

TENNESSEE VALLEY AUTHORITY

Water Resources
Aquatic Biology Department

THERMAL VARIANCE MONITORING FOR
BROWNS FERRY NUCLEAR PLANT,
WHEELER RESERVOIR, 1987 - 1989

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INTRODUCTION

Monitoring to determine location and success of sauger spawning in Wheeler Reservoir was initiated in March 1985 and conducted annually through 1989. Cove rotenone sampling to determine trends in reservoir fish standing stocks was also conducted annually on three coves. Results of these activities are summarized below.

METHODS

Larval fish sampling began in March each year. Samples were collected weekly for seven weeks, night sampling only, using a 0.5 m diameter towed net. Six sample transects were established: (1) Tennessee River Mile (TRM) 282, below the mouth of Elk River; (2) TRM 285, above the mouth of Elk River; (3) TRM 292, downstream of Browns Ferry Nuclear Plant (BFN); (4) TRM 310, upstream of the I-65 bridge; (5) TRM 337, upstream of Hobbs Island; and (6) TRM 340, above the mouth of Flint River. Six tows of 10 minutes each were made at each of stations 1-4 including two surface to mid-depth, two mid-depth to 0.5 m above stream bottom, and one full stratum tow from each overbank. Four tows each were made at stations 5 and 6, including two sets of stratified channel samples as described above. No overbank areas exist at transects 5 and 6.

In the laboratory, samples were processed for Stizostedion (sauger and walleye) and Perca flavescens (yellow perch) only.

Cove rotenone samples were conducted each year during late August-early September at three locations; TRM 275.2-Second Creek, TRM 285.8-Lawrence County Park, and Elk River Mile (ERM) 2.7. Standard field techniques for rotenone sampling are contained in Tennessee Valley Authority's (TVA) Biological Resources Procedures Manual, section S&F OPS-FO-BR- 23.9.

RESULTS AND DISCUSSION

Monitoring for Sauger Reproduction

Larval fish sampling during 1985 and 1986 failed to capture any sauger larvae. This would indicate either minimal or totally unsuccessful spawning by sauger during both years. Drought-induced conditions (e.g., low flow, decreased turbidity) may have prevented successful sauger spawning. Turbidity was suggested by Scott and Crossman (1973) to play an important role in survival of sauger eggs by reducing adhesiveness and increasing buoyancy during fertilization.

Occurrence of sauger larvae at BFN has been shown to be directly related to discharge rates at Guntersville Dam (TVA 1983). Sauger usually spawn at night, and recent studies in the Watts Bar tailwater indicate that spawning success is strongly correlated with continuous nighttime flows (TVA 1990). Mean nighttime flows below Guntersville Dam during March, April, and May were higher during 1987 and 1989 than during 1985, 1986, and 1988 (figure 1). The third year of sampling (1987), in less severe drought conditions, produced 15 larval sauger,

and the first specimen was collected on March 31 (table 1). Larvae were collected from all transects except TRM 286, just above the mouth of the Elk River. Seven of the 15 larvae were collected at the most downstream transect, TRM 282, just downstream from the mouth of Elk River. In 1988, the same sampling regime yielded only one larval sauger in 252 samples. During 1989, under more normal flow conditions, five larval sauger were collected in 216 samples. Two of the larvae were collected from TRM 286 and one each from TRM's 282, 293, and 310. Dates of collection ranged from April 5 through April 18 and total length ranged from 9 to 11 mm. Because of similar total length distributions at all transects (table 1), it is possible that some sauger spawning could have occurred in the Elk River.

Yellow perch, which have recently become established in Wheeler Reservoir, spawned successfully each of the five years sampled (table 2). During 1989, 55 yellow perch larvae were collected in 216 samples. This species is influenced less by flow and turbidity during spawning than are sauger and uses aquatic vegetation and a variety of other habitats for depositing egg masses (Scott and Crossman 1973). The rationale for monitoring reproduction of yellow perch as part of this investigation is that this species belongs to the same family (Percidae) as sauger and both are generally considered "coolwater" species. One original concern over the proposal for a thermal variance at BFN was that the increased temperature of 10° F would cause sauger to congregate during winter near BFN diffusers resulting in abnormal seasonal gonadal maturation. Research on which

this hypothesis was based was conducted on yellow perch. Results of this research suggested that yellow perch required a lengthy (120 days) winter "chill period" during which the temperature remained below 6° C. These results were also considered applicable to sauger and walleye. Temperatures in Wheeler Reservoir in winter do not approach this minimum chill period, yet our results from this evaluation of sauger reproduction have shown that yellow perch have reproduced successfully during this period.

Cove Rotenone Samples

Results of cove rotenone sampling in 1987 (table 3) indicated similar standing stocks and species composition to those reported for 1986. The biomass estimate was 632 kg/ha compared with 704 and 613 kg/ha in 1985 and 1986, respectively. In 1988, the fish standing stock by number as well as biomass increased, 64,735 fish weighing 742 kg per hectare (table 4). Both of these values are higher than the means for the period 1969 through 1989 (52,720 fish weighing 711 kg/ha). Estimated standing stocks in 1989 (table 5) were lower, 17,319 fish weighing 678 kg per hectare. Standing stock estimates (number and biomass/ha) from 1969 through 1989, by cove, are presented in figures 2 and 3.

No sauger were collected from the three coves in 1986, 1987, or 1988 (figure 4). In 1989, both young-of-year and harvestable size sauger were collected in the Wheeler rotenone samples. Although cove rotenone sampling is not considered an effective method for estimating sauger

standing stocks, it does provide some indication of reproductive success and occurrence. Mean number of sauger in Wheeler Reservoir from 1969 through 1989 was 9.8 fish/ha weighing 0.7 kg (table 6).

Standing stock of yellow perch in 1987 was 115 fish/ha weighing 0.6 kg/ha, the highest ever recorded for this species in Wheeler Reservoir (figure 5). In 1988, the estimated standing stock was only 2/ha (0.07 kg/ha). In 1989, 14.3 yellow perch/ha weighing 0.14 kg/ha were observed. Mean number of yellow perch in Wheeler Reservoir from 1969-89 was 8.5/ha (0.06 kg/ha), even though they were only collected for the first time in 1977.

SUMMARY

Since BFN went off line (August 1985), thermal variance monitoring on Wheeler Reservoir has been limited to sampling for larval sauger (Phase I) to document occurrence, location(s) and relative success of spawning; and annual cove rotenone sampling (Phase III) to monitor reservoir fish standing stocks. Results of larval sampling indicate an apparent failure by sauger to spawn successfully three (1985, 1986, and 1988) out of five years, with limited spawning success the third (1987) and fifth (1989) year. This conclusion is based on the comparison of the 1985-89 data with previous monitoring results in 1973-80. An average of 73 larval sauger per year were collected in Wheeler Reservoir during this eight year period. The tailwaters of Guntersville Dam are obviously the primary spawning location for sauger in Wheeler Reservoir, based on TVA investigations in other reservoirs

and data presented here. Other potential locations such as the Elk and Flint Rivers were neither confirmed nor eliminated during this monitoring program.

Water temperature fluctuations, flow rates, and turbidity during late winter and early spring are known to influence sauger spawning success. Thus, the severe drought conditions experienced in the Tennessee Valley during 1985-88 have likely been responsible for lack of successful sauger spawning. Because sauger do not normally live past age five in the Tennessee River, it is obvious that three or more unsuccessful year classes could reduce the total population to a level insufficient to maintain itself. Further evidence for several year class failures is the absence of sauger from three successive years (1986-88) of cove rotenone samples; they were previously collected every year since 1969 (figure 3). Results of recent similar investigations of the sauger population in Chickamauga Reservoir (Hickman 1990), indicate a system-wide decline for this species. Evidence seems to correlate this decline with the extended period of severe drought experienced throughout the valley. The results from the Chickamauga study indicate that nighttime flows below mainstream dams during March, April, and May were insufficient for optimum sauger spawning.

Contrary to the apparent decline of sauger discussed above, incidental reports indicated a substantial harvest of sauger by sport fisherman below Guntersville Dam during the winter of 1989-90. Also, on

January 30, 1989, 124 sauger were collected below Guntersville Dam during a gill net survey by Alabama Game and Fish Department. This information indicates that enough sauger have survived the drought period to reestablish a successful sport fishery.

Results of cove rotenone sampling in 1987 indicated near normal fish standing stocks (table 3). In 1988, both number and biomass estimates were higher than the 21-year mean values of 52,720 fish/ha weighing 711 kg/ha (table 5). Number per hectare in 1989 (17,319) was much lower than the 21-year mean value, but biomass (678 kg/ha) was near normal.

REFERENCES

- Hevel, K. W. 1988. Survey of the population dynamics of sauger (Stizostedion canadense) in Chickamauga Reservoir, Tennessee 1986 and 1987. Tennessee Valley Authority, Office of Natural Resources and Economic Development, Division of Services and Field Operations, Norris, Tennessee. 44 pp.
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- Scott, W. B. and E. J. Crossman 1973. Freshwater fishes of Canada. Fish. Res. Board of Canada, Ottawa. Bull. 184. 966 pp.
- Tennessee Valley Authority. 1983. A supplemental 316(a) demonstration for alternative thermal discharge limits for Browns Ferry Nuclear Plant, Wheeler Reservoir, Alabama.

GUNTERSVILLE NIGHT TIME FLOWS

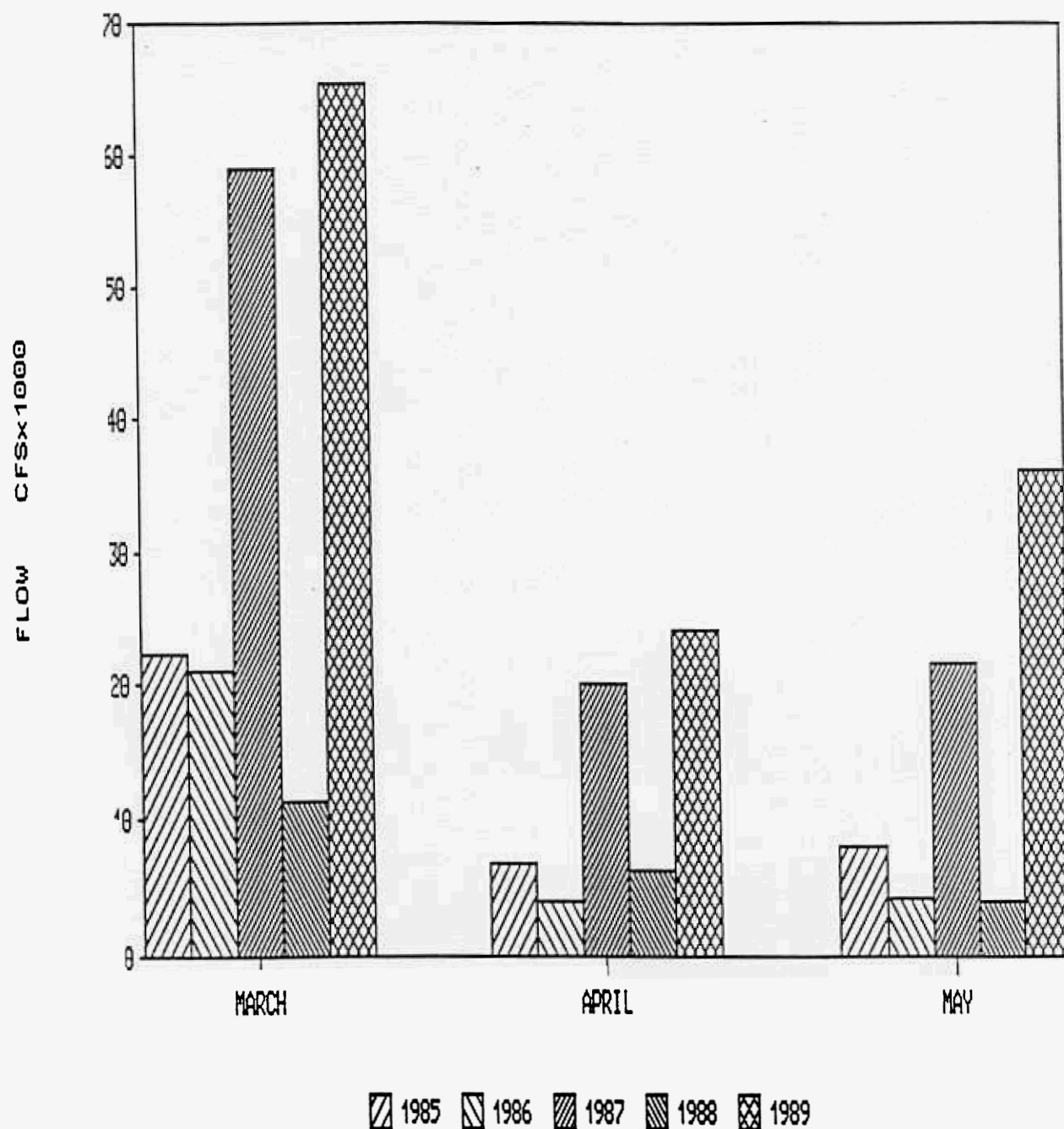


Figure 1. Mean nighttime (8 p.m. to 6 a.m.) flows from Gunterville Dam during March, April, and May from 1985 through 1989.

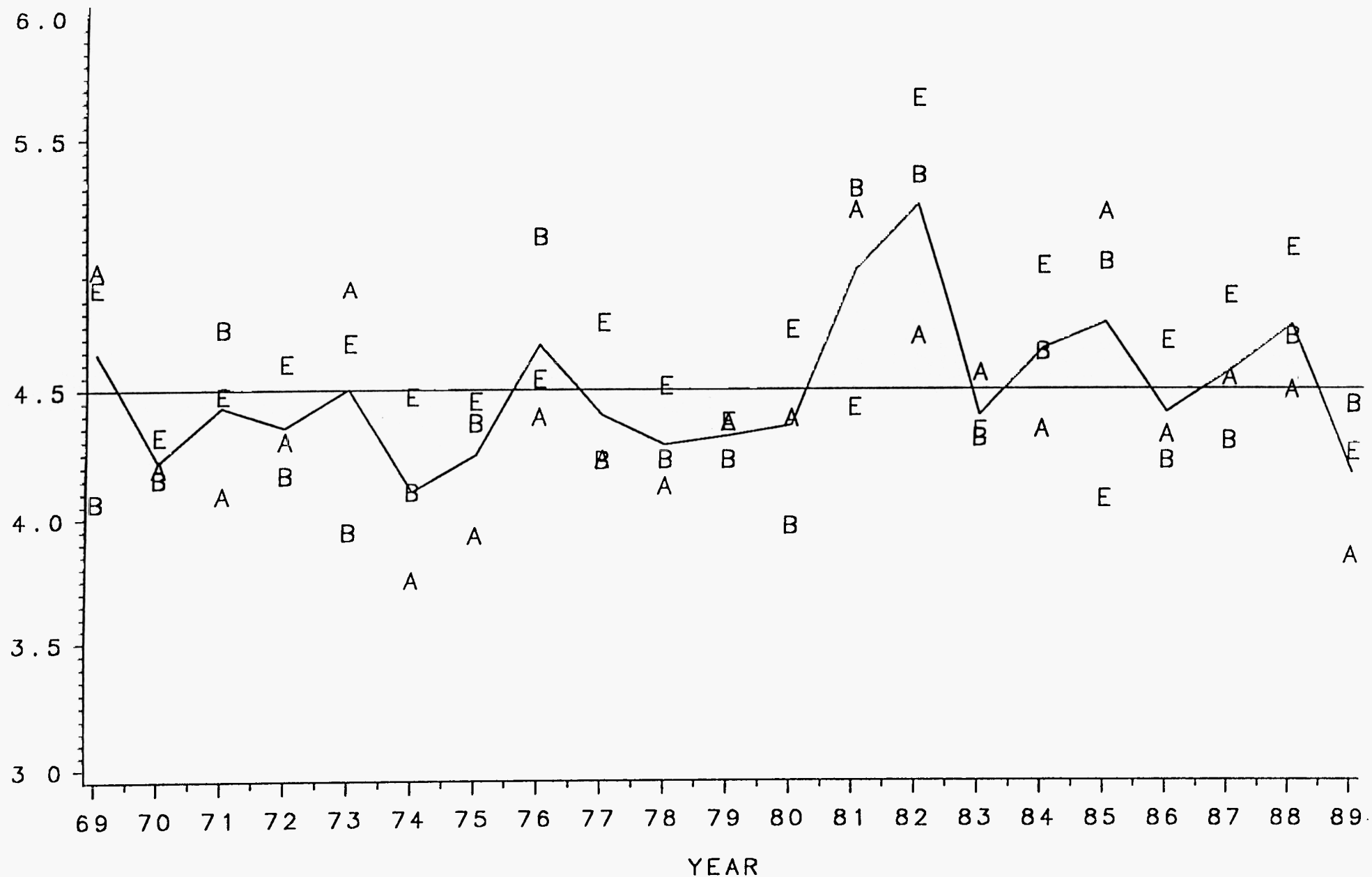
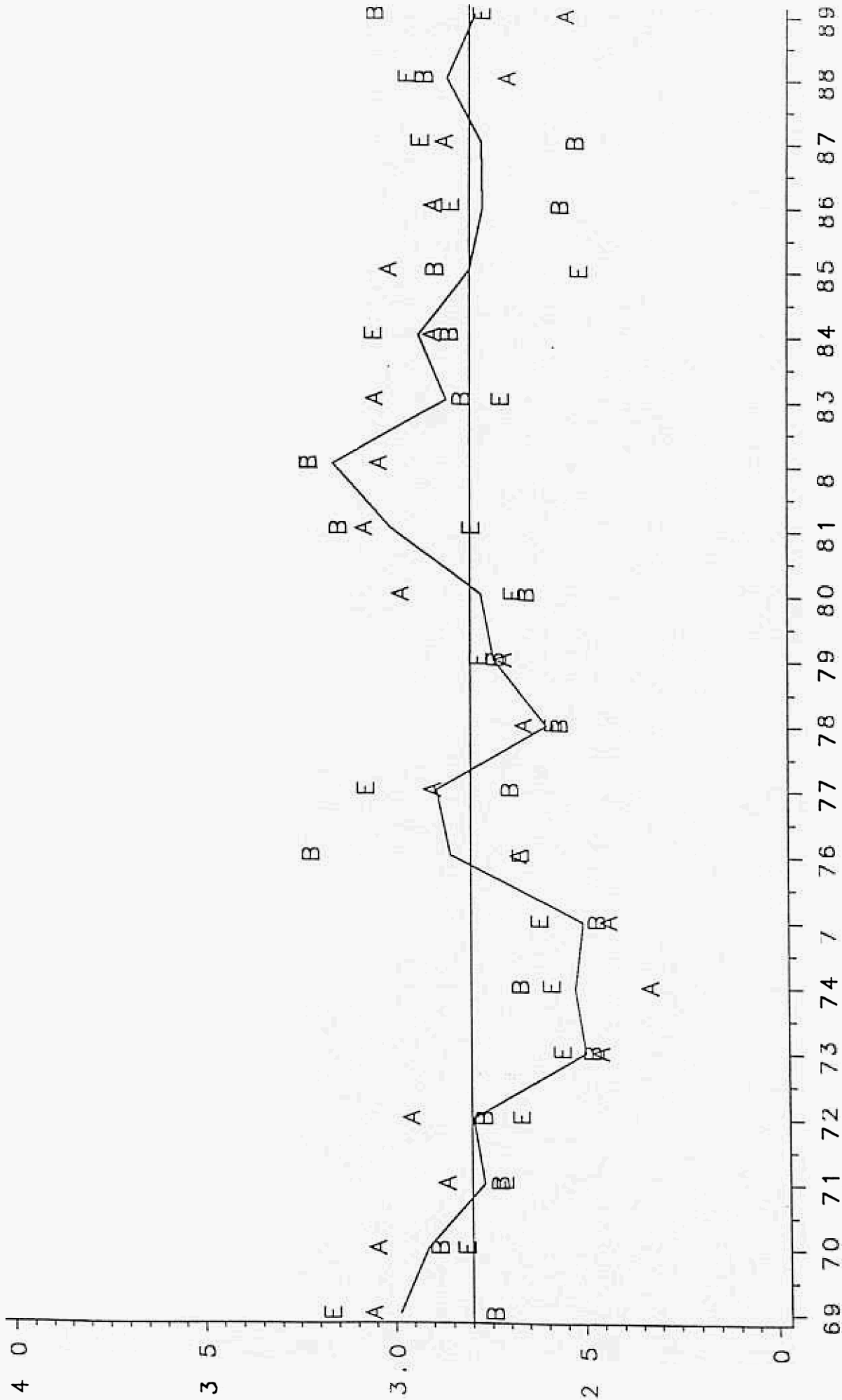


Figure 2. Total standing stocks [\log_{10} (number per hectare + 1)] of fish collected in three cove rotenone samples on Wheeler Reservoir from 1969 through 1989. Straight line represents median.



Total Biomass (log₁₀ kg) of fish collected in three
 Representative years 1969 through 1989. Significant

samples on which

SAUGER

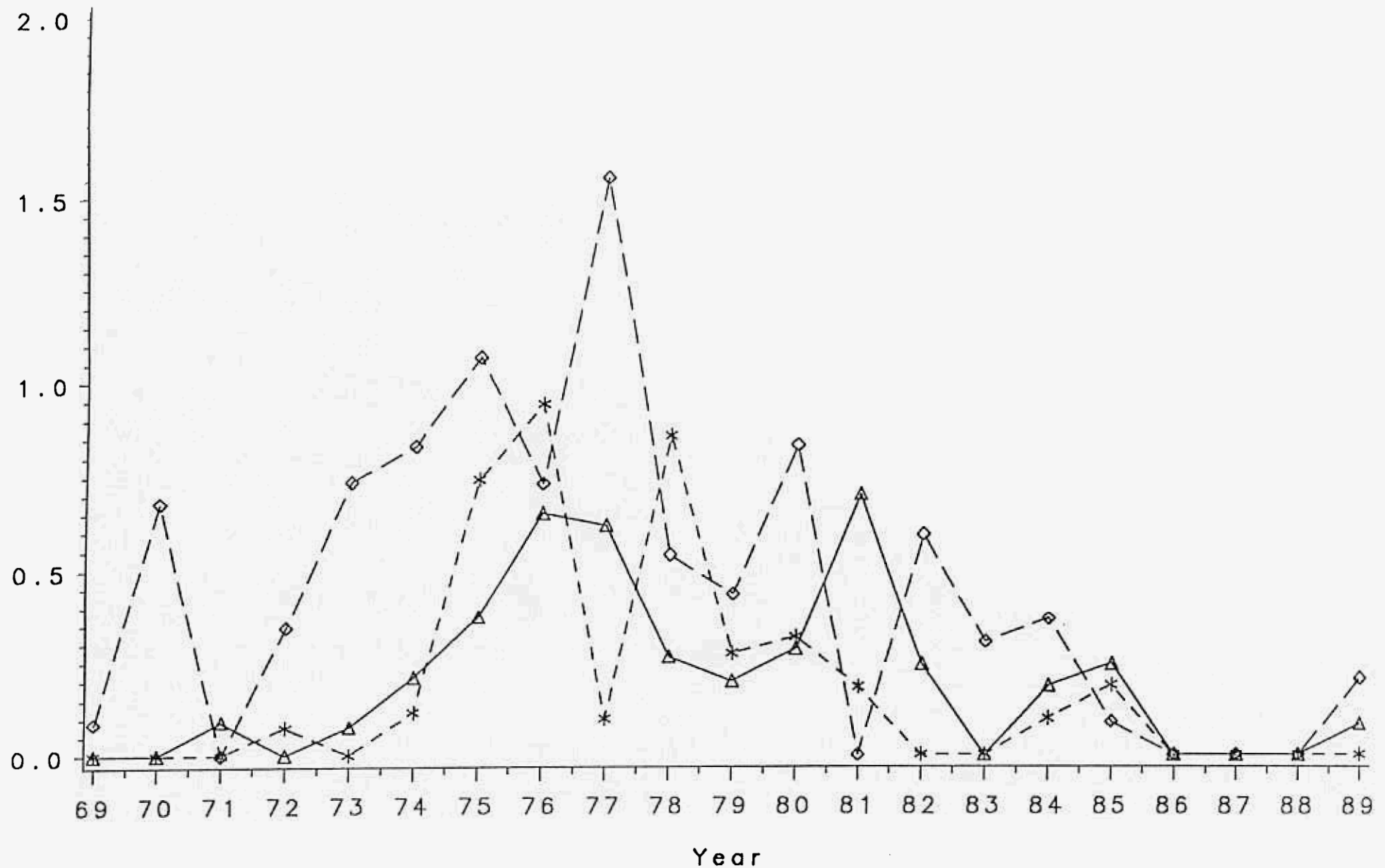


Figure 4. Standing stock [$\log_{10} (\text{number per hectare} + 1)$] of young of year, intermediate and harvestable sauger collected in three cove rotenone samples on Wheeler Reservoir from 1969 through 1989.

YELLOW PERCH

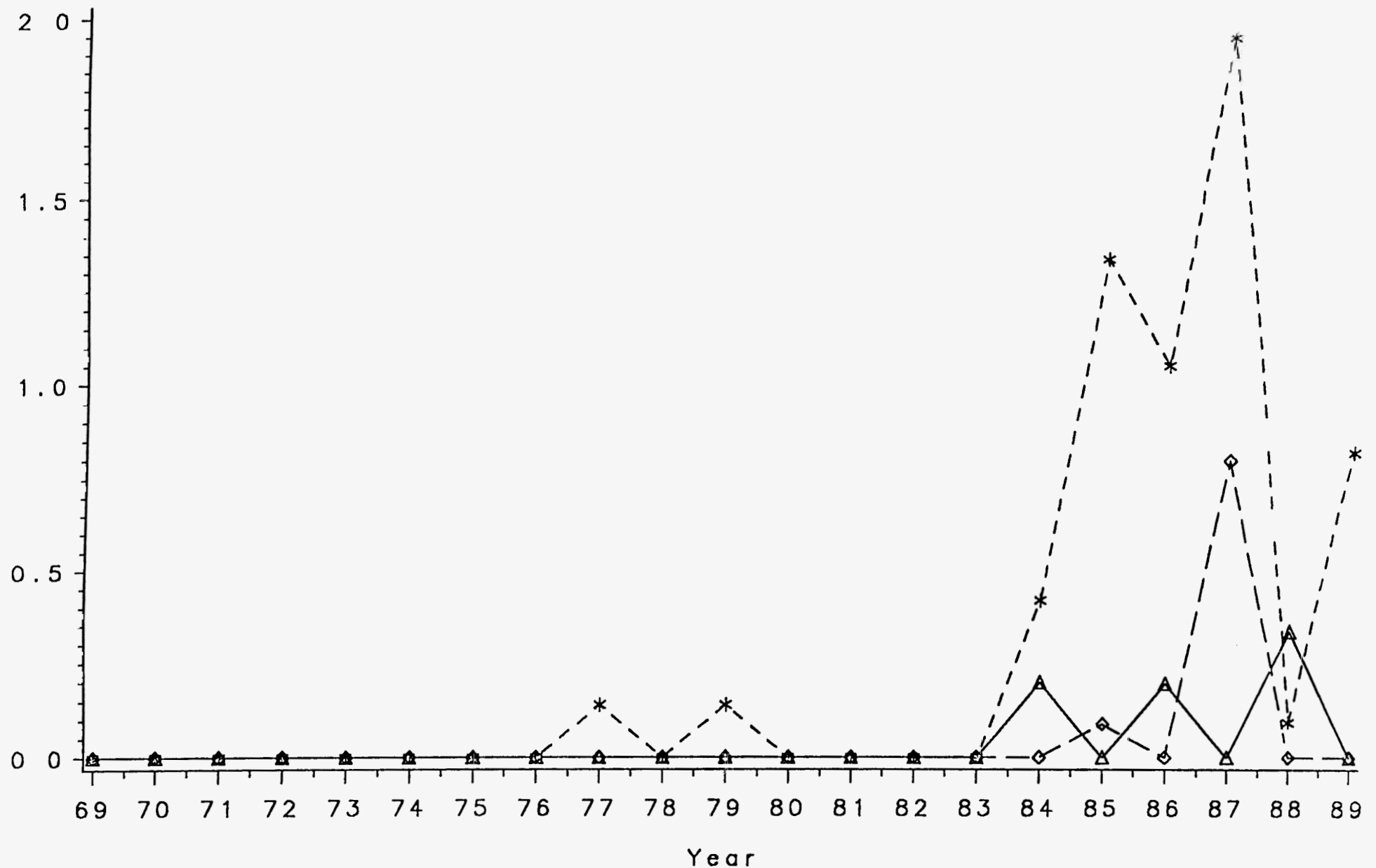


Figure 5. Standing stock [$\log_{10} (\text{number per hectare} + 1)$] of young of year, intermediate and harvestable yellow perch collected in three cove rotenone samples on Wheeler Reservoir from 1969 through 1989.

Table 1. Temporal and spatial distribution of fifteen sauger larvae collected in Wheeler Reservoir during 1987. Numbers in parentheses are total length in millimeters.

Date	Mean Temp (C)	Tennessee River Mile					
		340	337	310	293	286	282
3/24	13.0	0	0	0	0	0	0
3/31	13.3	0	0	0	1(9)	0	0
	11.5	1(9)	0	0	0	0	0
	15.0	0	2(10-11)	0	0	0	0
	18.8	0	1(9)	0	0	0	5(9-14)
	19.1	0	0	0	0	0	1(12)
	20.6	<u>2</u> (10-11)	<u>0</u>	<u>1</u> (11)	<u>0</u>	<u>0</u>	<u>1</u> (18)
Transect Total		3	3	1	1	0	7
Total Length Range mm		9-11	9-11	11	9	-	9-18

ABD-N 00301

Table 2. Total number of sauger and yellow perch larvae collected in Wheeler Reservoir during 1985 through 1989.

Year	Number of Samples	Sauger	Yellow Perch
1985	252	0	17
1986	252	0	19
1987	251	15	126
1988	252	1	44
1989	216	5	55

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Table 3.

MEAN NUMBER AND WEIGHT (KG) OF FISH PER HECTARE IN 3 SAMPLES IN
WHEELER RESERVOIR, 1987

SPECIES	--YOUNG OF YEAR--		--INTERMEDIATE--		---HARVESTABLE---		-----TOTAL-----	
	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT
-----GAME-----								
WHITE BASS	1.79	0.04	5.00	0.34	1.28	0.49	8.07	0.87
YELLOW BASS	692.20	2.25	25.67	1.70	5.80	0.71	723.67	4.66
HARMOUTH	408.95	0.85	13.58	0.31	23.98	1.59	446.51	2.76
GREEN SUNFISH	91.22	0.23	23.45	0.41	8.62	0.54	123.29	1.18
BLUEGILL	19421.80	55.58	1844.71	28.40	451.24	28.22	21717.75	112.20
LONGEAR SUNFISH	1137.18	3.31	838.32	15.10	136.53	6.79	2112.03	25.20
REDEAR SUNFISH	1389.60	4.50	775.56	12.01	139.90	13.33	2305.05	29.84
SMALLMOUTH BASS	57.04	0.31	37.70	1.27	19.47	5.52	114.21	7.11
SPOTTED BASS	30.17	0.17	8.60	0.23	0.61	0.15	39.38	0.55
LARGEMOUTH BASS	80.95	0.38	108.80	3.17	29.20	12.87	218.95	16.42
WHITE CRAPPIE	16.53	0.04	6.10	0.04	8.44	2.07	31.08	2.15
YELLOW PERCH	10.01	0.02	105.30	0.61	-	-	115.31	0.63
GROUP TOTAL	23337.43	67.68	3792.81	63.60	825.06	72.29	27955.30	203.57
-----ROUGH-----								
SPOTTED GAR	1.13	0.07	1.15	0.22	0.85	0.59	3.13	0.88
LONGNOSE GAR	-	-	-	-	0.28	0.09	0.28	0.09
SKIPJACK HERRING	2.05	0.03	3.68	0.21	-	-	5.72	0.24
CARP	-	-	-	-	1.67	8.75	1.67	8.75
SMALLMOUTH BUFFALO	-	-	-	-	18.83	34.86	18.83	34.86
SPOTTED SUCKER	0.56	0.01	1.96	0.29	46.77	19.83	49.29	20.14
GOLDEN REDHORSE	-	-	-	-	10.67	5.41	10.67	5.41
CHANNEL CATFISH	22.39	0.16	1.00	0.08	26.44	16.52	49.84	16.76
FLATHEAD CATFISH	13.13	0.09	1.48	0.16	5.37	6.64	19.97	6.90
FRESHWATER DRUM	38.94	0.42	76.41	4.22	185.20	55.62	300.55	60.26
GROUP TOTAL	78.20	0.78	85.67	5.19	296.08	148.32	459.95	154.29
-----FORAGE-----								
GIZZARD SHAD	3197.80	17.90	-	-	2490.39	221.35	5688.19	239.24
THREADFIN SHAD	7571.37	32.49	-	-	4.39	0.11	7575.75	32.59
GOLDEN SHINER	33.39	0.60	-	-	-	-	33.39	0.60
EMERALD SHINER	65.09	0.17	-	-	-	-	65.09	0.17
BLUENOSE MINNOW	411.30	0.38	-	-	-	-	411.30	0.38
BLACKSPOTTED TOPMINNOW	32.45	0.10	-	-	-	-	32.45	0.10
ORANGESPOTTED SUNFISH	6.84	0.01	23.05	0.09	15.78	0.13	45.67	0.23
LOGPERCH	60.60	0.44	-	-	-	-	60.60	0.44
RIVER DARTER	1.00	T	-	-	-	-	1.00	T
BROOK SILVERSIDE	63.54	0.09	-	-	-	-	63.54	0.09
GROUP TOTAL	11443.38	52.18	23.05	0.09	2510.56	221.58	13976.99	273.85
FINAL TOTAL	34859.01	20.64	3901.53	68.88	3631.70	442.19	42392.24	631.71

Table 4. MEAN NUMBER AND WEIGHT (KG) OF FISH PER HECTARE IN 3 SAMPLES IN WHEELER RESERVOIR, 1988

SPECIES	--YOUNG OF YEAR--		--INTERMEDIATE--		--GAME		---HARVESTABLE---		-----TOTAL-----	
	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT
WHITE BASS	0.82	0.03	5.04	0.38	8.43	2.23	14.30	2.63		
YELLOW BASS	152.99	1.37	16.19	1.12	4.69	0.54	173.87	3.03		
WARWOUTH	87.70	0.32	24.76	0.46	9.96	0.77	122.41	1.56		
GREEN SUNFISH	70.20	0.30	58.85	1.11	23.26	1.46	152.31	2.87		
BLUEGILL	10253.88	32.09	4217.55	62.55	623.58	37.30	15095.00	131.94		
LONGEAR SUNFISH	356.90	1.56	704.92	11.76	79.30	3.74	1141.12	17.06		
REDEAR SUNFISH	2280.64	8.03	369.81	6.99	178.05	14.69	2828.50	29.72		
SMALLMOUTH BASS	42.17	0.23	39.62	1.00	21.12	9.94	102.91	11.17		
LARGEMOUTH BASS	61.24	0.31	51.82	1.66	20.76	10.40	133.83	12.36		
WHITE CRAPPIE	4.64	0.01	0.55	T	2.81	0.96	8.01	0.97		
YELLOW PERCH	-	-	0.31	T	1.85	0.67	2.16	0.07		
GROUP TOTAL	13311.18	44.25	5489.43	87.03	973.81	82.10	19774.42	213.38		
SPOTTED GAR	2.19	0.13	1.13	0.31	2.04	2.73	5.36	3.17		
LONGNOSE GAR	0.55	0.02	0.27	0.06	1.91	1.60	2.73	1.68		
NORTHERN HOGSUCKER	-	-	-	-	0.31	0.08	0.31	0.08		
SMALLMOUTH BUFFALO	-	-	-	-	9.88	21.36	9.88	21.36		
SPOTTED SUCKER	-	-	2.46	0.36	32.59	18.20	35.04	18.56		
GOLDEH REDHORSE	-	-	0.31	0.05	7.34	4.82	7.66	4.87		
CHAIHEL CATFISH	2.52	0.02	2.20	0.15	15.91	7.26	20.63	7.43		
FLATHEAD CATFISH	10.50	0.06	2.31	0.18	1.76	1.17	14.57	1.41		
FRESHWATER DRUM	4.92	0.06	33.19	1.52	57.37	22.94	95.48	24.52		
GROUP TOTAL	20.66	0.30	41.88	2.62	129.12	80.17	191.66	83.09		
GIZZARD SHAD	3894.02	23.81	-	-	-	-	-	-		
THREADFIN SHAD	35909.15	96.72	-	-	-	-	-	-		
CENTRAL STONEROLLER	0.31	T	-	-	-	-	-	-		
SILVER CHUB	0.31	0.01	-	-	-	-	-	-		
GOLDEH SHINER	27.45	1.68	-	-	-	-	-	-		
EMERALD SHINER	15.46	0.04	-	-	-	-	-	-		
FATHEAD MINNOW	0.31	T	-	-	-	-	-	-		
BULLHEAD MINNOW	102.94	0.22	-	-	-	-	-	-		
BLACKSPOTTED TOPMINNOW	19.75	0.04	-	-	-	-	-	-		
MOSQUITOFISH	5.82	0.01	-	-	-	-	-	-		
ORANGESPOTTED SUNFISH	8.74	0.01	12.57	0.05	4.92	0.04	-	-		
LOGPERCH	49.72	0.53	-	-	-	-	-	-		
RIVER DARTER	0.27	T	-	-	-	-	-	-		
BROOK SILVERSIDE	129.45	0.21	-	-	-	-	-	-		
GROUP TOTAL	40163.72	123.28	12.57	0.05	4592.82	321.76	44769.11	445.08		
FINAL TOTAL	53495.56	167.83	5543.88	89.70	5695.75	484.02	64735.18	741.55		

Table 5.

MEAN NUMBER AND WEIGHT (KG) OF FISH PER HECTARE IN 3 SAMPLES IN
WHEELER RESERVOIR, 1989

SPECIES	--YOUNG OF YEAR--		--INTERMEDIATE--		---HARVESTABLE---		-----TOTAL-----	
	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT
-----GAME-----								
WHITE BASS	3.48	0.07			1.64	0.24	5.12	0.31
YELLOW BASS	18.06	0.22	0.80	0.04	0.81	0.12	19.67	0.38
UNIDENTIFIED SUNFISH	3.49	T					3.49	T
WARMOUTH	368.47	0.67	29.14	0.54	21.34	1.72	418.95	2.93
GREEN SUNFISH	38.07	0.07	23.61	0.48	9.19	0.61	70.88	1.17
BLUEGILL	3379.63	5.01	1802.14	30.05	720.60	42.16	5902.37	77.22
LONGEAR SUNFISH	705.46	1.42	337.84	6.11	55.44	2.62	1098.75	10.15
REDEAR SUNFISH	529.41	1.93	195.74	3.48	134.01	13.18	859.16	18.58
SMALLMOUTH BASS	19.72	0.13	13.39	0.66	13.02	3.00	46.12	3.79
SPOTTED BASS	2.12	0.01			0.30	0.05	2.42	0.06
LARGEMOUTH BASS	46.08	0.32	65.09	4.55	46.18	15.37	157.35	20.23
WHITE CRAPPIE	-	-	-	-	1.37	0.35	1.37	0.35
BLACK CRAPPIE	-	-	-	-	0.27	0.02	0.27	0.02
YELLOW PERCH	-	-	14.31	0.14			14.31	0.14
SAUGER	1.08	0.04	-	-	0.27	0.06	1.34	0.10
GROUP TOTAL	5115.06	9.90	2482.07	46.05	1004.44	79.50	8601.58	135.44
-----ROUGH-----								
SPOTTED GAR	1.80	0.01	3.47	0.75	4.88	3.25	9.16	4.02
LONGNOSE GAR	1.27	T	1.44	0.08	0.30	0.24	2.01	0.33
SKIPJACK HERRING	.92	0.04	6.23	0.28			8.15	0.31
CARP					3.36	13.88	3.36	13.88
NORTHERN HOGSUCKER		-	0.30	0.04			0.30	0.04
SMALLMOUTH BUFFALO	-	-	-	-	18.12	46.50	18.12	46.50
BIGHOUTH BUFFALO					0.27	2.04	0.27	2.04
SPOTTED SUCKER	0.54	0.01	1.37	0.16	32.65	17.44	34.56	17.60
GOLDEN REDHORSE					7.62	5.86	7.62	5.86
YELLOW BULLHEAD	-	-	-	-	0.54	0.07	0.54	0.07
BROWN BULLHEAD					0.27	0.02	0.27	0.02
CHANNEL CATFISH	2.96	0.01	0.81	0.05	9.86	8.33	13.62	8.39
FLATHEAD CATFISH	7.40	0.04	8.29	0.80	4.88	2.60	20.56	3.43
FRESHWATER DRUM	58.43	0.56	19.64	1.27	71.53	27.71	149.60	29.54
GROUP TOTAL	72.31	0.67	41.56	3.44	154.28	127.93	268.15	132.04

Table 5. (Continued).

SPECIES	--YOUNG OF YEAR--		--INTERMEDIATE--		---HARVESTABLE--		-----TOTAL	
	NUMBER	HEIGHT	NUMBER	HEIGHT	NUMBER	HEIGHT	NUMBER	HEIGHT
	-----FORAGE-----							
SHAD, HERRING	0.54	T					0.54	T
GIZZARD SHAD	1591.13	16.49	-	-	5558.73	386.51	7149.86	403.00
THREADFIN SHAD	759.42	5.95	-	-	0.61	0.01	760.03	5.96
SILVER CHUB	1.88	T	-	-	-	-	1.88	T
GOLDEN SHINER	15.03	0.71	-	-	-	-	15.03	0.71
EMERALD SHINER	16.82	0.02	-	-	-	-	16.82	0.02
GHOST SHINER	0.30	T	-	-	-	-	0.30	T
SPOTFIN SHINER	15.28	0.03	-	-	-	-	15.28	0.03
MIMIC SHINER	0.61	T	-	-	-	-	0.61	T
STRIPED SHINER	4.24	0.01	-	-	-	-	4.24	0.01
BULLHEAD MINNOW	332.11	0.22	-	-	-	-	332.11	0.22
BLACKSTRIPE TOPMINNOW	28.81	0.03	-	-	-	-	28.81	0.03
MOSQUITOFISH	1.60	T					1.60	T
ORANGESPOTTED SUNFISH	0.81	T	11.82	0.05	-	-	12.63	0.05
STRIPETAILED DARTER	14.61	0.01	-	-	-	-	14.61	0.01
LOGPERCH	79.01	0.63	-	-	-	-	79.01	0.63
BROOK SILVERSIDE	16.37	0.02	-	-	-	-	16.37	0.02
GROUP TOTAL	2878.57	24.13	11.82	0.05	5559.33	386.52	8449.72	410.70
	8065.94	34.70	2535.45	49.53	6718.06	593.95	17319.44	678.18

Table 6. Mean number and weight (kg) of fish per hectare in 63 cove rotenone samples from Wheeler Reservoir during 1969 through 1989.

SPECIES	--YOUNG OF YEAR--		--INTERMEDIATE--		---HARVESTABLE---		-----TOTAL-----	
	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT	NUMBER	WEIGHT
-----GAME-----								
WHITE BASS	14.67	0.21	5.59	0.40	4.51	0.87	24.77	1.48
YELLOW BASS	167.51	0.69	7.42	0.49	2.02	0.28	176.95	1.46
BLACK BASS			0.04	T			0.04	T
IDENTIFIED SUNFISH	565.69	1.66					565.69	1.66
SMOUT	349.20	0.68	61.60	1.21	19.14	1.37	429.94	3.26
DOBSONFISH	0.05	T			0.01	T	0.07	T
GREEN SUNFISH	119.22	0.35	39.22	0.69	9.22	0.57	167.66	1.60
WHEGILL	5316.76	12.28	1422.63	23.66	380.45	26.54	7119.84	62.48
WHEGILL	1226.03	3.38	674.68	11.80	69.20	3.40	1969.91	18.58
DEAR SUNFISH	619.72	1.94	142.30	2.66	77.99	8.83	840.01	13.43
IDENTIFIED BASS	0.03	T					0.03	T
ALLMOUTH BASS	47.12	0.30	21.98	0.89	11.71	3.32	80.81	4.51
OTTED BASS	22.70	0.13	6.24	0.18	1.16	0.25	30.10	0.56
RGEMOUTH BASS	73.82	0.50	93.38	3.82	27.50	10.40	194.70	14.72
ITE CRAPPIE	14.67	0.06	15.61	0.29	8.77	1.78	39.05	2.13
ACK CRAPPIE			0.04	T	0.27	0.04	0.31	0.04
LLOW PERCH	0.49	T	7.81	0.05	0.18	0.01	8.49	0.06
UGER	7.24	0.19	1.46	0.16	1.13	0.32	9.83	0.67
GROUP TOTAL	8544.94	22.37	2500.01	46.30	613.27	57.98	11658.21	126.64
-----ROUGH-----								
OTTED GAR	2.52	0.14	1.23	0.24	1.91	1.58	5.66	1.95
NGNOSE GAR	0.37	0.01	1.16	0.15	0.55	0.30	2.09	0.46
ORTNOSE GAR	0.09	T	0.07	0.01	0.03	0.03	0.18	0.04
WFIN	0.01	T			0.03	0.03	0.04	0.03
IPJACK HERRING	11.05	0.17	8.09	0.37	0.63	0.16	19.77	0.70
ONEYE	0.04	T	0.06	0.01			0.10	0.01
ASS PICKEREL	0.02	T					0.02	T
RP			0.05	0.01	6.66	21.94	6.71	21.95
VER CARPSUCKER			0.02	T			0.02	T
IDENTIFIED HOGSUCKER					0.02	0.01	0.02	0.01
ORTHERN HOGSUCKER	0.07	T	0.25	0.03	0.12	0.04	0.44	0.07
ALLMOUTH BUFFALO	1.43	0.07	5.09	7.03	34.09	58.00	40.61	65.10
GMOUTH BUFFALO	0.02	T	0.30	0.61	1.29	3.24	1.61	3.85
OTTED SUCKER	37.06	0.71	27.75	3.27	58.57	22.72	123.39	26.71
IDENTIFIED REDHORSE	0.30	0.01	0.50	0.07	3.63	1.98	4.43	2.06
ILVER REDHORSE	0.46	0.01	0.08	0.01	1.51	1.12	2.05	1.14
ORTHEAD REDHORSE	0.04	T	0.01	T			0.05	T
IVER REDHORSE	0.10	T	0.02	T			0.11	T
LACK REDHORSE	0.08	T	0.03	T	0.80	0.46	0.91	0.47
OLDEN REDHORSE	0.83	0.01	1.60	0.21	17.80	11.15	20.22	11.37
LUE CATFISH	0.03	T			0.03	0.03	0.06	0.03
LACK BULLHEAD	0.02	T	0.03	T	0.43	0.10	0.47	0.10
ELLOW BULLHEAD	0.02	T			0.03	T	0.04	T
ROWN BULLHEAD			0.01	T	0.04	T	0.05	T
HANNEL CATFISH	14.68	0.09	10.20	0.64	27.17	14.43	52.05	15.16
LATHEAD CATFISH	7.41	0.05	4.07	0.36	4.59	3.05	16.08	3.45
FRESHWATER DRUM	124.10	0.99	74.76	3.95	102.51	43.62	301.37	48.56
GROUP TOTAL	200.74	2.27	135.38	16.98	262.43	184.00	598.55	203.25
-----FORAGE-----								
IZZARD SHAD	21717.51	102.28			3546.30	239.87	25263.81	342.14
HREADFIN SHAD	12557.51	33.09			6.71	0.16	12564.23	33.25
RANGESPOTTED SUNFISH	38.43	0.10	38.16	0.15	4.36	0.04	80.94	0.29
IXED & UNID MINNOWS	868.75	3.98					868.75	3.98
GROUP TOTAL	35182.21	139.44	38.16	0.15	3557.37	240.06	38777.73	379.66
FINAL TOTAL	43927.88	164.09	2673.55	63.44	4433.06	482.03	51034.49	709.56