

PRODUCTION AND RETURNS FROM THE COMMERCIAL PRODUCTION OF FISH IN ARKANSAS DURING 1966*

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1967

ABSTRACT

Commercial fish farming is the fastest growing industry in the field of agriculture in Arkansas. Due to its fast growth, allied industries have not kept pace. Part of the difficulty has been the lack of knowledge in the right places as this industry has developed.

To collect statistics on this ballooning industry, a meeting between interested agencies was held at Stuttgart, Arkansas. At this meeting a questionnaire was developed with the idea of programming the information for IBM storage. The results of the questionnaire are discussed in the paper, the information received was expanded to cover the non-responders.

It is the express purpose of this paper to present an accurate estimate of the 1966 commercial fish production in the State of Arkansas. An industry as young as this one with a value of \$9,165,000 is worth keeping tabs on.

INTRODUCTION

Commercial fish farming currently represents one of the fastest growing facets of agriculture in Arkansas. Although the industry is relatively young, farm production of fish has experienced an explosive rate of growth. New ponds are rapidly being constructed and the acreage increases monthly. Already land devoted to fish farming represents one-ninth that of the mammoth rice culture in the state (Sneed, 1966).

Recent advances in technology and in the availability of trained personnel have contributed to the growth of the industry and favorable attitudes on the part of lending agencies have given further impetus to the continued expansion. Once considered a highly specialized type of farming which could be of limited importance to the state, fish farming now contributes significantly to farm income. Although early buffalo culture was unprofitable, the returns from the intensive production of minnows and catfish have been good. In Lonoke County, the 1965 contribution to the income of the county from 10,000 acres of fish farming was estimated to be \$4 million. Income from 110,000 acres of soybeans, on the other hand, contributed only \$6 million (Sneed, 1966).

A rapid change in the major species produced has occurred during the past ten years. Green and Mullins (1959) reported that in 1958, buffalo were the predominant species of food fish raised, usually in some combination with bass, catfish, or crappie. Acreage devoted to this type of commercial fish production was reported to have been 3,446 acres. Minnow culture was not included in their report, but it is estimated to have been about 4,000 acres. A survey of fish farming conducted in 1960 by Stevenson and Meyer (unpublished) indicated that approximately 3,600 acres of buffalo were being raised at that time with about 250 acres devoted solely to channel catfish. By 1963, however, buffalo played only a minor role in managed commercial fish production in the state. An unpublished 1963 survey by Sims and Martin showed that the acreage of buffalo at that time was 748 acres as opposed to 3,585 in 1960. Minnow acreages had increased over 100 per cent, rising from a

*A portion of this data collected under the auspices of PL 88-309, the Commercial Fisheries Research and Development Act.

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1960 total of 4,073 acres to 8,249 in 1963. Catfish culture had expanded from 260 acres to 1,070 by 1963.

The current report indicates that in 1966 approximately 4,500 acres in Arkansas were devoted solely to catfish with an additional 5,000 acres utilizing this species in combination with other fishes. Few farmers currently raise buffalo other than as a species to include with catfish. A sizeable production of buffalo is harvested from large irrigation reservoirs but the species plays only a minor role in managed commercial fish production.

Bait fish culture has continued to flourish. The estimated 13,000 acres devoted to golden shiners in 1966 failed to meet market demands and many farmers have continued to build additional ponds. Dollarwise, bait fishes contributed approximately 62% of the total income from fish farming.

The rapid growth of any industry, particularly a farm industry, presents problems from the standpoint of technical assistance. The relative youth of intensive fish farming coupled with its rapid expansion has created a communications gap between technical field personnel, the farmers, and their elected representatives. The high number of novices in fish culture has taxed assisting agencies to the limit and further expansion of the industry can only increase the need for technical assistance. Before any organized support can be aroused for the fish farming industry, it is vital that an accurate picture of the existing industry be obtained. Feed mills and processing firms can be encouraged to assist farmers if they can be convinced of the size and stability of commercial fish farming. Needed legislation to support research or changes in existing regulations can be effected only when legislators and administrators are aware of the extent and potential of fish farming. It is the purpose of this paper to present an accurate estimate of the 1966 commercial fish production in the state of Arkansas.

A recent questionnaire was distributed by the University of Arkansas Agricultural Experiment Station in cooperation with the Fish Farming Experimental Station, the Game and Fish Commission, the Agricultural Extension Service and the Bureau of Commercial Fisheries, asking numerous questions concerning the nature and extent of individual operations. The data obtained from this survey were evaluated by technical workers in the field and compared with known acreages and production. Values given in this report represent conservative figures for each category and the authors realize that the totals will represent minimum figures. Certain types of fish farming presented circumstances in which it was impossible to obtain concrete information. In these, estimates were made based on production in similar types of culture.

Automatic data processing is being employed to handle the data to provide rapid handling and analysis of data for future years. As a follow-up to the mail inquiry, field visits by extension personnel will be made to increase the volume of data to be processed by the computer and to provide more accurate information in succeeding years.

Fish farming, as considered in this manuscript, includes all farmers who, at one time or another, offer fish for sale which have been produced on private property. Consequently, the scope of this report is exceedingly broad. Operations considered in this study included large surface water reservoirs whose primary function was to provide irrigation water for rice but which were harvested occasionally to sell a fish crop. Also included are reservoirs stocked with fish but left unmanaged until harvest and intensively managed ponds in which a precise number of stocked fish had been carefully fed and cared for. Sources of water ranged from run-off following rains, water pumped from lakes and bayous, spring water, or water from wells. A wide variety of fish species was likewise considered as may be seen from Table 1. In order to provide some form of organization to the great diversity of data which had to be considered, the industry was classified in five major categories, namely; bait minnows, sport fishes, fingerling fishes, food fishes, and fee-fishing lakes. Each will be discussed separately.

TABLE 1—COMMERCIAL FISH PRODUCTION IN ARKANSAS DURING 1966.

	Acres	Production In Lbs./Acre	Lbs.—Total Production	Price Per Pound	Total Value
BAIT MINNOWS					
Golden Shiners	13,000	250	3,250,000	\$1.25	\$4,000,000
Fathead Minnows	1,000	400	400,000	.75	300,000
Goldfish	1,000	1,000	1,000,000	1.00	1,000,000
Israeli Carp	50	1,000	50,000	.50	25,000
SUB TOTAL	15,050	***	4,700,000	***	\$5,325,000
SPORT FISHES					
Fingerlings:					
Bass, Sunfishes, Crappie	600	200	120,000	1.00	120,000
Food Size:					
Bass, Sunfishes, Crappie	5,000	50	250,000	.50	12,500
Trout	5	10,000	50,000	1.00	50,000
SUB TOTAL	5,605	***	420,000	***	\$ 182,500
FOOD FISHES					
Mixed Species	5,000	200	1,000,000	.12	120,000
Buffalo	250	2,000	500,000	.20	100,000
Catfish — Intensive	4,250	1,000	4,250,000	.45	2,000,000
Catfish — Extensive	5,000	25	125,000	.30	37,500
Catfish Fingerlings	500	500	250,000	4.00	1,000,000
SUB TOTAL	15,000	***	6,125,000	***	\$3,257,500
FEE FISHING					
All Species — Extensive	10,000	20	200,000	15.00/Acre	150,000
Catfish — Intensive	250	1,000	250,000	1.00/lb.	250,000
SUB TOTAL	10,250	***	450,000	***	\$ 400,000
GRAND TOTAL	45,655	***	11,695,000	***	\$9,165,000

BAIT MINNOWS

The production of bait fishes is currently the leading contributor to the total income derived from fish farming. Golden shiners are produced in over 85% of the acreage devoted to this type of culture and yield approximately 75% of the income from bait minnows. Fathead minnows, goldfish, and Israeli carp make up the other significant production of fishes used for bait. Nearly all of the water area used for the production of bait fishes is devoted to mono-species culture and is supplied from wells. A notable exception to this practice is the technique of including relatively low stocking rates of channel catfish fingerlings with minnows. This practice has apparently not reduced minnow production and has yielded additional production of large fingerlings in the fall which command a premium price.

Much of the production of minnows in the state is sent to markets elsewhere in the nation, particularly in the southeastern states. Figures related to sales reflect the prices paid by wholesale dealers or jobbers. The value reported thus pertains only to the first level of income production from the fish. Before minnows are used as bait, they frequently will pass through the facilities of wholesale dealers, jobbers, and retail bait shops; each deriving an income from the fish as they pass through.

The prices reported are those for pond-run fishes with an average size distribution. It is realized that minnows in the lower size ranges command much higher prices than those listed and that over-sized fish will bring substantially less.

The 1966 production of bait fishes is estimated to have totaled 3,800,000 pounds with a gross value of \$5,325,000. Golden shiners contributed 75 per cent of this figure and, based on an area of 13,000 acres,

the species returned roughly \$300 per acre. Thirty-four per cent of the acreage devoted to shiners is located in Lonoke County with substantial acreages in Prairie and Woodruff counties.

Goldfish were produced on a substantially lower acreage but they returned a higher gross, estimated to be \$1,000 per acre.

SPORT FISHES

A continuing market exists for the sale of fingerling bass, crappie, and sunfishes for use in stocking farm ponds and recreational fishing areas. While the acreage in the state devoted strictly to this type of production is low, many fingerlings are reared incidental to other types of culture and all find a ready market.

The advent of fish-out operations at which anglers pay for the privilege of fishing has provided a market for large bass, crappie, and other sport fish species. Game fishes reared in extensive type operations command premium prices if they can be provided live to the operators of fee fishing installations. Production per acre is low.

Suitable water areas for the production of trout are limited in the state. Trout are generally raised in concrete raceways and production figures are not comparable to warmwater culture. Raceway culture requires a continuous flow of water whereas in pond culture, additional water is supplied only to replace losses due to evaporation or for the maintenance of suitable water conditions. Trout producing operations in the state are small but in 1966 they produced 50,000 pounds of trout worth approximately \$50,000. A considerable portion of the crop was sold through fee fishing operations associated with the hatcheries.

FOOD FISHES

The most conspicuous development in the commercial production of food fish is the replacement of the buffalo by the channel catfish as the primary species. As indicated earlier, since 1960, the culture of buffalo fish has declined steadily due to low cash returns and, in part, to the increased interest in the production of catfish. Green and White (1963) reported that income from buffalo-bass types of culture was a net loss which ranged from \$3.85 to \$13.43 per acre.

Another significant development is the trend toward mono-species culture of catfish to replace the old mixed species combinations. Minnow producers have learned that low numbers of catfish may be included in minnow ponds without adversely affecting production. This practice has contributed materially to the production of catfish but information concerning yield is sparse and difficult to obtain.

Associated with the increased interest in the production of catfish has been a demand for fingerlings to be used to stock ponds used in intensive culture. Farmers will stock from 1,000 to 2,000 fingerling fish per acre with most preferring to use 1,500. At this rate, the acreage recorded for intensive catfish production required over 6.5 million fish in 1966. When the number of fish needed to stock extensive type culture operations and mixed species cultures, the number soars to over eight million fingerlings. While farmers desire to purchase the largest fingerlings available, thousands of two- to three-inch fingerlings were sold. The value reported for fingerling sales reflects a conversion of the total production to four-inch fish sold at four cents each. Larger fingerlings may bring up to ten cents each but smaller fish will bring only one to three cents each. In general, fingerling catfish prices will approximate one cent per inch of body length.

The great number of fingerlings which can be produced per acre of water provides a high rate of return since most fish are sold at a given price per individual. Dependent upon the skill of the hatcheryman, production figures will vary greatly. Some farmers report 20,000 fingerlings per acre while more successful farmers will harvest up to 100,000 per acre. Dollar value for the 1966 crop is conservatively estimated to have been \$1,000,000. A sizeable portion of the crop was retained on

farms where they were used to stock intensively managed ponds. Since these fish did not enter the market, no production figures or dollar values were ascribed to them.

Nearly one-half of the total poundage of food fish produced in Arkansas during 1966 consisted of channel catfish. Value of the catfish crop was placed at \$3,037,500. Intensively managed rearing ponds yielded 80 per cent of the crop and returned a gross income of approximately \$450 per acre.

Current market prices reflect a failure of production to meet local demands. Many farm-raised fish were sold for well over 50 cents per pound, particularly if the fish were dressed at the point of sale. Fish which were sold to fee fishing operations also brought inflated prices. Figures given in Table 1 reflect an effort to convert all types of sales to a common factor and are known to be conservative. Production on many farms has exceeded 1,000 pounds per acre but this figure represents the statewide average and is the figure presented by Hulseley (1964). Farms which hold their fish for two rearing seasons must consider that the return per acre should be halved in order to arrive at the return per acre per annum.

FEE FISHING

A need for recreational fishing by Arkansans is reflected in the success of numerous fee fishing operations across the state. Anglers are charged a base fee for the privilege of fishing and, at intensively managed installations, are charged for the fish taken. Two types of operations exist. In one, the owner stocks the pond and allows the fish population to develop on the available natural food. Fertilizer may be added to increase the fertility of the water area but no other attempt is made to encourage fish production. Operations of this type generally charge a fee for the privilege of fishing and may rent boats to the anglers but require no further payment by the fisherman.

The second type is a carefully managed operation in which the stocked fish are fed to insure rapid growth. Care is taken to maintain optimal water conditions in the reservoir and efforts are usually made to control vegetation. In addition to a basic fee for the privilege to fish, the angler pays a set price per pound for the fish he has caught. Generally, catfish or trout are the species utilized since both will "bite" readily. As records indicate that the population is substantially reduced, additional fish may be stocked from rearing ponds or purchased from fish farmers. Income at such fee fishing installations is often supplemented by the sale of bait, cold drinks, snacks, and occasionally by the rental of fishing equipment. While the gross return from such operations appears high, the operational cost is also high, particularly if fish to stock the lake must be purchased at the going market price. During 1966, approximately one-fourth of the total water area utilized in fish farming was involved in some type of fee-fishing. Income from all acreage totaled 10,250 acres but returned only about \$15.00 per acre. However, if the intensively managed area is considered separately, the gross return per acre climbs to approximately \$1,000.

DISCUSSION

An examination of the per acre returns from intensive fish farming (Table 2) indicates that this practice compares favorably with rice and exceeds that of soybeans and oats. A comparison of the operational costs (Gross minus Net) provides evidence of some of the limiting factors in the development of fish farming. Moore (1966) reports that initial land costs, levee construction, and well costs are high and states that the initial costs of land development may run from \$200 to \$1,000 per acre. Costs of production vary greatly. Catfish production may cost from 25 to 35 cents per pound although many of the successful farmers will spend from 20 to 25 cents per pound. Grizzell (1966) reports figures from a farm for which production costs, including amortization of levees, totaled about 19 cents per pound of fish harvested.

TABLE 2—PER ACRE RETURNS FROM VARIOUS FARMING PRACTICES IN ARKANSAS.

Crop	Gross	Net*
Rice	\$ 191.25	\$ 107.70
Soybeans — Irrigated	70.50	31.25
Soybeans — Nonirrigated	56.40	26.50
Oats	35.00	1.75
Catfish — Intensive	450.00	150.00
Catfish — Fingerlings**	1,000.00	500.00
Mixed Species	24.00	20.00
Golden Shiners	307.70	200.00
Fathead Minnows	300.00	200.00
Goldfish**	1,000.00	500.00
Sport Fish — Fingerlings	200.00	100.00
Sport Fish — Food Size	25.00	20.00
Trout**	10,000.00	2,000.00
Fee Fishing — Extensive	15.00	12.00
Fee Fishing — Catfish**	1,000.00	350.00

* Arable crop figures as per Grant and Mullins (1963).

** Specialized types of culture.

The reader will quickly become aware that there are many facets of fish farming which appear to have been overlooked. Speciality types of culture such as ornamental fishes, exotics, or of such predators as the flathead catfish exist in the state, but in general, contribute only a small percentage of the income from fish farming.

Another area which has not been included in this report is an estimate of the additional return within the state which results from the handling of fish by the wholesaler or jobbers. In the case of bait minnows, it is known that most of the second level of income production is produced within the state. However, in order to reach such data, figures would be needed on the production of each graded size of minnows and the existing price for each. At present, this sort of information is not available and cannot be extrapolated from the data at hand.

Additional income is provided from fish farming through charges for the transportation of fish. Trucks which haul live fish from fish farms to fish-out or fee-fishing lakes often charge 50 cents per mile. Approximately half of the 1966 crop of catfish and food sized sport fishes were sold live for recreational fishing. This would amount to hauling over three million pounds of fish during the year without any consideration given to the trucking or shipping of minnows. Again, it is impossible at this time to make a concrete estimate of the additional income produced within the state from this source.

Income to the state through the sale of fish feeds, fertilizers, chemicals, equipment, and vehicles is not included. Pond construction and well development costs plus natural gas or electrical power used in the industry also are omitted.

SUMMARY

Financial returns from the first level of income production in the state of Arkansas yielded a conservative \$9,165,000 during 1966. Bait fishes contributed \$5,325,000, food fishes \$3,257,000, fee fishing \$400,000, and the sale of sport fishes produced \$182,500.

Per acre returns of intensive fish farming compared favorably with rice and exceeded that of soybeans or oats. Golden shiner minnows and channel catfish were the primary income producing species in large scale operations although trout, goldfish, fingerling catfish, and catfish fee fishing lakes returned the highest per acre returns.

ACKNOWLEDGMENTS

A portion of the data presented in this paper was collected as part of Arkansas' "Commercial Fisheries Industry Survey" Project 4-12-D, a Federal Aid to Commercial Fisheries project.

LITERATURE CITED

- Grant, W. R. and T. Mullins. 1963. Enterprise Costs and Returns on Rice Farms in the Grand Prairie, Arkansas. Agricultural Experiment Station, University of Arkansas. Rept. Series 119. 35 pp.
- Green, B. L. and T. Mullins. 1959. Use of Reservoirs for Production of Fish in the Rice Areas of Arkansas. Agricultural Experiment Station, University of Arkansas, Special Report No. 9. 13 pp.
- Green, B. L. and J. H. White. 1963. Comparisons of Three Selected Rice Rotations in Eastern Arkansas: Fish-Rice, Soybeans-Rice, Fallow-Rice. Agricultural Experiment Station, University of Arkansas. Bulletin No. 664. 20 pp.
- Grizzell, Roy A. 1966. Commercial Production of Blue Catfish in Ponds and Reservoirs. Journal of Soil and Water Conservation. Vol. 21(3) : 1-3.
- Husley, A. H. 1964. Trends in Commercial Fish Farming Practices in Arkansas. Proceedings of the 18th Annual Conference of the Southeastern Association of Game and Fish Commissioners, Clearwater, Florida. October 18-21, 1964. (Mimeo.)
- Moore, C. R. 1966. Fish Farming in Arkansas. Agricultural Economist. University of Arkansas Agricultural Extension Service. Vol. 8(3) : 1-3.
- Sneed, K. E. 1966. Fish Farming—Southern Style. American Fishes and U. S. Trout News. Vol. 11 (4) : 12-14.

THE PARASITES OF THE FRESH WATER FISHES OF LOUISIANA

II. CHECK LIST OF PARASITES

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INTRODUCTION

In 1967 Arnold, et al, recorded the incidence and distribution of the parasitism in the freshwater fishes of Louisiana. The results of that study provided the basis for the current check list of the parasites of the fishes of Louisiana.

The identification of the parasites and the terminology used in this paper have been based for the most part on the original research publications in this field, the 1932 and 1953 U. S. D. A. Index-Catalogue of Medical and Veterinary Zoology, the 1963 Trematode series of this same publication, and the works of Yamaguti.

CHECK LIST OF PARASITES

Lepisosteidae — Gars

Lepisosteus oculatus (Winchill)— Spotted gar

Trematoda

None

Cestoda

Proteocephalus sp.

Nematoda

Contraecaecum spiculigerum (Rudolphi 1809)

Acanthocephala

None

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