

FILE

JOB COMPLETION REPORT

As required by
FEDERAL AID IN FISHERIES RESTORATION ACT
TEXAS

Federal Aid Project No. F-3-R-14

Region 3-B Fisheries Studies

Job No. B-23 Population and Reproduction Study
of Channel Catfish in Lake O' the
Pines

Project Leader: Joe E. Toole

J. R. Singleton
Executive Director
Texas Parks and Wildlife Department
Austin, Texas

Marion Toole
D-J Coordinator

Eugene A. Walker
Director, Wildlife Services

March 9, 1967

ABSTRACT

A total of 34 channel catfish (Ictalurus punctatus) was collected from Lake O' the Pines this segment with experimental gill nets and trot lines. Hydrogen sulfide tests were conducted at monthly intervals on 8 permanent sampling stations on the reservoir to determine if toxic concentrations of the gas are periodically present. Criteria for hydrogen sulfide toxicity to channel catfish are taken from Project F-8-R-10, Job E-1 Completion Report.

Extensive flooding of Lake O' the Pines during the spring and summer of 1966 provided a thorough mixing of the reservoir waters and made difficult the evaluation of hydrogen sulfide gas present.

It is concluded that sufficient collections have been made to determine that only a limited population of adult channel catfish is present in Lake O' the Pines. Recommendations are made to continue this study for 1 additional segment for the purpose of acquiring hydrogen sulfide data under normal water level conditions. With the completion of the coming segment recommendations for stocking advanced fingerling channel catfish in Lake O' the Pines will be made if hydrogen sulfide concentrations are found to be tolerable.

SEGMENT COMPLETION REPORT

State of Texas Name: Region 3-B Fisheries Studies
Project No. F-3-R-14 Title: Population and Reproduction
Job No. B-23 Study of Channel Catfish in
Lake O' the Pines
Period Covered: February 1, 1966 - January 31, 1967

OBJECTIVES:

To determine the need for stocking channel catfish (Ictalurus punctatus) in Lake O' the Pines.

1. To determine current population levels of channel catfish in Lake O' the Pines.
2. To determine if toxic concentrations of hydrogen sulfide gas are periodically present in Lake O' the Pines.

TECHNIQUES USED:

Standardized gill nets and trot lines were set this segment for the collection of channel catfish in Lake O' the Pines. Baited hoop nets were used during the 1965 segment but discontinued due to their lack of success. Hydrogen sulfide analyses were made at monthly intervals at 8 permanent sampling stations on the reservoir. Sodium thiosulfate-iodine titrations were used for these tests. Values for pH were recorded in conjunction with each hydrogen sulfide test as well as surface water temperature. Gill nets used in this study were 150 feet in length and 8 feet in depth with mesh size ranging from 1 to 3½ inches. Trot lines used were constructed of nylon seine twine and equipped with 3/0 O'Shaugnessy hooks. These lines were baited with shiners, cut shad and catalpa worms. A total of 55 experimental nets were set (8,250 feet) and approximately 2,000 baited hooks were set this segment for sampling channel catfish in Lake O' the Pines.

FINDINGS:

Thirty-four channel catfish were collected this segment from Lake O' the Pines. Nets and trot lines were set at monthly intervals in the reservoir with the exception of June, when 3 collections were made. Table 1 contains collection dates, size data and individual condition factors for each channel catfish taken.

In mid-April, 1966 the reservoir was filled by flood waters to approximately 10 vertical feet above conservation pool level. This flooded condition persisted through June, 1966. During this period the normally

Table 1
Channel Catfish Collection Data

Date	Number	Length	Weight (grams)	"K"	Sex
2/11/66	-	-	-	-	-
3/30/66	-	-	-	-	-
4/25/66	1	-	4083	-	-
5/24/66	2	255	304	1.83	male - 3
6/8/66	9	522	3176	2.33	female
		500	1758	1.41	male - 3
		396	1021	1.64	female - 3
		295	1539	2.10	female - 5
		293	404	1.61	female - 5
		280	412	1.88	female - 3
		172	82	1.61	male - 3
		262	314	1.76	male - 3
		261	305	1.71	immature
6/10/66	13	503	2495	1.96	male - 5
		439	1474	1.74	male - 5
		420	1503	2.03	male - 5
		364	851	1.76	female - 5
		288	464	1.94	male - 3
		250	362	2.32	female - 3
		261	360	2.03	female - 3
		220	213	2.00	male - 3
225	141	1.24	female - 3		

Table 1 Cont.

Channel Catfish Collection Data

Date	Number	Length	Weight (grams)	"K"	Sex
6/10/66		193	107	1.49	immature
		179	106	1.85	female - 3
		179	97	1.69	immature
		183	102	1.66	male - 3
6/29/66	2	189	101	1.50	female - 3
		400	1219	1.91	female - 2
7/66	2	-	-	-	-
8/66	-	-	-	-	-
9/30/66	2	275	392	1.88	female - 5
		185	90	1.42	immature
10/2/66	2	-	-	-	-
11/22/66	1	318	652	2.03	male - 3
12/66	-	-	-	-	-
1/67	-	-	-	-	-

"K" Range 1.24 - 2.32

Average "K" - 1.79

clear waters of the reservoir were thoroughly mixed and a homogeneous condition prevailed. This flushing action no doubt dissipated any stratified concentrations of toxic hydrogen sulfide gas in the reservoir. As contained in Table 2, Lake O' the Pines Hydrogen Sulfide Study 1966, only occasional traces of hydrogen sulfide gas were found.

The results of laboratory tests under Project F-8-R-10, Job E-1, were used as criteria in this study for determining lethal concentrations of hydrogen sulfide gas. According to these findings the median lethal dosage (LD 50) of un-ionized hydrogen sulfide is 0.8 p.p.m. at pH 6.8, 0.7 p.p.m. from pH 7.0 to pH 7.6 and 0.6 p.p.m. at pH of 7.8 for channel catfish fry. At pH of 7.0 the LD 50 was found to be 1.0 p.p.m. for fingerling catfish, 1.3 for advanced fingerlings and 1.4 for adult channel catfish.

The highest concentration of hydrogen sulfide recorded this segment was a reading of .618 p.p.m. un-ionized at the Johnson Creek station on September 23. The pH reading at this date was 7.1. A concentration of .337 un-ionized H₂S was recorded at this same station number 3, on October 25, with a pH reading of 7.3. On November 21, the un-ionized H₂S had dropped to .187 p.p.m. with a pH reading of 6.8. On January 4, 1967 no hydrogen sulfide was found at station number 3.

Factors used to compute the un-ionized hydrogen sulfide in p.p.m. from total hydrogen sulfide content was taken from Standard Methods for the Examination of Water, Sewage and Industrial Wastes. These data are contained in Table 2.

A wide range of pH values was recorded at the various stations in the reservoir. The lowest pH of 6.5 was recorded at station number 1 on November 21, 1966. The highest reading was pH 8.6 recorded at station number 4 on April 14, 1966. The pH values for each analysis are listed in Table 3. All pH readings were made with a colorimetric method with a Hach direct reading colorimeter. Table 3 also contains surface water temperatures for each analysis.

Of the 34 channel catfish collected this segment, 24 were taken during the flood period in the month of June. A total of 15 experimental gill nets were set and approximately 300 baited hooks were set in conjunction with netting activities. Individual fish taken during this period ranged from 82 grams in weight to 7 pounds. Fifteen immature channel catfish were collected. Condition factors ("K" factors) ranged from 1.24 to 2.32 with the average "K" being 1.79.

Two adult females were approaching ripeness. All individuals were in good physical condition. Gonadal examinations revealed no abnormalities.

As the reservoir returned to normal pool level in early August, 1966, 5 nets were set but no channel catfish were taken. In September collections, 2 fish were netted, a spent female and an immature specimen. One additional catfish was collected in November, 1966.

Table 2

Factors to Compute Un-ionized Hydrogen Sulfide
From Total Hydrogen Sulfide Contents

<u>pH</u>	<u>Factor</u>	<u>pH</u>	<u>Factor</u>	<u>pH</u>	<u>Factor</u>
5.0	0.98	6.8	0.44	7.7	0.091
5.4	0.95	6.9	0.39	7.8	0.073
5.8	0.89	7.0	0.33	7.9	0.059
6.0	0.83	7.1	0.29	8.0	0.048
6.2	0.76	7.2	0.24	8.2	0.031
6.4	0.67	7.3	0.23	8.4	0.020
6.5	0.61	7.4	0.17	8.8	0.0079
6.6	0.56	7.5	0.14	9.2	0.0032
6.7	0.50	7.6	0.11	9.6	0.0013

These factors are applicable at a temperature of 25°C. For temperatures below 20°C. or above 30°C. or for sewages having a mineral solids content exceeding 2,000 mg/l, suitable corrections should be made.

Taken from Standard Methods for the Examination of Water, Sewage and Industrial Wastes, page 274.

It is probable that the channel catfish taken in the June collections entered Lake O' the Pines from Wilkes Reservoir, a private lake located on the upper reaches of Johnson Creek. This reservoir has a substantial channel catfish population and the fish could have readily entered Lake O' the Pines during the flood period.

Figure 1, indicates size range of the channel catfish taken in the June 10, collection. Figure 2, is a photograph of the flood crest at highway 729 bridge on Johnson Creek on Lake O' the Pines.

It should also be noted that the entire June collection of channel catfish was made near the dam, in an area below the mouth of Johnson Creek. It is logical that fish entering Lake O' the Pines through Johnson Creek would be in this area during flood stage.

Figure 3, is a map of Lake O' the Pines showing relative locations of the 8 permanent sampling stations for hydrogen sulfide analysis and Wilkes Reservoir.

Table 3

Lake O: the Pines Hydrogen Sulfide Study - 1966

Station #1 - East Abutment of the Dam		3	15	28	14	31	17	27	11	9	23	25	21	4
		Mar.	Mar.	Mar.	Apr.	May	June	June	Aug.	Sept.	Sept.	Oct.	Nov.	Jan.
Water Temp. °F		52	65	57	65	75	76	82	88	80	78	68	65	50
pH		7.3	7.7	7.4	7.7	6.5	6.8	7.1	6.8	7.3	6.5	7.6	8.3	7.3
Total H ₂ S ppm		.64	-	-	-	-	-	-	-	-	-	-	-	-
Unionized H ₂ S ppm		.147	-	-	-	-	-	-	-	-	-	-	-	-
Station #2 - Hurricane Creek														
Water Temp. °F		56	63	58	65	71	78	88	88	79	78	68	65	50
pH		7.5	7.5	7.6	8.5	7.2	6.7	6.9	8.0	6.9	7.2	7.7	8.3	7.5
Total H ₂ S ppm		-	-	-	.85	-	-	-	-	-	1.065	1.9	.213	-
Unionized H ₂ S ppm		-	-	-	.017	-	-	-	-	-	.245	.173	.005	-
Station #3 - Johnson Creek														
Water Temp. °F		53	65	58	65	70	78	88	88	79	78	71	65	50
pH		7.4	7.5	7.5	7.8	7.3	6.9	7.5	7.3	7.5	7.1	7.3	6.8	7.5
Total H ₂ S ppm		1.06	.64	-	.0426	-	-	-	-	-	2.13	1.9	.426	-
Unionized H ₂ S ppm		.18	.0896	-	.0031	-	-	-	-	-	.618	.437	.187	-
Station #4 - Alley Creek														
Water Temp. °F		55	65	58	65	75	78	88	88	79	78	68	65	50
pH		8.2	8.2	7.7	8.6	7.6	7.1	7.5	8.0	7.5	7.3	7.4	6.7	7.6
Total H ₂ S ppm		.43	-	-	-	-	-	-	-	-	-	-	-	-
Unionized H ₂ S ppm		.013	-	-	-	-	-	-	-	-	-	-	-	-

Lake O' the Pines Hydrogen Sulfide Study - 1966

Station #5 - Mim's Chapel		15	14	31	17	27	11	9	23	25	21	4
		Mar.	Apr.	May	June	June	Aug.	Sept.	Sept.	Oct.	Nov.	Jan.
Water Temp. °F	61	61	65	76	78	88	88	80	87	68	65	50
pH	7.3	7.4	7.3	7.2	6.8	7.6	7.3	7.4	7.2	7.6	7.6	7.6
Total H ₂ S ppm	-	.64	-	-	-	-	-	-	.213	-	-	-
Unionized H ₂ S ppm	-	.147	-	-	-	-	-	-	.051	-	-	-

Station #6 - Highway 155 East		61	63	68	85	76	90	88	80 <th>78</th> <th>68</th> <th>65</th> <th>50</th>	78	68	65	50
Water Temp. °F	61	63	68	85	76	90	88	80	78	68	65	50	
pH	7.5	7.1	7.1	7.1	6.8	8.3	7.4	7.2	7.4	7.6	7.6	7.6	7.5
Total H ₂ S ppm	1.27	-	-	-	-	-	-	-	-	.213	-	-	
Unionized H ₂ S	.178	-	-	-	-	-	-	-	-	.023	-	-	

Station #7 - Copeland Creek		58	58	66	80	78	88	88	80 <th>79</th> <th>68</th> <th>65</th> <th>50</th>	79	68	65	50
Water Temp. °F	58	58	66	80	78	88	88	80	79	68	65	50	
pH	7.6	7.8	7.4	8.1	-	7.6	6.6	7.2	8.2	7.6	7.6	7.6	7.6
Total H ₂ S ppm	.21	1.9	-	-	-	-	-	-	-	-	-	-	
Unionized H ₂ S ppm	.023	.139	-	-	-	-	-	-	-	-	-	-	

Station #8 - Brushy Creek		59	58	66	80	-	88	88	80 <th>78</th> <th>68</th> <th>68</th> <th>50</th>	78	68	68	50
Water Temp. °F	59	58	66	80	-	88	88	80	78	68	68	50	
pH	8.0	7.6	7.7	7.0	-	6.9	7.5	7.2	6.8	7.9	7.9	7.4	
Total H ₂ S ppm	.43	-	.43	-	-	-	-	-	.2	-	-	-	
Unionized H ₂ S ppm	.021	-	.039	-	-	-	-	-	.088	-	-	-	

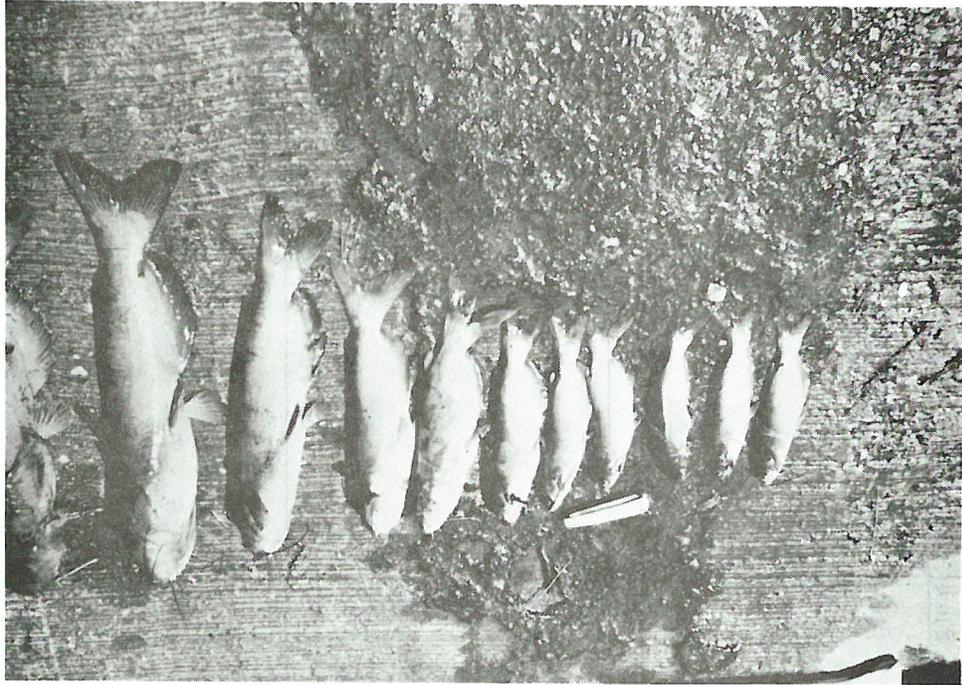


Figure 1. Channel catfish collected during flood conditions



Figure 2. Peak of flood waters May, 1966

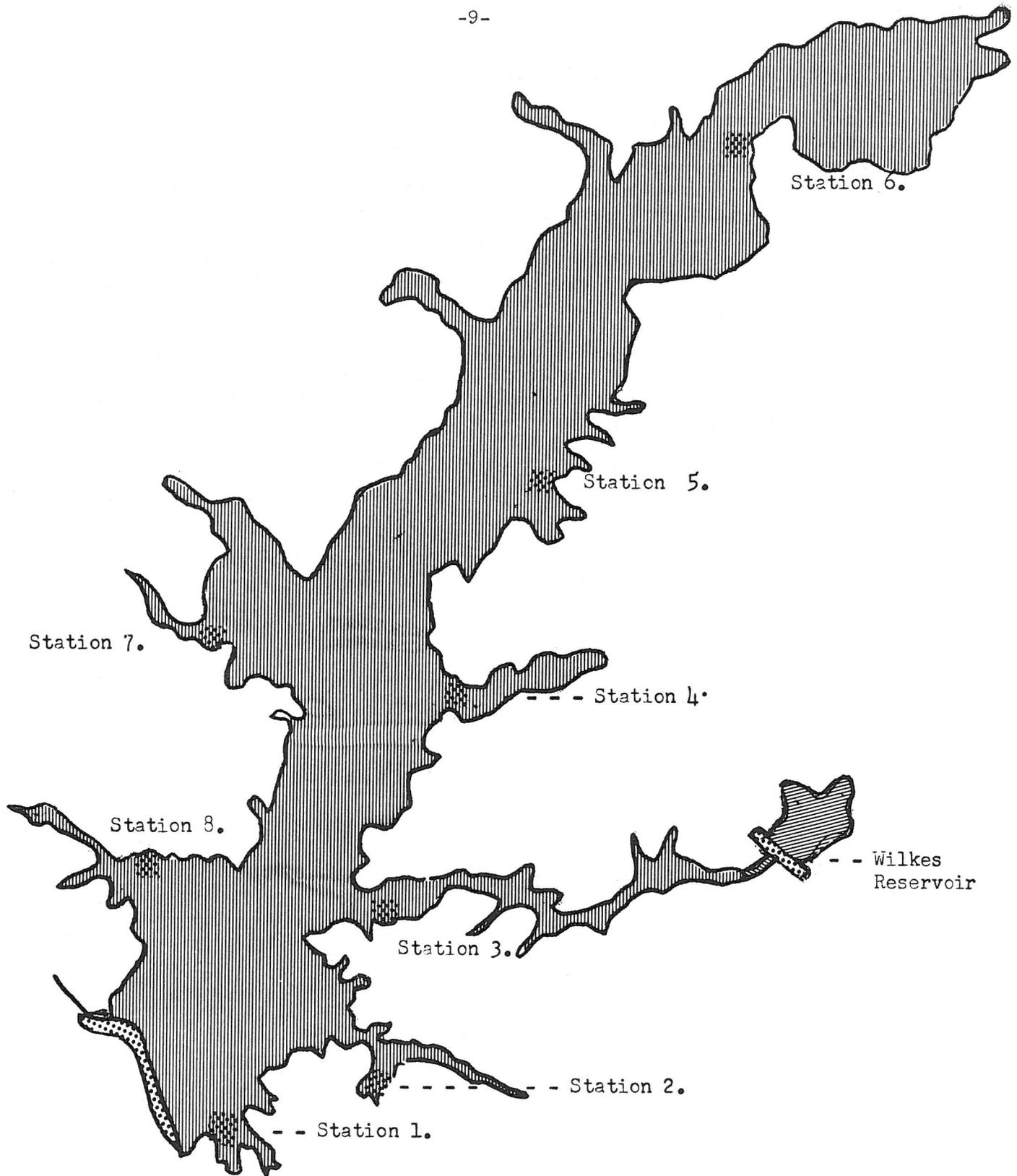


Figure 3. Permanent hydrogen sulfide sampling stations on Lake O' the Pines

CONCLUSIONS AND RECOMMENDATIONS:

The extensive flooding of Lake O' the Pines this year provided, temporarily, a better habitat for channel catfish with the flushing action and thorough mixing of the waters. Inversely, it was detrimental to the establishment of hydrogen sulfide concentrations in the reservoir. Also, as previously mentioned, the samples of channel catfish collected in June, in all probability, entered the reservoir during flood stage and cannot be considered as a valid sample of the native channel catfish population. It is concluded that only a very limited population of adult channel catfish exists in Lake O' the Pines. Spawning activities are very limited at best. It is recommended that this job be continued for 1 additional segment to secure additional hydrogen sulfide evaluations in normal conservation pool conditions. Additional stocking of advanced fingerling channel catfish will be recommended with the termination of this study if hydrogen sulfide levels are found to be tolerable.

Prepared by Joe E. Toole
Project Leader

Approved Marion Toole
Coordinator

Date March 9, 1967

Charles E. Gray
Fisheries Supervisor