Supplemental Winter Feeding of Hybrid Sunfish in Mississippi[1]

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Abstract: The effects of supplemental feeding on the winter growth of male bluegill (*Lepomis machrochirus*) x female green sunfish (*L. cyanellus*) F_1 hybrids were investigated in northeast Mississippi. Four 0.04 ha ponds were each stocked at the rate of 2471 fish per ha. Fish in 2 ponds were fed daily while the other fish subsisted only on natural food. After 90 days at water temperatures below 15 C, fed fish were significantly ($P < 0.05$) heavier. but not longer than non-fed fish. Coefficients of Condition (K) for fed fish showed a significant ($P < 0.05$) increase through the winter and were significantly higher than K for non-fed fish, which showed no significant change in K through the winter.

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The use of hybrid sunfishes has been suggested as an attractive means of controlling fish population densities in small bodies of water (Lewis and Heidinger 1978), thereby favorably influencing fish growth. One of the most promising of these hybrids is the male bluegill × female green sunfish (hereafter denoted as BG × GS). In addition to its many other desirable attributes, this hybrid is especially well suited to artificial feeding, and feed conversions during warm months range from 1.1 to 1.5 (Lewis and Heidinger 1971). Heidinger (1975) reported a 32% weight gain for caged BG × GS hybrids fed artificial feed during the winter months in Illinois, and a 30% weight gain for this hybrid subsisting on natural food during the same period in ponds. Heidinger (1975) did not, however, report feed conversions for the fed fish.

The objective of this study was to compare winter growth of fed and non-fed BG × GS F_1 hybrids in ponds in Mississippi.

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Methods

Four 0.04 ha ponds were each stocked with young of the year BG × GS hybrids at the rate of 2471 per ha. Fish were individually weighed and standard length was measured at stocking (7 December 1980) and again at harvest (7 March 1981). These measurements were used to calculate initial and final Coefficients of Condition (K) as described by Hile (1936). Fish in 2 of the 4 ponds were fed once daily, except when ponds were iced over, using a 35% protein commercial catfish fingerling feed, while fish in the remaining 2 ponds were not fed. Fish were fed approximately 3% of body weight per day, with feeding rates adjusted biweekly using an assumed feed conversion of 3:1. The fish were fed 79 of the 90 days. Afternoon surface water temperatures averaged 5.7 C and ranged from 0 C (frozen over) to 14 C.

Benthic samples were taken from each pond on the date of stocking. An Ekman dredge was used to take 5 random samples from each pond. The 5 samples from each pond were then combined to form 1 composite sample per pond. These samples were examined and organisms were identified and counted.

Student's t-test was used to test for differences between mean weight gain, mean increase in length, mean K ketween fed and non-fed fish, and mean number of benthic organisms between treatment ponds.

Results and Discussion

Analysis revealed no significant difference ($P > 0.05$) between mean length increases of fed and non-fed fish (Table 1). There was, however, a significant difference ($P < 0.05$) between mean weight gains for fed and non-fed fish. Fish receiving feed outgained fish on natural food by nearly 45%. Consequently, fed fish, though the same mean length as non-fed fish, were heavier and therefore plumper than the non-fed fish. This is readily evidenced by comparison of K for fish in the 2 treatment groups. Fed fish had a mean K of 2.35, which was significantly higher ($P < 0.05$) than the mean K of 1.87 for non-fed fish. In addition, non-fed fish showed no significant ($P > 0.05$) change in K during the winter, whereas fed fish had a significant ($P < 0.05$) increase in K during the same period.

Since analysis of benthic samples from the 4 ponds revealed no significant differences ($P > 0.05$) in the mean numbers of potential food organisms between the 2 treatments (Table 2), the increased weight gain of fed fish can be attributed to the supplemental feeding.

The mean feed conversion for fed fish was 1.57, which is similar to values reported by Lewis and Heidinger (1971) for spring and summer feeding

Table 1. Initial and Final Mean Lengths, Weights, and Coefficients of Condition (K) for BG X GS F_1 Hybrid Sunfish Wintering on Natural Food or Natural Food With Supplemental Feeding

Pond	Initial Weight (g)	Final Weight (g)	Change in Weight (%)	Initial Length (mm)	Final Length (mm)	Change in Length (%)	Initial K	Final K
				Non-Fed Fish				
2	12.3	34.0	177	86.0	123.6	44.0	1.90	1.80
4	11.9	34.3	189	83.7	121.2	45.0	2.00	1.90
(Treatment Mean)	12.1a	34.2a	183a	84.9a	122.4a	44.5a	1.95a,c	1.85a,c
				Fed Fish				
7	12.4	44.7	262	85.6	123.5	44.0	2.00	2.40
3	12.1	43.5	259	86.5	123.2	43.0	1.90	2.30
(Treatment Mean)	12.3a	44.1b	261b	86.1a	123.4a	43.5a	1.95a,c	2.35b,d

a, b — Treatment means within any column not followed by same letter are significantly ($P < 0.05$) different.
c, d — Treatment mean K within any row not followed by same letter are significantly ($P < 0.05$) different.

experiments in Illinois. Winter feed conversions should be higher than summer feed conversions, especially for warmwater fish within a given climatic area. No comparative data are available for feed conversion of BG × GS hybrids in the southeastern United States, but the observed feed conversions are substantially more efficient than winter feed conversions (1.98 to 2.90) of channel catfish (*Ictalurus punctatus*) in Mississippi (Reagan and Robinette 1978).

The growth of non-fed hybrids was perhaps more impressive than the growth of the fed fish. Although weight gain was significantly less for non-fed fish, increase in length between non-fed and fed fish was not different. Non-fed hybrids increased in length approximately 45% and almost tripled their weight ($\bar{x} = 183\%$). In southern Illinois ponds with 1.5 times as many days in a winter study, this same hybrid increased in weight only 31% while stocked at only ⅓ the rate used in this study (Heidinger 1975). Water temperature in this study averaged 5.7 C, which may have been warmer than the water during Heidinger's (1975) study. Density of benthic organisms was high in this study and availability of natural food was probably not a limiting growth factor. This study confirms that BG × GS F_1 hybrids can show substantial weight gains during the winter in northeast Mississippi whether fed or non-fed.

Owners of farm ponds stocked with hybrid sunfish in the southeastern United States should consider the option of a winter feeding program. The BG × GS hybrid will gain significantly more weight when fed during the winter, a factor which should lead to an earlier catchable population of fish and larger fish over several years.

Table 2. Mean Density (No. organisms/m²) of Benthic Organisms in Non-Fed and Fed Hybrid Sunfish Culture Ponds[a]

Taxon	Fed Ponds		Non-Fed Ponds	
	2	4	7	3
Oligochaeta	323	290	301	397
Gomphidae	118	107	172	151
Chironomidae	505	538	613	473
Planorbiidae	677	731	624	709

[a] There was no significant ($P > 0.05$) difference in density of organisms between treatments in either total number of organisms per pond or number of organisms at each taxonomic level.

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