These include Goatweed (*Croton capitatus*) and Common Lespedeza (*Lespedeza striata*).

Native annuals and perennials found on these strips include:

Flowering spurge ..... (*Euphorbia corollata*)
Noseburns ..... (*Tragia* spp.)
Queen's Delight ..... (*Stillingia sylvatica*)
Tropic Croton ..... (*Croton glandulosa*)
Pencil Flower ..... (*Stylosanthes biflora*)
Butterfly Pea ..... (*Centrosema virginianum*)
Wooly Wild Bean ..... (*Strophostyles helwola*)
Milk Pea ..... (*Glactia* spp.)
Partridge Pea ..... (*Cassia fasciculata*)
Dollar Peas ..... (*Rhynchosia* spp.)
Cracca ..... (*Thelphrosia* spp.)
Tick Clovers ..... (*Desmodium* spp.)
Beakrushes ..... (*Rhynchospora* spp.)
Nutrushes ..... (*Scleria* spp.)
Foxtail Grass ..... (*Seteria lutescens*)
Florida Paspalum ..... (*Paspalum floridanum*)
Pitchfork Paspalum ..... (*Paspalum bifidum*)
Fringeleaf Paspalum ..... (*Paspalum ciliatifolium*)
Panic Grasses ..... (*Panicum* spp.)
Swamp Sunflower ..... (*Helianthus angustifolius*)
Coneflowers ..... (*Rudbeckia* spp.)
Beefsteak-plant ..... (*Perilla frutescens*)
Ruellia ..... (*Ruellia* spp.)
Sorrel ..... (*Oxalis* spp.)
Green silkyscale ..... (*Anthaenantia villosa*)

After stand establishment longleaf pine continues more favorable to quail than either loblolly (*Pinus tadea*) or slash pine (*Pinus caribaea*). A number of factors are responsible for this and include wider spacing, thinner crowns, slower rate of crown closure, and the more liberal use of fire as a silvicultural tool in longleaf management.

We have some color slides prepared that show both the plants invading the disk areas and some plants that have been introduced to similar strips plowed as pre-suppression fire breaks.

TECHNICAL FISH SESSION

RESULTS OF AN OPENING WEEK CREEL CENSUS AND TAGGING STUDY ON THREE STATE-OWNED LAKES

By CHARLES C. BOWERS and MAYO MARTIN *
Kentucky Department of Fish and Wildlife Resources
Frankfort, Kentucky

ABSTRACT

The greatest concentrations of fishermen on Kentucky's state-owned lakes have been observed to occur during the first week following the opening of these lakes to fishing. To measure the impact of this surge of fishermen on an unsuspecting fish population, an opening week creel census and tagging study was conducted on 3 dissimilar state-owned lakes. In each lake bass were caught by angling and tagged. Tag returns were remarkably similar: 27%, 30.9%, and 27.5%. Evidence seemed to indicate strap jaw tags adversely affected the growth of tagged bass. In the creel census 70% of the largemouth bass

* Co-authors.

Micropterus salmoides, caught in the first week from the 3 lakes were taken in the first 30 hours. The data indicates largemouth bass have a capacity for learning. The bluegill, *Lepomis macrochirus,* catch was small. A different opening date is recommended.

INTRODUCTION

In recent years Kentucky's lake building program has been turning out an increasing number of new lakes to be stocked and managed for public fishing. These lakes range in size from 33 to 305 acres.

Kentucky's Department of Fish and Wildlife Resources has had a few state-owned lakes for many years, and has stocked a large number of medium-sized lakes for municipalities, private individuals, companies, and clubs. The responsibility of ownership of these many new state lakes, and the fact that so many were being stocked at one time, brought numerous problems sharply into focus.

The lakes are located in areas with inadequate fishing waters. In each area local sportsmen's clubs, and to a certain extent a large percentage of the surrounding population, have labor or monetary interest in the land acquisition and land clearing for the lake. Local enthusiasm mounts with the construction of the dam, filling of the basin with water and the year-long wait for the largemouth bass fry to grow to maturity and spawn the first time, and finally burst into a circus of fishing activity with the grand opening of the lake to fishing. This sudden burst of fishing is directed primarily at a lake full of uneducated largemouth bass. During the first week a large percentage of the catchable bass are caught out.

This opening surge of fishing then is of vital interest to the Department in making its plans for the stocking, opening, and management of lakes now being built and those to be built in the future.

The authors of this paper were assigned to this problem in the spring of 1955. The purpose of this investigation was to determine what happens during the opening week of fishing in state lakes.

The general plan was simple. Several newly stocked lakes were chosen and as many bass as possible were tagged on regular inspection trips. During the initial week of fishing a creel census was taken at each lake.

DESCRIPTION OF LAKES

Three lakes were chosen for study purposes. These lakes were selected mainly because they were being opened at approximately the same time, but fortunately they were entirely different, as described below, and were at least 140 miles apart in different soils regions.

Marion County Sportsmen's Club Lake, hereafter referred to as Marion County Lake, is a 33-acre lake with a small watershed (4.5 to 1), located 5 miles southeast of Lebanon in central Kentucky, in a region called the Knobs because of the curious conical hills. It has no farmland on the watershed. The main source of fishermen are from nearby towns and farms. On May 20, 1955, the methyl orange alkalinity was 21 p.p.m. and total hardness (as $CaCo_3$) 35 p.p.m. The water was a brown color with a Secchi Disk reading of approximately 2 feet. The lake was stocked when it reached 15 acres in size. At the time of the creel census the lake was 19 acres in size. It has one access point.

Smoky Hollow Lake is a 43-acre lake located in Carter Caves State Park in the extreme northeastern part of Kentucky. It has a 8,400-acre watershed (195 to 1) of high wooded hills. A small percentage of the watershed is covered by narrow bottomland farms. Methyl orange alkalinity measured 124 p.p.m. and total hardness (as $CaCo_3$) was 142 p.p.m. The immediate area near this lake is not densely populated, however, large centers of population are within easy driving range. The lake was full and very clear when the census was taken. One good access point and several more difficult ones are available.

Bullock Pen Lake is a 178-acre lake located in north central Kentucky about 30 miles south of the Cincinnati-Covington-Newport urban area of about one

million population. It drains a series of fairly low ridges and valleys with about a 20 to 1 ratio of watershed to lake. The watershed is mostly farmland with good soils. The water maintains a heavy bloom most of the time. Methyl orange alkalinity was 106 p.p.m. and total hardness (as $CaCo_3$) was 156 p.p.m. when checked in the summer of 1955. At least 4 good public access points are available to fishermen, with other access points through private roads. At the time of stocking and creel census the lake was approximately 150 acres in size.

TAGGING AND TAG RETURNS

The primary interest and concern of this study was the large initial catch of largemouth bass in newly opened state lakes. For this reason, emphasis was placed on catching and tagging bass, but a few fish of other species were tagged as they were caught.

Tagging Procedure

All of the fish tagged were taken by hook and line. Before these lakes were opened to fishing, the fish were extremely easy to capture with hook and line. The best 4 hours of fishing and tagging resulted in 108 largemouth bass, 1 Kentucky bass, 1 smallmouth bass, and 1 bluegill. All of the fish were caught on small spinning lures, mainly spinners and spoons with porkrind. All of the bass were tagged in the upper jaw with numbered monel strap tags, bearing the legend "Game and Fish, Frankfort." The earliest tagging was done with No. 1 strap tags, but most of the fish were tagged with No. 3 strap tags. The total length of each fish was measured to the nearest tenth of an inch on a stadard fish measuring board.

Tag Returns

Previous experience with catches of bass on opening day had prompted postponing the opening until 1:00 p. m., and reducing the creel limit to five bass per fisherman. Bullock Pen was opened at 4:00 p. m. In spite of this, the tagging returns from the three lakes during the first five days ran higher than have been reported for an entire season in many older lakes. As is shown in Figure No. 10, the percentage of tagged bass recaught in the three lakes was 27.1, 30.9, and 27.3. These percentages were based on a return of 43 out of 159 tagged bass at the 19-acre Marion County Lake, a return of 46 of 149 tagged bass from the 43-acre Smoky Hollow Lake, and a return of 18 of 66 tagged bass at the 178-acre Bullock Pen Lake.

Since the opening week, on Marion County Lake, there have been additional tags sent in by the Conservation Officer. There were six additional tags for 1955 and 25 for 1956. This means 46.5% of the original fish tagged have been recaptured.

Most of the very large percentages of tagged largemouth bass returns have been reported from smaller lakes. The returns for larger lakes are usually much smaller. Eschemeyer (1942) reported a June recapture of largemouth bass as 14.2% with a yearly percentage of 18.5% at Norris Lake in Tennessee. Also at Norris Lake, Manges (1950) reported an average return for a 5-year period of tagging largemouth bass as 18.4%. Fisher (1953) reported getting back 19.7% of the tagged bass at the 5,000-acre Millerton Lake in California.

A few workers have reported high yields of largemouth bass from small lakes and ponds. In ponds newly opened to fishing, Surber (1947) reported the capture of 71 per cent of the bass from two separate small ponds, each less than an acre in size. The fish were removed from one of these ponds in a 49-day period, the other pond was fished for a 55-day period.

Bennett (1954) reported large percentages of marked fish being caught certain years at Ridge Lake, Illinois. The season's recatch varied from 9.4% to 62.4% in this 18.1 acre lake.

Evidence That Jaw Tags Effect the Growth Rate

Various workers have intimated or presented evidence that fish tagged with strap tags in the jaw do not grow as well as untagged fish. Pechacek (1956) presented evidence that jaw tags adversely affected the rate of growth and condition of cold-water fish in Wyoming. On the other hand, Cooper and

Benson (1951) found that the rates of growth of hatchery-reared trout changed little after marking. The evidence at Marion County Lake seems to indicate that jaw tags result in a slower rate of growth.

The mean length of 43 tagged largemouth bass recaptured 9/15-18/55 was 10.4 inches while the mean length of 60 untagged bass captured at the same time was 11.1 inches. Since the mean length of 108 bass tagged on 7/19/55 was 9.9 inches, it would appear that the tagged bass grew only 0.5 inches as compared with 1.2 inches for the untagged bass.

An interesting side light to this study is the behaviour of the fish that were captured while tagging was being carried on. Two tagged bass actually rose to the artificial lure again and were recaught the same day they were tagged. One of these crossed the Marion County Lake and was retaken about 400 to 500 yards from where it was tagged. In all, there were 5 recaptures during the 3 days of tagging at Marion County Lake. There were 2 recaptures at Smoky Hollow during 2 days of tagging. At Bullock Pen Lake there was only 1 recapture during 2 days of tagging.

STOCKING RECORD

The 3 study lakes were stocked with the same species and sizes of fish used in Kentucky's farm pond program. The original stocking was intended to form the basic population to which other species may be added later.

Marion County Lake (then 15 acres)			
Largemouth Bass	1,500	fry	5/17/54
Bluegill	400	2½" to 6"	5/28/54
Smoky Hollow Lake (43 acres)			
Largemouth Bass	5,000	fry	5/31/54
Bluegill	900	adult	7/28/54
	780	adult	8/11/54
Bullock Pen Lake (then 150 acres)			
Largemouth Bass	15,000	fry	5/18/54
Bluegill	1,566	adult	7/ 6/54
	1,600	adult	7/29/54
Redear Sunfish *Lepomis microlophus*	500	2"	12/ 8/54

TABLE I

OPENING WEEK CREEL CENSUS AT MARION COUNTY LAKE

	Bass Caught	Bluegill Caught	Total Fish	Fishermen	Total Hours Fished	Per Fisherman: Bass	Bluegill	Fish	Bass Per Hour	Fish Per Hour	Avg. Cost Per Fisherman	Total Cost Per Day	Bass Caught by: Live	Art.
9/15/55	396	13	409	235	441.24	1.69	.06	1.74	.90	.93	$1.65	$388.70	100	296
16	68	2	70	75	141.58	.91	.03	.93	.48	.49	2.12	159.00	31	37
17	37	6	43	49	118.50	.76	.12	.88	.31	.36	1.31	63.95	20	17
18	39	0	39	67	80.75	.58	.00	.58	.48	.48	1.10	73.95	26	13
TOTALS	540	21	561	426	782.07	1.27	.05	1.32	.79	.71	$1.61	$685.60	177	363

	* Bass Caught by Avid Fishermen: Fishermen	Fish	Hours	Bass Per Avid Fisherman	Bass Per Hour	* Bass Caught by Casual Fishermen: Fishermen	Fish	Hours	Bass Per Casual Fisherman	Bass Per Hour
9/15/55	115	216	251.08	1.88	.86	120	180	190.16	1.50	.95
16	31	50	75.00	1.61	.67	44	18	66.58	.41	.27
17	24	28	74.25	1.17	.38	25	9	44.25	.36	.20
18	29	27	44.00	.93	.61	38	12	36.75	.32	.33
TOTALS	199	321	444.33	1.61	.72	227	219	337.74	.96	.65

* The avid and casual fishermen were arbitrarily divided on the basis of how many fishing trips they said they made per year. If they made more than 50 trips per year they were classed as avid fishermen and less than 50 were classed as casual.

TABLE II

OPENING WEEK CREEL CENSUS AT SMOKY HOLLOW LAKE

	Bass Caught	Bluegill Caught	Longear Sunfish Caught	Fishermen	Total Hours Fished	Per Fisherman: Bass	Bluegill	Fish	Fish Per Hour	Bass Per Hour	Cost Per Fisherman	Total Cost Per Day	Bass Caught by: Live	Art.
7/27/55	238	2	–	100	371¼	2.38	.02	2.40	.65	.64	$4.68	$ 468.10	68	170
28	78	2	3	72	302	1.08	.02	1.15	.27	.26	9.54	687.10	24	54
29	55	0	–	60	171¾	.92	.00	.92	.32	.32	4.78	286.50	36	19
30	63	2	–	93	316½	.68	.02	.70	.21	.20	3.59	333.80	37	26
TOTALS	434	6	3	325	1,161½	1.34	.03	1.36	.38	.37	$5.46	$1,775.50	165	269

	* Bass Caught by Avid Fishermen					* Bass Caught by Casual Fishermen				
	Fishermen	Fish	Hours	Bass Per Avid Fisherman	Bass Per Hour	Fishermen	Fish	Hours	Bass Per Casual Fisherman	Bass Per Hour
7/27/55	46	145	185.00	3.15	.78	54	93	186.75	1.72	.50
28	38	54	136.00	1.42	.40	34	24	166.00	.71	.14
29	25	34	72.25	1.36	.47	35	21	99.00	.60	.21
30	38	42	149.75	1.11	.28	55	21	166.75	.38	.13
TOTALS	147	275	543.00	1.87	.51	178	159	618.50	.89	.26

* The avid and casual fishermen were arbitrarily divided on the basis of how many fishing trips they said they made per year. If they made more than 50 trips per year they were classed as avid fishermen and less than 50 were classed as casual.

TABLE III

OPENING WEEK CREEL CENSUS AT BULLOCK PEN LAKE

Date	Bass Caught	Bluegill Caught	Catfish Caught	Total Fish	Fishermen	Hours
8/1/55	187	70	38	295	77	269
8/2/55	228	125	50	403	114	398
8/3/55	42	26	9	77	32	111
8/4/55	55	107	14	176	58	138
8/5/55	23	4	..	27	16	63
TOTALS	535	332	101	968	297	979

	Bass Per Fisherman	Bluegill Per Fisherman	Catfish Per Fisherman	Fish Per Fisherman	Bass Per Hour	Fish Per Hour
1	2.43	0.91	.49	3.8	.70	1.10
2	2.00	1.10	.44	3.5	.57	1.01
3	1.31	.81	.28	2.4	.38	.69
4	.95	1.84	.24	3.02	.40	1.28
5	1.44	.25	..	1.68	.37	.42
TOTALS	1.80	1.11	.34	3.25	.55	1.00

CREEL CENSUS

CREEL CENSUS PROCEDURE

The authors and respective assistants worked separately on Smoky Hollow and Bullock Pen Lakes, but combined their efforts and ideas on Marion County Lake.

Each fisherman was asked as he was quitting, questions concerning his catch, hours spent fishing, cost of his trip, and the average number of fishing trips he made a year. His catch was then examined for tags.

The main access points were covered at Smoky Hollow, but even so at least seventy-one fishermen escaped uninterviewed the first day through rough back trails. Successive days of censusing were fairly complete. At Bullock Pen Lake there were so many good access points that only about half of the fishermen could be checked before they left. This percentage remained the same all week. At Marion County Lake the census was virtually complete, since it had only one entrance.

THE CREEL OF LARGEMOUTH BASS

The impact of a host of eager anglers upon a population of unwary largemouth bass is readily apparent in the creel data (Tables I, II, III). Eight hundred twenty-one bass were caught the first day of fishing in the three lakes. This catch represents 54% of the total number of bass caught in the three lakes the first week. Actually Bullock Pen Lake was not opened until 4:00 p. m. the first day. Most of the fishermen waited until the second day so they would have a full day for fishing. This is reflected in the data because the second day's catch was greater than the first day. If one includes the second day on Bullock Pen with the first day data it increases the catch to 1,049 bass the first 30 hours, or 70% of the total bass catch.

Bass rapidly became harder to catch as the days progressed (Figures 3 and 4). The catch per unit effort shows an immediate drop after the first day, except in Bullock Pen where the drop is more like the other 2 lakes after the second day.

It is believed this drop off is due to the basses' growing knowledge of fishermen and baits, as suggested by Aldrich (1938) and Bennett (1954). This same drop off was reported by Thompson and Hutson (1950), but they did not attempt an explanation.

The data on fish caught by artificial and live baits seems to support the supposition that bass have a capacity to learn. During first day on Smoky Hollow and Marion County Lakes artificial baits took by far the greater number of bass, but by the fourth day live baits were taking more (Figure 9). It is believed this reflects a growing distrust, and a degree of selection by the bass on the basis of experience.

CREEL OF BLUEGILL

Kentucky has a policy of stocking small numbers of adult bluegill per acre. Usually 20 to 50 bluegill per acre are used. Bluegill are stocked prior to the time when the bass have a need for piscivorous diet. This type of stocking is used in an effort to prolong the almost inevitable time when the lake becomes overcrowded with slow growing intermediate sized bluegills.

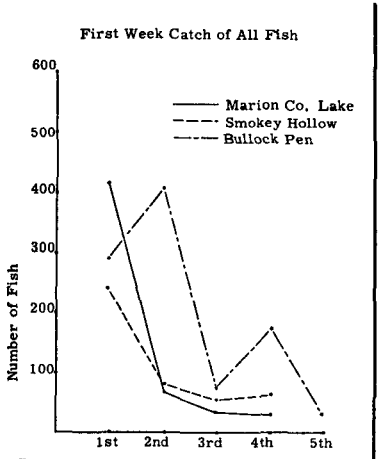

Figure 1

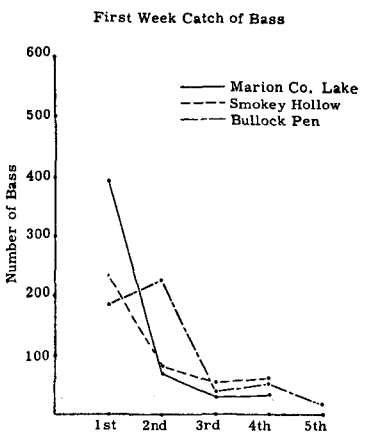

Figure 2

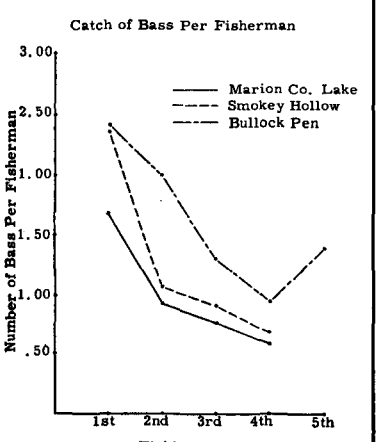

Figure 3

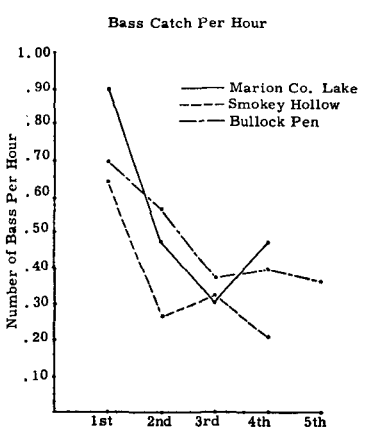

Figure 4

Presumably because of the low numbers of adult bluegill stocked, bluegill entered the creel only in token numbers at 2 of the lakes (Tables I and II). In Bullock Pen Lake (Table III) there was a small bluegill fishery. Three hundred thirty-two bluegill were recorded the opening week.

WILD FISH

Wild fish made up an appreciable percentage of the creel in only one of the 3 lakes studied. Bullock Pen Lake contained a fishable population of black bullhead, *Ameiurus melas*. These bullheads were intentionally planted by uninformed and unidentified persons. Dead bullheads with net marks clearly visible were found near one access point during the winter of 1954-1955. The bullheads caught ranged from 9 to 12 inches long.

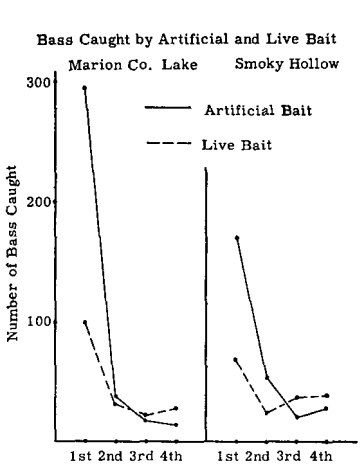

Figure 9

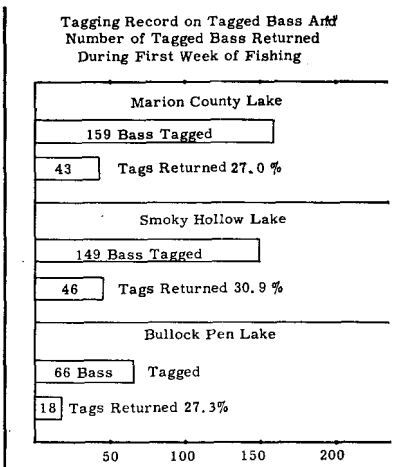

Figure 10

A COMPARISON OF THE LARGEMOUTH BASS CATCH BY AVID AND CASUAL FISHERMEN

Perhaps an explanation is needed regarding what is meant by avid and casual fishermen. It was evident during the creel census of the lakes that so-called "experts" were catching many of the bass. The problem was to devise a method of analyzing this difference. Therefore the data was arbitrarily divided on the basis of how many trips the fishermen made per year. If they made more than 50 trips per year they were classed as avid fishermen and if less than 50 they were classed as causal (Tables I and II). This division may be crude since some fishermen may have a tendency to exaggerate the number of trips they make; however, the division seems to work well in that it strikingly shows a great difference in the catch of the 2 groups. The first day both the avid and casual fishermen made a respectable catch (Tables I and II and Figures 5, 6, 7, and 8). In fact, in the Marion County Lake, the casual fishermen caught more bass per hour the opening day than did the avid fishermen (Table I, Figure 5). After the opening day the avid fishermen caught many more fish per fisherman and per hour (Tables I and II and Figures 5, 6, 7 and 8). This is further evidence that bass learn rapidly and once wary are not easily fooled. Bennett (1954) also wrote that bass lose their vulnerability under intensive fishing and most of the fish are caught by fishermen that might be termed experts, but he presented only a small amount of evidence to support his views.

Since our evidence indicates that bass in becoming increasingly difficult to catch, leave many fishermen fishless it would seem there is a need for additional species of fish. With this in mind, Kentucky is at present experimenting with blue catfish, *Ictalurus furcatus*; channel catfish, *Ictalurus lacustris*; white bass, *Morone chrysops*; walleye, *Stizostedion vitreum*; black crappie, *Pomoxis nigromaculatus*; and redear sunfish, *Lepomis microlophus* to try and find a species which will either retain a degree of catchability or by its habits add to the inexperienced fishermens creel.

RECOMMENDED OPENING DATE

It is believed that January 1 following the first spawn of the originally stocked largemouth bass would be the most desirable date for opening lakes of this type. The fishermen would tend to trickle out to the lake, and therefore the bass would become wary before being exposed to intensive fishing pressure. Perhaps the same number of bass will be caught, however it is anticipated the catch will be spread over a greater length of time.

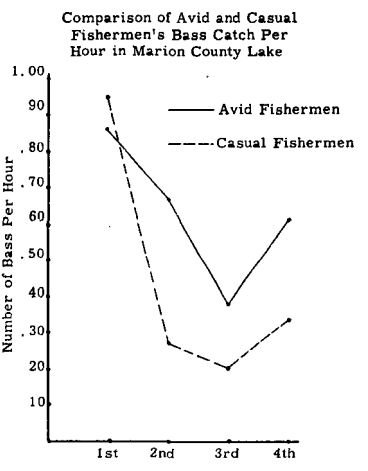

Figure 5

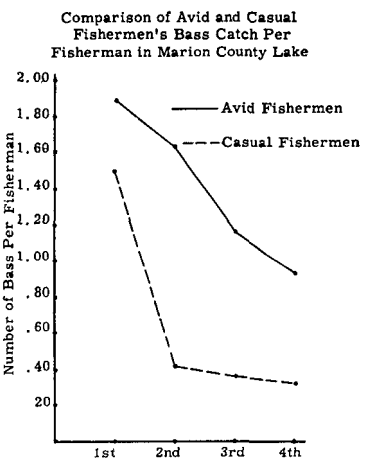

Figure 6

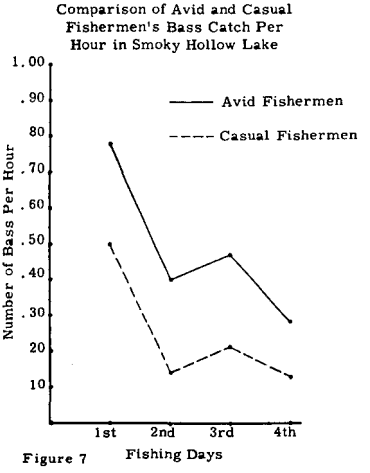

Figure 7

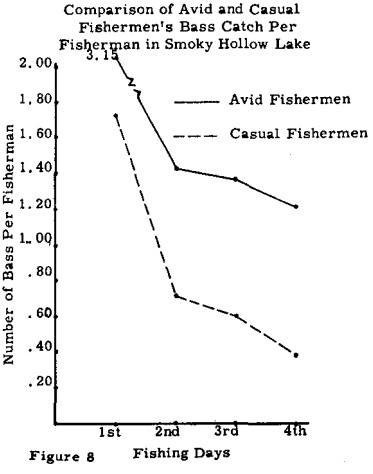

Figure 8

ACKNOWLEDGMENTS

The study was approved and made possible by Mr. Minor Clark, Director of Fisheries, and Mr. Bernard Carter, Chief Biologist. Mr. Lewis Gerow, Mr. William Broughton and Mr. Ray Renaker, Biologist's Assistants, helped tag the bass and helped with the creel census. Mr. Mercer Peters, Chief Chemist, made the chemical analysis of these lakes.

We further wish to acknowledge the assistance of three of the department's Conservation Officers. One officer, Mr. Curtis Lobb, we especially wish to commend because through his efforts we were able to obtain a virtually complete creel at the Marion County Lake.

Other officers that helped with the study, were Mr. Dennis Brandenburg and Mr. Boronlo Jones.

The figures were photographed by Mr. Emile Carpenter and the typing and mimeographing were by Miss Lucille Stewart, Mrs. Betty Sayle, Mrs. Elizabeth Sutherland and Mr. Herbert Fincel.

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INVESTIGATIONS AND MANAGEMENT OF THE DEWEY LAKE FISHERY[1]

By ELLIS R. CARTER

INTRODUCTION

Dewey Lake is an 1,100-acre impoundment formed by a Corps of Engineers' dam across Johns Creek in Floyd County, Kentucky. It contains 17,200 acre-feet of water at an average depth of 15.6 feet. During the period November 1 to April 1, each year, the lake is lowered five feet and covers 880 acres. During this time the lake contains 12,300 acre-feet at an average depth of 14.0 feet. The lake is 16.8 miles long, and averages approximately 1,000 feet in width, with nine major embayments. Normally, it is relatively clear.

The lake was impounded in the spring of 1950, and checks have been made on the fishery by means of rotenone sampling and a general creel census each year since 1951. Rotenone samples have indicated that game fishes have declined both in numbers and weight. The creel census has shown a steady falling off of fishing success to the point where fishing is below a reasonable norm.

In order to determine what factors were causing these conditions, a more intensive study was begun in April, 1954. This study was to include a general creel census, rotenone sampling, and netting and tagging in an effort to estimate the actual numbers of each species present in the lake.

At the end of the first year of study, a part of the problem was believed to be the presence of an over-abundance of shad in sizes too large for forage. At that time a program of management was initiated whereby as many as possible of the shad were to be removed selectively by use of rotenone. This was done in March, 1955, and changes brought about as a result of the shad kill were observed by continuation of the same studies that were made in 1954, except that the creel census was more extensive.

1 Kentucky Federal Aid Project F-8-R.