The sale of clams and seed clams was one of the brightest stars in Florida’s aquaculture picture last year, according to the report “Active Aquaculture Producers” released recently by Florida’s Agriculture Statistics Service.

The report shows an increase in clam sales from $12.7 million in 1997 (earned by 318 producers) to $15.9 million last year (earned by 351 producers). This represents 18.6 percent of all aquatic products raised and sold in Florida—not bad for a fledgling industry that utilizes only a tiny portion of the coastline.

Leslie Sturmer, UF/IFAS multi-county extension faculty in Cedar Key, has helped shepherd the industry and was understandably pleased with last year’s results.

“Industry observers predicted a bumper crop for 1999,” said Sturmer. Despite several adverse weather events in the past three years (too much fresh water provided by El Niño and then a very high salt content from La Niña’s drought), clam sales increased by 25 percent, and production by 35 percent. That clearly shows they’re still on the rise.”

To top it off, an $863,000 grant was recently awarded by the U.S. Department of Agriculture for a Florida hard clam project. Those involved include Florida’s Department of Agriculture and Consumer Services/Aquaculture and several UF/IFAS Department of Fisheries and Aquatic Sciences faculty: Drs. Shirley

Continued on page 3.
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The following UF/IFAS faculty and staff are available to answer questions or provide technical support for aquaculture, fisheries and aquatic sciences, and pond management. Feel free to contact them.

Holly Blalock, a native of Murray, Kentucky, recently finished her Master’s thesis Community Ecology of Three Species of Florida’s Freshwater Clams. She did so by spending many hours in the New River—one of North Florida’s most obscure waterways. This little blackwater river is a haven for several species of clams, supporting the largest remaining population of oval pigtoe clams (*Pleurobema pyriforme*) left in the country. It also holds the only known, surviving population of Suwannee moccasinshell (*Medionidus walkeri*). As Holly points out, freshwater mussels are important aquatic animals for most rivers. They filter water, process nutrients for other aquatic animals to utilize, and are a food source for many species of fish, birds, and mammals. They’re also in decline in many watersheds for a variety of reasons. Sixty fresh water species are known from Florida, but many are imperiled and seven are listed as endangered or threatened.

The blackwater New River, naturally stained with tannins from the surrounding watershed, was a tough site from which to collect samples. The deepest pools were seven or eight feet deep, with zero visibility for divers. Holly had to work by feel alone, groping deep into the sand with bare hands, to feel for clams. Shallow stretches were sampled while wading.

Study areas were marked to prevent the same area from being sampled twice. Ice scoops were used to shovel bottom sediments into sieve baskets, which filtered out the sand, leaving only shells, live animals and debris for study.

Holly’s husband Jeffrey Herod, US Geological Survey fisheries biologist, helped out—as did a number of summer volunteer undergraduates. Happily, the group had no close encounters with snapping turtles, alligators or large fish. The study lasted eight months, with interruptions during high rains.

Holly found invasive Asian clams (*Corbicula fluminea*) were fairly abundant, and may be impacting native clam stocks. The invasive clams were removed from Holly’s sampling area. She is not yet ready to say if the Asian clams are displacing the natives, or how they got there.

Some 200 mature clams were collected and brought back to the lab for examination. Federal collection permits were obtained for the project, which included a few endangered species.

As a result of this study, Holly noted the following:
- Several species of native clams, that have been collected in the past, were not found during this study.
- Habitat preferences were established for a couple of species.
- Habitat didn’t seem to affect shell morphology (outer structure).
- Endangered clams were not found near high densities of Asian clams.

Holly is now working as a fisheries biologist with the USGS, Florida Caribbean Science Center in Gainesville. She will soon begin work on a PhD under the guidance of Dr. Shirley Baker.

Dr. Chuck Cichra was Holly’s master’s advisor.
Florida’s total aquaculture sales generated $86 million last year—less than the $102 million record set in 1997. The drop was mainly due to a decrease in tropical fish sales, traditionally the state’s biggest seller. All told, there were 7,585 acres of land or bay bottom in Florida devoted to aquaculture in 1999.

**Results of Florida’s 1999 aquaculture production survey:**

**Tropical fish**—constituted half of the state’s sales with sale totals of $43.1 million, down $14 million from 1997 figures. Most of the decrease resulted from lower sales of live-bearing fish (such as guppies, mollies, platties and swordtails).

Some 48.2 million square feet of water surface area in Florida is used to produce tropical fish, most of it centered in Polk and Hillsborough counties.

**Aquatic plants**—had sales of $13.6 million or 15.9 percent of Florida’s total sales. These figures are only for farm produced plants used in wetlands restoration, for food, and in the aquarium and water gardening market. It does not include the sale of plants harvested from the wild.

**Shellfish (other than clams)**—experienced sales of $6.3 million or 7.5 percent. Most of these were post–larval shrimp exported to South American shrimp mariculture ponds. Crawfish and freshwater shrimp were also produced.

**Sports and gamefish**—constituted 0.7 percent, with sales reaching $620,000. This was a drop from $1.04 million in 1997. There were 16 growers who reported sales.

**Other aquatics**—reported sales of $450,000 or 0.6 percent. Twenty-seven growers used 120 acres of water to raise eels, softshell turtles and other crops.
An evaluation of sturgeon fry growth comparing continuous feeding of live brine shrimp (Artemia) versus decapsulated brine shrimp eggs has just been completed. The continuous artemia delivery system included two artemia containers (hatching jars), a two chamber bellows-type pump, and a laboratory timer.

Once a day, the required amount of hatched artemia and decapsulated eggs were transferred to the individual containers and the timer set to pump every 30 minutes into the nursery tanks.

Major advantages of the system include significant reduction in labor compared to hand feeding and increased fry growth due to multiple feedings.

Study results showed over a 30% increase in fry growth with the continuous feeding of live artemia versus decapsulated brine shrimp eggs. The next phase of this project, which is funded by the Florida Wildlife and Conservation Commission, is to evaluate sturgeon fingerling growth using various commercial diets.

Another Atlantic sturgeon project, funded by Florida Sea Grant, is evaluating fish growth in tanks and in ponds. The tank growth study is being conducted in cooperation with a local farmer and has been underway for five months. The pond evaluation is expected to begin this winter.

**Goldfish School**

In October, a pilot 4-H goldfish program is scheduled to begin. This will provide an opportunity for 4-H students, ages 10 and up, to learn many aspects of caring for a fish. These include fish health, water quality, nutrition and feeding. Participants will attend a field day at the farm on October 7 to learn about fish, aquarium setup and maintenance, and how to feed and care for their fish.

Goldfish will be supplied along with much of the necessary equipment and supplies, courtesy of various company sponsors and, in part, by individual sponsors that the children have identified. Participants will record their goldfish experience during the seven-month growing period and present this information along with their fish in a 4-H District II event scheduled for May, 2001.

**Department of Fisheries and Aquatic Sciences Gainesville**

**Fishing For Success a Summer Hit!**

The Department was a bustling place this summer. The Fishing For Success (FFS) aquatic youth education program attracted nearly 1300 participants from Gainesville and around the state including groups from the YMCA, 4-H, UF Gator Lab, Florida Museum of Natural History, public and private schools, and summer camps.

Despite the heat and humidity, everyone enjoyed learning about fish, aquatic invertebrates and plants. Fishing for largemouth bass, sunshine bass, bluegill, and channel catfish was also a big hit. (Many fish were provided by the Florida Fish and Wildlife Conservation Commission).

We also saw increased participation by rehabilitative organizations in need of therapeutic recreational activities for patients. FFS was able to accommodate them by working with the U.S. Geological Survey, which provided handicapped-accessible fishing facilities.

All groups expressed delight and satisfaction with the hands-on nature of the program.

**Shellfish Aquaculture Cedar Key**

**Update on Pilot Clam Crop Insurance**

The pilot crop insurance program for cultured clams is in its first year of evaluation for growers in several Florida counties. During that time, a steep learning curve was experienced by growers involved in the program, as well as insurance agents, crop adjusters, and USDA/Risk Management Agency insurance specialists.

Now that several clam losses have been reported, the mechanics of implementing an insurance claim are just beginning to be worked out. Unfortunately, when losses do occur, it may not be so easy to pinpoint the cause of death, especially if mortalities are the result of several environmental factors.

This is of special concern, since the policy clearly places the burden of proof on the insured grower for this information. Insured causes of crop loss include hurricane, tidal wave, storm surge, windstorm, freeze, increase or decrease in salinity, oxygen depletion, and disease.

Clam farmers can obtain required weather documentation for insurance settlements by contacting their county extension office.

**Water Quality**

Along with the new clam crop insurance program came the realization that water quality data were needed to help assess conditions on the clam leases. To remedy this, a continuous water quality monitoring system was put into place this year, with data loggers on temporary loan from the UF/IFAS Tropical Aquaculture Laboratory in Ruskin.

Monitoring was conducted in cooperation with the Florida Department of Agriculture and Consumer Services, Shellfish Assessment Section (SEAS) field personnel in Cedar Key.

Two monitoring sites...
were established at lease areas in Levy and Dixie Counties. As a result, data on water temperature, salinity, dissolved oxygen, and pH have been recorded every 30 minutes at these sites. The new source of continuous data reveals important details of variability over short periods of time — which wasn’t available from manual monthly sampling conducted by SEAS.

Data collected so far have already proven to be beneficial:

♦ Growers are now able to make informed decisions about when to plant and transfer seed. For example, when northwest winds prevailed, salinities dropped by 12 ppt in less than a 48-hour period on several occasions. Planting nursery bags at that time could have been stressful to small seed. Growers meeting their leases can now be field-tested with growing nursery bags at that time could have been stressful to small seed.

♦ Comparing crop losses with water quality and weather events, provides evidence for both growers and insurance companies.

♦ It will also help the industry to begin refining management practices, resulting in improved production and profitability.

Growers can now obtain water quality information each month at the Levy and Dixie County Extension offices. Monthly graphs are also posted to the Florida clam e-mail discussion group: CLAMNL@lists.ufl.edu

For more about water quality monitoring, read about the CLAMMRs project on page 3.

Record keeping
Another requirement included with the crop insurance program is the need for growers to keep track of clam production on their leases. Computerized spreadsheets are now being developed by Sea Grant marine economist Dr. Chuck Adams. They will be used to keep records of crop inventories; planting and harvesting activities for both nursery and grow-out phases; calculation of plant yields (survival); and crop times. The spreadsheet format will also allow farmers to track records of farm income, production costs and other expenses. The computer program will be field-tested with growers to get their opinions.

Growers meeting
A meeting held this past August in Cedar Key, allowed growers to provide input and comments to USDA Risk Management Agency representatives concerning crop insurance. This dialogue is necessary to make policy improvements during the pilot phase.

Contract changes for the 2001 crop were posted by September in the USDA Risk Management Agencies‘ web site: www.act.fcic.usda.gov

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Tropical Aquaculture Laboratory
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If tropical fish farmers were to list the nuisance species of most concern on a fish farm, one would certainly hear about troublesome aquatic plants, birds, snakes, frogs and turtles; all pose a threat to fish, either by reducing productivity or actually loss to predation. However, one animal found on fish farms poses a direct threat to the fish farmer himself, the lowly fire ant (Solenopsis invicta). Fire ants were accidentally introduced from South America into the port of Mobile, Alabama in the late 1930s. They out-compete native ants, thrive, and continue to expand their range throughout the southeast U.S., and northward. Many researchers are working toward the control and eradication of the species.

One of those individuals is Dr. David Oi, a research entomologist with the University of Florida. Oi is working cooperatively with our UF/IFAS Tropical Aquaculture Lab in Ruskin, to conduct a study on the use of Extinguish fire ant bait to control fire ants on fish farms.

Our 7-acre research demonstration farm was divided into three sections for this experiment: an Extinguish treatment area, and two untreated control areas.

Ant mounds were counted and treated on March 13. The area was re-sampled on June 29. During that time, untreated control areas showed a 62% increase in the number of mounds: 63 active mounds when the experiment began, and 102 active mounds on June 29.

The treated area showed an 80% reduction in the number of active mounds (102 active mounds were reduced to 9 active mounds). The farm was sampled again on August 17. The number of active mounds in the treated area had not increased. More sampling will be required, but preliminary results look promising.

When asked about the study, Dr. Oi stated, “It looks good so far...There has been a dramatic reduction in the number of mounds in the treated area. Now we are waiting to see how long it will be before the ants return.”

Extinguish contains the active ingredient Methoprene, also used as a mosquito larvicide. Toxicity to aquatic organisms is low, and during this study, there have been no fish mortalities. Extinguish costs about $8 per pound (depending on quantity purchased) and can be found at most farm supply stores. Some distributors of this product are Terra, BWI, VW and R, Lesco, VAP and VHP. Also, you can contact Wellmark International (marketers of Extinguish) for more information. Extinguish is not readily available at retail outlets.
Submission of Fish for Diagnostic Evaluation
Ruth Ellen Klinger and Ruth Francis-Floyd

Introduction
Determining the cause of a fish’s illness and death can be difficult and frustrating for anyone who works with fish. Disease problems are commonly misdiagnosed and fish are often incorrectly treated with over-the-counter medications.

A vicious cycle arises when the first treatment doesn’t work and another one is tried, then another, and so on. Not only is this method a waste of time and money, but it usually does more harm than good to the fish in question. In addition, over-treatment, and the time lag from problem onset to submission could allow secondary infections, caused by an agent(s) that invades fish tissue after the damage by the initial agent has occurred, to take hold. Therefore, it is important to contact a diagnostic laboratory as soon as the problem occurs to prevent misdirection in your fish health management plan.

When fish become sick or die, the first response should be to find out why. The sooner the cause of their demise is determined, the faster a response can be taken to rectify the situation. Whether it is a pond, home aquarium, production farm, or a fish kill observed in the wild, it is imperative to respond quickly and correctly. The following is the proper procedure to submit fish and water samples to a diagnostic facility. If these steps are followed, one ensures a correct evaluation and the best recommendation for treatment.

The Importance of History and Records
When a client contacts a diagnostic laboratory, they will be asked a routine set of questions to help identify the problem. It is beneficial to everyone involved to have a knowledgeable background of the system and the animals that live there. Keeping records of water chemistry parameters, water changes, species in the system, and recent additions can accelerate the diagnosis process and needed recommendation. The following is a selection of questions the client should be prepared to answer:

General questions:
- What is the size and design of the system involved?
- How old is the system?
- What are the species and number of each species in that system?
- What are their sizes and ages?
- What are the species in trouble? Which are not?
- Have there been recent additions? What species and when?
- When was the abnormal behavior or death first noticed?
- Number of sick fish per day? Number of mortalities per day?
- What weather changes were observed (important in pond cases?)
- Have there been problems in this system before?
- Have there been problems with this/these species before?

Behavioral Changes
- What are the fish doing (e.g., flashing, increased breathing rate, lethargic)?
- What is the fish’s position in the water column (at surface, vertical, lying on the bottom, near the aerator or pond edge)?
- Are the fish eating? If not, when did they stop?

Physical Changes
- What is the fish’s body condition (e.g., thin, bloated)?
- Are one or both eyes normal, sunken in, or popped out?
- Are the fins clamped down, frayed, or bloody?
- Are the gills discolored, bloody, or frayed?
- Are there lesions or growths on the fish?
- What else looks abnormal on the fish?

Routine Procedures
- What type and size of feed is fed?
- How much and how often is it fed per day?
- Any change in feeding or system maintenance recently?
- When was the last water change? How much was changed?

Previous treatments
- When was the last treatment?
- What was the treatment(s) and dosage(s)?

Submission of a Water Sample
Fish spend their entire life in water, which means when a fish gets sick, that environment must be tested. No matter how clean you think your water is, no matter what your water source is, or that your system is flow-through, you must have recent records of your water chemistry parameters (e.g., temperature, pH, ammonia, nitrite, dissolved oxygen) or submit a water sample for analysis. A good diagnostic laboratory will first test the water for any deviation in quality.

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Large mouth bass *Micropterus salmoides*, bluegill *Lepomis macrochirus* (commonly called sunfish or bream), and channel catfish *Ictalurus punctatus* are the most commonly stocked species in Florida ponds. All three of these species are native (occur naturally) to Florida. When properly managed, these species can provide excellent fishing for many years. However, pond owners are often not satisfied with the growth rate of bluegill.

Over the years, research has shown that hybrid sunfish generally have faster growth, are more aggressive, are easier to catch, and have reduced breeding potential compared to either parent species.

Hybrids can occur naturally when two species (such as bluegill and redear sunfish *Lepomis microlophus*) spawn with each other in the wild, or they can be artificially produced by fertilizing the eggs of one species with the sperm (milt) of a second species.

The eggs are hatched and the resulting fry (newly hatched fish) are stocked into fertilized production ponds until they are large enough to sell to pond owners. When referring to a particular hybrid, the two species names that produced the hybrid are separated by the letter “x.” For example, the above mentioned hybrid would be referred to as a “bluegill x redear sunfish” hybrid.

One popular hybrid is advertised as the Georgia Giant®. The exact two species used to produce this hybrid have not been made public. Green sunfish *Lepomis cyanellus* x bluegill hybrids have been stocked into recreational fishing ponds for many years. The importation, sale, possession, or transport of green sunfish and its hybrids is illegal in the state of Florida (Florida Administrative Code 68A-23.008).

Green sunfish are not native to Florida. This law is in effect due to the concern that green sunfish and its hybrids might become established in the state.

Selected Readings


Bluegill (*Lepomis macrochirus*)

Redear sunfish (*Lepomis microlophus*)

Green sunfish (*Lepomis cyanellus*)
Fee Fishing in Florida

It's no secret that the public will pay good money to fish, especially in waters guaranteed to have fish. As the saying goes “If you build it, they will come.”

Three basic types of fee-fishing exist in Florida for the public: day leasing, long term leasing, and fish-out.

Day leasing involves charging a nominal fee for a day of fishing on a scenic pond that usually offers a selection of bass, crappie, bluegill, redear sunfish or catfish—mostly spawned on location.

Long term leasing is much like a hunting lease, usually involving a written agreement. A picturesque setting is often one of the most important selling points in this type of operation, combined with high-quality fishing for bass or panfish.

Fish-out means paying for what you catch. Fish-out sites require the highest level of management and costs, including high stocking rates. However, it also offers potentially the highest profit.

One of the newest fish-out commercial operations in Florida is Shongaloo Fisheries near Waldo. Shongaloo offered free fishing and coordinated its grand opening with Florida's state-wide Fishing Derby Day this summer. As a result, they were able to enlist extra help from the Florida Fish and Wildlife Conservation Commission (FWC) and UF/IFAS fisheries biologists, who volunteer their time each year for Derby Day. More than 200 people appeared from as far away as Jacksonville. Fortunately, the event planners were prepared with plenty of loaner tackle and free bait, courtesy of Fishing For Success and the Florida Fish and Wildlife Conservation Commission.

They weren't the only experts on hand, however; Shongaloo's owner, Dr. Jerry Shireman, certainly knows something about raising fish. A retired professor, and co-founder of UF/IFAS's Department of Fisheries and Aquatic Sciences, Shireman is also the former chief of the Florida Game and Fresh Water Fish Commission/Division of Freshwater Fisheries (now the FWC).

Channel catfish and sunshine bass were in a biting mood. Some 800 to 1,000 fish were hauled away by the fish-hungry public in only four hours. Limits were set at five catfish and five sunshines per angler. More than half of the anglers were children.

Shongaloo has been an early success for more than one reason. Dr. Shireman now provides catfish, crappie and bluegill fingerlings for 13 other fee-fishing sites in Florida, out of an estimated 100 businesses. Dr. Shireman has been growing more fish and says he will re-open the farm for fee-fishing around Halloween. For more information, call: Shongaloo Fisheries 352/468-1251.

For those interested in building their own fee-fishing operation, all three types of fee-fisheries are discussed in UF/IFAS Circular 809 Fee Fishing in Florida, by Dr. Chuck Cichra. This publication and others related to aquaculture and/or pond management are available from your county extension office or on the UF/IFAS publications web site: http://edis.ifas.ufl.edu