DIFFERENCES IN GROWTH AND CATCHABILITY OF NATURAL BASS POPULATIONS IN FLORIDA[1]

by
JOE E. CRUMPTON AND STEPHEN LEE SMITH
Florida Game and Fresh Water Fish Commission
Eustis, Florida

[1] Contribution from Federal Aid in Restoration Funds under Dingell-Johnson Project F-24, State of Florida. Publication No. 20, Florida Game & Fresh Water Fish Comm., Fisheries Research Laboratory, P. O. Box 1903, Eustis, Fl. 32726.

ABSTRACT

Largemouth bass collected from selected Florida locations and stocked in hatchery ponds were studied for growth and catchability differences. Data indicates that some populations grow faster than others and that females grow faster than males. Experimental fishing data indicates that some populations show trends towards greater catchability, but no one population was shown significantly more catchable.

INTRODUCTION

Increased fishing pressure on largemouth bass, *Micropterus salmoides,* in recent years has spawned a need for development of advanced management techniques. The large size and fighting ability of Florida's largemouth bass has made it a prime target of bass anglers throughout the country. Habitat degradation of many Florida lakes is expressed in limited fishing success even in waters where high density bass populations exist. Numbers of "trophy" bass, the incentive for many bass anglers, are on the decline. This situation may be either environmentally induced or genetic in nature. Regardless of the cause, it is believed that the problem could be alleviated through stocking of largemouth bass which were selectively bred for greater catchability and growth.

Studies by Bennett (1954), Byrd (1959), and Bowers and Martin (1957) indicate that largemouth bass populations vary with regard to hook and line vulnerability. Studies comparing the Florida and the northern subspecies in California waters indicated that the northern subspecies was caught about twice as often as the Florida, thus substantiating previous research (Bottroff, personal communications[1]).

A heavy bodied strain of bass which also grew more rapidly would be tremendously popular with the bass angler. Studies by Clugston (1964) and Pardue and Hester (1966) indicated that largemouth bass have tremendous variation in growth rates. California investigators further substantiate this fact, indicating that the Florida subspecies grows faster and attains greater weights than do northerns, as well as demonstrating a greater longevity (Bottroff, personal communication).

Prior to the initiation of a selective breeding program, in order to locate initial parent stocks, it was necessary to determine if differences in growth and catchability exist between natural bass populations in Florida.

MATERIALS AND METHODS

Largemouth bass were collected from a total of 19 lakes and streams across Florida over a three year period. Fish were collected from as many watershed types as possible to provide greatest genetic variation.

Bass were collected by hook and line and by electrofishing. The most successful electrofishing apparatus, due to the high variance in water conductivity statewide, consisted of copper cables charged by a 3500-watt Homelite alternating current generator attached to a Chenault[2] booster. The apparatus has the capability of producing 0 to 25 amperes and 0 to 500 volts at 180 cycles per second.

All bass were tagged upon capture with numbered spaghetti dart-type tags or metal jaw tags, the most successful being the Floy® FD-68B dart tag. A tag was injected into the musculature immediately below each side of the dorsal fin with the T-shaped base anchored through the dorsal pterygials.

[1] Larry Bottroff, Department of Fish and Game, Room 6042, 1350 Front Street, San Diego, California 92101.

[2] J. P. Chenault, Rt. 6, Richmond, Kentucky 40475.

All fish were subjected to measurements for growth prior to stocking and at termination of each growth segment. Measurements for length were affected on a millimeter measuring board and for weight on a balance beam gram scale. Length and weight gains were expressed in gains per day due to different time periods between stocking and recapture for each population.

Bass stocking ratios varied from 3 to 13 fish from each collected population in each of three hatchery ponds. Fish collected from 1971 to early 1974 were segregated into specific size groups. Fish collected from late 1974 to 1975 were stocked randomly. Prior to bass stocking all ponds were stocked with forage species.

Catchability tests were conducted using various types of spinning and casting equipment. Test fishing consisted of 30 minute or 45 minute fishing periods ("rounds") divided equally among the three ponds. One to three fishermen fished the ponds during any one period, but the number of fishermen was not varied during a period. Each fisherman's time constituted a "round". Effort and bait changed between fishing periods, but were the same for all ponds within a given fishing period. Each "round" was recorded as to number of strikes, number of fish hooked and lost, number hooked and landed, weather, time of day, and bait type.

Lures were categorized according to characteristics exhibited by the lure while being retrieved. Surface lures included types that floated and were retrieved only along the surface. Subsurface lures included floating and sinking lures that were retrieved subsurface. Bottom lures including sinking lures retrieved along the pond bottom. Lures were never changed within a "round".

RESULTS

Growth Study, 1971

Ten largemouth bass collected from each of 13 locations across the state were stocked into a pond at Oviedo Fish Hatchery in the fall of 1971. After allowing the collected populations a few days to adjust to the pond environment, the pond was drawn down. Drawdown revealed excessive tag losses. Only 12 of the original 130 fish could be identified.

Bass were recollected by the end of November 1971. Upon collection the fish from each population were stocked equally among three Oviedo Hatchery ponds.

The experimental fishing portion of the study indicated possible high mortality rates among representative populations. The ponds were drawn down in early April 1972 and only three surviving bass were found. Considering that other ponds at Oviedo had exhibited high mortality rates among adult fish, increased mortality was postulated to be due to low dissolved oxygen. As a result of these difficulties all subsequent experiments were moved to Richloam Fish Hatchery.

Growth Study, 1972

In the fall of 1972, nine largemouth bass were collected from each of 15 locations across Florida (Table 1). In mid-February the ponds were drained and growth gains were recorded (Tables 2 and 3). The period between stocking and recapture varied from 92 to 145 days.

A paired t-test on male and female length and weight gains from combined averages of the three ponds yielded a t-value for length gains significant at $\alpha = 0.001$, and a t-value for weight gains significant at $\alpha = 0.01$. It is evident that females grew faster than males in all size classes but most significantly in the 275mm to 325mm class. A correlation between male and female length gain by collection location yielded a high correlation coefficient ($r = 0.63$) indicating a correlation between growth rates of males and females in all populations. One way analysis of variance tests for length and weight gains between populations was significant at $\alpha = 0.025$.

An examination of mean growth between three stocked hatchery ponds revealed that length gains differed significantly. The best mean increase per day was 0.164mm in the pond stocked with small bass (275 to 325mm). The poorest mean increase per day was 0.85mm in the pond stocked with large bass (325 to 375mm).

Growth Study, 1973

In the fall of 1973, largemouth bass were again collected from 15 locations across the state (Table 1). In late January 1974 ponds were drained and growth gains were recorded (Tables 2 and 3). Periods between stocking and recapture varied from 140 to 186 days.

A paired t-test of male and female length and weight gains from the combined averages of the three ponds was significant at $\alpha = 0.02$ while the t-value for weight was significant at $\alpha = 0.05$. Again females outgrew males in all size classes and was most significant in the 250mm to 350mm class. A high correlation coefficient ($r = 0.95$) supports previous findings indicating a correlation between growth rates of males and females in all populations.

Table 1. Collection sites of largemouth bass for growth and catchability studies.

Body of Water	*County*	*Dates Collected*
N. W. Fla.		
Choctawhatchee River	Washington	1972, 1973
Lake Jackson	Leon	1971, 1972, 1973
Lake Seminole	Jackson	1971, 1972, 1973, 1974
N. Cent. Fla.		
Lake George	Volusia	1971, 1972, 1973
Newnan's Lake	Alachua	1971
Lake Oklawaha	Putnam	1971, 1972, 1973
Lake Weir	Marion	1971, 1972, 1973, 1974
Central Fla.		
Lake Carlton	Orange	1971
Lake Dora	Lake	1973
Lake Griffin	Lake	1971
Lake Harris	Lake	1972, 1973, 1974
Lake Minneola	Lake	1972, 1973
Lake Panasoffkee	Sumter	1971, 1972, 1973, 1974
Lake Yale	Lake	1972
So. Cent. Fla.		
Lake Ivanhoe	Orange	1972, 1973
Lake Poinsette	Orange	1971, 1972, 1973
Lake Tohopekaliga	Osceola	1971, 1972, 1973, 1974
So. Fla.		
Everglades Conservation Area III	Broward	1971, 1972, 1973
Lake Okeechobee	Okeechobee	1971, 1972, 1973

Table 2. Average daily increases in lengths of largemouth bass from selected populations.

Collection	*1972-73*		*1973-74*		*1974-75*	
Location	*Av.* ♂	*Av.* ♀	*Av.* ♂	*Av.* ♀	*Av.* ♂	*Av.* ♀
Choctawhatchee	.150	.255	.085	.191		
Dora			.145	.361		
Everglades	.043	.104	.122	.142		
George		.035	.122			
Harris	.142	.234	.164	.261	.116	.118
Ivanhoe	.052	.154	.256			
Jackson	.188		.111	.157		
Minneola	.073		.215	.312		
Okeechobee	.097	.188	.105	.219		
Oklawaha	.089	.069	.077	.252		
Panasoffkee	.174	.212	.211	.194	.107	.219
Poinsette	.040	.240	.150	.240		
Seminole	.178	.203	.079	.081	.105	.134
Tohopekaliga	.016	.077	.102	.095	.061	.099
Weir	.025	.085	.108	.164	.120	.120
Yale	.070	.217				

Table 3. Average daily increases in weights of largemouth bass from selected populations.

Collection Location	*1972-73* Av. ♂	*1972-73* Av. ♀	*1973-74* Av. ♂	*1973-74* Av. ♀	*1974-75* Av. ♂	*1974-75* Av. ♀
Choctawhatchee	.941	1.703	.284	.698		
Dora			.621	1.260		
Everglades	.605	.615	.749	1.222		
George		.401	.623			
Harris	.838	1.271	.686	1.021	.909	1.048
Ivanhoe	.423	.679	.714			
Jackson	.942		.876	1.562		
Minneola	.154		.559	1.339		
Okeechobee	.744	1.229	.211	.639		
Oklawaha	.482	.766	.558	1.523		
Panasoffkee	1.068	1.334	.566	.251	.754	1.142
Pointsette	.323	1.304	1.131	1.046		
Seminole	1.043	1.678	.488	.212	.812	1.032
Tohopekaliga	.599	.113	.687	.483	1.020	1.335
Weir	.044	.812	.103	.261	1.067	.911
Yale	.521	1.157				

Tests for one way analysis of variance were calculated for average daily increases in total length and weight (by sex, in combination of sexes, and by pond by sex). The F-test for length gains for males and females from the pond containing the large bass was significant. Weight gains for the medium females was the most significant at $\alpha = 0.005$. Data from 1972-73 and 1973-74 indicates that growth between the 15 populations (ponds combined) differs (Table 4).

One way analysis of variance of mean growth between the three stocked hatchery ponds indicates that length gains differed significantly at $\alpha = 0.05$. The best mean increase per day was .8934mm in the pond stocked with small bass (250 to 350mm) and the poorest was .0067mm in the pond stocked with large bass (350 to 450mm).

Table 4. Growth rankings of selected populations of largemouth bass.

Collection Location	*1972-73*	*1973-74*	*1974-75*
Choctawhatchee	Superior	Average	
Dora		Superior	
Everglades	Poor	Average	
George	Poor	Average	
Harris	Superior	Superior	Good
Ivanhoe	Average	Superior	
Jackson	Superior	Average	
Minneola	Poor	Superior	
Okeechobee	Good	Average	
Oklawaha	Poor	Good	
Panasoffkee	Superior	Superior	Superior
Poinsette	Good	Superior	
Seminole	Superior	Poor	Good
Tohopekaliga	Poor	Average	Poor
Weir	Poor	Average	Average
Yale	Good		

Growth Study, 1974

In the fall of 1974 largemouth bass were collected from five selected locations across the state (Table 1). In early February 1975 the ponds were drained and growth gains recorded (Tables 2 and 3). The period between stocking and recapture varied from 95 to 143 days.

Paired t-tests for male and female growth rates revealed length gains significant at $\alpha = 0.3$ and weight gains significant at $\alpha = 0.1$. Females outgrew males in four of the five representative populations, but male growth rates exceeded female rates in both length and weight in the Lake Weir population. The faster growth rates in all populations were exhibited by the smaller size class fish. One way analysis of variance tests were calculated for average daily growth rates (by sex, in combination of sexes, and populations combined by sex), but were in all cases nonsignificant.

One way analysis of variance of mean growth between the three stocked hatchery ponds indicated that length gains did not differ significantly. The best mean increase per day was 1.2500mm and the poorest was 0.0096mm.

Catchability Study

The experimental fishing study was begun in mid-February 1972 at the Oviedo Fish Hatchery. Twenty-one "rounds" of fishing, using 11 different baits, produced only two strikes due to the low survival of the bass stocked.

Experiments to determine catchability of representative bass populations in the Richloam Hatchery ponds were initiated in mid-November 1972. Experimental fishing segments usually coincided with pond growth periods. The final segment was terminated in late January 1975. A total of 163 "rounds" were attempted. Table 5 describes the types of lures used and a comparison of the success between fishing segments. Seventy-seven different lures were utilized during the four experimental fishing segments. Segment one yielded no return catches; segment two, one (Lake Weir); segment three, nine; and segment four, one (Lake Seminole). In segment three a single fish from Lake Okeechobee was landed three times, and a fish from Lake Poinsette was landed twice in one day.

Table 6 indicates the numbers of fish landed during experimental fishing segments one through three which included all populations collected. Those populations yielding the most catches were Lake Okeechobee with 13, Lake Poinsette 8, Lake Weir 8, and Lake Tohopekaliga 7 catches.

Table 5. Results of catchability experiments from Richloam ponds.

Lure Type	*# Rounds Fished*	*# Strikes Not Hooked*	*# Hooked & Lost*	*# Hooked & Caught*	*Catch/ Hours Effort*	*Hits/ Hours Effort*
11/72-1/73						
Surface	12	5	0	7	1.2	2.0
Subsurface	15	13	4	6	.80	3.1
Bottom	5	6	4	3	1.2	5.2
10/73-1-74						
Surface	11	12	5	7	1.3	4.4
Subsurface	13	3	4	3	0.5	1.6
Bottom	24	26	16	14	1.2	4.6
6/74-7/74						
Surface	19	22	2	10	1.1	3.4
Subsurface	25	35	8	27	2.2	5.6
Bottom	18	31	6	12	1.3	5.5
11/74-1/75						
Surface	4	1	2	3	1.5	3.0
Subsurface	7	2	2	20	5.7	6.9
Bottom	10	12	0	14	2.8	5.2
Combined Totals	163	168	53	126	1.7	4.2

Table 6. Number of catches by population from experimental hatchery ponds.

Collection Location	Fishing Segments 11/72-1/73	10/73-1/74	6/74-7/74	11/74-1/75
Choctawhatchee	1	0	4	
Dora		3	0	
Everglades	1	2	3	
George	0	0	1	
Harris	1	1	2	5
Ivanhoe	1	1	3	
Jackson	1	1	3	
Monneola	0	2	1	
Okeechobee	3	1	9	
Oklawaha	0	0	1	
Panasoffkee	0	2	1	10
Poinsette	1	2	5	
Seminole	0	4	0	9
Tohopekaliga	3	1	3	5
Weir	1	2	5	7
Yale	0			
Totals	13	22	41	36

DISCUSSION

The failure of the results from the 1971-72 growth study can be attributed to several causes. To prevent possible bias due to feeding dominance, all bass were stocked into one pond, resulting in a densely populated situation. Bright, day-glow orange tags were used to mark the fish and the bass were visually observed taking tags from one another's backs. This phenomenon and natural tag loss attributed to the great number of unidentifiable individuals at drawdown. High mortality rates at the second stocking were attributed to low dissolved oxygen in the water.

Data from 1972 through early 1974 growth studies indicated that some populations grew faster than others. Growth of females was proven to be faster than males in all size classes but was most evident in the smaller fish. Growth data also indicated that the differences between length gains for the study ponds did not appear to be related to the difference in population densities of the ponds at study termination. However, data indicate that length gains may have been affected by decreased growth potential with increased size of bass, or possibly resulted from a coincidental difference in food availability in the three ponds.

Due to low survival rates among several of the representative populations from the Richloam ponds, it was suspected that the statistical tests for growth might be somewhat clouded. For this reason in 1974-75 only five representative populations were studied. This increased the numbers of individuals stocked and insured greater survival, thus allowing better statistical interpretation of the data. Five populations studied were selected: Lakes Harris and Panasoffkee because of superior growth rates, Lakes Tohopekaliga and Weir due to slower rates and Lake Seminole because meristics tests indicated this to be the only population with influence from the northern subspecies.

Data from the 1974-75 growth study indicated that some populations grew faster than others, although not significantly. However, using parameters as in previous studies, four of the five representative populations showed average or above average growth (Table 4). The greatest mean increase per day was exhibited by fish from Lake Panasoffkee, a lake selected for superior growth rates and the poorest mean increase per day from Lake Tohopekaliga, a lake selected for slow growth rates.

Results of the first three segments of the experimental fishing showed trends toward greater catchability of some populations. Lake Okeechobee (13 catches) was the most catchable of the representative populations. In a comparison of the five populations used in the final growth study, none were shown to exhibit exceptional catchability. Data did not indicate that populations having higher survival rates experienced higher numbers of catches.

Data from hatchery growth studies indicated that two of the selected lakes and streams tested exhibited consistently superior growth rates. Overall results of the experimental fishing indicated possible trends towards more catchable populations, but no one population could be termed most catchable. Although the data do not establish a certain population as being the fastest growing or most catchable, it has been shown that large variations in these characteristics do exist. Those populations exhibiting trends towards faster growth and greater catchability can provide desirable parent stocks for the selective development of these characteristics.

LITERATURE CITED

Bennett, G. W. 1954. Largemouth bass in Ridge Lake, Coles County, Illinois. Ill. Nat. Hist. Surv. Bull. 26(2):217-276.

Bowers, C. C. and M. Martin. 1957. Results of an opening week creel census and tagging study on three state owned lakes. Ann. Conf. S. E. Assoc. Game & Fish Comm. Proc. 10:244-254.

Byrd, J. B. 1959. Angling success and seasonal distribution of catch in Alabama's state-owned public lakes. North Am. Wildl. Conf. Proc. 24:225-237.

Clugston, J. P. 1964. Lrowth of the Florida largemouth bass, *Micropterus salmoides floridanus* (LeSuerr), and the northern largemouth bass, *M. s. salmoides* (Lacepede), in subtropical Florida. Trans. Am. Fish. Soc. 93(2):146-154.

Pardue, C. B. and F. E. Hester. 1966. Variation in growth rate of knownage largemouth bass (*Micropterus salmoides* Lacepede) under experimental conditions. Proc. S. E. Assoc. Game & Fish Comm. 20:300-310.

MONTHLY FOOD HABITS OF VARIOUS SIZE GROUPS OF BLACK CRAPPIE IN LAKE OKEECHOBEE

by

LOTHIAN A. AGER

Fisheries Division

Florida Game and Fresh Water Fish Commission

Lake Okeechobee Biological Station

Okeechobee, Florida 33472

ABSTRACT

Concurrent with other life history investigations of black crappie, *Pomoxis nigromaculatus* (LeSeuer), in Lake Okeechobee, monthly examinations of stomach contents were made. Three food items — amphipods, oppossum shrimp, and fish — comprised the bulk of the diet. A change in diet occurred in early winter when the occurrence and number of tendipeds dropped to a very low level, and again in late srping to early summer when tendipeds began to comprise a substantial portion of the diet. Data collected indicate tendipeds were primarily ingested as the pupae move toward the water surface and leave their cases rather than being picked from the bottom mud. Small black crappie (from 60 to about 240 millimeters) primarily utilized crustaceans and insects as food items. Increasingly larger fish more frequently utilized fish as food.

INTRODUCTION

Lake Okeechobee, a 730 square mile freshwater lake in peninsula Florida, supports a nationally famous winter black crappie fishery. The lake basin contains about 80,000 acres of freshwater marsh comprised of over 150 species of plants. The remainder of the basin is limnetic providing over 350,000 acres of habit for the pelagic black crappie. Bottom substrates are principally muck, sand, marl, and rock.

Concurrent with other life history investigations of the black crappie, *Pomoxis nigromaculatus* (LeSeuer), examinations of stomach contents of black crappie were made. There are no previously published food habit studies of this species for Lake Okeechobee.

This investigation of monthly food habits of black crappie was begun in August, 1971 and concluded in July, 1972. Huish (1957) found threadfin shad to be a major summer food item of black crappie examined from Lake George, Florida. Dendy (1946) observed that adult black crappie fed on aquatic insects during spring and early summer in Norris Reservior, Tennessee, but relied primarily on young fish in late summer and fall. Reid (1950) reported black crappie to have fed on fishes and to a lesser extent, on Malacostraca, dipterous larvae, pupae and adults, and Entomostraca in Orange Lake, Florida.