GUADALUPE RIVER

Report of Fisheries Investigations

Experimental Selective Rotenone Killing of Undesirable Fish Species in Flowing Streams. (Continuation of Job E-3, Project F-9-R-5)

by

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Dingell-Johnson Project F-9-R-6, Job E-3
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Segment Completion Report

State of TEXAS

Project No. F-9-R-6 Name: Fisheries Investigations and Surveys of the Waters of Region 7-B.

Job No. E-3 Title: Experimental Selective Rotenone Killing of Undesirable Fish Species in Flowing Streams. (Continuation of Job E-3, Project F-9-R-5).

Period Covered: July 1, 1958 - June 30, 1959

Abstract:

Two trial applications were made during this segment. Pro-Noxfish was used at concentrations ranging from 0.08 ppm to 0.12 ppm.

In the first test Pro-Noxfish was used and metered into flowing water at a rate of 0.10 ppm for 42 hours. Bullhead catfish, sunfish, shad, and suckers were killed. A small number of largemouth bass, minnows and channel catfish were also killed.

In the second trial Pro-Noxfish was metered into flowing water at concentrations ranging from 0.08 ppm to 0.12 ppm for a period of 51 hours. Channel catfish, bullhead catfish, largemouth bass, sunfish, gizzard shad, and gray redhorse suckers were killed. The kill was a non-selective one.

A new metering device was used in these two trials. It proved to be superior to the old device but still required frequent adjustment.

There are strong indications that the liquid fish toxicants are settling or at least flowing in the lower stratum of the stream.

The physical characteristics of the test sites prevented any information on the rate of oxidation from being obtained although no fish were killed 500 yards beyond the point where the chemical was introduced.

In the next segment a more complex and systematic approach will be made. It is hoped that some information useful to this particular job will be obtained from Job E-5, F-9-R-7.

Objectives:

To determine the amount of fish toxicant needed and the rate of metering for any given volume of water in streams to selectively kill undesirable fish species.

To develop a metering device and technique for dispensing and dispersing desired amounts of fish toxicant in to flowing water to selectively kill undesirable fish species.

Procedure:

In this segment, two field trial applications were made using the apparatus described in Job E-3, Project F-9-R-5.

The first trial was made on Pulliam Creek, a tributary of the Nueces River in Edwards County. The water was flowing 10 c.f.s. at the time of treatment.

The metering device was set up in a narrow riffle area between two pools. The creek was dammed with sand bags to channel the water through a two foot pass into which the chemical was dispensed. Two large racks were placed just below the metering device to aid in the mixing of chemical and water.

From the treatment point the water flowed through a pool approximately ten yards wide and one hundred yards long. From this pool the water flowed over a two foot fall into a large pool approximately thirty yards wide and two-hundred yards long with depths from two to twelve feet.

The treatment was started at a rate of 0.09 ppm and continued for twelve hours. After three hours of treatment, two gray redhorse suckers had been killed. Treatment was increased to 0.10 ppm for the next thirty hours. Sunfish, bullhead catfish, shad, gray redhorse suckers, and small largemouth black bass were killed. Small numbers of channel catfish and minnows were killed (Table 2). A live box containing one largemouth black bass and three sunfish was placed a few yards below the metering device. At the end of forty-two hours of treatment the fish in the live box showed no sign of distress. No fish were killed below the large pool (approximately four hundred yards from the metering device). Fish were in distress throughout the large pool but not below it.

The second trial during this segment was made at the Francis-Honey Creek Farm, on the Guadalupe River near Hunt, in Kerr County. The volume of flow was 28 c.f.s. at the time of treatment. The metering device was set up at a highway crossing. The water flowed through a culvert and dropped one foot into the stream bed. This provided a good mixing action. The stream flowed from the crossing through a riffle area a few yards below the crossing and into a lake impounded by a dam one-half mile downstream.

Treatment with Pro-Noxfish was started at a rate of 0.08 ppm and continued for ten hours. The rate was increased to 0.10 ppm when no fish were observed to be in distress. Treatment was increased to 0.12 ppm before fish began to surface. Sunfish and small largemouth black bass were killed before shad began to die. Shad, up to three pounds and fifteen ounces in weight, were taken in nets before the treatment. Channel catfish were in distress after twelve hours of treatment at 0.12 ppm. Bottom feeding fish were apparently effected more than shoreline feeding species. The treatment lasted fifty-one hours. A count of the fish killed which floated was made by boat. Divers equipped with SCUBA made a count of the dead fish that sank.

Findings:

The large numbers of bullhead and channel catfish along with other bottom hiding fish would indicate the toxicant is settling to the lower stratum of water. In the test on the Francis Ranch, most of the sunfish and bass killed were in the rapid flowing section of the stream from the treatment point to 100 yards below the point of introduction. Dead bullhead catfish were most numerous at that point where the stream velocity became negligible some 100 yards below the apparatus.

Gizzard shad, being an open water fish and usually inhabiting the upper levels of a body of water, would be unaffected by the toxicant. This was almost the case in this treatment.

Fishing with artificial lures was done occasionally during both treatments. On the Pulliam Creek test, fishing was good through the entire treatment period; but on the Guadalupe treatment the fish did not strike during the last evening of treatment. The gills of largemouth bass and sunfish, which were the only species caught, were very inflamed. The owner of the property adjacent to the Guadalupe River where the kill was made reported good fishing after the treatment even though the kill was not at all selective with respect to shad or any other forage fish. This would indicate the removal of some food source other than fish, possibly the bottom dwelling aquatic insects. There are several factors which could influence the number of sunfish taken in gill nets after the kill, but one possibility is the removal of these aquatic insects by the toxicant, necessitating additional movement by sunfish to obtain sufficient food. All of the above facts tend to indicate that the liquid fish toxicant settles to the stream bottom flows in the lower stratum of water. To further substantiate this possibility, darters (Etheostoma sps.) are usually the first fish to be affected.

If in fact the toxicant is settling, it might be possible to use dispersants to correct this fault.

Strictly on the basis of the information obtained from the gill net sets before and after the treatment, it would indicate a fair selective kill of shad was obtained, but it is felt that there was an inherent error in the net sampling, rather than a successful kill. It is possible that the channel catfish population was slightly reduced, but certainly not to the extent indicated by the net samples. Most of the channel catfish killed were less than six inches in length. Of course longnose gar were unaffected by the treatment even though the net samples indicate they were virtually eliminated.

Overnight setting of several gill nets is no doubt a poor method of evaluating the exact success of a kill. However, better methods have not been advanced. The men using SCUBA were very helpful in determining the kill at the time of treatment.

Table No. 1 gives the before and after netting results, along with fish picked up on the surface and by SCUBA divers at the time of treatment.

In both tests during this segment the metering apparatus was set up above a large pool, which required 24 to 36 hours for the volume of flow to displace all the water contained in the pools. Under these circumstances the rate of oxidation of the fish toxicant could not be evaluated to any degree of accuracy, but in neither case were fish killed beyond one-half mile below the point of chemical introduction. Only a small amount of oxidation would have to occur before the toxicity level would drop below a concentration lethal to shad.

In future segments it will be necessary to determine the dispersing characteristics of the chemical used as a fish toxicant. It is now obvious that merely metering a certain amount of a liquid fish toxicant into a stream will not produce a selective kill of shad.

A much more complex and orderly approach than had been anticipated must be made. Much needed information could come from the Aquatic Chemist now working on Job E-5, F-9-R-7.

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Table 1. Guadalupe River Treatment at the Francis - Honey Creek Farm.

Species	Gill Net Collection before Treatment 4-16-59		Fish Collection during Treatment 4-20-59		Gill Net Collection after Treatment 6-15-59	
	Number	Percent	Number	Percent	Number	Percent
Longnose gar	30	26.32	0	0.0	1	1.47
Gizzard shad	49	42.98	22	18.48	15	22.06
Gray redhorse sucker	5	4.39	2	1.68	0	0.0
Channel catfish	11	9.65	22	18.48	4	5.88
Yellow bullhead catfish	4	3.51	51	42.88	10	14.71
Flathead catfish	0	0.0	0	0.0	1	1.47
Largemouth bass	4	3.51	9	7.56	1	1.47
Sunfish *	11	9.64	13	10.92	36	52.94
Totals	114	100.00	119	100.00	68	100.00

* Includes warmouth, green sunfish, redear sunfish, yellowbelly sunfish and bluegill sunfish.

Table 2. Pulliam Creek Treatment at Forrest Weldon Farm.

Species	Fish Collection during Treatment 3-19-59 Number	Percent
Gizzard shad	25	20.68
Gray redhorse sucker	16	13.22
Spottail minnow	3	2.47
Stoneroller	3	2.47
Channel catfish	4	3.30
Bullhead catfish	22	18.19
Largemouth bass	10	8.26
Sunfish	33	27.28
Greenthroat darters	5	4.13
Totals	121	100.00