

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

Stomach Contents of Some Game Fish From Rock Creek
Near Missoula, Montana

Robert C. Averett and Tommy L. Smith

November 1960

Rock Creek, which flows into the Clark Fork River approximately 25 miles east of Missoula, Montana is one of the most heavily-fished streams west of the Continental Divide in Montana. It is planted annually with about 30,000 hatchery-reared rainbow trout. In 1958, the Montana Fish and Game Department initiated a creel census study on Rock Creek, primarily to evaluate the return of hatchery fish to fishermen.

In September 1959, a collection of fish was taken from a section of a side channel of Rock Creek by electro-fishing. These fish were taken to obtain a ratio of dressed-to-round weights of the fish for use as a conversion factor on the fish weight data taken at creel census stations. As a matter of interest, we took 25 stomachs from those fish collected for the creel census study and obtained stream bottom samples from the area where the fish were collected. We thought that some relationships could be shown between fish stomach contents and faunal composition of the stream bottom.

DESCRIPTION OF STREAM SECTION

Approximately five miles from its confluence with the Clark Fork River, Rock Creek branches into a series of side channels. These side channels unite to form one main side channel, in which flows about $1/3$ the total volume of the entire stream. This main side channel returns to the main stream after about $1/4$ mile. During the low-water period, in late summer, the uppermost minor channel flows at a volume that can be electro-fished with the equipment we now have. About 175 feet of this channel are accessible to shocking.

This section flows along the road and contains a pool area, with a log-jam at its upper limit, about 25 feet of riffle area just below that and the remainder, a straight flow (run area) about $1\frac{1}{2}$ feet deep over a fairly uniform rubble bottom. The only shaded portion of the section is at the log-jam near the upper end.

METHODS

Bottom Samples

One day prior to the electro-shocking operation, four 4-square feet bottom samples were taken with a window screen sampler from representative places (riffle and run) in the section to be shocked.

After shocking the section, six more 4-square foot bottom samples were taken. All organisms, with the exception of very small diptera (samples of these were taken) were picked from the screens and preserved in alcohol.

A 175-foot section of the side channel was blocked at its lower limit by a block net. No attempt was made to prohibit upstream fish movement. The section was shocked, from upstream down, twice, to collect a large portion of the fish in that area. A total of 156 fish were collected. This total comprised 55 natural rainbow trout, 1 hatchery rainbow, 2 Loch Leven, 11 eastern brook and 87 whitefish.

Stomachs of 25 fish (see Table 1) were labeled and preserved in alcohol for later analysis for this phase of the study.

Stomach Contents

The stomach contents from 2 brown trout, 11 brook trout, 7 rainbow trout, and 5 whitefish were analyzed. Of these 25 stomachs, only two were empty - one from a brown trout and one from a brook trout.

The contents of each stomach was sorted to order, except in the case of the Trichoptera (caddis flies), where the two forms were separated into families. Coleoptera (beetles) were sorted into adult and larval forms.

The volume of each group was determined by immersion in water and recorded as milliliters displaced. Any volumetric amount less than 0.1 milliliters was listed as trace (tr.).

Length range in the brown trout was 7.7 to 12.9 inches; in the brook trout 6.4 to 10.9 inches; in the rainbow trout 9.0 to 11.8 inches; and in the whitefish 9.6 to 10.9 inches. Because of the small size difference it was not deemed practical to separate the stomach contents by fish size class. The greatest size difference was with the brown trout. However, there were only two brown trout stomachs collected, and one of these was empty.

The results of the stomach analysis are presented in Table 1. Although the fish sample size was too small for statistical treatment, it might be of value to note the contrast in food selection between the whitefish and trout. With the exception of Lepidostomatidae (?) a case-making Trichoptera, the whitefish appear to feed extensively upon the smaller, more inconspicuous organisms. Even the Plecoptera fed upon by the whitefish were smaller in size than those fed upon by the trout. The Small Diptera, Ephemeroptera, and the net-spinning caddis Hydropsychidae constituted the bulk of the organisms taken by the whitefish. Although two adult Coleoptera were found in brook trout stomachs, the larval forms of this Order were found only in the whitefish stomachs.

Rock Creek is well-known locally for its emergence of large Plecoptera (*Pteronarcys* sp.), called locally "hellgrammites". Rainbow trout stomachs analyzed in this study appeared primarily to contain the nymph of this insect.

The water temperature during the time the fish were captured (September 15, 1959) was 50°F.

Incidental to this study we found that all brook trout stomachs contained a roundworm parasite. This parasite was sent to Montana

State College for identification. No parasites were observed in the stomachs of the other fish species.

Bottom Samples

Table 2 shows the organisms taken in the bottom samples, along with the temperature and the type of water each sample was taken in. Because of the large amount of debris on the screen, it was impractical to collect all of the Diptera and Oligochaeta that were taken with each sample. Therefore, Table 2 shows only the minimum number of these organisms taken.

Although the Plecoptera made up 43.4 percent of the total insects collected in the bottom samples, they constituted only 11.5 of the insects found in the stomach samples. Their percent utilization more than doubles, however, when only the trout stomachs are taken into consideration.

Conclusions

We realize that a total of 25 stomachs is too small a sample to draw valid conclusions from. We do however, feel that there are several significant factors brought out by this study. The rainbow trout examined ate the larger Plecoptera almost to the exclusion of the other insect orders; while the whitefish appeared to feed upon the smaller insect forms, particularly Diptera larvae. Fish were found only in the stomachs of eastern brook trout. Also, the brook trout stomachs contained the greatest variety of insects. Although the Plecoptera were by far the most abundant insects taken in the bottom samples, they ranked fourth in the total amount of insects fed upon by all the fish examined in this study.

Table 1.

Stomach Contents by Number, Volume in ml and Frequency of Occurrence by Fish Species, Rock Creek

	Brown Trout (2)		Eastern Brook (11)		Rainbow (7)		Whitefish (5)		
Organism	No.	Vol. Freq.	No.	Vol. Freq.	No.	Vol. Freq.	No.	Vol. Freq.	Total
Plecoptera	1	tr 1	10	1.4 7	45	25.3 6	18	1.1 4	74
Trichoptera									
Hydropsychidae	1	tr 1	9	0.4 4	1	0.1 7	63	1.4 5	74
Lepidostomatidae (?)	1	tr 1	92	0.7 6	25	0.2 2	15	0.1 1	133
Ephemeroptera	1	tr 1	7	tr 5			86	0.3 3	94
Diptera			1	tr 1			254	0.5 3	255
Hymenoptera (red-ant)			1	tr 1					1
Oligochaeta			1	tr 1					1
Coleoptera									
Adult			2	tr 2					2
Larvae							8	tr 2	8
Pisces			2	4.0 2					2

Number in () under fish species refers to sample size.

Table 2.

Composition of 10 Four-Square Foot Bottom Samples Taken From Rock Creek in Area of Fish Capture

Date	Temp. °F.	Type of Water	Plec. N. V.		Trichoptera Hydro* Lent.** N. V. N. V.			Ephem. N. V.		Diptera N. V.		Coleoptera Adult Larvae N. V. N. V.			Olig. N. V.		Average# Sq. Ft.	Total for Sample		
Sept. 13	50	Rifle	123	15.0	52	3.0	18	0.1	7	tr	27	0.6	1	tr	5	tr	0	0.0	58.1	233
Sept. 13	50	Rifle	59	2.5	34	1.4	2	tr	18	0.1	19	0.3	3	tr	3	tr	0	0.0	34.2	138
Sept. 13	50	Run	63	11.0	19	0.7	10	tr	9	0.1	30	1.1	0	0.0	5	tr	0	0.0	34.0	136
Sept. 13	50	Run	151	19.0	33	1.4	2	tr	0	0.0	15	0.8	9	tr	9	tr	0	0.0	54.3	219
Sept. 21	49	Rifle	88	23.0	15	0.7	113	0.7	20	0.1	5	0.7	0	0.0	1	tr	0	0.0	60.2	242
Sept. 21	49	Rifle	68	9.0	0	0.0	82	0.9	52	0.2	15	1.8	4	tr	4	tr	1	tr	56.2	226
Sept. 21	49	Run	103	17.0	23	1.4	50	0.5	52	0.3	10	0.4	0	0.0	3	tr	0	0.0	60.1	241
Sept. 21	49	Run	92	16.0	4	0.1	61	0.6	13	0.1	13	0.6	0	0.0	5	tr	0	0.0	47.0	188
Sept. 21	49	Run	79	8.0	1	tr	73	0.6	17	0.1	7	0.2	0	0.0	3	tr	0	0.0	45.0	180
Sept. 21	49	Run	39	5.0	0	0.0	79	0.2	47	0.2	7	tr	5	tr	10	tr	0	0.0	46.3	187

N = Number
V = Volume

Plec. = Plecoptera
Ephem. = Ephemoptera
Olig. = Oligochaeta

* = Hydropsychidae
** = Lepidostomatidae (2)