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Rationale of the Distribution of the Sculpin, *Cottus* sp., in the Salmon River, Idaho

Abstract

The distribution of the sculpin, *Cottus* sp., in certain areas of the Salmon River which are critical for the spawning and nursery of the Chinook salmon was studied for suggestions of the explanation of the distribution. The inhabitation of two tributaries and the non-inhabitation of the headwaters of two other tributaries can best be explained by the available data as demonstrating a prey preference for the Chinook salmon over the Dolly Varden and the Eastern Brook char. The number of individuals of the sculpin family present, the average size of the individuals, and the mouth gape of a random specimen emphasize a potential predator problem.

Introduction

Control of the predation and competition of the sculpin, *Cottus* sp., in certain sections of the Salmon River of Idaho seems to be indicated (Primbs and Platts, 1976). Since such control would be facilitated by determining the distribution of the sculpin in this drainage, sampling of the total fish population within five representative areas of the Salmon River during July, August, and September of 1976 was made, and the pattern of the distribution within these areas was studied for suggestions of the explanation of the distribution.

Methods

During summer low stream flow, total fish populations were sampled at five sites on four tributaries of the Salmon River—the South Fork of the Salmon River, Johnson Creek, Bear Valley Creek, and Frenchman Creek: one site was located on each tributary, except on Bear Valley Creek, which was sampled at two sites approximately two miles apart (Fig. 1).

The sampling sites extended approximately 549 m. Collections were made twice over the entire 549 m in 3-m sections at a time by setting a seine at the downstream terminus of the section sampled and by then operating a Smith-Root electrofisher first in an upstream direction and then in a downstream direction. Fish were collected continuously after stunning by use of two hand nets and finally by inspection of the seine when the 3-m section was completed. The genus or the species (primarily in one case of the game fish), the total length, and the individual body mass were determined for all fish collected.

Results and Discussion

In the headwaters of two tributaries—Johnson Creek and the South Fork of the Salmon River—no sculpins were found. A partial explanation of the absence of sculpins in Johnson Creek may be the Deadhorse Rapids, which could at low water serve as a

barrier to the movement of sculpins (Corley, pers. comm., June 1977). In Johnson Creek the Eastern Brook char (*Salvelinus fontinalis*) was the preponderant species inhabiting the area, whereas in the South Fork the Dolly Varden char (*Salvelinus malma*) was the exclusive and only species occurring. At the two Bear Valley Creek sites and at the site on Frenchman Creek, however, sculpins were found in large numbers, numbers which have a positive correlation with the numbers of Chinook salmon (*Oncorhynchus tshawytscha*) (Table 1).

Johnson Creek and the South Fork of the Salmon River are both anadromous fish spawning areas (U.S. Fish and Wildlife Service, 1964), and Chinook salmon are numerous in both streams. But the sites sampled were in the headwater reaches of these two

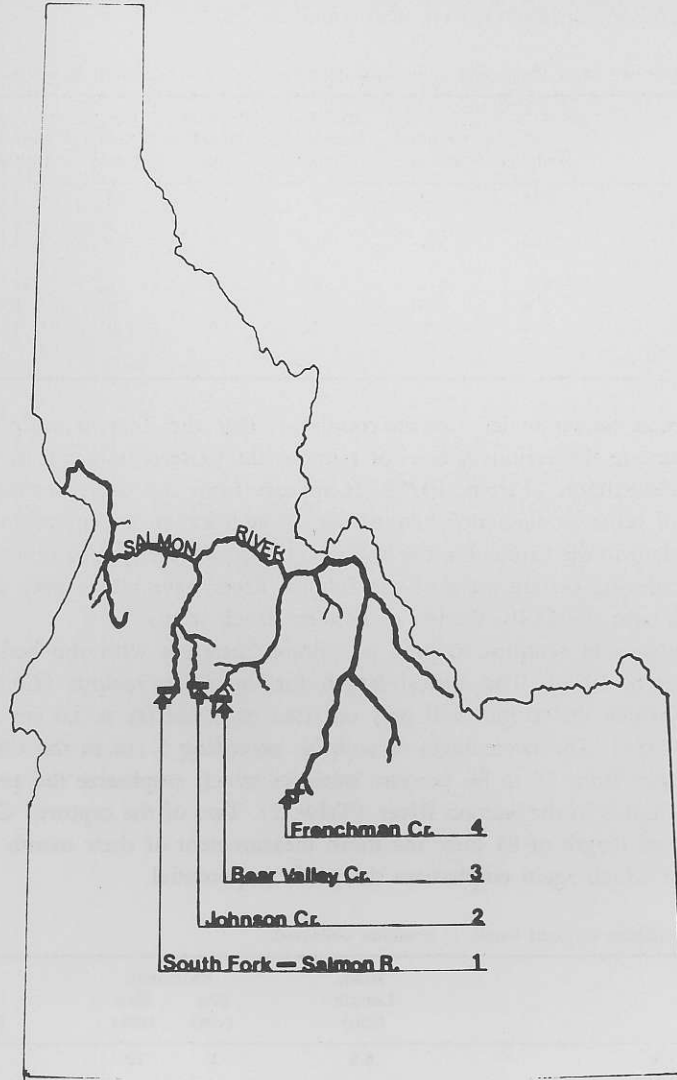


Figure 1. Sampling sites on four tributaries of the Salmon River, Idaho. One site was located at each point marked on map above except on Bear Valley Creek, which was sampled at two sites approximately two miles apart.

streams, beyond the migration range of the Chinook. The sculpin (*Cottus beldingi*) has been reported to be absent from uppermost waters (Gord and Flittner, 1974; Maughan, 1976). Other sculpins, however, do inhabit headwaters—e.g., the Columbia sculpin (*Cottus hubbsi*) (Maughan, 1976). Of the sculpins captured, approximately 2 percent were identified down to species, and the entire 2 percent randomly sampled belonged to the species *Cottus hubbsi*. The sculpins identified down to species were taken from the Big Meadows site of Bear Valley Creek in 1976 and from the Stolle Meadows site of the South Fork of the Salmon River in 1975 (Primbs and Platts, 1976). The Stolle Meadows site is 9.7 km downstream from the headwaters site sampled in 1976 and reported herein. At the Stolle Meadows site Steelhead trout—Rainbow trout (*Salmo gairdneri*) were also found in 1975.

TABLE 1. Number of sculpins and other fish collected within 549 meters of stream length.

Stream	Sculpins	Chinook Salmon	Rainbow Trout	Eastern Brook Char	Dolly Varden Char	Mountain Whitefish	Squawfish
Bear Valley Cr. (Big Meadows)	649	61	9	24	11	2	0
Bear Valley Cr. (Mace Meadows)	1179	122	81	56	19	11	0
Frenchman Cr.	1515	575	0	510	0	29	0
Johnson Cr.	0	0	2	233	0	0	1
South Fork-Salmon River	0	0	0	0	141	0	0

It has been shown under aquaria conditions that the Torrent sculpin has a prey preference among the various species of salmon; the preference was least for the Chinook and Coho salmon (Patten, 1975). It appears from the data presented above and the results of other studies cited herein that, in addition to an environmental requirement equivalent to the Chinook's, the sculpin (*Cottus hubbsi* and/or other species) successfully inhabiting certain areas of the Salmon River have also a prey preference for the Chinook over the Dolly Varden or Eastern Brook trout.

The tendency of sculpins to prey on salmon increases with the body size of the sculpin (Patten, 1971). The critical length for the Slimy sculpin (*Cottus cognatus*) at or above which the sculpin will prey on trout eggs and fry is 5.0 cm (Clary, 1972; Northcote, 1954). The percentages of sculpins exceeding 5 cm in the three tributaries sampled ranged from 74 to 86 percent, statistics which emphasize the predator potential of the sculpins in the Salmon River (Table 2). Two of the captured Columbia sculpin had a total length of 81 mm; the mean measurement of their mouth gape was 9.5 mm, a factor which again emphasizes the predator potential.

TABLE 2. Statistics on total length of sculpins collected.

Stream	Mean Length (cm)	Extremes		Percentage of Sculpins Exceeding 5 cm
		Min. (cm)	Max. (cm)	
Bear Valley Cr. (Big Meadows)	6.2	1	10	81
Bear Valley Cr. (Mace Meadows)	5.9	2	11	74
Frenchman Cr.	7.0	1	11	86

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