COMPARISON OF POPULATION ESTIMATES OF LARGEMOUTH BASS IN FORREST LAKE, MISSOURI, UTILIZING A BASS TOURNAMENT AND AN ELECTROSHOCKER FOR COLLECTION OF RECAPTURES

by
GARY D. HICKMAN[1]
Fisheries Management Biologist
Missouri Department of Conservation
and
KERRY W. HEVEL[1]
Missouri Department of Conservation

ABSTRACT

This study was designed to obtain population estimates of largemouth bass in 703-acre Forrest Lake, Missouri, and also to compare population estimates obtained using electrofishing and tournament angling as recapture methods. A total of 283 electroshocked bass was marked with floy tags during September 30—October 4, 1974. Recaptures obtained during a two-day (October 12-13, 1974) bass fishing tournament yielded a population estimate of 1,203 bass over 250mm (10 in) in total length. During October 15-17, 1974, bass were resampled by electrofishing resulting in a population estimate of 1,032 bass over 250mm in length.

INTRODUCTION

Forrest Lake has provided anglers in the north Missouri with excellent white crappie, largemouth bass and channel catfish fishing; but during the past few years, the quality of largemouth bass fishing in Forrest Lake has deteriorated. The reason for this decline is unknown. The overall objective of the Forrest Lake studies was to determine if the lake could support a larger bass population. To do this, an estimate of the size of the bass population was needed.

The most widely used method of determining the size of bass populations is the mark and recapture census. Largemouth bass are usually collected for marking or tagging by electrofishing. Recaptures, however, may be taken by a variety of methods including cove rotenone, creel census, electrofishing or the relatively new technique of using bass fishing tournaments (Holbrook *et al.*, 1972).

Swingle, *et al.*, (1965) found that while the electroshocker was an effective tool to capture bass, it appeared that marked and unmarked fish were not equally vulnerable to capture. To counteract this potential bias, angling should give a more accurate population estimate since some fishermen would be fishing in deep water where electroshocking is inefficient (Grinstead and Wright, 1973). Therefore, it was decided to estimate bass populations using two recapture methods: electroshocking and tournament angling.

MATERIALS AND METHODS

Forrest Lake is a relatively shallow (maximum depth—18 meters) lake located in the middle of Thousand Hills State Park in north central Missouri. The lake was constructed in the fifties by the city of Kirksville to be used as a water supply reservoir. The lake drains approximately 10,000 acres of fertile cropland.

During the week of September 20 through October 4, 1974, largemouth bass 250 mm (10 in) or greater in total length were tagged using numbered, fluorescent orange floy tags. The bass were collected mainly during daylight hours using a boat-mounted DC electroshocker. The fish were measured and weighed and were tagged adjacent to the soft rays of the dorsal fin before being released in the same general area of collection.

Nineteen fishermen competed in a tournament on Forrest Lake which began at 7 a.m. on October 12 and ended at 12 noon October 13. Only bass over 300 mm (12 in) in length were brought to the weigh-in station. Anglers were instructed to measure and record all bass caught between 10 and 12 inches and note tag numbers when present before releasing them. All bass brought to the weigh-in station were dipped into a bath of 10 percent Furacin and then placed in a 243 cm x 122 cm x 122 cm holding net until the end of the tournament after which time all fish were released back into the lake. During October 15-17, 1974, the lake was sampled by electrofishing to obtain recaptures for an independent population estimate.

Population estimates were made using the formula suggested by Ricker (1958):

---

[1] Tennessee Valley Authority Division of Forestry, Fisheries, and Wildlife Development, Norris, Tennessee 37828.

$$N = \frac{M(C+1)}{(R+1)}$$

where
- N = estimated population
- M = number of fish marked
- C = number of fish captured
- R = recaptures of marked fish

The population estimates were broken down to various size groups of bass for better evaluation from a management viewpoint

RESULTS

A total of 283 largemouth bass were tagged and released in Forrest Lake prior to the tournament. Eighty-four bass over 250 mm in total length were caught during the fishing tournament; of these, 19 were recaptures. Using Ricker's formula, a population estimate of 1,203 bass (1.71 per surface acre) over 250 mm in length was obtained. This was further broken down into number of bass over 300 and 380 mm in length (Table 1). The fishing tournament produced 38 bass over 300 mm in length, with 12 of these being recaptures. These data yield a population estimate of 342 bass over 300 mm in length or 0.49 bass per acre larger than 300 mm. Only 14 bass over 380 mm (15 in) in length were caught during the tournament. Five of these fish were recaptures yielding a population estimate of 105 bass over 380 mm or 0.15 per acre.

Using the shocker, 112 bass over 250 mm in length were collected after the tournament. Of these, 30 were recaptures resulting in a population estimate of 1,032 bass (1.47/acre) over 250 mm in length in Forrest Lake. When considering only bass over 300 mm in length, 44 bass were collected with 11 of these being recaptures. This resulted in a population estimate of 428 bass over 300 mm or 0.61/acre. Thirteen bass over 380 mm in length were collected by electrofishing. Of these, 5 were recaptures yielding a population estimate of 98 bass or 0.14/acre in Forrest Lake.

Estimates were also made by combining the data for both collection methods (Table 1). A total of 196 bass over 250 mm in length were collected using both collection methods with 49 recaptures giving a population estimate of 1,115 bass over 250 mm or 1.59/acre. Eighty-two bass over 300 mm were taken by both methods with 23 of them being recaptures. This data gives a population estimate of 394 bass over 300 mm or 0.56/acre. There were only 27 bass over 380 mm in length collected using both methods with 10 of these being recaptures resulting in a population estimate of only 107 bass over 380 mm in length or 0.15/acre in Forrest Lake.

DISCUSSION

The two independent estimates of the numbers of bass in Forrest Lake were quite close. This suggests that either the estimates are accurately depicting the population, or both sampling techniques are sampling from only a portion of the total population. Swingle, et al., (1965) discovered that population estimates of largemouth bass in a 3.5-acre experimental pond, utilizing electroshocking and angling to collect recaptures, were found to be in error by approximately 50 percent which was attributed to bias resulting from sampling only a portion of the total population. However, their study extended over an eight-month period and the authors stated that a more dependable estimate could be obtained by intensive sampling during a shorter time period. In this study, there was no reason to assume that fishermen were only fishing the areas which had been sampled by our electroshockers. Therefore, we conclude that the biases introduced by these two recapture methods were probably not the same.

The population estimates were broken down into different size groups to determine if there was a drastic reduction of any particular size group of fish and if either estimate was size biased. It appears as though high mortality begins as the bass reach 300 mm in length. Of the total population, 71 percent of the bass are between 250 to 300 mm in total length (Figure 1). The high mortality after 300 mm is probably caused by fishermen harvesting bass. Apparently the two recapture methods are not size biased since both methods resulted in similar numbers of bass in each size group. Because of the close similarity of the estimates the results of both recapture methods were combined (Table 1). This combination lowers the confidence intervals of the overall estimates and resulted in an overall estimate of 1,115 bass (C.I. = 843-1,387) in Forrest Lake.
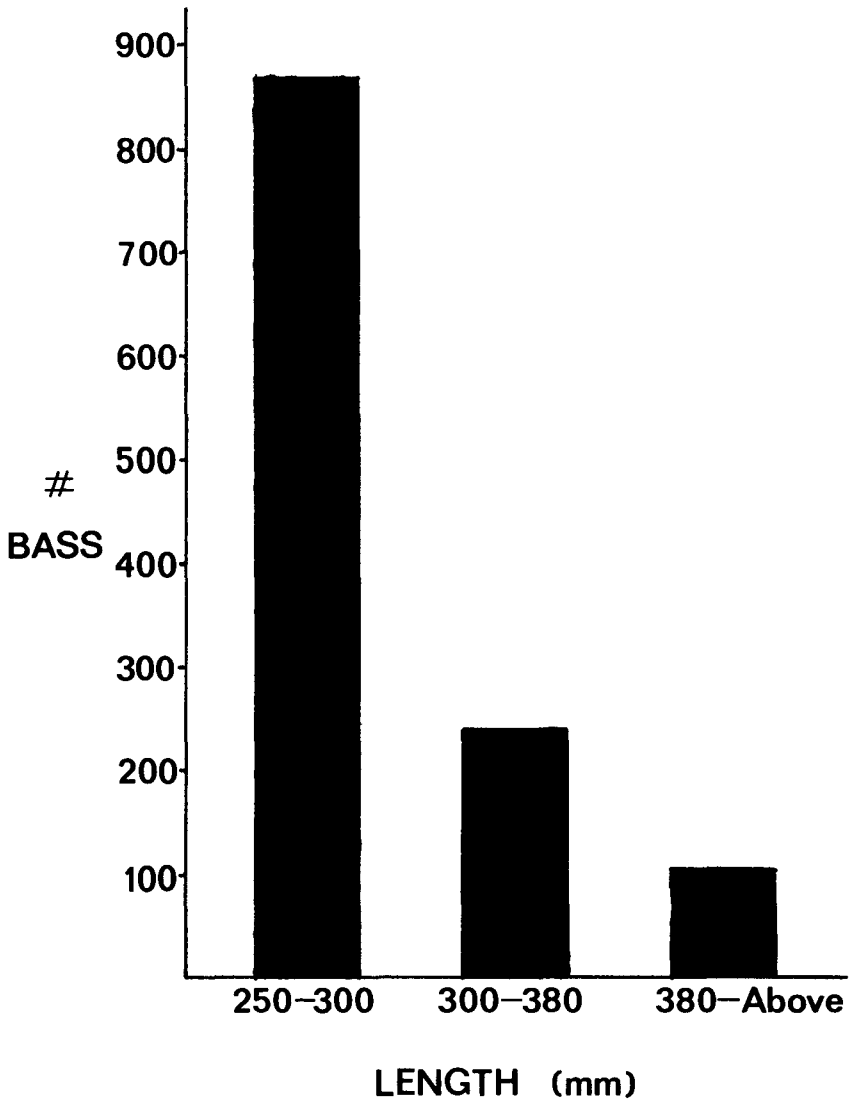
Figure 1. Tournament estimates of different size groups of largemouth bass in Forrest Lake, Missouri.

Table 1. Population estimates of bass over 250, 300, and 380mm in length derived from collections made using a bass tournament, electroshocker, and a combination of both.

Collection Method	M	C	R	$\frac{M(C+1)}{(R+1)}$	Bass Acre	Confidence Interval
Bass Over 250mm (10 in.) in Length						
Tournament	283	84	19	1,203	1.71	733-1,673
Shocker	283	112	30	1,032	1.47	716-1,348
Combined	283	196	49	1,115	1.59	843-1,387
Bass Over 300mm (12 in.) in Length						
Tournament	114	38	12	342	0.49	188-496
Shocker	114	44	11	428	0.61	216-640
Combined	114	82	23	394	0.56	258-530
Bass Over 380mm (15 in.) in Length						
Tournament	42	14	5	105	0.15	39-171
Shocker	42	13	5	98	0.14	38-158
Combined	42	27	10	107	0.15	57-157

LITERATURE CITED

Grinstead, B. G. and G. L. Wright, 1973. Estimation of black bass, *Micropterus* spp., population in Eufaula Reservoir, Oklahoma, with discussion of techniques. Proc. Okla. Acad. Sci. 53: 48-52.

Holbrook, J. A., D. Johnson, and J. P. Strzemienski, 1972. Management implications of bass fishing tournaments. Proc. Southeastern Assoc. of Game and Fish. Comm. 26: 320-324.

Ricker, W. E., 1958. Handbook of computations for biological statistics of fish populations. Fish. Res. Bd. Canada, Bull. 119: 300 pp.

Swingle, W. E., R. D. Smitherman, and S. L. Smith, 1965. Estimations of bass numbers in a farm pond prior to draining with electroshocking and angling. Proc. Southeastern Assoc. of Game and Fish. Comm. 19: 246-253.