

# VARIATION IN GROWTH OF BLUEGILL ATTRIBUTED TO DIFFERENTIAL STOCKING RATES OF ADULT FISH IN LARGEMOUTH BASS-BUEGILL COMBINATIONS

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## ABSTRACT

The growth of bluegill is compared from four Alabama farm ponds where two ponds were stocked with adult bass and bluegill and two were stocked with adult bass and fingerling bluegill. Results from fishing records show that the stocking rate of adult bass plus fingerling bluegill produces larger than average bluegill the first year after stocking.

## INTRODUCTION

Swingle and Smith (1940) and Swingle (1951) reported results of stocking adult fish to obtain desirable largemouth bass (*Micropterus salmoides*, Lacepede) and bluegill (*Lepomis macrochirus*, Rafinesque) fishings in farm ponds. Stocking a small number of adult bluegill with bass fingerlings was of interest because hatchery production of bluegill would not be necessary if such an approach were used. However, this procedure usually resulted in overcrowded bluegill populations.

Later stocking experiments using adult fish showed that stocking adult bass with either adult or fingerling bluegill produces crowded bass populations which can result in larger than average size bluegill (greater than 0.25). This paper summarizes previously unpublished results from these experiments (The Fisheries Research Annual Reports of the Alabama Agricultural Experiment Station, Auburn University).

## MATERIALS AND METHODS

**Bass:** bluegill combinations using adult bass with either adult or fingerling bluegill were stocked in various Auburn University Agricultural Experiment Station ponds which ranged in size from 2.5 to 9.7 acres. Growth and reproductive success of the stocked fish were monitored with a 6 x 50 ft. bag seine (1/4 inch-bar mesh) and a 3 x 15 ft. minnow seine (1/8 inch-bar mesh). The number and weight for each species was recorded from sport fishing. After a period of time, three of the four ponds used were drained, and all fish counted and weighed. *Adult Bluegill and Bass* (Series A): In November of 1955, a 2.5-acre fertilized pond was stocked with a total of 10 adult bluegill ranging in total length from 7 to 9 inches plus 2,500 fathead minnows (*Pimephales promelas*). The following February, 8 adult bass ranging in lengths from 8 to 9 inches were stocked.

In February of 1956, a 5.2-acre fertilized pond (Series B) was stocked with a total of 8 adult bass (8 to 9 inches), 10 adult bluegill (8 to 9 inches), plus 5 adult redear sunfish (*Lepomis microlophus*) ranging in length from 5 to 8 inches. *Adult Bass with Fingerling Bluegill* (Series C): In October 1962 a 9.75-acre fertilized pond was stocked with 1,000 bluegill fingerling per acre. In November, 20 bass (8 to 9 inches) and 9,750 fathead minnows were added.

In 1968 the same 9.75 acre pond (Series D) was stocked at the same rates with bass and bluegill as Series C. In addition, 4,875 redear fingerlings and an ad-

ditional 9,750 fathead minnows were stocked. Also an undetermined number of channel and white catfish escaped from cage culture experiments in the pond and were observed in the catch records.

## RESULTS

### *Adult Bluegill and Bass*

(Series A): During the first summer, bass and bluegill spawned heavily. By October early spawned bluegill had reached 6 inches in total length, but the bass reproduction appeared somewhat stunted; there was a scarcity of forage of the size that the majority of bass could eat.

During June of 1957 public fishing was allowed. The average weight of the bluegill in the creel was 0.17 lbs and only 0.09 lb. for bass (Table 1, A). The crowded bass condition was reduced somewhat by the harvest of 717 bass. Seining in 1957 indicated that a few bluegill had reached 8 inches and had spawned successfully. There was no indication however, that bass had spawned successfully. In September of that year, 433 Israeli carp *Cyprinus carpio* were stocked in an attempt to eliminate dense stands of *Juncus* and *Potamogeton*. The pond became muddy and the plants disappeared.

Public fishing was allowed again in 1958. The average weight caught for bluegill was 0.16 lb. and 0.15 lb. for bass. Seining in 1958 showed many 4- to 5-inch bluegill present and that they had spawned. A light hatch of bass was reported.

In January of 1959, the pond was drained and a total of 370.5 lb. of fish per acre was recovered. The largest bluegill were in the 8-inch group. The weight ratio between forage species small enough to be eaten by the bass and the bass themselves (Y/C ratio) was only 0.2. The percentage of harvestable forage ( $A\bar{P}$ ) in the population was 88 per cent. Both values are indicative of an overcrowded bass population (Swingle, 1950).

(Series B): June seining records indicated that bass and bluegill had spawned successfully. However there was no evidence that redear had spawned. By October, 5-inch bluegill were present.

Public fishing was permitted in June of 1957. Average weights were 0.19 lb. for bluegill and 0.52 lb. for bass (Table 1, B). The few redear caught averaged 1.45 lb., and were obviously from the original stocking.

In 1958, 500 brood tilapia (*Tilapia mossambica*) were added to the pond. Fishing during this year produced an average weight of 0.23 lb. for bluegill and 0.44 for bass. Also in March of 1959, 597 channel catfish (*Ictalurus punctatus*) were added (8-11 inches); fishing during that year produced an average weight of 0.26 lb. for bluegill and 0.71 lb. for bass.

When the pond was drained in January of 1960, the largest bluegill inch-group obtained was 9 inches. A total of 461.5 lb. of fish per acre was recovered. The population values observed, Y/C (bass only) = 0.46 and  $A\bar{P}$  = 89 indicated a pond crowded with carnivorous fish.

### *Adult Bass with Fingerling Bluegill*

(Series C): In May of 1963, 9,750 tilapia (*Tilapia nilotica*) were stocked when a serious problem with Pithophora developed; the tilapia effectively controlled the algae, but the tilapia all died in December due to low temperatures. Seining records from May through October (Table 2) show that the stocked bluegill had reached the 6-inch group by June but grew slowly after July; this was thought to be due to competition with tilapia and small bass during the period July to mid-December. It should be noted that predation by young bass almost entirely prevented survival of young-of-the-year bluegill.

In July of 1964, seine sampling produced bluegill in the 8-inch group. Fishing records collected during the period from February to November show an average weight for bluegill of 0.31 lb. (Table 1, C).

During June of 1965, 75 grass carp (*Ctenopharyngodon idella*) were stocked. Also, by June of 1965, 9-inch bluegill were present in the seine samples and fisherman's creel. Fishing during that year yielded bluegills that averaged 0.46 lb. In 1966 and 1967 bluegills averaged 0.61 and 0.63 pounds respectively in the fisherman's catch.

In 1967 the pond was drained. A total of 419.3 lb. of fish per acre was recovered. The largest inch-group for bluegill was 12 inches. The population values,  $A_T = 76.3$  and  $Y/C = 1.06$  indicated a pond tending toward overcrowded "C" species.

(Series D): Seining showed that the stocked bluegill and redear reached the 4-inch group the following May, and the 5-inch group by June. By August, both the bluegill and redear were in the 6-inch group. Also, bass, bluegill and redear reproduction was evident.

Seining in 1969 showed that bluegill and redear had reached the 8-inch group. Bass, however, remained overcrowded and in poor condition. Fishing for that year gave average weights of 0.30 lb. for bluegill and 0.27 lb. for redear (Table 1, D).

Seining in 1970 again showed bluegill and redear in the 8-inch group. However, fishing yielded average weights of 0.35 lb. for bluegill and 0.29 lb. for redear. Bass continued in an overcrowded condition; average weight for those caught was 0.70 lb.

During 1971 and 1972, bass remained crowded. Average weights from fish during these 2 years were 0.24 and 0.39 lb. for bluegill; redear averaged 0.38 and 0.45 lb.; bass averaged 0.82 and 0.93 respectively. This pond has not been drained.

## DISCUSSION

Although the results from the two stocking rates, adult bass-bluegill and adult bass-fingerling bluegill, are confounded to some extent by other species being introduced, several basic principles are evident. These are: 1) that larger than average bluegill can be produced in ponds crowded with bass; 2) that this will occur more readily when fingerling bluegill at a rate of 1,000 per acre are stocked than when a few adult bluegill are used; 3) that this situation results when an overcrowded bass population through predation almost entirely prevents survival of young-of-the-year bluegill; and 4) that bass can more easily control bluegill reproduction from a relatively large spawning population than from a small one.

These experimental results may be compared to those from ponds stocked at a rate of 100 bass fingerlings with 1,000 bluegill fingerlings per acre. In this case the average weight for bluegill taken by fishermen during the first year after stocking is considerably less than 0.25 lb. Stocking relatively small numbers of adult bass and bluegill does not produce larger than average bluegill until the third year after stocking. However, the bluegill population did not become stunted as was usually the case when 100 fingerling bass per acre were stocked with adult bluegill (Swingle, 1951). In the latter case the small number of bass fingerlings was incapable of controlling bluegill reproduction resulting from a relatively small number of spawning adults. When adult bass are used, an overcrowded bass population results which in these experiments was able to more effectively control the bluegill reproduction.

When a few adult bass are stocked with fingerling bluegill at a rate of approximately 1,000 per acre, larger than average bluegill are produced the first

Table 1. Average Weight in Pounds From Fishing.

Stocking method	Year after stocking											
	1st			2nd			3rd			4th		
	Bluegill	Readear	Bass	Bluegill	Redear	Bass	Bluegill	Redear	Bass	Bluegill	Redear	Bass
A. Adult bass plus adult bluegill, 2.5 acre fertilized farm pond, 1955 stocking	0.17	0.20	0.09	0.16	0.09	0.15	-	-	-	-	-	-
B. Adult bass, adult bluegill, plus adult redear 5.2 acre fertilized farm pond, 1957 stocking	0.19	1.45	0.52	0.23	-	0.44	0.26	-	0.71	-	-	-
C. Adult bass plus fingerling bluegill, 9.75 acre fertilized farm pond, 1962 stocking	0.31	-	0.27	0.46	-	0.50	0.61	-	0.63	0.63	-	0.90
D. Adult bass, fingerling bluegill, plus fingerling redear, 9.75 acre fertilized farm pond, 1968 stocking	0.30	0.27	1.44	0.35	0.29	0.70	0.24	0.38	0.82	0.39	0.45	0.93

Table 2. Average number of bluegill caught per 50 foot seine haul in a 9.75 acre fertilized farm pond from stocking adult bass-fingerling bluegill in the fall of 1962 (Series C).

Month	Inch groups (total length)						
	2"	3"	4"	5"	6"	7"	
May	-	5.0	4.5	3.0	-	-	
June	-	3.0	18.5	65.0	20.5	-	
July	-	-	1.5	8.0	12.5	0.5	
August	-	0.6	-	3.3	10.0	0.3	
September	-	-	4.0	3.3	3.0	-	
October	-	-	0.3	1.5	4.0	1.0	

year after stocking. In this respect, the crowded bass population produced by stocking adult bass would seem to be more effective than stocking a large number of fingerlings. Fingerlings from brood ponds often are very similar in size and as a result can only prey on a rather narrow range in size of prey species. Adult stocking, however, can produce in a pond a population of fingerlings with a greater range in size distribution (H.S. Swingle, Personal communication).

Stocking fingerlings bluegill at rates greater than 1,000 per acre results in a reduced rate of bluegill reproduction both with and without bass being present (H.S. Swingle, personal communication). In this case, predation pressures coupled with a reduced rate of bluegill reproduction apparently is responsible for the large size of bluegills in this experiment.

Ponds stocked with adult bass-fingerling bluegill have continued to produce excellent bluegill fishing for a number of years. However, such systems cannot be as productive as balanced bass-bluegill ponds because of the large proportion of bass to bluegill present, and some restraints on fishing are necessary. Additional studies are necessary to determine optimum rates of harvest.

#### LITERATURE CITED

- Swingle, H. S. 1950. Relationships and dynamics of balanced and unbalanced fish populations. Ala. Poly. Inst. Agr. Exp. Sta. Bull. 274:73 pp.
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- Swingle, H. S. and E. V. Smith. 1940. Experiments on the stocking of fish ponds. Fifth North Amer. Wildlife Conf. Trans. 267-276.

### **SUMMARY REPORT SOUTHERN DIVISION OF AMERICAN FISHERIES SOCIETY TWENTY-SECOND ANNUAL MEETING**

The Southern Division of the American Fisheries Society held its annual meeting in conjunction with the 27th Annual Conference of the Southeastern Association of Game and Fish Commissioners in Hot Springs, Arkansas on October 14-17, 1973. Sixty-six members in good standing were present for the business meeting. There was a total of 115 paid registrants.

President Clugston introduced to the membership Dr. Richard Wade, Executive Director of the American Fishery Society. Dr. Wade reported on financial matters, membership, Journal publications and other activities and highlights for the past 12 months. Five new chapters and three new sections (Fish Health, Fish Culture and Fisheries Administrators) were cited.

Reports were presented covering all committee activities. One resolution, endorsing the "Proposal for a National Reservoir Fisheries Management Act" as presented by the Reservoir Committee, was presented to and approved by the membership.