Fisheries Report 04-10

SURVEY OF THE TROUT FISHERY IN THE CANEY FORK RIVER

March – October 2003

A Final Report Submitted To

Tennessee Wildlife Resources Agency
Nashville, Tennessee

By

Phillip W. Bettoli, Ph.D.
Tennessee Cooperative Fishery Research Unit
Tennessee Technological University
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EXECUTIVE SUMMARY

1. The trout fishery in the Caney Fork River below Center Hill Dam was investigated between March and October 2003 using a roving creel survey. The river was last surveyed in 1997. In 2003 the river was stocked with 20,005 catchable ($\geq$ 200 mm total length) brown trout and 112,287 catchable rainbow trout. The river was stocked with 30,627 fingerling brown trout the previous November and those fish recruited to the fishery in late spring 2003. The river was also stocked with 51,916 and 53,178 fingerling rainbow trout in fall 2002 and fall 2003, respectively.

2. Fishing pressure over the 8-month survey totaled 67,681 h (90% confidence interval $\pm$ 22,368) and was essentially unchanged from the 1997 survey. Both 1997 and 2003 were years of above-average rainfall and river discharge and fishing pressure was low as a result. In contrast, fishing pressure in 1995 (a drought year) was 21-23% higher than in 1997 and 2003 over comparable periods.

3. Catch rates were high (2.38 fish/hour) when the 2003 survey began but declined linearly as the survey progressed. Catch rates were poor (0.23 – 0.45 fish/hour) the last three months of the survey, which corresponds to the time when the upper reach of the tailwater (where most of the fishing pressure occurred) experienced severe hypoxia. Catch and harvest rates remained unchanged since 1997, but were lower than in 1995.

4. Anglers caught more than 39,000 rainbow trout and harvested nearly 23,000 fish during the 2003 survey. About 4,500 brown trout were caught, of which 1,607 were harvested. The number of trout caught per angler was nearly identical in 2003 (3.20 fish/trip) and 1997 (3.29 fish/trip). Likewise, the number of trout harvested by anglers who had finished fishing was similar in 2003 (1.00 fish) and 1997 (1.18 fish). In contrast, anglers in 1995 (a low water year) caught and harvested significantly more fish (5.2 and 1.70 fish per trip).

7. Based on length-frequency distributions and the expanded estimates of harvest, about 364 rainbow trout longer than 40 cm (~ 16 inches) total length were harvested during the 2003 survey. No brown trout longer than 40 cm were observed in the creel.

8. The state and county residencies of anglers interviewed on the Caney Fork River remained virtually unchanged since earlier surveys. The single largest group of anglers that fished the Caney Fork River were from metropolitan Nashville. Few local anglers (e.g., from Smith and Dekalb country) were interviewed.

EXECUTIVE SUMMARY - continued

9. Most (58%) anglers in 2003 fished with bait and the percentage of anglers who were flyfishing (18%) has changed little from the 1995 and 1997 surveys (18% and 13%, respectively).

10. These results, previous research results, and the results from ongoing studies all demonstrate the influence of the weather on the Caney Fork River trout fishery. In wet years, fishing activity is reduced because of high flows. However, reductions in fishing mortality do not translate into better trout survival and more trout holding over from one year to the next because higher rainfall in the watershed translates into poorer water quality of the reservoir releases in late summer and fall. The quality of the fishery and the amount of pressure it receives will be driven by rainfall patterns until such time that the quantity and quality of reservoir releases improves.

INTRODUCTION

The Tennessee Wildlife Resources Agency (TWRA) intensively manages the trout fishery in the Caney Fork River below Center Hill Dam in middle Tennessee. Between March and October 2003, a roving creel survey was used to examine fishing pressure and harvest rates by trout anglers fishing the Caney Fork River. Attributes of the anglers using the resource for that 8-month period were also examined. Fishing activity was last surveyed in 1997 (Devlin and Bettoli 1999) and 1995 (Bettoli and Xenakis 1996). Net economic value of the Caney Fork trout fishery during a 6-month fishing season ($486,000) and total value (net value plus expenditures; $1.78 million) were the highest of any trout tailwater in Tennessee (Williams and Bettoli 2003). Anglers that were classified as "consumptive specialists" by Hutt and Bettoli (2003) were the single largest angler group on the Caney Fork River in a 2002 human dimensions survey; however, the Caney Fork River had a fairly uniform distribution of five angler subgroups relative to other tailwaters in Tennessee, suggesting that the potential for conflict among anglers was high. When asked their opinion on various management alternatives, anglers on the Caney Fork River expressed the greatest interest in managing the fishery with minimum size limits and improving water quality and habitat.

The Caney Fork River in 2003 was stocked with 112,287 catchable (greater than 200 mm total length) rainbow trout Oncorhynchus mykiss, a slight increase in the number stocked each year in the mid and late 1990s (~ 100,000 fish). In the late 1990s and early 2000s, TWRA stocked about 17,500 catchable brown trout Salmo trutta each spring, but beginning in 2002, the stocking program for brown trout was revised. The number of catchable brown trout stocked each spring increased only slightly (to about 20,000 fish), but an additional ~ 30,000 fingerlings were stocked each November.

STUDY AREA

Center Hill Dam is located on the Caney Fork River at river kilometer 43 (CFRkm 43), in DeKalb County, Tennessee (Figure 1). The dam is approximately 100 km east of Nashville and was constructed by the U.S. Army Corps of Engineers (USACE) for the purpose of flood control and hydroelectric power generation. Center Hill Dam was completed in 1948 and created an impoundment with a surface area of 9,332 ha and a drainage area of 5,631 km^2. The Caney Fork River flows northwest for 43 km before its confluence with the Cumberland River near Carthage, Tennessee.

The low gradient of the river (0.28 m/km) provides little habitat typically found in trout streams such as cascades, plunge pools, and boulders. The meandering of the river creates some habitat diversity in the form of scour pools, gravel bars, and shallow runs; however, the meanders and peaking hydroelectric discharges cause severe bank erosion in some areas. Although these areas experience undercut banks, a positive effect is that fallen trees add structure to the stream channel and create refuges for trout during periods of generation. However, the narrow riparian zone will conceivably be exhausted of trees in the next few decades.

The pool:run:riffle ratio at baseflow was 1.9 : 1.0 : 1.2, although pools accounted for almost 90% of the total surface area (135 hectares) in the 26-km reach of the river surveyed (Devlin and Bettoli 1999). Instream cover was sparse. Bank erosion was severe throughout most of the tailwater.

The Caney Fork River receives hypolimnetic discharges when Center Hill Reservoir is stratified. Turbine intakes are located 30 m below the surface at full summer pool. Discharges and the fluctuations in downstream water levels are dependent on regional power demands and rainfall in the watershed. Generation normally follows a diel cycle, occurring once or twice every day. Generation usually decreases or ceases at night and on weekends. Discharge capacity for each of the facility's three turbines is normally 100 m^3/s; a total maximum discharge through all three turbines is about 350 m^3/s (Ramachandran 1986). During periods of peak generation, water levels in the tailwater rise by more than 3 m. Seepage from the reservoir

maintains a baseflow of ~ 2.55 cms (90 cfs) during periods of no generation (B. Sneed, personal communication, USACE).

Center Hill Reservoir receives treated sewage effluent from five municipal wastewater treatment plants. Even though the main basin of the reservoir has shifted from eutrophy to mesotrophy since the mid-1970's, this system still receives a high annual nutrient load (Gordon and Pucker 1991). As a result of high nutrient loads and stratification, DO concentrations of Center Hill Dam's discharges usually become severely hypoxic by late summer (Devlin and Bettoli 1999).

Center Hill Reservoir is thermally stratified from May to October (USACE 1996) and water temperatures in the tailwater in 2003 were excellent for trout growth and survival (Figure 2). However, the hypolimnetic water becomes anoxic during late summer and fall. The dam does not have multilevel intakes and no permanent modifications have been made to the dam to improve water quality or flows. Therefore, the USACE has attempted to increase DO concentrations in the tailwater using several methods. In 1994 and 1995, sluice releases increased DO concentrations but also increased water temperatures to levels that were lethal to salmonids. Also, turbines were half-loaded during special operations; however, DO concentrations were not maintained above the target level of 6.0 mg/L (Bettoli and Xenakis 1996). Turbines were 3/4 -loaded during special operations in September and October 1997 but DO concentrations could not be increased above 2.0 mg/l (B. Sneed, personal communication. USACE). Hub baffles were subsequently installed on the turbines in 2000 - 2001 in an attempt to increase DO concentrations. Although the hub baffles did increase dissolved oxygen concentrations slightly (~ 1-2 mg/L over ambient concentrations), they could not prevent dissolved oxygen concentrations in the discharges from dropping to as low as 1.7 mg/L in late summer 2003 (J. Meerbeek, Tennessee Technological University, unpublished data).

The growth and condition of rainbow trout and brown trout in the Caney Fork River is currently being investigated and was last reported by Devlin and Bettoli (1999). Although both species grew well in late fall and winter, fish grew slowly in length and lost weight during summer and early fall when DO concentrations dropped below 2.0 mg/L.

METHODS

A stratified, non-uniform probability roving creel survey was in effect on the Caney Fork River from March to October 2003. The survey was designed to collect information about the amount of fishing pressure that the tailwater was receiving, the catch and harvest rates of rainbow trout and brown trout and the catch per unit of effort for both species.

The survey followed the same general design as the 1997 survey. The survey of the 26-km tailwater was stratified by area. Area 1 included the reach from the dam to the I-40 rest stop (access points 1 through 4), and area 2 consisted of the reach from the third (westbound) I-40 overpass to the Stonewall Bridge (Figure 1). In order to reflect differences in angling effort (Bettoli and Xenakis 1996), area 1 had a 75% probability of being sampled, and area 2 had a 25% probability of being sampled. In the 1997 survey the ratio of anglers counted in area 1 and Area 2 was 3:1. The only substantive difference between the 1997 survey and the 2003 survey was that the 1997 survey was divided into 16 two-week periods and the 2003 survey reported catch and effort statistics by month.

Between 6-8 weekend days and holidays and 8-10 weekdays were scheduled for sampling each month. More days were worked per month when pressure was expected to be highest (May-August). Sample days were divided into three equal work periods based on sunrise and sunset times with equal probabilities of sampling during the first, second, or third shifts. The clerk counted anglers in the area being surveyed once each work shift. The time to start the count was randomly selected from a list of possible start times for each shift, beginning at the start of each shift and every 30 minutes thereafter until 1 h before the end of the shift. The counts were adjusted upwards when more boat trailers were counted than boats by adding the mean number of anglers per boat for each boat that was presumed to be on the river, but was not observed. When more vehicles than anglers were observed at Congo Bottom and the Stonewall Bridge access areas, the counts were adjusted upwards by the mean party size ($\overline{X}$ = 2.05) for every unaccounted vehicle.

Before and after the count, the clerk interviewed anglers. If anglers agreed to be interviewed, they were asked how long they had been fishing, whether they were finished fishing, and how many trout they had caught. Anglers were asked their state of residency and

Tennessee residents were also asked for their county of residence. The clerk also recorded the method of fishing being used by each angler. Finally, the clerk examined the catch of each angler to see if any tagged fish were harvested. A copy of the interview sheet is attached in the appendix.

Adjusted counts each work shift were expanded to estimate effort in each stratum (i.e., kind-of-day) and then pooled to estimate effort each month following the methods of Pollock et al. (1994). Mean catch and harvest rates were measured using the mean of ratios method, which is recommended for roving creel surveys (Pollock et al. 1997). Interviews of parties that had been fishing for less than 30 minutes were excluded from the analysis. Total catch and harvest of both trout species each month were then estimated. Fishing pressure was low several months (e.g., September and October), and few interviews were obtained; for those months, catch and harvest rates were averaged for the entire month and used to estimate the catch and harvest each survey day. Standard errors of catch, harvest, and effort each month were calculated according to Pollock et al. (1994). A spreadsheet program performed all necessary calculations. The pooled variance for total pressure, total harvest, and total catch of each species was calculated using the mean-square-successive-difference-between-periods procedure. The square root of the variance was multiplied by 1.64 to generate 90% confidence intervals.

The average number of trout harvested by complete-trip anglers and incomplete-trip anglers was compared using the Wilcoxon rank-sum test (also known as the Mann-Whitney U-test), a nonparametric equivalent of the t-test. Harvest rates did not differ ($P = 0.39$) between complete-trip parties ($n = 102$ parties; mean = 0.28 fish/angler/hour; SE = 0.06) and incomplete-trip parties ($n = 200$ parties; mean = 0.33 fish/angler/hour; SE = 0.04). Differences in catch rates between the two groups of anglers approached statistical significance ($P = 0.055$); complete-trip anglers reported catching more fish (0.91 fish/hour; SE =0.14) than incomplete-trip anglers (0.63 fish/hour; SE = 0.08). Too few complete-trip anglers were intercepted and interviewed to restrict the analyses to only those anglers; therefore, data from all interviews were pooled to calculate mean catch and harvest rates each survey day in order to predict the total catch and harvest of trout each day and each month.

The results from the 2003 survey were compared to results from surveys of the Caney Fork River conducted in 1997 (Devlin and Bettoli 1999) and 1995 (Bettoli and Xenakis 1996).

The 1995 survey only ran for 26 weeks (compared to 32 weeks for the 1997 survey); therefore, results from each survey were compared over the same 26-week time periods.

RESULTS and DISCUSSION

Fishing Pressure

Fishing pressure over the eight-month survey totaled 67,681 h (90% confidence limits ± 22,368; Table 1). Fishing pressure followed the same seasonal pattern that is characteristics of other Tennessee tailwaters, including the Caney Fork River. Pressure peaks in June or July and drops precipitously after August. Average trip length was 3.93 h; thus, anglers made an estimated 17,222 trips to the tailwater in the 2003 survey. Average trip length in 1997 was shorter and the estimated number of trips was 21,287.

Fishing pressure in 2003 was similar to, and statistically indistinguishable from, the pressure the river received in 1997 (65,991 h for a survey that was two weeks shorter than the 2003 survey). Caney Fork River flows during the 2003 survey were the highest since 1994 (Figure 3) and flooding prevented any fishing for several weeks in May 2003. Coincidentally, the 1997 fishing season was also noteworthy for being a high water year that negatively impacted fishing pressure. The 1995 survey encompassed a period of low rainfall and river flows and fishing pressure was 10 – 13% higher (74,534 h) than in 1997 and 2003, despite the fact that the 1995 survey was 6 weeks shorter. Over comparable periods (April – October), fishing pressure in 1995 was 21-23% higher in 1995 than in 1997 and 2003.

A good way to relate the pressure a fishery receives relative to other tailwaters is to calculate the number of hours anglers fish per week per unit area over comparable periods:

River	Start of 26-week Survey	Total Pressure (h)	Pressure (h) per hectare per week	Reference
Hiwassee	3/27/01	59,380	7	Luisi and Bettoli (2001)
Elk	4/ 4/95	14,340	10	Bettoli and Besler (1996)
S.F. Holston	4/ 1/02	39,594	11	Bettoli (2003a)
Clinch	3/30/96	75,876	12	Bettoli and Bohm (1997)

Watauga	3/28/98	53,444	15	Bettoli (1999)
Caney Fork	3/29/97	61,853	17	Devlin and Bettoli (1999)
Caney Fork	4/ 1/03	60,991	17	This study
Watauga	4/ 1/02	87,787	19	Bettoli (2003b)
Caney Fork	4/ 4/95	74,534	21	Bettoli and Xenakis(1996)
S.F. Holston	4/ 1/97	84,119	36	Bettoli et al. (1999)

Despite high river flows and poor water quality, the Caney Fork River continued to be fished heavier than several other tailwaters in Tennessee. No new access has been developed at the Caney Fork River since the 1997 survey and it is not surprising that similar discharge patterns in 1997 and 2003 yielded similar amounts of fishing pressure. The impact of new access on a tailwater fishery was evident in the Watauga River, which experienced a 50% increase in fishing pressure between 1998 and 2002 that was attributed, in large part, to the opening of a public campground and boat ramp on the river (Bettoli 2003b). TWRA reduced the number of fish stocked the Betty's Island access area since 2001 because it was difficult to safely drive hatchery trucks down to the river. Although that was still a popular fishing area, anglers for the most part had to rely on fish moving into the Betty's Island reach from upstream (Happy Hollow) and downstream (Congo Bottom) stocking sites.

The loss of Betty's Island (the upstream boundary of Area 2) as a regular stocking site may have been a factor in redistributing fishing pressure in the tailwater. The ratio of mean angler counts (weekends only) in Area 1 and Area 2 increased from 3:1 in previous surveys to 5:1 in the 2003 survey. Total angling pressure (river-wide) did not increase in 2003; thus, more anglers fished in Area 1 and fewer anglers fished downstream in Area 2.

Catch and Harvest

Anglers caught 39,366 rainbow trout and harvested 22,776 fish during the survey period (Table 1). Nearly 4,500 brown trout were caught, of which 1,607 were harvested. The number of trout of trout caught per angler was nearly identical in 2003 (3.20 fish/trip) and 1997 (3.29 fish/trip; Figure 4). Likewise, the number of trout harvested by anglers who had finished fishing

was similar in 2003 (1.00 fish) and 1997 (1.18 fish). In contrast, anglers in 1995 (a low water year) caught and harvested significantly more fish (5.2 and 1.70 fish per trip; P = 0.10).

The length-distribution for most of the rainbow trout observed in the creel reflected the size distribution of recently stocked fish (Figure 5); the modal length was 26 cm and nearly all of the 301 rainbow trout that were measured were between 19 and 33 cm TL. Five rainbow trout that were holdovers from the previous year based on their size (41-43 cm) were observed in the creel and measured. Only 29 brown trout were measured; the largest was 39 cm TL. None of those brown trout would have been legal under the minimum size regulation (45.7 cm TL) that went into effect March 2004.

Catch rates were high (2.38 fish/hour) when the survey began but declined linearly as the survey progressed (Table 1). Catch rates were poor (0.23 – 0.45 fish/hour) the last three months of the survey, which corresponds to the time when the upper reach of the tailwater (where most of the fishing pressure occurred) experienced severe hypoxia . Despite the poor catch rates at the end of the survey, the pooled catch rate over the entire survey was a respectable 0.91 fish/hour, down only slightly from 1997 (0.98 fish/hour).

Angler Characteristics

Nearly all (97%) of the 645 anglers interviewed in 2003 were Tennessee residents; that number has remained unchanged from the 1995 and 1997 surveys. Unlike several other Tennessee tailwaters, the Caney Fork River fishery was not a local fishery. Residents of the three counties that encompass the river (Smith, Dekalb, and Putnam) represented only 18% of all anglers. As in previous surveys, most Tennessee anglers that fished the Caney Fork River resided in and around metropolitan Nashville. Four counties (Wilson, Williamson, Davidson, Sumner) accounted for the majority (55%) of all anglers interviewed and that percentage was nearly identical in the 1995 and 1997 surveys.

Most (58%) anglers interviewed in 2003 fished with bait and the percentage of anglers flyfishing (18%) has changed little from the 1995 and 1997 surveys (18% and 13%, respectively). There was only a slight negative bias in the 2003 estimate of the percentage of anglers fly fishing: those same fly fishermen represented 22% of anglers observed during the instantaneous counts.

CONCLUSIONS

The nearly identical amounts of fishing pressure the Caney Fork River received in 1997 and 2003 points out the overriding influence of river flows on fishing activity in this tailwater. Unlike east Tennessee tailwaters, fishing pressure drops to near zero during periods of dam discharge. The river cannot be wade-fished at any level of power generation and the narrow channel and fast currents restrict most boat fishing to powered craft, as opposed to rafts and McKenzie-style drift boats, which are very popular on east Tennessee tailwaters. Managers should expect fishing pressure and subsequent harvest and return rates to vary in a predictable manner as a function of how much rain falls in the Caney Fork River watershed.

Fishing pressure in 2003 shifted from downstream to upstream reaches compared to previous surveys, perhaps in response to the cessation of trout stockings at the Betty's Island stocking site. TWRA installed a stocking tube further downstream at the Congo Bottom access area, but few (~ 6) vehicles can park there. If increasing fishing pressure and rates of return for stocked fish (even during wet years) is a priority, TWRA should investigate ways to improve access to the river at Betty's Island to allow regular trout stockings to resume at that popular site.

It is too soon to judge the efficacy of recent efforts to improve the quality of the trout fishery in the Caney Fork River by imposing a minimum size limit on brown trout. Given the influence of river discharge on this fishery, the positive effects that might be expected from this particular regulation would be most pronounced in years with low flows, when fishing pressure would be high.

ACKNOWLEDGMENTS

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Table 1. Fishing pressure and number of rainbow trout and brown trout caught and harvested by anglers fishing the Caney Fork River, Tennessee, March – October 2003. Mean catch-per-unit-effort rates based on interviews of parties that had finished fishing when interviewed.

Month	Pressure (hours)	SE	Rainbows Caught	SE	Rainbows Harvested	SE	Browns Caught	SE	Browns Harvested	SE	Mean CPUE
March	3572	1512	5150	2729	2033	956	8	8	0	0	2.38
April	3283	1005	2963	1247	763	324	320	180	155	91	1.51
May	3821	1534	3333	1892	1640	810	220	117	48	23	1.45
June	19117	3081	11978	2450	9876	2928	2212	1550	863	467	0.75
July	15234	2711	8008	1621	4514	1205	724	287	268	242	0.67
August	13680	2676	4650	1104	3225	1057	649	467	125	81	0.45
September	5220	1430	647	449	389	293	225	152	142	139	0.229
October	3754	970	2637	1809	336	308	122	86	6	5	0.27
Total	67681	13639	39366	8508	22776	7880	4480	1925	1607	790	0.91

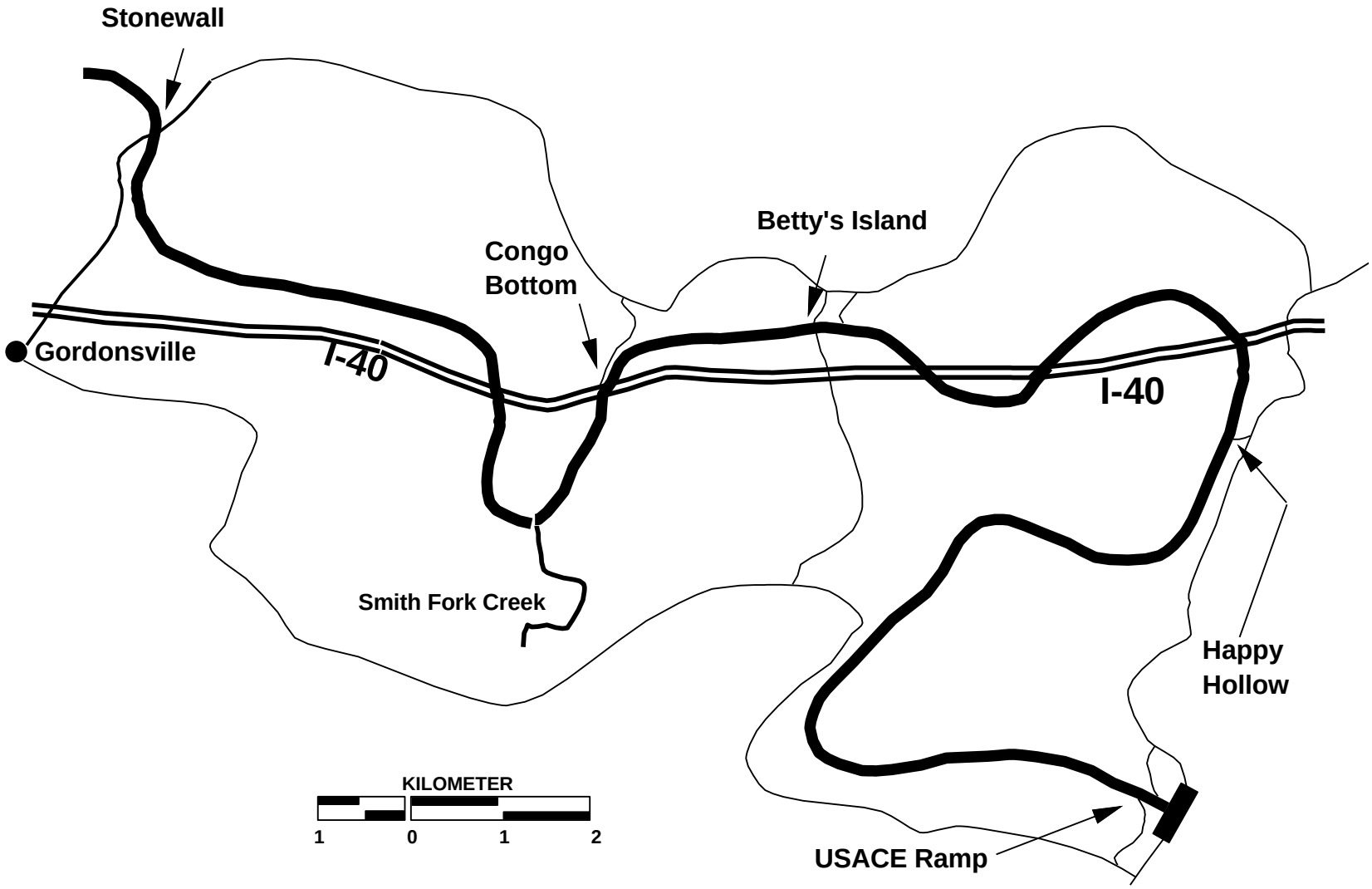

Figure 1. Map of the Caney Fork River. The Area 1 survey reach was between the dam and the I-40 rest area; area 2 encompasssed the reach between Betty's Island and the bridge at Stonewall.

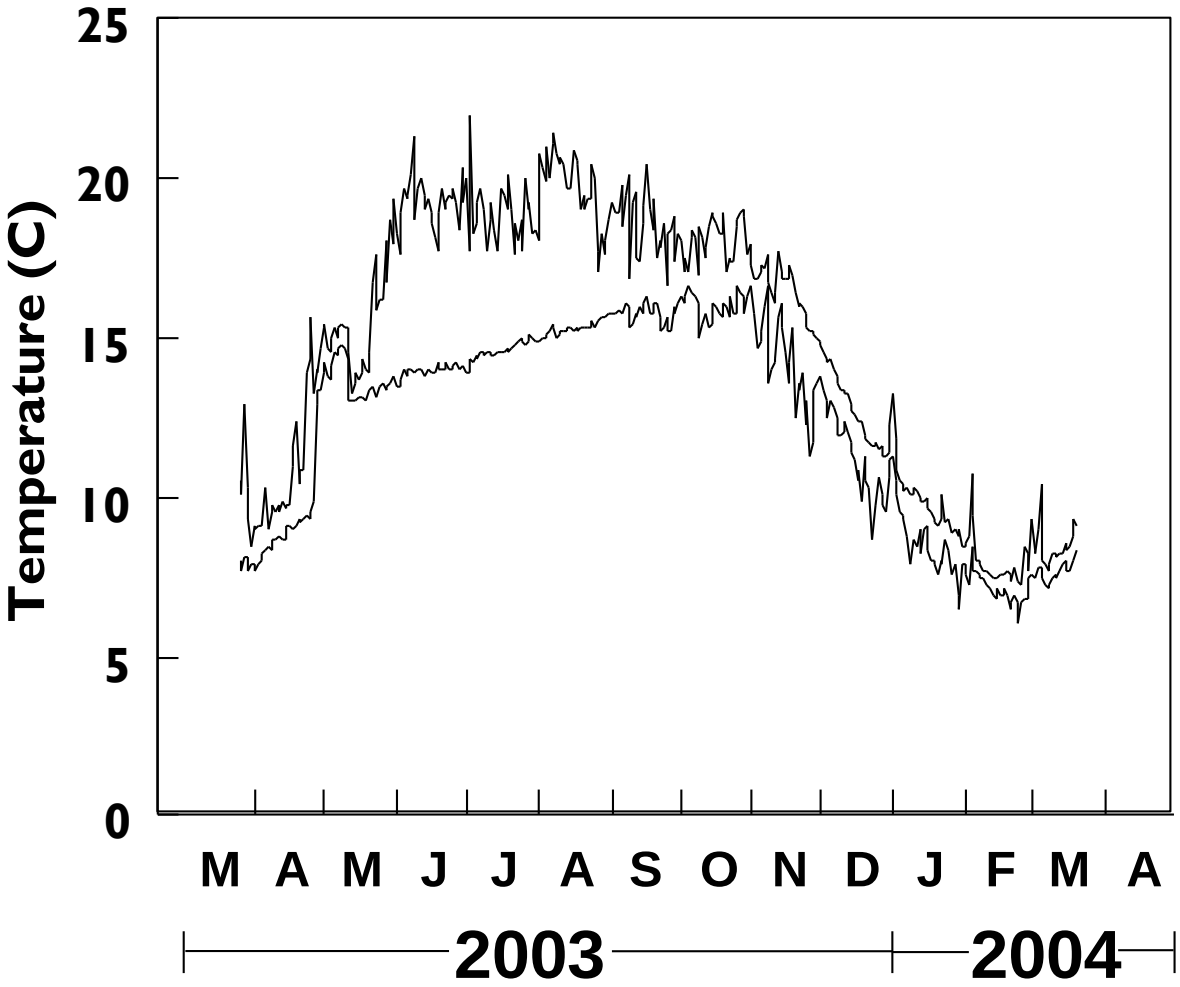

Figure 2. Minimum and Maximum daily temperatures (°C) recorded by three temperature loggers in the Caney Fork River from March 2003 to March 2004. The loggers were placed in the river at Lancaster, Congo Bottoms, and the bridge at Stonewall.

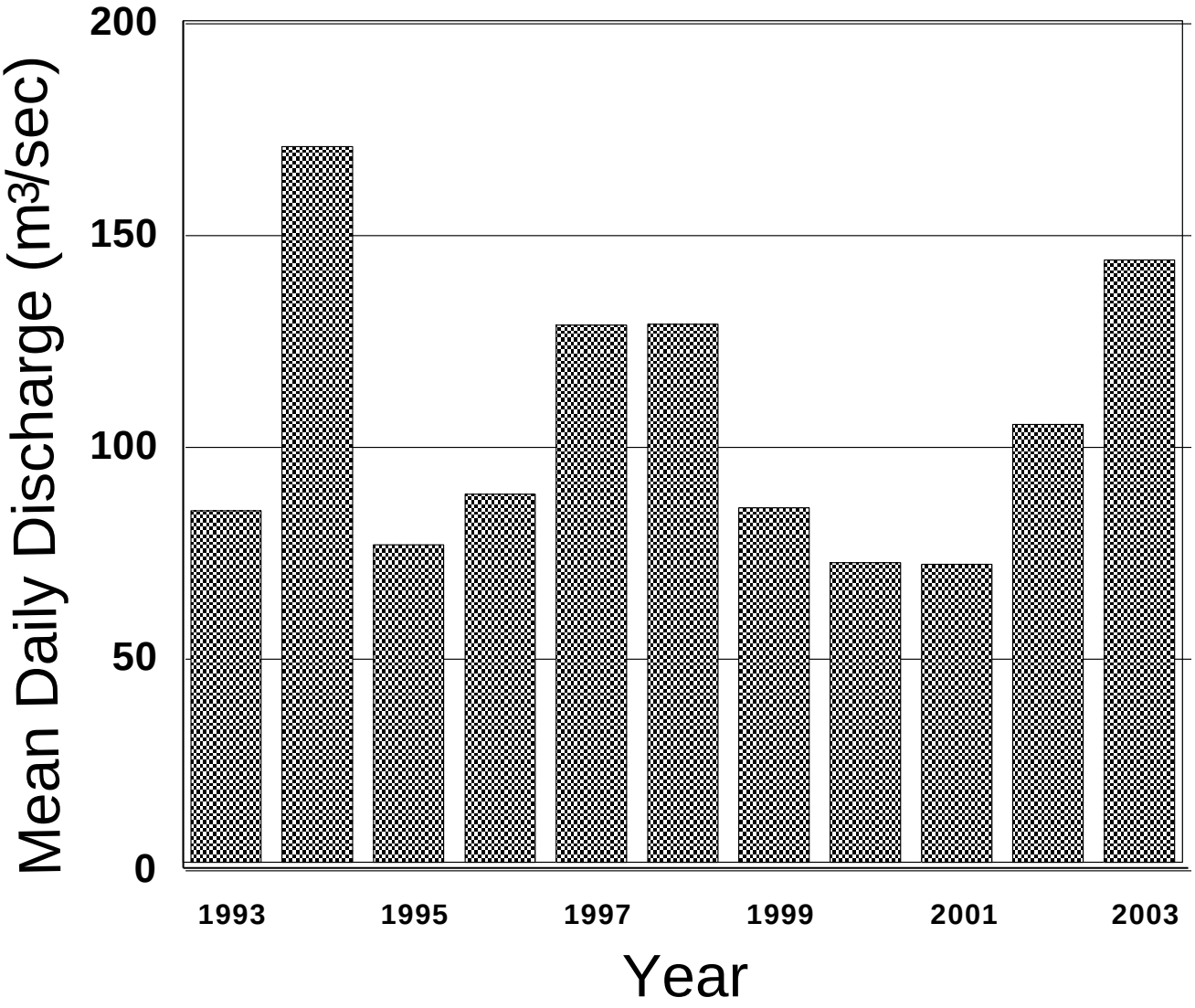

Figure 3. Mean daily discharge from Center Hill Dam, March 1 through October 31, 1993-2003.

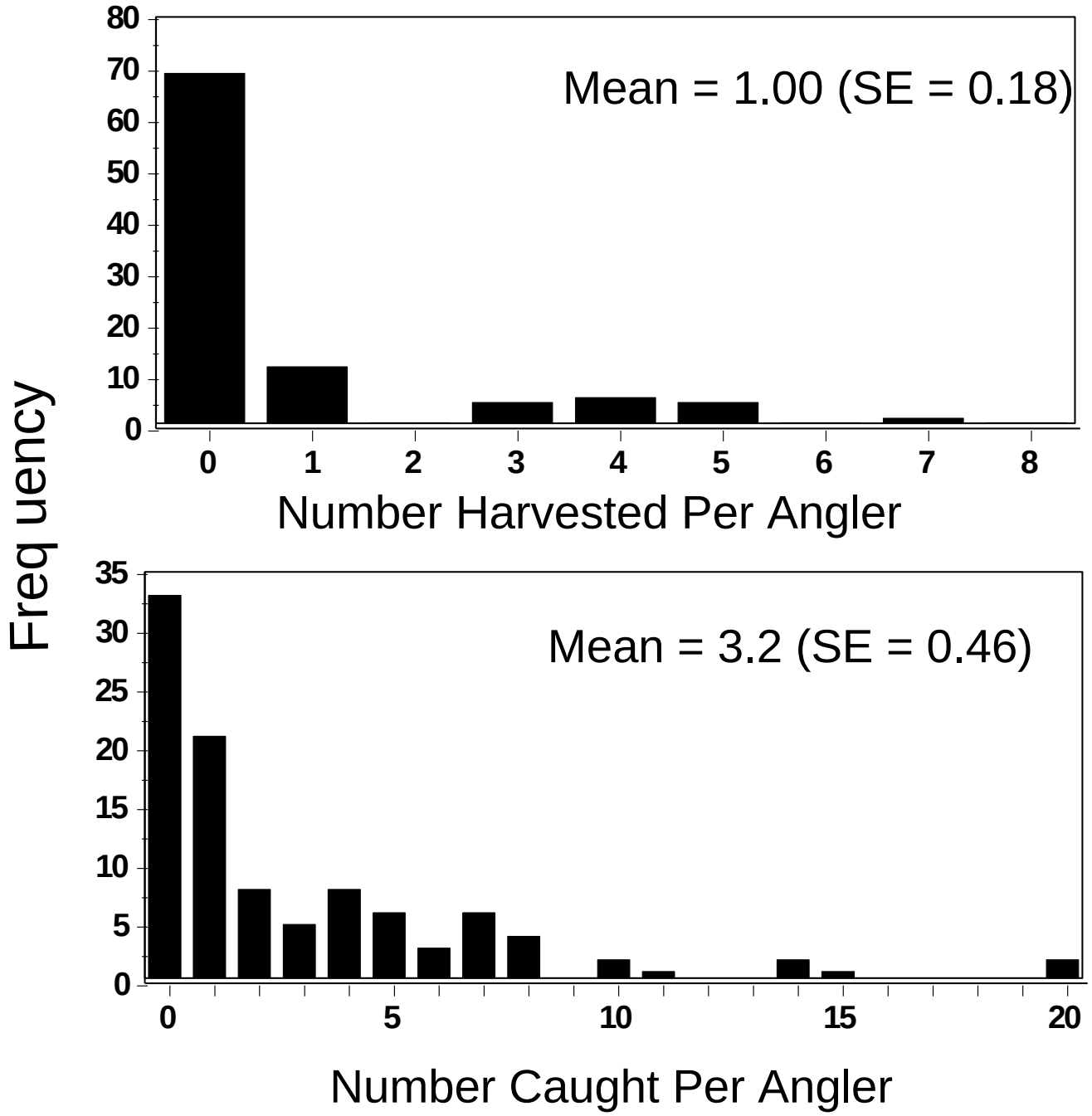

Figure 4. Frequency distribution of the average number of trout harvested and caught by each member of parties that had completed fishing when interviewed on the Caney Fork River, March - October 2003. N = 102 parties.

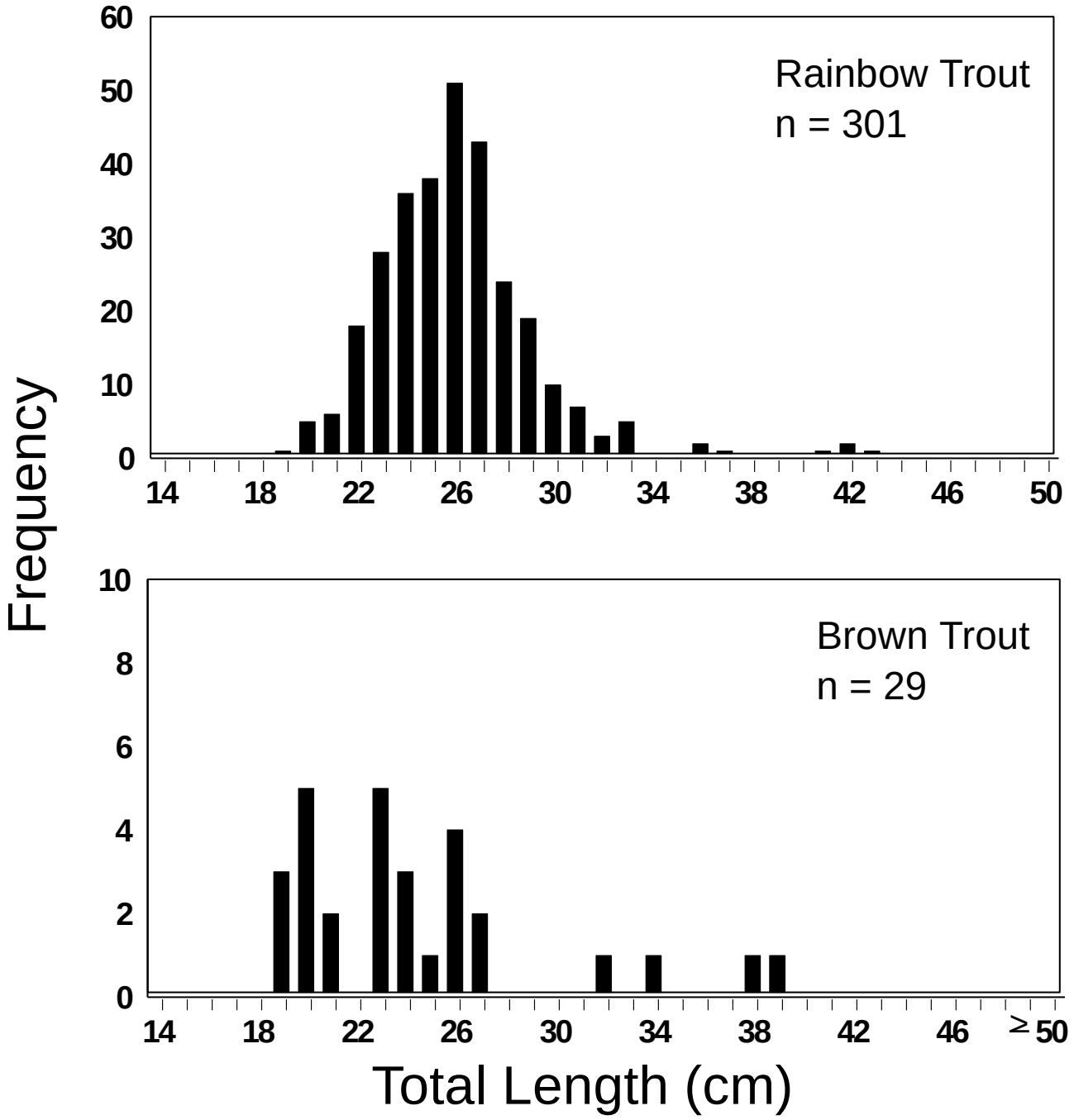

Figure 5. Length-frequency distributions of the trout observed in the creel of anglers in the Caney Fork River, March - October 2002.

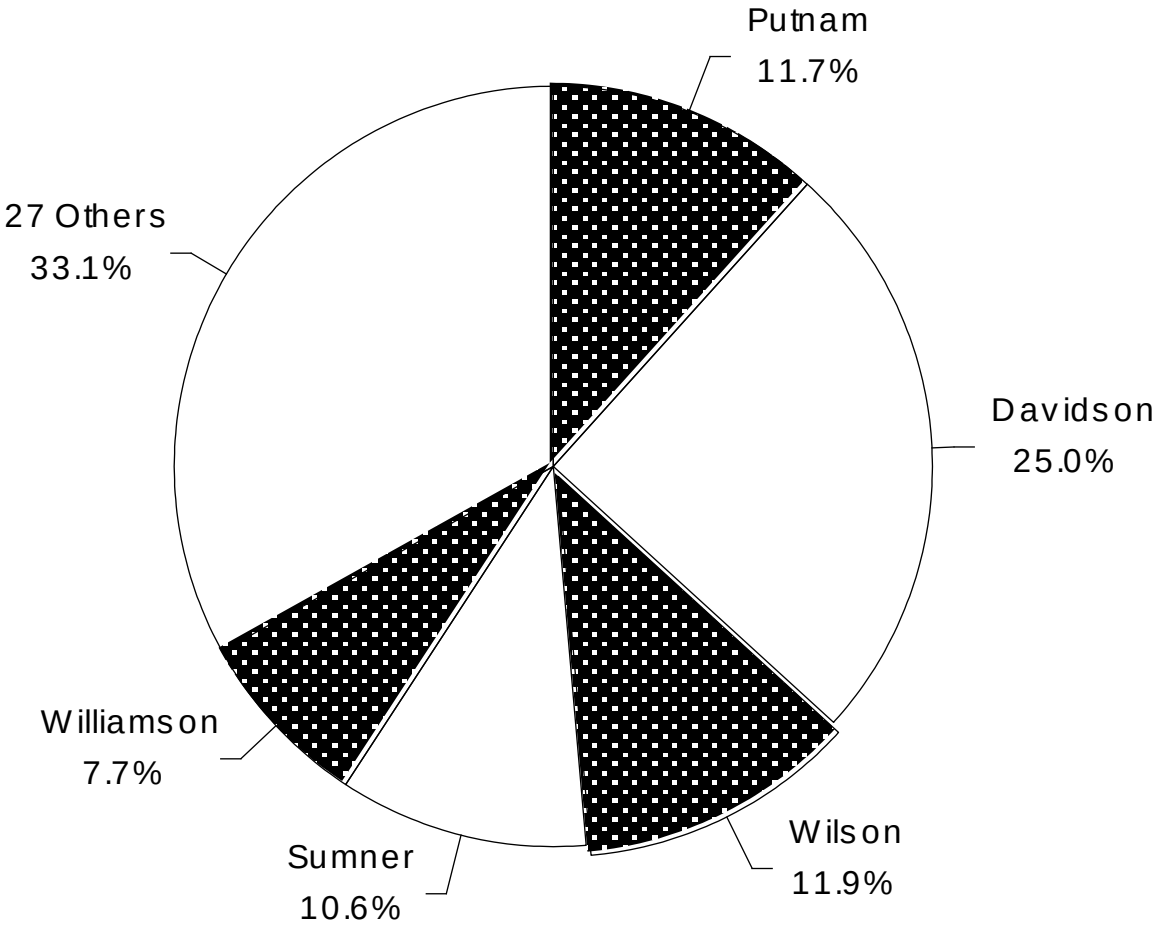

Figure 6. Tennessee county residency of anglers interviewed on the Caney Fork River, March - October 2003.

APPENDIX

INTERVIEW SHEET - CANEY FORK 2003

DATE (mm/dd) _____ INTERVIEW NUMBER _____

KIND-OF-DAY _____ AREA (1 OR 2) _____
Weekday = 1 Weekend / holiday = 2

ACCESS POINT (1 - 8) _____ NUMBER IN PARTY _____←

START OF FISHING _____ END OF FISHING _____
(MILITARY TIME) (or time of interview) (MILITARY TIME)

Time Fishing _Hours_____minutes_____.____
By Party

COMPLETED TRIP ? _____ SPECIES FISHED FOR _____
Yes = 1 No = 2 Trout = 1; Any/Other = 2

Number of **Rainbows CAUGHT** = _____ Number of **Rainbows KEPT** = _____

Total Lengths of Rainbows Kept (nearest cm): _____

Number of **Browns CAUGHT** = _____ Number of **Browns KEPT** = _____

Total Lengths of Browns Kept (nearest cm): _____

For METHOD, TERMINAL GEAR, and LOCATION, the numbers entered in each line should equal the number in the party.

METHOD → STILLFISHING ____ SPINFISHING _____ FLYFISHING _____

TERMINAL GEAR → ARTIFICIAL LURES or FLIES _____ BAIT _____

LOCATION → BOAT _____ OTHER _____

STATE _____ AND COUNTY (Tennessee residents only) _____

DAILY SHEET – Caney Fork 2003

Date (mm/dd/yr) _____ **Day Type** _____

01 = Weekday 02 = Weekend

Area _____

Start of Count _____ **End of Count** _____

River Stage at Start of Count _____ 0 = No Generation 1 = Generation

	ANGLERS						
Area/ Access Point:	**Spin**	**Fly**	**Unknown**	**Cars**	**Boats**	**Trailers**	**Leg End Time**
AREA 1							
1. Dam & campground				X			
2. Road to Lancaster				X			
3. Happy Hollow				X			
4. Rest Area				X			
AREA 2							
5. Above Betty's Island				X			
6. Below Betty's Island				X			
7. Congo Bottom							
8. Stonewall							
Totals:							
	Spin	**Fly**	**Unknown**	**Cars**	**Boats**	**Trailers**	**Leg Time**

Adjusted Angler Count (Leave Blank) _____

Begin Mileage: _____ **Comments** _____

End Mileage: _____

Odometer: _____ **CLERK** ____ (Initials)

START & END TIMES FOR CREEL SURVEY SHIFTS

Caney Fork River - 2003

Month	Days	Daylight Hours	Sunrise	1/3rd	2/3rd	Sunset	Shift Length (h)
March	1 - 15	11.67	6:10	10:03	1:56	5:50	3:53
	16 - 31	12.17	5:50	9:53	1:56	6:00	4:03
April	1 - 5	12.67	5:30	9:43	1:56	6:10	4:13
	(DST starts April 6)						
	6 – 15	12.92	6:20	10:38	2:56	7:15	4:18
	16 - 30	13.42	6:05	10:33	3:01	7:30	4:28
May	1 - 15	13.83	5:50	10:27	3:04	7:40	4:37
	16 - 31	14.25	5:35	10:20	3:05	7:50	4:45
June	1 - 15	14.50	5:30	10:20	3:10	8:00	4:50
	16 - 30	14.67	5:30	10:23	3:16	8:10	4:53
July	1 - 15	14.50	5:40	10:30	3:20	8:10	4:50
	16 - 31	14.17	5:50	10:33	3:16	8:00	4:43
August	1 - 15	13.75	6:00	10:35	3:10	7:45	4:35
	16 - 31	13.33	6:10	10:37	3:04	7:30	4:27
September	1 - 15	12.67	6:25	10:38	2:51	7:05	4:13
	16 - 30	12.17	6:35	10:38	2:41	6:45	4:03
October	1 - 15	11.58	6:45	10:37	2:29	6:20	3:52
	16 - 25	11.08	7:00	10:42	2:24	6:05	3:42
	(DST ends October 26)						
	26 - 31	10.83	6:05	9:42	1:19	4:55	3:37