Pond Culture of Freshwater Shrimp in North Georgia

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Introduction to the Industry

Production of freshwater shrimp (Machrobranchium rosenbergii) in Georgia is becoming a unique niche market that some farmers find highly enjoyable and profitable. Farming this crop varies slightly from the work being conducted at the Georgia Marine Shrimp Project funded by GAITT.

Farming this alternative crop has had its ups and downs in the Southeast, but today's farmers hope that new advances in research and production practices will make shrimp farming a permanent fixture in Georgia's Ag-Economy.

Production in Georgia varies greatly depending on the producer. Some find the crop a rewarding alternative, while others continue to be frustrated with failure. Today, however, failures can be mostly attributed to things easily prevented if the producer had only done his/her homework before entering into production. As with any new agricultural venture make sure to know what you're getting into. Aquaculture is expensive, it requires attention to detail, and mistakes made early on are often impossible to overcome in a production season.

Marketing Freshwater Shrimp

Marketing of the product is done at the farm level in Georgia. Juvenile prawns are typically stocked in June and harvested again in October. Production levels in Georgia range anywhere from 700 – 1500+ lbs per acre, and sell for an average of $8.00 per pound. Selling the shrimp should be very easy while it is new to your area. It's also a good idea to focus on size at harvest. The bigger they are, the easier they are to sell. Nobody will pay top dollar for a bumper crop of popcorn shrimp.

Marketing shrimp is almost like any other product. If you have a quality product in the right place it will sell. Location will play an important role as the number of producers statewide increases. Competition could also drive prices down to levels where profits are scarce. That hasn't happened yet, but it is something you should consider in terms of long-term investments.

Freshwater shrimp are unique in the market in that their size dominates. It's difficult to impossible to get large shrimp at times in the market, and if you can find them they've got a hefty price tag. Another facet of the mystique of freshwater shrimp is that they are home-grown in ponds. These ponds are free of pollutants and pesticides. Georgia shrimp farmers hope to relieve pressure from coastal resources by providing shrimp for sale with less bycatch or sea turtles to worry about. Freshwater shrimp are also marketed on the organic or environmentally friendly approach to add to the mystique of the product. Some organic producers in other states are getting 10, 12 even 15 dollars per pound for their "organic" product. Fall harvests also coincide with the time when leaves change and folks are out driving looking for things to do. Shrimp farmers are hoping they'll choose to go home with a few shrimp on ice.

Using Structures to Enhance Production

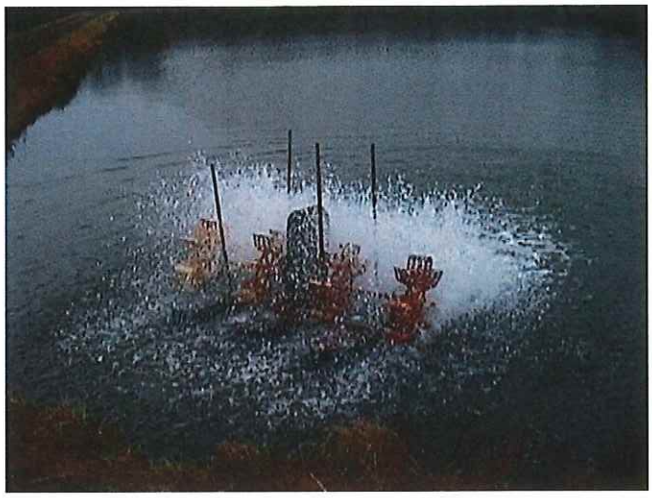
The use of orange PVC construction fence as "structures" is becoming common practice for shrimp farmers in the southeast. Research from other states shows that a combination of increased stocking rates, structures, increased aeration, and elevated feeding levels close to harvest time increases the total production in prawn ponds to levels exceeding 1500 lbs per acre.

Structures in the ponds serve as a place for the juvenile prawns to spread out. Each shrimp carefully guards it's territory, and if there's not enough space conflict will arise. A good rule of thumb is 1.6 square foot of area on the pond bottom or structures per shrimp will suffice. Having the structures decreases competition for space and allows each shrimp more room to grow by distributing them up higher in the water column. Research with structures also showed an increase in feed conversions, which means you're producing more pounds of shrimp with the same amount of feed. Producers also need to remember to distribute the feed across the entire surface of the pond. This even distribution keeps competition for food resources from arising. Competition for food and space leads to decreases in production and thus loss of profit.

Structures are placed in the pond either vertically or horizontally, basically by personal preference. Structures should typically last 4-5 years in production ponds, and research at Kentucky State has shown they are cost effective. One thing to remember is to place your structures in the pond in a manner in which they won't hinder you at harvest time. Placing the rows of structures too close together will make it difficult to walk down the rows at harvest time. If you're using vertical structures make sure to place them in the pond so that a harvest crew in waders can easily get through the rows. Also don't forget to leave your catch basin free of structures to facilitate easier harvest. A catch basin is a small pool at the base of the pond that holds about a foot or two of water. This is used to hold your catch prior to harvest. They are sometimes made of block or concrete to aid in harvest. It is also possible to siphon mud from your block catch basin prior harvest with flexible pipe prior to harvest using your existing drain system.

Aeration – Another Key Component

There are several alternatives for aeration in freshwater shrimp production ponds. The main thing to remember is your goal – total circulation of the pond volume to prevent stratification & turnover. Producers use a variety of systems other than the paddlewheel aerator suggested in research publications. It's not that producers don't want to opt for the paddlewheel, it's just that there's no supply of the small sizes needed in the ¼ to ½ acre ponds utilized by prawn farmers. Hopefully retail outlets will increase stock for 2002-2003.



Paddlewheel aerators are a good choice because they circulate the entire pond volume. This helps facilitate oxygen transfer to all levels of the pond. The shrimp in turn have greater volumes of oxygenated water in which they can inhabit. Top quality aeration will also help keep the pond bottom oxygenated, decreasing the chance of problems with midge larvae at harvest. Midge larvae are the tiny black or red worms you often see under the shell of the shrimp when they're pulled from the mud. Dr. George Lewis, our recently retired Fisheries Specialist at the University felt they should be of no cause for concern, and don't pose any risk upon consumption. They do, however, detract from the marketability of the shrimp at the pond bank.

Other options for aeration include "fat cat" systems using a blower and airstones or "rocks" as one producer calls them. Another option is surface agitators. The main thing is to ensure you're getting total circulation of the entire volume of the pond. You can do this by using a dissolved oxygen meter, dissolved oxygen test kit, or if by nothing else wading to feel for variances in temperature. Effective aeration should prevent any thermoclines, and thus any large temperature breaks by depth. It's not so much temperature you're worried about, it's the lack of oxygen typically found under the thermocline in ponds.

Three Phase Production: Pond & Pond Construction

Production in Georgia ponds began with the least complicated route of production, stocking of juvenile prawns into ponds. These prawns were stocked at rates of 16,000 per acre, and were obtained from hatchery/nursery facilities in Texas. Stocking densities vary from 16,000 to 24,000 depending on the producer. Lower stocking rates and proper aeration & feeding should result in a larger size shrimp. Some producers got greedy in 2001 and doubled their stocking rates. They ended up with a pond full of popcorn shrimp that are impossible to sell at $8.00 per pound.

Pond design is another facet of prawn production that has to be closely evaluated if producers are to be successful. Pond design for prawns is similar to fingerling catfish production. Typically these are small ponds that are easily filled and drained. They should contain a "catch basin", which is a dug out rectangular holding pool at the bottom of the pond at the end with the drain pipe. This catch basin serves as a temporary holding pool that the shrimp are collected in at harvest. Some shrimp will become stranded out in the pond, but most will follow the flow of the water if done correctly.

The pond should also be designed so that they can be drained completely without the use of a pump. For most producers, utilizing your property's natural slope is an easy way to build small hillside or levee ponds that drain easily and some producers stair-step their ponds so that they drain one into the other for water conservation purposes. SRAC publications on pond construction are located at: http://www.msstate.edu/dept/srac/fslist.htm.

Another unique alternative some of the producers in Mississippi and Kentucky have began using is a harvest trap on the other side of the pond dam. The basic design involves utilizing a larger pipe, approximately a 12" pipe for a ½ acre pond. The standpipe has a gate valve at the base of the catch basin. The larger pipe drains the pond more quickly causing the shrimp to pass through the pipe into a basket on the back side. This basket can be easily lifted with a tractor or manually changed by swapping baskets as they fill.

Three Phase Production: Nursery

As experience grew producers sought to lower their production costs and also generate revenue by implementing the nursery phase of production. Nursery facilities are indoor production systems utilized to grow out post larval prawns to juvenile sizes. It doesn't take a very large indoor recirculating system to raise enough prawns for a few ½ acre ponds. The process does require a greater deal of time and maintenance on your part, but many producers feel it is well worth the effort. The process takes some 60 days to grow the post larvae out to juvenile sizes. The major additional cost of facilitating the nursery stage is labor, electricity and for some water. Georgia nurseries produced over 800,000 juvenile prawns for sale in 2002, and we look forward to more work in this area in 2003.

The nursery enables the producer to cut his own costs for juvenile stock by buying post-larvae in large quantities. They typically sell for $100 per thousand depending on how many you purchase. Securing healthy, uniformly sized, juvenile stock is a fundamental step towards success in prawn farming. Local nurseries look forward to doubling production in 2003 as well as adding the hatchery phase.

Three Phase Production: Hatchery

The Hatchery Phase of production is a stage that Dr. James Tidwell at Kentucky State University advises to leave to the experts for the present time. This stage is said to be much more intense and takes an experienced hand to make it work. Currently hatcheries are operating in Texas, Mississippi, Kentucky, and Tennessee. Most sell post-larval prawns to surrounding nursery facilites for growout at reasonable prices. Producers looking to cut costs in the short term can look to implementing the nursery stage of production, unless they are willing to take a definite risk

This process is much more costly and difficult that even the nursery phase. It involves both fresh and saltwater recirculating systems. Much work has to be done to figure out methods of production that are cost efficient and achievable to the Georgia producer.

Transporting Prawns for Stocking

Handling during transport and stocking can be the most critical step in the culture of shrimp in ponds. Stress and mortality at this time could result in total failure of the entire crop for the growing season. With that said let's look at some techniques to ease losses during transport. The best way I can explain it is to treat your prawns like $200 fish you just bought at the pet store to put in your aquarium. Without proper care you'll be out $200 in a hurry, so take your time an follow the steps.

Juvenile shrimp are often transported in large plastic bags filled with water, prawns, and oxygen. The bags are packed in Styrofoam coolers to maintain temperature and also to keep the prawns in the dark until the bags reach the pond. Transport is a critical time for juvenile shrimp, and it's our job to ensure safe passage. On the nursery side it often helps to have a day set aside each week to sell juveniles, that way you can hold them off feed for 24 hours prior to sale. This helps clean them out and prevent toxic ammonia from building up in the bags.

Bags should be stocked at rates no greater than 10 grams of shrimp per liter. At this stocking rate the juvenile prawns should be safe for up to 8 hours, given that enough oxygen is placed in the bag at closure. Lack of oxygen in the bags is usually the cause of stress or mortality, so make sure to put plenty, and make sure to get to the pond bank as quickly as possible. You can also help things by keeping temperatures stable.

Once the shrimp are bagged up put them in a cooler to keep them in the dark and also to maintain temperatures at 72 F during transport. Make sure to make every effort to prevent sloshing and rough handling as much as possible during transit. Once at the pond bank make sure to equalize the pH and temperature in the bag to that of your pond by #1 floating the bags for 30 minutes and then by slowly transferring water from the pond to the bag prior to stocking. It also wouldn't help to time your arrival at the pond bank at or near dusk to reduce stress. The less stress the shrimp endure during transit should translate into less stress at harvest time in October.

Reducing Mortality From Aquatic Insects at Stocking

If there wasn't enough to worry about in getting the shrimp to the pond you don't want to overlook the a vital step of eliminating predatory aquatic insects prior to stocking. This should occur several days prior to stocking your pond. Pond preparation, which includes liming, fertilizing, aerating, and eliminating insects are vital steps to your success. Having the pond prepared properly often separates growers those who have and those who have not at harvest time. Selling shrimp is what we are all interested in so don't overlook anything. Each step in the pond preparation process is of vital importance!

To continue with reducing insects, stress and reduced vigor from transport translates into an opportunity for predatory insects to take a toll immediately following stocking. For years producers in the aquaculture industry have utilized oil and diesel fuel mixtures to eliminate insects from ponds prior to stocking fishes. Published reports were found to recommend a 2:1 ratio of motor oil to diesel fuel at a' rate of 1-2 gallons per acre. These practices are not recommended by Extension, and are currently under scrutiny by the FDA. Pictured to the left is an example of a predatory aquatic insect sometimes called a water boatman or backswimmer taken by Basliaan Drees at TAMU.

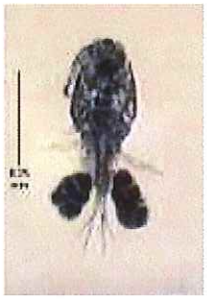
Kentucky State University research suggests using other alternative such as corn oil or fish oil. Menhaden fish oil applied at 1.6 ga/ surface acre appears to be an effective alternative to petroleum products. Corn oil was also effective at eliminating aquatic insects when applied at rates of 4.8 gallons per surface acre. The practical advantages to using corn oil or fish oil as a replacement to diesel and oil are: compliance with FDA laws, promotion of environmental safety, and potential compliance with organic certification requirements. There is also a chance that diesel and oil treatments can kill your juvenile prawns through contact or ingestion during stocking.

Overall a reduction in the number of shrimp lost in handling and stocking should result in higher yields and thus more profits for the producer. Pond preparation prior to stocking is often a neglected part of typical management that needs more attention. Pond preparation practices include: liming, fertilizing, pond levee repair, and treating for insects. Having things ready for your shrimp before they arrive could be the difference between money in your pocket and money in someone else's.

Period from Stocking to Initial Feeding

Prawn ponds are managed for phytoplankton and zooplankton production prior to stocking. This zooplankton serves as the initial food source for your juvenile prawns. To get a good zooplankton population you should fertilize your pond every week. A good source of organic fertilizer is cottonseed meal. It's relatively inexpensive and it tends to break down more slowly, posing less threat to water quality than other sources of organic fertilizers. Inorganic fish pond fertilizer can also be used at label rates.

Make sure to check your hardness. If total hardness levels don't exceed 20 ppm you'll never get a bloom and thus your time, money and effort are wasted. To raise hardness levels above the 20 ppm use broadcast applications of bulk agricultural limestone at rates of 1-2 tons per acre as you would a recreational pond. You also need to remember in a commercial situation you'll need to feed at least 2000 lbs of feed over the course of the growing season to produce 800 pounds of shrimp per acre.



This 2.5 pounds of feed per pound of shrimp must be calculated and monitored throughout the growing season to ensure your not overfeeding at the onset and underfeeding close to harvest. Sample your shrimp periodically using traps, umbrella nets, or cast nets to calculate your feeding rates and to monitor size. Another tip is to broadcast the feed over the entire surface of the pond to prevent competition for feed and feeding locations. Broadcasting feed will give all the shrimp access to the feed.

Harvesting Your Product

Fall has arrived and it's time for harvest. This is a very enjoyable time if things run smoothly or a very large headache if they don't. Fall is the time to see if you followed all the steps to top production levels or if transport and stocking losses translate into total mortality.

The first thing to remember at harvest time is temperature. Waiting too late could increase your chance of mortality significantly. An unusually cold morning in late October could leave you in a very bad situation. Most folks harvest when water temperatures average < 20 C. If temperatures drop below 15 C you could have a total loss of production.

Harvesting is very hard on the shrimp so care should be taken. Pond design should be conducive to easy draining – ideally in the course of a few hours. Make sure to remove any prawns stranded in the mud to keep from losing a marketable product. Sometimes they tend to hide under debris or in shallow pockets or footprints in the pond bottom. Successful draining will allow rapid yet gentle removal of prawns from the catch basin by hand with minimal mortalities. Time is of the essence when prawns are confined in small areas.

Take care not to damage or hurt the prawns. Damaged prawns are less likely to survive long enough to purge their gut prior to sale. Also make sure not to stack the prawns greater than 6" deep in baskets during harvest. The purging process usually requires about eight hours in clean, preferably flowing water. Care should be taken to remove dead or dying prawns. Soft shrimp may also need to be separated prior to purging. After purging the shrimp are generally ready to sell.

Harvest time is also a very important time for you to also make notes about your pond design. It's unfortunately also the time when producers wonder how much easier their job would be if they had a harvest basket on the back side of the dam or at least a catch basin. It doesn't take a large investment of time or money to properly design your pond to facilitate an easy and timely harvest. It may take a few years of trodding in the mud to convince producers, but once you've experienced a block catch basin you'll never return to trodding in the mud.

Icing and Preparing Your Shrimp For Sale On-Farm

This past year of harvest presented a new problem/opportunity for shrimp farmers – too many shrimp. In the event that the number of shrimp exceed your ability to harvest or purge efficiently there is another option to aid producers – ICE. According to the Georgia Department of Agriculture it is currently legal to sell shrimp on site without a permit. It is also legal to thoroughly rinse the shrimp at harvest and immediately ice them down to reduce losses during purging.

The shrimp can then be sorted into bags by weight and stored until sale the following morning. This helps break up the hectic time of harvest, purge, catch, & sale that producers currently undergo. However, the shrimp may not be sold off site without proper permits

The 2002 growing season looks to be the first season that commercial growers test the commercial market through Off-Farm Sales. Areas producers are interested in investigating include farmers markets, internet sales, restaurants, etc. For more information about Off-Farm sale of freshwater shrimp contact the Department of Agriculture at (404) 656 - 3621 or (800) 473 – 0119.

Permits for Sale of Shrimp Off-Farm

Georgia freshwater shrimp farmers may venture into the area of wholesale or retail sale of shrimp off-farm in 2002. Once you get into sales off-farm the permit process begins to ensure consumer safety. The Georgia Department of Agriculture regulates wholesale and retail sales of food products according to the Georgia Food Protection Act (Section 26 – 2 – 25). This section states "It shall be unlawful for any person to operate a food sales establishment without having first obtained a license from the Commissioner".

The basic regulatory requirements include: Facilities, Pest Control, Sinks, Warewashing, Handwashing, Service, Toilets & Urinals, Water, Hot Water, Plumbing, Sewage, Outside Premises, Refrigeration, Food, Labeling & Inspection. Contacts for more information include: John Rudeseal (770) 535 - 5955 in Northeast Georgia, and also the Georgia Department of Agriculture in Atlanta at (404) 656 – 3621 or (800) 473 - 0119.

Storing, Preparing & Eating Freshwater Shrimp

Source – KY Aquaculture Assn

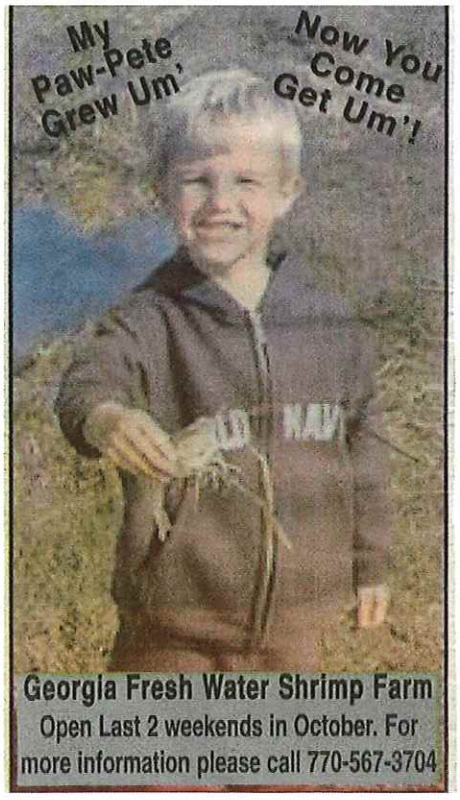
Freshwater prawns are similar to the shrimp you are used to buying in many ways, but also have unique attributes. Almost all shrimp you see in grocery stores are, or have been, frozen. Freshwater prawn tails contain less than 0.5% fat. What little fat there is, is largely highly unsaturated (heart healthy) fat. Freshwater prawns contain less cholesterol than saltwater shrimp. The texture of freshwater prawns is in some ways more similar to lobster and preparation and recipes are similar for both.

Prawns are excellent boiled. Grilling is especially good. If grilling, you need to leave the shells on or marinate (or baste) the prawns, since they contain so little fat. They are also excellent sauteed or broiled. As with all shellfish, it is important to keep them cold. Packed in ice that is able to drain away water as it melts is ideal. If live or whole, remove the heads as soon as possible. The digestive juices in the head can cause the tail meat to become "mushy." The heads are prized by chefs for preparation of seafood or shrimp stocks.

Whole shrimp can be kept on ice up to 5-10 days and refrigerated 4-9 days. Prawn tails can be kept on ice up to 10 days and frozen up to 6 months. When thawing frozen tails it is important they not be thawed to room temperature. Begin cooking when they are still firm with ice crystals. When freezing be sure there is at least a thin layer of water on them as they are put in the freezer. A good way is to put tails in a zip-lock bag, add some water, partially zip the bag, squeeze out most of the water, then finish zipping. This will "vacuum pack" the tails in water if done correctly.

Prawns are delicious cooked with the heads on. The natural juices are preserved and the delicate flavor of the prawn may be enjoyed most fully when they are prepared in this method. For attractive serving you may wish to trim the antennae and front claws, but it is not necessary.

Prawns may be cooked in the shell or shelled. Experience through testing indicates that the meat stays slightly more firm when cooked in-shell. Like any freshwater seafood, prawns should be cooked before serving. To remove the shell before or after cooking, either snip the shells down the back or grasp the bottom edge where the shell connects with the legs, and peel. The shell should come off easily in large pieces. It is best to prepare the prawns as quickly as possible and they should not be allowed to remain in the refrigerator for extended periods of time. If using frozen prawns, thaw rapidly under running water and use immediately. Do not allow them to stand at room temperature for extended periods of time.



Georgia Shrimp Farming's Future

Markets for shrimp worldwide appear strong. With the increasing pressure put on coastal fisheries and increasing demand for seafood products its obvious aquaculture will become a growing player in the market. People also like the thought of knowing where there food comes from, who grew it, what it was fed, etc. In the present times of uncertainty, wouldn't it be better to support home grown products that we can learn to trust and rely on?

Freshwater shrimp farmers in Georgia have overcome some of the major obstacles before them in recent years and are poised for their next challenge – large scale production and the potential for off-farm sale and processing. It will be interesting to see how

this pans out. As for those of you interested in entering the enterprise, freshwater Shrimp and aquaculture in general definitely aren't for everyone. It's a unique commodity that a number of producers in Georgia are really enjoying. For others it's something that can become very costly and losses have occurred.

Those statements, however, can be made of any type of commercial agriculture. You've honestly got to love what you're doing. For some profitability is measured two ways, financial and spiritual. It's a unique way to make ends meet for those who get into it, not a way to pencil quick profits without work or input. There is risk involved, but with a conscious effort to learn everything you can and to always be on top of the game you can make educated decisions based on both sides of the story.

As with any agricultural venture – invest and manage wisely, it often takes years to build a successful business. Read all you can about the topic, work hard at following the advice that is given, and hopefully you'll have a few extra shrimp for your local county agent next October.

This freshwater shrimp farming update is prepared by Steven Patrick, Chairman of the GACAA Aquaculture Committee. If you have any questions or suggestions send them to stevep@uga.edu or 706 754 2318. The information has been compiled for information only in an attempt to provide prospective farmers in Georgia the most accurate picture of the industry in Georgia as it stands. Trade or brand names and photos are for information only. The Cooperative Extension Service does not warrant the standard of any products mentioned; neither does it imply approval of any product to the exclusion of others that may also be suitable.

Putting Knowledge to Work