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## COST ANALYSES OF SPORT FISHING IN COMMERCIAL CATFISH PONDS

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#### ABSTRACT

Fishermen were interviewed as they fished for catfish and largemouth bass in pond S-1 (22 acres) and pond S-7 (2.5 acres) of the Auburn University Fisheries Research Unit to determine selected expenditures per trip. From September 15 to December

5, 1965 and from March 16 to June 16, 1966, 13,528 people fished, of which 1,434 were interviewed. In addition to the \$1.00 pond permit fee, fishermen spent \$1.25 per trip for travel and \$0.89 per trip for bait and equipment. Average round trip distance traveled per fisherman was 34.5 miles. The individual average expenditure per trip was not related to day of the week. Total expenditures were estimated to have been \$42,628 for 150 days of fishing. Permit cost was \$13,528; bait cost, \$6,872; equipment, \$5,297 and travel expense, \$16,931. The gross expenditure was \$1,740 per surface acre of water.

## INTRODUCTION

As demand for fishing increases, sale of fishing privileges on a daily permit basis in private ponds may be expected to continue its upward trend. Investigations have revealed methods for managing catfish populations in ponds (Prather, 1959, 1965). The number of commercial ponds utilizing catfish as the principal species will probably increase in the future.

Driscoll and Kern (1966) have determined the net benefit of this type fishery to Alabama operators; however, they did not determine the effects of the pond operations on the surrounding communities. This project was undertaken to determine the amount of money contributed to the economy of surrounding areas. The amount of money that fishermen are willing to spend and the distance they will travel to fish may be used as an index to the value of a fishery.

Fishermen were interviewed as they fished in pond S-1 (22 acres) and pond S-7 (2.5 acres) of the Auburn University Fisheries Research Unit (Figure 1). Interviews were conducted in October, 1965 and from March through June, 1966. Computations of expenditures for travel and tackle were analyzed. An effort was then made to show some of the economic effects of this fishery on the surrounding area.

## MATERIALS AND METHODS

Ponds S-1 and S-7 were stocked with 1,500 channel catfish, *Ictalurus punctatus* (Rafinesque), and 1,500 white catfish, *Ictalurus catus* (Linnaeus), fingerlings per acre in December, 1964. Fingerling *Tilapia mossambica* Peters and *Tilapia aurea* Trewavas (= *Tilapia nilotica* Linnaeus) were stocked at a rate of 250 per acre in April, 1965. In May, 1965, 50 fingerling largemouth bass, *Micropterus salmoides* (Lacepede), per acre were added. Natural food in the pond was supplemented with Auburn No. 2 pelleted fish food at rates varying from one to 35 pounds per acre per day.

The ponds were open for public fishing from September 15 to December 5, 1965 and March 16 to June 16, 1966. Fishing time was from 7:00 a.m. to 5:30 p.m. daily except Sunday. For the \$1 fee a fisherman could keep five catfish and five tilapia. Five extra catfish could be taken for an additional 30¢ per fish.

Fifty anglers were interviewed daily or all fishermen present when there were fewer than 50. In October, 1965, interviews were conducted on two Mondays, two Tuesdays, one Wednesday, three Thursdays, no Fridays and three Saturdays. Interviews were conducted twice weekly beginning March 18, 1966. The schedule was on a three-week cycle with interviewing on Wednesday and Saturday of the first week, Monday and Friday of the second week, and Tuesday and Thursday of the third week.

Fishermen were contacted while they fished, and a survey form (Figure 2) was completed for each person holding a permit. A standard distance from the fishing area to surrounding towns (Figure 1) was determined from highway maps. Transportation expense based on eight cents per mile was computed for round trip distance. Total expense for each car was divided by the number of fishing passengers to determine the cost for each individual.

Fishermen were asked what bait and equipment items they had pur-

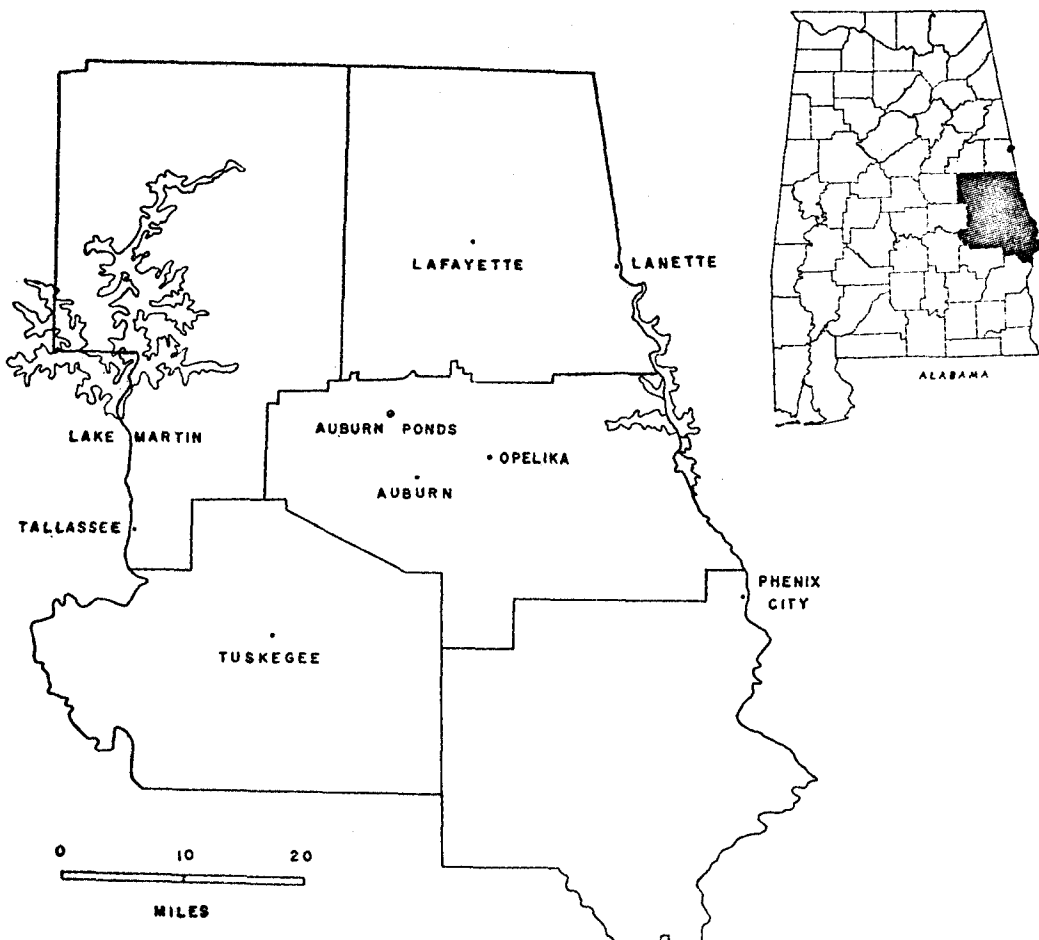


Figure 1. Location of Auburn University Experimental Ponds and area of fishermen origin.

Figure 2. Questionnaire completed for each fisherman interviewed at ponds S-1 and S-7 of Auburn University Fisheries Research Unit, October, 1965 and March 16 to June 16, 1966.

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- I. Date \_\_\_\_\_ Location \_\_\_\_\_ Permit No. \_\_\_\_\_
- II. In (or near) what town do you live \_\_\_\_\_?  
 Miles traveled to fish (round trip) \_\_\_\_\_  
 Method of travel. Own car \_\_\_\_\_ with friends \_\_\_\_\_ other \_\_\_\_\_  
 Number of fishermen in car \_\_\_\_\_
- III. Fishing equipment purchased for trip:  
 hooks \_\_\_\_\_, line \_\_\_\_\_, floats \_\_\_\_\_, sinkers \_\_\_\_\_, cane pole \_\_\_\_\_,  
 rod \_\_\_\_\_, reel \_\_\_\_\_, net \_\_\_\_\_, other \_\_\_\_\_.
- IV. Bait purchases for trip:  
 worms \_\_\_\_\_, catfish bait \_\_\_\_\_, minnows \_\_\_\_\_, other \_\_\_\_\_.
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chased for the current trip, thus avoiding estimating the cost per trip for major pieces of equipment. Standard costs based on average retail prices of local merchants were used for bait and small tackle items (Table 1). Soft drink concession and boat rental were the only concessions at the ponds.

TABLE 1. Standard prices of bait and small items of equipment used for calculating cost per trip of fishermen at ponds S-1 and S-7 (Auburn University) in October, 1965 and March 16 to June 16, 1966.

Bait	Cost	Equipment item	Cost
earthworms	\$0.75	hooks	\$0.15
catfish bait	\$0.75	line	\$0.30
minnows	\$0.50	floats	\$0.50
shrimp	\$0.65	sinkers	\$0.30
chicken liver	\$0.50	cane pole	\$1.00

Information from each completed questionnaire was punched onto an IBM data card. Days of the week and towns were given a code number. An IBM 407 tabulator was then used to obtain totals for each item of bait and equipment, travel expense, and distance traveled to fish. By sequential sorting and tabulating, totals were obtained for each sample date, the six days of the week, and each town represented.

## RESULTS

A complete count of fishermen was taken from permit sales, which made possible estimation of total expenditures by expanding the sample. During the 150 days which the ponds were open, 13,528 people fished an average of 5.66 hours each. Most fishermen used spinning tackle and fished with several rods each. A majority of the anglers fished one or more days per week, and many fished exclusively in the Auburn ponds. Approximately one percent of the anglers fished from boats. The sample is separated according to day of the week on which interviews were conducted (Table 2). Utilizing the average per trip expense of \$2.15

TABLE 2. Daily fishermen interviews, average miles traveled and cost of trip, and range of daily average cost at ponds S-1 and S-7 of Auburn University Fisheries Research Unit, September 15, 1965 to June 16, 1966.

Day of week	Fishermen interviewed	Interviewing days	Per trip average		
			Miles traveled	Cost	Daily range of cost
Monday	266	6	35.3	\$2.06	\$1.70 - \$2.46
Tuesday	221	5	36.3	1.87	1.63 - 2.29
Wednesday	228	5	30.7	2.35	1.29 - 4.45
Thursday	280	7	37.1	2.18	1.81 - 2.64
Friday	60	3	32.2	2.45	1.90 - 3.12
Saturday	383	8	33.8	2.18	1.84 - 2.81
Total	1,438	34	34.5	2.15	1.29 - 4.45

(excluding permit receipts), total expenditures were calculated to be \$29,100 for 150 days of fishing. Bait cost was \$6,872; equipment \$5,297, and travel expense \$16,931.

Table 3 shows mileage classification of each fishing trip to the Auburn ponds. Each distance range was arbitrarily selected by mileage from the Auburn ponds to identify areas of fisherman origin. Expenditures for each area are given.

The percentage of anglers purchasing various items of equipment and bait, and the estimated total expenditure for each item are tabulated in Table 4. Almost all rod and reel purchases were made in the first week of the spring season. Other purchases were not related to season except for choice of baits. Earthworms were always the favorite bait.

Chicken liver and shrimp were popular in the fall, but in spring and summer, commercial catfish baits were more popular.

TABLE 3. Estimated total individual fishermen expenditures based on miles traveled per trip to Auburn University Fisheries Research Unit ponds S-1 and S-7, September 15, 1965 to June 16, 1966.

Mileage (round trip)	Percentage of fishermen	Estimated total fishermen	Estimated fisherman expenditures			
			Per trip			
			Total	Bait and equipment	Travel	Total
Less than 30	59.1	7,995	\$1.74	\$0.97	\$0.77	\$13,897
30 - 49	5.3	717	1.95	0.39	1.56	1,398
50 - 75	32.9	4,450	2.81	0.86	1.95	12,488
76 - 100	2.0	271	3.30	0.65	2.65	894
Over 100	0.7	91	4.71	0.77	3.94	447
Combined	100.0	13,524	2.15	0.89	1.25	29,100

TABLE 4. Percentage of fishermen purchasing equipment and bait and their estimated total cost for fishing in Auburn University Fisheries Research Unit ponds S-1 and S-7, September 15 to June 16, 1966.

Item	Percentage purchasing	Estimated total expenditure
Sinkers	12.2	\$ 544
Hooks	11.8	330
Floats	6.9	535
Lines	2.5	189
Rods	1.0	1,318
Reels	1.0	1,982
Cane poles	0.5	78
Nets	0.1	33
Other tackle	2.4	288
Worms	27.1	2,951
Catfish bait	18.1	1,879
Minnnows	10.9	951
Other bait	10.9	1,091

## DISCUSSION

The results of this study show that 24.5 surface acres of water generated a turnover of \$42,628 in 6½ months in communities surrounding the Auburn ponds. Of the \$42,628, \$29,100 was spent by fishermen in preparation for trips to the ponds. Transportation accounted for 39.7 percent of the monies spent by anglers. Bait dealers sold an estimated \$6,872 of fish bait to individuals fishing in the Auburn ponds, that amounted to 16.1 percent of the total receipts. Fishing tackle accounted for 12.5 percent of all purchases made by fishermen. The remaining 31.7 percent of the total cost was for permit sales at the ponds. The amount of money spent for permits was put directly back into the economy through salaries, maintenance, and fish feed purchases.

The range of average daily expenditures (Table 2) indicates that the average daily expenditure per person was not related to day of the week. Therefore, the average cost per person for all fishing days may be used in estimating total expenditures. The value of an estimate of total cost of fishermen participating in a program such as this one gives investigators sound reasons for backing proposed projects of this type.

A list of special clothing, food, and miscellaneous items purchased is difficult to obtain; therefore, this study does not have complete coverage of items purchased and trip expenditures. An estimate of expenditures for major items of equipment may also be subject to error.

Brown, Singh, and Castle (1964) in evaluating the Oregon salmon and steelhead sport fishery defined net economic value as "the estimated value of the sport fishery resource to a single owner who could charge for the opportunity of fishing." They further discuss methods of arriving at a value based on proposals of Clawson (1959), which employs a demand curve measured by plotting estimated costs per unit as a function of the number of visits per 1,000 population in a zone in a given distance range. As distance and travel cost increase, alternative fishing sites are selected more frequently. The authors believe that an important consideration is omitted from this method in that it does not consider benefits received by businesses engaged in furnishing fishermen with necessary items needed for participation in their sport. The results of this study show that for every dollar taken in by Auburn University, 1.7 dollars were spent in the surrounding areas.

Because this is a case study of Auburn University Fisheries Research Unit experimental ponds, results may not be comparable to privately owned ponds. The idea of fishing in experiment ponds may have attracted many anglers who believed that fishing would be better than in less intensively managed waters.

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## THE EFFECT OF ROTENONE ON CERTAIN FISH FOOD ORGANISMS

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#### ABSTRACT

While all four fish food organisms (damselfly nymphs, dragonfly nymphs, mayfly nymphs, and caddisfly larvae) were killed by various rotenone concentrations, dragonfly nymphs had the greatest resistance and caddisfly larvae the least. Concentrations of rotenone currently being used in fish eradication would not effect the populations of the test organisms except that a very slight reduction in the caddisfly larvae population might result from the higher concentrations that are sometimes used. No change in structure or deterioration of gills before and after rotenoning could be observed by microscopic examination. Survival of all four organisms was excellent under laboratory conditions. Oxygen deficiencies were not a factor in killing test organisms. Mayfly nymphs consumed the greatest amount of oxygen and damselfly nymphs the least. The damselfly nymphs could survive a low oxygen tension without their gills while the other test organisms could not.

#### INTRODUCTION

The data herein presented concern the effect of rotenone on four