

A QUANTITATIVE CREEL CENSUS ON TWO ARMS OF BULL SHOALS RESERVOIR, MISSOURI¹

By RALPH M. BURRESS
Missouri Conservation Commission
Columbia, Missouri

ABSTRACT

A quantitative creel census was conducted for eight years on the Missouri portion of Bull Shoals Reservoir; on the Little North Fork Arm from 1953 through 1958, and on the White River Arm from 1955 through 1960.

Sport fishing catch from the Little North Fork Arm averaged 39.2 pounds per acre (44.0 fish) over the six-year period. About 89.3 percent of the weight of fish taken was of predacious game fishes, including 49.6 percent (19.6 pounds per acre) of largemouth bass (*Micropterus salmoides*), 9.2 percent (3.5 pounds per acre) of spotted bass (*Micropterus punctulatus*), and 23.1 percent (9.4 pounds per acre) of black crappie (*Pomoxis nigromaculatus*). Total fishing pressure per acre ranged from 35.5 hours (7.5 trips) to 105.3 hours (22.4 trips) with an average of 61.2 hours (12.6 trips). The rate of catch increased from 0.57 fish per hour in 1953 to 0.86 fish per hour in 1958. The percentage of successful anglers varied from 78.1 to 88.0 percent.

Sport fishing catch from the census area in the Missouri portion of the White River Arm averaged 73.4 pounds per acre (75.8 fish) over the six-year period. About 63.4 percent of the weight of fish taken was predacious game fishes, including 11.5 percent (8.5 pounds per acre) of largemouth bass, 20.1 percent (15.0 pounds per acre) of white bass (*Roccus chrysops*) and 29.7 percent (21.7 pounds per acre) of white crappie (*Pomoxis annularis*) and black crappie. In addition, channel catfish (*Ictalurus punctatus*) comprised 21.6 percent (15.9 pounds per acre) and flathead catfish (*Pylodictis olivaris*) comprised 10.0 percent (7.9 pounds per acre) of the total harvest. Total fishing pressure per acre ranged from 53.3 hours (10.5 trips) to 113.9 hours (18.1 trips) with an average of 87.8 hours (16.3 trips). The rate of catch varied from 0.49 fish per hour in 1955 to 1.08 fish per hour in 1958. The percentage of successful anglers varied from 65.1 to 89.8 percent.

Although the White River Arm produced more fish than the Little North Fork Arm, the catch of black bass in the former was less than half as great as in the latter. This is thought to result from greater competition offered by the much higher populations of crappie and white bass in the White River Arm. While creel composition of the two arms differed greatly, there was in both a very close relationship between harvest in pounds per acre and fishing pressure in pounds per acre. This indicates that fishing had not been heavy enough to affect the fish populations adversely.

INTRODUCTION

Each new impoundment presents a challenge to fishery biologists to understand the factors governing its productivity and to apply this knowledge so that its full potential for providing good fishing can be realized. This study was made to obtain basic facts regarding development of the sport fishery on two arms of Bull Shoals Reservoir. The results showed great differences between the fish population and methods of fishing in the two areas, measured the productivity of each, and strongly indicated the effects of competition between predator species.

Bull Shoals Reservoir, a Corps of Engineers impoundment on the White River, is located centrally in northern Arkansas and southern Missouri. It was impounded in 1952 for flood control and power production. Its area at full pool level (elevation 654) is 45,440 acres, about 9,900 acres of which lie in Missouri. The reservoir is about 88 miles long, and its drainage area covers 6,036 square miles of predominantly forest and farm land.

Figure 1 shows the relative locations of the study areas within the reservoir. The "Y" shaped area on the Little North Fork Arm was about 12 miles long,

¹ This work was financed in part with federal-aid in fish restoration funds under Missouri's Dingell-Johnson Project F-1-R.

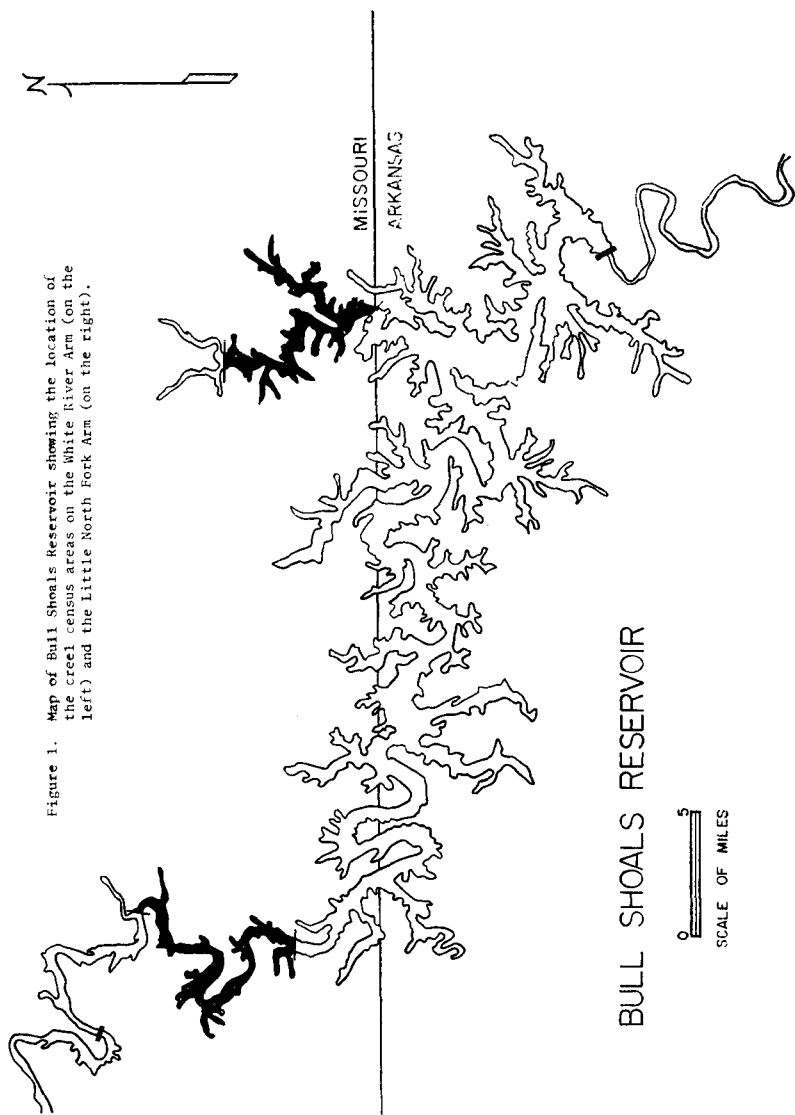


Figure 1. Map of Bull Shoals Reservoir showing the location of the creel census areas on the White River Arm (on the left) and the Little North Fork Arm (on the right).

had a water depth at the Arkansas line of about 114 feet at full pool, and the water was consistently clearer than that in the White River Arm. The latter area was about 12 miles long, with a water depth of about 54 feet at its lower end. Lake elevations during the study varied from about 387 feet during the drought of 1954 to about 694 feet during the flood of 1957 (a difference of 107 feet). Annual fluctuations normally are less than half this great.

CREEL CENSUS METHODS

In January, 1953, a quantitative creel census was begun on the Little North Fork Arm to evaluate its fishery. This census operated continuously until the end of 1958. A similar creel census on the White River Arm was begun in April, 1955 and continued until the end of 1960.

The major duties of the census clerks were to make systematic counts of fishermen and to interview anglers. They worked an eight-hour day for 25 days a month, with alternate working days being spent on each area. The working hours and counting hours were stratified according to a pre-arranged schedule. Although working days frequently lasted until sunset, they never began before 7:00 a. m., because fog and poor visibility often interfered with fisherman counts prior to that time. Boat counts were made each morning and afternoon over a previously designated course. The starting point of the morning count was alternated each day and the afternoon count was begun at the opposite end of the area. The clerks interviewed as many anglers as possible each day and divided their time between the two commercial docks and the boat-launching sites on the areas. Information collected for each fishing trip included the date, number and residence of anglers in the party, hours fished, method of fishing, kind of bait used, species and number of fish caught, and estimated average length of each kind of fish taken. Scale samples were collected as needed for age and growth studies and tags were collected from anglers and dock operators. The methods for analyzing and extrapolating the data were similar to those described by Kathrein (1953). Only data obtained by creel census clerks were used in this study.

CREEL COMPOSITION AND POPULATION CHANGES

During the six-year study, an estimated 224,000 fishing trips were made on the Little North Fork Arm, and 215,000 trips were made on the White River Arm. The percentages of anglers interviewed were 9.1 and 5.9 for the two areas, respectively. The compositions of the creels from the two areas were so dissimilar as to suggest they came from different lakes. The fishery of the Little North Fork Arm was supported mainly by largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*) and black crappie (*Pomoxis nigromaculatus*), and that of the White River Arm was supported largely by crappie (mostly white crappie, *Pomoxis annularis*), white bass (*Roccus chrysoptus*), channel catfish (*Ictalurus punctatus*) and largemouth bass.

Several features of the Little North Fork Arm creel were unique (Table I). Largemouth bass were dominant with bluegill comprising a higher percentage and crappie a lower percentage of the creel than in any other reservoir area we have studied. Largemouth bass averaged 33.3 percent of the creel numerically and 49.6 percent of the harvest by weight (Table II). Bluegill were second numerically averaging 29.2 percent and fourth by weight (6.8 percent). Black crappie were third numerically (29.2 percent) and second by weight (23.1 percent). Surprisingly enough, no white crappie were taken by angling or netting during the census period, although a few are present now. Spotted bass were fourth numerically (4.4 percent) and third by weight (9.2 percent). Both spotted bass (*Micropterus punctulatus*) and smallmouth bass (*Micropterus dolomieu*) were more than 10 times as important in the creel of the Little North Fork Arm as in that of the White River Arm. Green sunfish (*Lepomis cyanellus*) and longear sunfish (*Lepomis megalotus*) made up 11.0 and 8.0 percent of the creel respectively during the first year of the census, but contributed little thereafter.

In the White River Arm, crappie (both black and white) were dominant in the creel (Tables 3-4). They averaged 49.3 percent numerically and 29.7 percent by weight. The population of white bass, which developed much more rapidly here than in the Little North Fork Arm, ranked second numerically: they made up 19.5 percent by number and 20.1 percent by weight (ranking third). Bluegill ranked third numerically (13.2 percent) and were fifth by weight (3.0 percent). Largemouth bass were fourth in number (7.6 percent) and weight (11.5 percent). Channel catfish, which were rather scarce in the creel in the Little North Fork Arm, ranked fifth numerically (6.1 percent) and were second by weight (21.6 percent). Flathead catfish (*Pylodictis olivaris*) also were important in the White River Arm, making up 10.0 percent of the total harvest by weight. Longear sunfish and drum (*Aplodinotus grunniens*) constituted 5.3 and 2.1 percent of the creel in the first year of the census, but were taken in small numbers thereafter.

Pre-impoundment studies of the fish population in the section of river included in the White River Arm creel census area showed that relatively few largemouth bass were present (Funk, unpublished). The ability of largemouth

TABLE I

ESTIMATED NUMBER OF FISH TAKEN AND PERCENTAGE COMPOSITION (IN PARENTHESES) OF THE CATCH FROM THE CREEL CENSUS AREA ON THE LITTLE NORTH FORK ARM OF BULL SHOALS RESERVOIR, MISSOURI, 1953-1958

Year	Largemouth Bass	Spotted Smallmouth Bass	White Bass	Black Crappie	Bluegill	Channel Catfish	Flathead Catfish	Others*
1953	26,900 (44.7)	975 (1.6)	5,475 (9.1)	2,225 (3.7)	10,775 (17.9)	300 (0.5)	175 (0.3)	13,350 (22.2)†
1954	18,300 (31.3)	1,925 (3.3)	2,925 (5.0)	20,750 (35.5)	11,875 (20.3)	825 (1.4)	525 (0.9)	1,325 (2.3)
1955	27,275 (24.6)	4,875 (4.4)	2,225 (2.0)	32,275 (29.1)	41,250 (37.2)	675 (0.6)	1,000 (0.9)	1,315 (1.2)
1956	30,850 (28.4)	4,875 (4.5)	450 (0.4)	13,575 (12.5)	55,375 (51.0)	650 (0.6)	650 (0.6)	1,875 (1.8)
1957	65,400 (44.0)	9,850 (6.6)	900 (0.6)	24,900 (16.7)	39,400 (26.6)	750 (0.5)	175 (0.1)	4,450 (3.1)
1958	105,000 (32.8)	17,000 (5.3)	1,275 (0.4)	89,650 (28.0)	62,050 (19.4)	1,375 (0.4)	325 (0.1)	6,225 (1.9)
AVERAGE	(33.3)	(4.4)	(2.6)	(22.3)	(29.2)	(0.7)	(0.5)	(4.5)

* Bullheads, green sunfish, carp, longear sunfish, suckers, drum, rock bass, warmouth, walleye, and eel.

† Predominantly green sunfish (11.0 percent) and longear sunfish (8.0 percent).

TABLE II

Species	ESTIMATED TOTAL WEIGHT AND WEIGHT PER ACRE (IN PARENTHESES) OF THE PRINCIPAL SPECIES TAKEN ANNUALLY FROM THE CREEL CENSUS AREA ON THE LITTLE NORTH FORK ARM OF BULL SHOALS RESERVOIR, MISSOURI, 1953-1958.					Totals	% of Total	
	1953	1954	1955	1956	1957			1958
Largemouth Bass	25,050 (8.7)	31,225 (22.7)	46,550 (15.6)	31,425 (10.9)	81,750 (19.5)	136,525 (39.9)	352,525 (19.6)	49.6
Spotted Bass	1,450 (0.5)	3,575 (2.6)	9,975 (3.3)	7,200 (2.5)	15,925 (3.8)	27,500 (8.0)	65,625 (3.5)	9.2
Smallmouth Bass	5,025 (1.8)	5,000 (3.6)	4,925 (1.6)	650 (0.2)	1,400 (0.3)	2,400 (0.7)	19,400 (1.4)	2.7
White Bass	(Trace)	None	(Trace)	225 (0.1)	2,225 (0.5)	30,325 (8.9)	32,775 (1.6)	4.6
Black Crappie	1,500 (0.5)	16,600 (12.1)	29,850 (10.0)	10,850 (3.8)	22,550 (5.4)	82,925 (24.2)	164,275 (9.4)	23.1
Bluegill	1,825 (0.6)	1,775 (1.3)	5,150 (1.7)	13,850 (4.8)	9,850 (2.3)	15,500 (4.5)	47,950 (2.6)	6.8
Channel Catfish	225 (0.1)	950 (0.7)	1,175 (0.4)	1,150 (0.4)	2,225 (0.5)	3,925 (1.1)	9,650 (0.5)	1.4
Flathead Catfish	525 (0.2)	1,875 (1.4)	3,950 (1.3)	700 (0.2)	1,025 (0.2)	3,025 (0.9)	11,100 (0.7)	1.5
TOTAL OF ALL SPECIES	38,075	61,350	101,925	66,500	138,150	304,350	710,350	

TABLE III

ESTIMATED NUMBER OF FISH TAKEN AND PERCENTAGE COMPOSITION (IN PARENTHESES) OF THE CATCH FROM THE CREEL CENSUS AREA
ON THE WHITE RIVER ARM OF BULL SHOALS RESERVOIR, MISSOURI, 1955-1960

Year	<i>Largemouth Bass</i>	<i>Spotted Bass</i>	<i>Smallmouth Bass</i>	<i>White Bass</i>	<i>Crappie*</i>	<i>Bluegill</i>	<i>Channel Catfish</i>	<i>Flathead Catfish</i>	<i>Otherst</i>
1955	11,075 (14.7)	1,350 (1.8)	225 (0.3)	2,475 (3.3)	31,225 (41.5)	8,125 (10.8)	12,425 (16.5)	1,800 (2.4)	6,550 (8.7) ‡
1956	14,575 (10.8)	1,225 (0.9)	75 (0.1)	14,325 (10.6)	70,575 (52.3)	18,900 (14.0)	8,475 (6.3)	1,275 (0.9)	5,500 (4.1)
1957	18,625 (10.2)	425 (0.2)	75 (Trace)	25,750 (14.1)	93,925 (51.3)	25,625 (14.0)	14,750 (8.1)	1,475 (0.8)	2,450 (1.3)
1958	19,100 (6.1)	1,025 (0.3)	75 (Trace)	71,300 (22.9)	153,325 (49.2)	49,900 (16.0)	10,250 (3.3)	900 (0.3)	5,875 (1.9)
1959	7,650 (3.9)	200 (0.1)	75 (Trace)	76,000 (38.3)	63,900 (32.2)	27,475 (13.8)	11,350 (5.7)	3,500 (1.8)	8,300 (4.2)
1960	6,200 (5.2)	200 (0.2)	25 (Trace)	17,775 (15.0)	76,550 (64.6)	7,725 (6.5)	6,275 (5.3)	1,025 (0.9)	2,725 (2.3)
AVERAGE	(7.6)	(0.4)	(Trace)	(19.5)	(49.3)	(13.2)	(6.1)	(0.9)	(3.0)

* Both black crappie and white crappie.

† Bullheads, green sunfish, carp, longear sunfish, suckers, drum, rock bass, warmouth, walleye, eel, trout, gar and quillback.

‡ Predominantly longear sunfish (5.3 percent) and drum (21 percent).

TABLE IV

ESTIMATED TOTAL WEIGHT AND WEIGHT PER ACRE (IN PARENTHESES) OF THE PRINCIPAL SPECIES TAKEN ANNUALLY FROM THE CREEL CENSUS AREA ON THE WHITE RIVER ARM OF BULL SHOALS RESERVOIR, MISSOURI, 1955-1960.
 ALSO INCLUDED ARE THE ESTIMATED TOTAL WEIGHT OF ALL SPECIES COMBINED AND THE PERCENT OF THAT TOTAL WEIGHT COMPRISED BY EACH SPECIES

Species	1955	1956	1957	1958	1959	1960	Totals	% of Total
Largemouth bass	18,900 (10.0)	19,125 (11.1)	27,925 (8.6)	35,200 (14.8)	7,650 (3.9)	6,050 (2.6)	114,850 (8.5)	11.5
Spotted Bass	1,300 (0.7)	1,475 (0.9)	600 (0.2)	1,675 (0.7)	250 (0.1)	250 (0.1)	5,550 (0.5)	0.6
Smallmouth Bass	200 (0.1)	125 (0.1)	150 (0.1)	75 (Trace)	75 (Trace)	(Trace)	625 (Trace)	0.1
White Bass	1,175 (0.6)	8,050 (4.7)	24,150 (7.4)	65,050 (27.3)	83,125 (41.8)	18,900 (8.1)	200,450 (15.0)	20.1
Crappie (Black and White)	17,575 (9.3)	30,000 (17.3)	44,625 (13.7)	95,825 (40.2)	42,725 (21.5)	66,025 (28.4)	296,775 (21.7)	29.7
Bluegill	1,025 (0.5)	2,350 (1.4)	7,375 (2.3)	11,850 (5.0)	5,675 (2.8)	1,825 (0.8)	30,100 (2.1)	3.0
Channel Catfish	26,725 (14.2)	20,150 (11.6)	47,025 (14.4)	44,800 (18.8)	48,900 (24.6)	27,875 (12.0)	215,475 (15.9)	21.6
Flathead Catfish	13,400 (7.1)	12,400 (7.2)	13,600 (4.2)	9,000 (3.8)	40,300 (20.2)	11,275 (4.8)	99,975 (7.9)	10.0
TOTAL OF ALL SPECIES	85,925	98,625	169,550	267,375	239,300	138,100	998,875	

bass populations to expand rapidly in a new environment has been observed in many places. Bennett (1954) in reporting his Ridge Lake studies pointed out that in 1941, when the lake was new, a relatively sparse population of adult bass produced the largest number of bass fry per acre recorded in that study. A similar rapid expansion of largemouth bass undoubtedly occurred when Bull Shoals Reservoir filled, and was responsible for the high initial population. Bennett (1954) also stated that, "The history of largemouth bass is new, unmanaged impoundments containing more than one species of fish is one of a high population at first, which gradually becomes smaller, so that, within a span of years equal to that covered by this study [10 years], the population may drop to a very low level." In the White River Arm, where white bass and crappie competed strongly with black bass in the last five years of the study, the black basses declined to about a third of their greatest abundance in the creel. The fact that largemouth bass and spotted bass populations in the Little North Fork Arm were at high levels throughout the study period probably was due in large measure to the comparative lack of competition with white bass and crappie.

The white bass population showed somewhat the same rapid expansion exhibited by the black bass, but only after a delay of several years. Harlan and Speaker (1956) state regarding white bass that, "Over a period of years their population may reach astronomical numbers, probably at the expense of other desirable fishes, then fall off sharply. . . ." This was our experience in the White River Arm, for the estimated harvest of white bass increased from 2,475 in 1955 to 76,000 in 1959 and declined 76.8 percent by 1960, when only 17,775 were taken. The other quite apparent population change in each of the study areas as indicated by creel composition was the expected decline of smallmouth bass. Although several hundred smallmouth were caught each year in Little North Fork Arm, this species was virtually absent from the White River Arm after 1955.

FISHING METHODS

On the Little North Fork Arm where the shoreline is not particularly conducive to shore angling, 5.4 percent of all anglers counted were fishing from the bank, but this group made up only 1.7 percent of the anglers interviewed. Most shore anglers still-fished with live bait, and the principal species they caught were bluegill (35.8 percent), largemouth bass (25.7 percent), longear sunfish (14.1 percent), and crappie (12.7 percent). On the White River Arm, the situation was strikingly different. Shore anglers made up 13.4 percent of all anglers counted, and 6.2 percent of all anglers interviewed. Here, too, most shore anglers used live bait, and the main species they caught were crappie (44.7 percent), bluegill (29.6 percent), white bass (11.4 percent), and channel catfish (4.1 percent).

The amount of fishing pressure exerted by shore fishermen on the creel census areas of Bull Shoals Reservoir is in decided contrast with that reported on Allatoona Reservoir, Georgia, by Wood *et al.* (1956). In that study, bank fishing accounted for the great majority of fishing hours during the first two years, but such usage declined sharply the third year.

Live bait was used exclusively by slightly over 60 percent of the fishermen on each arm, but still fishing was done exclusively by far more anglers on the Little North Fork Arm (57.8 percent) than on the White River Arm (39.3 percent). Furthermore, there was a considerable difference between the areas in the amount of use of other baits and fishing methods. On the Little North Fork Arm where black bass were sought more avidly, five times as many hours were spent in casting as in trolling. Anglers using artificial baits exclusively expended 36.3 percent of the total fishing hours, and took 50.0 percent of the black bass and 51.4 percent of the white bass creeled. Trotliners expended 3.5 percent of the total fishing hours and harvested 62.2 percent of the channel catfish and 82.9 percent of the flathead catfish taken.

That black bass were not sought so diligently on the White River Arm is reflected by the fact that more trotling than casting was done, and trolling hours nearly equalled casting hours. Also, ten times as many fishermen used a variety of fishing methods during each fishing trip on the White River Arm. Anglers using artificial baits exclusively expended 29.8 percent of the total fishing hours, and took 69.3 percent of all the black bass and 75.5 percent of

the white bass creel. Trotliners expended 15.6 percent of the total fishing hours, and harvested 81.5 percent of the channel catfish and 89.1 percent of the flathead catfish taken. Considering both arms together, trotlining produced slightly more channel catfish per hour in spring and more flathead catfish per hour in summer than in other seasons. This method took more than 100 times as many channel catfish as flatheads in the winter months.

FISHING PRESSURE, SUCCESS AND HARVEST

In 1953, when the lake was new, fishing pressure was a modest 35.5 hours per acre (7.5 trips) on the Little North Fork Arm (Table V). Although the rate of catch was only 0.57 fish per hour, 81.3 percent of the anglers were successful, and the harvest per acre amounted to 20.6 fish weighing 12.9 pounds. As the lake became better known fishing pressure increased, and reached a peak of 105.3 hours per acre (22.4 trips) in 1958. The rate of catch also climbed rather steadily, amounting to 0.86 fish per hour in 1958. In 1958, the year of greatest angler use and success, the harvest per acre amounted to 93.6 fish weighing 88.9 pounds and 88.0 percent of the anglers were successful. Since bluegill were consistently numerous in the catch, the average weight of the fish taken exceeded one pound in only one year. The sport fishing catch from this arm averaged 39.2 pounds per acre (44.0 fish) over the six-year period. The average catch per fisherman trip varied from 1.7 pounds in 1953 to 3.7 pounds in 1958. About 89.3 percent of the weight of fish taken during the study was comprised of predacious game fishes, including 49.6 percent (19.6 pounds per acre) of largemouth bass, 9.2 percent (3.5 pounds per acre) of spotted bass, and 23.1 percent (9.4 pounds per acre) of black crappie. Houser and Heard (1957) reported that in Fort Gibson Reservoir, the harvest of largemouth bass and spotted bass amounted to 5.1 and 0.9 pounds per acre, respectively.

Fishing pressure was consistently higher on the White River Arm than on the other arm, since it was about 30 miles closer to Springfield, Missouri's third largest city. About 45 percent of all anglers censused came from the Springfield area. In 1955, pressure was 72.3 hours per acre (13.1 trips), and the harvest per acre amounted to 35.4 fish weighing 39.9 pounds. Only 65.3 percent of the anglers were successful, and the rate of catch was a poor 0.49 fish per hour. Thereafter, the total number of fishing trips increased steadily through 1959, amounting to 24.3 trips per acre (111.9 hours) that year. The rate of catch reached a peak of 1.08 fish per hour in 1958 and the percentage of successful anglers reached 89.8 percent in 1960. The greatest harvest was made in 1959 when 99.7 fish weighing 120.0 pounds were taken per acre. One-sixth of the weight of this harvest was made up of a record catch of large flathead catfish. In 1959 largemouth bass fishing was poor in Bull Shoals Reservoir and good in nearby newly impounded Table Rock Reservoir; hence, fishing pressure on Bull Shoals was cut almost in half in 1960.

The sport fishing catch from the White River Arm census area in pounds per acre was 87.2 percent greater than that of the Little North Fork Arm, averaging 73.4 pounds per acre (75.8 fish) over the six-year period. The average catch per fisherman trip varied from 3.0 pounds in 1956 to 5.7 pounds in 1960. About 63.4 percent of the weight of fish taken was comprised of predacious game fishes, including 11.5 percent (8.5 pounds per acre) of largemouth bass, 20.1 percent (15.0 pounds per acre) of white bass, and 29.7 percent (21.7 pounds per acre) of white and black crappie. In addition, channel catfish comprised 21.6 percent (15.9 pounds per acre), and flathead catfish comprised 10.0 percent (7.9 pounds per acre) of the total harvest. Because of this comparatively large harvest of catfish, the average weight of the fish taken exceeded one pound in three of the six years studied.

As might be expected, the seasonal intensity of fishing was quite different for each area. On the Little North Fork Arm, 36.5 percent of all fishing hours censused were expended in the spring when bass fishing was heaviest; 25.7 percent of the hours were expended in summer, 24.9 percent in the fall and 12.9 percent in winter. On the White River Arm, fishing pressure was more evenly divided among the three major seasons. Pressure was slightly higher in spring (31.7 percent), followed by summer (30.8 percent), fall (28.0 percent) and winter (9.5 percent).

TABLE V

	<i>Little North Fork Arm</i>					<i>White River Arm</i>						
	1953	1954	1955	1956	1957	1958	1955	1956	1957	1958	1959	1960
No. Anglers Interviewed	2,895	4,404	3,393	3,436	3,240	3,153	1,386	2,082	2,317	2,573	2,424	1,976
Percent Anglers Successful	81.3	82.8	78.1	81.7	84.8	88.0	65.3	65.1	74.4	80.6	88.3	89.8
Rate of Catch (Fish/Hr.)	0.57	0.59	0.68	0.70	0.62	0.86	0.49	0.66	0.81	1.08	0.82	0.93
Census Area Acreage	2,871	1,376	3,150	2,885	4,200	3,425	2,138	1,730	3,260	2,382	1,990	2,325
Total No. Fishing Trips	21,760	18,851	29,980	30,916	45,899	76,905	27,891	33,561	38,046	43,136	48,417	24,341
Fishing Trips/A	7.5	14.1	9.7	10.6	11.0	22.4	13.1	19.4	12.2	18.1	24.3	10.5
Total No. Fishing Hours	103,356	94,331	156,550	151,314	227,745	357,300	154,185	186,756	211,978	271,285	222,684	254,287
Fishing Pressure (Hrs./A)	35.5	69.4	50.4	52.0	54.6	105.3	72.3	108.0	67.6	113.9	111.9	53.3
Total No. Fish Taken	60,173	58,450	110,900	108,587	148,607	320,538	75,250	134,929	183,114	311,762	198,390	118,503
Total Wt. Fish Taken (Lbs.)	38,075	61,340	101,915	66,494	138,142	304,334	85,925	98,624	169,555	267,386	239,291	138,085
No. Fish Harvested/A	20.6	42.4	35.3	37.0	34.7	93.6	35.4	78.0	59.6	130.9	99.7	51.0
Wt. Fish Harvested/A (Lbs.)	12.9	44.5	32.5	23.0	32.9	88.9	39.9	57.0	52.0	112.3	120.0	59.4

ORIGIN OF ANGLERS

Although the creel census areas were only 30 miles apart, there was a marked difference in the origin of anglers. Anglers from the local county (Ozark County) made up 24.2 percent of those visiting the Little North Fork Arm, and St. Louis County and Jackson County (Kansas City) ranked second (22.9 percent) and third (13.0 percent), respectively. Both cities are about 260 miles from the area, but its reputation for bass fishing proved to be a strong attraction. Out-of-state anglers made up 6.4 percent of the total, with the majority of these coming from Kansas and Illinois.

Anglers from the Springfield, Missouri area (Greene County) made up 45.0 percent of all those interviewed on the White River Arm while only 16.2 percent came from the local (Taney) county. The percentage of anglers from other counties (including St. Louis and Jackson) was much lower. Out-of-state anglers made up 8.8 percent of the total, most of these coming from Kansas and Illinois.

DISCUSSION

A review of published data on fishing pressure, success and harvest with data collected in this study shows that fishing in Bull Shoals Reservoir compares rather favorably with that in other impoundments. Patriarche and Campbell (1957) showed that in the first six years of angling on Clearwater Lake, Missouri, fishing pressure ranged from 44.1 to 111.2 hours per acre, the rate of catch ranged from 0.34 to 0.65 fish per hour, and the harvest ranged from 6.8 to 31.3 pounds per acre. Wood *et al.* (1956) reported that in the first three years of fishing on Allatoona Reservoir, Georgia, fishing pressure varied from about 8 to 17 trips per acre, and fishing success declined from 0.66 and 0.78 fish per hour for boat and bank anglers, respectively, in the first year after impoundment to 0.11 and 0.20 fish per hour in the third year. The values for both Clearwater and Allatoona reservoirs are lower than those for Bull Shoals. Houser and Heard (1957) estimated that 592,671 fishing trips averaging 6.2 hours in duration were made on Fort Gibson Reservoir, Oklahoma, during the period September, 1955, through August, 1956 (about the fourth year after impoundment). Thus, fishing pressure apparently was substantially higher than in Bull Shoals Reservoir. However, the rate of catch (0.75 fish per hour) and the harvest (74.6 pounds per acre) were quite similar to corresponding values for the White River Arm.

One of the more interesting features of this study was the high harvest of largemouth bass and spotted bass in the Little North Fork Arm. The former species alone comprised 33.3 percent of the total number and half the total weight of fish taken, and the latter made up 4.4 percent of the total number and 9.2 percent of the total weight. Kathrein (1953) reported that largemouth bass made up from 7.5 to 25.5 percent of the creel numerically at Clearwater Lake, Missouri, during its first four years of impoundment. Barkley (1960) stated that in Enid Reservoir, Mississippi, which was impounded in the same year as Bull Shoals Reservoir, the combined catches of largemouth and spotted bass amounted to 12.9 percent of the creel numerically in 1958-59 and 5.7 percent in 1959-60. He also showed that in Grenada Reservoir, Mississippi, which was impounded in 1954, the combined catches of largemouth and spotted bass amounted to 10.6 percent of the creel numerically in 1958-59 and 20.0 percent in 1959-60. Chance (1858) showed that largemouth bass and spotted bass made up from 4 to 50 percent of the fish creeled in Norris Reservoir from 1938 to 1954, with the bass catch being much higher in the first four years than it was thereafter. Other authors have reported bass harvests of widely varying magnitudes, but either the lakes were so unlike Bull Shoals Reservoir or the census periods were confined to months of greatest fishing success so that the results are difficult to compare.

Although the White River Arm produced roughly twice as many pounds of fish per acre as the Little North Fork Arm, the catch of black bass in the former area was less than half as great as in the latter. In 1957 the total harvest of largemouth bass in the Little North Fork Arm more than doubled over that of 1956 and it increased again by nearly two-thirds in 1958. During this same time the weight of bass harvested per hour of angling increased each year, indicating that fishing had not been heavy enough to affect the bass population adversely. It was unfortunate that the creel census could not have been

extended for another year on the Little North Fork Arm to evaluate reports by dock owners and anglers that bass fishing declined markedly in 1959. However, there is good reason to believe that increasing populations of white bass and crappie offered strong competition as they did on the White River Arm, with much the same result.

Creel limits were varied rather widely by regulation changes during the study period, with the general trend being toward liberalization. However, no effect could be discerned on the harvest as a result of the regulation changes. A far greater effect on harvest was brought about by the drought of 1954, when greatly reduced lake levels caused the pressure per acre to go up markedly, and by the influence of Table Rock Reservoir when bass fishing there became good and caused a 50 percent reduction in pressure on Bull Shoals.

ACKNOWLEDGMENTS

The author wishes to thank P. G. Barnickol for assistance in planning this study; Joseph W. Kathrein, Mercer H. Patriarche, Willis D. Hanson, Hugh F. Clifford, and James P. Fry for analyzing creel census data; Onis V. Robbins and Clarence W. Pumphrey for collecting creel census data; John L. Funk and other members of the staff for aid in preparing this report.

LITERATURE CITED

- Barkley, Harry, 1960. Two years of creel census on three north Mississippi flood control reservoirs. Proc. 14th Ann. Conf. S. E. Assoc. Game and Fish Comm., pp. 148-173.
- Bennett, George W. 1954. Largemouth bass in Ridge Lake, Coles County, Illinois. Ill. Nat. Hist. Surv. Bull. 26 (2)217-276.
- Chance, Charles J. 1958. History of fish and fishing in Norris, a TVA tributary reservoir. Proc. 12th Ann. Conf. S. E. Assoc. Game and Fish Comm., pp. 116-127.
- Harlan, James R., and Everett B. Speaker. 1956. Iowa fish and fishing. State of Iowa, pp. 1-377.
- Houser, Alfred, and William R. Heard. 1957. A one-year creel census on Fort Gibson Reservoir. Proc. Okla. Acad. Sci., Vol. 38:137-146.
- Kathrein, Joseph W. 1953. An intensive creel census on Clearwater Lake, Missouri, during its first four years of impoundment, 1949-1952. Trans. N. Am. Wildl. Conf 18:282-295
- Patriarche, Mercer H., and Robert S. Campbell. 1957. The development of the fish population in a new flood-control reservoir in Missouri, 1948-1954. Trans. Am. Fish. Soc., Vol. 87 (1957), pp. 240-258.
- Wood, Roy, Richard H. Macomber, and Robert K. Franz. 1956. Trends in fishing pressure and catch, Allatoona Reservoir, Georgia, 1950-53. Jour. Tenn. Acad. Sci., Vol. 31, pp. 215-223.

DYNAMICS OF THE LARGEMOUTH BASS POPULATION IN BULL SHOALS RESERVOIR, MISSOURI

By WILLIS D. HANSON

ABSTRACT

Black bass fishing in the White River Arm of Bull Shoals Reservoir, Missouri, was regarded as sensational for several years following its impoundment in 1952. In 1958, just after a tagging program was added to test netting and creel census programs, an unpredicted decline in black bass fishing began.

Only largemouth bass nine inches or longer were tagged so population estimates include only that portion of the population. In 1958, black bass numbers reached an all-time high, but late that year the population began a decline which continued throughout the study. The average length of bass captured by electro-fishing increased each succeeding year, indicating a population of larger bass fewer in number.