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SPOTTED GAR PREDATION ON BLUEGILL AND SELECTED FORAGE SPECIES[1]

By Tom M. Scott, Jr.[2]

ABSTRACT

Fingerling spotted gar, *Lepisosteus oculatus* (Winchell), stocked at rates of 100 and 148 per acre into four Alabama ponds containing bluegills, *Lepomis macrochirus*, and fathead minnows, *Pimephales promelas*, failed to control crowding of bluegill within a 22-month experiment.

Plastic-lined pools stocked with adult gar and equal numbers of bluegills, golden shiners, *Notemigonus crysoleucas*, largemouth bass, *Micropterus salmoides*, and white catfish, *Ictalurus catus*, showed the least reduction in numbers of bluegill, followed by golden shiners, white catfish, and largemouth bass. An emaciated condition that developed in the largemouth bass may have contributed to their vulnerability.

INTRODUCTION

Gar, *Lepisosteus spp.*, may be a liability through competition with or predation on more desirable species, or an asset by reducing the numbers of overabundant forage species (Lagler, et al. 1943; Hunt, 1952; and Holloway, 1954).

This report is an evaluation of spotted gar as a predator on bluegill, in four Alabama ponds and their relative preference for selected species in plastic-lined pools.

[1] This research was conducted at the Fisheries Division of Auburn University Agricultural Experiment Station and supported in part by Alabama Department of Conservation D-J Project F-10-R.

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SPOTTED GAR-BLUEGILL COMBINATIONS

On May 9 and 10, 1965, fingerling spotted gar, 1.2 to 3.4 inches in length, were obtained by seining through shallow flooded vegetation of a brood pond previously stocked with adult gar and fathead minnows. Examination of the stomachs of eight young gar, 1.5 to 2.9 inches in length showed that all except one had eaten fathead minnow fry.

The fingerling gar were stocked on May 9 and 10, 1965, at the rate of 100 per acre into a one-acre pond and a 0.1-acre pond. On June 25, 1965, two 0.25-acre ponds were stocked with 148 gar fingerlings per acre. In January, 1965, the one-acre pond was stocked with 1000 fathead minnows and 1000 bluegill, one to two inches in length. The other ponds were stocked on this date with 1000 fathead minnows, and with 1500 bluegill, one to two inches long, per acre. All ponds were fertilized.

Seining checks using 15- and 50-foot seines were begun during 1965 and continued into 1966 to observe growth and reproduction of forage fish present as indicators of gar predation, as was done with bass and bluegills (Swingle 1956). The ponds were drained during October, 1966, and the fish populations recorded. Contamination by other forage fish species in the ponds and by aquatic vegetation in one pond are not thought to have greatly altered the pattern of bluegill reproduction or survival.

Four gar were sacrificed in spring of 1966 and examined for gonadal development. Two were males with poorly developed gonads, and the other two showed no gonadal development. The gar did not spawn.

Bluegill reproduction occurred throughout the summer of 1965 in the expanding populations of all four ponds. However, crowding was evident by June, 1966, and there was no bluegill reproduction in any of the ponds until the latter part of the summer. The crowding took place with bluegill two to three inches in length. At draining, larger numbers of recently hatched bluegill were recovered from the ponds with the larger concentrations of gar.

A summary of the results upon draining October 3-10, 1966, in the four ponds is given in Table 1. The standing crop at the end of 22

TABLE 1 — RESULTS UPON DRAINING PONDS STOCKED WITH BLUEGILL, FATHEADS AND SPOTTED GAR 22 MONTHS (JANUARY, 1965 TO OCTOBER, 1966).

Pond	Total pounds per acre	Spotted gar pounds per acre	Survival of gar, percent	F/C	A_T	A_F
E-866	427.9	101.3	78.0	3.2	53.0	40.5
F-766	382.5	114.1	94.6	2.4	22.3	16.8
F-866	286.9	102.5	100.0	1.8	4.7	7.4
T-266	298.0	70.4	100.0	3.2	7.0	9.2

months varied from 298 to 427.9 pounds of fish per acre. The highest production was in the pond (E-866) that had been filled with water about two months prior to stocking in January, 1965. This is the only pond in which the values for A_T (53) and A_F (40.5) were in the balanced range; however, even this population did not achieve balance as the gar did not spawn. In all populations the two- to three-inch bluegills had accumulated in proportionally greater numbers than would be expected had the predator been the largemouth bass. The weight of spotted gar per acre was quite high, varying from 70.4 to 114.1 pounds. Maximum size of spotted gar approximately six months of age was 18.7 inches. Average sizes of gar in the four ponds at approximately 18 months of age varied from 0.70 to 1.29 pounds, and were within the 15.7- to 23.6-inch range. Survival of fingerling gar varied from 78 to 100 percent and averaged 93.1 percent.

VULNERABILITY OF SELECTED SPECIES TO PREDATION BY SPOTTED GAR

Ten each of bluegill, golden shiner, largemouth bass, and white catfish were placed in each of 21 circular plastic-lined pools 10 feet in diameter and 2.5 feet deep. The bluegill were 2.0 to 3.0 inches in length and the other fish ranged from 2.5 to 3.5 inches in length. Two days later one spotted gar within the length range of 21 to 27 inches was added to each of 14 plastic-lined pools previously stocked with the smaller fish. Seven pools were maintained as controls. After a 28-day exposure period, the pools were drained. The results (Table 2) indicate

TABLE 2 — RELATIVE VULNERABILITY OF FOUR SPECIES OF FISHES TO PREDATION BY SPOTTED GAR OVER A 28-DAY EXPOSURE PERIOD.

Prey Species	Average percent remaning per pool		Estimated percent loss to predation[5]
	Control[3]	With spotted gar[4]	
Bluegill	97.1	70.0	27.9
Golden shiners	92.9	43.3	53.4
White catfish	98.6	7.5	92.5
Largemouth bass	60.0	2.5	95.8

[3] Average of 7 pools
[4] Average of 14 pools
[5] $\frac{\text{Number lost in test}}{\text{Number surviving in controls}} \times 100$

that the order of decreasing preference of gar for these species was: largemouth bass, white catfish, golden shiners, and bluegills. An emaciated condition developed in the largemouth bass. The weakened condition of these fish, probably a result of starvation, apparently rendered them more vulnerable to predation by gar.

DISCUSSION

Predation by largemouth bass stocked at 100 per acre in earthen ponds with bluegill combinations as previously described usually has prevented crowding of bluegill the second year when survival of largemouth bass does not fall below 70 percent. In two ponds survival of spotted gar was 100 percent; and 94.6 and 78.0 percent in the others. The weight of gar produced per acre averaged 97 pounds, which is approximately 30 to 40 percent higher than the average production of largemouth bass under similar conditions. This would suggest that the spotted gar probably was more efficient in food conversion than largemouth bass.

In no population did balance result. However, the spotted gar might be used as a supplemental predator in largemouth bass-bluegill combinations. It is anticipated that the averaged-sized spotted gar would feed on the smaller intermediate-sized bluegill in such populations. If sportsmen refuse to or are unable to harvest them, this might be of advantage.

In the vulnerability study, the order in which the species were reduced was generally reversed from that which might be desired. The extent to which prey preference, species ecology in the artificial habitat, and the weakened condition of the largemouth bass affected the results is unknown. The vulnerability of bluegill and largemouth bass to spotted gar in this study differed greatly from the vulnerability of these same species to longnose gar (Netsch, In press).[6]

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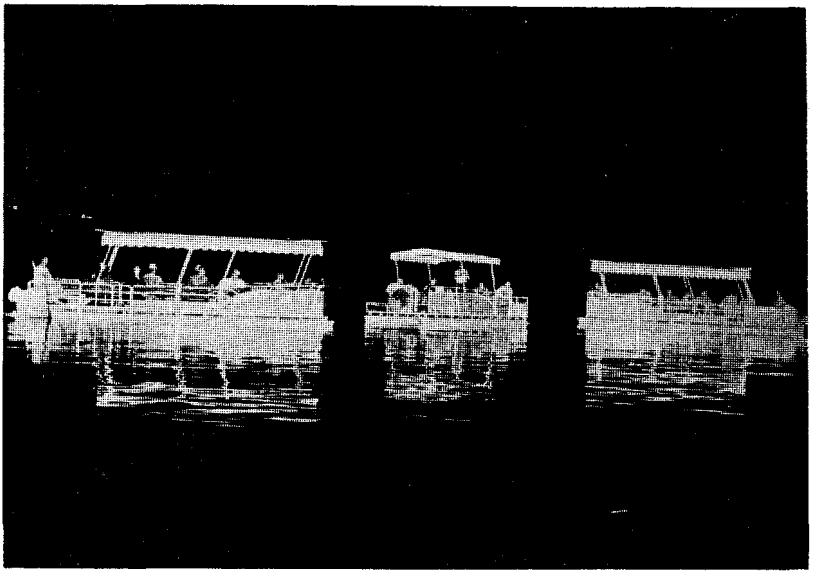

A SURVEY OF BULL SHOALS LAKE, ARKANSAS, FOR THE POSSIBILITY* OF AN EXISTING TWO-STORY LAKE SITUATION

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ABSTRACT

The position of Bull Shoals Lake as the lower lake in a chain of four large reservoirs located on the main stem of the White River in Arkansas and Missouri is described. During the three years of 1961, 1962, and 1963, physical-chemical determinations were made at three sampling stations situated along the channel of the lake.

Trout requirements with respect to temperature and dissolved oxygen as reported by other authors in the Southeastern United States are reviewed. Data collected showed that trout could survive year 'round

*A paper prepared for presentation at the Twenty-First Annual Conference, Southeastern Association of Game and Fish Commissioners, New Orleans.