

Cage Production of Red Drum Weaned from Trash Fish to Extruded Feed in Xiamen, Fujian Province

Results of ASA/China Feeding Trial 35-01-131

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ABSTRACT

Weaning of 161-g red drum (*Sciaenops ocellata*) from trash fish to extruded feed, followed by growout to market size on extruded feed, was demonstrated in a cage feeding trial at the He Sheng Fa Cage Fish Farm in Ma Nan Bay, Xiamen, Fujian Province, China. Red drum that had only been fed with trash fish were stocked in three, 8.0-m³ cages at a density of 100 fish per m³ and weaned from trash fish to extruded feed over a period of one week. After weaning to extruded feed, red drum were fed to satiation twice daily with a 43/12 extruded, floating marine fish feed formulated by ASA using dehulled soybean meal as partial replacement for fishmeal. Red drum grew from 161 g to 834 g in 155 days on the ASA feed, with an average FCR of 1.99:1. Average fish carrying capacity at harvest was 74.5 kg/m³ of cage. The average fish survival rate was 89.5%. Net economic return and return on investment for the trial were RMB 360/m³ and 43.3%, respectively. The trial demonstrated that sub-market size red drum could be weaned from trash fish to extruded feed without difficulty. However, chronic poor water quality conditions at the trial site resulted in feed conversion efficiency with the 43/12 extruded feed that was substantially below standard. FCR with the extruded feed was still significantly better than that obtained in the area with trash fish. Feed cost per kilogram of fish growth with the ASA extruded feed was RMB 9.55, which was substantially below the cost of producing red drum with trash fish. Red drum production performance was confounded by chronically poor water quality at the test site. Dissolved oxygen level was generally below 60% saturation throughout the production season. Results of the trial indicate that Ma Nan Bay is a high-risk culture site that will likely continue to experience chronic water quality problems and periodic catastrophic fish kills related to poor water quality. Use of highly polluting trash fish and too many fish cages are the primary problems that constrain fish production. The number of fish cages needs to be drastically reduced in Ma Nan Bay and the use of trash fish prohibited to permit recovery of the ecosystem and allow sustainable fish culture in the future.

INTRODUCTION

The American Soybean Association (ASA), in cooperation with the He Sheng Fa Cage fish Farm in Ma Nan Bay, Xiamen, Fujian Province, conducted a cage feeding trial with red drum in 2001. The objective of the trial was to demonstrate the feasibility of weaning sub-market size red drum from trash fish to extruded aquafeed and completing the culture of the red drum to market size with the extruded feed.

MATERIALS AND METHODS

Three, 8.0-m³ cages (2 m x 2 m x 2 m) at the He Sheng Fa Cage Fish Farm in Ma Nan Bay, Xiamen, Fujian Province, were used for the trial. Cages were constructed of nylon mesh netting with a rigid top frame, opaque cover and feed enclosure to contain extruded, floating feed pellets. The three cages were positioned in a single row on the outside edge of the farm, with a minimum of one cage width between and on all sides of each cage to allow good water exchange.

The three trial cages were stocked in May with sub-market size red drum (*Sciaenops ocellata*) at a density of 100 fish per m³. The red drum had previously only been fed trash fish. The red drum were weaned over a one-week period from trash fish to the ASA 43/12 (43% crude protein and 12% crude fat) marine fish growout feed in extruded, floating pellet form (Table 1). The ASA 43/12 feed is formulated with 35% soybean meal to reduce feed cost. Shanghai DaJiang aquafeed mill produced the feed. Weaning was accomplished by replacing a portion of the trash fish each day with extruded feed until the sea bass were consuming 100% extruded feed. The trial was started after weaning to extruded feed was completed. During the trial the red drum in all trial cages were fed to satiation twice daily with the extruded feed. Fish in all trial cages were fed identically at each feeding.

Trial management was based on the ASA LVHD cage production model. Fish in all cages were sampled once per month on the same date each month. All cages were harvested at the conclusion of the trial to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival. Production costs were recorded throughout the trial to permit calculation of net economic return and return to investment (ROI) at the end of the trial.

RESULTS

Red drum were fed for 155 days between 29 May and 31 October 2001. Red drum grew from 161 g to an average weight of 834 g during the 155-day feeding period (Figure 1; Table 2). Average FCR with the ASA 43/12 feed for this period was 1.99:1. Average fish carrying capacity at harvest was 74.5 kg/m³. The average fish survival rate was 89.5% (Table 2).

Feed cost per kilogram of fish growth with the ASA extruded feed was RMB 9.55. Average market price for red drum was RMB 16/kg. Net economic return and return on investment (ROI) for the two trial cages averaged RMB 360.3/m³ and 43.3%, respectively (Table 2).

SUMMARY AND CONCLUSIONS

The trial demonstrated that sub-market size red drum could be weaned from trash fish to extruded feed without difficulty. However, red drum growth and feed conversion efficiency in this trial were below standard as a result of chronic poor water quality at the trial site. Dissolved oxygen levels in early April were only 3.0 mg/l to 3.5 mg/l at water depths of 1.0 to 4.0 meters. The dissolved oxygen saturation level at the site was 60% or lower throughout the production season. Dissolved oxygen saturation levels of 30% were not uncommon. A heavy afternoon rainstorm in August caused a significant fish kill due to LODOS conditions brought on by water column mixing that brought anoxic water from the bay bottom to the surface.

While feed conversion efficiency with the ASA 43/12 feed in this trial was well below standard, it was still significantly better than that obtained in the area with trash fish. The RMB 9.55 cost for feed per kilogram of fish growth with the ASA extruded feed was substantially below the cost of producing red drum with trash fish.

Results of the trial indicate that Ma Nan Bay is a high-risk culture site that will continue to experience chronic water quality problems and periodic catastrophic fish kills related to poor water quality. Widespread use of highly polluting trash fish and too many fish culture cages are significant factors constraining fish production. The number of fish cages needs to be drastically reduced in Ma Nan Bay and the use of trash fish prohibited to permit recovery of the ecosystem and to allow sustainable fish culture in the future. ASA will not conduct further marine fish cage trials in this area because of the high levels of pollution and corresponding poor water quality conditions.

ACKNOWLEDGEMENTS

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Chinese Currency and Production Unit Conversions:

RMB 8.26 = US\$1.00

1.0 kg = 2.2 lb

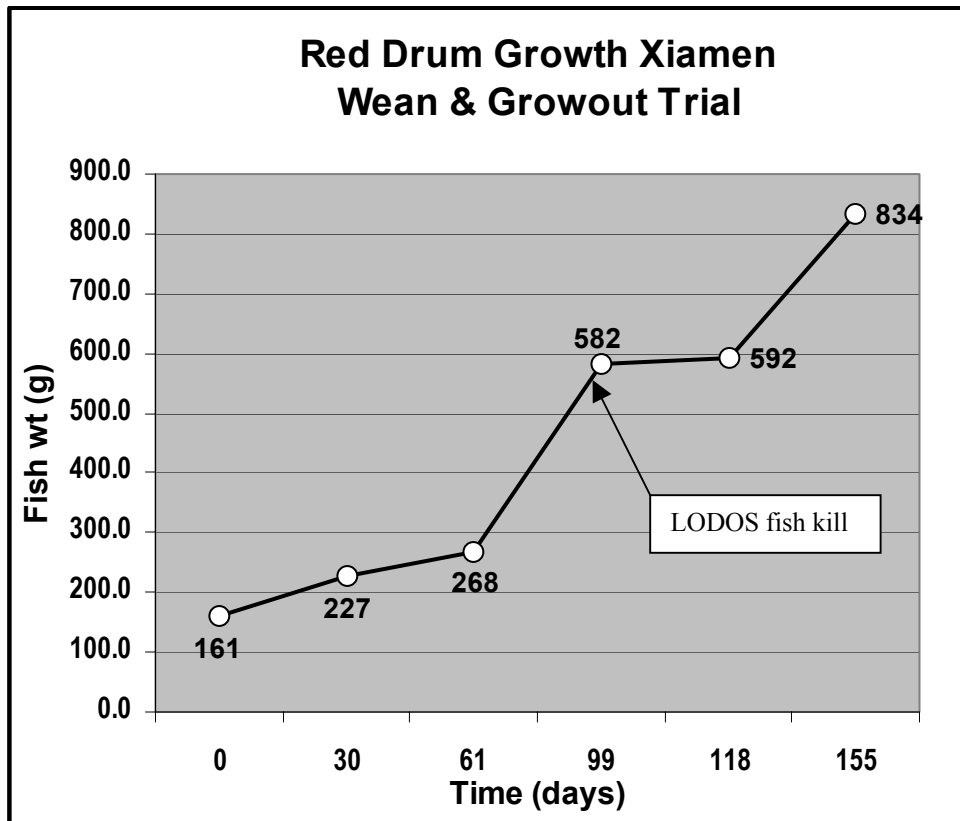


FIGURE 1. Growth curve for red drum cultured with extruded aquafeed following weaning from trash fish. Red drum grew from 161 g to 834 g in 155 days on the ASA 43/12 extruded aquafeed, with an average FCR of 1.99:1. The ASA feed was formulated with 35% soybean meal to reduce cost, and yielded significantly lower FCR and feed cost per unit of fish growth than trash fish. Average feed cost per kilogram of red drum growth with the 43/12 extruded feed was RMB 9.55. Chronic poor water quality at the Xiamen site significantly impacted red drum production performance.

Table 1. Formula for the ASA 43/12 marine fish growout feed used in the 2001 red drum wean and growout trial conducted in Ma Nan Bay, Xiamen, Fujian Province, China.

Ingredient	Percentage of feed
Soybean Meal 43	35.00
Fishmeal, anchovy 63/6.5	37.00
Wheat Flour 10	14.20
Wheat Gluten	4.60
Fish Oil, Unspec.	8.40
Vit PMX	0.50
Min PMX	0.25
Stable Vitamin C35	0.03
Ethoxyquin	0.02
TOTAL	100.00

¹The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 43/12 indicates 43% crude protein and 12% crude fat.

Table 2. Results of the 2001 ASA aquaculture trial at Ma Nan Bay, Xiamen, Fujian Province, that demonstrated weaning of red drum from trash fish to extruded feed, followed by growout to market size in 8.0-m³ cages using the ASA LVHD cage production model and ASA extruded aquafeed.

Cage No.	Feeds	Stocking rate (fish/m ³)	Initial fish weight (g)	No. days fed	Fish harvest weight (g)	Survival (%)	P _G ¹ (kg/m ³)	FCR	Net income (RMB/m ³)	ROI (%)
1	43/12	100	156	155	876.3	84.9	74.4	1.97:1	358.3	43.1
2	43/12	100	167	155	870.5	89.8	78.1	1.89:1	418.3	50.3
3	43/12	100	160	155	756.3	93.9	71.0	2.11:1	304.3	36.6
Mean	43/12	100	161	155	834.4	89.5	74.5	1.99:1	360.3	43.3

¹ P_G = Gross Production, expressed as fish weight per cubic meter of cage