A Statistical Comparison of Incomplete and Complete Angler Trip Catch Rates

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ABSTRACT

A comparison of two sets of data for incomplete and complete angler trips showed that catch rates for walleye, sauger, and all species combined were not different at the 10% level of significance.

INTRODUCTION

Creel survey of anglers is a useful fish management technique used to determine the harvest of fish from a body of water. Harvest rates are useful in setting fishing regulations and determining the effects of recreational angling upon a fishery.

Creel survey data can be collected by interviewing anglers while they are in the process of fishing (incomplete angler trip) or after the angler has ceased fishing (complete angler trip). Because of difficulties with collecting information only from complete angling trips (e.g. covering many access points, creel clerk sitting idle at access), it has been the practice to sample incomplete angling trips for many surveys (Kucera et. al. 1976, Sternberg 1974, Daley and Skrypek 1964, and Geis and Gustafson 1977). These creel surveys used the assumption that there was no difference in catch rates between complete and incomplete angler trips, but the validity of this assumption had not been

tested in these studies nor in the open literature at the time this study was initiated. After this study had been completed a paper by Malvestuto, Davies, and Shelton (1978) indicated that there were no significant differences between catch rates of incomplete and complete angler trips on a Georgia reservoir.

STUDY AREA AND METHODS

The study area was the 6.5 miles of Mississippi River, from Lock and Dam No. 3 downstream to the Highway 63 bridge at Red Wing. Data was collected during March and April, 1977 in conjunction with the Prairie Island creel survey (Gustafson, Fierstine, and Geis, 1978) and a creel survey conducted by DNR fisheries personnel stationed at Lake City.

Two different sets of data were analyzed to test the hypothesis of no difference between incomplete and complete trip angler catch rates. For one set of data, 84 fishing parties were interviewed twice during the course of a fishing trip, first while fishing and again after completing their trip. Boat license numbers were recorded and used to identify fishing parties so that incomplete and complete trip data from the same parties could be paired. Numbers of each species of fish captured and length of trip were also recorded.

For the second set of data, catch rates from 153 complete angler trips were compared to an equal number of incomplete trips. For this data the incomplete and complete angler trips were not necessarily of the same parties. As there was more incomplete data than complete data, an equal number of incomplete trips were randomly selected from the same day as the complete trips.

The "same party" data was examined using a paired t-test and a signed rank test developed by Wilcoxon (Snedecor and Cochran, 1967). A t-test and The Wilcoxon test were used on the "different party" data. For each test, walleye, sauger, and all fish combined were tested separately.

FINDINGS

The differences in the average catch per hour of walleye, sauger, and all fish combined for incomplete and complete angling trips from the "same party" data are 0.01, 0.03, and 0.02 fish per hour, respectively. These differences are not significant at the 95 percent level (Table 1). The 95 percent confidence intervals around the differences of the means for incomplete and complete angling trips are included in Table 1. The average angling party trip time for incomplete trips was 10.01 man-hours as compared to 16.19 man-hours for the complete trips.

The calculated t-value for the "same party" data indicates that the difference in catch rates for incomplete and complete trip angler catch rates for walleye is significant at the 40 percent level ($0.30 < p < 0.40$). The calculated t-value for both sauger and all fish combined are significant at the 60 percent level ($0.50 < p < 0.60$).

A Z-value greater than 1.96 signifies rejection at the 5 percent level. The calculated Z-values from the Wilcoxon test are all equal to or less than 1.019. At the 5 percent level, the Wilcoxon test fails to reject the hypothesis that the mean of the paired differences is equal to zero.

The calculated Z-value for the "same party" data indicates that the differences in incomplete and complete angler trip catch rates for walleye are significant at the 30 percent level ($.308 < p < .312$). The Z-value for sauger does not become significant until the 97 percent level ($.976 < p < .984$). The Z-value for the catch rates of all fish combined is significant at the 84 percent level ($.841 < p < .849$).

The differences in the average catch per hour of walleye, sauger, and all fish combined for incomplete and complete angling trips from the "different party" data are 0.01, 0.04, and 0.02 fish per hour, respectively.

These differences are not significant at the 95 percent level. The 95 percent confidence intervals around the differences of the means for incomplete and complete angling trips are included in Table 2.

The calculated t-value for "different party" data indicates that the difference between the incomplete and complete angler trip catch rates for both walleye and sauger are significant at the 50 percent level ($0.40 < p < 0.50$). The t-value for all fish combined is significant at the 30 percent level ($0.20 < p < 0.30$).

As before, a Z-value greater than 1.96 signifies rejection at the 5 percent level. The calculated Z-values from the Wilcoxon test are all less than or equal to 1.93. At the 5 percent level, the Wilcoxon test fails to reject the hypothesis that the difference of the means of incomplete and complete trip catch rates is equal to zero.

The calculated Z-value for the "different party" data indicates that the differences in incomplete and complete angler trip catch rates for walleye are significant at the 81 percent level ($.810 < p < .818$) and the Z-value for sauger is significant at the 15 percent level ($p = .156$). The Z-value for all fish combined is significant at the 5 percent level ($p = .054$).

DISCUSSION

Only one of 12 of the tested values, the Z-value for all fish combined for "different party" data, indicated that the differences between incomplete and complete angler trip catch rates may not be of an acceptable level to be combined or used interchangeably. This is no problem since harvest estimates are calculated using the catch rates for each species, not for all fish combined.

The authors have interpreted the results of the paired t-test and Wilcoxon test on the "same party" data and the t-test and Wilcoxon test on the

Table 1. Statistics for the "same party" angling data from the Mississippi River, Red Wing, Minnesota, 1977

	Average catch per hour		Calculated t-Value*	95% C. I. about mean of differences	Calculated Z for Wilcoxon's test**
	Incomplete	Complete			
Walleye	0.05	0.06	-0.90	$-0.03 \leq \mu d \leq 0.01$	1.019
Sauger	0.37	0.34	0.67	$-0.04 \leq \mu d \leq 0.08$	0.026
All fish Combined	0.42	0.40	0.67	$-0.04 \leq \mu d \leq 0.08$	0.197

*t_{83} = 1.989; Calculated value needed for significance at 95% level.

**Z = 1.960; Calculated value needed for significance at 95% level.

Table 2. Statistics for the "Different party" angling data from the Mississippi River, Red Wing, Minnesota, 1977

	Average catch per hour		Calculated t-Value*	95% C. I. about differences of means	Calculated Z for Wilcoxon's test**
	Incomplete	Complete			
Walleye	0.04	0.05	-0.71	$-0.04 \leq \bar{x}_1 - \bar{x}_2 \leq 0.02$	0.237
Sauger	0.29	0.25	0.69	$-0.07 \leq \bar{x}_1 - \bar{x}_2 \leq 0.15$	1.420
All fish Combined	0.34	0.32	0.31	$-0.11 \leq \bar{x}_1 - \bar{x}_2 \leq 0.15$	1.930

*t_{153} = 1.960; Calculated value needed for significance at 95% level.

**Z = 1.960; Calculated value needed for significance at 95% level.

"different party" data as indicating that differences between catch rates from incomplete and complete angler trips are of acceptable levels to be combined and/or used interchangeably. Malvestuto, Davies, and Shelton (1978) using a paired t-test on data collected during a creel survey on a reservoir in Georgia also found no significant difference in the catch rates of incomplete trips and complete trips.

The use of incomplete angler trip data allows more data to be collected in a specified time period than if only complete angler trip data was collected. This allows a saving in man-power and cost, and the increase in sample size theoretically reduces the variance of the sample. This method of data collection also eliminates the public relations problem of a census clerk sitting idle at access points waiting for anglers to complete their angling trips.

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