



WaterWorks

Highlighting UF/IFAS Programs in Fisheries and Aquatic Sciences, Aquaculture, and Pond Management

University of Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences Volume 4 Number 3 2000

Calendar of Events

July 13

Sanitation Training for Shellfish Processors

FWCC Field Station / Cedar Key, FL
Leslie Sturmer 352/543-5057

July 16 - 20

Aquatic Plant Management Society - 40th Annual Meeting

Handlery Inn / San Diego, California
Presentations on all aspects of aquatic plant management, biology, and ecology.
Mike Stewart 601/634-2606

September 9

Introduction to Tilapia Aquaculture Workshop

Orlando, FL
All-day workshop will cover the major topics in tilapia aquaculture. Pre-registration required.
Debbie Britt Pouder 850/674-3184

Late Summer (to be announced)

Sturgeon Aquaculture

UF Mitchell Aquaculture Farm / Blountstown, FL
Overview of sturgeon culture practices, marketing and economics, research and regulatory issues.
Debbie Britt Pouder 850/674-3184

October 13 - 14

Florida Aquaculture Association Conference

Harbor Branch Institute / Fort Pierce, FL
Shrimp farming, aquaculture tour, industry updates, market outlooks and more.
Kim Dees 800/333-4264 ext 416

Aquatic Plants A Blooming Proposition

Fish and clams aren't the only hot commodities in Florida aquaculture these days. According to the most recently released Florida Aquaculture Survey (1998), there is real money in aquatic plants. Figures reveal that some \$13.2 million in sales were made in Florida during 1997, by 59 growers. That's quite an increase from the \$8.6 million reported earned by 72 growers only two years earlier (The 1999 survey is due out in July). There is a serious investment of land, time and equipment, of course.

Florida's aquaculture industry serves four distinct markets: aquariums, water gardening, wetland restoration and mitigation, and also food — primarily watercress.



Joe Richard

Aquatic plant grower Don Bryne at his family owned Suwannee Laboratories, Inc. in Lake City.

One of Florida's veteran aquatic plant farms, Suwannee Laboratories, Inc. is family owned and operated by Don and Shirley Bryne and has been for 35 years. Growing and selling

aquatic plants is second nature for the Bryne family — importing,

Continued on page 3.



The following UF/IFAS faculty and staff are available to provide technical support and answer questions related to aquaculture, fisheries and aquatic sciences, and pond management.

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Student Involvement at UF

Undergraduate and graduate students are an important part of the teaching, research, and extension programs at the University of Florida. Involvement of individual students in these programs is highlighted in each issue of **WaterWorks**.

Dan Willis knows his grass carp, and for good reason. Under the watchful eye of Dr. Dan Canfield, Jr. Willis has spent hundreds of hours testing these controversial exotic fish famous for their large appetites for aquatic vegetation. This graduate student from Okeechobee High School earned a Bachelor of Science degree in Wildlife Ecology and Management, and then completed a master's degree only recently. His thesis, "Training Grass Carp to Respond to Sound as a Fish Removal Technique," paves the way toward solving a major dilemma affiliated with the use of grass carp for controlling aquatic vegetation.

Too many carp in a pond or lake can consume virtually all the vegetation, and once these fish are stocked, they are extremely difficult (if not impossible) to remove. Several removal methods have been investigated, such as herding, angling, netting, electrofishing, and the use of toxic fish baits. All have met with only limited success.

Is there another way? Data from Willis' study suggests that it is possible to train

grass carp to respond to low frequency sound.

The theory goes that if these fish continue to return to a designated area when the sound is presented without reinforcements (such as food), it may be possible to place the carp into



Amy Richard

lakes with nuisance aquatic plants, allow them to consume the desired amount of plants, and then attract them to a location from which they can be more easily removed.

Research showed the carp had different reactions to varying sound frequencies. Fish trained with the 1000-hz sound showed no difference in their response time; it took the grass carp approximately four seconds to reach the feeding site before they were trained and four seconds after they were trained. However, grass carp in the 800-hz tank came to the feeding site in 12 seconds before they

were trained and five seconds after training.

Grass carp in the 600-hz tank came to the feeding site in seven seconds before they were trained, and three seconds after they were trained. These data suggest that grass carp can indeed be trained to respond (gather) to sound.

Willis' research is based on previous studies showing that various fish species respond favorably to sound. In 1923, Karl Von Frisch showed that a brown bullhead in an aquarium could be trained to come out of hiding to feed in response to whistling sounds. Saltwater fish have also been shown to respond. In 1968, Joseph D. Richard showed that some species of marine fish are attracted to pulsed, low frequency sounds, including three species of grouper and three of snapper, among others.

Based on Willis' study, grass carp have the potential to be removed after reducing aquatic vegetation in a waterbody. This new technique will make it possible to move fish from one lake/pond to the next, without having to use herbicides or electrofishing.

Continued from page 1.

exporting, and even creating award-winning hybrid water plants at their farm, just south of Lake City.

A typically hot summer afternoon finds the entire family packaging live plants and boxing them for a delivery truck waiting outside. A member of the family will

soon be driving the truck to the Jacksonville airport.

With plenty of warm Florida weather, two interstate highways intersecting nearby, and Jacksonville International airport only 45 minutes away, it's clear that little was left to chance when planning this farm.

Outside the humid packing room are growing sheds and water tanks of every description and size. The bigger tanks have roofing material overhead that is adjusted to each season. A hot summer sun is

dulled by fiberglass, while the winter sun easily penetrates a poly-plastic roof liner.

This summer, the cruel drought seems blunted by the farm's lush greenery, which makes the place feel like an oasis. A thick forest on the west side of the complex shields the late afternoon sun. Four wells supply constant water, which is recycled through two fish ponds and is then used twice more. The first pond contains catfish of various sizes, providing natural bacteria and fertilizer to the recycled water. "But mostly they provide fresh catfish dinners," says co-owner Shirley Bryne.

Three generations of Brynes now work at the aquatic plant farm. The oldest still builds shipping boxes. The farm, some of it first owned by Shirley Bryne's family, now makes up about 80 acres, with 15 acres taken up by various ponds, sheds and water tanks. Wildlife seem to accumulate here. Numerous bullfrogs hop and splash through the shallows in broad daylight, chasing insects.

Suwannee Laboratories, Inc. currently ships 80 tons of aquatic plants each year, using UPS delivery each day, sometimes four times daily during the peak summer season. The operation runs so smoothly, that Don and Shirley can travel any time during the remaining eight months of the year, searching for new plants in faraway lands. It seems like the perfect life-style, though they've worked hard to get there.

The family has experimented with various water lilies of the *Nymphaea* genus, and each successful new species is named after a family member. The Angela lily, for instance, named after their daughter, won first place in 1996 at the International Lily Society.

"Don Bryne has been supportive of our



Joe Richard

tissue culture program here at UF, said Dr. Mike Kane, at the Environmental Horticulture Department. "He helped us get funding in the early years through the State Aquaculture Marketing Development Aid Program. We've worked together with aquarium plants, especially tropical and hardy water lilies."

Don Bryne has also served as president of the Florida Aquaculture Association, and is currently vice president. He says,

growers in Florida and elsewhere are a tight-knit fraternity that help each other.

One of the keys to the company's success has been its ability to change with the times. The business itself has shifted away from its previous market of years ago, comprised mostly of kids growing plants in small aquariums around

the country. According to Don, electronic games are partially to blame for the market change.

Today, the best market is in rare and more expensive outdoor pond plants sought by adults. "New and different, something exotic, that's the market today," says Bryne. Indoor aquarium plants are still in demand, but more so during winter. Outdoor ornamental plants for ponds make up the summer trade.

The ability and excuse to travel seems to be one of Don and Shirley's favorite perks of

the business. They've traveled widely in their quest for aquatic plants, and in doing so have made many friends. As Don says, "When you think about it, it's quite amazing to phone or e-mail a friend halfway around the world, order a few plants and have them arrive at your doorstep in only a few days. Our travels have been productive and we've made some wonderful friends in this business, both in Florida and in various countries."



Joe Richard

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UF/IFAS Aquaculture and Pond Management Update

Shellfish Aquaculture

Cedar Key

This year's annual Hard Clam Industry meeting, held in April, focused on implementing a dry tempering regime for aquacultured clams during summer months.

Based on several years of research conducted jointly by the Florida Department of Agriculture and Consumer Services (DACs) and the University of Florida Aquatic Food Products Lab, this proposed regime is to be conducted to extend the shelf life of clams in refrigerated storage. By incorporating a step-down temperature acclimation prior to placement into customary cold storage, clams harvested from subtropical waters are better able to adjust to the cold, increasing survival by 6 to 10 days.

DACS Division of Aquaculture, which oversees all shellfish regulatory activities, recently announced that industry will be allowed to temper aquacultured clams only when following a predetermined time-temperature scheme.

During the first year (summer 2000), all certified shellfish wholesalers interested in tempering are required to participate in a validation process. Participating certified dealers will have to modify their HACCP plan to include tempering



Patrick Baker

as a critical control point. Validation includes sample collections of tempered and non-tempered product for microbiological analysis. The UF Aquatic Food Products Lab will conduct all sample collections and laboratory analysis.

The intended starting date for industry validation is in June. Interested dealers need to arrange the necessary paperwork and HACCP requirements before beginning tempering. For more information, contact Victor Garrido with DACs at 352/392-1991, extension 305.

On-line Clam Talk

Members of the clam farming community can now join the Florida Clam Industry Forum, an electronic mail list and discussion group. The purpose of the CLAM-L mail list is to promote discussion among individuals interested in the

business, technology and science of clam aquaculture in Florida. It's hoped that this forum will provide an avenue for rapid exchange of new ideas, information, and advice. Potential topics include problems and solutions, new technology, conditions at a particular lease area, new mollusc species for aquaculture, or availability of clam seed from suppliers. It will also keep members informed of upcoming workshops and meetings.

To subscribe, send a message to: LISTSERV@LISTS.UFL.EDU. In the message body, type SUBSCRIBE CLAM-L. To send a message to the CLAM-L discussion group, send a message to: CLAM-L@LISTS.UFL.EDU. Remember that when you reply to a CLAM-L message, it goes to everyone on the mail list! Personal replies should be sent directly to the original sender, (remove the CLAM-L address from the recipients list and replace with a personal e-mail address).

Questions about the list should be sent to Dr. Shirley Baker via e-mail: sembaker@mail.ifas.ufl.edu.

The Clam Forum is sponsored by the Dept. of Fisheries and Aquatic Sciences and the Florida Cooperative Extension Service.

Leslie Sturmer
352/543-5057

Department of Fisheries and Aquatic Sciences

Gainesville

Sturgeon Workshop

A sturgeon management workshop was held on May 2 at the Department to discuss the status of introducing Atlantic sturgeon into Florida for commercial aquaculture, and to review the latest research on Gulf of Mexico sturgeon.

Atlantic Sturgeon

The State of Florida has officially requested permission from the Atlantic States Marine Fisheries Commission (ASMFC) to import Atlantic sturgeon from New Brunswick, Canada.

First, the State of Florida has to provide a full proposal, including who will be doing the farming, where farms will be located, and who will be importing the fish. Also, Florida is required to provide conditions of the status of stocks of Atlantic sturgeon in Canada to prove that removal of



Amy Richard

Biologist Doug Colle examines sturgeon eggs.

Atlantic sturgeon fingerlings from Canada won't negatively impact their stocks.

Gulf of Mexico Sturgeon

Several faculty and staff from the Department were on hand to report on their research.

◆ Doug Colle, a biological scientist, collects sturgeon for UF studies, as well as maintains broodstock and hatchery fish. Doug reported this year's collection efforts resulted in the capture of 101 sturgeon, with a 45% recapture rate (previously tagged). Two were spawned with partial ovulation providing 400 juveniles for the 2000 year class.

Three of the fish



Doug Colle

Dr. Daryl Parkyn with Gulf of Mexico sturgeon.

caught were tagged in 1992, providing valuable growth data—stocked fish seem to be maturing at the same rate as the wild population.

◆ Dr. Mike Allen and graduate assistant Bill Pine are using existing data to construct a computer model to assess potential long-term population trends of Gulf of Mexico sturgeon in the Suwannee River. Recapture data are being used for estimates of recruitment, annual survival, and population growth. The model will analyze mark and recapture data to estimate recruitment of young fish into the population. The output can be used as a benchmark and guide for population management.

◆ Debra Murie's study will produce a model to estimate feeding periodicity – estimating percentage recovery of foods as a function of digestion. Fish were captured and released on the Suwannee River after having stomach contents collected for analysis.

◆ Daryl Parkyn's work will examine oxygen and temperature requirements of Gulf of Mexico sturgeon, to provide a description of the interplay of temperature, water velocity, and oxygen demand. Data gathered could provide red flags for certain systems indicating where sturgeon could survive, as well as areas where they might

not be able to survive. This work will also be useful in establishing minimum water flow requirements in rivers with Gulf of Mexico sturgeon.

◆ Frank Chapman experimented with egg removal. In his broodstock study, three female fish were injected with hormones. Two successfully ovulated, and 400 juvenile fish are now being raised as a result. All adult sturgeon were released back into the Suwannee River after spawning trials were completed.

These efforts are essential in increasing our knowledge about the life history and habits of these ancient fish.

Doug Colle
352/392-9617 ext 263



Dr. Shirley Baker

Clam Research Adding Muscle

July marks Shirley Baker's first anniversary at the Department as resident invertebrate biologist.

Shirley earned her Ph.D. from the Virginia Institute of Marine Sciences, College of William and Mary,

where she studied the physiology of oyster larvae and spat during metamorphosis. Her two postdoctoral positions (St. Paul, Minnesota and Stony Brook, New York) involved studying different aspects of the interactions of native freshwater mussels with the exotic zebra mussel.

In her new position at UF, Shirley is providing research and technical assistance to Florida's hard clam industry, among other things.

Joe Richard
352/392-9617 ext 290

UF/IFAS Students & Faculty Win Big

Two UF/IFAS graduate students were recently awarded the 4th Annual Roger Rottmann Memorial Scholarship, by the Florida chapter of the American Fisheries Society (AFS). Both students, Jeff Hill and Tom Glancy, are from the Department of Fisheries and Aquatic Sciences and advised by Dr. Chuck Cichra.

In addition, Jeff Hill and Bill Pine (advised by Dr. Mike Allen) received the Department's Student of the Year award for 1999.

Jeff Hill (Ph.D. student), Tom Glancy (M.S. student), and Amy Hester (M.S. student) received scholarships from the International Women's Fishing Association (IWFA).

Jeff Hill is working on the biology of peacock bass (cichlid) in the



Kids Fishing Day at the Mitchell Aquaculture Farm.

Debbie Britt Pouder

canals of south Florida; Tom is studying the ecology of nearshore oyster, seagrass and saltmarsh habitats; and Amy's work focuses on the biology of warmouth in Florida lakes. Jeff and Amy are the first two freshwater students to ever receive this IWFA scholarship.

Three faculty were also recognized for excellence this year:

◆ Dr. Chuck Cichra, associate professor, received a Superior Accomplishment Award for recognition of his outstanding contribution to the UF/IFAS Agriculture and Natural Resources program.

◆ Dr. Ruth Francis-Floyd, UF/IFAS Aquatics Animal Health Specialist was recognized for her outstanding contributions to fish health research and extension.

◆ Leslie Sturmer, UF's multi-county field agent, was recognized for her tireless contributions to shellfish aquaculture in Florida.

Mitchell Aquaculture Demonstration Farm

Blountstown

Kids Fishing Day

In cooperation with the Florida Fish and Wildlife Conservation Commission, the farm hosted a Kids Fishing Day this Spring (Saturday, April 1st). Some 206 participants, ranging in age from 14 months to 15 years, creel a total of 874 fish. Kids were allowed to keep up to five fish. Most limited out, averaging just over four fish each. Many enjoyed their first fishing experience ever.

Cameras and video recorders documented the day's success. Each child received a Certificate of Participation, Junior Fishing License, and sample packet of PowerBait.

The event will be a re-occurring program at the farm.

Debbie Britt Pouder
850/674-3184

UF/IFAS Aquaculture and Pond Management Update (continued)

Whirlwind Pond Management Tour

County extension faculty in the Florida Panhandle recently organized a series of five recreational pond management workshops.

Dr. Chuck Cichra, extension fisheries specialist, conducted workshops in Pensacola, Crestview, Bonifay, Blountstown, and Tallahassee during the week of May 22. Escambia County extension agent Max Griggs helped organize and coordinate events.

Topics included pond construction, fish stocking, fish management, and habitat management. More than 200 pond owners attended. Extension faculty met with individual pond owners before and after each workshop to answer questions and provide technical assistance. Attendees indicated the workshops were informative and well worth their time.

Cichra and county

faculty also visited several landowners to provide site-specific consultations.

Workshops can be scheduled for your area. Contact your local county extension agent.

Chuck Cichra
352/392-9617 ext 249

Fishing For Success Continues to Make A Splash

So far this year, more than 2,000 children have visited the Department of Fisheries and Aquatic Sciences facility in northwest Gainesville, to participate in the Fishing For Success aquatic youth education program.

The program was established to provide opportunities for youth to learn about Florida's freshwater aquatic plants, invertebrates, and fish, and the water in which they live. Activities begin with aquatic scavenger hunts in the Department's ponds, after which they are introduced to the plants and animals collected, including basic concepts of aquatic food webs and energy flow.

Youth were also introduced to some rather unique fish life, including the Atlantic and Gulf of Mexico sturgeon. Afterwards, most participants were given an opportunity to fish in the ponds, which are stocked with large-mouth bass, bluegill, channel catfish, and



School children are treated to a rare close encounter with a Gulf of Mexico sturgeon at the Department of Fisheries and Aquatic Sciences.

Joe Richard

hybrid striped bass. Fishing ponds are currently being established in several counties throughout Florida by departmental staff, in conjunction with county faculty, private pond owners, law enforcement agencies, and local youth to provide more fishing opportunities for youth and families.

Aquatic education activities are available on a year-round basis.

Sharon Fitz-Coy
352/392-9617 ext 241

Prison Catfish

Thanks to UF/IFAS cooperative extension agent Max Griggs, a recent fish-farming project near Pensacola introduced prison inmates to fish-farming.

With only a half-acre pond, the Escambia County Road Camp Prison raised 7,500 pounds of catfish from 3,500 fingerlings. Prisoners raised the fish, cleaned and ate them. Cost for the

pond to some disease. So we used only commercial feed pellets."

The Escambia County Prison, located 15 miles north of Pensacola, is currently having a difficult time locating another 3,500 fingerlings to restock their pond. Their initial supplier no longer carries them, and most suppliers reportedly won't bother with such a small shipment of fish.

So, plans are underway to start a small hatchery at the prison to raise a reliable source of catfish fingerlings. Excess fingerlings will be sold to the local 4-H Club.

Initially, 200 – 300 pounds of catfish were harvested at a time for meals. The last 2,000 pounds were harvested at one time, cleaned and frozen for future meals. That way, the pond could be cleaned and put back to work, growing more fish.

There was no point in feeding that many big catfish after they had grown to ideal size.

Did the inmates enjoy the process?

"I'll say this," laughed Bethea. "They sure didn't enjoy hand-cleaning 2,000 pounds of catfish at one time. "It took a day and a half for six guys to skin those fish. By the end of that time, they were getting pretty darn good at it."

Max Griggs
850/477-0953



Dr. Chuck Cichra

Joe Richard

Exotic Fishes In Florida: Spotted Tilapia

by Jeffrey E. Hill

While many people are familiar with blue tilapia, commonly seen in Florida fish markets, less is known about the spotted tilapia, a prohibited species found only in South Florida. After several inquiries about the spotted type, Jeff Hill was kind enough to shed a little light on the matter with this article.

Spotted tilapia *Tilapia mariae* have been in Florida waters since the early 1970s. Known as cichlids, they are one of about five tilapia species now established in the state. They were first established in Dade County, but have since moved on to Brevard, Broward, Collier, Indian River, Martin, Monroe, and Palm Beach counties. Being a tropical species, they are likely confined to south Florida due to low winter temperatures in the rest of the state. Their lower lethal temperature (the temperature below which they die) is about 11.2 C or 52 degrees Fahrenheit.

Spotted tilapia are on the Florida list of prohibited species and its live possession is regulated by the Florida Fish and Wildlife Conservation Commission (FWC). As such, they may only be kept under permit for scientific purposes and must be maintained indoors with safeguards to prevent their escape.

These fish are native to fresh waters of tropical west Africa. Their name refers to the six to nine spots located along the sides of adult. Juveniles, however, look very different, with vertical bands instead of spots. In fact, juveniles are so different in appearance that they were once described as a separate species. They grow to about 310 mm total length (12 inches).

Spotted tilapia are generalists, very adaptive fish. In Africa, they live in rivers and streams. In Florida however, they inhabit canals, lakes and ponds. It is also an opportunistic feeder, eating insects, grass shrimp, other invertebrates, algae and detritus (organic

matter) — whatever is available. In other states, spotted tilapia are kept in aquaria and have even been known to eat sponge filters!

Unlike other species of tilapia in Florida which brood their eggs and fry in



Noel Burkhead

Spotted tilapia *Tilapia mariae* (adult)



Leo Nico

Spotted tilapia *Tilapia mariae* (juvenile)

their mouths, the spotted tilapia lays eggs in nests on the substrate (the bottom below the silt). Both parents clean a nest site down to a hard surface or bare sand. Parent fish aggressively protect their offspring for several days after leaving the nest.

This species breeds year-round, but reproduction peaks during warmer months. These generalist qualities and parental care for their young make them good candidates for successfully invading areas outside their native range.

Spotted tilapia are abundant in many freshwater systems of south Florida and are often the dominant species in terms of biomass. They were so abundant in canals of Broward and Dade counties that the FWC introduced another exotic fish, the peacock cichlid *Cichla ocellaris* (butterfly peacock bass) in an attempt to control their numbers. Spotted tilapia regularly occur in the diet of predatory fishes such as the peacock cichlid and native largemouth bass *Micropterus salmoides*.

There are few data available concerning the impacts of spotted tilapia. However, it is suspected that the abundance of black acara *Cichlasoma bimaculatum*, another exotic cichlid species long established in south Florida, and redear sunfish *Lepomis microlophus* are negatively correlated with the abundance of spotted tilapia. This means that there tends to be fewer black acara and redear sunfish when spotted tilapia abundance is high. In fact, spotted tilapia appear to have largely replaced black acara in many of the larger canals in south Florida.

There are nearly 100 species of tilapia in the world and a few species are important food fish. Spotted tilapia now make up a fairly substantial proportion of the recreational panfish catch in many areas of south Florida. However, it is not a fish that Florida consumers will find in seafood markets or restaurants due to its prohibited status.

There are other tilapia species commonly farmed in tropical and subtropical regions of the world, including Florida. Central Florida even has a commercial fishery for blue tilapia *Oreochromis aureus*.

For more information on spotted tilapia or other exotic fish species, see the *Nonindigenous Fishes Database of the U. S. Geological Survey* (<http://nas.er.usgs.gov>) or contact:

Jeff Hill

Dept. of Fisheries and Aquatic Sciences
352/392-9617 ext. 236

E-mail: JCICHLA@ufl.edu



Amy Richard

About the author: Jeff Hill, a PhD student at the Department of Fisheries and Aquatic Sciences, is shown here lecturing about tilapia for a fish taxonomy class.



Joe Richard

Pictured above are some of the participants at the Third Annual Graduate Student Symposium for the Department of Fisheries and Aquatic Sciences. The event was held at the Austin Carey Forest in Gainesville this Spring (April 13 - 14). The Symposium provides students an opportunity to present their research to peers and faculty. Thirty-one projects were presented with topics ranging from: food web structures of reef fish; methyl mercury uptake kinetics in blue-green algae in the Everglades; early development and regulation of cell cleavage in the sea anemone; habitat and diet comparison of largemouth and shoal bass in the upper Chipola River – to name a few. For more information about graduate studies at the Department, call the graduate secretary at 392-9617 ext 233, e-mail: fishweb@gnv.ifas.ufl.edu or check out the web site: <http://www.ifas.ufl.edu/~fishweb/index.htm>.

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