

populations of carnivorous and forage fish in large reservoirs. Catfish above 16 inches in length are considered to be predators and as such they play an important part in the control of the numbers of fish (including rough fish) present in reservoirs (Swingle, 1954). A unilateral harvest of predatory species by commercial line fishermen fishing for catfish and sport fishermen fishing for bass, crappie, sauger, and catfish without legalized commercial net fishing to control carp, buffalo and other forage species could bring about a reduction in the poundage of predatory game species in large reservoirs. The long-term result could be fewer harvestable sized game fish and the possibility of an unbalanced fish population causing poor sport fishing.

It is recommended, therefore, that the commercial net fishing program allowing the use of trammel and gill nets with a minimum bar-mesh of 3 inches be continued in the TVA lakes and other public waters in Alabama where large populations of non-game fish are present and not adequately harvested.

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HOW MANY OUT-OF-STATE FISHERMEN PURCHASE MORE THAN ONE LICENSE IN KENTUCKY, AND WHERE AND WHEN DO THEY FISH?

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ABSTRACT

Since the distribution of Federal Dingell-Johnson funds to the several states is determined in part by the number of out-of-state licensees fishing in a state, the Federal Government requested that Kentucky check its license sales to determine the number of duplicate purchases in order that the funds might be administered properly. To comply with

this request, the Kentucky Department of Fish and Wildlife Resources asked the Division of Science and Mathematics, Asbury College, to determine for the state the number of duplications which occur annually in the purchase of ten day non-resident fishing licenses.

Carbon copies of 52,500 ten-day non-resident licenses sold in Kentucky in 1960 were made available to the college. The plan of operation was (1) to determine the number of duplications within each of the 120 counties of the state (intra-county duplications), (2) to determine the ratio of such intra-county duplications to the inter-county duplications resulting from the purchase by a licensee of licenses from two or more counties, and (3) to gather concurrently, if possible, as much additional information from the licenses that might be of value to conservation officials, sportsmen, and dock operators.

The first two points deal primarily with repeated license purchases and the last point with interesting information about the fishermen. For this reason, the paper is divided into two main parts. The first and more technical part answers the question, "How many out-of-state fishermen purchase more than one license in Kentucky?"; and the second part answers the question, "Where and when do they fish?"

After all data were gathered, it was found that 3,200 fishermen purchased 3,600 duplicate licenses, or 6.8 per cent of the total license sales for this category. It was also learned that these fishermen made their purchases primarily in the 17 counties which surround the state's five largest man-made lakes. Most of their home states were found to lie to the north of Kentucky. Also determined were the city of residence, the age and sex of the fishermen, the time of year fished, and the occurrence of husband-wife teams.

For the year of the study (1960), 52,548 ten-day licenses were sold. Handwritten, carbon copies of most of these were made available to the investigators. The copies were in serially numbered books of 50 each. (Some books still contained unsold licenses.) A county-by-county count revealed that the number of carbons available in some counties was less than the number of sales reported. Usually, this appeared to be due to the loss or misplacement of one or more books of licenses. Occasionally, it appeared to be due to bookkeeping errors, e.g., reporting the sale of a voided license. No adjustment in the total sales was made for these discrepancies; however, adjustment was made in that the number of legible licenses on hand was used as the basis of the calculations. Compensation for the difference, whether due to illegible copies or to missing copies, was made later. For eight of the 120 counties, no carbons were available. The result of these counts is summarized in Table 1.

The plan of the survey was (1) to determine the number of duplications within each of the 120 counties of the state and (2) to determine the ratio of such intra-county duplications to the inter-county duplications resulting from the purchase by a licensee of licenses from two or more counties.

The Department of Fish and Wildlife Resources office requested that the licenses for each of the 112 counties be kept separate. Thus, a single alphabetization for the entire state, by which all duplications of legible licenses could have been directly ascertained, was ruled out. Instead, the licenses for each of the 112 counties were alphabetized separately.

In the alphabetization process, whenever a duplication occurred within a county, the two or more copies were clipped together with paper clips for easy identification.

TABLE 1.
NUMBER OF LEGIBLE, ILLEGIBLE, AND MISSING LICENSES

<i>Classification</i>	<i>Quantity</i>
Legible from 112 counties	48,610
Illegible from 36 counties	502
Available from 112 counties	49,112
Missing from 25 counties	1,505
Sold in 112 counties	50,617
Unavailable from 8 counties	1,931
Sold in 120 counties	52,548

At first, the number of illegible licenses appeared to be quite high. Many surnames could not be read with certainty. However, often more than one member of a family purchased a license at the same time, as determined by date, address and serial number, and usually one of these members was careful to write the name clearly. In other instances, the issuing agent filled out the name on the non-signature side with sufficient variation to make a confident decipherization possible. (Printing on the part of the agent or licensee was a great aid.) Other times, after the major portion of the names were alphabetized, a doubtful spelling could be tried several places in hopes that a duplicate or similar family name would shed light on the interpretation. In all cases, if the initial of the surname could be determined without doubt, it was then sufficient to determine only that the name was neither (1) elsewhere in that county nor (2) in the random sample discussed later. At such a time, a license became legible for practical purposes even though the name could not be read with certainty. Such procedures reduced the number of illegibles to slightly more than one per cent of the total licenses available. Many of these were blanks or near blanks resulting from the omission of the carbon or from the use of worn carbon.

The existence of duplicates was determined by comparison of the vital data: name, address, age, height, weight, and color of hair and eyes. Allowance was made for the natural change of age by the occurrence of a birthday between consecutive purchases and for the erroneous change of a year due to a hasty answer. Similar small variations were found in the weights and heights. Small variations were accepted; large ones were questioned. Changes in hair and eye coloring frequently occurred because of the interpretation of the individual writing the form and because of the abbreviations used. In nearly all cases, the signature of the licensee was the deciding factor.

In some cases, all the information, including the house number (an often omitted item), matched completely except for the signature. In such cases, it could usually be determined that some one member of the family had signed the licenses of all the members of the party. The chance of these being two people of the same name and age in the same house was too small not to call such licenses duplicates.

Another situation arose when all the information except the address matched. Because of the fluid state of the American population, a number of moves were to be expected. Unless a move were to take a fisherman very far, his trip-fishing habits would not be expected to be disrupted. In these cases, the signature became the deciding factor. Search was normally made for other members of the family to aid in confirming or rejecting a possible duplication.

Checks on the accuracy of the alphabetization and on the legitimacy of the duplications were obtained, as well be mentioned later. Some names were relocated and several duplications were formed or canceled as greater familiarity was gained.

The final count revealed 1,824 duplicates, 188 triplicates, 27 quadruplicates, 2 quintuplicates, and 1 sextuplicate on the intra-county level, giving a total of 4,336 licenses for 2,042 persons. This was an excess of 2,294 licenses out of the 48,610 which could be read. A more detailed breakdown of the licenses and duplications for the 20 largest counties and for the remainder of the state is given in Table 2.

The 502 illegible and 1,505 missing licenses doubtlessly contained duplicates, both within themselves and between themselves and the legible licenses. A direct extrapolation led to the proportion

$$\frac{2294}{48,619} = 502 + 1505 = \frac{x}{50,617}$$

where $x=95$ duplicate licenses within the set of illegible and missing licenses. This raised the intra-county count of duplicate licenses to 2,389. The number of duplications existing between the 2,007 illegible and missing and the 45,184 legible licenses in the 44 counties containing them could not be determined but was assumed to be negligible. (A plotting of the number of duplicate licenses against the number of legible licenses for each county shows that the relationship is nearly

TABLE 2.
DISTRIBUTION OF LICENSES AND DUPLICATIONS FOR THE 20 LARGEST
COUNTIES

County	Licenses		Sample Size	Duplications				Total
	Number Issued	Legible		2	3	4	Other	
Marshall	15,852	15,007	155	624	60	6	2	692
Pulaski	4,529	4,388	46	182	21	9		212
Calloway	3,687	3,676	34	162	16	1		179
Livingston	3,375	3,279	33	103	14	1		118
Russell	3,182	3,092	30	108	16	5	1	130
Wayne	2,177	2,050	16	104	13			117
Clinton	1,987	1,900	22	69	6			75
Trigg	1,947	1,895	21	65	12			77
McCracken	1,918	1,910	21	84	9	2		95
Whitley	1,130	1,106	12	18	2			20
Lyon	942	941	9	29	1			30
Floyd	678	667	6	21	2			23
Henderson	609	555	6	16	1			17
Ballard ¹	568							
Mercer ¹	541							
Caldwell ¹	421							
Garrard	378	372	6	8	1			9
Cumberland	357	354	4	13		1		14
Boyle	348	346	1	9				9
McCreary	319	316	3	6				6
Subtotal	44,945	41,854	425	1,621	174	25	3	1,823
95 others	7,202	6,756	72	203	14	2	3	219
5 others ¹	401							
Total	52,548	48,610	497	1,824	188	27	3	2,042

¹ Carbon copies not available.

linear above 500 licenses and of low correlation below 500 licenses. Hence, the above linear extrapolation was considered adequate without further adjustment.)

Assuming that the same proportion held for the duplications within the 1,931 licenses for the eight counties not available for examination, the proportion continued: $\frac{2294}{48,610} = \frac{2389}{50,617} = \frac{x}{52,548}$, where $x=2,480$

intra-county duplications for the 120 counties. This was an increase of 91.

In the first part of the survey, nothing had been revealed concerning the number of inter-county duplications caused by fishermen buying subsequent licenses in other counties. It was not feasible to run every name through each of the remaining 111 counties, so five random samples of 99 or 100 names each were used.

These samples had been drawn previous to the alphabetization of the licenses while they were still in book form. This gave, then, a sampling of licenses rather than licensees. The immediate advantage was that the serial numbers were employed for the major portion of the counting. Approximately one per cent of the issued licenses were selected for the samples—497 licenses of which four were illegible and two were duplications. A table of random numbers was used to vary the spacing between the licenses selected. Those selected were placed, in order, in one of the five sub-samples. The county-by-county count of licenses issued, mentioned previously, was obtained at this time by addition of the random numbers, and portions thereof, used for each county.

The five samples were alphabetized. For convenience, typewritten sheets of 24 or 25 names each, giving name, age, city, and state of the purchaser, and the county of the purchase, were prepared. After the other licenses were alphabetized within their counties and all intra-county duplications found, a worker took a sheet of names, familiarized himself with them and with the possible alternate interpretations, and went through the corresponding portion of each of the 112 counties look-

ing for duplications. When the existence of a duplicate was suspected, comparison was made with the actual license in the sample. As a safety measure, all names beginning with the same initials as those on the sample sheets, as well as all the illegibles, were checked in order to catch alternate interpretations. In addition, this served to catch errors in alphabetization. The fact that the sample sheets were run through by three or four persons other than the one who alphabetized a particular set led to new interpretations or to confirmations of earlier decisions.

The licenses in the sample became involved in two categories of duplications: (1) additional intra-county duplicates, which were added to the count obtained by alphabetization, and (2) inter-county duplicates. (Two licenses became involved in both.) The number of duplicate licenses obtained in each of the two categories was recorded to give five measures of the inter/intra-county ratio. A summary of these results is given in Table 3.

The drawing of the sample before the determination of the intra-county duplicates made the probability of a licensee's name appearing in the sample directly proportional to the number of licenses he purchased. Therefore, the proportion of duplicates in the sample could not be used to predict the proportion in the state as a whole, hence the need for determining the number of the intra-county duplicates and the value of the inter/intra-county ratio.

Had the sample been drawn from the alphabetized and clipped set of names in each county, then the probability of drawing names with only intra-county duplicates would have been the same as those who had no duplicates but names appearing in two counties would have had twice the probability of being drawn. That would have distorted the inter/intra-county ratio beyond use.

TABLE 3.
NUMBER AND KIND OF DUPLICATIONS AND EXCESSES IN EACH OF THE FIVE SAMPLES

Sample Number	Inter-county		Intra-County			Duplicate Lisenses		
	Single ¹	Duplicate	Duplicate	Triuplicate	Inter	Intra	Ratio	
1	0	6	7	0	6	7	0.857	
2	1	1	7	0	2	7	0.286	
3	1	4	10	2	5	14	0.357	
4	0	1	4	0	1	4	0.250	
5	0	4	4	2	4	8	0.500	
Total	2	16	32	4	18	40	0.450	

¹ Single licenses were matched with intra-county duplicates of prior dates to form triuplicates.

The sample served to bring together with nearly equal probability a set of names which were involved with duplicate licenses. The mean of the inter/intra-county ratios of duplicate licenses was 0.450. Hence, for the estimated 2,480 intra-county duplicates, the number of inter-county duplicates was $2,480 (0.450) = 1,116$. This gave a total of 3,596 duplicate licenses of all kinds for the state, i.e., 6.8 per cent of the 52,548 licenses sold.

The fundamental calculations above can be brought together by the formula $N = c T(1 + r)$, where

$\frac{L}{N}$

c = number of intra-county duplicates clipped,
 T = total number of licenses sold,
 L = number of legible licenses,
 r = inter/intra-county ratio,
 N = number of duplicates of all kinds.

Substitution in this formula yields $N = \frac{2294 (52,548) 1.450}{48,610} = 3,596$

duplicate licenses.

¹ Extrapolations and ratios similar to the above, but with reference to the number of licenses, indicate that these licenses were purchased by approximately 3200 fishermen.

TABLE 4.
DISTRIBUTION OF LABOR AND FUNDS

<i>Type of Work</i>	<i>Time Required</i>
Separation of books of 10-day licenses from other licenses	30 man-hours
Selection of random samples and count of licenses for each county	50 man-hours
Alphabetization of licenses and count of intra-county duplicates	440 man-hours
Determination of inter/intra-county ratio	270 man-hours
Checks on the above steps	100 man-hours
Total	890 man-hours
Done by administrators	90
Done by clerical help	795 man-hours

772.75 hours at \$1.00 = \$772.75
 22 hours at \$1.25 = \$ 27.50
 Total \$800.25

TABLE 5.
TOTAL NUMBERS OF FISHING LICENSES SOLD IN KENTUCKY FOR THE
YEAR 1960

<i>Type of License</i>	<i>Number Sold</i>	<i>Cost of License</i>
Resident statewide	253,786	\$3.25
Non-resident 10-day	52,500	2.25
Non-resident annual	18,051	5.50
Commercial	2,277	5.50
Ohio River sport	2,306	3.25
Ohio River commercial	292	5.50
Total	329,212	

The mechanics of this survey required approximately 890 man-hours of work, distributed as shown in Table 4.

The Commonwealth of Kentucky is considered by some to be a border state, being part southern and part northern in its traditions. There are also Republicans who, today, want it entirely in their camp, and some Democrats who want it in theirs. Out-of-state fishermen are not very much interested in the politics of a state, but they are interested in driving to a place where the fishing is good and the distance to be traveled is not too far. In looking at a map of the United States, as they worked on the preceding part of this paper, the authors observed that many fishermen in the north central states seemed to have learned that good warm-water fishing was to be had by going south of the border—no, into the border state of Kentucky—to do their fishing, while those south of the border state seemed more content to stay at home and fish in their own backyards.

The man who makes several trips a year into a state to fish is the man in whom the boat dock operator, the motel manager, the restaurant owner, the biologist and the conservation official are interested. To get additional information on such men, the authors gathered other data which it is hoped might be of help in planning a fishing season's program and an advertising campaign for those who serve the fishing public.

Table 5 summarizes the total sales in all license categories in Kentucky for the year 1960. For the year, 86 percent of the non-resident 10-day licenses were sold in the 17 counties which contain the five major lakes. These five lakes are: Kentucky, Cumberland, Dale Hollow, Herington and Dewey (Figure 1). Table 6 shows the counties associated with each lake and the total number of licenses sold in each county and the number of out-of-staters who probably made more than one trip into a county. (Since it was the licenses of the non-resident repeaters that were available for study, most of the data for this part of the paper

TABLE 6.

A CONTRAST OF THE TOTAL NUMBER OF FISHING LICENSES SOLD WITH THE POSSIBLE NUMBER OF OUT-OF-STATE FISHERMEN MAKING MORE THAN ONE TRIP TO FISH IN THE SAME LAKE AND COUNTY—1960

<i>Lake and County</i>	<i>Total Licenses Sold</i>	<i>Annual Non-Residents Sold</i>	<i>Non-Resident 10-Day Repeaters</i>	<i>Total That Probably Made More Than One Trip</i>
Kentucky (totals)	46,837	4,859	1,094	5,953
Marshall	24,236	2,503	679	3,182
Calloway	8,129	984	181	1,165
Livingston	7,453	785	127	912
Trigg	4,686	285	77	362
Lyon	2,333	302	30	332
Cumberland (totals)	35,306	2,570	508	3,078
Pulaski	11,775	1,086	209	1,295
Russell	8,204	427	133	560
Wayne	4,996	527	116	643
Whitley	4,750	278	19	297
Clinton	1,505	112	18	130
Laurel	2,416	55	7	62
McCreary	1,660	85	6	91
Dale Hollow (totals)	4,075	237	70	307
Clinton	2,614	196	56	252
Cumberland	1,461	41	14	55
Herrington (totals)	8,340	245	32	277
Mercer	3,250	82	14	96
Boyle	2,584	43	9	52
Garrard	2,506	120	9	129
Dewey (totals)	4,643	257	22	279
Floyd	4,643	257	22	279
Totals for all lakes	99,201	8,168	1,726	9,894

were secured from the information on these licenses; this represents a sample of more than 17 percent.) These same 17 counties accounted for 27 percent of the total license sales for the year within the state and for 45 percent of the annual non-resident sales.

FROM WHAT STATES DID THE FISHERMEN COME?

In studying the 10-day license repeaters for Kentucky's five main lakes, it was found that more fishermen from Illinois, Indiana, Ohio and Missouri came to the bluegrass state than did fishermen from any other states. Table 7 gives a summary of the home states of the fishermen in each lake.

It will be noted that Kentucky and Cumberland lakes were the two most popular lakes, with Kentucky Lake alone accounting for about 60 percent of the 10-day and annual returnees. The counties which border the western shore of Kentucky Lake (Marshall and Calloway) account for most of the fishermen, largely because of dock and camping facilities and ease of access; Marshall County alone accounted for 62 percent of the returning 10-day license purchasers. In both Marshall and Calloway counties, they came in greatest numbers, respectively, from Illinois, Indiana and Missouri. For the eastern side of the lake, however, Indiana was first, Illinois second, and Missouri third. It is interesting to note that the two Kentucky counties which border Tennessee (Calloway and Trigg) have the fewest Tennessee fishermen. In all, 21 states had fishermen leave their home state and come at least twice to fish in Kentucky Lake; and they came from as far away as New York and California.

Cumberland and Dale Hollow lakes are in the south-central part of the state, but Dale Hollow lies mostly in Tennessee, with only two arms extending into Kentucky. One arm is in Cumberland County and the other in Clinton County. Part of Cumberland Lake is also in Clinton

TABLE 7.
NUMBER OF OUT-OF-STATE REPEATERS FISHING IN KENTUCKY LAKES ACCORDING TO RESIDENT STATE

Lake and County	State										Total	
	Ill.	Ind.	Ohio	Mo.	Tenn.	W. Va.	Mich.	Ark.	Ga.	Fla.		Others
Kentucky (totals)	482	307	32	195	32	1	14	6	2	2	21	1,094
Marshall	355	171	13	102	15	1	8	3	1	1	9	679
Calloway	55	39	7	74	7		3	1	1		1	181
Livingston	35	49	9	8	12		2	2	1		9	127
Trigg	28	33	3	10	2		1					77
Lyon	9	15		1	3						2	30
Cumberland (totals)	13	120	328	4	11	12	2		4		14	508
Pulaski	2	29	161		6	3	2		3		3	209
Russell	7	51	57	4	1	7					6	133
Wayne	2	23	83		2	2					4	116
Whitley	1	1	14		1				1		1	19
Clinton	1	12	14		1							18
Laurel		3	4									7
McCreary		1	5									6
Dale Hollow (totals)	5	33	22		2	2				3	3	70
Clinton	4	26	2		2	1				3		56
Cumberland	1	7	2			1					3	14
Herrington (totals)	2	10	17				3					32
Mercer	1	5	7				1					14
Boyle		2	5				2					9
Garrard	1	3	5									9
Dewey (totals)		1	1			20						22
Floyd		1	1			20						22
Totals for all lakes	502	471	400	199	45	35	19	6	6	5	38	1,726

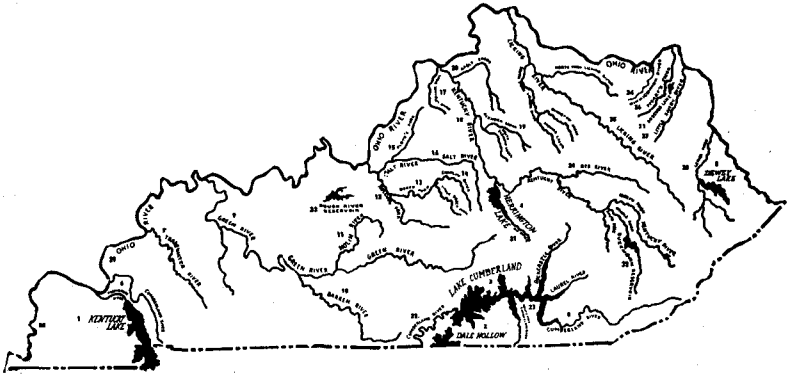


Figure 1. The five major fishing lakes in Kentucky in 1960.

County. Both of these lakes drew their out-of-state fishermen largely from Ohio, Indiana and Illinois. Approximately 75 percent of the Cumberland Lake repeaters came from Ohio, while in Dale Hollow, only 30 percent came from that state. Nearly half of the Dale Hollow fishermen, instead, made the trip down from Indiana. The shoreline of Lake Cumberland lies within seven counties. Most of the out-of-state fishermen were attracted to the docks in Pulaski, Russell and Wayne counties. Cumberland Lake drew fishermen from 17 states; again, the farthest came from New York and California. Dale Hollow attracted repeaters from 7 states; Florida and New York were the farthest.

Herrington Lake is the oldest of the five man-made lakes under consideration. The dam was finished in 1924, and it impounds an area of 1,600 acres extending into three counties, Mercer, Boyle and Garrard. As is usually true, the fishing was good the first three or four years; but a heavy shad population build-up soon made it hard to catch sport fish. During the last three years, the Department of Fish and Wildlife Resources has been selectively poisoning the shad, and for the last two years, the sport catch of black and white basses has shown marked improvement. Table 7 shows that only 32 out-of-state fishermen made two or more trips to Herrington to purchase a 10-day license. They came from Ohio, Indiana and Illinois. If the sport fish catch continues to improve at this lake, some of the northern fishermen who drive on down to Cumberland and Dale Hollow may start stopping off at this lake which is 90 miles nearer home.

Dewey Lake is a water-storage and fishing lake in eastern Kentucky which was opened to the public for the first time in 1950. Twenty-two repeaters came in from 3 states. Of this number, 20 made their two or more trips from West Virginia.

FROM WHAT CITIES DID THEY COME?

In this day of mushrooming metropolitan areas where, for example, as in Greater Chicago, there are, according to Rand McNally's latest *Atlas* (1961), well over 200 separate incorporations with post offices, it becomes extremely time consuming to locate the smaller municipalities within a large city. Unless a city or municipality had 4 or more repeaters, it was not thought necessary to list it as an important city furnishing Kentucky with fishermen; and there are probably a number of instances where additional fishermen should have been included with the totals for Chicago, St. Louis, Cincinnati, Detroit, Indianapolis, and several other large cities.

The city which more than any other sent fishermen to Kentucky Lake was St. Louis, Missouri. This city was represented by 88 repeaters, and if the totals, 39 and 14, for East St. Louis and Alton, Illinois, are added in, the total becomes 141. Indianapolis is second with 66; Evansville, Indiana, had 36; Chicago, Illinois, had 29; Danville, Illinois, 28; Mt. Vernon, Illinois, 18; Terre Haute and Washington, Indiana, 16 each;

Gary, Indiana, 15; and Sikeston, Missouri, 14. Other cities sending four or more repeaters were Cincinnati and Columbus, Ohio; Decatur, Champaign, Granite City, Vandalia, and Carmi, Illinois; and East Prairie, Missouri.

Since three fourths of the repeaters going to Lake Cumberland were from Ohio, the cities of this state were well represented. Out of the total of 328 Ohioans for the lake, 105 were from Cincinnati, 54 from Dayton, 26 from Hamilton, 9 from Middleton, 7 from Franklin, and 4 from Akron. Indianapolis, Indiana, was represented by 23 fishermen; Charleston, West Virginia, and Chicago, Illinois, by 5; and Huntington, West Virginia, by 4. Among other cities represented were Springfield, Columbus, and Cleveland, Ohio; Oak Ridge and Knoxville, Tennessee; Columbus, Indiana; and Pittsburgh, Pennsylvania.

From Dale Hollow, only two cities had four or more returning fishermen; Indianapolis had 7, and Dayton had 6. For the most part, the 70 repeaters came from scattered localities in Indiana, Illinois, Ohio, and West Virginia.

On Herrington Lake, there were three cities represented by at least 4 repeaters. Cincinnati had 7, Dayton 5, and Indianapolis 4. Among other cities represented were Jeffersonville and New Castle, Indiana; Fairborn and Xenia, Ohio; Pontiac, Michigan; and Chicago, Illinois.

Out of the 22 repeaters on Dewey Lake, three West Virginia cities accounted for more than half of the total; Logan had 8, Williamson 4, and Huntington 2. There were only two repeaters from other states, one from Fort Wayne, Indiana, and one from Fairborn, Ohio. The remaining 6 fishermen came from small West Virginia cities.

HOW FAR ARE SOME OF THE MAJOR CITIES?

There follows the approximate distance in miles from some of the major cities to Kentucky Dam: Sikeston, 95; St. Louis, 200; Indianapolis, 270; and Chicago, 400.

The distances to Lake Cumberland are: Cincinnati, 190; Dayton, 240; Indianapolis, 300; St. Louis, 450; and Chicago, 480. The distance from these same cities to Dale Hollow is approximately 30 miles farther than to Lake Cumberland, and the distance to Herrington Lake is approximately 90 miles less than the distance to Lake Cumberland.

WHEN DID THE REPEATERS MAKE THEIR TRIPS?

There were more short-term license purchasers who made their first trip to Kentucky waters in April than in any other month. This was true for all lakes except Dewey, which was not opened until May to fishing. In both May and June, the number of first-timers exceeded the number of second-trippers; but by July, there were more repeaters coming, and the number of repeaters continued to increase through October, with a slight decline being shown in August. Figures 2 and 4 contrast the first-timers with the repeaters.

Since Kentucky Lake accounted for 64 percent of the total number of returnees in the state, it was thought that some indication of the preferable months out-of-staters like to fish in the tailwaters might differ from the months they prefer the backwaters. Therefore, Figure 3 was compiled by plotting the totals for Marshall and Lyon, the two tailwater counties, and the totals for Calloway, Trigg and Livingston, the three backwater counties. The popularity of the tailwaters is quite apparent. It would seem that the out-of-staters prefer the tailwaters over the backwaters by a ratio of almost 2 to 1. April and May were the most popular months for the first-timers in the tailwater. The backwater counties showed no double peak, and only April was the preferred month. Also, by way of contrast, the tailwater fishermen came back in the greatest numbers in October, while in the backwaters, they returned in September and October in equal number. The tailwaters did not have an August decline, while the backwaters did. Perhaps one other interesting thing about the tailwater-backwater contrast is that the numbers of returning backwater fishermen did not show much fluctuation from May through October, while the returnees in the tailwaters show two definite plateaus, one in May-June, and the other in July-August.

The Lake Cumberland graph (Figure 4) approximates that of Kentucky Lake in that there is a double peak in April and May and a single

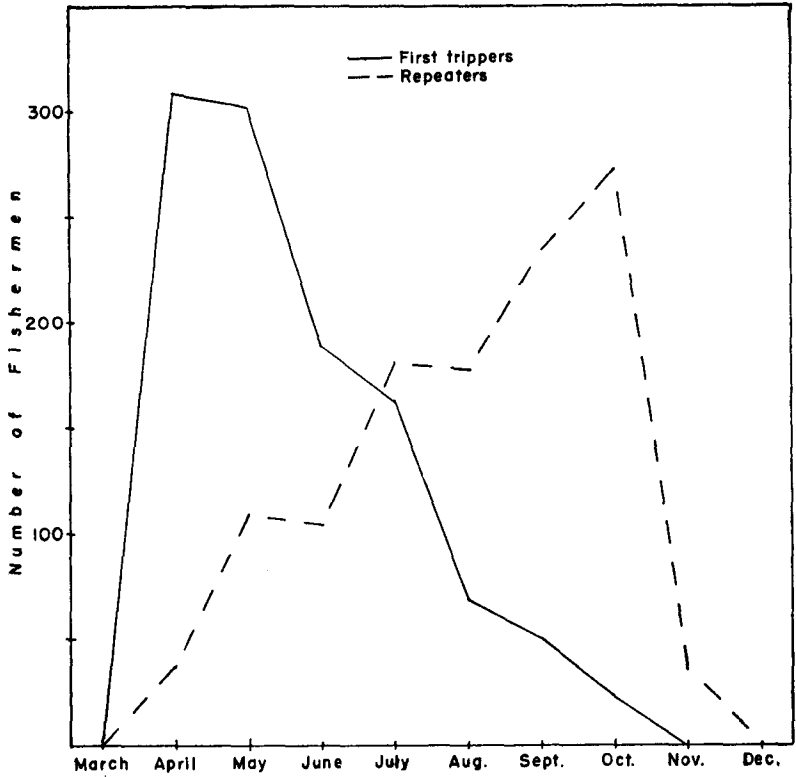


Figure 2. A comparison of license purchases for the Kentucky Lake area.

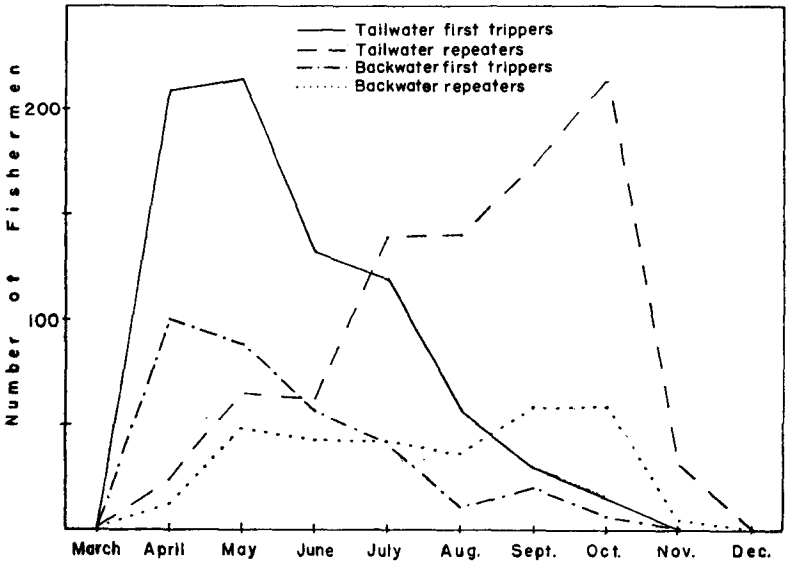


Figure 3. A contrast of license purchases for the tailwater and backwater areas of Kentucky Lake.

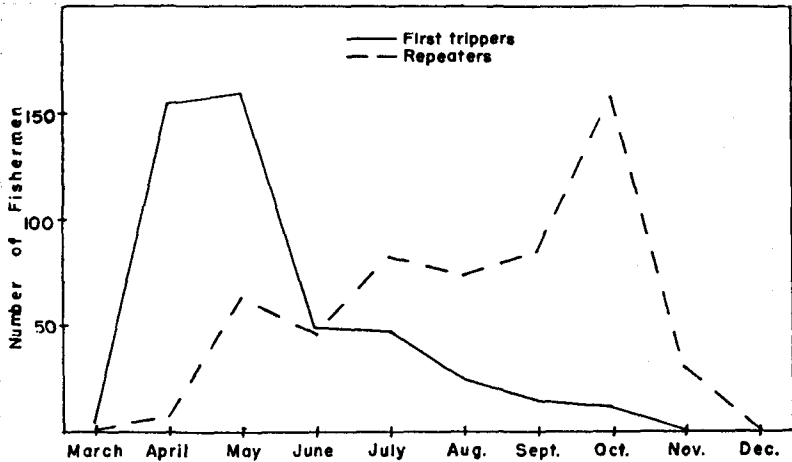


Figure 4. A comparison of license purchases for the Lake Cumberland area.

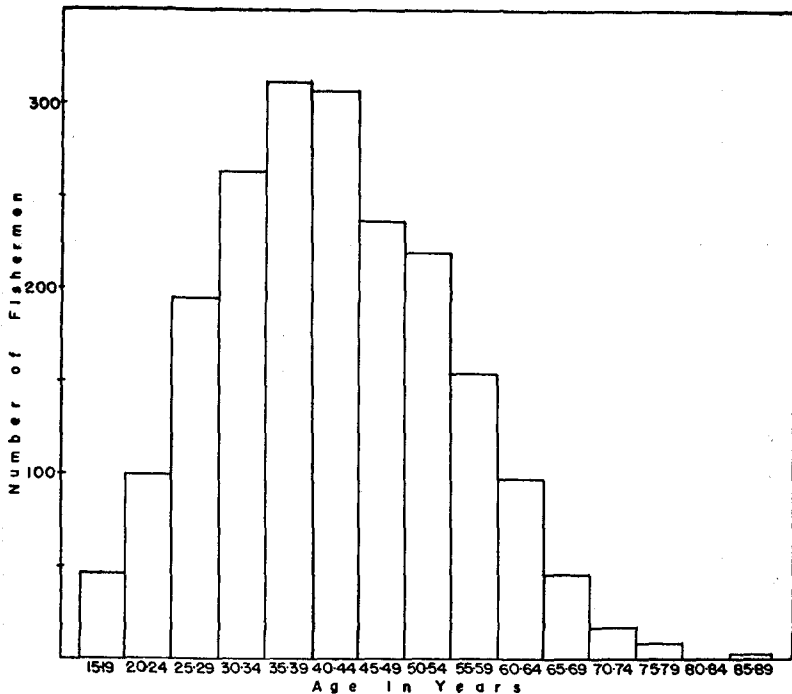


Figure 5. The age distribution of fishermen purchasing duplicate licenses.

peak in October. Graphs are not given for Dewey, Herrington, and Dale Hollow because of the small number of repeaters and their fairly even distribution over the season. On Dewey, May and October were the months the first-timers chose to make their trip; seven came in May and 10 in October; smaller amounts came the other months. There were

usually six or seven returning fishermen on Dewey from May through the rest of the season. On Herrington, May and August were the months the first-timers came in greatest numbers, five and eight fishermen respectively. September and October were the months most returned. On Dale Hollow, 27 made their first trip in April, and May had only 11; the number of returnees ranged from 9 to 12 from July through September, and October had the highest number, with 17 repeaters.

HOW MANY TIMES DID THE REPEATERS FISH?

It has already been stated that there were 2,042 persons who purchased more than one 10-day license in the same county, and in a few instances, some of them bought as many as 3 to 6 licenses instead of the more economical seasonal license. Those out-of-staters who were so kind to the state with their excessive purchases seemed to scatter their trips throughout the fishing season. In the 17 counties which contain the five lakes under consideration and where there were 1,731 repeaters, there were 164 three-trippers, 26 four-trippers, 2 five-trippers, and 1 six-tripper. One five-tripper made his purchases in April (2), June, July, and October; the other in April, June, August, September, and October. A man from southern Illinois, who made six trips to Kentucky Lake, purchased his licenses in April (2), May, July, October and November.

WHAT WERE THE AGES AND SEXES OF THE REPEATERS?

Figure 5 is a histogram showing the age distribution of the more than 1,700 repeaters for the five lakes. If one were to take these figures as being representative of the fishing public, he could say that fishing is engaged in by all age groups from 16 to 80; and those younger than 16 fish, too, but they are not required to purchase a license. People in the prime of life (35 to 45 years of age) seem to make up most of the fishermen population. The sex of the repeaters was also determined, and for every six men who fished, there was one fisherwoman.

DO HUSBANDS AND WIVES FISH TOGETHER?

In tabulating the age and sex of the repeaters, it was fairly easy at the same time to ascertain when a man and woman were husband and wife by the facts that they purchased consecutive licenses, lived under the same roof, were near the same age, and had the same last name. In such instances, they were recorded as a fishing team. For the five lakes, there were 163 such teams. Kentucky Lake had 119 teams; Lake Cumberland, 39; and Dale Hollow, 5.

CONCLUSION

People do like to fish in Kentucky. Take the case of the man from Alabama who fished in Kentucky Lake in the spring and then moved to Indiana near Lake Michigan and then left that Great Lake's state to make two trips back to Kentucky in the fall. Also, there is the case of the fisherman from New Mexico who came to Kentucky waters in April and then moved to Georgia, but by July, he was back in Kentucky again after the limit.

TWO NEW FISHERY RESEARCH PROGRAMS IN THE SOUTHEASTERN UNITED STATES

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ABSTRACT OF PAPER

Appropriations for the Bureau of Sport Fisheries and Wildlife, beginning July 1, 1961, include two items of interest to southeastern fishery managers and administrators. One is the sum of \$85,000 for research or reservoir fish productivity in the White River Interstate Reservoir Complex in northern Arkansas and southern Missouri. The other is the sum of \$105,000 for studies of methods of eliminating undesirable fish from streams and lakes in the southeastern United States.