Report of Fisheries Investigations

Underwater Observations of Fish Populations in Clear Water Lakes of Central Texas, including the Effect of Various Sound Frequencies on Fish

by

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A B S T R A C T

Experiments designed to attract fish to underwater sound were discarded because of the inability to carry out the continuous field activities necessary. Tape recordings of the sounds produced by river carpsucker, Carpiodes carpio, were made. These sounds consisted of short trills in the 200 to 1000 cps range. Attempts to re-broadcast these sounds underwater were futile. The experiments are believed to be important in fisheries work but must be abandoned until suitable laboratory facilities to carry on the work are available.

Segment Completion Report

State of TEXAS

Project No. F-2-R-8 Name: Fisheries Investigations and Surveys of the Waters of Region 6-B.

Job No. E-5 Title: Underwater Observations of Fish Populations in Clear Water Lakes of Central Texas including the Effect of Various Sound Frequencies on Fish.

Period covered: February 1, 1960 - January 31, 1961

OBJECTIVES

Testing the responses of fish to sound was included under Job E-5, Projects F-2-R-6 and F-2-R-7. The experimental work is still far from complete since more frequencies will have to be tested before definite conclusions can be reached.

Since experimental work in previous segments seemed to indicate that some species of fish were attracted to underwater sounds, this reaction will be studied further. An attempt will also be made to ascertain the practical application of the use of underwater sound in fisheries management.

In addition, general observations on fish activities, habitat requirements and behavior patterns will be conducted.

PROCEDURE

Work during the segment was concerned entirely with two objectives. The primary one was to develop recording and transmitting equipment with sufficient fidelity and gain to accurately reproduce the low intensity underwater sounds made by freshwater fishes and to transmit these sounds at increased volume. The second phase involved devising sampling methods which would lend themselves to statistical analysis in field experiments utilizing sound to attract and repel fish.

No work was done on visual observations with SCUBA equipment because of above normal turbidity and continued ear trouble among members of the diving team.

The broadcast of pure tones, randomly selected, was to be continued. Because of the inadequacies of the sampling techniques utilized in the preceeding segment this phase of the work program was not continued.

The sampling technique used in segment 7 permitted only one sample and one control in a 24-hour period. The time required for an adequate sample for each frequency tested would require at least 30 days of continuous field activity. The required manpower and time were not available for this large-scale work.

Efforts were made to increase the sample number by utilizing quick release drop nets instead of the gill net square previously employed. The use of drop nets would possibly triple the number of samples which could be made in a 24-hour period. This was not considered enough gain to justify the expense of sustained field work, since hundreds of pure tones and mixed frequencies had to be screened.

It was decided to drop the artificially-produced sounds and to attempt to utilize the natural sounds produced by freshwater fish species.

Again, the limitations of field work in these experiments became apparent. Recording equipment which worked well in the laboratory would not respond correctly in the field. Interference, including 60-cycle hum, surface noises, and the sounds produced by aquatic organisms other than fish, prevented the recording of undistorted fish sounds.

The delicacy and fine adjustment inherent in the equipment used made transportation of the sound system from the laboratory to the field difficult.

FINDINGS

Actual experiments during the segment were limited to recording fish sounds in Lake Travis. Forty to fifty adult river carpsucker, Carpiodes carpio, were placed in a 10' x 6' x 4' hardware cloth enclosure. A hydrophone was suspended in the enclosure and sounds produced were recorded on tape. Initially, recordings were made utilizing only the hydrophone for pick-up, a Tektroni low-noise amplifier, and the tape recorder.

Because of the large hydro-electric plants and numerous power lines in the area, 60-cycle hum interfered with the recording quality. A 60-cycle "T" was introduced in the system to null this interference. After introduction of the "T" the quality of the recording improved significantly.

During the segment eight 1,200-foot tapes were used to record carpsucker sounds. An attempt was made to analyze the tapes on a sonograph. Although a repeated short trill in the 200-1000 cps range was observed, low level interference on the tapes prevented an absolute breakdown of the call.

The recorded "trills" were believed to be carpsucker sounds since they were not recorded at any other location in open water of the lake or in the empty livebox. Identical sounds were recorded in every instance where carpsuckers were present.

Repeated efforts were made to re-broadcast these recorded sounds to determine their effect in attracting or repelling other fish of this species. The equipment used would not reproduce the sounds effectively. The hydrophone used as the underwater speaker distorted the sounds and made them unrecognizable. A consulting engineer assisted in this phase of the project but the equipment could not be converted to an effective transmitting device.

CONCLUSIONS

Underwater sound could become an important tool in fisheries management. Previ

studies under this project have shown that certain frequencies repel the gizzard shad, Dorosoma cepedianum, and a variety of sounds apparently attract members of the family Centrarchidae which includes the largemouth bass, one of the most sought after game species in the Region.

As difficulties with the equipment increased during the segment it was concluded that the experiment would be better suited to the laboratory than to the field. The recording of fish sounds and screening of sounds with possible attractive qualities could be done with higher fidelity and at much lower cost in the laboratory where a source of natural water for tanks and aquaria and a supply of test animals exists.

RECOMMENDATIONS

It is recommended that the job be dropped until laboratory facilities with necessary requirements can be obtained.

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