RESULTS OF SELECTIVE SHAD TREATMENTS IN SIX CENTRAL FLORIDA LAKES

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ABSTRACT

The use of rotenone in an attempt to reduce the number of gizzard and threadfin shad in several Central Florida lakes has been intensified during the past two years.

Descriptions and procedures employed in selective shad treatments of Lake Tarpon, Lake Seminole, Lake Tsala Apopka, Alligator Lake, Lake Julianna and Scott Lake are discussed in detail.

Creel census data was not available, therefore, fish population samples collected over a two year period were compared to determine if a change has occurred in the species composition of the treated water areas.

INTRODUCTION

In 1963 a bill was passed by the legislature adding $1.00 to the resident fishing license for a Fishery Improvement Program which has enabled the Fisheries Division of the Florida Game and Fresh Water Fish Commission to expand Fish Management services throughout the state.

The use of rotenone in an attempt to reduce the large number of gizzard and threadfin shad in several Central Florida lakes has been intensified during the past two years.

Selective shad removal in Florida was initiated with four experiments conducted on a 5.5 acre lake located on an island in Johns Lake, Orange County, Florida (Huish 1957). Seine haul samples were used to determine the changes that occurred in the species composition following rotenone treatments.

DESCRIPTION OF WATER AREAS

LAKE TARPON

Lake Tarpon, formerly called Lake Butler, is located approximately two miles southeast of Tarpon Springs, Florida. The lake is subject to rapid fluctuations caused by an underground connection to the Gulf of Mexico. A perforated limestone wall is located in a 120 foot sink just south of Gibsons Point, on the west shore. This sink apparently connects to the Gulf in or near Spring Bayou at Tarpon Springs. Changes in salinity which occur in the lake are related to the frequent changes in water level.

Surface acreage of Lake Tarpon was determined by means of a planimeter on aerial photographs obtained from the Soil Conservation Service. The surface acreage fluctuates from 2,530 acres to 2,590 acres, depending on the varying lake level.

Water depths obtained with both sounding lines and electronic depth finders vary from 8.1 feet to 8.7 feet (Klant 1961), depending on the flushing action of the underground sink.

The only known point of entry of salt water into Lake Tarpon is the sink located south of Gibsons Point. Chloride samples, taken from the surface along the west shore of the lake, ranged from concentrations of

4,380 p.p.m., or 12.8%, on June 24, 1945, to 185 p.p.m., or .5%, on October 5, 1949.

Aquatic vegetation is sparse throughout the entire water area with the exception of a few water hyacinth that occasionally line the shore of the lake. Hyacinth Control Crews, stationed at the Pinellas County Fish Hatchery located on the southwest shore of the lake, periodically treat these water hyacinth in an effort to control their growth and to prevent their spreading over the water area.

Fishing pressure is heavy at times on Lake Tarpon because it is one of the few large public lakes located in the heavy populated west coast Pinellas County. Winter tourists from nearby St. Petersburg, Tampa, and Clearwater frequently make use of the various fish camps located on the lake.

LAKE SEMINOLE

The second largest public fishing lake in Pinellas County, Lake Seminole, has a surface acreage of 728 acres and an average depth of 5 feet. It is located six miles west of Pinellas Park, Florida, and ten miles south of Clearwater, Florida.

Lake Seminole was formed by damming up a section of Long Bayou which flows into Boca Ciega Bay. Boca Ciega Bay in turn empties into the Gulf of Mexico, west of St. Petersburg, Florida. Located at the north end of the lake is a second dam and a pumping station which is used to prevent flooding of homes in the watershed. Both dams have a history of being washed out due to heavy rains.

Lake Seminole is constricted approximately two miles north of the southern-most dam. This area is commonly referred to by local fishermen as "The narrows". The water north of this area is very shallow and contains a large number of stumps and fallen trees.

Aquatic vegetation consisted primarily of water hyacinth, pickerel weed, cattails, elodea, and eel grass.

Lake Seminole is utilized by several commercial trotline fishermen whose catches consist of brown bullhead and a few channel catfish.

One fish camp is located on the west shore of Lake Seminole. Boats, bait, fishing tackle, and a boat ramp are available at this location. Fishing pressure varies due to the tourist season and weather condition.

LAKE TSALA APOPKA

Lake Tsala Apopka is essentially a flood plain of the Withlacoochee River and is located on the northeast boundary of Citrus County, Florida. The lake is approximately twenty-four miles long and from six to ten miles wide, depending on the location. It is estimated that a total of one hundred ninety-two square miles of water make up the Lake Tsala Apopka Chain.

Lake Tsala Apopka is directly connected to the Withlacoochee River in at least three areas, therefore, water levels are dependent on the fluctuations of the river. Manipulation of water levels and dredging by various landowners in the area have caused prolonged periods of low water. Fishing success, according to local residents, has usually dropped off with the lowering of the water levels as was the case in 1938, 1954, and 1963.

A small area of Lake Tsala Apopka (715 acres with an average depth of 11 feet) near Inverness, Florida, was found to contain a large number of gizzard shad.

Low water has increased the aquatic vegetation problems throughout the entire Lake Tsala Apopka. White water lily, maidencane, and spatterdock were the principal emergent species observed in the area treated for shad. Submerged vegetation included water hyssop, parrot's feather and bladderworst.

LAKE JULIANNA

Lake Julianna, a fairly deep lake, is located in Polk County approximately four miles north of Auburndale. It has an average depth of 14 feet. The surface acreage of Lake Julianna was determined by means of a planimeter on aerial photographs. The surface area of the lake was found to be 932 acres during periods of normal water levels.

The bottom of Lake Julianna consists primarily of sand with a small margin of mud along the shore and for all practical purposes is saucer-shaped in appearance.

Submerged aquatic vegetation is sparse in Lake Julianna due to the heavy algae blooms that are experienced several times each year. Emergent vegetation is composed primarily of maidencane, spatterdock, pickerel weed, and water hyacinth.

Lake Julianna has a relatively undeveloped shore. A few orange groves are located on the north and west sides which contribute nutrients in the form of fertilizer washed into the lake after heavy rains.

Three fish camps located on Lake Julianna provide boat ramps, boat rentals, fishing tackle, and live bait for fishermen. Fishing pressure is heavy during the bedding of bluegill, shellcracker, and black crappie.

ALLIGATOR LAKE

Alligator Lake, which was formed by damming Alligator Creek just before it flows into the Old Tampa Bay, is located on the south edge of Safety Harbor, Florida. It has a surface area of 86 acres and an average depth of 4.5 feet.

Aquatic vegetation is abundant in the water area. Large beds of elodea grow in the shallow water located on the lakeside of the dam. Water hyacinth and eel grass were the other major aquatic plants found in Alligator Lake.

Although no fish camps have been established, a primitive boat launching area is located on the North Shore.

The dam was washed away in 1960 following a period of heavy rain and high tides. A concrete dam was constructed and the water area totally renovated. The lake was restocked in 1960 with largemouth bass, bluegill, and shellcrackers.

The city of Safety Harbor is in the process of acquiring roads and lake front property in an attempt to provide a boat ramp site and parking space for the sport fisherman.

SCOTT LAKE

Scott Lake is located three miles south of the city limits of Lakeland, Florida. It has a surface area of 277 acres and an average depth of 10 feet.

The most abundant aquatic plant in Scott Lake is spatterdock which grows in a narrow band around much of the shore. Occasional stands of maidencane are found near the shore in very shallow water.

Summer kills of threadfin shad have been reported during periods of extreme high temperatures that occur in July and August.

No fish camps are located on Scott Lake and the watershed area has not been developed by the landowners.

Polk County, through its Recreation Department, has obtained waterfront property, constructed a concrete boat ramp, and provided a parking area for the numerous fishermen using this water area.

MATERIALS AND METHODS

SAMPLING METHODS

Rotenone spot samples made in the various lakes covered in this report were approximately one acre in size. An area 209 feet by 209 feet was measured and marked off by survey crews. The average depth was determined and the water treated with 5% emulsifiable rotenone at a concentration of 1.0 p.p.m. The chemical was poured, full strength, over the bow of work boats that first moved along the outside edge of the sample site and then moved shoreward in ever decreasing sweeps. All fish observed by the survey crew were picked up, weighed in tenths of a pound, measured to the nearest inch group and recorded, regardless if they were within or outside the measured sample area. No second day pick-ups were attempted due to movements caused by wind action or the recovery of small fish by gulls and other fisheating birds.

Electro-fishing samples were made in conjunction with rotenone spot samples wherever it was possible to operate the gear.

Equipment consisted of a portable Milwaukee 120-240 volt, 2500 watt, 2-phase generator, Model No. G25DE, mounted in a 14 foot plywood boat. The boat is equipped with a bow rail and a foot operated deadman switch to prevent injury to pick-up personnel.

The electro-fishing equipment is operated for one hour periods along the shore of the lake under investigation. All fish observed during the one hour operation are collected, weighed, measured, and recorded. This is considered to be an electro-fishing sample.

Rotenone spot samples and electro-fishing were not successful in obtaining consistent numbers of black crappie to give an accurate account of this specie of fish. Black crappie were observed in fishermen creel's but were not taken in any great degree in the lakes sampled during this study.

LAKE TARPON

The fish population of Lake Tarpon has been under investigation by various regional fish biologists of the Florida Game and Fresh Water Fish Commission since 1958. Haul seines, gill nets, trammel nets, rotenone spot samples, and electro-fishing devices have been employed to collect fish for sampling purposes. Differences in methods of recording data have made it impossible to utilize the information collected prior to 1963.

Sampling on Lake Tarpon in 1963 and 1964 (see Table I) consisted of one acre rotenone spot samples only, due to the high salinity of the water encountered during the investigation period. Electro-fishing devices were unable to operate in 1963 and 1964 although they had been used successfully in 1960.

The first selective shad treatment on Lake Tarpon was conducted on October 3, 1961, at 6:00 A.M. Location of the loading site and base for operations was Stetler's Fish Camp on the west central shore, just off U. S. 19. One airboat and six outboard motorboats were used in applying 730 gallons of rotenone. The rate of application was calculated to be .1 p.p.m. The chemical was gravity fed, undiluted, from 55 gallon barrels mounted on custom made racks.

Lake Tarpon was divided into six sections and marked off with yellow flags placed on shore. This proved inadequate and floats were placed on each section line between the flags.

All personnel were required to bring life preservers, spare parts for outboard motors, and tools. A boat was assigned for observation work and safety patrol.

The kill following the first selective shad treatment of Lake Tarpon was rather heavy. It included not only gizzard shad but largemouth bass,

bluegill, shellcrackers, and black crappie. A decision was made to reduce the amount of chemical on the next treatment following observations made on subsequent days.

The date of the second selective shad treatment operation for Lake Tarpon was October 2, 1962.

The main loading site and base of operations was at Stetler's Fish Camp with a secondary loading site at the Pinellas County Fish Hatchery, on the southwest shore.

A total of ten outboard motorboats were used to apply 355 gallons of rotenone. The rate of application was determined to be .05 p.p.m.

The chemical was gravity fed from 30 gallon barrels which had been diluted to a 50% solution by adding 15 gallons of lake water to 15 gallons of rotenone.

The lake was divided into six sections with an observer assigned to the northern three sections and a second observer assigned to the southern three sections. These observers were instructed to watch for possible signs of heavy concentrations of chemical and advise boat operators applying rotenone to avoid the areas.

Observations made, both on water and in the air, indicated that less than 3% of the game fish were killed by the second selective shad treatment. It was estimated that 250,000 pounds of gizzard shad were removed from Lake Tarpon during this operation.

The third and last selective shad treatment of Lake Tarpon was scheduled for September 23, 1963. High winds and rain forced a postponement until September 26, 1964.

Procedures and methods for the third treatment were identical to the second selective treatment of Lake Tarpon.

The lake was treated with 367 gallons of rotenone which was diluted to a 50% solution, and gravity fed from 30 gallon barrels mounted on fourteen foot outboard motor-boats. The rate of application was .05 p.p.m.

LAKE SEMINOLE

Fish population samples conducted in Lake Seminole since 1959 have indicated a large population of threadfin shad. Samples collected by the rotenone spot method and electro-fishing have shown the per cent composition by number of threadfin shad to range from 40.7 in 1963 to 2.9 in 1964. (See Table II).

Lake Seminole was selectively treated for threadfin shad for the first time on August 9, 1960, at which time a total of 74 gallons of 5% emulsifiable rotenone was applied by one airboat and two 14-foot outboard motor boats. The rate of application of rotenone was determined to be .06 p.m.

The chemical distributed by the airboat was diluted by adding 52 gallons of lake water to 3 gallons of rotenone. Airboat crews were instructed to spray the mixture over the lake surface coming no closer than 200 feet of the shore. Outboard motorboat crews applied their rotenone, undiluted and gravity fed, from barrels mounted on racks.

Lake Seminole was treated at the same rate and in the same manner on October 4, 1961, October 3, 1962, and September 25, 1963.

LAKE TSALA APOPKA

The results of fish population sampling completed by the Fish Management Division on Lake Tsala Apopka, during the early spring of 1963, indicated that the fish population was as normal as could be expected with the low water conditions that existed during the investigations.

A total of forty-four spot samples were made during a three weeks period with 7,419 individual fish being weighed and measured.

Aerial observations made in conjunction with the activities of our surface boat crews revealed that approximately two-thirds of the surface waters of Lake Tsala Apopka were not available to the boat fisherman due to the low water and dense aquatic vegetation.

Several recommendations were made following these investigations.

1. Desirable water level controls to be established and maintained by the joint efforts of the Four River Basin group and the Game and Fresh Water Fish Commission.
2. A program of cutting boat trails into selected inaccessable areas since a large part of Lake Tsala Apopka is infested with aquatic vegetation.
3. A voluntary creel census to be set up at various fish camps to determine fishing success throughout the Chain-of-Lakes.
4. Selective shad treatment in the 715 acres just east of the town of Inverness, Florida.

Recommendations 2 and 4 were carried out by the Fish Division of The Florida Game and Fresh Water Fish Commission.

The reason for selectively treating Lake Tsala Apopka, near Inverness, was the heavy concentration of gizzard shad found during the fish sampling work. (See Table III.)

Lake Tsala Apopka was treated on September 12, 1963, with 90 gallons of 5% emulsifiable rotenone, or at the rate of 0.1 p.p.m. The chemical was gravity fed, full strength, from two air-boats operated by Hyacinth Control Division personnel.

After a period of observation, both from the air and water surface, it was determined that approximately 71,500 pounds of gizzard and threadfin shad had been removed from Lake Tsala Apopka.

LAKE JULIANNA

Sampling of the fish population in Lake Juliana revealed a large number of threadfin shad in 1963. (See Table IV.)

Since many fishermen using this lake fish for black crappie, it was felt that removal of a large part of the threadfin shad population would increase black crappie in the fishermen's creel.

Lake Juliana was selectively treated for threadfin shad on October 10, 1963, with 600 gallons of 5% emulsifiable rotenone. The rate of application was .07 p.p.m.

While a good threadfin shad kill was observed, approximately 300 adult largemouth bass (ranging from 3 pounds to 12 pounds) were destroyed during the operation. It is believed that a combination of high winds and misunderstood instructions caused the rather high game fish kill.

Following observations of the water area it was determined that 18.5 pounds per acre of threadfin shad were killed for a total of 7,000 pounds.

ALLIGATOR LAKE

Alligator Lake was selectively treated on September 25, 1963, for the removal of threadfin shad. This lake has been under observation by the Fish Management Division for the past two years. Sampling indicated a good population of largemouth bass and bluegill. While threadfin shad were not felt to be a problem it was decided to selectively treat the water area in an attempt to improve largemouth bass fishing. (See Table V.)

The lake was treated with 6 gallons of 5% emulsifiable rotenone. The water area was divided into two parts and 3 gallons of chemical

was mixed with 27 gallons of lake water. The mixture was gravity fed from barrels mounted on 14-foot outboard motorboats.

Since Alligator Lake was overflowing into Old Tampa Bay during the time of the treatment, potassium permanganate was applied at the dam in an effort to neutralize the action of rotenone. A small kill of salt water species was experienced on the bay side of the dam, however, it was felt that the use of potassium permanganate prevented the kill from being much larger in size.

SCOTT LAKE

Scott Lake had a history of summer kills of threadfin shad and very spotty fishing success. Sampling consisting of both rotenone spot samples and electro-fishing indicated a good population of largemouth bass and bluegill. Rough fish, primarily spotted gar, made up 37.7% composition by weight. (See Table VI.)

Scott Lake was treated on October 10, 1963, with 90 gallons of Fish Tox Plus, 5% emulsifiable rotenone, a product of Southern Mill Creek Products, Inc., of Tampa, Florida. The lake was divided into three sections of approximately 91.5 acres and the rotenone gravity fed from barrels mounted on 14-foot outboard motorboats.

Observations made after completion of the application of chemical revealed only threadfin shad and a few gizzard shad had been killed by the treatment. No game fish were observed in distress following the operation.

SUMMARY

Creel census was not available in the lakes selectively treated for shad covered in this paper, therefore, an attempt has been made to compare per cent composition of numbers and weights of the various species of fish collected in fish population samples.

The cost of selective shad treatment, based on the amount of chemical used to treat the 49,251 acre feet of water considered in this paper, has been calculated at 22c per acre foot. This figure does not include salaries, travel expenses ,operating of equipment, and miscellaneous expenses.

LAKE TARPON

Largemouth bass decreased in numbers but increased in size following the selective treatment in 1963. Newspaper reports and verbal information from fish camp operators indicated largemouth bass and black crappie fishing had improved in 1964.

LAKE SEMINOLE

Lake Seminole was one of four lakes in which largemouth bass increased both in weight and numbers in 1964. Reports from C. B. Birdsong, owner of the Lake Seminole Fishing Lodge, indicate that bass fishing has improved with the largest fish caught this year weighing a little over 14 pounds. Good catches of bluegill were reported when the weather permitted the fishermen to use the lake.

LAKE TSALA APOPKA

Largemouth bass increased in both numbers and weight in samples collected in 1964. Newspaper articles reporting on fishing conditions in Lake Tsala Apopka indicate spotty fishing success both for largemouth bass and bluegill.

Population samples from 1964 show a drop in numbers and weights of shad species. (See Table VII.)

LAKE JULIANNA

A drop from 65.5% to 32.5% composition by weight of largemouth bass in Lake Julianna was possibly caused by the bass kill that occurred following the selective treatment in 1963. Sampling completed in the late spring of 1964 indicated a very heavy spawn of largemouth bass that will probably fill the void left by the removal of adult fish.

Camp operators report bass fishing has declined over previous years. Bluegill and shellcracker catches are spotty. Recent reports from one camp operator indicate that while the average size has decreased, the number of largemouth bass has increased in the fisherman's creel.

ALLIGATOR LAKE

Alligator Lake was the smallest water area treated for the removal of shad covered in this paper.

Largemouth bass, taken in sampling completed in 1964, indicated an increase in both number and weight. Bluegill and shellcracker decreased in numbers and weights following treatment. (See Table VII.)

Fishing success on Alligator Lake is unavailable since no fish camps are located on the area, and creel census work was not attempted on the lake.

SCOTT LAKE

Fishing success in Scott Lake has been excellent for the past year. Limit catches of largemouth bass, bluegill, shellcrackers, and black crappie have been reported following the selective shad treatment of October 10, 1963. Catches of bluegill and shellcracker averaging one pound a piece are not uncommon from this water area.

Largemouth bass and bluegill increased in numbers and weights, according to fish population samples conducted after treatment. (See Table VII.)

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TABLE I

LAKE TARPON

1963 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES BEFORE THIRD SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	1"-11"	38	2.4	6.0	10.9
Bluegill	1"-10"	76	7.7	12.0	35.1
Shellcracker	5"-11"	14	3.5	2.2	15.9
Black Crappie	1"-1"	2	Tr.	.3	Tr.
Warmouth Bass	2"-7"	11	.7	1.7	3.1
Gizzard Shad	9"-10"	14	4.7	2.2	21.4
Threadfin Shad	2"-3"	429	2.3	67.9	10.5
Golden Shiner	5"-6"	11	.6	1.7	2.7
Brook Silverside	2"-4"	11	Tr.	1.7	Tr.
Gobies Sp.	2"-3"	4	Tr.	.6	Tr.
Channel Catfish	2"-2"	2	Tr.	.3	Tr.
Brown Bullhead	2"-2"	14	Tr.	2.2	Tr.
Sailfin Mollie	2"-2"	5	Tr.	.8	Tr.
TOTAL		631	21.9	99.6	99.6

1964 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES AFTER THIRD SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	1"-18"	46	15.7	4.1	11.2
Bluegill	1"-9"	394	35.9	44.0	25.7
Shellcracker	6"-10"	10	4.1	1.1	2.9
Black Crappie	3"-6"	2	.1	.2	.1
Warmouth Bass	1"-6"	40	1.2	4.5	.8
Gizzard Shad	8"-14"	192	64.2	21.5	45.9
Threadfin Shad	3"-3"	8	Tr.	.9	Tr.
Golden Shiner	6"-10"	69	10.9	7.7	7.8
Brook Silverside	1"-3"	33	Tr.	3.7	Tr.
Gobbies Sp.	1"-3"	51	Tr.	5.7	Tr.
Channel Catfish	6"-15"	5	2.2	.5	1.5
Brown Bullhead	2"-18"	4	3.7	.4	2.6
Seminole Killifish	3"-6"	40	1.6	4.5	1.1
TOTAL		894	139.6	99.8	99.8

TABLE II

LAKE SEMINOLE

1963 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES BEFORE FOURTH SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	6.0-23.0	8	13.5	1.2	21.9
Bluegill	2.0-8.0	261	26.9	41.2	43.7
Shellcracker	6.0-8.0	35	6.8	5.5	11.0
Warmouth Bass	2.0-6.0	28	1.0	4.4	1.6
Black Crappie	5.0-6.0	2	.2	.3	.3
Golden Shiner	2.0-11.0	25	4.8	3.9	7.8
Brown Bullhead	5.0-12.0	6	1.9	.9	3.0
Gizzard Shad	9.0-11.0	10	3.8	1.5	6.1
Threadfin Shad	1.0-6.0	258	2.6	40.7	4.2
TOTAL		633	61.5	99.6	99.6

1964 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES AFTER FOURTH SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	1.0-22.0	47	65.5	5.5	46.2
Bluegill	2.0-8.0	322	33.8	38.2	23.8
Shellcracker	4.0-8.0	75	12.4	8.9	8.7
Warmouth Bass	1.0-4.0	13	1.5	1.5	1.0
Black Crappie	10.0-10.0	1	.3	.1	.2
Golden Shiner	1.0-9.0	230	11.2	27.3	7.9
Brown Bullhead	2.0-15.0	9	5.3	1.0	3.7
Gizzard Shad	5.0-13.0	70	8.8	8.3	6.2
Threadfin Shad	2.0-5.0	25	.3	2.9	.2
Brook Silverside	1.0-4.0	5	Tr.	.5	Tr.
Channel Catfish	9.0-11.0	6	.2	.7	.1
Seminole Killifish	4.0-6.0	37	1.4	4.3	.9
Sheephead	11.0-11.0	1	.9	.1	.6
TOTAL		841	141.6	99.3	99.5

TABLE III

LAKE TSALA APOPKA

1963 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES BEFORE SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	3.0-9.0	14	1.4	2.1	2.2
Bluegill	1.0-8.0	335	6.2	51.7	9.9
Shellcracker	2.0-9.0	59	3.6	9.1	5.7
Warmouth	1.0-5.0	26	.5	4.0	.8
Black Crappie	3.0-7.0	9	.6	1.3	.9
Stumpknocker	5.0-5.0	1	.1	.1	.1
Chubsucker	2.0-13.0	23	2.6	3.6	4.1
Golden shiner	3.0-10.0	64	41.8	9.9	67.2
Gizzard Shad	5.0-14.0	68	4.7	10.5	7.5
Threadfin Shad	3.0-3.0	48	.7	7.4	1.1
TOTAL		647	62.2	99.7	99.5

1964 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES AFTER SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	1.0-25.0	70	30.4	4.9	14.6
Bluegill	1.0-8.0	196	10.2	13.7	4.9
Shellcracker	2.0-10.0	28	4.9	2.0	2.3
Warmouth	1.0-7.0	147	9.9	10.3	4.7
Black Crappie	1.0-12.0	270	7.3	18.9	3.5
Chubsucker	1.0-15.0	131	21.4	9.2	10.2
Golden Shiner	2.0-10.0	371	5.5	26.0	2.6
Gizzard Shad	2.0-15.0	43	15.2	3.0	7.3
Threadfin Shad	1.0-5.0	47	.4	3.3	.1
Chain Pickerel	8.0-18.0	10	9.0	.7	4.3
Redfin Pickerel	7.0-7.0	1	.1	.1	.1
White Catfish	14.0-14.0	1	1.3	.1	.6
Brown Bullhead	13.0-13.0	6	1.7	.4	.8
Bowfin	17.0-23.0	6	19.2	.4	9.2
Longnose Gar	30.0-47.0	8	34.5	.6	16.5
Spotted Gar	11.0-23.0	81	38.0	5.7	18.2
TOTAL		1429	208.0	99.3	99.9

TABLE IV

LAKE JULIANNA

1963 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES BEFORE SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	5.0-21.0	96	85.8	6.0	65.5
Bluegill	1.0-10.0	211	12.8	13.0	9.2
Shellcracker	1.0-10.0	87	11.5	5.5	8.5
Warmouth	1.0-7.0	22	1.6	1.5	1.5
Brown Bullhead	1.0-15.0	29	Tr.	2.5	Tr.
Yellow Bullhead	1.0-6.0	4	Tr.	1.5	Tr.
Mudfish	15.0-21.0	4	8.0	1.5	6.0
Threadfin Shad	1.0-6.0	1005	5.8	66.0	4.5
Gizzard Shad	6.0-14.0	26	6.5	2.5	4.8
TOTAL		1520	132.0	100.0	100.0

1964 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES AFTER SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	1.0-21.0	98	41.8	4.8	32.5
Bluegill	2.0-11.0	177	13.1	8.7	10.2
Shellcracker	2.0-11.0	294	33.5	14.5	26.1
Warmouth Bass	1.0-8.0	14	1.3	.7	1.0
Brown Bullhead	10.0-16.0	6	7.2	.3	5.6
Threadfin Shad	1.0-4.0	80	.4	3.9	.3
Gizzard Shad	2.0-12.0	226	1.9	11.2	1.4
Black Crappie	1.0-3.0	842	Tr.	41.7	Tr.
Stumpknocker	5.0-6.0	6	.7	.3	.5
Golden Shiner	2.0-8.0	173	4.3	8.5	3.3
Dollar Sunfish	2.0-3.0	37	Tr.	1.8	Tr.
Seminole Killifish	3.0-6.0	18	.5	.8	.3
Madtom	1.0-3.0	35	Tr.	1.7	Tr.
Bowfin	5.0-23.0	3	8.7	.1	6.7
Spotted Gar	18.0-20.0	7	7.5	.3	5.8
Longnose Gar	41.0-41.0	1	7.4	.1	5.7
TOTAL		2017	128.3	99.4	99.4

TABLE V

ALLIGATOR LAKE

1963 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES BEFORE SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	3.0-11.0	10	2.3	3.5	10.2
Shellcracker	1.0-7.0	44	5.3	15.2	23.5
Bluegill	1.0-8.0	213	12.6	73.7	55.8
Brown Bullhead	5.0-6.0	12	1.2	4.2	5.3
Threadfin Shad	5.0-5.0	4	.2	1.4	.9
Black Crappie	5.0-5.0	1	.1	.4	.4
Warmouth	4.0-4.0	1	.1	.4	.4
Golden Shiner	7.0-8.0	4	.8	1.4	3.5
TOTAL		289	22.6	100.2	100.0

1964 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES AFTER SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	1"-20"	109	24.0	11.1	27.3
Shellcracker	3"-8."	51	7.4	5.2	8.4
Bluegill	2"-8"	327	21.0	33.5	23.9
Brown Bullhead	6"-9"	30	3.6	3.0	4.1
Threadfin Shad	2"-8"	125	4.5	12.8	5.1
Black Crappie	1"-8"	73	.8	7.5	.9
Warmouth Bass	1"-6"	34	1.2	3.5	1.4
Golden Shiner	1"-10"	207	13.2	21.2	15.0
Spotted Gar	21"-25"	3	6.3	.3	7.1
Bowfin	15"-15"	1	1.2	.1	1.4
Mullet	22"-22"	1	4.2	.1	4.8
Gizzard Shad	6"-6"	3	.3	.3	.3
Gambusia	1"-2"	10	Tr.	1.0	Tr.
Yellow Bullhead	9"-9"	2	.1	2.0	.1
TOTAL		976	87.8	101.6	99.8

TABLE VI

SCOTT LAKE

1963 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES BEFORE SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp Weight
Largemouth Bass	4.0-23.0	46	55.1	6.7	42.2
Bluegill	1.0-9.0	319	16.4	46.3	12.5
Shellcracker	3.0-8.0	61	5.7	8.9	44.4
Golden Shiner	3.0-8.0	15	1.3	2.2	.9
Seminole Killifish	3.0-5.0	44	1.7	6.4	1.3
Brook Silverside	2.0-3.0	87	.3	12.6	.2
Thraedfin Shad	2.0-4.0	87	.6	12.6	.6
Spotted Gar	18.0-25.0	29	49.3	4.2	37.7
TOTAL		688	130.4	99.9	99.8

1964 POPULATION COMPOSITION SUMMARY OF ALL
SAMPLES AFTER SELECTIVE SHAD TREATMENT

Species	Size Range	Number	Weight	% Comp. Number	% Comp. Weight
Largemouh Bass	2.0-21.0	26	18.6	8.4	45.8
Bluegill	2.0-8.0	145	8.8	46.9	21.6
Shellcracker	2.0-7.0	26	1.4	8.4	3.4
Golden Shiner	2.0-9.0	11	.7	3.5	1.7
Seminole Killifish	4.0-5.0	62	1.5	20.0	3.7
Brook Silverside	2.0-2.0	2	Tr.	.6	Tr.
Thraedfin Shad	2.0-5.0	31	.3	10.0	.7
Spotted Gar	19.0-21.0	6	9.3	1.9	22.9
TOTAL		309	40.6	99.7	99.8

TABLE VII

A COMPARISON OF PER CENT COMPOSITION BY NUMBERS AND WEIGHTS FOR FIVE SPECIES OF FISH FOLLOWING SELECTIVE SHAD TREATMENT IN LAKE TARPON, LAKE SEMINOLE, LAKE TSALA APOPKA, LAKE JULIANNA, ALLIGATOR LAKE, AND SCOTT LAKE.

	TARPON				SEMINOLE			
	1963		1964		1963		1964	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Largemouth Bass	6.0	10.9	5.1	11.2	1.2	21.9	5.5	46.2
Bluegill	12.0	35.1	44.0	25.7	41.2	43.7	38.2	23.8
Shellcracker	2.2	15.9	1.1	2.9	5.5	11.0	8.9	8.7
Gizzard Shad	2.2	21.4	21.5	45.9	1.5	6.1	8.3	6.2
Threadfin Shad	67.9	10.5	.9	Tr.	40.7	4.2	2.9	.2

	TSALA APOPKA				JULIANNA			
	1963		1964		1963		1964	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Largemouth Bass	2.1	2.2	4.9	14.6	6.0	65.5	4.8	32.5
Bluegill	51.7	9.9	13.7	4.9	13.0	9.2	8.7	10.2
Shellcracker	9.1	5.7	2.0	2.3	5.5	8.5	14.5	26.1
Gizzard Shad	9.9	67.2	3.0	7.3	2.5	4.8	11.2	1.4
Threadfin Shad	7.4	1.1	3.3	.1	66.0	4.5	3.9	.3

	ALLIGATOR				SCOTT			
	1963		1964		1963		1964	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Largemouth Bass	3.5	10.2	11.1	27.3	6.7	42.2	8.4	45.8
Bluegill	73.7	55.8	33.5	23.9	46.3	12.5	46.9	21.6
Shellcracker	15.2	23.5	5.2	8.4	8.9	4.4	8.4	3.4
Gizzard Shad	*	*	.3	.3	*	*	*	*
Thraedfin Shad	1.4	.9	12.8	5.1	12.6	.6	10.0	.7

* None Observed