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ENERGY EFFICIENCY AND AUTOMATED AERATION CONTROL ON AN EXPERIMENTAL SHRIMP FARM: IMPLICATIONS FOR THE CATFISH FARMER

Richard Hogland, David Teichert-Coddington, David Rouse and Claude Boyd

Auburn University, Department of Fisheries and Allied Aquacultures, Auburn University, AL., 36849 (334-844-4786)

Earthen ponds at the Claude Petet Mariculture Center, Gulf Shores, AL, were stocked with *Penaeus setiferus*, a Gulf of Mexico white shrimp, at 42.2/m². Ponds averaged 1050m² in area and 0.9m in depth. Ponds were lined to prevent seepage and bottoms were refilled with soil. Shrimp were fed a commercial diet consisting of 35% crude protein. Ponds were equipped with 1-horsepower Aire-0₂ aspirator type aerators. Treatments included aeration controlled by automated oxygen sensing and switching devices, timers, or manually. Each method was replicated three times. Automated devices, marketed by Autohand*, initiated aeration when dissolved oxygen concentrations dropped below 3.2 mg/L, and turned off aerators when dissolved oxygen concentrations rose above 4.2 mg/L. Times were set to initiate aeration when the dissolved oxygen concentration was predicted to drop below 3.2 mg/L and turn off at 0700 hr. Manually controlled aerators were turned on in the early evening when early morning dissolved oxygen concentrations started to approach 3.2 mg/L; aerators were usually turned off during the day, but might be left on if the day was overcast. The objective of the study was to evaluate the energy efficiency of automated aeration control versus the other two types of aeration controls commonly used on farms.

Ponds were harvested during 21 to 23 October 1996. 102 to 114 d after stocking. There were no significant differences among treatments for yield, mean weight, or survival ($P > 0.05$) (see table). Yields significantly increased with higher survival ($P < 0.05$). Mean shrimp weight tended to decrease with increasing survival, but the relationship was not significant. Higher initial stocking rates and better survival would have resulted in greater production without significantly affecting individual growth rates. Mean electricity consumption was significantly different among treatments. Automated control of aerators consumed 62 and 80% less electricity than timed and manually controlled aerator treatments, respectively. Timed control of aerators consumed 48% less electricity than manually controlled aeration. Automated and timed control of aerators reduces the variable energy costs of aeration. The economic benefit of automated aeration control is expected to be a function of stocking density, aerator operation time and pond area per unit sensor. Automated controls should reduce the risks of fish kills and decreased feeding from low dissolved oxygen concentrations. Timers are a simple, low cost solution to reducing aerator operating time, but their use includes predictions of when low dissolved oxygen concentrations will occur, and this may be an unacceptable risk for some producers.

Variable	Aerator control		
	Automated	Timed	Manual
Gross shrimp yield (kg/ha)	1859 ± 497 a	1486 ± 208 a	1741 ± 312 a
Mean shrimp weight (g)	7.9 ± 1.00 a	6.4 ± 1.07 a	5.7 ± 0.45 a
Survival (%)	59 ± 22.8 a	58 ± 10.7 a	74 ± 7.6 a
Electricity (kwatt-hr)	137 ± 86.5a	363 ± 26.6b	702 ± 25.9c

Means within a row followed by different letters are significantly different ($P < 0.05$).

*Autohand, Inc. was the Royce representative for the Mississippi Delta catfish industry.



Sanitaire – Royce Technologies
 14125 South Bridge Circle Charlotte, NC 28273
 800-347-3505
 Tel 704-409-9898 Fax: 704-9899
www.royce technologies.com
 European Office: London Asia-Pacific Office: Australia

