

SEGMENT COMPLETION REPORT

As required by

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Federal Aid Project No. F-3-R-10

Fisheries Investigations and Surveys of the Waters of Region 3-B

Job No. E-1 Experimental Use of Copper Sulphate in
Killing Undesirable Fish Species

Project Leader John N. Dorchester

H. D. Dodgen

Executive Secretary

Texas Game and Fish Commission

Austin, Texas

Marion Toole
D-J Coordinator

Eugene A. Walker
Director, Program Planning

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A B S T R A C T

During this segment two private club lakes were treated with copper sulphate to obtain selective fish kills. Bio-assays were conducted for each lake prior to treatment. This chemical has proved to be efficient in controlling bullhead catfish and chub suckers. Sunfish have a higher tolerance for copper sulphate but the chemical greatly increases their movements, which enables very successful netting results to be obtained with these species after treatment.

It is recommended that this job be continued during the coming segment in an effort to explore more fully the potential value of copper sulphate as a fish toxicant. This can be accomplished only with extended field and laboratory studies.

SEGMENT COMPLETION REPORT

State of Texas

Project No. F-3-R-10 Name: Fisheries Investigations and Surveys of the
Waters of Region 3-B.

Job No. E-1 Title: Experimental Use of Copper Sulphate in
Killing Undesirable Fish Species.

Period Covered: February 1, 1962 - January 31, 1963

Objectives:

To further evaluate copper sulphate as a fish toxicant in the waters of eastern Texas by a combination of laboratory and field tests.

Procedures:

During this segment two private club lakes, Pine Lodge Lake near Elkhart and 3-H Club Lake near Carthage, were treated with copper sulphate to obtain a selective fish kill. A bio-assay was conducted in the laboratory prior to treatment using water from the respective lake. Small catfish and sunfish were exposed to various concentrations of copper sulphate in an effort to determine what concentration of the chemical would prove toxic to each particular species. It was also important to determine if any variation in the water quality of one lake compared to another would cause the toxic concentration of the chemical would prove toxic to each particular species. It was also important to determine if any variation in the water quality of one lake compared to another would cause the toxic concentration of the chemical to be varied.

Both of the lakes were netted before and after the copper sulphate treatments. This, of course, would indicate whether or not the expected numbers of undesirable fish had been killed.

Techniques Used:

History

Pine Lodge Lake is located 11 miles south of Palestine, near Elkhart in Anderson County. It contains 42.9 surface acres and 240 acre feet of water. Maximum depth is 20 feet and the average depth is about 6 feet.

The lake was renovated in 1952 with rotenone and restocked in 1953 with 30,000 largemouth bass (Micropterus salmoides), 2,000 black crappie (Pomoxis nigromaculatus) and 2,000 channel catfish (Ictalurus punctatus). During the past few years however, fishing has been very poor. Biologist C. R. Inman surveyed the lake in May 1961 and found it to be overpopulated with sunfish and bullhead catfish.

The 3-H Club Lake is located ten miles west of Carthage, in Panola County. The lake contains 27 surface acres and 220 acre feet of water. The lake was completely renovated in 1956. Ten tons of limestone was added in 1960 and submerged plants were treated that year also. In March 1961, 5,000 pounds of commercial fertilizer (10-20-10) was applied. The fishing has been poor in this lake also for the past few years.

A netting survey by Biologist Inman in December 1961, indicated that this lake was also overpopulated with bluegill sunfish (Lepomis macrochirus) and bullhead catfish (Ictalurus sp.). These species accounted for 67.97 per cent of the total netting catch. The data contained in both lake histories was taken from Mr. Inman's reports.

Bio-assays

Prior to the treatment of both Pine Lodge Lake and 3-H Club Lake, a bio-assay was run. Water was hauled from the lake on which the treatment was pending. Twelve 5-gallon wide mouth jars were used in the test. Sixteen liters of water was placed in each jar and aerated by means of an air stone in each jar. One of the jars served as a control jar and it contained no chemical. The eleven remaining jars contained concentrations of copper sulphate beginning with 1.0 parts per million and increasing 0.2 p.p.m. for each jar. Thus a range of 1.0 to 3.0 p.p.m. was obtained. Two small catfish and two small sunfish were placed in each jar. An effort was made to keep the size of the fish uniform but this was not entirely possible. A time check was made approximately every 15 hours at which time all dead fish were recorded.

Netting Methods

All pre-treatment and post-treatment netting was conducted with experimental type gill nets 125 feet in length. The mesh size changes every 25 feet, and ranges in diameter from 1-, 1½-, 2-, 2½- and 3 inches. Eight of these nets were set in both lakes mentioned in this report. The pre-treatment netting was conducted the night before treatment and the post-treatment netting was approximately one week following the treatment.

All fish netted were weighed and counted according to species. Coefficients of condition ("K" Factors) were calculated for some of the game fish species.

Method of Chemical Application

The copper sulphate was applied from an outboard boat with the aid of a special rig which consists of a steel frame that clamps across the width of the boat and suspends a fiberglas screened bucket in the water. As the boat moves through the water the copper sulphate is fed into the bucket where it is dissolved by the water as it flows through the screened bucket. The prop-wash from the outboard motor aids in dispersing the dissolved chemical.

Pre-Treatment Netting Results

One thousand feet of gill nets were set in Pine Lodge Lake on July 16, 1962. A total of 76 specimens was collected, 62 of these were bluegill sunfish, bullhead catfish and chub suckers. This is 81.58 per cent by number of undesirable species.

In 3-H Club Lake, 1,000 feet of net was also set. A total of 109 fish were caught and 103 of these were bluegill sunfish, and bullheads. This composes 94.50 per cent of the total catch. These data suggest heavy overpopulation of these species in both lakes.

Chemical Application

On July 18, 1962, 1,300 pounds of copper sulphate was applied to Pine Lodge Lake. This was a concentration of 1.5 p.p.m. It was originally planned to treat this lake with a 2.4 p.p.m. concentration of the chemical, which would have required approximately 1,800 pounds of copper sulphate. The 1,300 pounds was on hand on the date of treatment and the remaining 500 pounds was due to arrive during treatment. However, due to a mix-up on the order, it was never received.

The lake had been previously sounded and marked off in four sections to enable a more even distribution of the chemical. The copper sulphate was applied in the previously described manner from an outboard boat.

On July 19, following the treatment, numerous dead chub suckers, yellow bullheads and bluegill sunfish were observed around the edges of the lake. Small bass could be observed swimming, apparently unharmed by the treatment. Also muskgrass (Chara sp.) in the lake appeared to be dying, thus indicating the copper sulphate's value as a plant toxicant also.

3-H Club Lake was treated with 1,000 pounds of copper sulphate on August 22, 1962. This was a concentration of approximately 2.2 p.p.m. The lake was down about 12 inches at the time of the treatment. The chemical was applied in the same method as in Pine Lodge Lake. Many dead bullheads were observed after the treatment and on August 28, 1962, when the post-treatment netting was in progress, the remains of a large flathead catfish (Pylodictis olivaris) was observed. Table 2 gives the water temperature of 3-H Club Lake, taken at 1-foot intervals, on the day of treatment.

Post-Treatment Netting Results

Table 2 shows both the pre-netting and the post-netting results from Pine Lodge Lake. A comparison of these two netting collections might erroneously imply that the treatment was completely unsuccessful due to the fact that many more bluegill sunfish and chub suckers were netted after the treatment than before. It should be noted however, that the copper sulphate causes great activity among sunfish populations. Therefore, even if a considerable number of sunfish are killed by the treatment, many more may be netted after the treatment than before due to the greatly increased activity of the fish. This no doubt, is true to some extent with suckers. Previous reports support this finding also.

In 3-H Club Lake, the number of sunfish netted after treatment was again a great increase over the pre-treatment netting collection. During the first netting, 88 bluegill sunfish were collected. After the copper sulphate treatment, 354 of this species was netted. Results such as these indicate that perhaps even if the chemical does not kill a really sufficient number of sunfish, it may, with an increase in the number of nets set, be used successfully simply by using it as an "agitator" to move the sunfish into the nets. By using a considerable footage of small mesh nets, the sunfish overpopulation problem in small lakes could possibly be lessened considerably.

Table 3 contains the netting data, from both collections, on 3-H Club Lake.

Conclusions and Recommendations:

Although all of the aspects concerning the use of copper sulphate as a fish toxicant have not yet been fully explored, the data in this report indicates that it is successful in controlling bullhead catfish and suckers. Sunfish seem to have a higher tolerance to the chemical but as mentioned, with the aid of copper sulphate sunfish can be netted very successfully.

It is recommended that this job be continued during the coming segment in an effort to explore more adequately the full potential of copper sulphate as a fish toxicant as well as its stimulating effects on the movements of certain fish species. It can also serve a dual purpose in some instances by controlling both undesirable fish and plants.

Prepared by Joe E. Toole
Asst. Project Leader

Approved by Marion Toole
Coordinator

Date June 25, 1963

Charles E. Gray
Regional Supervisor

Table 1. Water Temperature of 3-H Club Lake

August 22, 1962

Depth (feet)	Temperature (degrees F.)
0	87.5
1	87.5
2	87.8
3	87.8
4	87.8
5	87.8
6	86.5
7	86.0
8	85.8
9	84.3
10	83.0
10.5	82.0

Table 2. Netting Results of Pine Lodge Lake

Before treatment: August 21-22, 1962

Species	Number	Percent	Weight	Percent	Average
Chub sucker (<i>Erimyzon sucetta</i>)	10	13.16	4.25	14.13	0.42
Yellow bullhead (<i>Ictalurus natalis</i>)	21	27.63	12.50	41.57	0.59
Largemouth bass (<i>Micropterus salmoides</i>)	5	6.57	8.88	29.53	1.77
Redear (<i>Lepomis microlophus</i>)	7	9.22	0.94	3.13	0.13
Bluegill (<i>Lepomis macrochirus</i>)	31	40.79	2.88	9.58	0.09
Black Crappie (<i>Pomoxis nigromaculatus</i>)	2	2.63	0.62	2.05	0.31
Total	76	100.00	30.07	100.00	

After Treatment: July 23-24, 1962

Species	Number	Percent	Weight	Percent	Average
Chub sucker (<i>Erimyzon sucetta</i>)	24	4.28	10.25	12.28	0.42
Black bullhead (<i>Ictalurus melas</i>)	1	0.18	0.56	0.68	0.56
Yellow bullhead (<i>Ictalurus natalis</i>)	13	2.33	8.12	9.72	0.62
Largemouth bass (<i>Micropterus salmoides</i>)	13	2.33	21.44	25.68	1.65
Warmouth (<i>Chaenobryttus gulosus</i>)	2	0.35	0.31	0.37	0.15
Redear (<i>Lepomis microlophus</i>)	34	6.07	3.00	3.59	0.08
Bluegill (<i>Lepomis macrochirus</i>)	459	81.96	35.56	42.59	0.07
Black crappie (<i>Pomoxis nigromaculatus</i>)	14	2.50	4.25	5.09	0.30
Total	560	100.00	83.49	100.00	

Table 3. Netting Results of 3-H Club Lake

Before treatment: August 21-22, 1962

Species	Number	Percent	Weight	Percent	Average
Blacktail redhorse (<i>Maxostoma poecilurum</i>)	1	0.92	0.19	0.48	0.19
Black bullhead (<i>Ictalurus melas</i>)	5	4.59	4.50	11.32	0.90
Yellow bullhead (<i>Ictalurus natalis</i>)	10	9.18	7.75	19.49	0.75
Redear (<i>Lepomis microlophus</i>)	3	2.75	1.13	2.84	0.38
Bluegill (<i>Lepomis macrochirus</i>)	88	80.73	25.44	63.98	0.29
Black crappie (<i>Pomoxis nigromaculatus</i>)	2	1.83	0.75	1.89	0.38
Total	109	100.00	39.76	100.00	

After treatment: August 28-29, 1962

Species	Number	Percent	Weight	Percent	Average
Largemouth bass (<i>Micropterus salmoides</i>)	2	0.54	1.88	2.15	0.94
Warmouth (<i>Chaenobryttus gulosus</i>)	5	1.36	1.31	1.50	0.26
Redear (<i>Lepomis microlophus</i>)	3	0.82	1.19	1.35	0.39
Bluegill (<i>Lepomis macrochirus</i>)	354	96.20	81.34	92.85	0.23
Black crappie (<i>Pomoxis nigromaculatus</i>)	4	1.09	1.88	2.15	0.47
Total	368	100.00	87.60	100.00	

