FISH PRODUCTION IN ARKANSAS DURING 1969 AS COMPARED TO OTHER STATES*

by

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ABSTRACT

Economic returns from the commercial production of fish in Arkansas during 1969 were approximately double those of 1966. Acreages devoted to the culture of golden shiners and channel catfish in Arkansas showed major increases. The cash return from shiners was up 60 percent, and that from catfish increased almost fourfold. The overall return to Arkansas from all fish culture exceeded $17 million, whereas the nationwide return from baitfishes and catfish alone was nearly $35 million.

Data collected from Arkansas fish farmers was analyzed with the aid of automatic data processing and are reported in the categories of Foodfish, Baitfish, Fingerlings, and Fee Fishing. Acreages, production, and dollar values of each category are presented. In Arkansas, golden shiners are the leading species in terms of acreage and dollar production. Channel catfish for foodfish rank a close second in dollar value. Fingerling production has become a major industry in the state, exceeeding $2 million in 1969. As in 1966, the sale of sportfish represented a negligible portion of Arkansas production.

INTRODUCTION

A study of the commercial culture of fish in Arkansas during 1966 indicated that, at that time, the industry returned over $9 million to the state at the first level of income production (Meyer, et al., 1967). During the three years since 1966, data collection has continued throughout the fish producing states with particular reference to the state of Arkansas. Automatic data processing has been employed to reduce the data to meaningful figures which permit analysis and comparison.

Significant increases have been apparent in all aspects of the industry. Nationwide, catfish continue to be the leading species cultured with annual increases in acreage from 25 to 40 percent. Production in pounds per acre of all species has climbed, perhaps reflecting increased experience on the part of the farmers, better technical assistance, or both. Prices paid to the farmer showed declines reflecting the increased production of fish, and profit margins fell accordingly. Catfish processing plants were built in several areas, but all installations encountered problems in fish acquisition, in price structure, and in marketing (Greenfield, 1970).

Recreational uses for fish provided a good market during the past three years (Gray, 1970). Purchasers of live catfish paid premium prices for fish to stock fee-fishing lakes near major population centers outside the growing area. Competition from this market provided support for the sale of one-pound or larger fish, and helped to maintain a "seller's market" situation for farmers. This inflation was, in part, the cause of problems encountered by processing plants in acquiring fish. Processing plants which paid over 35 cents per pound produced a product with a wholesale cost of approximately 88 cents

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per pound (Greenfield, 1970). When extrapolated to retail prices through supermarket outlets, buyer-resistance due to high prices was encountered in some areas.

Sales of baitfish showed a marked slump during marketing of the 1968 crop. Over-production in local areas coupled with unfavorable angling conditions in the spring of 1969 created concern among many farmers about surpluses and marketing problems. A sizeable acreage formerly devoted to minnow culture was diverted to catfish production in 1969. Large producers with established market patterns and outlets continued to develop new acreages with the result that the total acreage in 1969 reflected a net gain over the previous year. Good angling conditions during the sale of 1969 crop provided a healthy, stable market with little indication of over-production.

Many innovations were introduced into commercial fish culture in 1969. Cage culture, long an established practice in the Orient, was attempted using channel *(Ictalurus punctatus)* and blue *(I. furcatus)* catfishes and met with some success. Raceways were tried, and these also indicated that catfish culture was feasible in such systems. Fish-activated or "demand" feeders were widely used during 1969 and provided acceptable results.

Management continues to be the limiting factor in fish culture. Poor management has been identified as the major cause of failure on farms that have not shown a profit. Inadequate water supplies which did not permit control of water quality is another major problem. Extended periods of hot, dry weather in 1969 emphasized the need for good management and adequate supplies of fresh water to meet management needs. Early recommendations of a minimum flow of 13 gpm per acre are proving inadequate and farmers find that double this amount is marginal during stress periods. It now appears that 50 gpm/acre may be a more ideal figure when planning or developing a fish farm.

Data included in this report were collected from a questionnaire distributed by the Fish Farming Experimental Station (Bureau of Sport Fisheries & Wildlife), the Arkansas Game and Fish Commission, and the Bureau of Commercial Fisheries. Results of field survey work by personnel at the Fish Farming Experimental Station are also included.

Values, production figures, and returns quoted are based on information supplied by fish farmers in Arkansas. These values were considered normal for fish farming and were used in determining estimates for surrounding states. It is recognized that prices or expenses may vary outside of the major fish producing area (Arkansas and Mississippi) but the figures used are considered realistic estimates for fish culture in the Delta region.

Fish farming, as considered in this discussion, includes any intentional production of fish on private property to be sold for profit. The scope of this report is, therefore, exceedingly broad. Data included reflect the intensively managed fish farms, large irrigation reservoirs which are harvested periodically (about once every 5 years), and irrigation reservoirs where the public is charged a fee for the privilege of fishing.

Sources of water ranged from run-off following rains, water pumped from lakes or bayous, or spring water, to water from wells. A wide variety of species was raised. In order to provide some form of organization to the data, the industry has been classified under four broad categories, namely; baitfishes, foodfishes, fingerlings, and fee-fishing lakes. Each category will be discussed separately.

BAITFISHES

Arkansas continues to lead the nation in the production of baitfishes. In 1969, 21,550 acres were devoted to the production of minnows to be used by anglers. The major portion of this total (93.7%) was used in the culture of the

golden shiner *(Notemigonus crysoleucas)*. This 20,200 acres produced $6,595,300 worth of shiners, or 91% of the total income derived from baitfishes. Fathead minnows *(Pimephales notatus)*, Israeli carp *(Cyprinus carpio)*, and goldfish *(Carassius auratus)* were produced in significant numbers, but the total acreage devoted to these species was less than 7 percent.

Acreages devoted to golden shiners showed a 55 percent increase over the 1966 figure, and production in total pounds was up by 95 percent. Per acre production in 1969 was 313 pounds compared to 250 pounds per acre in 1966, a 25 percent increase (See Table 1). Improved management techniques are credited for most of the per-acre increase.

Prices received by producers showed a 17 percent decline in payments for golden shiners, whereas prices for the other species remained constant or above the 1966 level. Despite a ready market for the 1969 crop of shiners, farmers accepted an average price of $1.04 per pound as compared to $1.25 in 1966. This price situation is probably an indication of possible concern about the over-production that occurred in 1968.

Even so, the dollar value of golden shiners in Arkansas exceeded that of channel catfish foodfish, the next highest income category. In dollar return per acre, shiners continued to lead (See Table 2).

Minnow production in other states was far less than that in Arkansas. Arkansas production accounted for 70% of the total acreage devoted to baitfish. Mississippi (13%) Louisiana (7%), and Missouri (4%) made up most of the remaining acreage, although some minnow culture is practiced in most of the southeastern or mid-south United States (See Table 3).

FOODFISHES

The intensive production of fish of edible size represented the fastest growing segment of the warmwater fish industry. Arkansas acreage allotted to this culture increased from 4505 in 1966 to 12,478 in 1969, a 176 percent increase during the three-year period. Significant changes were evident in the production of all species. It is noteworthy that four species were cultured intensively for food. Channel catfish, blue catfish, buffalo *(Ictiobus* Spp.*)*, and rainbow trout *(Salmo gairdneri)* were included in the 21,483,900 lbs. produced in 1969. Trout were raised exclusively in raceways so acreage comparisons are not valid. Over 1½ million pounds of trout were produced. Channel catfish constituted over 80 percent of the production (Table 1) and 82 percent of the dollar value of foodfish. Blue catfish yielded 4 percent of the return and buffalo 2 percent. Buffalo, which had shown a marked reduction in acreage from 1960 through 1966, were again produced in volume with an estimated 1½ million pounds produced.

Although cultural methods currently employed in catfish culture are similar for both blues and channels, a significant difference was noted in the net profit (Table 2). Cost of production are similar for the two species. Blue catfish, however, demonstrate a growth rate well below that of channels and, during the first growing season after being stocked as fingerlings, up to 75 percent may fail to reach market size. In channel catfish populations, 80 to 90 percent of the fish may reach saleable size. During a second year of feeding, the difference between the species is less, but net returns from both species will drop.

A few farmers stock mixed populations of blue and channel catfishes. These farmers report that by stocking up to 10 percent of the total population with blues, a growth rate equal to that of channels is achieved.

Dollar value for intensive foodfish production in Arkansas totalled $7,859,800, only slightly more than returns from baitfish culture.

Income production from the extensive culture of foodfish species, including sportfishes, was negligible, constituting less than one percent of over-all total value. Per-acre production from this culture is low and harvest are uncertain.

The 1969 figures indicate little change in extensive fish culture efforts from 1966.

Nationwide, statistics on foodfish production are available only on catfish production. Each year the total acreage and poundage set new highs. This culture was characterized by a 40 percent increase in acreage between 1968 and 1969. Nearly all of the production resulted from open pond culture but pilot studies using cages and raceways have been successful. It is anticipated that efforts using this type of culture will increase in the future.

Mississippi is the leading state in the production of catfish (Table 3). It is estimated that nearly 18,000 acres were stocked with these species in 1969. Of this, 3,500 acres were devoted to fingerling production and about 1,500 acres were used to maintain broodstock. Thus, about 14,000 acres of foodfish yielding 21 million pounds of fish were produced. Not all of this amount was harvested. Arkansas was second in total acreage (11,811) with approximately 10,600 acres devoted exclusively to food-sized fish and produced about 18 million pounds of fish. These two states raised 75 percent of the catfish produced in the nation in 1969; 40 percent in Mississippi and 35 percent in Arkansas.

It should be noted that Arkansas farmers reported a per-acre yield of 1,769 pounds of food-sized catfish. This is well above the figure reported for other states which is estimated to be 1,500 pounds per acre. This difference may reflect a longer history of fish culture in Arkansas, closer proximity to technical assistance, or perhaps low estimates for other states.

FINGERLING FISH

Concurrent with the upward surge in acreage devoted to foodfish has been a substantial increase in the acreage devoted to catfish fingerlings. The demand for fingerlings to stock the 1970 acreage exceeded the 1969 production. Arkansas production from 1,411 acres is reported to have been approximately 38 million fish, worth nearly $2 million (Table 1).

The increased interest in buffalo resulted in a market for fingerlings of this species. A value of $118,100 is reported for the 1½ million fingerlings produced in Arkansas. In 1966, no market was available for buffalo fingerlings and difficulty was encountered in the sale of adult buffalo for food. Production of buffalo outside of Arkansas is not extensive and is restricted to Mississippi where a limited acreage is utilized.

The sale of fingerling sportfishes in Arkansas was not a significant item in the data reported for 1969. Those persons desiring to introduce sportfishes usually purchased adult fish at food fish prices and released these into their pond. Few farmers apparently were willing to apply the special handling techniques required to maintain fingerlings of sportfish species. As in 1966, the sale of sportfish constitutes a very low fraction of the total industry. In 1969, it made up less than 1 percent of the total industry.

Returns from fingerling production are the highest in the fish farming industry (Table 2). Yields in pounds per acre do not approach those of food fish but dollar returns are higher due to the fact that fingerlings are sold at a per-individual price rather than by the pound.

FEE FISHING

Recreational harvesting of fish by anglers may be classified in two categories. In one, natural populations of fish are allowed to develop and fishermen pay only a "gate fee" and possibly a boat rental charge. Anglers bring their own bait and are allowed to catch as many as possible without additional charge. Harvests are generally low in pounds-per-acre. Such "fee-fishing" ponds or lakes are usually multiple use reservoirs which may also be used for irrigation of arable crops.

TABLE I

COMMERCIAL FISH PRODUCTION IN ARKANSAS DURING 1969

BAIT FISHES

	Acres	lbs/A.	Total lbs.	Price/lb.	Total Value
				$	$
Golden Shiner	20,200	313	6,341,700	1.04	6,595,300
Fathead Minnow	871	300	261,300	1.39	363,200
Goldfish	204	660	134,600	1.00	134,600
Israeli Carp	280	800	224,000	.65	145,600
	21,555 A.	XXX	6,961,600 lbs.	XXXX	$7,238,700

FOOD FISHES - Intensive

	Acres	lbs/A.	Total lbs.	Price/lb.	Total Value
				$	$
Channel Catfish	9,841	1,769	17,407,300	.379	6,440,700
Blue Catfish	569	1,415	805,200	.40	322,000
Buffalo	2,042	830	1,695,200	.08	135,600
Trout	26	71,000	1,576,200	.615	961,500
	12,478 A.	XXXXX	21,483,900 lbs.	XXX	$ 7,859,800

FOOD FISHES - Extensive

	Acres	lbs/A.	Total lbs.	Price/lb.	Total Value
				$	$
Sport Fishes (all species)	378	39	14,850	.455	6,700
Mixed Species	4,320	200	864,000	.12	103,700
	4,698 A.	XXX	878,850 lbs.	XXX	$ 110,400

FINGERLINGS

	Acres	No./Acre	Total No.	Price/fish	Total Value
				$	$
Channel Catfish	1,401	46,241	64,819,000	.038	1,944,600
Blue Catfish	40	26,650	1,012,600	.05	50,600
Buffalo	45	35,000	1,575,000	.075	118,125
Trout	4	51,675	206,100	.104	20,600
	1,490	XXXX	67,612,700 fish	XXXX	$ 2,133,925
OVER ALL TOTALS	40,221	XXXX	XXXXXX	XXXX	$17,342,825

TABLE 2

PER ACRE RETURNS FROM VARIOUS FARMING PRACTICES IN ARKANSAS IN 1969*

Crop	Gross	Net
	$	$
Rice	243.36	107.40
Soybeans-Irrigated	97.48	45.73
Soybeans-Nonirrigated	88.97	47.50
Oats	46.80	8.22
Channel Catfish - Food Fish	654.47	133.47
Blue Catfish - Food Fish	565.90	44.90
Buffalo - Food Fish	66.40	34.60
Trout - Food Fish**	43,666.67	15,260.67
Mixed Species - Food Fish (Extensive)	24.00	20.00
Sport Fishes - Food Fish	17.86	12.86
Channel Catfish - Fingerlings**	1,387.98	693.99
Blue Catfish - Fingerlings**	1,332.37	666.18
Buffalo - Fingerlings**	2,625.50	2,125.50
Troute - Fingerlings**	5,153.75	2,153.75
Golden Shiners	326.50	201.50
Fathead Minnows	417.00	292.00
Goldfish	660.00	535.00
Israeli Carp	520.00	395.00
Fee Fishing - Intensive:		
Channel Catfish	8,200.00	4,300.00
Blue Catfish	4,333.00	1,384.00
Trout	29,133.33	4,913.33
Fee Fishing - Extensive:		
Channel Catfish	1,156.94	635.94
Mixed Species	157.41	107.41

*Arable crop figures as per Mullins and Grant, 1968.
**Specialty cultures.

TABLE 3

ESTIMATED GROSS RETURNS FROM INTENSIVE CULTURE OF WARMWATER FISH IN 1969

State	Species	Acres	Value
			$
Alabama	Minnows	528	187,440
	Catfish	933	438,510
	TOTAL	1,461	625,950
Arkansas	Minnows	20,200	7,238,700
	Catfish	11,845	8,385,300
	TOTAL	32,045	15,624,000
California	Minnows	160	56,800
	Catfish	587	275,890
	TOTAL	747	332,690
Florida	Minnows	80	28,400
	Catfish	224	105,280
	TOTAL	304	133,680
Georgia	Minnows	-	-
	Catfish	699	328,530
	TOTAL	699	328,530
Kansas	Minnows	-	-
	Catfish	483	227,010
	TOTAL	483	227,010
Louisiana	Minnows	1,971	705,705
	Catfish	3,222	1,514,340
	TOTAL	5,193	2,220,045
Mississippi	Minnows	3,768	1,337,640
	Catfish	17,972	11,340,332
	TOTAL	21,740	12,677,972
Missouri	Minnows	1,254	445,170
	Catfish	794	373,180
	TOTAL	2,048	818,350
Oklahoma	Minnows	106	37,630
	Catfish	415	195,050
	TOTAL	521	232,680
Tennessee	Minnows	90	31,950
	Catfish	261	122,670
	TOTAL	351	154,620
Texas	Minnows	480	170,400
	Catfish	2,595	1,219,650
	TOTAL	3,075	1,390,050
TOTALS	Minnows	28,637	10,239,835
	Catfish	40,030	24,525,742
	TOTAL	68,667	$ 34,765,577

The second category concerns intensively managed ponds, usually stocked with food-sized fish at high densities. Fishermen pay a "gate fee", boat and/or gear rental; may purchase bait, cold drinks and snacks; in addition to paying a set rate per pound for the fish they catch. In such operations, the greatest area of profit may stem from the sale of services rather than the sale of fish.

In Arkansas, the latter type of fee-fishing is not common. Only 26 acres were utilized in this type of culture, with catfish and trout used as the primary species. Returns were high with gross values up to $29,000 per acre for trout. Since these are specialized cultures with concentrated fish populations acreage figures are usually misleading. Gross returns also appear exaggerated, but operational costs are also very high.

Some farmers permitted angling in ponds where an intensively managed crop of food-sized catfish had been raised. The fishermen thus performed the harvest for the farmer, paid for the privilege of doing so, and also paid a premium price for the fish taken. As a rule, the farmer made no special arrangements and anglers furnished their own gear and bait. This type of fee-fishing was used on 210 acres of channel catfish in 1969, and farmers reported over $1150 per acre gross returns as compared to $650 per acre in conventional pond culture.

The willingness of the public to pay premium prices for recreational fishing, however artificial, is especially evident in the Arkansas data. Arkansas has an abundance of natural fishing areas, lakes, streams, ponds, and reservoirs. Yet, an apparently significant fraction of the population enjoys the "instant fishing" at fee-fishing facilities.

This fact is further emphasized by the large numbers of buyers from areas around population centers in Missouri, Ohio, Illinois, etc., who purchase large quantities of live food-sized fish to be used for fee fishing. This market is sufficiently large that a number of individuals have developed a business of hauling live fish for the fee-fishing markets.

The demand for food-sized catfish by the fee-fishing market has provided a dual outlet for the sale of fish and has provided support for the prices received by farmers. Prices paid by haulers of live fish are well above those paid by processing plants, but it should be noted that this market is during spring and summer months only. Farmers must therefore hold their crop for part of a second growing season in addition to the added expense of careful handling to assure survival. The possibility of oxygen depletions always exists in ponds heavily stocked with large fish.

Another asset results from the fee-fishing market. If all of the nation's present production were channeled solely through processing plants, there is a strong likelihood that the production would overwhelm the existing market system. A lack of standardization of product has stymied market promotion efforts to date. Until a more orderly production and marketing system is available, the fee-fishing market must be considered as a vital factor in the success of the warmwater fish cultural industry.

DISCUSSION

Comparisons of the returns derived from fish culture with those from arable land indicate that fish farming is an increasingly important enterprise in the southern United States. Net returns from well-manged fish farms were equal to or better than those from rice or soybean crops (See Table 2).

The level of profit in fish farming is closely tied to management skills. Lupher (1970) reported that at a production of 1,000 pounds of catfish per acre, Mississippi fish farmers should expect a net loss of $26 per acre. At 1,500 pounds per acre, $99 net were possible. On farms producing 2,000 pounds per acre, a profit of $179 was realized.

At production costs of $521 per acre as reported by Lupher (1970). Arkansas farmers raised their food-sized catfish at a cost of 29.5 cents per pound.

Mississippi farmers who produced 1500 pounds of catfish per acre did so at approximately 34.7 cents per pounds. These figures are in close agreement with those reported by Greenfield (1970) and Grizzell (1967). Costs of this level indicate why many fish farms have failed to show a profit. As the total production of catfish rises, it is anticipated that price paid to farmers will fall. To offset this decline, farmers will have to increase the efficiency and volume of their operations to show a profit.

Costs of production vary greatly from farm to farm, dependent on the level of management. Some of the better managed farms report that they are able to produce catfish at slightly over 20 cents per pound. This figure, however, does not include taxes and interest on the invested capital. Nevertheless, it is indicative that improved management skills provide an area by which costs can be reduced.

Various types of fish culture cannot be readily compared. Acreage figures or returns per acre are less useful than prices received per pound when attempting to compare returns. Variations in operating costs are important considerations if one is contemplating a choice of the type of culture he might best use.

Income from fish culture returned $17,636,825 to Arkansas farmers during 1969 compared to $9,165,000 in 1966. This represents the first level of income production only and does not include income to the state from the sale of utilities, fish feed, chemicals, fertilizers, equipment or vehicles. Pond construction and well costs are also not included. Data on the re-sale of fish or dressed-product were likewise not available.

Nationwide, warmwater fish culture represents an estimated $34 million industry. Two states, Arkansas and Mississippi, receive over 80 percent of this income (Table 3).

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CRAWFISH-WATERFOWL, A MULTIPLE USE CONCEPT FOR IMPOUNDED MARSHES

by

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ABSTRACT

A study was initiated in order to evaluate crawfish *(Procambarus clarki)* production in several impoundments managed for waterfowl on Rockefeller Refuge, Grand Chenier, Louisiana. Impoundments have been intensively managed for waterfowl on the refuge for the past 16 years, however, this has been through a gravity flow system. Pumping units were installed in three of the impoundments in 1968, bringing under water control some 6,000 acres of marshland. Certain management techniques employed in these impoundments, particularly in the areas controlled by pumping units, have significantly increased the production of crawfish as well as desirable waterfowl food plants. It is hoped that programs of this nature will stimulate the owners of large tracts of marshes to manage their holdings for wildlife.

It is probable that more wetlands would be created and preserved if land owners could get some assurance of added profits from multiple land usage programs such as the production of crawfish in waterfowl impoundments. This potential exists in Louisiana and bordering states where crawfish are a commercially important human food item.

INTRODUCTION

It is apparent that little by little the marshlands of Louisiana are being altered into areas not conducive to wildlife dependent upon wetlands. The quantity and quality of nursery grounds for sport and commercial fisheries are gradually declining, and each year the vast wetlands that are so very important to our furbearers and wintering waterfowl decrease in size.

Landowners trying to get maximum yield from their lands have gradually drained and channelized many acres of prime coastal marshland. Oil exploration, agriculture and navigation are probably three of the major interests involved. Oil exploration began in 1920 in the Louisiana marshes and has resulted in the alteration of waterfowl wintering habitat due to drainage, pollution and saltwater intrusion. Marsh drainage for agriculture also greatly reduces the value for wildlife. The construction of navigation channels have led to the rapid drainage of thousands of acres of one time prime waterfowl habitat.

Since land-use practices have a direct influence on wildlife, the development of practices which result in financial gain to the landowner and at the same time benefit wildlife are essential.

Multiple use practices offer the greatest solution for capitol gain from a particular marsh area. However, the development of practices which are compatable is essential.