

# **Production of Brown Croaker in Near-Shore Ocean Cages: Results of a Feeding Demonstration in Quanzhou, China**

## **Results of ASA/China 2003 Feeding Trial 35-03-125**

Michael C. Cremer, Zhang Jian and Hsiang Pin Lan  
American Soybean Association  
Room 902, China World Tower 2  
No. 1 Jianguomenwai Avenue  
Beijing 100004, P.R. China

### **ABSTRACT**

The growth performance of brown croaker (*Miichthys miiuy*) was evaluated in an ASA coastal cage trial in Dongtou, China. Croaker were stocked at 250 fish per m<sup>3</sup> in three replicate cages of size 6.4-m<sup>3</sup> and fed to satiation twice daily with the ASA extruded marine fish fingerling and growout feeds. Brown croaker grew from 10 g to 213 g in 117 days, with an average FCR of 2.0:1. Average fish survival was 51.7%. High mortality early in the trial and strong tidal currents required modifications to trial implementation and construction of the cage frames.

### **INTRODUCTION**

The American Soybean Association (ASA), in cooperation with Dongtou Fisheries Technology Extension Center, conducted a feeding trial in 2003 to evaluate production of brown croaker (*Miichthys miiuy*) in coastal cages using the ASA LVHD cage technology and ASA extruded marine fish feeds.

### **MATERIALS AND METHODS**

Three cages of size 6.4-m<sup>3</sup> each at the Dongtou Fisheries Technology Extension Center experimental cage fish farm in Sanpan Bay, Dongtou, Zhejiang Province, 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 4-g brown croaker purchased by the Dongtou Fisheries Technology Extension Center experimental cage fish farm. Brown croaker were stocked in the three trial cages at 2,000 fish per cage (312.5 fish per m<sup>3</sup>). Target size for brown croaker was 250 g per fish.

## **ASA FY03 Dongtou Brown Croaker Coastal Cage Trial**

Brown croaker were fed the ASA 47/15 (47% crude protein and 15% crude fat) marine fingerling feed in extruded, floating pellet form from fish size 4 g to fish size 25 g (Table 1). When fish reached size 25 g, they were weaned to the ASA 43/12 (43% crude protein and 12% crude fat) marine growout feed (Table 2). The 43/12 growout feed was formulated with 35% dehulled soybean meal, as a partial replacement for fish meal, to reduce feed cost. Both feeds were formulated by ASA and produced by the Shanghai DaJiang aquafeed mill. Fish were fed to satiation three times daily for the first month, and twice daily thereafter, with fish in all cages fed the same amount at each feeding. Feeding commenced on 20 June 2003.

Brown croaker 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 fish 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**

High mortality occurred immediately after stocking the cages in early May. As a result, the trial was postponed until it was determined that the condition of the remaining fish was sufficient to proceed. The remaining croaker were cultured to an average size of 10 g, and the trial was restarted. The three trial cages were restocked on 10 June 2003 with 10.3-g brown croaker at a density of 1,600 fish per cage (250 fish/m<sup>3</sup>), and the trial was restarted on 20 June 2003.

Brown croaker were fed a total of 117 days between 20 June and 16 October 2003. Brown croaker grew from an average weight of 10.3 g to an average weight of 213 g during this period (Table 3). Average FCR with the combination of 47/15 and 43/12 feeds was 2.0:1 (Table 3). Gross production averaged 176.6 kg per cage, or 27.6 kg/m<sup>3</sup> of cage volume. Fish survival averaged 51.7% (Table 3).

Net economic return obtained from sales of the 213-g brown croaker averaged RMB 1,433 per cage (RMB 224/m<sup>3</sup>) at a market price of RMB 30/kg for brown croaker. Average return on investment was 37% (Table 3).

## **SUMMARY AND DISCUSSION**

Brown croaker survival rates of 50-55% were reported to be typical for the Dongtou area with this species. The reason for the low survival rate of brown croaker was not determined, although local fish producers believe it is related to stock quality. It may also relate to declining water quality and/or strong tidal currents in this area.

Feeding response with brown croaker was similar to that observed with yellow croaker in other ASA trials. Both croaker species swim along the interior cage netting seeking feed. Croaker are subdued in their feeding habits, and do not aggressively feed on floating pellets inside a central feed enclosure in the cage like sea bass, pompano and other species.

### **ASA FY03 Dongtou Brown Croaker Coastal Cage Trial**

Compression of the fish culture cages by tidal currents necessitated changing the cage design to incorporate rigid frame cages in September. The original cage support, which was limited to a top frame, was replaced with a 2 m x 2 m x 2 m metal cage frame to eliminate net deflation and maintain a constant cage volume.

Brown croaker did not reach the target market size of 250 g due to the limited culture period that resulted from high early fish mortality and problems with the cage design.

### **ACKNOWLEDGEMENTS**

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### **Chinese Currency and Production Unit Conversions:**

RMB 8.26 = US\$1.00

1.0 kg = 2.2 lb

## ASA FY03 Dongtou Brown Croaker Coastal Cage Trial

Table 1. Formula for the ASA 47/15 marine fingerling feed used in the 2003 brown croaker trial conducted at Dongtou, Zhejiang Province, China.<sup>1</sup>

Ingredient	Percentage of feed
Fishmeal, anchovy 67/7-8	48.70
Wheat flour 10	20.00
Soybean Meal	10.00
Wheat gluten 68	10.00
Fish Oil, Unspecified PV=10<20	10.50
Min PMX T&S 1	0.25
Vit PMX F2	0.50
Stable Vit C35	0.03
Ethoxyquin 66	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. 47/15 indicates 47% crude protein and 15% crude fat.

**ASA FY03 Dongtou Brown Croaker Coastal Cage Trial**

Table 2. Formula for the ASA 43/12 marine fish growout feed used in the 2003 brown croaker trial conducted at Dongtou, Zhejiang 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.

**ASA FY03 Dongtou Brown Croaker Coastal Cage Trial**

TABLE 3. Results of the 2003 ASA aquaculture trial at Dongtou, Zhejiang Province, that evaluated growth performance of brown croaker in 6.4-m<sup>3</sup> coastal cages using the ASA LVHD cage production model and soy-inclusion extruded marine fish feeds.

Cage No.	BC <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/m <sup>3</sup> )	Survival (%)	FCR	Net (RMB/m <sup>3</sup> )	ROI (%)
1	10.0	250	117	216.3	26.2	48.4	2.1:1	182	30.1
2	11.2	250	117	210.3	29.3	55.6	1.9:1	275	45.5
3	9.6	250	117	212.5	27.3	51.2	2.0:1	215	35.6
Mean	10.3	250	117	213.0	27.6	51.7	2.0:1	224	37.0

<sup>1</sup>BC = Brown Croaker

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