COMMERCIAL APPLICATION OF BIOFLOC TECHNOLOGYFOR PRODUCTION OF *Litopenaeus vannamei* JUVENILES

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Bowers Shrimp Farm
Collegeport, Texas, USA

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Introduction

- Bowers Shrimp Farm, Collegeport, Texas
- Established in 1989
- 370 acres of shrimp ponds
- 75 acres fish ponds

Introduction

- Four outdoor nursery ponds have been used off and on over the past 10-12 years
- Nursery ponds are limited to stocking of the adjacent growout ponds
- In recent years some growout ponds have been double cropped using direct stocking
- However, direct stocking limits the culture period in the growout pond
- In 2013 the farm incorporated the use of an indoor nursery to extend the culture period and increase flexibility of stocking growout ponds

Introduction

- Newly constructed 13,500 ft^2 indoor nursery
- Provided a head start for PLs in first crop
- Allowed for head starting PLs for the 2^{nd} crop while extending the culture period of the 1^{st} pond crop
- Allowed stocking any pond on the farm
- Nursery was also used, unexpectedly, to culture several batches of PLs that arrived when temperatures were to low for direct stocking

Nursery

Cycles

- 5 cycles in 2013 (Feb 18th to Aug 28th)
- 21-52 days
- Mean temperatures 25-30 C
- Number of tanks in cycles ranged from 2-8

Goals

- Determine if the system was suitable for juvenile production
- Develop a simple and reliable method to produce and harvest juvenile shrimp indoors for stocking into outdoor ponds
- Take advantage of low cost electricity
- Extend production period in ponds
- Increase final weights of shrimp from ponds
- Take advantage of compensatory growth
- Increase overall farm production

Bowers RW System

- Loosely patterned after the 100 m^3 RWs at the Texas AgriLife facility in Flour Bluff
- 8 concrete RWs
- 12 a^3 air injection nozzles per RW
- Two 3 hp pumps per RW
- 125 m^3 max volume
- Center partition
- No solids removal devices were included in 2013

Water

- Seawater from Matagorda Bay
- 30 ppt salinity
- Water was not chlorinated
- Filtered through 540 micron sock
- 25-75% of water was reused between cycles

Shrimp

- PL 8-11, mostly PL-8
- Stocked at 12/L (12,000/m^3)
- SIS and KAVA (previously HSF)
- Acclimated in hauling tank with RW water
- Fed EZ-Artemia (Zeigler Bros.) during the acclimation process
- Gravity drained into RWs

RW Management

- Cycles were started using 6 nozzles with reduced flow
- Stirring of RW bottoms was required during the first week to prevent sedimentation
- Pump intake filters were cleaned several times each day
- System was maintained by 2 people during the day and 1 person at night
- Weekends & holidays- 1 person during the day and 1 at night
- Night person checked DOs and cleaned filters
- No monitors or alarm systems

Feed

- Zeigler PL RW Plus and EZ Artemia
- Cargill or Rangen after 25-30 days
- Started with two 12-h beltfeeders
- Switched to four 24-h beltfeeders to reduce labor and increase feed distribution
- Feed consumption checked twice daily (8am-6:30pm)
- Feed rates were determined by feed consumption and observation of shrimp

Water Quality

- Ammonia, nitrite, nitrate, and alkalinity were tested using a LaMotte kit for saltwater
- DO was checked frequently using a hand-held DO meter (YSI 550A)
- pH was checked using a pH pen (pHtestr 10)
- Suspended Solids were checked using Imhoff cones

Water Quality

Nitrogen

- Ammonia levels ranged from 0.1 mg/L to >6.0 mg/L during Cycle 1
- Nitrite levels reached >16 mg/L during Cycle 1
- Molasses was added to control ammonia prior to establishment of adequate nitrifying bacteria populations
- During Cycle 1 water was exchanged to reduce concentrations of nitrogenous compounds and excess solids
- Ammonia and nitrite levels were negligible during subsequent cycles
- Nitrate was checked infrequently due to water exchanges, short duration of cycles, and the dilution of biofloc water with new seawater between cycles

Water Quality

- DO ranged from 4.7 to 8 mg/L and was usually between 5.5-6.2 mg/L
- pH ranged from 7.3 to 7.5
- Alkalinity ranged from 100 to 200 mg/L and was adjusted to 160 mg/L using calcium hydroxide
- SS ranged from 0.1 to 13 mL/L
- Water was occasionally exchanged to remove excess solids during some of the longer cycles
- Ammonium chloride was used between some of the cycles to maintain nitrification

Harvest

- RWs were drain harvested
- Shrimp were dewatered, weighed, and loaded onto transport trailers

Transport

- Transported using liquid oxygen
- 10-15 minutes to pond
- Shrimp were released into the ponds without any additional acclimation

Summary of first year nursery cycles in eight 125 m^3 raceways from Feb-Aug 2013

Cycle	RWs (#/cycle)	Duration (days)	Temp (C)	Av. Wt. (g)	Survival (%)	FCR	Yield (kg/m^3)
1	8	48	25.7	0.17	67	0.95	1.1
2	2	27	25.0	0.10	76	1.05	0.8
3	3	22	25.9	0.05	136	1.1	0.5
4A	2	49	29.5	1.22	44	1.1	4.0
4B	6	41	29.6	0.74	44	1.07	3.1
5	8	25	30.0	0.18	72	0.96	1.2

Lessons Learned

- Have molasses on hand before starting
- Start with good reagents
- Solids do not pass well through 540 micron mesh but do pass through 800 micron well
- DO was not a factor
- Four 24-hr feeders vs. two 12-hr feeders increased distribution but not capacity

Future Considerations

- Target ≤0.2 g shrimp for increased survival
- Increase stocking densities
- Incorporate solids removal
- Limit water exchanges
- Salinity will probably be lower (15-20 ppt)