

An Internship in Applied Shrimp Aquaculture at Greene Prairie Aquafarm, AL

Jacob Oehrig

Department of Environmental Science, Taylor University, Upland, IN 46989

Background Information

Greene Prairie Aquafarm began in 2001 when the owners, H. R. (Rud) Schmittou and David Teichert-Coddington, left their jobs at the Department of Fisheries and Allied Aquacultures and the International Center for Aquaculture and Aquatic Environments at Auburn University, AL to make a commercial run at what they had been teaching. Both men had been part of numerous extension work projects and studies both domestically and abroad. David had spent a number of years working in various countries in Central America conducting research and beginning both shrimp and fish aquaculture programs. Rud worked predominantly in China where the current aquaculture industry can be credited in a large part to his name.

Greene Prairie Aquafarm is located in west, central Alabama, about 150 miles from the Gulf coast. The farm is located above the Eutaw Aquifer which, at a well depth of 600-675 feet produces brackish water with a salinity around 4 ppt. For the past 20 years, this water has been used for the production of channel catfish. However, the market is fairly saturated with catfish farms and gains are marginal due to high competition and supply. So, Rud and David decided to try another saltwater species with much higher profit potential: Pacific White Shrimp (*Litopenaeus vannamei*). The farm now has 17 earthen ponds containing a total of 54 surface acres of water.



Shrimp Larval Acclimation

Shrimp go through a number of stages as larvae. In the last stage they look like "normal" shrimp but they swim upside down. When they flip over and begin swimming right side up they are classified as "post larvae" or in the shrimp industry "PL's." PL's are purchased from a hatchery and placed in large acclimation tanks at the farm where they are slowly brought down to the salinity of the ponds. It is at this step where risks are at their highest. If temperature, salinity or oxygen change too quickly, the whole stock could easily die. Acclimation can begin only when the shrimp have fully developed gills but the whole process must be completed before ammonia build-up in the tanks begins causing mortality.



Acclimation tanks with dissolved oxygen probe in inset

Feeding

There is enough of a market for shrimp feed that a number of companies have begun to commercially produce it. As such, our feed was a commercially-bought, proprietary blend of crude proteins, fish meal, and other ingredients. The feed came in pellet form and was distributed into the ponds two times a day via a feed truck. The amount of feed distributed to each pond was determined by pond size, numbers of shrimp, and shrimp growth rates. The last two metrics were estimated based on weekly population samples.



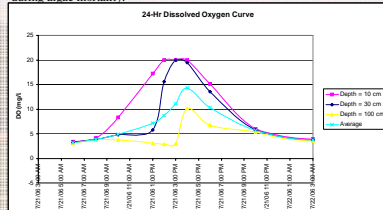
Pelletized commercial feed



Feed truck with blower

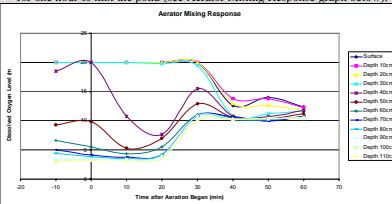
Oxygen Management

In reality, oxygen management can be more appropriately labeled "algae management." Algae are the principal producers of oxygen in the ponds and understanding and managing its inputs are the true keys to oxygen success. Shrimp can survive in water with as little as 2-3 mg/L of dissolved oxygen (DO) as long as they are slowly brought down to that level and are not kept at that level for extended periods of time. Under normal circumstances, the oxygen produced from algae via photosynthesis is more than adequate to maintain safe levels of DO during respiration demands at night (see 24-hr Curve below). However, there are three instances when supplemental aeration is required: cloudy days, mid-day mixing, and during algae mortality.



Cloudy Days: Photosynthesis rates drop dramatically during overcast days. The result is the dissolved oxygen content may not reach a sufficient level to cover the pond respiration demand during the night and aeration becomes necessary.

Mid-day Mixing: By mid-afternoon there is a significant stratification of dissolved oxygen in the ponds. Shrimp are bottom feeders and so it is important to keep the DO level safe at the bottom of the pond so the shrimp do not get stressed or die. Therefore, every afternoon the aerators were run for one hour to mix the pond (see *Aerator Mixing Response* graph below).



10-hp main aerator, 3-hp venturi-prop aerator, Emergency tractor-driven aerator

Algae Mortality: There are times when a significantly dominant algae species in a pond will die suddenly due to changes in the environment. The resulting reduction in oxygen production needs to be balanced by aeration.



DO sensor with wiper, Microcontroller with radio telemetry system and relays

Greene Prairie Aquafarm utilizes an automated oxygen sensor array system which is able to turn aerators on and off based on preset values and send real-time data to a central computer for a quick entire farm synopsis.

Harvest

Harvest of the first ponds began at the end of August and continued into October. We would harvest 1-3 ponds a week and work 10-14 hours a day. A standard yield based on our stocking densities would be around 3,000 lbs/acre. However, our yields this season were uncommonly low. While the exact reason is unknown, a major factor is poor quality control at the hatchery. The following is a pictorial presentation of the harvest process.

Pond water is initially pumped into adjacent ponds overnight to save water. In the morning, the outlet pipe cover is opened and a crew continually seines the pond while the water drains.



The shrimp are pulled to the outlet pipe where they are raked down.



The water and shrimp flow out the other side of the drain into a basket. This basket allows the excess water to drain out but traps all of the shrimp.



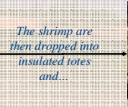
A hydraulic pump on the back of the basket pumps the shrimp up to the desalinating tower on the dike.



The shrimp fall into a bait net where they are weighed.



The water falls through the grate but the shrimp slide out a side chute.



The shrimp are then dropped into insulated totes and...



are immediately covered in ice.



The full totes are driven down to plants in Mobile, AL where they are de-headed, processed and quick-frozen.



Other Responsibilities

I was fortunate to be able to be involved with every aspect of running a shrimp farm. Here are just a few examples of activities in which I was involved:



Weekly pond population sampling



Welding repair of harvest basket



Tractor repair and maintenance



Surveying for greenhouse construction



Aerator mechanical and electrical repair

Acknowledgments

I would like to acknowledge and thank both my uncle, David Teichert-Coddington, and H. R. (Rud) Schmittou for the amazing time at Greene Prairie Aquafarm. I learned more from rubbing shoulders with them than any classroom experience could have taught me. I would also like to thank Taylor University MES department faculty for all that they taught me in the field of environmental science.

For further information

Mail: Greene Prairie Aquafarm, Box 10152, US Highway 43, Boligee, AL 35443
Phone: 205-372-2844 or 888-280-4043 (cell)
E-mail: david@GreenePrairieAquafarm.com
Web: www.GreenePrairieAquafarm.com

