13th) EWRS International Symposium on Aquatic Plants in Poznan, Poland, in 2012. A special Working Group, consisting of Dr. Joe Caffrey (Ireland), Dr. Teresa Ferreira (Portugal), Dr. Jacques Haury (France), Dr. Seppo Hellsten (Finland) and Dr. Krzysztof Szoszkiewicz (Poland), has been appointed to make preparations for the next symposium in cooperation with the chairman of the EWRS Working Group on Invasive Plants, Dr. Christian Bohren. Information will be posted on the EWRS webpage in 2010 (http://www.ewrs.org/).

EU Water Framework Directive (WFD): http://ec.europa.eu/environment/water/water-framework/info/intro_en.htm

A Q U A P H Y T E

AQUAPHYTE is the newsletter of the Center for Aquatic and Invasive Plants (CAIP) and the Aquatic, Wetland and Invasive Plant Information Retrieval System (APIRS) of the University of Florida / Institute of Food and Agricultural Sciences (UF/IFAS). Support for CAIP is provided by the Florida Fish and Wildlife Conservation Commission, Invasive Plant Management Section, and UF/IFAS.

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AQUAPHYTE is sent to managers, researchers and agencies in 71 countries around the world. Comments, announcements, news items and other information relevant to aquatic and invasive plant research are solicited.

Inclusion in **AQUAPHYTE** does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

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photo by Jeffrey T. Hutchinson

Lythrum salicaria *(Linnaeus 1753), known as purple loosestrife among other common names, is an aquatic herb native to Europe (extending from Great Britain to central Russia), Japan, Manchuria China, southeastern Asia, and northern India. It is capable of invading a variety of wetland habitats, including marshes, river and stream banks, pond edges, lakes, roadside ditches, and reservoirs, and has invaded Canada, the United States, Ethiopia, and Australia. This species is listed in 100 of the World's Worst Invasive Alien Species: A selection from the Global Invasive Species Database, by Lowe, S., Browne, M., Boudjelas, S., De Poorter, M. (2000, 2004). Published by The Invasive Species Specialist Group (ISSG) of the Species Survival Commission (SSC) of the World Conservation Union (IUCN), 12pp. Electronic version available at: www.issg.org/*