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Health & Welfare

Pompano reared to market size in RAS

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Low-salinity culture successful



USDA-ARS and HBOI-FAU researchers raised pompano to market size in five months with high survival.

Florida pompano (*Trachinotus carolinus*) are found in coastal waters of the Atlantic Ocean from Massachusetts, USA, to Brazil and throughout the Gulf of Mexico, where this high-value species is prized by both recreational and commercial fishermen. Due to pompano's superior market value, interest in its culture developed in the United States during the 1960s and 1970s.

Research conducted during this time period focused largely on developing production methods using ponds, in-pond cages, and flow-through tanks. Common results for these studies included poor growth and feed conversion of fish greater than 200 g, usually coupled with poor survival, resulting in the inability to produce market-size fish of greater than 450 grams.

However, in a preliminary study conducted at Louisiana State University by the lead author using small-scale recirculating aqua-culture systems (RAS) maintained at a salinity of 23 to 28 ppt, it was demonstrated that juvenile pompano can be reared at relatively low densities from an initial weight of 17 grams to over 450 grams in four to five months and 700 grams in eight to nine months, with 95 percent survival.

Florida study

The ability to rear fish at relatively high densities is of importance to commercial aquaculture operations, especially those employing RAS. Although both positive and negative relationships between stocking density and various fish production indices have been documented, the latter is usually the case, as shown by the results of density studies conducted on a variety of marine finfish species.

The authors recently carried out a study to compare production characteristics and body composition of juvenile pompano reared to market size in commercial-scale RAS at moderate and high culture densities. Because results of limited research coupled with anecdotal observations at the research facility suggested that pompano can grow at reduced environmental salinities, fish were reared at a nominal salinity of 5 ppt.



The fillet yield of cultured pompano is near 40 percent.

Experimental setup

Studies were conducted in four, 45-cubic-meter replicate recirculating systems at the United States Department of Agriculture Agricultural Research Service's Sustainable Tank Aquaculture Recirculating Research Facility on the campus of Harbor Branch Oceanographic Institution at Florida Atlantic University.

To initiate a 110-day rearing trial, juvenile pompano reared from eggs produced on site were stocked in two tanks of each of the four RAS at an initial nominal density of 6.5 (low density) or 13.0 kg per cubic meter (high density) – equivalent to 200 or 400 fish/tank, respectively. The mean weight of the fish at stocking was 259.0 ± 3.0 grams.

At initiation of the trial, 15 fish were collected and stored at minus-20 degrees-C for subsequent analysis of whole body composition. After stocking, fish were fed a commercial 50 percent-protein, 14 percent-lipid 4.7-mm floating pelleted diet at a targeted daily feed rate of 3 percent body weight. Water temperature ranged 27.0 to 28.5 degrees-C.

Standard procedures were used for determining the proximate components of the fish and the diet fed during the rearing trial. Energy retention, protein efficiency ratio and protein productive value were also determined.

Results

Significant differences in mean weight and weight gain were evident between the treatments on days 87 and 110. The 632.2-gram final mean weight of fish reared at low density was greater than the 570.0 grams for fish reared at high density. Weight gain for fish reared at low density (371.5 g) was greater than that for fish reared at high density (312.7 grams).

No significant differences in specific growth rate existed between the density treatments, although it decreased over the course of the trial. The final growth rates for fish reared at low and high density were 0.81 and 0.74 percent per day, respectively. The final absolute growth rate for fish reared at low density (3.4 grams per day), however, was greater than the 2.8-gram-per-day rate for fish reared at high density.

Feed conversion efficiency decreased steadily with time, although no difference existed between density treatments until day 110. At that time, fish reared at low density exhibited 29.0 percent efficiency compared to 25.5 percent for fish reared at high density. Significant differences in feed consumption by fish reared at each density were observed at days 66, 87 and 110.

No significant differences in whole body composition, energy retention, hepatosomatic index and fillet yield were observed between the treatments (Table 1). However the protein efficiency ratio of fish reared at low density (0.61) was greater than that of fish reared at high density (0.54). In addition, the protein productive value of fish reared at low density (13.7 percent) was greater than that of fish reared at high density (11.5 percent).

Weirich, Dietary efficiency variables, hepatosomatic index and fillet yield of pompano, Table 1

Variable	Low Density	High Density
Energy retention (%)	16.80 ± 0.60 ^a	15.50 ± 0.30 ^a
Protein efficiency ratio	0.61 ± 0.02 ^a	0.54 ± 0.01 ^b
Protein productive value (%)	13.70 ± 0.60 ^a	11.50 ± 0.40 ^b
Hepatosomatic index (%)	1.10 ± 0.04 ^a	1.15 ± 0.05 ^a
Fillet yield (%)	39.80 ± 0.70 ^a	39.10 ± 0.60 ^a

Table 1. Dietary efficiency variables, hepatosomatic index and fillet yield of pompano reared at two different densities in low-salinity RAS. Values sharing the same letter are not significantly different ($P > 0.05$).

No significant gender-based differences were detected regarding percentage of population, final weight, and fillet yield. The gender-sensitive indicators of male fish (0.53 percent), however, were lower than those of female fish (1.19 percent).

Critical ions

While limited research has been conducted to investigate the possibility of rearing marine species at low salinities, studies conducted thus far have shown that production and survival can be enhanced via maintenance of critical ions including calcium, magnesium and potassium. In this study, sulfate, potassium and magnesium concentrations approximated levels expected in diluted natural seawater, while calcium levels were amended and maintained at a level that approximated the concentration expected at a salinity of 15 ppt.

Further research

Results of this study demonstrated that Florida pompano can be reared to market size at high density in low-salinity RAS. While increased density reduced overall production, additional studies are warranted to determine optimal rearing density on an economical basis. In addition, research must be

concentrated on the development of finishing diets for final stages of pompano production to increase feed conversion efficiency. Further research is needed to evaluate the potential of rearing pompano in RAS at salinities lower than 5 ppt, perhaps through environmental and/or dietary enhancement of critical ions.

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