AFA 2008 Abstracts
Aquaculture Session

Marketing and Economics of Live Marine Baitfish Produced in Saline Waters of the Black Belt Region of Alabama

by **Robert G. Nelson**, Ronald P. Phelps and Steven J. Morris

Demand characteristics of the MS-AL marine live bait market are being evaluated using several independent approaches including: (1) current surveys of bait dealers in MS and AL; (2) past surveys from AL, FL and TX; (3) 2001-07 Live Bait Dealer Ticket data from MS; (4) actual auctions of live bait; and (5) national and state angler survey data. Supply characteristics are being evaluated by interviewing wild-catchers and bait distributors. Four shrimp producers in the Black Belt region have expressed interest in culturing bait fish, and two have started production on a limited scale. Economic feasibility is being estimated with separate enterprise budgets for natural/free spawners (e.g. bullminnows, sheepshead minnows), and induced spawners (e.g. spot, croaker, pinfish, etc.). Transportation, holding and distribution costs are also being evaluated. Acceptability of cultured bullminnows and spot is high among most retailers and fishermen surveyed in MS and AL, with some exceptions (e.g. bait dealers who catch their own bait and view cultured baits as competition).

Demonstration of commercial in-pond raceways for enhanced production and reduced cost for channel catfish, Jesse Chappell,

We developed and deployed commercial scale, in-pond raceways on farms in west Alabama. The systems are a combination of raceways and partitioned systems that use confined animal production with harvest of manures produced and filter-feeding fish as grazers of planktonic biota stimulated by unutilized feed nutrients. The first system developed was installed in a 6 acre earthen pond of an average depth of about 5 feet. Six cells were constructed of concrete blocks on a reinforced concrete pad. Cells are 16 feet wide and 38 feet long. They are arranged side by side and share common walls. Each cell has a ½ HP water-mover (paddlewheel) at its upstream end which rotates at 0.7 to 1.5 RPM and allows exchange of water in a cell as frequently as once every 1-2 minutes. For additional life support, an aeration grid was installed just downstream from the water-mover. Fish are confined in cells by use of two panels which extend across the width of the cell. The first is placed upstream adjacent to the aeration grid and the second, downstream about 8 feet from the end of the raceway. A timer regulated feeding system was installed in each cell and is supplied with feed in bulk via an overhead tube originating at the bulk feed storage tank. Access ways are installed across all cells at upstream and downstream points. Just at the downstream-most point of the raceway cells, a recessed manure trap was installed at the furthest downstream point and at the end of the "quiescent zone". The quiescent zone is designed to allow for settling of waste or other particles as they pass through the cells. The "Vee" shaped trap extends across width of the raceway cell and is effective in trapping and removal of particle waste. A baffle was fixed in the pond to force water passing through the production cell to circulate around the ponds axis and not take a path of least resistance back to the intake channel.

Cells were originally stocked with 9-10,000 advanced juveniles at 80-200 grams in weight. Response to feed has been excellent. Dissolved oxygen levels remained high at all times and all points in heavily fed cells. Ammonia and nitrite levels have remained well below stressful levels. We have also stocked cells with 25,000 stockers we had initially planned to split into 2 cells and have observed excellent growth, survival and uniformity. From our observations we expect this type production will be able to significantly improve annual yield to above 35,000 pounds per acre and also achieve survival rates above 90% and feed efficiencies below 1.7 to 1. We are currently working on a management and economic model which will be highly descriptive of the system, its management and production economics. We expect that by gains made in survivorship, feed efficiency, management of disease and overall production, we will be able to significantly reduce the cost of production, greatly increase yield and thus improve profitability.

The project has generated several excellent press pieces and has been visited by several groups and many individuals. Approximately 250 people have physically visited the sites and more than 250,000 informed about demonstration of the technology via media.

Pond Production of live bait shrimp, *Penaeus setiferus* and *Farfantepenaeus duorarum* in Alabama

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Recreational fishing is an activity that has been growing during the last decades generating a multi million dollar industry in the US. However, continuous supply of live bait remains as one issue in the establishment of a solid market. Culture of bait shrimp is an alternative which would solve many the supply issues. A pond raised shrimp study is being conducted at Auburn University with Brown shrimp *Penaeus setiferus* and Pink shrimp *Farfantepenaeus duorarum* to collect basic information on production, harvest techniques, and markets in Alabama.

The research is being conducted at Claude Peteet Mariculture Center in Gulf Shores, Alabama. Brown shrimp postlarvae (PL9-12) were obtained from Ocean Boy Farm, while pink shrimp were obtained from the Shrimp Mariculture Research Facility of the Texas Agricultural Experiment Station. Brown shrimp postlarvae were stocked directly in 0.1 ha in six ponds, three at low density (33 shrimp/m^2) and three more at high density (67 shrimp/m^2), while three more ponds were stocked with pink shrimp at 42 shrimp/m^2.

Culture followed standardized production conditions. Feed inputs are pre-scheduled using feeding protocols that have maximum feed inputs of 3.08 kg/ha/day, 6.15 kg/ha/day and 4.07 kg/ha/day for low density ponds, high density ponds and pink shrimp ponds respectively. The growout stage was 18 weeks for Brown shrimp, and 12.5 weeks for Pink shrimp. Brown shrimp stocked at high density had an average growth rate of 0.65 grams/week, with a survival of 29.4%, average production of 238.6 kg per pond, and Feed Conversion Ratio of 1.60. Similar results in terms of growth rate and survival were found in low density ponds, with average growth rates of 0.70 grams/week and survival of 33.4%, but pond production was lower with 145.1 kg and higher FCR of 2.12. Pink shrimp had lower growth rate with 0.49 grams/week, and was harvested at smaller size (6.1 grams), with an average production of 94.0 kg, 37.1% survival, and FCR of 1.84. Shrimp was harvested in a total of 35 groups with an average of 2000 shrimp per group during late September and October at which time there was little if any native shrimp being captured from the wild for bait use. Albeit preliminary these results indicate that the species should be selected not based on growth rate but other characteristics that support local culture such as hardiness of the species to transport, survival and ease of spawning.

Preliminary trials to evaluate the use of soy protein concentrate in feeds for Florida pompano (*Trachinotus carolinus*)

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Two growth trials were carried out in two independent semi-closed recirculating systems at the Claude Pettet Mariculture Center Facility in Gulf Shores, AL. Juveniles were obtained locally and acclimated to research conditions prior to initiation of the trials. The first growth trial was conducted over a 95 day culture period using juvenile fish (9.3 g. mean initial weight) stocked at a rate of 25 fish per tank (900 L) using three replicate tanks per dietary treatment. Eight practical diets were formulated to confirm the suitability of current ASA feed formulations. The second growth trial was conducted with juvenile Florida Pompano (8.2 g mean initial weight stocked at 10 fish per tank (600 L) and cultured over a115 days period to conduct preliminary research on the acceptability of soy protein concentrates in practical diet formulation for the Florida pompano. Water quality parameters were taken once per day . Fish were counted, weighed every two weeks. At the termination of each study, group weights, individual weights and total lengths were taken for the fish in each tank. Feed conversion ratio (FCR) was calculated at the end of the feeding trials.

Production parameters for the first growth trial were as follows: the ASA reference diet (diet 1) numerically produced the best performance. There were no significant differences from diet 2, which contained an alternative vitamin and mineral premix. The performance of fish maintained on Diet 4 was the poorest even though this diet had high levels of fish meal possibly indicating that the digestibility of this ingredient is less than that of soybean meal. Diet 3 was formulated to use soy protein concentrate as a replacement for soybean in the diet. The results from this diet were intermediate and indicate that there may be limitations to the level of soy protein concentrate that can be used. The second growth trial was designed to preliminarily evaluate different levels of soy protein concentrate (0, 12, 16 and 20% diet) as a replacement for fish meal. Production parameters were similar to those obtained in the first experiment. The initial reduction of fish meal from 30% of the diet to 15% 0f the diet resulted in minimal differences in performance. Reducing fish meal content further (diets 3 and 4) resulted in significant reduction in growth. Unfortunately, it is not clear as to what may have caused this reduced growth but it was probably due to differences in digestible protein.

Results from the present research are encouraging as we have validated the vitamin and trace mineral premixes, identified the fish meal levels can be reduced and that moderate levels of soy protein concentrate can be used. However, we also did find the high levels of soy protein concentrate resulted in reduced performance of the fish which needs to be further investigated.

Freshwater Prawn Production in Tanks

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Production of freshwater prawns (Macrobrachium rosenbergii) has been tried in most of the Southeastern U.S. (and other parts of the U.S.) for years with varying degrees of success. Tanks and raceways have been used for brood stock and the production of PLs but very little for commercial production of food size animals. Two of the most challenging problems to overcome in the production of prawns are predator protection and harvesting. Tanks might provide the ideal situation for protecting the prawns and certainly for the convenient harvesting of them. A three year trial of production of prawns in tanks with various stocking densities was conducted at the Wiregrass Research & Extension Center (Headland, AL) during growing seasons 2003-2005. Four fifteen hundred gallon tanks were constructed from feed bin rings and swimming pool liners (custom fitted) under a shed, adjacent to a two acre pond that is primarily used for irrigation of row crops. Two 1/3 H.P. submersible pumps were suspended in the pond approximately two feet under water and pumped a continuous supply of water to the four tanks. The water volume in the tanks was controlled by external stand pipes rigged with valves for draining the tanks. The tanks contained a centrally located stand pipe constructed of PVC well head that allowed the water to continuously flow from the tanks, taking with it most of the production waste and providing a “screen” to keep the prawns from escaping the tanks. Air to the tanks was supplied by a 1 H.P. regenerative blower located in the ceiling rafters of the shed. Four 12” x 1” air stones were placed in each tank to supply oxygen and keep waste solids suspended and flowing from the tanks with the continuous supply of water fed to the tanks from the submersible pumps. A substrate was added to the tanks (highway safety fencing material) and feeding trays were suspended in each tank. A 38-40% commercial shrimp sinking pelleted food was fed to the shrimp daily during the growing season.

The three year tank production of prawns revealed some distinct problems with this prawn production method and proved to be commercially unfeasible for several reasons. Very few of the prawns reached a size that would be practical for the food market. Food conversion was poor and survival was not any better than pond production of the prawns. Harvesting and collecting the prawns from the production tanks at the end of the growing season was convenient and relatively easy when compared to harvesting the prawns from an open pond. Predator control (birds) was successful after a PVC coated chicken wire barrier was added to the shed housing the tanks. Most of the harvested shrimp were too small for the food market (3 – 15 g.) and had very low economic value. Since the prawn is a tropical animal, it also is very difficult to justify the expenses of over-wintering the animals and continuing growth the following season.

Perhaps a much better application for tank production of prawns (food size) would be to grow them to a larger size and release them in ponds early in the growing season. The larger size attained prior to release in production ponds could increase survival and productivity in properly prepared and predator-protected ponds.

Demonstration of fish and plant production in greenhouses using alternative energy heating energy, Travis Brown

A project focused on use of alternative energy and energy conservation, a controlled environment aquaculture project was undertaken which used shelled corn as a fuel for winter heating two greenhouses. One greenhouse was equipped with a simple fish production system comprised of two elongated, plywood and plastic lined tanks which held a total volume of about 55,000 gallons of water. Life support was provided by 2 Sweetwater blowers of 1.5 H.P. each and a very low level (1-6%) daily water exchange. The second greenhouse was set up to produce plants and initially greenhouse tomatoes were cultured. The culture media was composted cotton gin waste placed in troughs excavated in the substrate soil. Two tomato cultivars were planted (Geronimo and Blitz) as transplants in October at a total of 600 plants in the 30 x 96 foot house. Fertilizers were applied pre-plant and subsequently on an as needed basis. Irrigation was provided both from a nearby rain-filled reservoir and water being removed from the fish house as water was exchanged.

We demonstrated use of shelled corn as a locally available, economical fuel which cost less than most other fuels. Typical corn pricing at $2.50-3.00 per bushel allowed very economical heating. The corn burning furnace we used was a 200,000 BTU unit which provided hot water in daylight hours to the fish system and hot air into the plant house during the night. Shelled yellow corn holds about 7500 BTU per pound so at the E.W. Shell Fisheries Experiment Station just north of the main Auburn University campus we used about 5-6 bushels per 24 hour cycle to heat the two houses. We will make several weeks trial (Jan.- Feb. 2008) of using wood fuel pellets as an alternative to corn since corn is currently very high priced. Strategically, purchasing corn in July or August or better yet growing your own would be a better hedge.

System yields were higher than we had projected. The fish system allows production of 10-12 tons of Tilapia per annual cycle. This equates to 300-350,000 pounds per acre per year! Tomato production was similarly robust at about 10,000 pounds per cycle. Two cycles per year would normally be cultured so about 10-12 tons per greenhouse of this size per year. This computes to 300-360,000 pounds of tomatoes per acre per year. Cost of production for Tilapia approximate 85 cents per pound but would reduce on a fully commercial system using multiple houses. Live wholesale price for Tilapia currently ranges from $1.65-2.00 per pound. Tomato production costs were in line with typical greenhouse systems but off-season marketing was able to receive an excellent price at $1.25-1.70 per pound.