# Fish Farming News

## SPECIAL FLORIDA AQUACULTURE FOCUS

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### Growers Supply opens new Tech Center East, sets workshops

SOUTH WINDSOR, CT – Growers Supply has expanded its location here to include Tech Center East, an innovative facility designed to offer a first-hand

look at some of the latest techniques in controlled environment agriculture. Tech Center East (TCE) is an educational center modeled after



A look inside Growers Supply's newly opened Tech Center East. Growers Supply photo

Growers Supply's Dyersville, IA location.

The TCE facility will provide visitors the opportunity to see products in use and to discover how the company can provide both the products and the expertise needed to design a complete controlled environment growing system.

In addition to serving as a showcase for Growers Supply's latest products, Tech Center East will host a series of controlled environment agriculture (CEA) schools.

These three-day workshops will cover topics including hydroponic growing, hydroponic fodder, and aquaponics.

The workshops, hosted by Growers Supply's resident experts on each topic, are designed to assist those who are interested in growing with a controlled environment.

Outside experts on each topic will also be present, providing information and educating attendees about how different systems will perform and work in specific applications.

Tech Center East will host its first CEA school Nov. 6-8.

The first day will highlight hydroponic systems; the second day features information on hydroponic fodder systems; and the third day will be an introduction and informational session about aquaponics.

Those in attendance will receive a packet of information for each day and contact info for speakers.

There is a registration fee of \$495 per person that will be returned in company credit upon the purchase of a complete growing system.

For more information on Tech Center East's CEA school, or to register for this event, contact Nichole Kemp at (800) 327-6835 ext. 120; e-mail <nkemp@esapco.com>; or visit <www.growerssupply.com/techcenter>.

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Image courtesy of: Blackwater Creek Fish Farm

# International symposium offers insights into technology and the evolution of clean, land-based recirc systems

SHEPHERDSTOWN, WV – Less than three years ago, the seafood industry and others were questioning whether Atlantic salmon – one of the most popularly cultured fish in the world – could be grown in cleaner and healthier land-based systems.

This past September, more than 140 scientists, engineers, academics, fish farmers and suppliers, conservationists, government representatives, and innovative entrepreneurs from 15 countries came together – to discuss not if it could be done, but rather how to improve the performance, sustainability, and cost of raising salmon and other fish in commercial, land-based aquaculture.

Over the last two decades, the Freshwater Institute's scientific and engineering research has developed fishfarming systems on land that produce healthy, tasty fish and leave water clean.

The Aquaculture Innovation Workshop, sponsored by The Conservation Fund Freshwater Institute (FWI) in partnership with Tides Canada, The Gordon and Betty Moore Foundation, and the Atlantic Salmon Federation, provided an open forum for these groups to learn about and discuss the challenges and rapidly emerging opportunities for land-based fish farming technology.

During the three-day international symposium, at the US Fish and Wildlife Service's National Conservation Training Center here, participants shared results from scientific studies and commercial advancements, identified opportunities to make this emerging aquaculture technology more environmentally friendly and economically viable, and highlighted the potential for growth with key decision makers in government, industry, and philanthropic organizations.

"The world's appetite for fish is increasing, and global demand has long passed what capture fisheries alone can provide; so aquaculture is challenged to cover the supply gap," said Joe Hankins director of the Freshwater Institute. "Over the last two decades, the

Freshwater Institute's scientific and engineering research has developed fishfarming systems on land that produce healthy, tasty fish and leave water clean.

"Until recently, this technology wasn't considered a practical option for the

seafood industry," Hankins continued. "Now we're seeing minds changing and an ever-increasing acceptance of this more-sustainable intensification technique as an efficient fish farming option.

"The wide-ranging make up of the workshop participants, across all aspects



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### Acknowledgements -

This special Focus on Florida Aquaculture issue of *Fish Farming News* would not have been possible without the support and hard work of the following individuals who contributed the editorial reports and photos that appear here. Our sincere thanks. –*Editor* 

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> Kurstan Noles with a market-sized hybrid striped bass at the Sunshiners fish farm in east-central Florida. Bob Robinson photo

program to her duties.

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#### FROM AROUND THE INDUSTRY

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of the issue, underscores this." Their mind shift is based in part on the foundational work being done in the FWI facilities in Shepherdstown.

As a leader in the development of sustainable solutions to water resource management, the Freshwater Institute has conducted extensive research into closed-containment harvesting techniques that produce the highest quality fish populations for food production without

vaccines, harsh chemicals, and antibiotics.

The workshop participants saw a third generation of Atlantic salmon nearing market size in FWI's production tank.

The ongoing successes of these land-based aquaculture systems were highlighted at the workshop as practical and sustainable solutions to help meet



the increasing demand for healthy food.

The international symposium was the fifth in a series of summits designed to provide a platform

for diverse groups to learn about cuttingedge technological advances, case studies for commercial-scale projects currently underway, and cost-benefit analyses. *See NEWS, page 30* 



Left, attendees of the Aquaculture Innovation Workshop visit the Freshwater Institute's closedcontainment facilities, also in Shepherdstown. Ryan Hagerty photo

Below, the international Aquaculture Innovation Workshop 5 was held recently at the National Conservation Training Center in Shepherdstown, WV. Ryan Hagerty photo

# **Rocco Cipriano: respected leader, innovator**

KEARNEYSVILLE, WV - As I get older, I find myself getting emotional when I thank the folks I look up to and respect in this world. Many of these people resist the recognition they deserve, but I admire their selfless dedication to helping others. Rocco Cipriano is one these individuals.

Cipriano trained with the best fish health professionals at the former Eastern Fish Disease Laboratory, which later was renamed the National Fish Health Research Laboratory and is now part of the US Geological Survey's Leetown Science Center.

The scientists within these laboratories greatly broadened

the scope of fish disease research from mainly parasites to other infectious and noninfectious

The man is a legend in fish

health, and, still, he will

causes. Cipriano has been an unsung member of this team of scientists for over 30 years. Imagine learning from the likes of S.F. Snieszko, Ken Wolf, Glen Hoffman, and Pete Bullock, all icons in the fish health field.

As an expert in microbiology and immunology, Cipriano was

FISH HEALTH NOTES BY ROD GETCHELL

> indispensable to the US Fish and Wildlife Service's National Fish Hatchery System. He probably is best known by most fish health scientists for his major contributions to fish bacteriology.

Now, as a member of the Fish Health Branch of the Leetown Science Center, Cipriano investigates persistent and emergent health issues associated with genetics, pathogens, and environmental stressors that undermine conservation and restoration of interjurisdictional populations, including depleted, threatened, or endangered fishes and aquatic organisms.

I know that is a mouthful, but that's how all encompassing his job is.

#### Research

Cipriano conducts integrated research to understand and solve emerging and known disease problems affecting fish and other aquatic resources.

I'll give you a few examples.



Dr. Rocco Cipriano of the National Fish Health Research Laboratory in a moment of reflection on the Gerrtyburg Battlefield.

Al Dove/Georgia Aquarium photo

If you want to know anything about why your fish are dying from the various species of Aeromonas or Flavobacteria, Cipriano is the expert to call or e-mail. Or, just look him up on Google Scholar. See FISH HEALTH, page 8



never say no to a conversation with a single student. That didn't happen 10 years ago, and still doesn't happen today. -Esteban Soto

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## Fish Health

One of Cipriano's focus areas has been the diseases of sea-run Atlantic salmon. His work has led to innovations in the management, treatment, and prevention of epizootics through non-lethal detection of *Aeromonas salmonicida*, which has helped serve the needs of hatchery managers working to restore native salmon to rivers in the Northeast.

Among the many manuscripts he has produced in this field, you will find a really cool paper documenting how the resident bacterial flora living in fish mucus changes prior to clinical outbreaks of furunculosis and then slowly re-colonizes the mucus with the "normal" collection of non-harmful microbes on the surviving fish.

#### Continued from page 6

You also will find extension pieces such as *Fish Disease Leaflets 66 and 68*, two of the many easy-to-understand products written by Cipriano and his colleagues at Leetown. He also coauthored the *Aeromonas* chapter in the well-known *Fish Diseases and Disorders* text by Patrick Woo and David Bruno.

Eastern Fish Heath Workshop Cipriano's most visible and appreciated role has been in chairing and coordinating 22 of 28 meetings of the annual Eastern Fish Health Workshop (EFHW), including for the last 17 years in a row.

Georgia Aquarium's Director of Research and Conservation Al Dove summed up the importance of Cipriano's effort this way.

"There's a special conference every year that's one of the best kept secrets in the fish world," he said.

Dove explained that the EFHW is a relatively small event, involving usually around 100 people, which means that those who attend can spend quality time with their colleagues.

The workshop covers a great diversity of topics, including: fish health in aquaculture and wild fisheries; coral health on reefs; aquarium animal health; and crustacean health. It also features mollusk sessions, as well as thematic sessions on subjects such as immunology and chemotherapy.

"Perhaps as a result of its breadth of subject, EFHW attracts folks of broad vision and diverse interests, and I just love that," Dove said. "I always leave energized by the people I meet and the topics we discuss."

Organizing successful meetings is a challenge that not many scientists can pull off. Cipriano has perfected the art to the benefit of hundreds of fish health enthusiasts. Only this year did he turn over the running of this event to six of his younger colleagues/protégés, with Dove and Roy Yanong leading the charge.

Said Yanong, "Whether it is connecting diverse scientists and other professionals to each other within the US or across countries, Rocco's inherent warmth, gregariousness, honesty, hospitality, inclusiveness, high standards, and high integrity – most embodied through the EFHW 'culture' he has fostered – has forged lifelong friendships, connections, and collaborations among otherwise disparate people and groups.

"Rocco's foundational culture of hospitality, equality, and integration is something we all strive to emulate," Yanong continued. "Those of us who are attempting to take over Rocco's reins at EFHW know that, if we can retain even a tenth of his 'cultural essence,' we will have been wildly successful."

#### Life-long friendships

Scott Weber first met Cipriano back in early 2001, while working as the head veterinarian at the New England



Dr. Rocco Cipriano speaking at the Third Bilateral Conference. Rod Getchell photo

Aquarium in Boston.

"Rocco approached me to speak at the EFHW. I have never looked back from the day I accepted his offer and we began to forge a friendship and a professional relationship continuing for more than 12 years."

Weber said that Cipriano not only stresses sound science at these meetings, but also constantly evolves the EFHW program to include new and emerging issues.

"Most importantly," said Weber, "he spends most of his time creating new relationships with people. He provides advice and mentoring, and always is there to listen."

As an extension of the EFHW, Cipriano also organized three bilateral conferences between the US and Russia, further fostering the aquatic animal health community. Weber said he felt greatly honored when he was asked to participate in the last meeting, which was held in 2009.

"This truly was two weeks of one of greatest collaborations in aquatic animal health, fostering a cultural and scientific exchange unparalleled," he said.

Weber described a recent visit with Cipriano, during which they talked about everything under the sun, though, most notably, not much of the conversation was about work.

"When I got up to leave, he told me how great this visit made him feel," Weber said. "And, that was the best gift Rocco could ever give me."

#### Many colleagues

Esteban Soto, assistant professor of bacteriology and mycology at Ross University's School of Veterinary Medicine in St. Kitts, first met Cipriano in 2005 during AQUAVET<sup>\*</sup> in Woods Hole, MA.

"Rocco gave a great lecture about coldwater fish bacteria. I kept asking all sort of questions in my Spanglish, and Rocco gracefully answered them with patience," Soto said. "I could easily see the great love for science and



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(800) 657-6446 Idaho (800) 272-6436 Texas (208) 543-4698 Fax (979) 849-6943 Fax absolute devotion to teaching that he had. Since that day I have admired and respected this man."

Soto went on to say that one of the beauties of Cipriano's personality is "humility," which he transmits to everyone attending the EFHW. "The man is

a legend in fish health, and, still, he will never say no to

a conversation with a single student," he said. "That didn't happen 10 years ago, and still doesn't happen today."

Paul Bowser, head of the Aquatic Animal Health Program at Cornell University, first met Cipriano at the 3rd Eastern Fish Disease Workshop held in 1978 in Auburn, AL.

"Since that time, I have considered him to be one of my most valued colleagues and friends," Bowser said. "We have worked on several cooperative efforts over the years and those interactions have always been productive as well as a pleasure."

Aside from his own PhD supervisor, Mark Fast, the Novartis Research Chair in Fish Health at the University of Prince



Photo courtesy of Tom Loch/MSU

Edward Island's Atlantic Veterinary College, said he could not think of a single person or event that has been more instrumental in his scientific career than Rocco Cipriano and the EFHW.

"Rocco's mentorship and, more importantly, his friendship, have opened many opportunities to me that I can never repay," he said.

Thomas Loch, a post-doctoral associate at Michigan State University, expressed similar sentiments.

"Rocco is a truly great friend, mentor, and collaborator," he said.

"His elegantly conducted research is highly regarded, and his ability to foster lasting relationships amongst up-andcoming scientists and world-renowned



Above, Rocco surrounded by Russian colleagues at the Third Bilateral Conference between the US and Russia. Rod Getchell photo

experts alike is unparalleled.

"But what stands out most to me," Loch continued, "is the passion and diligence that is engrained in everything that Rocco does. As a result, I have no problem overlooking that he's a Yankees fan."

Cornell researcher Emily Cornwell emphasized Cipriano's unique ability to see promising developments in other fields and combine them with a thorough grounding in the history of fish health research to ask intriguing questions that the rest of us haven't thought of yet.

"He helped to create the collaborative community of fish health researchers that exists today," she added, referring to Cipriano's role in organizing the EFHW.

#### Last word

Solving numerous fish health quandaries is obviously a role Cipriano relishes. When he makes a presentation describing his latest investigations, I am on the edge of my seat scribbling notes as fast as I can. He has always been at the cutting edge.

If you have read this far, you will now know why I, and many others, admire Dr. Rocco Cipriano.

Thanks for reading Fish Health Notes.

Dr. Rod Getchell works in the Aquatic Animal Health Program at the Cornell University College of Veterinary Medicine.

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## Introduction, overview of Florida aquaculture

Diverse industry, strong support network, natural advantages combine to create climate for growth

reported \$68.7 million in farmgate sales.

production systems that include ponds,

tank systems that clean and recirculate

molluscan or live rock culture from the

These systems are used to produce a wide variety of animals or plants for

ornamental, food or miscellaneous

Ornamental sales totaled \$35.5

production water, and approximately 2,200 acres of coastal waters leased for

Florida aquaculturists utilize

indoor and outdoor tanks, indoor

state of Florida.

markets.





Early morning aeration is key to catfish farming in sunny Florida. FDACS photos

million – consisting of freshwater or marine animals and plants that included freshwater tropical fish, koi, crayfish or marine fish, corals, live rock, snails, and

(Polytanks) (Lots and Lots) (Polvtanks) (Minnows, Fry, etc.) Boy, have we got tanks! All



he strength and vitality of Florida

aquaculture originates from

hard-working farmers, favorable climate,

excellent science and technical resources,

aquaculture surprises people due to the

diversity of species, production systems,

A voluntary 2012 production survey

and a proactive state government.

The composition of Florida

A \$69 million industry

completed by 404 of 686 aquafarms

and markets.

the diversity of farmed species,

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(320) 693-8370 1-800-328-7659 shrimp sold to the aquarium or water garden markets.

Sales of aquaculture products for human consumption totaled \$24.1 million and included freshwater or marine fish, clams, oysters, shrimp, prawns, alligators, and turtles.

The balance of the farms produced animals or plants for bait, pond stocking, exotic leather, wetland restoration or mitigation, or environmental testing markets.

#### Family farms are key

By and large, Florida aquafarms are small, family-owned operations.

During the 2012 survey 402 operations reported 765 unpaid workers (typically family members or partners) and 93% of the 686 farms reporting using 20 water acres or less for production.

However, small does not mean that they are unimportant or economically insignificant.

Recognition of aquaculture's economic importance to rural inland and coastal communities and farmer-led politicking has resulted in significant state government level services related to regulations and extension and research.

Florida alligator farmers favor heavily insulated, individual growout houses that maintain a warm environment to speed up growth. FDACS photo





High intensity lighting is required for the indoor culture of live corals in tank systems. FDACS photo



Tilapia for the live or iced wholefish market do just fine in a converted poultry barn that contains very simple concrete block tanks or raceways. FDACS photo

#### Supportive services

In Florida, aquaculture is agriculture and is regulated as such.

The Florida Dept. of Agriculture and Consumer Services, Division of Aquaculture <http://www. floridaaquaculture.com/>, provides a one-stop office for state regulations as well as the first point-of-contact to lease state waters for marine fish and shellfish aquaculture.

This office also holds a programmatic general permit for marine aquaculture from the US Army Corps of Engineers so that shellfish farmers do not have to acquire individual permits.

And the division provides an ombudsman to help resolve local



Phytoplankton culture tanks are universal to Florida clam and oyster hatcheries. FDACS photo

government or federal regulatory conflict.

#### Strong academic sector

Florida's aquafarming community and public and private research facilities are sharing technology and solving challenges to speed new species and production system improvements from

the laboratory to the farm.

The University of Florida administers three applied aquaculture research and extension centers:

- Tropical Aquaculture Laboratory <http://tal.ifas.ufl.edu/>;

• Shellfish Aquaculture Extension <http://shellfish.ifas.ufl.edu/>; and

See FLORIDA AQUACULTURE, next page







## Florida Aquaculture

• Indian River Aquaculture Research and Demonstration <a href="http://irrec.ifas.ufl.edu/Aquaculture">http://irrec.ifas.ufl.edu/Aquaculture</a>>.

Florida Atlantic University directs Harbor Branch Oceanographic Institution's long running aquaculture research and education program <a href="http://www.fau.edu/hboi/aquaculture/">http://www.fau.edu/hboi/aquaculture/</a>>.

These public programs offer oneon-one technical assistance, how-to publications, and hands-on workshops.

Private not-for-profit organizations with aquaculture-oriented programs include Mote Marine Laboratory <a href="http://www.mote.org">http://www.mote.org</a> and the University of Continued from previous page

Miami <http://www.rsmas.miami.edu>. Unique to these entities is their focus on system and species research and student education.

#### Additional advantages

Florida offers additional advantages for developing and operating an aquafarm.

Its subtropical environment favors warmwater species, shortens growout times, and reduces heating and structural costs.

There are no personal income and limited corporate taxes, sales tax



Coastal submerged land is also leased by the state of Florida to culture live rock.

exemptions on capital equipment, fuel use to power farm machinery, feeds and other farm inputs, and reduced property taxes on agriculturally-zoned land.

A multimodal transportation system includes 14 deepwater seaports, 21 commercial service airports, nearly 3,000 miles of railway track and 18,000 miles of highways to move seafood products quickly and cheaply to national and international markets.

And a huge seafood processing and distribution network serves 19 million

residents, 91 million tourists and a \$73.8 billion hospitality industry that are always hungry for fresh fish and shellfish.

Surprised?

Well you should be. Florida aquaculture is the nation's

best kept aquaculture secret. Interested?

Contact the FDACS Division of Aquaculture for more information at <www.FloridaAquaculture.com> or <Kal. Knickerbocker@FreshfromFlorida.com.>



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An aerial view of freshwater ornamental farms in Florida's Hillsborough County. UF/IFAS/Craig Watson photo

The freshwater ornamental industry is the oldest, most diverse, and largest segment of Florida aquaculture.

With roots dating back into the late 1920s, the state's freshwater ornamental farmers have survived many changes and challenges.

Today they operate some of the most sophisticated farms in the nation, producing some 400-600 varieties of fish for aquariums and outdoor garden ponds.

Florida is the natural home for this industry in the US, as most of the fish are tropical species that don't do well when it gets cold.

Even in the Sunshine State there are periodic freeze events that are

disastrous to tropical fish out in ponds. A particularly bad first week of January, 2010 killed 80% of the fish.

But for domestic production, Florida is the hands-down best place to grow tropical fish in the continental US.

Not only tropical species, but temperate species like goldfish and koi are also a major part of Florida's industry, with several producers concentrating on producing "high end" varieties and color morphs.

Florida is also flat, with a shallow water table, so pond construction involves digging a hole and letting it fill up.

The industry has seen some shrinkage in the number of operations and total farm-gate value, but currently it appears

that things have leveled off and the industry is becoming more stable.

Over the past 10 years there have been a series of drastic changes that have led to this decrease in sales and farms.

Perhaps the greatest change has been the consolidation of the market at the retail, wholesale, and inevitably, the production level.

Today the majority of freshwater ornamental fish are sold at large retail stores who often have their own distribution centers, which has eliminated many family owned pet shops and regional wholesalers.

This has led to farms in Florida producing for this market, with a smaller number of wholesalers in the state supplying them.

These marketing outlets also carry fewer species and varieties of fish, making it more difficult for small farms to find a niche in the market.

At the same time this consolidation was occurring, there also was a major land buying boom in Florida that bought large chunks of agricultural land in the state, especially near "service corridors."

Ornamental fish farms that were strategically developed near the interstates (to make getting their product to the airport easy) were also prime development sites for homes.

While prices for land are stabilizing, the other impact of the land boom has been the tremendous capital investment needed today to start up a farm from scratch.

But perhaps the largest challenge to Florida farms has always been, and continues to be, foreign

competition, especially from Southeast Asia and China. Most farms in Florida

still employ time-proven methods of outdoor pond production, but the management has steadily improved.

Pond aeration is now standard, and new technologies are being deployed to improve dissolved gases.

JS

Feed formulations are one of the biggest changes in today's production versus 20 years ago, with several major feed companies constantly producing better diets for both indoor and pond production.

Pond covers that protect the fish from winter freeze events are also much more standard. If a structure is used, it is also easier for farmers to put up netting to protect against birds and other predators in the spring and summer.

In the hatchery, Florida's farmers employ the latest technology available for spawning and larval rearing.

Working closely with University of Florida (UF) scientists and others, See FRESHWATER ORNAMENTALS, next page



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A hi-fin sunset variatus. Harry Grier/Florida Tropical Fish Farm Association photo

A beautiful African cichlid. Harry Grier/Florida Tropical Fish Farm Association photo

**Freshwater ornamentals** 

*Continued from previous page* Florida is constantly developing reproductive strategies for new species and varieties of fish.

The complexity of operating a major Florida ornamental hatchery – often times employing thousands of tanks which are set up and emptied weekly – is an exercise in management not for the faint of heart. Even though Florida has the best climate for growing fish outdoors, indoor recirculating systems have proven themselves here like nowhere else in aquaculture.

Aquarium fish are sold by the piece, not by the pound, but it would be hard to find an aquatic product worth more by weight than ornamental fish. So, while recirculating systems can

o, while recirculating systems can

sometimes be huge failures for food production, the value of ornamentals makes the costs worth it.

Indoor production is used primarily for species and varieties that have very specific water quality requirements, are difficult to raise in outdoor ponds for a variety of reasons, or simply lend themselves well to high density production and large volume sales.

Florida's farms are quick studies that are very good at "mining" for

information and new technologies.

Freshwater ornamental production in Florida is a dynamic and exciting field that dates back to the era of steamships and trains, and through time has become a jewel in our nation's aquaculture industry.

The management requirements and complexity of the trade make it a difficult field to enter today, but Florida's farms are constantly adapting to meet the challenge.

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# Marine ornamental fish, invertebrates, corals Florida leads shift from wild harvest to cultured trade

Since the beginning, the marine aquarium trade has relied primarily on capture fisheries for its supply. In the ornamental trade, an estimated 95% of the freshwater fish come from farms, but on the marine side the number can be flipped – about 95% are still coming from the reefs of the tropics.

However, big changes are occurring.

#### Fish

In the 1960s, Frank Hoff, Martin Moe, and others pioneered the production of clown fish.

Even though production was possible, farms were unable to compete with the low cost of imported specimens from the Philippines and Indonesia, and for a long time captive production was limited to hobbyist and start-ups that did not survive for very long.

It was not until the 1990s that production technologies improved to increase growth and survival, and commercial farms started becoming viable.

With profit came investment in new



Red and blue mandarins.

species, and today in addition to all the clown fish, there are almost 100 species of fish in production at some level, including angelfish, seahorses, dotty backs, and gobies.

On the clown fish side, the inevitable color varieties also started appearing in hatcheries, and today Florida and others are producing fish that have no wild counterpart to compete with.

These "designer" clowns can capture a very hefty price per fish, especially until someone else starts breeding them (also an inevitable fact of the industry).

Despite all this, success was still limited to species that have relatively large eggs and/or some sort of parental care during the early life stages, which translated into being able to feed traditional food items like rotifers and artemia. The trade routinely includes over 2,000 species, so 100 is just a fraction of the market.

In the last few years, there have been significant breakthroughs in marine finfish culture, *See MARINE ORNAMENTALS, next page* 







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## **Marine ornamentals**

*Continued from previous page* and these advances are being put into play with some of the pelagic spawning marine ornamentals.

Fish like the mandarin goby are a great example of something that just a few decades ago was only available from the wild.

Research supported by the Association of Zoos and Aquariums and the Seaworld Busch Gardens Conservation Fund is underway to increase the number of species available from farms, and Florida is in the lead in that effort

#### Invertebrates, rocks, plants

The marine aquarium hobby was revolutionized sometime around 1980 when people discovered that if they made just a few changes in their filtration and lighting, they could not only do a better job of keeping fish, they also could keep a wide variety of other organisms in their home aquaria.

Florida's farms have taken full advantage of this growing trade.

Live rock is porous limestone that is covered with microorganisms, algae, and invertebrates, and serves as the foundation for marine reef aquariums.

Not only does the rock contain things that are interesting to look at, like feather duster worms, it also is home to bacteria that serve as the biological filter in an aquarium.

Collection of "wild" live rock was banned in state waters in 1989, federal waters of the Atlantic in 1996, and in federal waters of the Gulf in 1997.

Florida aquaculture stepped right in. Using federal and state water bottom



lease sites, producers deploy landbased limestone which can be easily distinguished from the "wild" rock when harvested.

Some producers have gone an extra step, creating "value added" live rock. After being well seasoned and covered with native species, the rock is brought onto land-based farms and "seeded" with more expensive, Indo Pacific invertebrates, such as polyp corals, or anemones.

Live rock serves as the base for a reef tank, but it is the other invertebrates, both hard and soft "corals" which give them their "bling".

Culture of most of these involve fragmentation or "budding" to create new material, and these farms look much like plant nurseries with shallow tanks full of racks of invertebrates being cultured.

Many have symbiotic alga associated with their tissues, so the greenhouses or lighted systems add even more to this image of a nursery.

Trends in this segment of Florida's production show some of the sharpest increases, especially in the number of certified producers.

Today, one can set up an absolutely stunning reef display, and every invertebrate in it will be from a Florida farm.

#### **Restoration corals**

Coral reefs are suffering on a global scale from a wide variety of stressors, and especially in Florida.

The state has experienced dramatic declines in the coverage of live coral on its shallow reefs.

Enter aquaculture.

Using offshore lease sites, flowthrough tanks along the coast, and even greenhouses inland, corals are being produced for restoration.

This year just one operation alone expects to "plant" some 30,000 colonies of staghorn coral (Acropora cervicornis) in waters off the Florida Keys.

Early studies have demonstrated that there is no significant difference bet ween survival and growth of corals produced in different situations, from open water to land-locked greenhouses, which has encouraged more efforts to expand this unique aspect of Florida's aquaculture.

Because these corals are heavily regulated, there has not been a good method for creating a "commercial" enterprise, but one never knows what may lie ahead.

In a nutshell, on the marine side of things, Florida has shown that there are indeed profitable and/or beneficial production opportunities, and as research continues it is safe to say this segment of the industry will only increase in size and scope.



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# Shellfish aquaculture

## Florida hard clam farming industry a unique success story

nlike the ornamental industry, shellfish aquaculture is a relatively new pursuit in Florida. Yet, in just over three decades, hard clams (Mercenaria mercenaria) represent the single, most important aquacultured food item produced by Florida's aquatic growers.

This industry traces its beginnings to the Indian River lagoon along the east central coast.

During the 1980s, unreliable sets of hard clams prompted harvesters to investigate aquaculture as an

alternative to fishing natural stocks. This transition

was facilitated by research conducted at Harbor Branch

Oceanographic Institution (HBOI), in which traditional culture techniques used in the Northeast were modified for Florida's subtropical, subtidal conditions.

The method used by the majority of clam growers in Florida is the bottom bag, which is made of a polyester mesh material.

The bag contains the clams in both field nursery and growout culture stages, providing predator protection as well as serving as the harvest device.

Since the early 1990s, hard clam culture has been on the fast track to

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A Florida work skiff designed for clamming with tumbler and grader located on the boat. Note the skiff features an open transom and roller rig which facilitates planting and harvesting of clam bags. USDA Rural Development photo

Over 100,000 seed clams are contained in this silo, or weller, at a nursery facility. Eric Zamora photo

their economic, resource management, and food production

interests to promote aquaculture production by leasing state-owned submerged lands and water columns.

Florida's warm waters and high natural productivity levels create a superb environment for growing molluscan shellfish.

See SHELLFISH AQUACULTURE, next page



means of economic

program graduates

were placed onto shellfish aquaculture

leases of 2-4 acres, the first leases to be

The state's progressive leasing

Dept. of Agriculture and Consumer

Services (FDACS), was the result of

program, administered by the Florida

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success on Florida's west coast - creating

jobs, producing incomes, and providing

recognition to the region's ability to be

a national leader in the production of

opportunities for the Florida fishing

regulations was the focus of federally-

introducing shellfish aquaculture as a

These community-based programs

aquacultured shellfish.

Expanding employment

industry affected by increasing

funded job retraining programs.

provided the infrastructure for

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## Shellfish aquaculture

Continued from previous page

Hard clam growth is almost yearround with a crop period of less than two years realized.

Seed are planted throughout the year, allowing for continuous availability of market-size clams.

This combination has allowed the industry to rapidly expand and attain national market share.

Florida clams are served at traditional clam bakes in the Northeast, high-end restaurants in California, and buffets at Las Vegas casinos, as well as being sold at national club stores and grocery chains.

Today, about 245 Florida growers in small-scale businesses produce millions of hard clams on 1,100 acres in 12 coastal counties.

In addition, 8-10 hatcheries produce over a half billon seed annually, 45 shellfish wholesalers process and ship clams, and other spin-off businesses including suppliers who sew the bags,

equipment manufacturers, and boat builders - have all flourished.

A University of Florida (UF) study conducted in 2007 (currently being updated for 2012) estimated that sales of cultured hard clams added \$53 million a year into the state's economy and supported over 600 jobs.

The hard clam culture industry has brought economic revitalization to many fishery-dependent communities with a second generation of farmers now making a living on the water.

Yet, over the past five years, the industry has been faced with increasing challenges.

Although none of the shellfish harvest areas in Florida were closed due to the presence of oil from the Deepwater Horizon spill in 2010, buyers and consumers perceived that seafood from the Gulf of Mexico was not safe.

Further, harmful algal blooms - in particular the red tide Karenia brevis

Harvesting clams from aquaculture leases located in the shallow waters of the Gulf of Mexico off the island community of Cedar Key. University of Florida IFAS pho

- have caused prolonged harvest closures in some growing areas of the state and market disruptions. Farmgate

prices for hard clams, which are sold primarily in the commodities market, are at an all-time low.

The prolonged economic recession is in part to blame. With higher



Harvesting clams from a shellfish aquaculture lease area (markers in background). If the harvest is successful, the contents of a polyester mesh growing bag will fill a bushel basket. Carlton Ward Jr. photo



This land-based nursery, known as the "clam condos," uses raceways on an aquaculture dock to rear millions of clams under semi-controlled conditions to a field planting size of about 6 mm. Eric Zamora photo

production costs, for example fuel, profit margins have become slimmer.

In response, several firms are adding post-harvest processing options, such as purging or freezing, to their product line to increase value.

Diversifying the industry by

developing farming technology and markets for other bivalve species could also increase economic stability and growth.

Currently, the sunray venus (Macrocallista nimbosa), a native venerid clam, is being investigated by UF and





Harvested clams are being washed (known in the trade as "tumbling") at a wholesale processing plant. Eric Zamora photo

HBOI research and extension faculty along with industry sectors for culture and market potential.

Recent oyster fishery failures experienced in the Gulf of Mexico region has stirred renewed interest in oyster culture.

This summer, the Florida governor and his cabinet approved several growers' requests for use of the full water column to accommodate off-bottom and floating oyster culture systems.

In addition to providing food and jobs, shellfish aquaculture is good for the environment – by providing ecosystems services – a claim few other farming efforts can justify making.

Clam farming demands the highest quality of water, creating positive impacts on land-use regulations.

For example, citizens of the island community of Cedar Key, which produces about 70% of Florida's clams, have worked together to protect the waters vital to the success of their commercial ventures.

Every septic tank has been eliminated, along with improved wastewater and stormwater treatment systems, acquisition and preservation of critical coastal properties, and adoption of a water-based ethic.

As long as coastal waters remain clean and people continue to enjoy high quality seafood products, the shellfish aquaculture industry in Florida should continue to prosper ... a success story unlike any other in the state.



Farm-raised Florida clams.





An attractive attribute of the sunray venus clam, along with its dense white meat, is the shell turns a orange-pinkish color when cooked. University of Florida IFAS photo



Above, the sunray venus clam, a native bivalve, is being considered as a potential aquaculture candidate to diversify the hard clam culture industry. University of Florida IFAS photo

Left, cooked Florida farm-raised clams are a nutritious seafood product. Eric Zamora photo



Harvested clams in baskets are being prepared for processing and shipping. Eric Zamora photo

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## **Reptile farming** Alligator, turtle production strong and growing in Florida

eptile farming is one of the most exotic sectors of Florida aquaculture, often involving rare and beautiful animals.

Florida's first alligator farm opened in 1893 and the continuous commercial production of alligators in Louisiana and

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Florida triggered the development of special rules by the US Fish and Wildlife Service to allow production after the American alligator was listed in 1967 under the thennew Endangered

This farming activity contributed to the delisting of

the American alligator from the ESA in 1987.

Reptile farming in Florida has expanded from the production of alligators, soft shell turtles and snapping turtles, to reptiles from all over the world - including very rare species like the Cuban crocodile and the painted terrapin.

Florida's fourteen alligator farms



This is the only albino Florida redbelly turtle known to exist. He is on loan to Dark Hammock Turtles from Clive Longden in a joint breeding effort. FDACS photo

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reported \$8.0 million in sales of alligator products in 2012, compared to \$4.1 million in 2005.

Most farms have

broodstock onsite to produce eggs but augment their stock by participating in egg and hatchling collection programs on public and private lands.

The public lands collections are run by the Florida Fish and Wildlife Conservation Commission (FWC) in cooperation with licensed alligator farmers.

Eggs from this collection are Marketing and Education

FWC implements a similarly structured hatchling collection program.

Eggs are held in incubators until hatching then hatchlings are raised in hothouses for

around 14 months when they are harvested. Products include

raw hides sold to international fashion markets, a variety of meat cuts, and hatchlings for growout at other facilities.

Also on the rise are turtle farms, increasing from 5 farms and \$222,000 in sales in 2005 to 28 producers and \$1.2 million in sales in 2012.

The increase in turtle farming may be attributed to the

FWC closure of all native, wild turtle harvesting for commercial use in Florida in 2009.

A large portion of native turtles sold from Florida was wild harvest prior to 2009, thus the closure transformed many turtle fishermen into turtle farmers.

Also, as a result of the rule change, turtle farms must rely on current broodstock, purchase broodstock from other existing farms, or purchase legally collected turtles from other states.

The turtle farming industry is divided into food production and animals destined for the pet trade.

There are over 100 species of native and exotic turtles cultured in Florida.

Almost all turtles native to Florida are cultured and aquaculturists have diversified their farm products to include a wide array of non-native, unusual species, and aberrant color morphs in high demand, to expand their available products.

Turtle eggs are collected from constructed laying areas, washed and incubated for around 60 days until hatching.

Hatchlings are typically shipped shortly after hatching.

Turtles intended for the food market include soft shells and snapping turtles and are sold as eggs, hatchlings, juveniles, or adults.

The majority of turtles produced in Florida are exported to China for further growout, consumption, or the pet trade.

As the pressures on wild reptile populations continue to increase, the importance and impact of aquaculture grow more critical.

Many turtle species in culture are rare and some have been virtually extirpated from their native range so it is vital that aquaculturists unlock the secrets to breeding and raising rare animals to aid conservation efforts.

MACUT

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sold to licensed alligator farms and the proceeds from sales are used to fund alligator research at FWC and the Florida Alligator Advisory Committee.





Water lilies being grown in a Florida nursery. Brandon McLane/Florida Aquatic Nurseries photo

othing completes an aquarium or garden pond like a variety of beautiful aquatic plants, and wetland restoration and mitigation projects require massive amounts of

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plants to do a good job.

Florida's aquaculture industry includes a segment that caters to both of these markets.

The earliest tropical fish farms in the state also produced and sold aquatic plants, many of them collected from the rivers, streams, and lakes of Florida.

With hundreds of springs, thousands of lakes, and several sizeable rivers – all located in a subtropical climate – the state is home to many native plants that are highly marketable for all of the above mentioned markets. Add to this hundreds of exotic species that can be readily adapted to captive culture in the state, and the aquatic plant industry has not only survived, but flourished.

While some wild collection still occurs, in the 1990s the state began to shift its focus to aquaculture for most native plants as well.

In the ornamental market, there are submersed, floating, and emergent plants.

For aquariums, most of these are submersed, which are divided into

two main groups: "bunch" plants, and rooted.

Bunch plants are usually those that can be grown easily from cuttings, but also include some of the "grasses" (not truly grasses) like *Sagittaria* and *Vallisneria*.

Producers will harvest half a dozen or so and bunch them together.

Rooted plants are sold either bare root or in containers, and include such plants as *Cryptocoryne* sp., *Anubias* sp., and *Echinodorus* sp.

In the late 1980s there was a major shift in production of many of these rooted species when nurseries started growing them in their emergent forms in greenhouses.

This allowed for the use of modern horticulture practices like fertigation and tissue culture to be employed, and has resulted in a product that is easier to handle and market.

North America is the main market for the aquarium trade in the world, and planted freshwater aquariums have grown in popularity.

Many hobbyists today are just as interested if not more, in the plants they grow, versus the fish they keep. Often the choice of fish is based on whether they will eat the plants or not.

Like the tropical fish industry, aquarium plants are tropical in nature, which gives Florida a competitive advantage in production in the US.

They are also marketed through the same channels as fish, and therefore it is common to have fish and plants together in the same shipment.

The other market for ornamental plants is for garden ponds.

This is where water lilies dominate, but Florida also produces a very wide





An aquarium nicely populated with a selection of aquatic plants. Pierre LePochat/WaterScapes Aquatic Plant Nursery photo

variety of floating and emergent ornamentals.

Many of these plants are sold as "annuals" as they do not overwinter in northern climates.

From a management standpoint, this presents a constant challenge to Florida producers as they try to predict their market potential each spring, performing a balancing act between meeting demand without overproducing. Water lilies have been in captive culture for a long time, and there is a constant effort by serious breeders to create new varieties, often times associated with national and/or global competitions.

The other area of aquatic plant production is wetland restoration, retention ponds, and mitigation sites using primarily native plants. As recently as the 1980s most of the

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You get some sense of the scope of the aquatic plant farming industry in Florida from this look inside a greehouse at a plant nursery. Brandon McLane/Florida Aquatic Nurseries photo



supply for these uses came from the wild, but today almost everything used for these purposes is coming from a dynamic aquatic nursery sector.

Projects vary between a small retention pond in a neighborhood, to hundreds of acres associated with a wetland restoration site.

Many of these plants are grown using traditional horticulture practices, and are marketed similarly. That is, as bare

root, quart, gallon, 3-gallon containers, etc.

These farms often work closely with wetland and environmental engineering companies to target their production to fulfill the needs of development.

As the demand for planted aquariums, water garden ponds, and wetland restoration increase, so will the demand for this segment of Florida's aquaculture industry.



## A quick tour around the Sunshine State Farms, folks, facilities: the bedrock of Florida aquacuture

or this special Focus on Florida Aquaculture issue of Fish Farming News, FFN roving columnist Bob Robinson traveled to the Sunshine State to look in on several farms and facilities for this month's From the Field report.

While by no means a comprehensive review of food fish and gamefish production in the state, his overview does provide a great snapshot look at some of the people who are key to Florida aquaculture and the diversity of the industry there. -Editor

#### Aquasafra

Tilapia fry and fingerling producer Located in Bradenton - on the state's west coast between Sarasota and St. Petersburg - Aquasafra is the result of a successful 20-year partnership between Mike Picchietti and Jim Riggin.

Their handson experience in aquaculture dates back to the late 1970s when both served stints in

the Peace Corps - Mike in Ghana and Jim in Costa Rica. They are both a little older and grayer now, but neither has lost the fire that first sparked their interest in aquaculture.

The Aquasafra hatchery employs culturing techniques to produce a nilotica-aurea hybrid that is white in color. Mike said this hybridization is key to producing an attractive, healthy, market-sized

fish that is highly sought after in live -

![](_page_23_Picture_9.jpeg)

**BY BOB ROBINSON** 

mostly ethnic - markets across the US.

A large part of the company's success is based on its 20-year reputation for providing fry and fingerlings that thrive in intensive aquaculture systems which demand a hardy fish.

Mike said Aquasafra has been successful at selecting and breeding fish that achieve strong growth rates in intensive systems while also

managing stress and minimizing disease issues

Aquasafra's customer base extends across a broad region, but Mike said a large and growing market is developing close to home - specifically in and around the Miami area.

Mike said a new wave of producers, primarily Cuban-Americans, have come online in the past three years or so and could, if present growth rates continue, develop a 5 million-pound-plus industry in South Florida.

Production systems, Mike said, are typically modified RAS set-ups using green water in tanks, raceways, and lined ponds.

The climate is right for outdoor production and Mike said this is allowing South Florida producers to keep their growout costs down and compete aggressively with producers in other regions.

This, he said, is having a major

![](_page_23_Picture_20.jpeg)

Ron and June Slay of Florida Fish Farms. Bob Robinson photo

![](_page_23_Picture_22.jpeg)

Above, the Aquasafra hatchery provides producers with a hardy nilotica-aurea hybrid fish that does well in intensive systems and is white in color, popular in ethnic live fish markets.

At left, Aquasafra's Mike Picchietti, left, and Jim Riggin. Bob Robinson photos

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![](_page_24_Picture_0.jpeg)

The sign at the entrance to Dugan Whiteside's property harkens back to the farm's origins. Dugan started the business growing eels but switched over to hybrid striped bass production several years ago. Bob Robinson photo

impact on live tilapia prices and markets across the US.

Mike, of course, is well known to many around the industry as the former US face of Regal Springs – a leading global producer of tilapia, with farms in Indonesia and Honduras.

He retired from Regal Springs a few years ago to focus more attention on Aquasafra and to free up his time to build a tilapia hatchery in Haiti with Operation Blessing.

Mike spends one week each month in Haiti helping oversee the hatchery that is currently producing about 400,000 tilapia fingerlings monthly.

The fish are grown out in lakes and fish ponds in Haiti to provide badly needed jobs and a locally grown food source.

For more information on the hatchery visit <www. obfishfarming.org>. For more information about Aquasafra, e-mail Mike at <aquasafra@aol.com>.

#### Florida Fish Farms

Grass carp, bass, bluegills and more

Taking a ride up I-75, I visited my good friends at Florida Fish Farms just outside of Center Hill, about 40 miles west of Orlando.

Many of you know the farm's owners, Ron and June Slay. In addition to being great people, Ron has a wicked sense of humor and is an outspoken cheerleader for aquaculture and the hardy survivors (like him) who are the backbone of US fish farming.

Ron left his job with what was then the Florida Game and Freshwater Fish Commission (new known as the FWC) nearly 25 years ago to cross over into the private sector.

I think he would be the first to tell you that decision was both a blessing and a curse.

The blessings, he says, are the freedom of being your own boss and the sense of satisfaction you get at the end of a good day of hard work.

Curses include the constant burden of dealing with too many rules and

I guess Dugan is proud of the story I did on his farm back in 2005. It was a good and interesting operation then and still is today. Bob Robinson photo regulations and the never-ending challenge of just simply trying to make a dollar at the end of the day.

To survive as a fish farmer Ron says you have to be ready to deal with the challenges you expect – like issues with hired help and pesky predators – while dealing with the ones you can't predict or plan for.

... Like fish dying at 4:30 in the morning when you are in the midst of spawning grass carp or bass.

... Or, finding out that a load of hybrid striped bass going to Israel has missed a connecting flight and the fish will now die from lack of oxygen.

If he had to do it all over again Ron admits that he would probably focus more on recirculating aquaculture.

Fish that are currently raised on his 35-acre farm include triploid grass carp, Florida largemouth bass, bluegills, redear sunfish, channel catfish, and koi.

Challenges notwithstanding, Ron

has mostly good things to say about fish farming in the Sunshine State.

"We have been blessed with a great Dept. of Agriculture (FDACS) and with good APHIS people (USDA's Animal and Plant Health Inspection Service) within the state of Florida.

"They know they are here to help, and actually do help."

Also key to Ron's success is a patient wife and his burning passion for what he does. His straight-talking approach has earned him many friends, and no doubt a few critics, over the years.

I, for one, am proud to have counted Ron as a treasured friend for more than 20 years and was happy to have the chance to visit him and June again for this report.

If you'd like to know more, check out the farm website at <www.floridafisharms.com>.

#### **Anguilla Fish Farms**

Hybrid striped bass

Regular readers of *Fish Farming News* may recall a feature I did on this farm some years back.

Located inland, southwest of St. Augustine on Florida's upper east coast, Anguilla Fish Farms is owned and operated by Dugan Whiteside.

The farm is named not for the island in the Caribbean, but rather for the European eel (*Anguilla anguilla*) since eel farming was the major focus of the operation for many years.

Dugan no longer raises eels and today the farm's See FROM THE FIELD, next page

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![](_page_24_Picture_37.jpeg)

## **From the Field**

*Continued from previous page* primary production is hybrid striped bass (HSB).

Another fish farming survivor, Dugan's education includes both bachelors and masters degrees in oceanography.

His first job was with the Virginia Institute of Marine Science (VIMS) where his work involved clams and scallops.

Somewhere along the way, Dugan developed an interest in glass eels and, in 1980, went into business with his father farming black eels in Florida.

Eel farming actually was more like eel ranching and was highly dependent on a supply of wild product harvested by local fishermen.

Catch rates were in steady decline for a decade (1987-97) and in 1998 Dugan decided to diversify into hybrid striped bass. By 2000 he was totally out of the eel production business and fully dedicated to HSB.

Growing out HSB fry/fingerlings

from Keo Fish Farms, Dugan is able to produce a 2-pound market-sized fish in about 18 months.

During growout his fish are fed a diet of 46% protein and 10% fat in an extruded floating pellet.

Production at Anguilla is in aboveground tanks, using a pass-through system with settling and water treatment in the final stages. This requires Dugan to have and operate under the restrictions of a National Pollutant Discharge Elimination System (NPDES) permit from the US Environmental Protection Agency (EPA).

Three production parameters he needs to monitor carefully to not violate the permit include: unionized ammonia; dissolved oxygen (DO); and a slight salinity (relating to well intake depth) in his incoming water supply.

Dugan's market is mostly for fish on ice, serving customers from Miami to

Montreal. He likes being his own boss and hearing positive feedback from

![](_page_25_Picture_14.jpeg)

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![](_page_25_Picture_16.jpeg)

Here's a good look at the growout tanks at Sunshiners. You'll see that they're outdoors under a cover of shadecloth. Bob Robinson photo

customers who appreciate the quality product he provides. They often tell him those are the best fish they've ever had.

Dugan said he struggles to find quality people willing to work at a wage that allows the farm to remain profitable. And, like other fish farmers, he spends lots of time dealing with cumbersome rules and regulations.

All in all though, Dugan said the positives outweigh the hardships and he's clearly not about to quit farming fish anytime soon.

For more information call the farm at (904) 692-1050.

#### Sunshiners

Hybrid striped bass

Just a short drive south of Anguilla Fish Farms lies another hybrid striped bass farm, Sunshiners.

Run by Kurstan Noles for owner Charles Lane, this farm (as the name indicates) initially focused on raising golden shiners for the baitfish market. Kurstan comes by fish farming naturally – his father was Dugan's righthand man at Anguilla for many years before passing away.

Sunshiners raises its fish in round tanks, outdoors under shade cloth. Each tank holds roughly 1,700 gallons of water and will support approximately 800 fish – or up to 1,200 pounds of production per tank.

Oxygen is supplied by an air blower system using 9" airstones supplied by Aquatic Eco-Systems. The goal with aeration is to maintain 5 ppm or better dissolved oxygen (DO).

Production water is pumped all throughout the property and 90% is recirculated back into the system after it has been treated onsite in the farm's settling area.

Both the pumps and air system are backed up by five propane generators at 75kw each.

Kurstan has about a 25-minute window to deal with a power outage

![](_page_25_Picture_32.jpeg)

when his fish are at market size. So, the back-up generators are on a sensor to come on when the power drops – which can happen frequently during summer thunderstorms in Florida.

The largest cost of production on this farm is energy input, Kurstan said.

Fish are fed once daily using a 45% protein, 12% fat floating feed.

Kurstan said he can produce a 1-pound fish in 12-14 months. The farm harvests fish at anywhere from the 1-pound to 2-pound size,

depending on market conditions and time of year.

His primary market, like Anguilla's, is for whole packed fish on ice, but Sunshiners also sells about 5%-10% of its annual production into the live market.

Kurstan said he is currently servicing customers from Miami to Maryland along the Eastern seaboard, and as far west as Louisiana.

The market is good and he would like to grow but said, "Regulations stunt the growth of the farm.

"The best part of this job is I love fish. "It's extremely hard work, but when you see the fruits of your labor, it's definitely worth it."

For more information on Sunshiners you can call the farm at (386) 937-2958.

![](_page_26_Picture_10.jpeg)

#### **Evans Fish Farm** *Sturgeon, tilapia*

Keep heading south, and a little inland west of Daytona Beach, and you'll eventually come to the 1,700-acre spread near Pierson known as Evans Farms.

A family-run business, this impressive operation includes timber harvesting, cattle ranching, a hunting reserve, and of course, fish farming.

Owned by Gene and Marilyn Evans, the Evans Fish Farm portion of the business focuses primarily on sturgeon production with tilapia as a secondary crop.

The farm raises Siberian, sevruga, osetra, and beluga sturgeon in tanks and is a respected producer of top quality, sustainable, farm-raised caviars. Gene and Marilyn Evans with their black lab, Blue, named after beluga sturgeon. Bob Robinson photo

They also raise tilapia in ponds as a tool to keep algae under control and sell those fish as well.

Sturgeon production tanks are made of concrete and, coincidentally, Gene also owns a concrete business. No discharge water leaves the farm, making it a "green" facility for sure.

Water quality and maintaining correct water temperatures are vital to sturgeon growth.

The Evans farm strives for and typically averages dissolved oxygen levels of 6-7 ppm, and 5 ppm is the absolute lowest DO level allowed.

Oxygen is produced by water flow pumping and aeration with airstones. The pumps and blower are backed up by stand-by generators in the event of power outages.

You might think of sturgeon as coldwater fish and, in the wild, they often are. But Gene said that through experience he has learned that a production system temperature of about 26°C (79°F) provides an ideal environment for healthy sturgeon growth. A fish that Gene would love to try rearing

![](_page_26_Picture_23.jpeg)

This sign marks the entrance to the Evans property, a diverse 1,700-acre spread that encompasses timber harvesting, cattle ranching, a hunting reserve, and the fish farm. Bob Robinson photo

> is the shortnose sturgeon. He feels it is a strong candidate for farming – but since it is a protected species it cannot be grown in captivity at this time. See FROM THE FIELD, next page

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![](_page_26_Picture_28.jpeg)

## From the Field -

Continued from previous page Perhaps at some point in the future the government will permit a culturing program specifically for purposes of wild stock enhancement.

Predator control is an imporant element of managing the fish farm, Gene said. Cormorants are an ongoing issue, but are kept in check thanks to a federal depredation permit. Wild hogs and alligators can also cause potential problems at any time.

Gene and Marilyn manage the farm, but they are helped out by their daughter, Jane Davis (who many of you know), grandkids, additional family, hired labor, and their black lab, Blue.

Jane has worked for the Disney folks for as long as I can remember, serving as the aquarium curator for the Living Seas exhibit and also overseeing the landbased aquaculture exhibit at Epcot.

She spends many weekends on the farm and is always just a phone call away to give advice or help out with a problem.

Gene, who before getting into aquaculture spent time diving on shipwrecks as a treasure hunter, knows something about risk versus reward.

When it comes to fish farming, he is blunt, "You don't make money losing money. You have to sell value.

"Florida is a great state for aquaculture. We need more farms, bigger farms, producing product in an environmentally responsible fashion.

"The Dept. of Agriculture (FDACS) is one of the best in the entire US and the universities here back us up."

If you want to engage in conversation with Gene, feel free to shoot him an e-mail at <gene.evans@mpi.net>.

#### **Mote Marine Laboratory**

Aquaculture Research Park Located just outside Sarasota, back on Florida's west coast, is Mote Marine Laboratory's Aquaculture Research Park.

As you enter the rural grounds of the park, the paved road is lined with majestic live oaks draped with hanging Spanish moss, giving the impression that you may have traveled back in time.

But you are soon brought back to the present, and even given a preview of the future, once you enter the facility and see the amazing work underway there.

Mote, as many readers will know, has been a leader in marine research since the independent nonprofit organization was founded back in 1955. They really began to ramp up their work in aquaculture with development of the 200-acre aquaculture park beginning in 2001.

Today, Mote's research programs at the aquaculture park are focused on developing new, cost-effective systems for growing marine and freshwater fish, plants, and invertebrates, using environmentally sound practices. This work includes investigating new species for development towards possible commercially viable production.

One such species is sturgeon. Jim Michaels, you might say, is the

brains behind Mote's sturgeon project. Jim's background includes working with tilapia and 17 years of growing white sturgeon in California. I actually visited his farm outside of Sacramento in the late 1980s and was very impressed.

After joining Mote, Jim knew that one of the keys to proving the feasibility of the recirculating aquaculture systems in use at the park's inland location was

![](_page_27_Picture_20.jpeg)

to work with high-value species. This is where his sturgeon experience came into play.

After plenty of research, Jim and his team selected Siberian sturgeon as the ideal candidate for study at the Mote park.

Consulting with US recirc experts Tom Losordo and Ron Malone, along with Peter Steinbach of Germany, Jim and the Mote research team developed a RAS system designed to be commercially profitable and environmentally sound. And then they set about proving their concept.

The market for the relatively slowgrowing sturgeon is both meat and, eventually, caviar.

Mote's fish provided their first caviar

harvest in 2006 and, at that point, it looked like the program would see a profit beginning in 2007.

Unfortunately, Mote was hit with two major setbacks; first a serious fire that destroyed a good bit of the team's work; and then the global economic nosedive that sent caviar prices spiraling downward by as much as 50%.

But, the program persevered. And now, the market for sturgeon meat has developed to where the facility can't produce enough fish to meet demand.

I asked Jim to give me an overview of where his program stands today.

Explaining that the captive, cultured fish at Mote mature much faster than their counterparts in the wild, Jim said his sturgeon are reaching sexual

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Staff moving sturgeon at Mote. Great care is taken in handling these highvalue fish.

Bob Robinson photo

maturity in 4-7 years – roughly 1/3 of the time it would take in the wild.

So, obviously, with these captive fish, caviar harvest comes quicker.

Jim said fish in the growout portion of his system are fed a diet of 45% protein, 19% fat. This is provided using a Skretting extruded, slow-sink feed that is delivering a feed conversion ratio (FCR) of about 1.65:1.

In the hatchery, Jim's team uses a richer diet to achieve consistent FCRs of 1:1.

The basic RAS production system at Mote is relatively simple, but effective.

Water is pumped once and then gravity is used whenever possible to move the water through purification, prior to recirculating it back into the culture tanks.

A rotating drum filter removes solids, followed by a media tank for ammonia removal, then CO2 stripping, UV sterilization, and then the water is pumped back into the tanks for reuse.

The sturgeon facility replaces just 12% or less of its water used daily. The recirculated water is a very good quality and looks like you could drink it. Ideal temperature for these fish, by the way, is 20-22°C (68°-72°F), Jim said.

Last year's total production was in the range of 40-50 metric tons of sturgeon meat along with about 1.6 tons of caviar.

You might say a mark of the program's success is the current situation – where the demand that Jim and his team have created for sturgeon meat now exceeds production capabilities.

The caviar business is more problematic. Jim said cheap, inferior imported product (where have we heard that before?) and the slowly recovering global economy continue to hold caviar prices down.

That said, I came away very impressed with the foundation Mote has laid for sturgeon farming on a sustainable, environmentally friendly, commercially viable scale.

Leaving Jim, I walked next door and met with Dr. Kevan Main, director of the Mote Aquaculture Park and head of the marine and freshwater research program there.

The goals for the research program, as I mentioned earlier regarding the sturgeon work at Mote, are twofold: to

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Dr. Kevan Main, director of the Mote Aquaculture Research Park and its many programs, shows me an aquaponics project underway at the park. Bob Robinson photo

develop inland marine recirculating systems; and to develop culturing methods – for emerging species for human consumption – and for restocking declining wild fisheries.

Kevan oversees multiple programs including work with snook, pompano, amberjack, and saltwater plants.

One of the more interesting projects her research team is currently working on is a integrated marine fish and plant system – where high nutrient water is filtered through trough beds of saltwater plants to clean it up (there is no saltwater discharge from her operations).

The harvest is native aquatic wetland plants that are used for remediation purposes.

Kevan said one of the biggest hurdles she faces on a daily basis is securing a consistent funding stream to overcome the challenges of researching and

![](_page_28_Picture_25.jpeg)

developing large-scale marine fish production systems.

Too often, she said, just as her teams are making solid progress toward developing new systems or species, the money dries up.

But, Kevan continues to have an optimistic outlook.

"One of the biggest hurdles facing US aquaculture today is the lack of technology for (producing) high-value candidate species."

Clearly, Mote has the facilities, the tools, and the expert people to help solve that problem.

For more information visit <www. mote.org/aquaculture/>.

See FROM THE FIELD, back page

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![](_page_28_Picture_38.jpeg)

Black gold: caviar from the farm-raised sturgeon at Mote.

Mote Marine Labs photo

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#### FROM AROUND THE INDUSTRY

*Continued from page 5* 

'We've come a long ways in three years," said Catherine Emrick, senior associate aquaculture innovation,

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Tides Canada.

"What this technology provides is not only a better way to produce Atlantic salmon but also a better way to develop

a diversified aquaculture industry that takes advantage of the infrastructure and resources already present."

"For the first time, this industry is seeing a technology that is scalable and gets a return on investment," said Norman McCowan, president of Bell Aquaculture.

The Freshwater Institute designed a closedcontainment system for

Steven T. Summerfelt, director of aquaculture systems research for the Freshwater Institute, presents at this year's . Aquaculture Innovation Workshop.

Ryan Hagerty photo

Bell to raise its signature perch on land that conserves water, reduces fertilizer use, and provides chemical- and pesticide-free healthy fish for human consumption.

The collaborative effort in this industry is the number one key to moving forward, and I am seeing a lot of that here," said Chris DePalma, CEO of SweetSpring Salmon Inc., who attended the Aquaculture Innovation Workshop.

"As time goes on we'll find more sustainable ways to produce this (seafood) protein.

"The recirculating aquaculture system technology is potentially revolutionary."

Presentations from the Aquaculture Innovation Workshop 5 are available for download at <http://tidescanada. org/salmon/aquaculture-innovationworkshops-and-reports/>. /ffn/

## Support urged for bill introduced to amend Lacey Act

WASHINGTON, DC – US Rep. Rick Crawford, (R-AR) has introduced the Aquaculture Risk Reduction Act (H.R. 3105) to amend the Lacey Act, with provisions important to many fish farmers.

His amendment is intended to prevent prosecution of fish farmers if regulated species are accidentally included with live shipments that cross state lines or are imported into the US.

In essence, this simply restores protection that previously existed.

Until the law was amended in 2008, accidental violators of the 100-year-old Lacey Act could not be prosecuted. US Fish and Wildlife Services (USFWS) had to prove that accused offenders had knowingly violated the act.

But it stands today, fish farmers who accidentally violate the Lacey Act provisions can be subject to penalties starting at \$100,000 for almost any offense.

Information about the Crawford bill can be found here: http://thomas. loc.gov/cgi-bin/bdquery/D?d113:10:./ temp/~bdbw6p:://bss//.

In a recent industry update, the National Aquaculture Association (NAA) encouraged fish farmers to urge their congressional representatives to support the Aquaculture Risk Reduction Act (H.R. 3105) and send letters of support to: The Honorable Doc Hastings, Chairman, House Committee on Natural Resources, 1324 Longworth Building, Washington, DC 20515.

The NAA further suggested faxing those letters of support to either the committee's fax at (202) 225-5929, or to Rep. Hastings' office fax at (202) 225-5816. /ffn/

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#### FROM AROUND THE INDUSTRY

#### International WorkBoat Show 2013

Oct. 9-11. Exhibition. New Orleans, LA. Contact (207) 842-5508 or visit <www.workboatshow.com>.

## Establishing a HACCP Program for the Feed Industry

Oct. 14-17. Feed manufacturing short course. Hilton Garden Inn, Manhattan, KS. Contact (703) 524-0810 or visit <www.afia.org>.

#### Japan High-Value Finfish Aquaculture Symposium

Oct 16-20. Symposium, field trips, and workshop, *Aquaculture Sushi 101*. Kagoshima, Japan. Visit <www.was.org>.

### Interstate Shellfish Sanitation Conference

Oct. 26 – Nov. 1. Biennial meeting. St. Anthony Hotel, San Antonio, TX. Contact (803) 788-7559 or visit <www. issc.org/2013biennialmeeting.aspx>.

#### Aqua 2013

Oct. 28-31. 15<sup>th</sup> aquaculture congress and trade show. Hilton Colón, Guayaquil, Ecuador. Visit <www.cnaecuador.com/aquaexpo>.

#### **Elsevier Aquaculture 2013**

Nov. 3-7. Conference. Las Palmas, Gran Canaria. Visit <www.aquacultureconference.com>.

#### 8<sup>th</sup> International Aquaculture Forum

Nov. 6-8. Conference and trade show. Tuxtla Gutierrez, Chiapas, Mexico. Visit <www.fiacui.com>.

#### **Aquamar Internacional**

Nov. 6-8. Seafood expo, conference, workshops. Mazatlan, Sinaloa, Mexico. Visit <www.aquamarinternacional.com>.

#### AFIA Equipment Manufacturers Conference

Nov. 7-9. Conference. Omni Amelia Island Plantation, Amelia Island, FL. Contact (703) 524-0810 or visit <www. afia.org>.

#### Expo Pesca/Acui Peru

Nov. 7-9. Conference and exhibition. Lima, Peru. Visit <www.thaiscorp.com>.

## 12th International Symposium on Aquaculture Nutrition

Nov. 20-22. Conference. Villahermosa, Tabasco, Mexico. Visit <www.ujat.mx/interioradentro. aspx?ID=17901&NODO=16>.

#### AFIA Regulatory Training Short-Course

Nov. 20-21. Short course. Renaissance Arlington Capital View, Arlington, VA. Contact (703) 524-0810 or visit <www.afia.org>.

## International Coldwater Prawn Forum

Nov. 21. Conference. London, United Kingdom. Visit <www. conferencemanager.dk/icwpf2011/theevent.html>.

#### 7<sup>th</sup> International Algae Congress

Dec. 3-4. Conference themed, Succesful Algae Applications in Aquaculture and Agriculture. Hamburg, Germany. Visit <www.algaecongress. com/page/3789>.

#### Asia Pacific Aquaculture 13

Dec. 10-13. Conference and trade show themed, *Positioning for Profit*. Ho

### Chi Minh City, Vietnam. Visit <www. was.org>.

#### 5<sup>th</sup> International Oyster Symposium

Dec. 10-13. Conference held jointly with Asian Pacific Aquaculture 13. Ho Chi Minh City, Vietnam. Visit <www. worldoyster.org/sympo/ios5/ios5\_info\_e. html>.

Coming Events is based on the information available at the time the column was written. Before making plans to attend an event, check with the contact to be sure there have been no scheduling changes.

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## From the Field

**Pentair Aquatic Eco-Systems** *Engineering, systems, supplies* 

Many of us are still adjusting to the name change since Apopka, FLbased Aquatic Eco-Systems (AES) was acquired last year by Pentair Inc.

But no focus on Florida aquaculture would be complete without a nod to what is now known as Pentair-AES.

Founded in 1978 by Bob Heideman, the company initially specialized in aeration and destratification of lakes and ponds.

Bob published his first catalog in 1981 and it included airstones of various sizes (that AES manufactured) and a variety of other useful products for lake managers and fish farmers.

The rest, as they say, is history. Over the ensuing years, AES grew to be a world leader in the supply business.

Every farm I visited during this Florida trip had an AES catalog sitting on a desk or shelf – and that's true pretty much everywhere I go. They really are the Grainger of aquaculture.

AES was where many of us in the

Though fish farmers may know Aquatic Eco-Systems best from the company's massive catalog, this sign greets visitors to the Pentair-AES offices and warehouse near Orlando. Bob Robinson photo

Continued from page 29

industry got our start, me included, and we all watched with interest as the company expanded into many new and different markets including: aquariums, pond and water gardens, wastewater management, aquatic habitats, aquatic engineering and design, consulting, and more.

Sadly, Bob passed away a few years ago but the company and his legacy live on.

In 2012 AES was purchased by Pentair, a global leader in the design, manufacture, and distribution of equipment, technology, and engineered solutions for the handling and treatment of water.

At about the same time, Pentair also

acquired Point Four Systems based in British Columbia, Canada. Point Four is probably the most skilled company I know in understanding dissolved gases and, specifically, oxygen systems and design.

Both AES and Point Four are now under the direction of the Pentair Aquatic Systems group, based in Sanford, NC. That group includes two of the most knowledgeable people in the industry when it comes to dealing with intensive aquaculture systems for aquaculture – Dr. Tom Losordo and Dennis Delong.

Team those guys up with Pentair-AES's Amy Stone, Huy Tran, and Brian Catanzaro and you have a top flight group of professionals that will help the aquaculture industry grow in Florida and elsewhere.

For more information visit <www. aquaticeco.com>

#### Final thoughts

It seems obvious from my recent visit, supported by other stories you will read in this special Focus on Florida Aquaculture issue, that aquaculture in the Sunshine State has great potential.

In addition to the farms, businesses, and institutions highlighted in this issue, more start-ups, more growth, and more excitement is in the wings. I know of two upstart shrimp facilities in the state that are either already up and running or in the advanced planning stages.

A sturgeon hatchery project that is in the works up in Florida's Panhandle region has the potential to hugely expand production of that species within the state.

From low-tech ponds to high-tech RAS facilities, from ornamentals to gators to sturgeon, Florida aquaculture is diverse – with opportunities for growth at any scale.

There was a common theme heard throughout my visits around the state: high praise to the University of Florida and to the state Dept. of Agriculture (FDACS) – and specifically for Paul Zajicek.

People said, "This is how it is supposed to work."

The state, the academic community, and industry all working together to solve problems and grow business. What a concept.

Combine that approach with the dogged determination of Florida's fish farmers, and the natural advantages of a long growing season and close proximity to major markets, and I think it is safe to say Florida aquaculture is definitely on the move.

Bob Robinson is director of sales and marketing at Kasco Marine Inc. He can be reached via e-mail at bob.r@ kascomarine.com>.

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