

LITERATURE CITED

- Copeland, J. B. and Melvin T. Huish. 1963. A description and some results of a statewide fish tagging program. Proc. Ann. Conf. S. E. Game and Fish Comm., 16 (1962): In Press.
- Governor Ferris Bryant's Committee on Recreational Development. 1963. Florida's Outdoor Recreation at the Crossroads. State of Florida, 36 pp.
- Swingle, H. S. 1952. Farm pond investigations in Alabama. Journ. Wildl. Mgt. 16(3):243-249.

RESULTS OF A TAGGING STUDY ON THE SPOTTED BASS, *Micropterus punctulatus*

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LEON KIRKLAND

Georgia Game and Fish Commission

Atlanta, Georgia

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ABSTRACT

One thousand seven hundred and forty-nine Spotted Bass were tagged in Allatoona Reservoir, Georgia, in the winter of 1961-62 and rewards were paid for return of the tags by sport fishermen. The nature of the Spotted Bass fishery and population density is described on the basis of these tag returns and creel census. Two hundred and sixty-two Largemouth Bass were tagged simultaneously and comparative data on the two species is given.

INTRODUCTION

The dominance of the Spotted Bass over the Largemouth Bass in the fishery at Lake Allatoona has resulted in an increased interest in this species as a potential predator in other situations.

Although the Largemouth was more abundant in the first few years after impoundment, the Spotted Bass has gradually become more and more prominent in the fishery until it makes up over 90% of the bass catch at present. Even though Allatoona is a relatively old reservoir at 14 years, the Spotted Bass still maintains a relatively high population and good fishery under conditions of heavy fishing pressure.

The present study was initiated to obtain further information on this species, with particular reference to its density, catchability, and harvest rate. If the Spotted Bass could be determined to be a desirable fish from the sportsman's standpoint, exhibit a good harvest rate and maintain itself well in an old reservoir, then it will probably be introduced in some of the other impoundments where it does not occur.

METHODS AND MATERIALS

The capturing and tagging of the fish for this study was carried out from Nov. 15, 1961 to March 15, 1962. All fish used in the experiment were captured with the electric seine and tagged with the Petersen tag (Kirkland, 1962). Studies on the mortality from tagging and the electric shocking using the same equipment and procedure has previously been found to be negligible (*ibid.*).

Effort was made to exert an equal amount of capturing effort in all areas so that tagged fish would occur in all areas in proportion to the population density. However, the difference in catch rate due to weather

and water factors was so great that any advantage obtained from this effort would have been destroyed.

A controlled study of the tag used indicated that there is a high incidence of loss of the Petersen tags in the tagging location used for this study (*ibid.*). For this reason, analysis of the data is made up to June 16 to reduce the chances for tag loss. No correction is made for this tag loss. Since the study was for part of the season only, all conclusions reached pertain only to this spring fishery.

Rewards were paid for tags returned during the study period. A minimum of \$1 was paid for each tag and a weekly prize of \$10 was paid for the highest tag number turned in. Other prizes of \$25, \$50, \$75, \$100, and \$500 were offered for specific tag numbers. The local sportsmen's club financed the reward payments and contributions were collected from local businesses and concessions around the lake.

All concessions on the lake were used as check-in stations and the fish weighed and measured on scales and measuring boards provided for that purpose. Concession operators were instructed on weighing and measuring the fish and recording this and other information on the forms provided.

Local radio and newspapers carried weekly information regarding the tagging program and interest was very good. It is believed that very few tags were missed and no correction is made for this type error.

Where fishing pressure, catch rates, total harvest, and other similar information is given, this material was collected by a routine creel census. Specific details of the census may be obtained from Georgia D-J reports of Project F-14-R. Unless otherwise stated, pressure figures are those obtained directly from creel census and are not expanded.

FACTORS AFFECTING RATE OF TAG RETURNS

Seasonal changes, surface temperature, water level, turbidity, fishing pressure and catch rate and the relationship of these variables are the primary factors that determine the rate of capture of tagged fish.

Turbidity records were not available for the study, but for the most part are closely related to lake elevation since a sudden rise in the elevation can be interpreted to mean an influx of turbid water. With a rise in water level, a rise in turbidity is also generally expected.

The effect of capturing and tagging the fish on its subsequent feeding activity is also a crucial factor that is important, particularly the first week or two following tagging operation. After this short recovery period, it is assumed that the tagged individuals react much the same as untagged fish in the population.

The spring fishery for both Largemouth and Spotted Bass in Allatoona Reservoir begins the latter part of February or the first of March depending on weather and water conditions.

SEASONAL CHANGES AND TEMPERATURE

Mid-week temperature records were taken at the dam during the study period and although the temperature varies considerably from the dam to upstream portions, this area is probably the best reference point since it is less subject to variability from minor weather changes. For the most part, the shallower areas of the bays and coves generally warm faster than lower sections near the dam; therefore, optimum temperature in these areas will be higher than the temperatures given.

Beginning around the first of March, the surface temperature starts a steady, sharp rise that lasts to around May 1 (Table 1). As the temperature rises so does the number of tags returned and the catch rate (Tables 1 & 2).

Since the number of tags returned is a function of both the fishing pressure and catch rate and the catch rate itself is independent of the variable of pressure, the catch rate is therefore a better index of how readily the fish are biting.

The catch rate is given as both Largemouth and Spotted Bass combined. The percentage each make up of this rate is comparable to the percentage each species comprises of the tags returned.

The optimum time for catching Spotted Bass according to the catch rate and tag returns is from the middle of March through the first

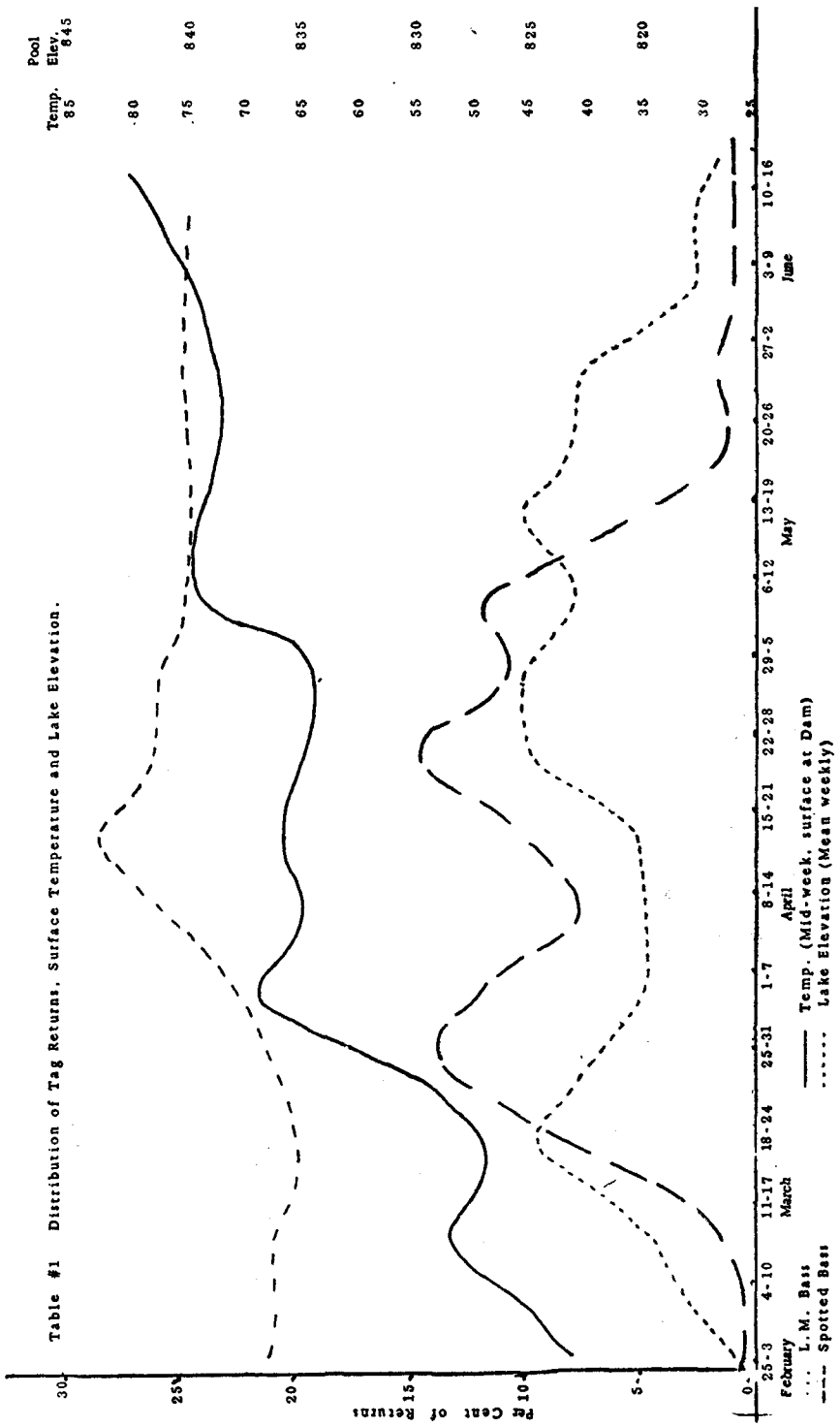
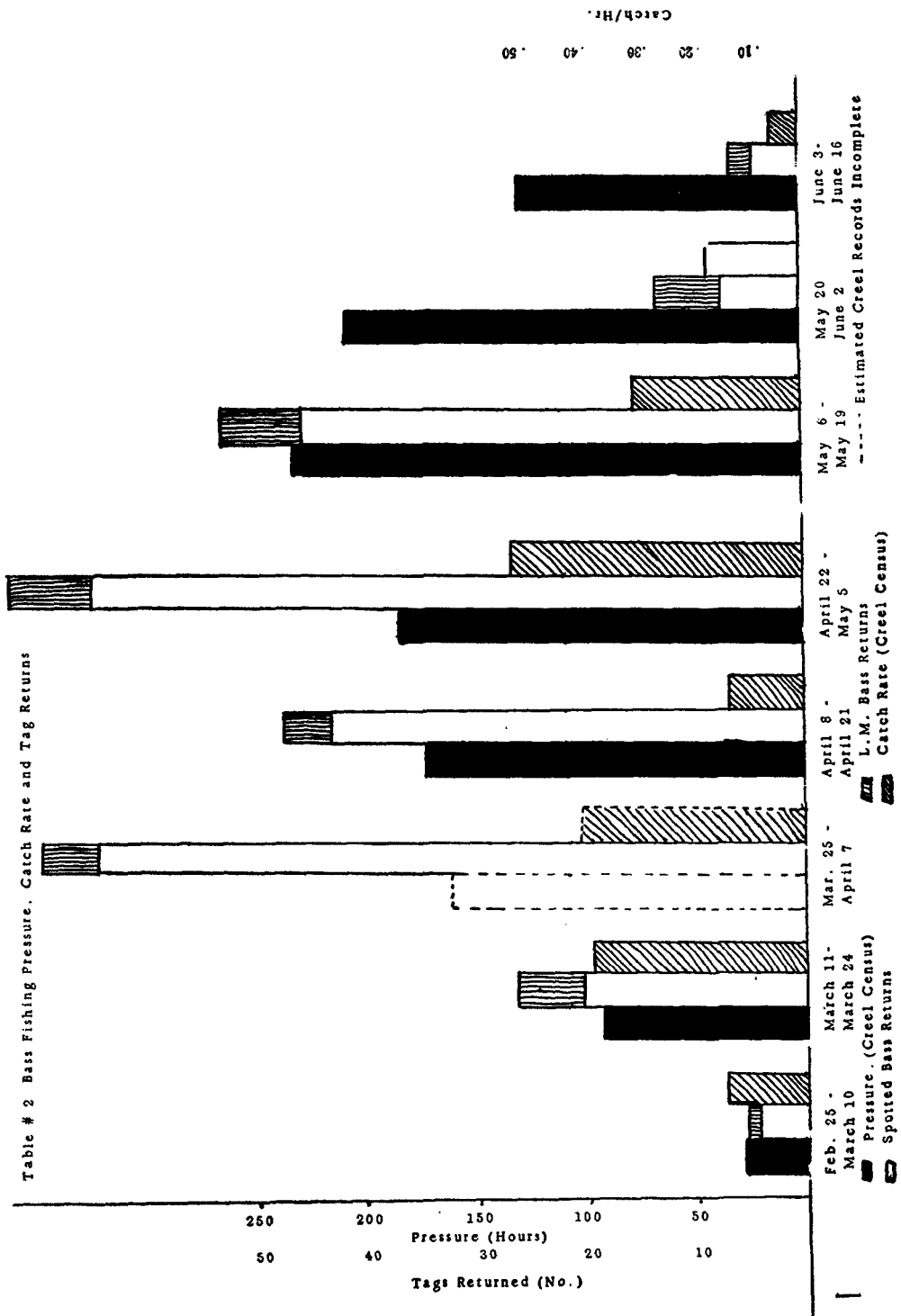


Table # 2 Bass Fishing Pressure, Catch Rate and Tag Returns



week in May. The surface temperature at the dam ranged from 50 to 65 degrees during this time. The highest catch rate was for the period of April 22-May 5, when the temperature was 60-65 degrees. Around May 10, when the temperature goes above 70 degrees, the catch rate declines sharply and by June 1, when the temperature goes above 75 degrees, the catch rate is so low fishing for Spotted Bass is soon abandoned.

The Largemouth Bass fishery is much the same as the Spotted Bass except that the Largemouth fishery continues to produce through the month of May, while the temperature ranges above 70 degrees. Once the surface temperature goes above 75 degrees, Largemouth fishing becomes so poor that fishing for this species is virtually non-existent.

WATER LEVEL

Since water level and turbidity is related as mentioned previously, it is difficult to separate their effects. It is worth while to note that around the middle of April, a flood did occur that resulted in a greatly reduced catch rate and lower tag returns during this period. The effects of small or slow changes in water level did not appear to cause any significant effects.

FISHING PRESSURE AND CATCH RATE

If the creel census and tagging study are both statistically accurate, then the number of tags returned should be directly proportional to the fishing pressure times the catch rate. In other words, the number of tags returned should be proportional to the total of fish caught.

The most likely source of error here is that tagged fish are quite readily taken by fishermen fishing for other species. Since bass fishing pressure is computed separately, if a large number of tagged fish are caught by crappie fishermen for instance, then the number of tagged fish returned will be proportionally higher than the fishing pressure times the catch rate. This will show more pronounced during the period when the other type fishing is heavier.

This is probably the reason that the number of returns becomes proportionately smaller in relation to pressure times catch rate the latter part of May and June. A large number of tagged bass were caught by crappie fishermen as evidenced by the bait study (page 8). Since crappie fishing pressure drops sharply after early spring, the number of bass taken by this method also decreases giving proportionately a lower number of returns for the later weeks of the study.

Immediately after the study began, there also appears to be proportionately lower number of returns than the total catch would indicate. This is a result of the "recovery period" following tagging since a large number of fish were tagged just prior to the beginning of the study. Some fish were also tagged during the early part of this two-week period. Tagging was not completed until March 15.

The tag returns show a good positive relationship to pressure times catch rate except for the instances mentioned.

Other catch rate changes have been previously explained on the basis of other variables.

One pertinent observation that could improve the fishery is that if more of the late season pressure could be applied earlier in the season when the catch rate is higher, a better harvest would be realized.

CHARACTERISTICS OF CAPTURE METHODS

The characteristics of a fish species as related to the methods by which it is taken by sport fishermen is one of the determining factors in its desirability as a sport fish.

The determination of the most successful methods of capture, if they are passed along to the fisherman, can also aid in a greater utilization of the resource by increasing the catch rate and harvest.

Although the determination of the number of fish caught by the tags returned for a particular fishing method is probably related to the efficiency of this method in capturing fish, unless the fishing pressure for each method is known, the true efficiency cannot be determined.

Table 3. Time Spotted Bass Were Caught from Tag Returns

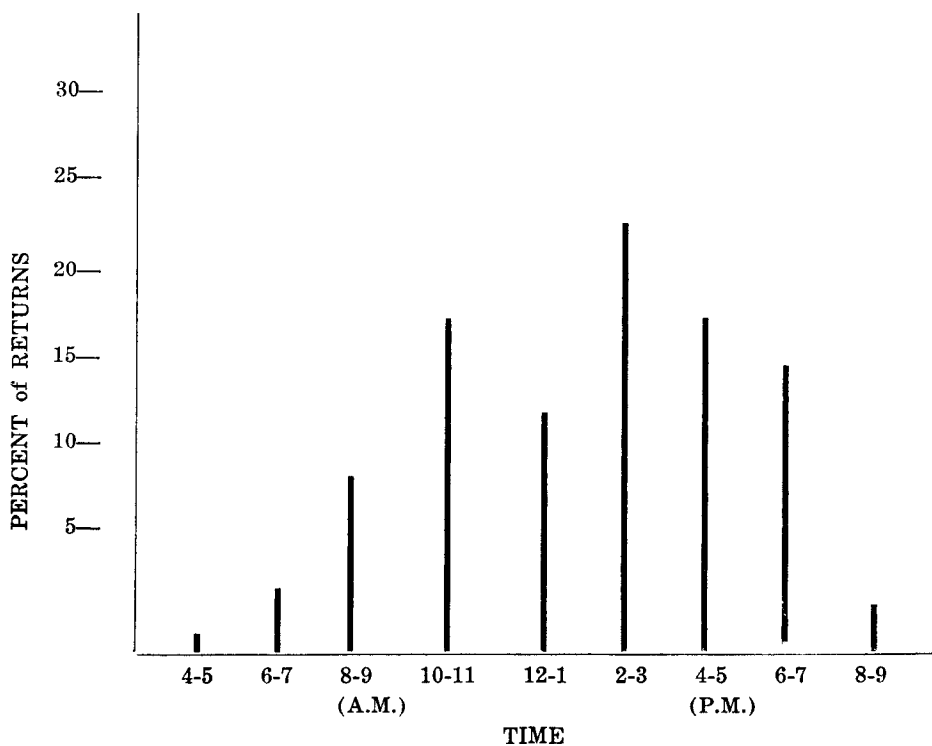
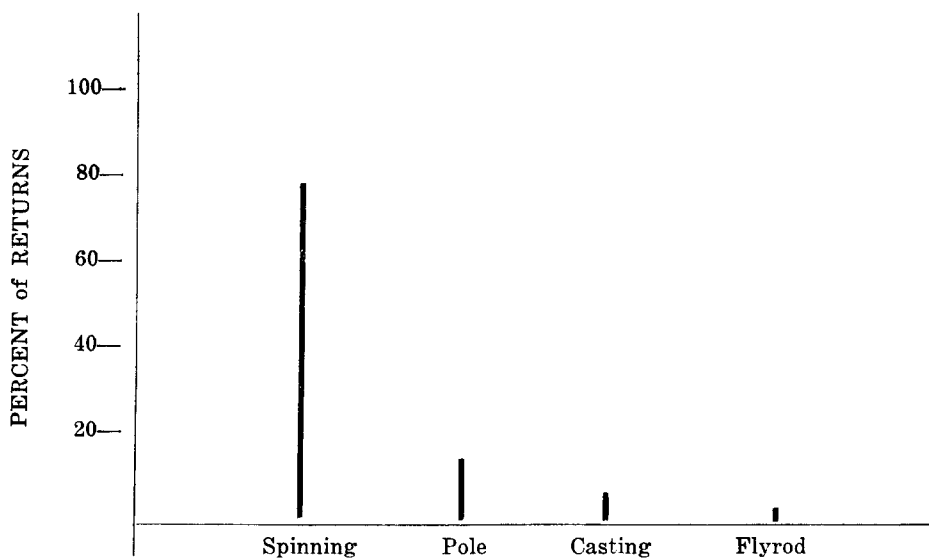


Table 4. Type Gear Used for Capturing Tagged Spotted Bass



Many times the methods which show the greatest return of tagged fish reflect the preference of the fishermen and not the efficiency of the method.

In table 3-7, the various methods are given with their success in returning tagged fish.

TIME OF DAY FISH WERE CAUGHT

The time of day at which the Spotted Bass can be caught (Table 3) is distributed differently than the current conception of bass fishing would dictate. It is commonly thought among bass fishermen that the best fishing time is early morning and late afternoon. This study shows the greatest returns in the middle of the day. However, pressure may be greatest during the mid-day period in the early spring. At any rate, the returns show that Spotted Bass are caught readily at all times during the day and are not restricted to early morning and late afternoon activity.

TYPE OF FISHING GEAR USED

The type gear used to catch tagged Spotted Bass (Table 4) is believed to reflect more the preference of fishermen than it does the ability of the gear to catch fish. This factor does indicate, however, that the Spotted Bass is taken by all types of gear used by fishermen.

DEPTH AT WHICH TAGGED FISH WERE CAUGHT

The Spotted Bass appears to be very similar to the Largemouth in preferring to stay near the surface in early spring (Table 5). Over eighty per cent of the tagged fish caught were taken in water less than six-feet deep.

TYPE BAITS USED

The various bait types and the pressure and catch rate for these baits are given in Table 6, 7. Salamanders and minnows are the two baits that show the highest number of tag returns. However, the catch rate and fishing pressure (Table 7) shows that for bass fishing, salamanders have a much heavier fishing pressure and higher catch rate. The reason for this apparent discrepancy is that crappie fishermen catch a large number of bass on minnows. Although the catch rate is rather low for this bait type, the amount of fishing done for crappie results in a great amount of pressure with this bait. Thirty-five per cent of the total bass catch was taken by fishermen fishing for other species.

Worms show the next highest return of tagged fish. These are both live and artificial worms combined since it was not possible to distinguish between the two on the reports of tagged fish sent in by fishermen. The pressure and catch rate data also would place worms in third place. Artificial worms showed the higher catch rate, but more fishing pressure was recorded with live worms.

Jigs were fourth in number of tagged fish returned. The pressure for jigs is very low even though a high catch rate was recorded for the small amount of pressure recorded. The sample is so small for this type bait that caution is advised in interpreting the results.

The same situation is probably true for jigs as explained for minnows. Since jigs are also used for crappie fishing, some of the tags returned were probably by crappie fishermen.

A comparison of Largemouth and Spotted Bass returns for the various bait types show very close agreement.

Largemouth appear to prefer minnows more than the Spotted Bass and the Spotted Bass seems to have a greater preference for salamanders. Since the salamanders are fished primarily on the bottom and the Spotted Bass is known as more of a bottom feeder, this result is not surprising.

Other types of artificial baits, though not showing as high a catch rate as salamanders, minnows, and jigs will take Spotted Bass and seemingly with about the same consistency as for the Largemouth Bass.

DEPTH
(FEET)

Table 5. Depth at Which Tagged Fish Were Caught

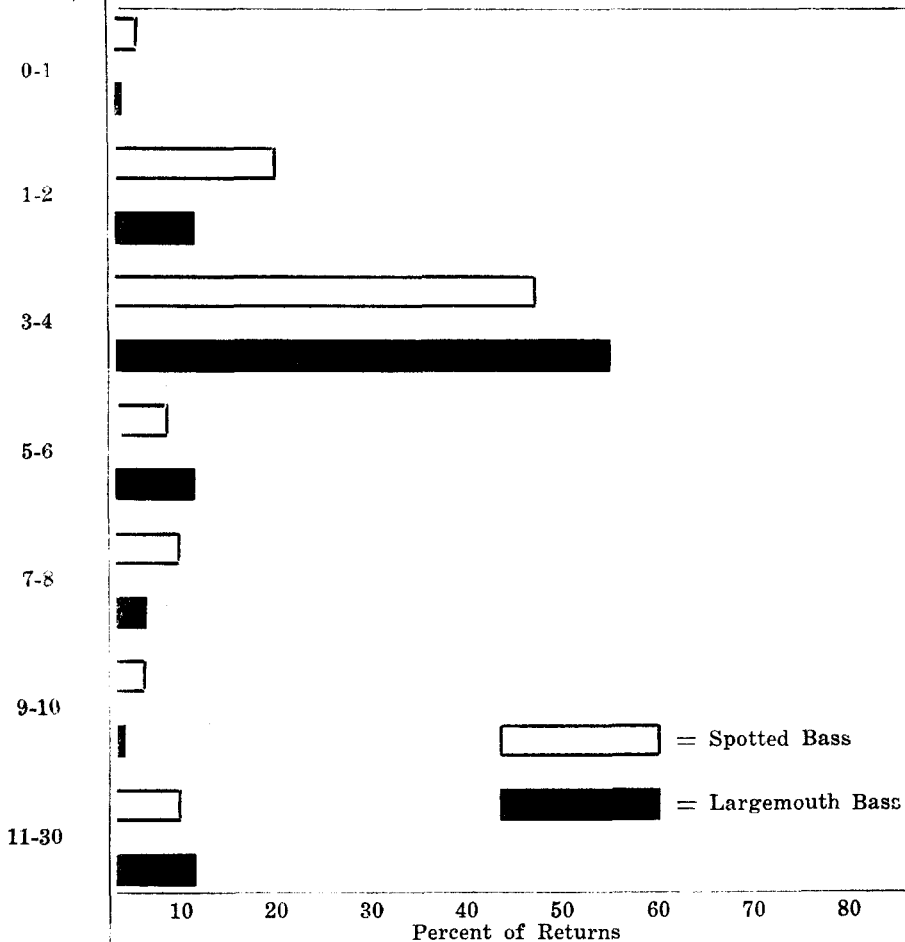


Table 7. Fishing Pressure & Catch Rate From Creel Census March 1 to June 16, 1962.

Worms*	52	17	.326
Spinners	24	2	.083
Jigs	5	10	2.0
Top Water	31	4	.129
Med. Plugs	81	10	.123
Deep Plugs	35	5	.142
Flies	4	0	.0
Minnnows	131	5	.038
Salamanders	718	215	.299
Total	1081	268	.247

Man-hrs. Fish Mean Catch Rate

*Both Live and Artificial.

Table 6. Type Bait Used to Capture Tagged Fish
Percent of Returns

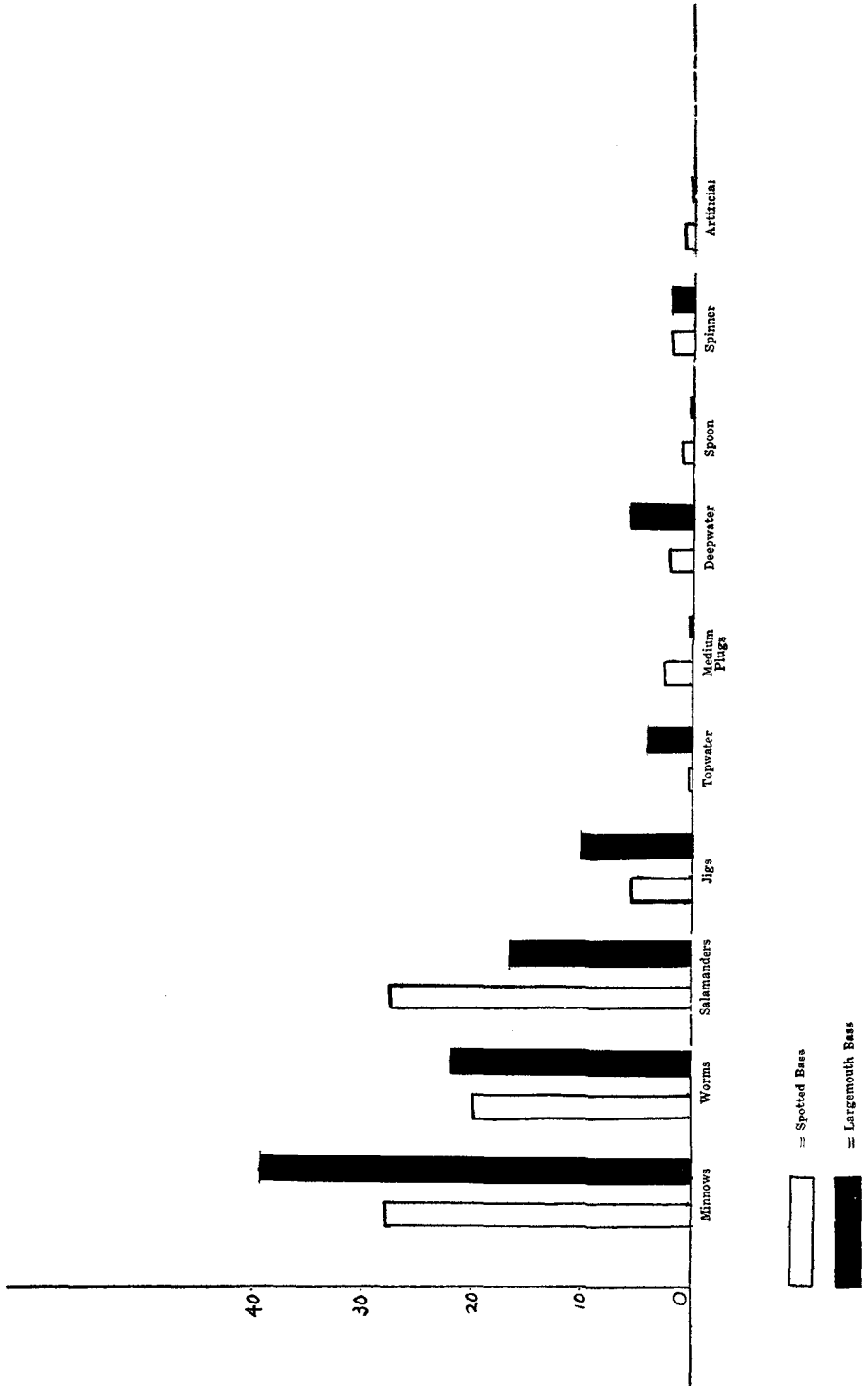
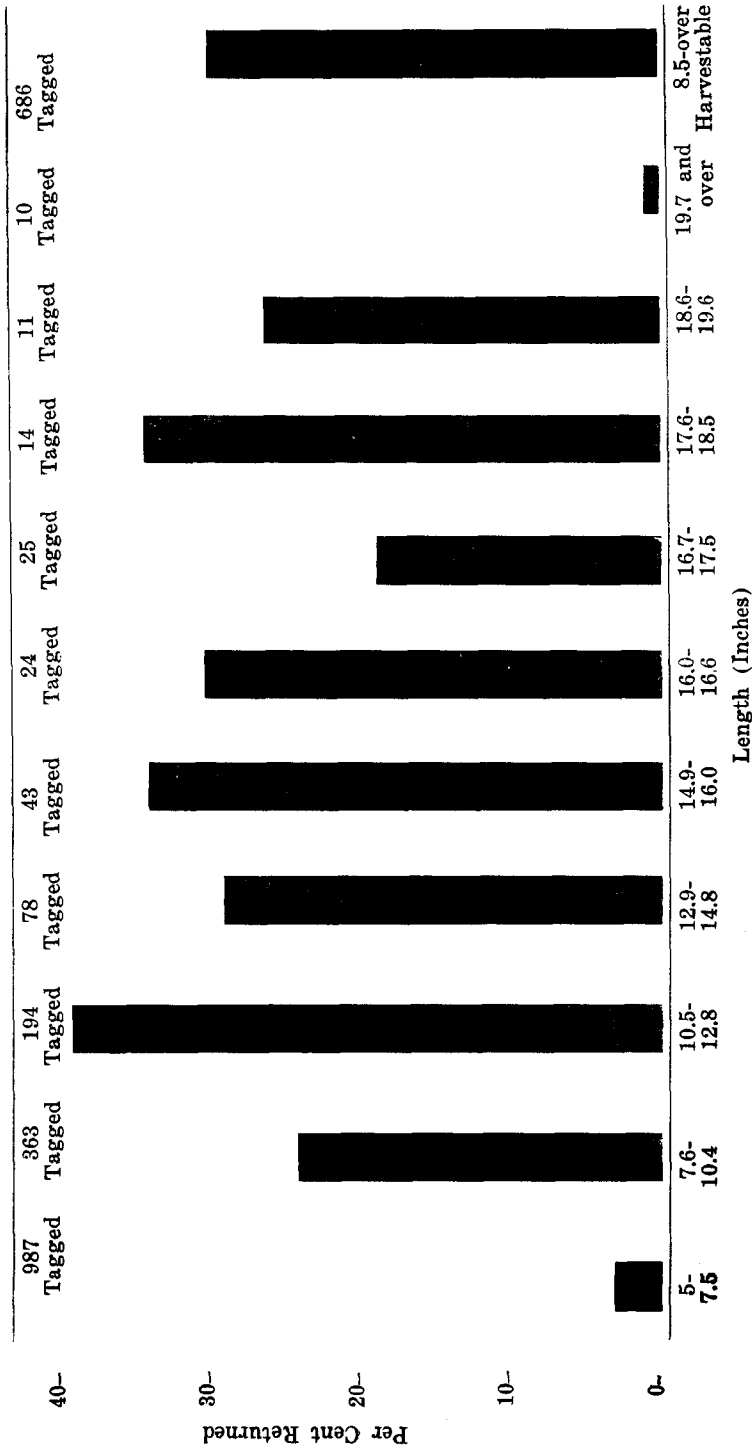


Table No. 8. Number of Spotted Bass Tagged and Per Cent of Tags Returned from February 25 to June 16, 1962.



HARVEST RATE AND TOTAL HARVEST FROM TAG RETURNS AND CREEL CENSUS

The rate of harvest is one of the most important factors in determining the desirability of a fish species as a sport fish. If the species in question is readily caught by the fisherman and can still maintain a good population of catchable-size fish, then this requirement is fulfilled.

SPOTTED BASS

The per cent harvest of the Spotted Bass for the period involved which was for only the spring fishery is relatively high compared to those reported for other bass species.

The harvest rate of catchable-size Spotted Bass in this study was slightly over thirty per cent for the four and one-half month period that the study involved (Table 8). This is a minimal figure assuming the catchability of tagged and untagged fish was the same.

Several factors involved in the study could have caused this per cent harvest to be lower than the actual harvest.

Since tagging was not completed until after the fishing season had begun as explained earlier, any fish caught before this time would add to the per cent harvested.

Although there was considerable interest in the program, there was undoubtedly some tags which were not turned in that would increase the number of tagged fish caught. Reports were also received of tagged fish being caught and re-released by interested sportsmen.

If there were any tagging mortality or if any of the tags were lost from the fish, this would also add to the per cent harvested by reducing the number of originally tagged fish on which the harvest rate is based.

If all these factors were known, the harvest rate would have been higher.

The calculated bass fishing pressure from creel census for the period involved is approximately twelve thousand man-hours or about 1.2 hours per acre for this ten-thousand acre impoundment. Using the mean catch rate of 0.247 bass an hour (Table 7), the total catch for bass fishermen was 2,964 bass in the four-month period. If thirty-five per cent of the total catch was taken by fishermen fishing for other species, then approximately 4,560 bass would have been removed from the lake during the study period. This is a catch of 0.46 bass per acre.

The harvest rate for tagged fish of harvestable-size (8.5" and over) was thirty-one per cent. If the total catch represents this per cent of the total population, then the total population in the lake was approximately 14,710 Spotted Bass of harvestable size. This is a concentration of 1.47 harvestable Spotted Bass per acre.

Although the tagging study was not carried out later than June 16 due to the loss of tags, the creel census continued and total catch and pressure is available for the remainder of the season from June 17 to December 2.

A very good fall season for Spotted Bass was experienced during this period. Bass fishermen spent approximately 29,660 hours fishing and caught a calculated number of 11,241 Spotted Bass. Only three per cent of the total catch was caught by fishermen not fishing for bass. This brings the total catch to 11,589 Spotted Bass from June 16 to December 2.

The combined catch for the season of March 1 to December 2 was 16,149 Spotted Bass, or 1.61 fish per acre.

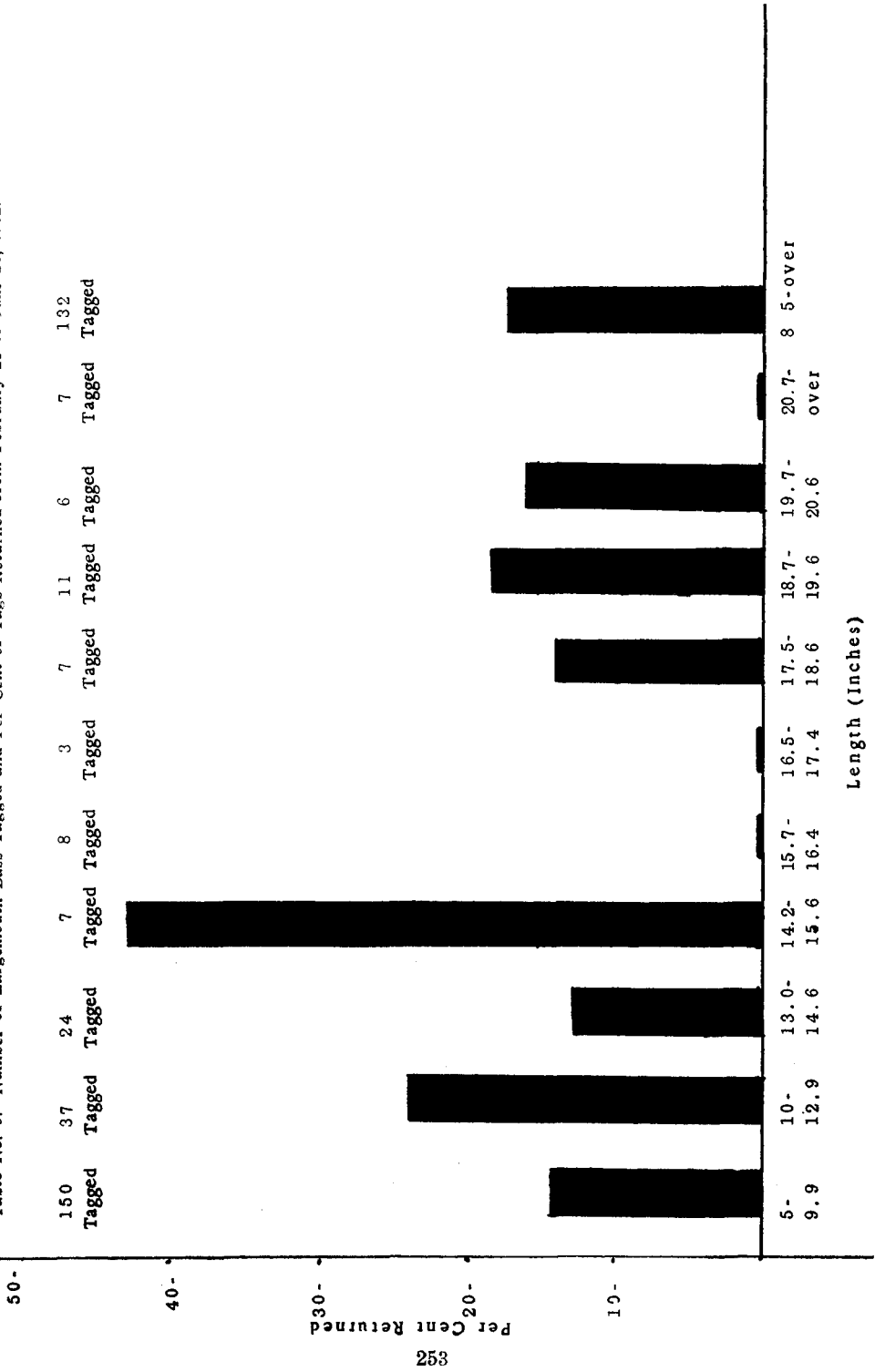
The combined fishing pressure for this period was 41,660 hours for a bass fishing pressure of 4.17 hours per acre.

The fish taken during the fall fishery are mostly small fish in their second and third year. This is the reason the total catch appears to exceed the total calculated population. These fish caught in the fall are primarily recruitment that have entered the harvestable-size class this season.

The increased harvest during the fall months does indicate, however, that a much higher percentage harvest would have been realized if the tag used could have been retained through the fall fishery.

The number of fish tagged and the harvest rates are broken into length groupings (Table 8) using a length frequency. The groupings

Table No. 9. Number of Largemouth Bass Tagged and Per Cent of Tags Returned from February 25 to June 16, 1962.



Per Cent Returned

Length (Inches)

do indicate age of fish fairly accurately up to four years. After this time, there is considerable overlap of ages between groupings.

The small fish of 5-7.5 inches showed the lowest harvest rate since they were actually below catchable size. The reason for tagging these small individuals was to determine the catch rate of young fish entering the fall fishery. However, most of these tags were lost before the fish were large enough to enter the fishery.

Fish in the 10.5 - 12.8 length range showed the highest rate of return at almost forty per cent. The other groups show very close agreement in per cent of tagged fish caught.

The grouping of harvestable-size fish over 8.5 inches, which can be considered as the fishable population, had a thirty-one per cent return as previously stated.

LARGEMOUTH BASS

The per cent returns for the Largemouth Bass tagged (Table 9) is given for a comparison of these returns with the Spotted Bass. Since much more information is available for this species, a comparison of the two fish on the basis of harvest rates and other factors is valuable in establishing the relative suitability of the Spotted Bass as a sport fish.

The number of Largemouth Bass tagged is much smaller than the Spotted Bass since they are much less abundant in the impoundment. The number of fish tagged in some of the groupings is so small that reaching a valid conclusion for the data is difficult. However, the total number of fish tagged of harvestable size is of such magnitude that a comparison can be made.

Of the 132 harvestable-size Largemouth Bass tagged, only 23 were returned for a 17.4 per cent harvest. This low return could be explained by the fact that since the population is primarily Spotted Bass, the fishermen concentrate on this species and not on the Largemouth. However, this is not the situation as determined by the fishing pressure distribution and fishing methods.

The fishing pressure continued heavy over the period that Largemouth Bass tag returns were being received and continued even after the returns and the catch rate was so low as to make fishing for them unproductive (Tables 1 & 2).

The baits that were used are the same baits used for Largemouth in the other lakes in the state. The salamander, minnows and worms are the three baits most commonly used for Largemouth fishing in this section.

Fishing methods for the two species have been shown to be very similar in this study.

On the basis of the data presented, it appears that the Spotted Bass is at least as readily caught as the Largemouth Bass and all indications are that it is more easily taken by the sport fisherman.

ESTHETIC VALUE

Since this Spotted Bass fishery is unique, being the only such fishery of magnitude in the state, fishermen's reaction to this fish and fishery have been observed. Comments regarding the fish's appearance, fighting qualities, and palatability are complementary.

Although the Spotted Bass is not inclined to jump when hooked as readily as the Largemouth; however, its speed, power and endurance, according to the fisherman, is greater for its size.

The only derogatory remarks that have been made regard the fish's size. The growth rate of the Spotted Bass is somewhat slower than the Largemouth Bass and it does not reach such a large size. Six pounds is the largest Spotted Bass recorded from this impoundment and fish over five pounds are rare. The reason for the small size of the fish taken is probably a result of the high rate of harvest under the heavy fishing pressure that is applied.

SUMMARY

The fishery and population density of Spotted Bass at Lake Allatoona, a ten-thousand-acre artificial impoundment in northwest Georgia, is described from the results of a tagging study and creel census.

The spring fishery for Spotted Bass started around March 1 and continued with a good rate of success until the middle of May.

The optimum fishing temperature on the basis of tag returns and catch rate was from 50-65° Fahrenheit, with the highest catch rate being recorded at 60-65 degrees.

The fishing methods for Spotted Bass parallel those of the Largemouth very closely.

In the spring, they are readily taken throughout the day and are not restricted to early morning and late afternoon high activity periods.

Spotted Bass are taken on a wide range of both artificial and live baits with live baits showing the highest preference by fishermen and the greatest number of tag returns.

Most of the Spotted Bass were taken at depths of less than six feet during this early spring period.

The catch of harvestable-size tagged Spotted Bass for the March 1 to June 16 period was approximately thirty-one per cent.

From this harvest rate and the total catch from creel census, it was determined that there was approximately 14,710 catchable-size Spotted Bass in the impoundment at that time or about 1.47 fish per acre.

The total catch of Spotted Bass for the March 1 to June 16 period was approximately 4,560 fish for a harvest of 0.46 fish per acre. The fishing pressure exerted to obtain this harvest was approximately 12,000 man-hours or about 1.2 hours per acre.

The total catch computed for creel census for the remainder of the seasons up to December 2, brought the total catch for the season to 16,149 Spotted Bass or approximately 1.61 bass caught per acre.

The total bass fishing pressure for the entire season was 41,660 hours or a pressure of 4.17 hours per acre.

The majority of the fish taken in June 17 to December 2 period was two to three-year-old fish just entering the fishery.

The Spotted Bass harvest rate was much higher than for Largemouth Bass tagged simultaneously. On the basis of this study, the Spotted Bass appears to maintain a good density of population under heavy fishing pressure and a high rate of harvest in the fourteen-year-old impoundment involved.

The other sport fishing qualities of this species indicate that the Spotted Bass is a highly desirable sport fish that might well be used in other situations where it does not occur.

BIBLIOGRAPHY

Kirkland, Leon 1962. "A Tagging Experiment On Spotted and Largemouth Bass Using The Electric Shocker and The Petersen-Disc Tag." Proceedings of the 16th annual conference, Southeastern Association of Game and Fish Commissioners, October 15-17, 1962, Charleston, South Carolina.