

COMPARISON OF CREEL SURVEY STATISTICS FOR PARTIES USING DIFFERENT TYPES AND METHODS OF FISHING IN THE OKLAHOMA STATE LAKE CREEL SURVEY

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A comparison of creel survey statistics for fishing parties using different types and methods of fishing is presented. Implications for creel-survey design are discussed.

The Oklahoma Department of Wildlife Conservation conducted a creel survey on its state-owned lakes from December, 1964 to December, 1965. Creel statistics have been presented by Jarman et al. (1) and an analysis of the methodology of the survey was studied by Brown (2). The present paper reports data obtained by interviews with fishermen at the completion of their trips to 10 of the lakes in the previous Oklahoma survey. This investigation was based upon a stratified random sample of fishing days. Weekdays were one strata and weekends and holidays, the other. Pertinent information for the lakes involved is given in Table 1.

TABLE 1. Oklahoma Department of Wildlife Conservation lakes.

Lake	County	Acreage	Maximum depth (feet)	Access Areas
Beaver	Jefferson	42.9	28	2
Burtschi	Grady	180.0	28	3
Dahlgren	Cleveland	26.4	20	2
Hall	Harmon	35.2	28	1
Kingfisher	Kingfisher	58.0	20	3
Ozzie Cobb	Pushmataha	69.4	20	1
Roman Nose	Blaine	60.0	24	1
Schooler	Choctaw	28.5	24	2
Schultz	Texas	56.8	14	2
Vincent	Ellis	169.0	41	2

METHODS

Fishing parties were classified by the creel checker as to the type of fishing, i. e., whether the party used artificial lures, live-bait, dead-bait, or various combinations. Many parties could not be classified as to a particular type of fishing. Either one fisherman used more than one type of gear or different members of the same party used different types of gear (Table 2). Parties

TABLE 2. Distribution of fishing parties by types of fishing.

Lake	Percentage of Total Parties Using Lure	Percentage of Total Parties Using Live	Percentage of Total Parties Using Dead	Percentage of Total Parties Using Other
Beaver	17.5	20.9	16.6	45.0
Burtschi	36.2	14.9	1.5	47.4
Dahlgren	20.9	5.2	0.9	72.9
Hall	25.7	29.2	2.3	42.7
Kingfisher	0.5	32.8	5.5	61.2
Ozzie Cobb	20.0	46.4	1.1	32.4
Roman Nose	22.1	23.7	6.6	47.6
Schooler	21.8	63.2	2.3	12.7
Schultz	26.2	43.1	7.9	22.8
Vincent	22.3	10.5	12.8	64.6

were also classified as to the method of fishing, i. e., whether the party fished from a boat, on the bank, in floaters, from a heated dock, or used a combination of these methods (Table 3). Fishing parties which

TABLE 3. Distribution of fishing parties by method of fishing.

Lake	Percentage of Total Parties Using Boat	Percentage of Total Parties Using Bank	Percentage of Total Parties Using Floater	Percentage of Total Parties Using Heated Dock	Percentage of Total Parties Using Other
Beaver	19.2	78.2	—	—	2.6
Burtschi	11.7	67.2	16.0	4.0	1.1
Dahlgren	8.9	77.8	6.2	—	7.1
Hall	42.1	28.7	27.5	—	1.8
Kingfisher	1.6	94.5	0.5	—	3.3
Ozzie Cobb	30.2	62.2	0.7	—	6.9
Roman Nose	4.1	84.4	10.8	—	0.6
Schooler	41.9	50.0	1.2	—	7.0
Schultz	5.5	78.6	10.7	—	5.2
Vincent	29.3	34.3	4.5	0.5	31.4

could be classified as to method and type were compared using analyses of variance to test for differences in the creel statistics of party size, number of fish caught, pounds caught, number per hour, pounds per hour, hours fished and man hours fished. Separate analyses of variance were computed for each lake for weekday and weekend strata. An example shall suffice to illustrate how this was done. For weekdays samples from Lake Beaver, live-

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bait, dead-bait and line-fishermen were present (Table 4). An analysis of variance was

TABLE 4. Party size by different types of fishing.

Lake	Period ¹	Lure	Live bait	Dead bait	Significant ²
Beaver	A	3.0	3.3	3.3	no
	B	3.0	2.7	3.3	no
Burtschi	A	2.5	3.1	3.0	yes
	B	3.1	3.4	3.7	no
Dahlgren	A	2.8	3.0	—	no
	B	3.7	4.4	—	no
Hall	A	2.3	3.2	—	yes
	B	2.7	3.2	—	yes
Kingfisher	A	—	2.8	2.6	no
	B	—	2.7	2.5	no
Ozzie Cobb	A	3.4	3.7	3.2	no
	B	4.6	4.1	—	no
Roman Nose	A	3.1	4.1	—	yes
	B	3.4	4.2	—	yes
Schooler	A	3.0	2.9	—	no
	B	3.4	3.3	—	no
Schultz	A	2.7	3.1	—	no
	B	3.0	3.7	3.5	yes
Vincent	A	2.9	4.1	3.7	yes
	B	3.1	4.1	3.1	yes

¹ Time of fishing trip: A, weekday; B, weekend.

² Results of analyses of variance.

used to compare the mean number of people in the parties of each of these types of fishermen. An analysis was then conducted for weekend fishermen from Lake Beaver. This procedure was repeated for all the lakes. After these twenty analyses of variance differences for party size were completed, the same approach was applied to all other values investigated, e.g., number of fish caught, etc. In Tables 4 to 17, the mean values for each category are given along with the results of the analyses of variances.

Wilcoxin (3) signed rank tests were used to compare the average values over lakes in an attempt to determine overall trends. The procedure here was to take a pair of creel methods or types to be compared for a given creel statistic, e.g., live-bait and lure fishermen for party size, and examine the paired mean values. In this example, the paired values in the first two columns in Table 4 would then be used in the Wilcoxin test giving a single test for comparing party size between boat and bank fishermen. This procedure was then repeated for all possible comparisons. Hereafter, when reference is made to presence or absence of difference between overall creel statistics, without reference to a particular test, the use of the 0.05 significance level determined by using a Wilcoxin signed rank test is assumed. The overall averages referred to

(Tables 18 and 19) are unweighted averages over all the individual estimates over lake and weekday-weekend strata. When a comparison is made with reference to a particular lake, analysis of variance is assumed. Duncan's multiple-range tests as described by Steel and Torrie (4) were used to separate individual lake-strata analyses of variance. Although the use of numerous repeated statistical tests is fraught with the possibility of finding spurious significant differences, no reasonable alternative seemed feasible.

RESULTS

When party size is considered for all lakes, live-bait fishermen had a larger party size than users of artificial lures in 14 of 18 comparisons (Table 4). The mean of the average party size for all lakes was 3.1 for lure, and 3.5 for live-bait users. Dead-bait users were compared to live-bait fishermen in 10 paired cases. Of these, dead-bait parties had the larger size in only two cases. In the latter comparison, dead-bait fishermen had the smaller party size in one case, were tied in one, and were larger in the remaining six. The overall average size for dead-bait users was 3.2 fishermen. Seven of the 20 analyses of various tests were significant.

Parties using live bait unquestionably caught the most fish (Table 5). They did so in 16 of 18 comparisons with users of artificial lures, and in 9 of 10 comparisons

TABLE 5. Number caught by different types of fishing.

Lake	Period	Lure	Live Bait	Dead Bait	Significant analysis of variance
Beaver	A	1.0	3.0	1.5	no
	B	2.2	4.1	1.2	yes
Burtschi	A	2.7	3.2	2.1	yes
	B	2.7	5.4	4.8	yes
Dahlgren	A	1.5	2.7	—	no
	B	1.3	4.3	—	yes
Hall	A	3.2	4.0	—	no
	B	2.5	2.9	—	no
Kingfisher	A	—	2.1	1.1	no
	B	—	1.1	1.0	no
Ozzie Cobb	A	2.9	3.8	2.0	yes
	B	3.6	7.4	—	yes
Roman Nose	A	2.1	4.1	—	no
	B	1.8	2.1	—	no
Schooler	A	3.6	4.7	—	no
	B	4.6	3.9	—	no
Schultz	A	4.0	2.4	—	no
	B	4.5	3.5	2.4	no
Vincent	A	2.6	12.3	6.0	yes
	B	3.9	4.5	5.0	no

with dead-bait users. The comparison of lead-bait and lure fishermen gave no such difference. The average number of fish caught was 4.4, 2.8, and 2.7 for users of live bait, lures, and dead bait respectively. Seven of the analyses of variance tests were significant.

On a weight-caught basis, the lure fishermen caught more than live-bait fishermen in 8 of 18 comparisons (Table 6). Dead-bait

TABLE 6. Pounds caught by different types of fishing.

Lake	Period	Lure	Live Bait	Dead Bait	Significant analysis of variance
Beaver	A	1.3	1.9	1.8	no
	B	1.5	3.1	1.1	yes
Burtachi	A	1.9	2.1	5.0	yes
	B	2.4	2.3	3.2	no
Dahlgren	A	2.2	2.4	—	no
	B	1.0	1.2	—	no
Hall	A	3.6	2.9	—	no
	B	5.1	2.1	—	yes
Kingfisher	A	—	1.7	1.4	no
	B	—	1.1	1.0	no
Oxzie Cobb	A	1.8	2.9	1.7	no
	B	2.4	2.8	—	no
Roman Nose	A	1.3	1.9	—	no
	B	1.7	1.2	—	yes
Schooler	A	2.0	2.1	—	no
	B	2.8	1.6	—	no
Schults	A	4.1	2.0	—	yes
	B	4.6	2.7	2.6	yes
Vincent	A	1.8	4.0	3.0	yes
	B	3.6	1.9	4.9	yes

users caught more pounds of fish in comparison with live-bait users. Apparently, most fish caught by live-bait fishermen were smaller. The average weight caught was 2.5 lb for lure fishermen, 2.2 lb for live-bait anglers, and 3.1 lb for dead-bait users. Dead-bait fishermen generally caught catfish of quite large average size. Eight of the 20 analyses of variance tests were significant.

In comparing number of fish caught per hour, live-bait fishermen were more successful than users of lures in 12 instances, they were equal in 2, and behind in four. This difference was not significant (Table 7). However, the comparison between dead and live-bait was significant, with the former being the least successful in 9 cases and the other pair of values being equal. In this respect, dead-bait fishermen did not differ from lure users. The overall averages were 1.8 for lure, 1.6 for live-bait, and 1.2 for dead-bait anglers. Seven of the analyses of variance tests were significant.

TABLE 7. Number caught per hour by different types of fishing.

Lake	Period	Lure	Live Bait	Dead Bait	Significant analysis of variance
Beaver	A	1.0	1.2	1.1	yes
	B	1.2	1.4	1.0	no
Burtachi	A	1.6	2.9	1.5	yes
	B	1.5	2.0	1.7	no
Dahlgren	A	1.1	1.5	—	yes
	B	1.0	1.2	—	no
Hall	A	1.5	1.5	—	no
	B	1.3	1.2	—	no
Kingfisher	A	—	1.1	1.0	no
	B	—	1.0	1.0	no
Oxzie Cobb	A	1.4	1.9	1.0	no
	B	1.4	1.7	—	no
Roman Nose	A	5.4	2.1	—	no
	B	1.4	1.5	—	no
Schooler	A	3.5	1.3	—	no
	B	2.6	1.5	—	no
Schults	A	1.6	1.2	—	yes
	B	1.5	1.2	1.1	yes
Vincent	A	1.6	4.2	1.6	yes
	B	1.2	1.5	1.1	no

Parties using artificial lures were more successful on a weight-per-hour basis than were parties using live bait in 10 cases, and less in 8 (Table 8). The comparisons between lure and dead-bait fishermen and between live-bait and dead-bait fishermen

TABLE 8. Pounds caught per hour by different types of fishing.

Lake	Period	Lure	Live Bait	Dead Bait	Significant analysis of variance
Beaver	A	1.0	1.1	1.1	no
	B	1.1	1.4	1.0	no
Burtachi	A	1.3	1.4	3.0	yes
	B	1.4	1.3	1.3	no
Dahlgren	A	1.2	1.4	—	no
	B	1.0	1.1	—	no
Hall	A	1.7	1.3	—	yes
	B	1.8	1.1	—	yes
Kingfisher	A	—	1.1	1.0	no
	B	—	1.1	1.0	no
Oxzie Cobb	A	1.1	1.2	1.1	no
	B	1.3	1.2	—	no
Roman Nose	A	1.2	1.3	—	no
	B	1.4	1.0	—	yes
Schooler	A	1.8	1.1	—	no
	B	1.5	1.1	—	no
Schults	A	1.6	1.1	—	yes
	B	1.5	1.1	1.2	yes
Vincent	A	1.3	1.7	1.8	no
	B	1.2	1.1	1.2	no

were also fairly evenly split. None of these differences was significant. The overall rates (lbs/hr) were: lure fishermen, 1.4; live bait, 1.2; dead bait, 1.4. Six of the 20 individual analyses of variance tests were significant.

On an hours-fished basis, 7 of the comparisons were significant (Table 9). Lure fishermen fished longer than live-bait users

TABLE 9. Hours fished by different types of fishing.

Lake	Period	Lure	Live Bait	Significant analysis of variance	
				Dead Bait	of variance
Beaver	A	3.3	3.7	3.6	no
	B	3.2	4.0	3.0	no
Burtschl	A	4.7	6.1	6.9	yes
	B	4.0	4.2	7.5	yes
Dahlgren	A	3.5	3.4	—	no
	B	3.1	4.5	—	yes
Hall	A	4.8	4.1	—	no
	B	4.3	3.7	—	no
Kingfisher	A	—	3.5	4.2	no
	B	—	4.7	5.3	no
Ozzie Cobb	A	3.9	4.6	4.7	no
	B	3.2	4.5	—	yes
Roman Nose	A	2.8	3.1	—	no
	B	3.6	3.3	—	no
Schooler	A	4.3	6.6	—	no
	B	5.5	6.4	—	no
Schultz	A	4.2	5.0	—	yes
	B	4.4	4.6	4.2	no
Vincent	A	5.0	4.4	9.7	yes
	B	5.6	4.9	8.0	yes

in only 5 of the 18 comparisons. Lure users fished significantly fewer hours than dead-bait fishermen. Dead-bait anglers had more hours in 6 of 8 cases. When compared with live-bait users, dead-bait fishermen fished the longest in 7 out of 10 cases. This difference was not significant. The average hours fished were 4.1 for lure fishermen, 4.5 for live-bait users, and 5.7 for dead-bait anglers.

Live-bait parties had more man-hours than did lure users in all but one of the 18 comparisons (Table 10). This overall difference

TABLE 10. Manhours fished by different types of fishing.

Lake	Period	Lure	Live Bait	Significant analysis of variance	
				Dead Bait	of variance
Beaver	A	5.5	7.2	8.2	no
	B	5.4	6.4	5.6	no
Burtschl	A	3.5	3.6	4.0	no
	B	11.3	9.0	20.8	no
Dahlgren	A	5.6	6.0	—	no
	B	7.0	14.5	—	yes
Hall	A	6.2	7.8	—	no
	B	7.2	6.2	—	no
Kingfisher	A	—	5.5	6.8	no
	B	—	3.2	3.7	no
Ozzie Cobb	A	8.3	10.7	9.8	no
	B	6.7	11.3	4.0	yes
Roman Nose	A	4.7	8.3	—	yes
	B	8.8	15.3	—	no
Schooler	A	7.4	14.6	—	no
	B	16.9	18.8	—	no
Schultz	A	6.8	10.6	—	yes
	B	8.0	14.1	10.1	yes
Vincent	A	7.8	10.7	24.2	yes
	B	11.8	4.0	22.4	yes

was significant. Dead-bait fishermen exceeded lure users in every case and live-bait parties in 7 of 10 cases. The former was significant, but the latter was not. As with

hours fished, 7 of the 10 analyses of variance of individual comparisons were significant.

Eight of the 19 comparisons for party size between different methods of fishing were significant (Table 11). Boat parties

TABLE 11. Party size of different methods of fishing.

Lake	Period	Number of Fishermen Using			Heated Deck	Significant analysis of variance
		Boat	Bank	Floater		
Beaver	A	3.5	3.4	—	—	no
	B	3.4	2.9	—	—	no
Burtschl	A	3.2	3.0	2.4	3.1	yes
	B	3.8	3.5	2.7	3.0	yes
Dahlgren	A	3.3	3.4	2.4	—	yes
	B	3.7	4.2	2.9	—	no
Hall	A	3.6	4.8	2.6	—	yes
	B	3.1	3.2	2.8	—	no
Kingfisher	A	—	2.8	—	—	—
	B	2.5	2.8	—	—	no
Ozzie Cobb	A	3.2	3.5	—	—	no
	B	4.0	4.2	—	—	no
Roman Nose	A	3.1	3.8	3.1	—	no
	B	3.6	4.0	2.8	—	yes
Schooler	A	3.1	2.9	—	—	no
	B	2.7	3.7	—	—	yes
Schultz	A	—	3.1	2.2	—	yes
	B	3.2	3.6	2.8	—	yes
Vincent	A	3.3	3.5	3.0	—	no
	B	3.5	3.8	3.2	—	no

exceeded bank users in average number per party in 6 of 18 comparisons. A signed-rank test showed no significant difference. Floater-fishermen were present in large enough numbers for comparison in 12 cases. They had the smallest party size in every case but one. The overall average of party size was 3.3 for boat, 3.4 for bank, and 2.1 for floater fishermen.

Parties using boats caught more fish than bank fishermen in 11 cases and the reverse was true in 8 (Table 12). This difference

TABLE 12. Number caught by different methods of fishing.

Lake	Period	Number of Fishermen Using			Heated Deck	Significant analysis of variance
		Boat	Bank	Floater		
Beaver	A	5.4	2.9	—	—	yes
	B	3.5	2.6	—	—	no
Burtschl	A	3.0	4.5	5.8	—	yes
	B	2.6	5.9	3.1	—	yes
Dahlgren	A	2.6	3.5	—	—	no
	B	2.9	1.2	—	—	no
Hall	A	6.3	5.4	3.6	—	no
	B	5.5	1.7	2.9	—	yes
Kingfisher	A	—	1.6	—	—	—
	B	1.0	1.7	—	—	no
Ozzie Cobb	A	8.7	5.6	—	—	yes
	B	10.0	3.4	—	—	—
Roman Nose	A	2.6	3.5	1.9	—	no
	B	1.8	2.3	1.9	—	no
Schooler	A	5.6	2.7	—	—	no
	B	4.3	3.9	—	—	no
Schultz	A	—	2.7	6.4	—	yes
	B	6.8	2.8	9.4	—	yes
Vincent	A	5.7	5.7	2.6	—	no
	B	4.6	3.8	5.3	—	no

was not significant, nor were the differences between floater and bank fishermen, and between floater and boat fishermen. Seven of the comparisons were significant. Boat fishermen caught 4.7 fish, bank, 3.2, and floater users, 4.1.

Eleven of the comparisons for weight caught were significant, and in 15 of 18 cases the boat fishermen caught more pounds than anglers using the bank (Table 13). The overall (lb) average for boat fishermen was

TABLE 13. Pounds caught by different methods of fishing.

Lake	Period	Number of Fishermen Using				Significant analysis of variance
		Boat	Bank	Floater	Heated Dock	
Beaver	A	3.7	2.2	—	—	yes
	B	3.1	1.8	—	—	no
Burtschl	A	4.1	1.8	3.1	3.8	yes
	B	3.7	1.5	4.8	2.0	yes
Dahlgren	A	1.6	1.7	4.9	—	yes
	B	1.1	1.5	1.4	—	no
Hall	A	4.1	2.8	4.6	—	no
	B	5.4	1.7	6.4	—	yes
King-fisher	A	—	1.5	—	—	—
	B	1.0	1.7	—	—	no
Ozzie	A	3.9	2.8	—	—	no
	B	3.9	2.1	—	—	yes
Roman	A	1.9	1.8	2.2	—	no
	B	1.8	1.6	2.0	—	no
Schooler	A	2.8	1.4	—	—	yes
	B	2.0	1.9	—	—	no
Schultz	A	—	2.2	6.9	—	yes
	B	5.4	2.3	9.5	—	yes
Vincent	A	2.4	2.4	2.5	—	no
	B	3.1	2.0	5.6	—	yes

3.1 and for bank users, 1.9. Floater fishermen caught more pounds than bank fishermen in 9 of 10 cases, and they caught more than boat fishermen in 11 of 12 cases. These differences were significant. Apparently, since the numbers captured did not differ significantly, the floater fishermen caught the largest fish, and, in this respect, they were followed by bank and then boat fishermen. Floater fishermen averaged a catch of 4.5 lb.

Neither the boat-bank, boat-floater, nor bank-floater comparisons were significant for the number caught per hour statistic (Table 14). Seven of the 19 comparisons were significant. Boat fishermen exceeded bank fishermen in 12 cases and were tied in 2. In the 10 pairs of boat and floater fishermen, the former were first in 6 instances and tied in one. Floater fishermen were more successful than bank users in 5 instances, tied in 2 and less in 4. Bank fishermen

TABLE 14. Number caught per hour by different methods of fishing.

Lake	Period	Number of Fishermen Using				Significant analysis of variance
		Boat	Bank	Floater	Heated Dock	
Beaver	A	2.5	1.3	—	—	yes
	B	1.5	1.3	—	—	no
Burtschl	A	3.6	1.8	2.2	3.0	yes
	B	2.6	1.5	2.4	1.8	yes
Dahlgren	A	1.3	1.2	1.3	—	no
	B	1.1	1.1	1.0	—	no
Hall	A	1.9	2.4	1.5	—	no
	B	1.8	1.1	1.4	—	yes
King-fisher	A	—	1.1	—	—	—
	B	1.0	1.1	—	—	no
Ozzie	A	1.9	1.7	—	—	no
	B	2.2	1.4	—	—	yes
Roman	A	2.1	3.1	2.3	—	—
	B	1.2	1.2	1.2	—	—
Schooler	A	2.3	1.2	—	—	no
	B	2.2	1.2	—	—	no
Schultz	A	—	1.4	2.5	—	yes
	B	1.5	1.2	2.2	—	yes
Vincent	A	1.1	1.6	1.2	—	no
	B	1.4	1.3	1.3	—	no

caught 1.8 fish per hour, boat, 1.5 and floater, 1.7, over all lakes surveyed.

Ten of the 19 analyses of variance for differences in pounds caught per hour fished were significant (Table 15). Boat fishermen

TABLE 15. Pounds caught per hour by different methods of fishing.

Lake	Period	Number of Fishermen Using				Significant analysis of variance
		Boat	Bank	Floater	Heated Dock	
Beaver	A	1.5	1.2	—	—	yes
	B	1.5	1.1	—	—	no
Burtschl	A	1.9	1.3	1.8	2.1	yes
	B	1.6	1.2	2.2	1.4	yes
Dahlgren	A	1.1	1.1	1.5	—	yes
	B	1.0	1.0	1.1	—	no
Hall	A	1.6	1.5	1.7	—	no
	B	1.7	1.1	2.1	—	yes
King-fisher	A	—	1.1	—	—	—
	B	1.0	1.1	—	—	no
Ozzie	A	1.4	1.3	—	—	no
	B	1.4	1.2	—	—	yes
Roman	A	1.3	1.4	3.0	—	yes
	B	1.2	1.1	1.2	—	no
Schooler	A	1.5	1.0	—	—	no
	B	1.3	1.0	—	—	no
Schultz	A	—	1.3	2.7	—	yes
	B	1.4	1.1	2.2	—	yes
Vincent	A	1.1	1.2	1.2	—	yes
	B	1.2	1.1	1.4	—	yes

were more successful than bank fishermen in 13 cases and were equal in 2. The contrast was not as favorable for boat fishermen as was the comparison of total weight caught. However, the difference was still significant. Floater fishermen were more successful than boat fishermen in 10 cases and more than bank fishermen in 11 cases. These differences were significant. The overall (lb/hr) averages were 1.4 for boat, 1.2 for bank and 2.0 for floater fishermen.

Boat fishermen fished more hours than

bank anglers in 12 cases and tied in one (Table 16). This difference was not significant.

TABLE 16. Hours fished by different methods of fishing.

Lake	Period	Number of Fishermen Using				Signifi- cant analysis of variance
		Boat	Bank	Floater	Waded Deck	
Beaver	A	3.6	3.7	—	—	no
	B	2.5	3.4	—	—	no
Burtachi	A	4.6	4.0	4.0	3.6	no
	B	5.4	4.2	4.4	3.2	yes
Dahlgren	A	4.8	4.6	5.8	—	no
	B	4.4	3.8	4.0	—	no
Hall	A	3.9	3.9	5.1	—	no
	B	4.9	3.9	4.3	—	no
King- fisher	A	—	5.5	—	—	—
	B	3.0	4.0	—	—	no
Oxlie	A	5.2	4.7	—	—	no
	B	5.3	3.8	—	—	yes
Roman	A	3.1	3.6	8.4	—	no
	B	4.5	3.8	3.9	—	no
Nose	A	4.7	5.4	—	—	no
	B	5.3	6.7	—	—	no
Schooler	A	—	4.8	4.6	—	no
	B	5.0	4.3	5.0	—	no
Schultz	A	4.6	5.3	6.9	—	no
	B	7.1	6.2	7.3	—	yes

cant. Boat and floater fishermen were about evenly divided in terms of hours fished. The former led in 5 cases and the latter in 6. Floater fishermen fished longer than bank anglers in 8 of 12 comparisons, and in another case the two were tied. This difference was not significant. Boat anglers averaged 4.6 hr., bank users, 4.4 and floater fishermen, 5.2. Only 3 of the 19 analyses of variance tests were significant.

When man-hours were considered, only 2 of the analyses of variance were significant (Table 17). Boat anglers had the greater

TABLE 17. Manhours fished by different methods of fishing.

Lake	Period	Number of Fishermen Using				Signifi- cant analysis of variance
		Boat	Bank	Floater	Waded Deck	
Beaver	A	7.1	8.0	—	—	no
	B	6.6	5.7	—	—	no
Burtachi	A	8.8	6.5	5.2	5.7	no
	B	14.4	10.2	16.3	5.4	yes
Dahlgren	A	10.5	10.6	7.6	—	no
	B	10.6	10.7	7.2	—	no
Hall	A	7.9	6.3	8.1	—	no
	B	1.2	8.6	7.2	—	no
King- fisher	A	—	3.5	—	—	—
	B	4.0	6.0	—	—	yes
Oxlie	A	9.9	10.3	—	—	no
	B	11.7	9.7	—	—	no
Roman	A	5.4	8.7	6.4	—	no
	B	10.0	12.7	9.2	—	no
Nose	A	8.5	11.1	—	—	no
	B	10.1	22.1	—	—	no
Schooler	A	—	10.0	6.5	—	no
	B	12.9	12.4	9.9	—	no
Schultz	A	9.2	11.8	12.3	—	no
	B	14.4	12.4	15.7	—	no

man-hours in 7 cases, and the reverse was true in the other 11. In comparison between boat and floater fishermen, the former had more man-hours in 6 cases and the latter in 5. When compared with bank anglers, floater fishermen logged more man-hours in 5 instances and less in 7. The overall (man-hr) averages were boat, 9.6, bank, 9.9, and floater, 5.6.

TABLE 18. Comparison of creel statistics of fishermen using various types of fishing.

Party size	Boat	Bank	Floater	Waded Deck
	Avg. (18) ¹ 3.3	Avg. (20) 3.4	Avg. (12) 2.1	Avg. (2) 3.1
Number of fish caught per trip	4.7	3.2	4.1	4.5
Weight of fish caught per trip	3.1	1.9	4.5	2.8
Number caught per hour	1.8	1.5	1.7	2.4
Pounds caught per hour	1.4	1.2	2.0	1.8
Man-hours fished	9.6	9.9	9.3	5.6
Hours fished	4.6	4.4	5.2	3.4

¹ Number in parenthesis equals number of week-day-weekend categories containing fishermen using a particular method of fishing.

TABLE 19. Comparison of creel statistics of fishermen using different methods of fishing.

Party Size	Lure	Live	Dead
	Avg. (8) ¹	Avg. (20)	Avg. (10)
Number of fish caught per trip	3.1	3.5	3.2
Weight of fish caught per trip	2.8	4.4	2.7
Number caught per hour	2.5	2.2	3.1
Pounds caught per hour	1.8	1.7	1.2
Manhours fished	1.4	1.2	1.4
Hours fished	7.7	10.0	12.3
	4.1	4.5	5.7

¹ Number in parenthesis equals number of week-day-weekend categories containing fishermen using a particular method of fishing.

DISCUSSION

In designing creel surveys, it is worthwhile to consider whether or not party size, hours fished, or the man-hours fished differed according to the type or method of fishing. Live bait fishermen had larger party sizes than lure users who, in turn, had a larger party size than dead-bait users. Parties using live and dead bait fished longer and had more man-hours than those using artificial lures. Comparison of parties using boats, floaters, or fishing from the bank did not produce as many overall significant differences, although floater fishermen did fish in the smallest parties. In addition to

the above, there were significant differences in the analyses of variance conducted on individual lakes. Lopinot (5, 6) studied state-owned lakes in Illinois and reported that boat fishermen spent a longer time fishing than bank-anglers in 14 of 15 cases. Moyle and Franklin (7), in a study of 14 Minnesota lakes, found that boat anglers had longer fishing trips than their shore counterparts.

There were numerous significant differences in the analyses of variances for the numbers and pounds by parties using either dead bait, live bait or artificial lures, and also for the tests among anglers using boats, floaters, or fishing from the bank. Catch-per-hour in terms of pounds and numbers did not appear strongly related to whether or not the parties used lures, live bait, or dead bait. However, floater fishermen in general caught larger fish than did boat-fishermen who, in turn, caught more pounds of fish than their counterparts fishing from the bank. These contrasts in terms of weight were significant even though the comparisons in terms of numbers-per-hour were not. In his study of fishing on Mississippi reservoirs, Barkley (8) found that boat fishermen generally had a higher catch-per-unit effort than bank fishermen. Lopinot (5), however, reported that catch rate was about the same for boat- and bank-fishermen on Illinois state lakes. Schulmbach (9) found that boat-fishermen had a higher catch rate than did shore users and that wading-fishermen caught the least in terms of numbers-per-hour in three of four comparisons of data from the Des Moines River, Iowa. In Schulmbach's fourth comparison, wading-anglers did the best; they were followed by boat- and then shore-fishermen. Stewart (10), in his study of South Dakota trout waters, found lure fishermen caught more fish-per-hour than live bait users. In surveys of Clear Lake, Iowa, boat- and dock-fishermen were found to do better than shore anglers, while those wading caught the most fish-per-hour (11, 12).

In view of this information, surveys designed to estimate rate of success should be careful not to bias the sample toward one method or other, or they should stratify on the basis of angling characteristics.

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