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A FIELD CHECK ON THE RELATIVE EFFICIENCY OF THE D. C. AND A. C. SHOCKERS
FOR COLLECTING FISH

By Gerald P. Cooper

During the period of October 4 to 12, 1955, a field party consisting of Institute personnel, District Fisheries Supervisors from Region I, and Dr. R. M. Bailey of the Museum of Zoology, University of Michigan, was engaged in a fish survey of the Huron and Silver rivers in Baraga County. Most of the fish collections were made by D. C. shocker, this being the type of shocker which has been in general use by Institute personnel during the past few years. However, at one station on the Silver River an intensive collection was made using both a D. C. and an A. C. shocker, in order to compare the fish-collecting efficiency of the two types of unit. Although the Institute has switched largely to the use of the D. C. unit, there is relatively little recorded information in the files as to how the two units compare.

The locality of the study was on the Silver River proper, in the northwest corner of Section 24, T. 51 N., R. 32 W., Baraga County. At this point an improved County road crosses the river. The collecting was done starting at a point 200 yards below the road bridge and extending upstream to a point 125 yards above the bridge. These distances were

paced off by a person walking along the bank. The collecting was done from 2:15 P.M. to 3:45 P.M. on October 6, 1955. The stream at this point is about 50 to 75 feet wide. The D. C. shocker was operated along the east bank of the stream, and the A. C. shocker was operated along the west bank. Both shockers were operated along the complete stretch of 325 yards of stream. Each shocker was operated to cover a strip of the stream channel, about 10 to 15 feet wide, immediately adjacent to the shoreline. Messrs. Reeve M. Bailey, Leland R. Anderson and Gerald P. Cooper operated the D. C. shocker from 2:15 P.M. to 3:00 P.M., while during this same interval Messrs. Florin Warren, Clifford L. Long and Walter R. Crowe operated the A. C. shocker. At 3:00 P.M. Messrs. Bailey, Anderson and Cooper switched over to the A. C. shocker, while Messrs. Warren, Long and Crowe switched over to the D. C. shocker, for the operation during the period from 3:00 P.M. to 3:45 P.M. Switching personnel was done with the idea of eliminating bias which might be due to variation in efficiency amongst the two crews. This site on the Silver River was chosen because the stream here is relatively straight in its course, and fish habitat conditions along the two sides of the stream are very similar. Neither shocker was operated in the central channel of the stream, and there was therefore no overlap in stream area covered by the two units. Both shockers were operated from very shallow water along the stream bank out to a depth of about 3 to 4 feet.

The D. C. shocker used here was a 230-volt, 2,500-watt, 2-stroke-cycle, Homelite generator purchased in 1955. It was rigged with 30 feet of #18 insulated wire going to each positive electrode, and each positive electrode was a single circle, 9 inches in diameter, of 6-gauge copper wire. With the D. C. shocker, the negative electrode

was a thin sheet of galvanized steel, 10 inches by 8 feet, attached to the bottom of the shocker boat.

The A. C. shocker was a 110-volt, 500-watt, 60-cycle, single-phase, Universal generator purchased in 1948. It was rigged with 32 feet of #18 wire going to each electrode. The two electrodes were 8" by 10" rectangular grids; each grid was bordered by 1 1/32-inch copper tubing and was meshed by 8 strands plus 31 strands of 1/16-inch copper wire.

All fish collected were preserved--separately for the two units. During the collecting, considerable effort was put into the recovery of lampreys from mud banks in shallow water, since the matter of kinds and abundance of lampreys was an important question in this survey of the Silver River.

In the laboratory, all fish in the two collections were identified, counted, and measured individually as to length. Identifications were verified by R. M. Bailey. The numbers and lengths of all fish in the two collections are summarized in Table 1.

Represented in the two collections were 16 species of fish, as follows: rainbow trout (Salmo gairdneri), brook trout (Salvelinus fontinalis), brown trout (Salmo trutta), rock bass (Ambloplites rupestris), brown bullhead (Ameiurus nebulosus), Michigan brook lamprey (Ichthyomyzon fossor), sea lamprey (Petromyzon marinus), white sucker (Catostomus commersoni), common shiner (Notropis cornutus frontalis), blacknose dace (Rhinichthys atratulus), longnose dace (Rhinichthys cataractae), creek chub (Semotilus atromaculatus), mudminnow (Umbra limi), johnny darter (Etheostoma nigrum nigrum), logperch (Percina caprodes), and northern muddler (Cottus bairdi).

Table 1

Length frequency distributions (total length) and numbers of specimens of fish taken by A. C. and D. C. shockers, Silver River, October 6, 1955

Kind of fish	Total lengths in inches																Total number of fish	Average [∇] length	
	1.3-1.5	1.6-1.8	1.9-2.1	2.2-2.4	2.5-2.7	2.8-3.0	3.1-3.3	3.4-3.6	3.7-3.9	4.0-4.2	4.3-4.5	4.6-4.8	4.9-5.1	5.2-5.4	5.5-5.7	5.8-6.0			6.1-6.3
By A.C. shocker (12 species)																			
Rainbow trout	...	...	...	5	5	1	...	...	...	...	...	...	...	...	...	...	...	11	2.5
Brook trout	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	2.7
Total trout	...	...	...	5	6	1	...	...	...	...	...	...	...	...	...	...	...	12	2.5
Rock bass	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	3.2
Mich. brook lamprey, adult	...	...	...	...	...	...	...	...	...	...	...	1	3	1	...	...	...	5	5.3
Ammocoete	...	...	...	...	...	...	1	...	1	...	...	5	9	8	5	3	...	32	5.4
Sea lamprey, ammocoete	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1	4.1
Total lampreys	...	...	...	...	...	...	1	...	1	1	...	...	6	12	9	5	3	38	5.3
White sucker	...	...	...	1	1	3	2	...	...	...	...	...	...	...	...	...	...	7	2.8
Common shiner	1	9	5	...	...	...	...	...	1	...	...	...	...	...	...	...	...	16	1.9
Blacknose dace	4	4	...	2	3	1	1	...	...	...	...	...	...	...	...	...	...	15	2.0
Longnose dace	...	1	5	9	1	1	...	3	...	1	1	...	...	...	...	...	...	22	2.6
Creek chub	...	5	6	1	...	1	1	1	...	...	...	...	...	1	...	1	...	17	2.6
Total suckers and minnows	5	19	16	13	5	6	4	4	1	1	1	...	...	1	...	1	...	77	2.3
Johnny darter	...	3	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	7	2.4
Northern muddler	...	4	...	1	4	3	4	1	...	...	...	...	...	...	...	...	...	17	2.6
By D.C. shocker (15 species)																			
Rainbow trout	...	...	5	5	11	4	1	...	...	...	1	...	...	1	2	...	1	31	3.0
Brook trout	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	2	4.6
Brown trout	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	2.9
Total trout	...	...	5	5	11	5	2	...	...	...	1	...	...	1	2	...	2	34	3.1
Brown bullhead	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	3.2
Mich. brook lamprey, adult	...	...	...	...	...	...	...	...	...	...	...	2	4	4	1	...	...	11	5.4
Ammocoetes	1	1	...	...	...	...	1	2	1	4	2	6	7	5	10	5	2	47	4.9
Sea lamprey, ammocoete	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	4.4
Total lampreys	1	1	...	...	...	...	1	2	1	4	3	6	9	9	14	6	2	59	5.0
White sucker	...	...	...	...	2	...	1	...	...	...	...	...	...	...	...	...	...	3	2.8
Common shiner	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	1.7
Blacknose dace	3	3	...	1	5	...	1	...	...	...	...	...	...	...	...	...	...	13	2.1
Longnose dace	...	...	3	12	7	6	3	2	1	...	1	...	...	...	...	...	...	35	2.7
Creek chub	...	1	3	...	...	...	1	...	...	...	...	...	...	...	...	...	...	5	2.2
Total suckers and minnows	3	9	6	13	14	6	6	2	1	...	1	...	...	...	...	...	...	61	2.5
Mudminnow	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	2.7
Johnny darter	...	...	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	4	2.8
Logperch	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1	4.4
Northern muddler	1	4	...	2	1	2	1	...	...	...	...	...	...	...	...	...	...	11	2.2
Total fish by A.C.	5	26	16	19	15	14	10	5	2	2	1	...	6	13	9	6	3	152	3.15
Total fish by D.C.	5	14	11	20	29	15	11	4	2	4	6	6	9	10	16	6	4	172	3.45

∇* Average lengths were computed from the original measurements made to the nearest 0.1 inch.

The A. C. shocker took 12 species, whereas the D. C. shocker took 15. Both shockers took a good series of all of the species which were common or abundant. The difference, as to the number of species, was in the fact that the D. C. shocker took 4 rare species (each represented by one individual specimen in the collection) whereas the A. C. shocker took only one rare species (the rock bass, represented by one specimen). This difference between the total number of species taken by the two units (largely due to the rare species) may have been mostly due to chance.

The differences which appear to be of some significance are as follows: The D. C. unit took more trout and more lampreys. The A. C. unit took more specimens of minnows, especially those of smaller size. The average size of all fish collected by the A. C. unit was somewhat smaller than of those collected by the D. C., largely due to the smaller size of the minnows. The total number of fish (172) taken by the D. C. was somewhat greater than the total number (152) taken by the A. C.

It was quite obvious in the operation of these two units that the A. C. stunned fish more completely, making it easier to merely dip the fish up, rather than having to actively pursue them. This may account for the greater number of small minnows taken by the A. C. shocker. This greater stunning (inactivation) by the A. C. shocker was especially obvious in the case of larval lampreys. On the other hand, with the D. C. unit there was the tendency for fish to be attracted to the electrode (a well known characteristic of D. C. current) which probably accounted for the greater total number of fish taken by the D. C. With the D. C. unit there was also the operating advantage that the two men with electrodes could wander around quite independently in their pursuit of fish, whereas with the A. C. unit the two operators with the electrodes had to maintain a certain juxtaposition for efficient operation of this unit.

The present study should be regarded as merely a single test in the comparison of these two units. The test should be repeated several times, on streams of various widths and with other variable conditions, in order to get a more adequate record of the relative efficiency of the two units.

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