
HYBRID STRIPED BASS¹

Project *Termination* Report for the Period
September 1, 2001 to August 31, 2005

NCRAC FUNDING: \$310,000 (September 1, 2001 to May 30, 2005)

PARTICIPANTS:

Paul B. Brown	Purdue University	Indiana
Christopher C. Kohler	Southern Illinois University-Carbondale	Illinois
William C. Nelson	North Dakota State University	North Dakota
<i>Industry Advisory Council Liaison:</i>		
Forrest Williams	Bay Port Aquaculture, Bay Port	Michigan
<i>Extension Liaison:</i>		
Joseph E. Morris	Iowa State University	Iowa
<i>Non-Funded Collaborators:</i>		
David LaBomascus	Genesis, Inc., Cedar Rapids	Iowa

REASON FOR TERMINATION

The project objectives were completed.

PROJECT OBJECTIVES

(1) Marketing

- a. Investigate and document current and potential demand (prices and quantities) for hybrid striped bass (live and processed), clearly identifying consumer groups, processors, and distributors by location, seasonality of demand, size preferences, unique demand attributes, i.e., "healer fish" in Chinese culture, and impact of increased supplies on market prices of hybrid striped bass and competitive species.
- b. Estimate the processing and distribution costs (supply chain costs and margins) to derive expected "farm gate live weight" prices as a function of producer and consumer locations.
- c. Conduct limited taste testing on hybrid striped bass to determine the effect of different feed rations.
- d. Develop a Web page that would be a component of the NCRAC Web site that would provide analysis results to clientele quickly and to allow easy updates.
- e. Design and investigate willingness of hybrid striped bass producers to become a part of a current market information system.

¹NCRAC has funded seven Hybrid Striped Bass projects. Termination reports for the first four projects are contained in the 1989-1996 Compendium Report; a project component termination report for two objectives of the fifth project is contained elsewhere in the 1997-98 Annual Progress Report; and a termination report for the remaining objective of the fifth project as well as the objectives of the sixth project is contained in the 2000-01 Annual Progress Report. This termination report is for the seventh project, which is chaired by Christopher C. Kohler. It was originally a 3-year study that began September 1, 2001.

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(2) Compare phase III production parameters and feed costs of hybrid striped bass/sunshine bass (female white bass × male striped bass) in ponds and recirculating aquaculture systems using commercially available diets (32, 36, and 40% protein) in a minimum of two locations (three feed treatments/location), with 100 g ± 20 g (3.5 oz ± 0.7 oz) phase III fish (minimum of three replications/treatment), in ponds at least 0.04 ha (0.1 acre), with a stocking density of 7,413 fish/ha (3,000 fish/acre), or in tanks at least 1,893 L/tank (500 gal/tank) with a 60 g/L (0.5 lb/gal) at harvest loading density. A need also exists to identify cost-effective, commercially available diets for phase III production.

PRINCIPAL ACCOMPLISHMENTS

OBJECTIVE 1

Work on this objective was undertaken by researchers at North Dakota State University (NDSU). As a part of this objective NDSU researchers conducted background research on domestic and international aquaculture markets to gain knowledge on the general structure of the aquaculture industry.

It was determined that demand for U.S. hybrid striped bass is mainly fresh product (still over 80% in 2002) to Asian markets in the United States and Canada. The live market is the most rapidly expanding portion of the market with over a 60% increase from 2001 to 2002, and more than doubling by 2004. Markets are concentrated in larger cities such as New York, Boston, Los Angeles, and Toronto. However, Asian populations have increased in other areas of the U.S. over the last ten years as shown by Census maps; these areas need to be looked into for new or increasing markets for hybrid striped bass. Other ethnic groups, including Hispanic/Latinos and African Americans, have also shown an interest in

hybrid striped bass according to various studies.

The demand for hybrid striped bass shows a typical relationship between volume and price, as volume increases, price decreases. From 1984 to 2004, the fresh sales price has gradually decreased from \$11.02 to \$5.51/kg (\$5.00 to \$2.50/lb) to while volume increased from 0.45 to 5.21 kg (1 to 11.5 million lb). Given North Carolina estimates of costs of pond production of hybrid striped bass of \$4.19/kg (\$1.90/lb) in 2001, these prices provide a fair return to producers. The price has been relatively stable since the late 1990s.

The marketing channel for hybrid striped bass is similar to most aquaculture products; producer to a broker to processor to wholesaler to food service or retail market. Ownership of the product is transferred at each step. In some cases, two of these steps are combined, i.e., broker/processor or processor/wholesaler. Starting with a producer price of \$5.51/kg (\$2.50/lb), there is typically a processor sales price of \$11.02, wholesaler price of \$13.23, and retail market price of \$17.64 per kilogram (\$5.00, \$6.00, and \$8.00 per pound, respectively). The price increases from level to level reflect real costs of transportation, processing, handling, and profits. From a regional or national perspective, there is substantial competition at the broker level with the number of firms in the industry decreasing at the processor and wholesaler level. Competition leads to efficiency and decreases opportunity for excess profits. There still can be local situations where the initial buyer has nearly a monopoly in the market.

NDSU researchers also found that there are several types of cooperatives that could work for the aquaculture industry. These include: Purchasing; Marketing; Processing

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and Marketing; and New Generation Processing and Marketing. However, the lack of interest by producers in developing their own marketing organizations, or the failure of these organizations, supports the conclusion that the current marketing/processing system works quite well. NDSU's survey of producers revealed very little interest in forming marketing cooperatives, which was consistent with results of a NCRAC-funded project by Sue Kohler in 2004.

Taste testing to determine the effect of feed rations was not conducted due to the inability of accessing the proper expertise and facilities.

The Web page component of the project was to be limited in scope. However, to make the results of the project more accessible at a low cost, a decision was made to expand the site and make it a very comprehensive collection of information for the hybrid striped bass industry. It includes the summary report of the marketing portion of this project. The content of the site was organized into eight major sections (Fish Information; Research; Producers; Links; Literature; Recipes; Contacts; and Videos/Presentations). Information from this activity will be incorporated in a new Web site being designed for NCRAC by Iowa State University staff.

OBJECTIVE 2

Southern Illinois University-Carbondale (SIUC) researchers investigated stock densities, culture systems, e.g., vertical raceways, ponds, recirculating aquaculture systems and cages, as well protein levels (32, 36, and 40% protein). Fish were stocked into vertical raceways (~8 m³ [282 ft³]) at two different densities (188 fish/m³ [5.3 fish/ft³] and 125 fish/m³ [3.5 fish/ft³]), and fed 40% crude protein for 121 days.

Fish production was negatively significantly affected by stocking density.

Fish grown in the vertical floating raceways were subsequently stocked by SIUC researchers into 12, 0.04-ha (0.1-acre) earthen ponds supplied with continuous aeration in April 2002. These phase III fish were stocked at a density of 6,177 fish/ha (2,500 fish/acre) and fed using diets with the same three protein levels. Fish were harvested in November 2002. There were no significant differences in fish production, dress out percentage, and feed conversion relative to the three dietary treatments. Production costs attributable to feed were \$1.25, \$1.38, and \$1.41/kg (\$0.57, \$0.63, and \$0.64/lb) gain for the 32, 36, and 40% protein feeds, respectively.

In addition to the previous studies, SIUC researchers investigated the use of a recirculating aquaculture system. Results from the SIUC recirculating aquaculture system study suggest that using finishing diets can reduce production costs of feeds when fish are fed to satiation during phase III of intensive production in a recirculating aquaculture system. Although fish fed diets containing lower concentrations of crude protein, 32% and 35%, respectively, consumed significantly more feed and did not gain weight maximally, the cost of feed per mass of fish produced was less, indicating that feeding reduced protein and energy near the end of the grow out cycle (~500 g [18 oz or 1.1 lb] individual fish weight) can be a cost effective strategy. While costs associated with feed used per mass of fish produced were not statistically significant, SIUC data indicate a cost reduction of \$4,000 on 45,360 kg (100,000 lb) of fish produced. Also, because producing fish rapidly is often a primary goal in aquaculture, and the fish fed diets containing lower protein and energy still grew within 95% of the maximum, these factors become important when examining

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the fluctuating costs of feeds and should be considered as an optional feeding strategy when feed prices are high.

Two practical diets were formulated by SIUC researchers to contain 45% crude protein and 15% lipid with different highly unsaturated fatty acids (HUFA) concentrations: (1) production diet (corn oil); and (2) finishing diet (fish oil). In a recirculating aquaculture system, there were no significant differences in fish production and fillet quality between these two diets. By implementing finishing diets in the production cycle, long-chain n-3 HUFA content may be augmented in fillets while dependence on dietary fish oil is reduced.

Researchers at Purdue University (Purdue) developed three production diets for grow out of hybrid striped bass. Those diets contained 32, 36, or 40% dietary crude protein, high levels of soybean meal, low levels of fish meal, and the essential amino acid profile determined optimal in previous laboratory studies. Fish were acquired from Keo Fish Farms (Keo, Arkansas) before the project actually began October 2001, and stocked into nine earthen 0.1-ha (0.25-acre) culture ponds in excess of 7,920 fish/ha (3,600 fish/acre) at the Purdue Aquaculture Research Laboratory (three ponds per each protein level). In 2002, ponds were seined and fish restocked at 7,920 fish/ha (3,600 fish/acre) into the same nine ponds.

Purdue researchers completed a laboratory study examining the best method of balancing diets for fish. Based on those data, balancing the essential amino acid needs of fish as a function of the dietary crude protein yielded the highest weight gains. Using those data, and results from a series of laboratory studies, Purdue researchers formulated practical diets containing 32, 36, or 40% crude protein and fed those diets to hybrid striped bass in

earthen culture ponds (0.1 ha or 0.25 acre) for two full growing seasons. There were no significant differences in weight gain (average size of fish was 0.86 kg [1.9 lb]), feed conversion ratio (average 1.62 across all three treatments), or final standing crop average of 5,836 kg/ha (6,543 lb/acre). Feed costs ranged from \$0.53/kg (\$0.24/lb) for the 32% protein diet to \$0.60/kg (\$0.27/lb) for the 40% protein diet.

IMPACTS

- ▶ While the principal impact will be upon producers' profits, it is impossible to estimate the degree of impact of the information generated and effect of a market information cooperative at this time.
- ▶ The production of hybrid striped bass as a food fish is rapidly developing as a viable industry in the North Central Region (NCR). For example, production of food-size hybrid striped bass in Illinois approached 113,400 kg (250,000 lb) in 2003. Results from this study further demonstrated the viability of rearing hybrid striped bass in ponds in at least the lower portion of the NCR. The indoor recirculating aquaculture system studies at SIUC also demonstrated the feasibility of raising these fish in such systems.
- ▶ Satiation feeding of fish in this study clearly contributed to improved feed efficiency and is commonly observed in studies where fish are fed in this manner. By utilizing a reduced protein and energy diet for larger fish, coupled with satiation feeding instead of feeding fish a restricted rate, costs can be reduced for pounds of fish produced.
- ▶ Feed represents the largest variable cost in intensive production of phase III hybrid striped bass, with protein levels and sources having the greatest affect on feed cost. Developments in dietary formulations will result in new, modern

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diets that meet the unique nutritional requirements of this species, while reducing ammonia and carbon dioxide excretion. Further, these diets contain ingredients that are available in the NCR and that can be manufactured in the region.

- ▶ Using a finishing diet at the end of the production cycle may affect the nutritional value of fish fillets to the consumer, preserve marketability of aquaculture products, and reduce perceived economic and environmental pressures of using marine-based feedstuffs.
- ▶ Based on data from this project, NCR producers now have new formulations for hybrid striped bass that have been tested in small-scale pond production situations at commercial densities. Further, consumption of feed was highest at temperatures of 19–26°C (66–79°F), typical of pond temperatures in the NCR in the summer. These formulations should be significantly less

expensive and readily manufactured in the NCR.

RECOMMENDED FOLLOW-UP ACTIVITIES

- ▶ Development of procedures for pond feed training during phase I to reduce costs and increase survival of fish.
- ▶ Complete diets for all phases of hybrid striped bass grow out are still needed.
- ▶ There is a need to develop brood stock diets specific for white bass and striped bass.
- ▶ Fatty livers are a common phenomenon in cultured hybrid striped bass. Whether fatty livers present a health problem for hybrid striped bass remains unknown.

PUBLICATIONS, MANUSCRIPTS, AND PAPERS PRESENTED

See the Appendix for a cumulative output for all NCRAC-funded Hybrid Striped Bass activities.

SUPPORT

YEARS	NCRAC- USDA FUNDING	OTHER SUPPORT				TOTAL	TOTAL SUPPORT
		UNIVER- SITY	INDUSTRY	OTHER FEDERAL	OTHER		
2001-05	\$310,000	\$128,053				\$128,053	\$438,053
TOTAL	\$310,000	\$128,053				\$128,053	\$438,053