

lodge them they squeaked vigorously and opened their tiny fox-like mouths threateningly. When drawn out of their retreat they fell helplessly to the ground and moved about feebly. Most of those clinging to the walls had a silvery covering of condensed moisture which so made them resemble the walls that close observation was required in locating them. Most of them were apparently almost incapable of movement. However there was one which flew away briskly when an attempt was made to pick it up and another flew away at our approach. This was

surprising for the temperature was below the freezing point that day. Twelve specimens were collected which later proved to be males without exception. In a warm room, they slowly revived and flew about. They kept alive and active in a warm room. The next morning much excrement was found to have been deposited.

Average Measurements of five specimens:

Length 90.8 mm. Tail 40.8 mm. Ulna 37 mm. Metatarsal 32.6 mm. 1. Metatarsal 32.1 mm. 2. Metatarsal 32.4 mm. 3.

STOMACH CONTENT ANALYSES OF FISHES PREYING UPON THE YOUNG OF PACIFIC SALMON DURING THE FRY MIGRATION AT McCLINTON CREEK, MASSET INLET, BRITISH COLUMBIA

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AS ONE PHASE of the investigation of the efficiency of natural propagation of Pink Salmon, *Oncorhynchus gorbuscha*, conducted at McClinton Creek, Massett Inlet, British Columbia, since 1930, an attempt has been made to determine what fish prey upon the eggs and fry of the species and to ascertain the loss sustained through the activity of such predators. For this purpose collections of Cottids, Dolly Varden Char, Cut-throat Trout, and Coho Salmon yearlings were made from February to June in the springs of 1931 and 1933 as follows:

	1931	1933
Cottids— <i>Cottus</i> sp.	81	84
Dolly Varden Char— <i>Salvelinus malma</i>	62	14
Cut-throat Trout— <i>Salmo clarkii</i>	11	
Coho Salmon— <i>Oncorhynchus kisutch</i>	365	20
*Mixture of Coho Salmon and Cut-throat Trout	1067	456
	1586	574
	2160	

Table I presents the data arising from the analyses of the stomach contents of the fish in the samples listed above.

Before passing final judgment on the basis of the evidence in Table I, it is necessary to consider the conditions under which the samples

were taken. In order to count the young of the various species of Pacific Salmon which are migrating seaward in the spring of the year, a barrier of fine wire screening has been constructed across the entire width of the stream. This structure halts the downstream migration of all fish larger than the smallest fry, and since it is built at an angle to the flow of the river, serves to guide them into a large rectangular pen at the lower end, from which they may be taken, counted and examined. Thus, when the runs are at their height, there is a concentration of fry along the screens and in the pen, and there is little doubt but that, during this temporary crowding, the small fish more easily fall prey to their predators. It has been noted that these same predators, the Cottid, the Dolly Varden Char, the Cut-throat Trout, and the Coho Salmon yearling, appear in large numbers immediately after dusk when the daily downstream migration begins and make excellent use of the opportunity for extra food which is afforded. Therefore, even though the results of the analyses may be more extreme than those which would be obtained under natural conditions, they do demonstrate the fact that much damage will arise from "enemy" fish, should there occur unnatural circumstances which produce a concentration of fry.

There appears to be a close similarity in the average number of Pink Salmon fry taken in the stomachs of a given predator in the two years, 1931 and 1933. The relative size of the

*Pressure of work prevented individual identification of the fish in these collections at the time when they were captured. Over ninety per cent. of the total were young Coho Salmon.

Table I. — ANALYSES OF CONTENTS OF FISH TAKEN AT McLINTON CREEK, MASSET INLET, B.C., DURING THE SPRINGS OF 1931 AND 1933.

Size	<i>Cottus</i> sp.		<i>Salvelinus</i> <i>malma</i>		<i>Salmo</i> <i>clarkii</i>	<i>Oncorhynchus</i> <i>kisutch</i>		<i>Oncorhynchus kisutch</i> & <i>Salmo clarkii</i>	
	1931	1933	1931	1933	1931	1931	1933	1931	1933
	1 3/4" - 7"				2 1/4" - 7"	2"- 6 1/4"	3 3/4" - 4 1/2"		
No. examined	81	84	62	14	11	365	20	1067	456
No. empty	59	39	5	1	6	75	1	170	18
Number containing									
1 pink salmon fry	7	13	5	2	2	46		153	68
2 — —	3	12	3	2	1	56	3	212	123
3 — —	3	9	3	3	1	73	6	220	119
4 — —	5	6	5			65	6	124	79
5 — —	1	2	7		1	20	2	80	32
6 — —		1	7	1		13	1	36	15
7 — —			4			7		24	2
8 — —	1	2	4	1		6		8	
9 — —			4			2		1	
10 — —			3			1	1	2	
11 — —			2	1					
12 — —			2	1					
13 — —			2			1		1	
14 — —			1						
15 — —			1	1					
19 — —			1	1					
22 — —			1						
23 — —			1						
Tot. pink salmon in stomachs	55	120	408	86	12	953	74	2623	1251
Av. No. per stomach	.7	1.4	6.6	6.1	1.1	2.7	3.7	2.5	2.7
Total Chum Salmon fry	2		76			10		33	
Total Coho Salmon fry and fingerlings	8	2	46			34	1	8	2
Stomachs containing insects		1		1				16	1
Stomachs containing fish eggs								4	1
Miscellaneous materials			2 trout					*	†

13. Stomachs contained unidentifiable fish remains.
1. Stomach contained a spider.

figures would indicate that the most voracious of the enemies is the Dolly Varden Char, followed by the Coho Salmon, the Cut-throat Trout and the Cottid respectively.

These data alone, however, may not be used to assess the absolute damage caused to the young salmon by any one species in the river.

For such a determination it is essential to know as well the actual numbers of the predator in the stream. Unfortunately no such counts are available, but from general observation we are led to the conclusion that from the point of view of absolute damage the order, from greatest to least, is probably: Coho Salmon, Cut-throat Trout, Dolly Varden Char, and Cottid.



Pritchard, Andrew L. 1936. "Stomach Content Analyses of Fishes Preying upon the Young of the Pacific Salmon during the Fry Migration at McClinton Creek, Massett Inlet, British Columbia." *The Canadian field-naturalist* 50(6), 104–105.
<https://doi.org/10.5962/p.339916>.

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