Results of Coastal Cage Fish Trials in Shenzhen with Green Grouper, Red Drum and Pompano

Results of ASA/China 2000 Feeding Trials 35-00-115/116/131

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INTRODUCTION

The American Soybean Association (ASA), in cooperation with the China National Fisheries Extension Center (NEC), the Guangdong Provincial Fisheries Extension Center, and the Long Gang Fisheries Research Institute coastal cage culture farm in Dong Shan Bay, conducted feeding trials with green grouper (*Epinephelus awoara*), red drum (*Sciaenops ocellata*) and pompano (*Trachinotus ovatus*) in 2000. The objective of the green grouper and pompano trials was to compare growth and economic performance of these species from fingerling to market size with a traditional fresh fish diet and a soymeal-based, extruded aquafeed. The objective of the red drum trial was to demonstrate that sub-market size red drum could be weaned from fresh fish to a soymeal-based manufactured feed and economically grown to market size on the manufactured feed.

MATERIALS AND METHODS

Green Grouper Growout Trial

Six, 1.5-m^3 floating cages at the Long Gang Fisheries Research Institute coastal cage culture farm in Dong Shan Bay, Guangdong Province, were used for the feeding trial. Cages were constructed of mesh netting with a solid frame, opaque cover and feed enclosure.

Cages were stocked with green grouper fingerlings with an average weight of 25 g per fish. Fish stocking density was 400 fish per m^3. Grouper were of uniform size and age at stocking.

Grouper in three of the cages were fed chopped, wild caught fresh fish. Grouper in the other three cages were fed the ASA 43/12 marine fish feed in extruded, floating pellet form (Table 1). Fish in all cages were fed to satiation twice daily. Fish in replicate cages of each feed treatment were fed identically. Feed treatment replications were randomly assigned to the six trial cages.

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 scheduled to be harvested at the conclusion of the trial to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival.

Red Drum Wean and Growout Trial

Three, 1.5-m^3 floating cages at the Long Gang Fisheries Research Institute coastal cage culture farm in Dong Shan Bay, Guangdong Province, were used for the feeding trial. Cages were constructed of mesh netting with a solid frame, opaque cover and feed enclosure.

Cages were stocked with sub-market size red drum with an average weight of 200 g per fish. Fish stocking density was 400 fish per m^3. Red drum were of uniform size and age at stocking.

Red drum were weaned from their previous fresh fish diet to an extruded pellet feed at the beginning of the trial. Weaning was accomplished by substituting 10% of the fresh fish each day with pelleted feed for a maximum of 10 days. After weaning, fish were fed the ASA 43/12 marine fish feed in extruded, floating pellet form (Table 1). Fish were fed to satiation twice daily, with fish in each cage fed identically.

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 scheduled to be harvested at the conclusion of the trial to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival.

Pompano Growout Trial

Six, 1.5-m^3 floating cages at the Long Gang Fisheries Research Institute coastal cage culture farm in Dong Shan Bay, Guangdong Province, were used for the feeding trial. Cages were constructed of mesh netting with a solid frame, opaque cover and feed enclosure.

Cages were stocked with advanced pompano fry with an average weight of 0.7 g per fish. Fish stocking density was 400 fish per m^3. Pompano were of uniform size and age at stocking.

Pompano in three of the cages were fed wild caught fresh fish in paste or chopped form. Pompano in the other three cages were fed the ASA 43/12 marine fish feed in extruded, floating pellet form (Table 1). Initial 43/12 feed pellet size was 1.5 mm. Fish in all cages were fed to satiation twice daily. Fish in replicate cages of each feed treatment were fed identically. Feed treatment replications were randomly assigned to the six trial cages.

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 scheduled to be harvested at the conclusion of the trial to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival.

RESULTS

Green Grouper Growout Trial

Four of the six trial cages were lost and never recovered in a typhoon on 28 August 2000, including all three of the ASA feed treatment cages. At the last scheduled sampling prior to the typhoon loss, green grouper fed the ASA feed had grown from 25 g to 120 g in 93 days (Figure 1). Green grouper fed fresh fish had grown from 25 g to 115 g in 93 days (Figure 1). Grouper survival was low in all cages, and was estimated to be only 20-25% at the last sampling.

Fish in the two cages that were not lost in the 28 August typhoon were fed fresh fish through 16 October 2000. Grouper in these cages grew from 25 g to 187 g in 146 days of feeding. FCR for grouper fed the fresh fish was estimated to be 7.70:1.

Growth of green grouper fed the ASA soymeal-based feed for 93 days was variable. Grouper increased their body weight by 79% in the first 32 days of feeding, 30% in the next 30 days, and 108% in the last 31 days before the typhoon. This growth pattern suggests that further culture work with this species is warranted. However, green grouper were observed to be sensitive to changes in water quality. Given the current decline in water quality in most coastal cage culture areas, there will likely be few sites with an environment suitable for the culture of green grouper.

The impact of the 28 August typhoon on near-shore trial cages indicates that 1.5-m^3 cages are too small for the coastal environment, and that cages for typhoon impact areas need to be designed so that they can be submerged during storms.

Red Drum Wean and Growout Trial

All fish in the three red drum trial cages were killed in a typhoon on 16 July 2000. At the last scheduled sampling prior to the typhoon loss, red drum weaned from fresh fish to the ASA 43/12 feed had grown from 200 g to 370 g in 57 days (Figure 2). Average FCR with the ASA feed during the 57-day feeding period was 1.27:1.

Growth and FCR of red drum fed the ASA soymeal-based feed for 57 days was excellent. Feed cost per kilogram of fish growth with the ASA feed was RMB 6.60. In comparison, estimated feed cost per kilogram of fish growth with fresh fish, using an FCR of 8:1, was RMB 14.40 at the prevailing fresh fish cost of RMB 1.80/kg. Results of the trial indicate that red drum has the potential to perform well when fed an extruded, soymeal-based feed under the environmental conditions prevalent in southern China.

The impact of the 16 July typhoon on the red drum trial indicates that 1.5-m^3 cages are too small for the coastal environment, and that cages for typhoon impact areas need to be designed so that they can be submerged during storms.

Pompano Growout Trial

Two of the six pompano trial cages were lost in a typhoon on 28 August 2000. Both lost cages were from the ASA feed treatment. At the last scheduled sampling prior to the typhoon, pompano fed the ASA feed had grown from 0.7 g to 37.9 g in 93 days (Figure 3). Pompano fed fresh fish had grown from 0.7 g to 27.5 g in 93 days. FCR for pompano fed the ASA 43/12 feed for 93 days was 1.95:1, based on a 21 August sampling of approximately 10% of each cage population. FCR for pompano fed the fresh fish diet for 93 days was 19.8:1. There was considerable variation in FCR, both within and among treatments, for both feed treatment groups at the June, July and August fish samplings.

Fish in the four cages that survived the 28 August typhoon were fed an additional 53 days before the trial was terminated. Pompano in the single ASA feed treatment cage grew from 37.9 g to 87 g in the final 53 days of feeding (Figure 3). Pompano fed the fresh fish diet grew from 27.5 g to 93 g in the final 53 days of feeding (Figure 3). Fish survival in the one ASA feed treatment cage was 61%. Average fish survival in the three fresh fish treatment cages was 64.7%. Estimated FCR for the ASA feed and fresh fish were 1.4:1 and 6.1:1, respectively.

Pompano were growing well on the ASA soymeal-based feed before a typhoon destroyed two of the ASA feed treatment cages. Pompano increased mean body weight by 67% in the first 32 days of feeding, 90% in the next 30 days of feeding, and 96% in the final 31 days of feeding before the typhoon. However, pompano growth during this 93-day period was slower than in the 1999 ASA pompano trial at the same site. This may be an indication of deteriorating water quality at the site.

The impact of the 28 August typhoon on pompano trial cages indicates that 1.5-m^3 cages are too small for the coastal environment, and that cages for typhoon impact areas need to be designed so that they can be submerged during storms.

ACKNOWLEGEMENTS

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Chinese Currency and Production Unit Conversions:

RMB 8.26 = $1.00
1.0 kg = 2.2 lb

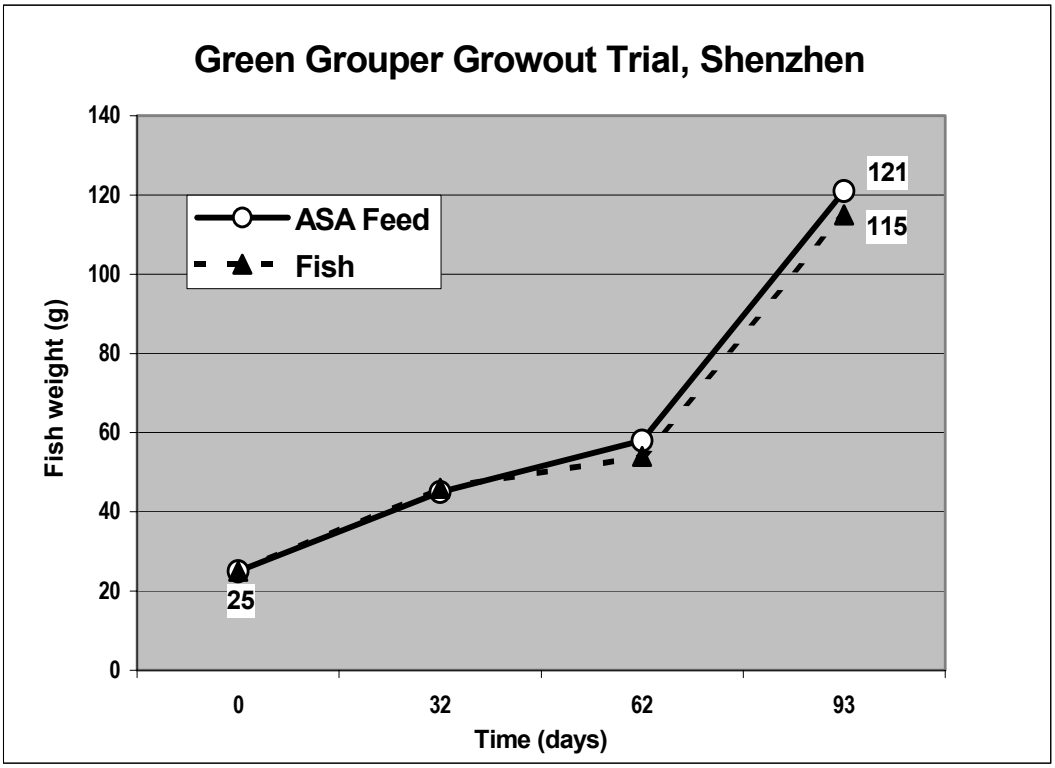

FIGURE 1. Growth curves for green grouper fed fresh fish (Fish) and an ASA 43/12 extruded, floating feed (ASA Feed) for 93 days in a fingerling to market growout trial conducted at Dong Shan Bay, Shenzhen. Four of six trial cages were lost in a typhoon on 28 August 2000, forcing early termination of the trial. Green grouper were growing well on the extruded feed prior to the typhoon, but green grouper sensitivity to water quality changes will limit its coastal production range in China.

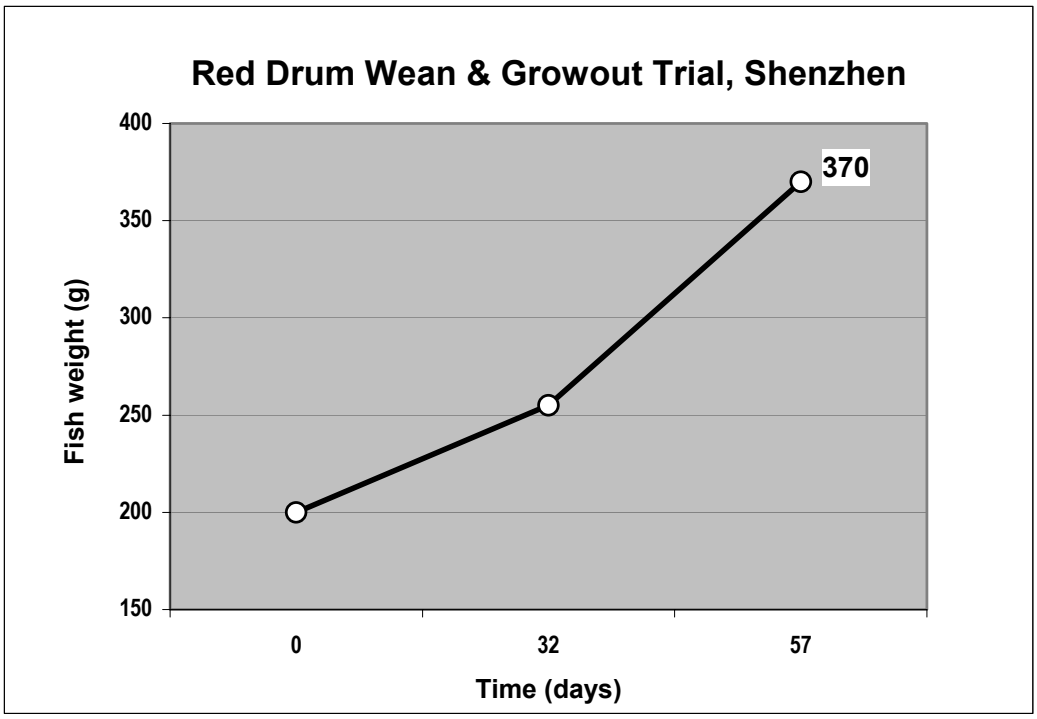

FIGURE 2. Growth curve for sub-market size red drum weaned from fresh fish to an ASA 43/12 extruded, floating feed and fed the extruded feed for 57 days in a wean and growout trial conducted at Dong Shan Bay, Shenzhen. Red drum FCR with the soymeal-based 43/12 feed was 1.27:1. Feed cost per kilogram of fish growth was RMB 6.60.

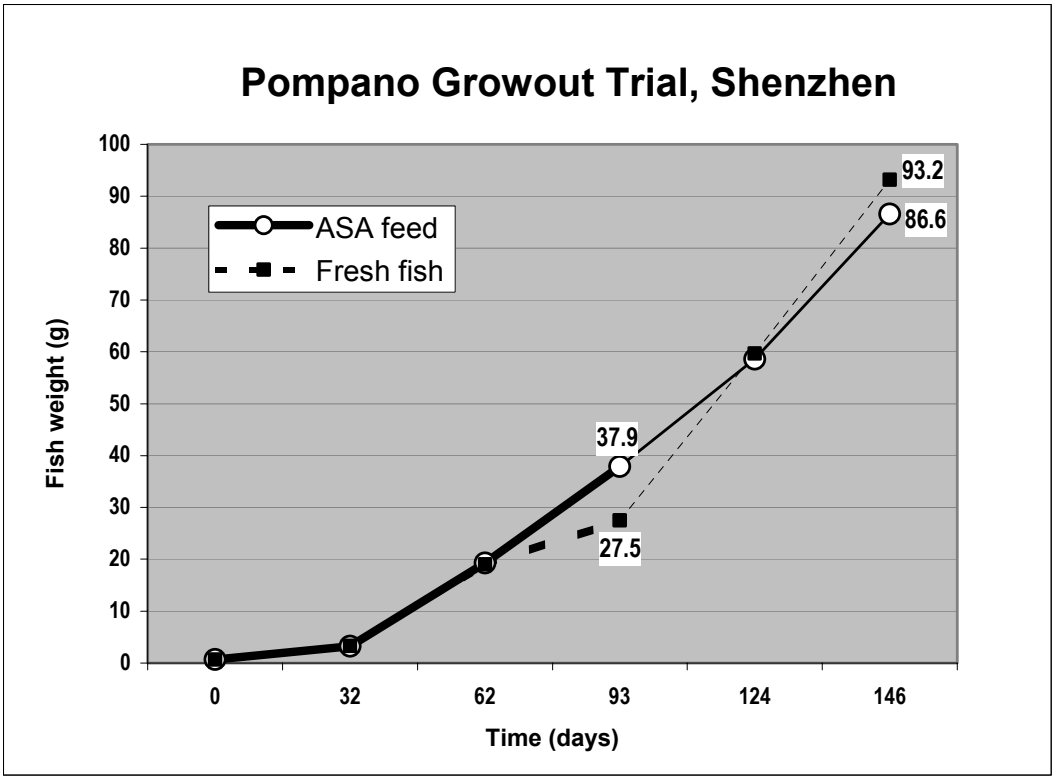

FIGURE 3. Growth curves for pompano fed fresh fish and an ASA 43/12 extruded, floating feed in a fingerling to market growout trial conducted at Dong Shan Bay, Shenzhen. Two of three extruded feed treatment cages were lost shortly after the 93-day sampling, and high fish mortality was experienced in the remaining cages.

Table 1. Formula for the ASA 43/12, soymeal-based marine fish feed used in the 2000 green grouper, red drum and pompano trials conducted at Dong Shan Bay, Shenzhen, China.

Ingredient	Percentage of feed
Soybean Meal 47.5	40.00
Fishmeal, anchovy 65/10	34.00
Wheat, SWW	16.50
Fish Oil, Unspec.	8.03
Corn gluten meal	1.00
Vit PMX Roche 2118	0.20
Min PMX F-1	0.25
Ethoxyquin	0.02
TOTAL	100.00

[1]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.