

# **Cage Production of Rockfish *Sebastes fuscescens* In Ocean Cages with Extruded Feed**

## **Results of ASA/China 2002 Feeding Trial 35-02-127**

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### **ABSTRACT**

The growth performance of rockfish (*Sebastes fuscescens*) was evaluated in an ASA coastal cage trial in Dalian, China. Rockfish were stocked at 175 fish per m<sup>3</sup> in three replicate cages of size 8.0-m<sup>3</sup> and were fed to satiation twice daily with the ASA 43/12 extruded marine fish growout feed. Rockfish grew from 86 g to 216 in 110 days, with an average FCR of 1.23:1. Fish survival averaged 96%. Growth of rockfish was reported to be slow during warm summer months, but that growth improved at water temperatures <20°C. Rockfish may be a candidate species for coastal cage culture, but further evaluation, particularly in cooler coastal waters, is required to evaluate species potential.

### **INTRODUCTION**

The American Soybean Association (ASA), in cooperation with Dalian Municipal Fisheries Extension Station and the Da Yao Wan Marine Cage Culture Base in Dalian, Liaoning Province, conducted a feeding trial in 2002 to evaluate production of rockfish (*Sebastes fuscescens*) in coastal cages using the ASA cage technology and ASA extruded marine fish growout feed.

### **MATERIALS AND METHODS**

Three cages of size 6.4-m<sup>3</sup> each at the Da Yao Wan Marine Cage Culture Base in Dalian were used for the trial. Cages were constructed according to ASA guidelines, and included opaque covers and feed enclosures. Cages were arranged on the perimeter of the cage farm with a minimum of one cage width of open space on all sides of each cage for adequate water exchange.

Fish were 86-g rockfish purchased by the Dalian cage fish farm. Rockfish were stocked in the three trial cages at 1,400 fish per cage (175 fish per m<sup>3</sup>). Target size for the rockfish was 300 g per fish.

Rockfish were fed the ASA 43/12 marine fish growout feed in extruded, floating pellet form (Table 1). Fish were fed to satiation twice daily, with fish in all cages fed the same amount at each feeding.

Rockfish in all cages were sampled once per month on approximately the same date each month to monitor growth performance. At the conclusion of the trial, the three trial cages were emptied

and the rockfish in each cage counted and weighed to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival. Production input costs were recorded throughout the trial and net income and ROI calculated at the end of the trial.

## **RESULTS**

Minimal fish weight gain occurred during the first three weeks of the trial. This was attributed to large size variation among the rockfish and contamination of the cage trial stock with greenling, a competitory species. The trial was halted on 9 July and the rockfish and greenling were separated and the rockfish graded and restocked in the three trial cages. The trial was restarted on 21 July.

Rockfish were fed a total of 110 days between 21 July and 8 November 2002. Rockfish grew from 86 g to 216 g during this period with an average FCR of 1.23:1 (Figure 1; Table 2). Average gross production at the termination of the trial was 36 kg/m<sup>3</sup>. Average survival for rockfish was 96%. Economic return for the sub-market size rockfish averaged RMB 98/m<sup>3</sup>, with an average ROI of 20%.

Rockfish growth and FCR improved significantly when water temperature cooled in late summer and early fall. FCR in the warmer summer months, when water temperature was approximately 25°C, averaged 1.6:1 (Figure 1). In late summer and fall, when water temperature dropped below 20°C, FCR improved to 1.01:1. Fish exhibited excellent growth and FCR in October when the average monthly water temperature was 16.5°C.

## **SUMMARY AND CONCLUSIONS**

Rockfish growth, feeding performance and FCR on the ASA extruded feed were good during cooler water temperatures, but declined at higher water temperatures during July and August. Poor FCR in the first three weeks of the trial was attributed to a combination of over-feeding, large size variation among the rockfish, and stock contamination with greenling. FCR improved substantially when the greenling were removed and the rockfish graded and restocked in the trial cages at a uniform size.

The trial cooperator reported that rockfish grow slowly in the Dalian area during the warm summer months, but that rockfish growth improves significantly when water temperatures decline to <20°C. Rockfish may be a candidate species for coastal cage culture, but additional testing, particularly in cooler coastal waters, is required to determine the culture value of this species.

## **ACKNOWLEDGEMENTS**

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### Chinese Currency and Production Unit Conversions:

RMB 8.26 = US\$1.00

1.0 kg = 2.2 lb

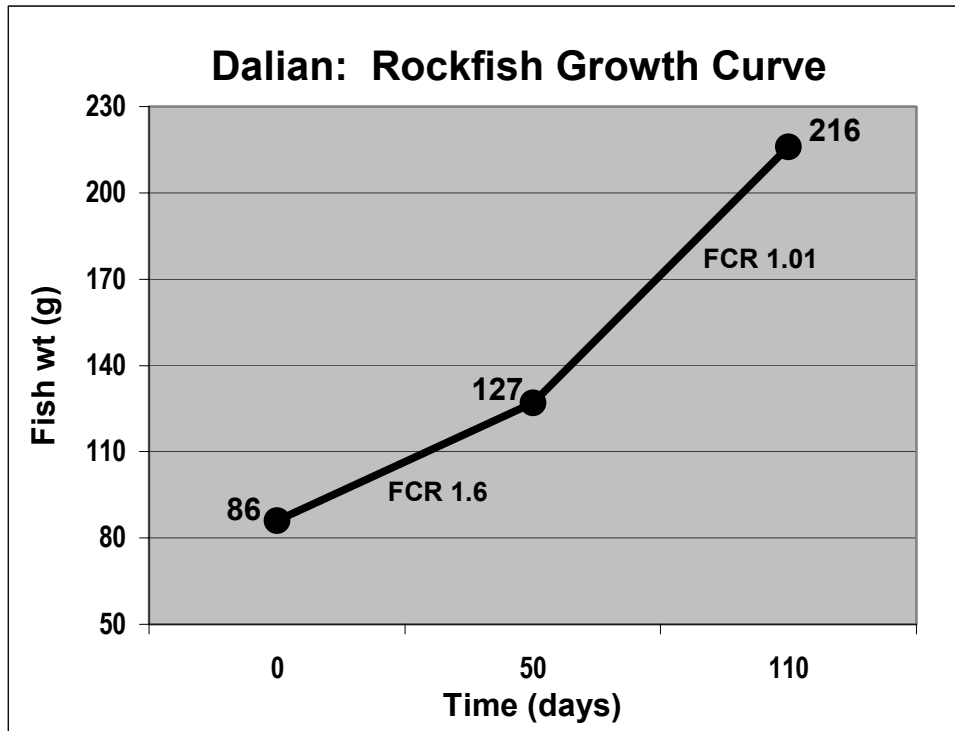


Figure 1. Growth curve for rockfish cultured in 8.0-m<sup>3</sup> LVHD cages in Dalian, Liaoning Province. Rockfish exhibited good feed conversion with the ASA marine fish growout feed, particularly as water temperatures cooled during in late summer and fall. Rockfish may be a good candidate species for coastal cage culture in cooler water regions. FCR for each sampling period is shown below the growth curve line.

Table 1. Formula for the ASA 43/12 marine fish growout feed used in the 2002 rockfish cage culture trial in Dalian, Liaoning Province, China.<sup>1</sup>

Ingredient	Percentage of feed
Soybean Meal	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

<sup>1</sup>The 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 2002 ASA aquaculture trial at Dalian, Liaoning Province, that evaluated growth performance of rockfish in coastal cages using the ASA LVHD cage production model and extruded marine fish growout feed.

Cage No.	ROK <sup>1</sup> stocking size (g)	Stocking rate (fish/m <sup>3</sup> )	No. days fed	Harvest wt. (g)	P <sub>G</sub> <sup>2</sup> (kg/mu)	Survival (%)	FCR	Net (RMB/mu)	ROI (%)
1	85.8	175	110	212	35.5	95.9	1.3	85.4	18
2	82.5	175	110	217	37.0	97.2	1.2	109.4	23
3	91.3	175	110	218	36.3	95.1	1.3	98.4	20
Mean	86.5	175	110	216	36.3	96.1	1.23	97.7	20

<sup>1</sup>ROK = Rockfish

<sup>2</sup>P<sub>G</sub> = Gross Production