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DISTRIBUTION AND HABITAT OF THE ENDANGERED SALISH SUCKER (*CATOSTOMUS* SP.)

by

Susan Inglis,

Arne Lorenz,

and

Marvin L. Rosenau

B. C. Environment, Lands and Parks

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ABSTRACT

The distribution of the endangered Salish sucker (Catostomus sp.) in the Lower Mainland was investigated and it's range was found to be considerably restricted compared to previous reports. Although once common throughout many streams of the south side of the Fraser River, they now have been, or are almost, extirpated from all former watersheds with the exception of the Nooksack River drainage. While the streams that the Salish suckers were found in were generally small (less than six metres in average width), they were found to utilize water with measurable current suggesting that they are fluvial-adapted fish. Our survey identified five age classes in Canadian streams. Very few differences were found, however, between the habitat requirements of juvenile and adult suckers. Salish suckers co-exist with other species of fish but show micro-habitat-preference differences from coho salmon (Oncorhynchus kisutch) and cutthroat (O. clarki) and rainbow (O. mykiss) trout for water depths, velocities and the amount of over-stream cover. Because Salish suckers are rapidly being extirpated due to urbanization, quick protective action is required by government agencies and the public to prevent the extinction of this species from Canadian watersheds.

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INTRODUCTION

The Salish sucker is an undescribed variant of the Longnose sucker (*Catostomus catostomus*) which evolved in isolation from the latter in the waters of the Olympic Peninsula during the Pleistocene glacial event (McPhail 1987). The Salish sucker is but one of a species assemblage of unique fishes that arose in this geographic area during this period (Schultz 1947). While the Longnose sucker is very common in British Columbia having a distribution that is province wide (Scott and Crossman 1973), the Salish sucker has a very restricted geography. Nevertheless, the literature suggests that the distribution of Longnose suckers does not overlap with the latter, coming within 45km of each other (McPhail 1987). Furthermore , because of the long-term geographic isolation between the two groups, enough morphological differentiation has occurred that McPhail suggest that the Salish sucker "can be considered a "species" in the making"(McPhail 1987).

Salish suckers reached south-western British Columbia through a chain of post-glacial freshwater bodies that connected through the Puget Sound area to the Lower Mainland (Thorson 1980; McPhail 1987). They seem to have invaded into the Lower Mainland through the Nooksack River drainage. This accounts for it's recent historical distribution, including rivers that flow directly into this watershed (e.g. Bertrand Creek; Fishtrap Creek) or those that are geographically so closely aligned to have precipitated headwater captures (e.g., Little Campbell River, Salwein Creek). Recent anecdotal and published (McPhail 1987) information suggests however, that the current range of Salish suckers is, indeed, becoming more restricted rather than expanding.

It has been some seven years since the last formal paper documented the status of Salish suckers in Canada (McPhail 1987). In that publication it was noted that the numbers of these fish have declined precipitously within the last 40 years with some populations having been extirpated (Little Campbell River). The cause of this decline is attributed primarily to the effects of urbanization (McPhail 1987). Furthermore, there has been a rapid escalation of human growth in this area, with the Lower Fraser Valley recording some of the fastest growth rates in Canada during the 1980's (Moore 1990), and no slowing of this trend in the foreseeable future.

As such, the Committee on the Status of Endangered Wildlife in Canada

(COSEWIC) has designated the Salish sucker as "endangered" (Campbell 1986) while the British Columbia Conservation Data Center has deemed these fish to be "critically imperiled" on both global and provincial levels (Cannings 1992). Because of the urgency required to save this animal from extinction, we embarked on a study to determine the present distribution and habitat utilization of the Salish sucker.

METHODS

The location for this study was the Fraser Valley, south of the Fraser River, from Surrey to Chilliwack in British Columbia, Canada. Thirty-four small urban / rural streams, from five watersheds, comprising 117 sites, were sampled for the presence of Salish suckers (Figure 1). Sampling sites were chosen on a geographical basis encompassing known Salish sucker locations (McPhail Personal Communications 1992) or by their proximity to watersheds. This study took place during the months of May-July 1992 when the streams were at or near summer base flows.

Discovery sample:

The discovery sample was done to determine a geographical distribution for Salish suckers in British Columbia. Capture methods during discovery was done primarily by electroshocking 20-200 meters of stream with a Smith-Root Model 12 Electrofisher backpack electroshocker. Gee's minnow traps, baited with preserved salmon roe, were used to capture fish at locations where electoshocking was impractical.

The captured fish were identified to species and a fork length (mm) measurement recorded. Fish identified as Salish suckers were, in addition to being measured for length, weighed and a scale sample taken. No fish were killed in the course of sampling and all were returned back to their waters of capture.

Salish sucker age classes were identified by length-frequency mixture analysis (program MIX, copyright 1985-1989 by ICHTHUS DATA Systems Release 2.4 June 1989) and confirmed by examination of scale annuli with a Neo-Promar Projection Microscope.

A stream-habitat evaluation was made of each sample site following the methods outlined by Reiser and Bjornn (1979). At each sampling site we measured the water temperature, the average wetted stream width, the length of stream sampled, the average and maximum water depth of the site, and the average water velocity. The substrate composition, instream / over-stream cover types and the percent occurrence of each were visually identified. The D90 was also recorded.

For each stretch of stream that was sampled a picture was taken of the site and labelled with the site location, date, and time that sampling took place.

Salish Sucker Habitat Utilization:

Once the discovery sample was complete, a detailed habitat assessment was done on streams known to contain Salish suckers. Twenty-two sites were chosen from Pepin, Fishtrap,and Bertrand Creeks and from Salmon River. Stretches of stream 10-20 meters long of one hydraulic type; either a pool, glide, or riffle, were sampled. A two or three pass removal method was performed with either a Coffelt Model 12 electroshocker or a Smith-Root Model 12 Electrofishing electroshocker. A third pass was only performed if a decline in catch was not obtained. Fork lengths (mm) were recorded for all species captured and weights were recorded for Salish suckers.

Population estimates for each species captured were calculated using the Seber and LeCren Method when a two-pass removal was used. The Zippen method for population estimates was followed when a three pass removal was performed (Platts et al 1983).

Each site was measured to obtain total area and the flow rate was recorded using a March McBirney Model 201D Portable water current meter. As in the discovery sample procedure, substrate and cover components were measured and recorded.

The data from the sites on Pepin Creek and Salmon River were correlated with various population densities and then analyzed using multivariate data analysis(Tuckey-Multiple Range Tests) to obtain a Salish sucker habitat profile.

RESULTS

Salish sucker distribution:

Salish suckers were found to be extant in five streams; Pepin Ck., Fishtrap Ck., Salmon R., Bertrand Ck., and Cave Ck., out of thirty-four streams sampled (Figure 1,Tables 1 and 2) in their Canadian range. Four of the streams containing Salish suckers; Pepin Ck.,Fishtrap Ck.,Bertrand Ck., and Cave Ck., are part of the Nooksack Drainage System. Of these four streams only Pepin Ck. contains healthy numbers of both juvenile and adult Salish suckers.

Cave Ck., which is a tributary of Bertrand Ck., had a significant population of Salish suckers in their first year class (Table 2). It should be noted that due to the unseasonably hot, dry weather, Cave Ck. was dry in several areas and the water quality was poor with temperatures recorded at 24-26°C. The two shallow (0.4 m) pools where the fish were located were separated by 20 meters of dry creek bed.

Of ten sites sampled on Bertrand Creek, only one adult Salish sucker was captured. Fishtrap Creek contained one population of adult and juvenile fish but the site where they were located was drained and the individuals relocated to a detention pond nearby.

The Fraser River Watershed historically has had several streams containing Salish suckers. Small populations of both adults and juveniles were found near the headwaters of the Salmon River. This however, was the only stream in this watershed where Salish suckers were found.

Table 2. The number of Salish suckers captured from each stream.

Stream	*Number of Salish Suckers Captured	Number of Sites Sampled
Pepin Ck.	54	7
Fishtrap Ck.	13	3
Salmon R.	18	10
Bertrand Ck.	1	10
Cave Ck.	56	2

*Numbers from discovery sample only .

Table 3. Age Class Determination from MacDonald and Pitcher mixture analysis.

Age	Range (mm)	Mean (mm)	Std. Err.
1+	0 - 100.99	69.74	1.72
2+	101 - 134.99	118.77	2.46
3+	135 - 172.99	147.98	2.81
4+	173 - 214.99	191.99	3.97
	n = 193	P = .0423	

Fig.1. The Canadian distribution of the Salish sucker, Catostomus sp.

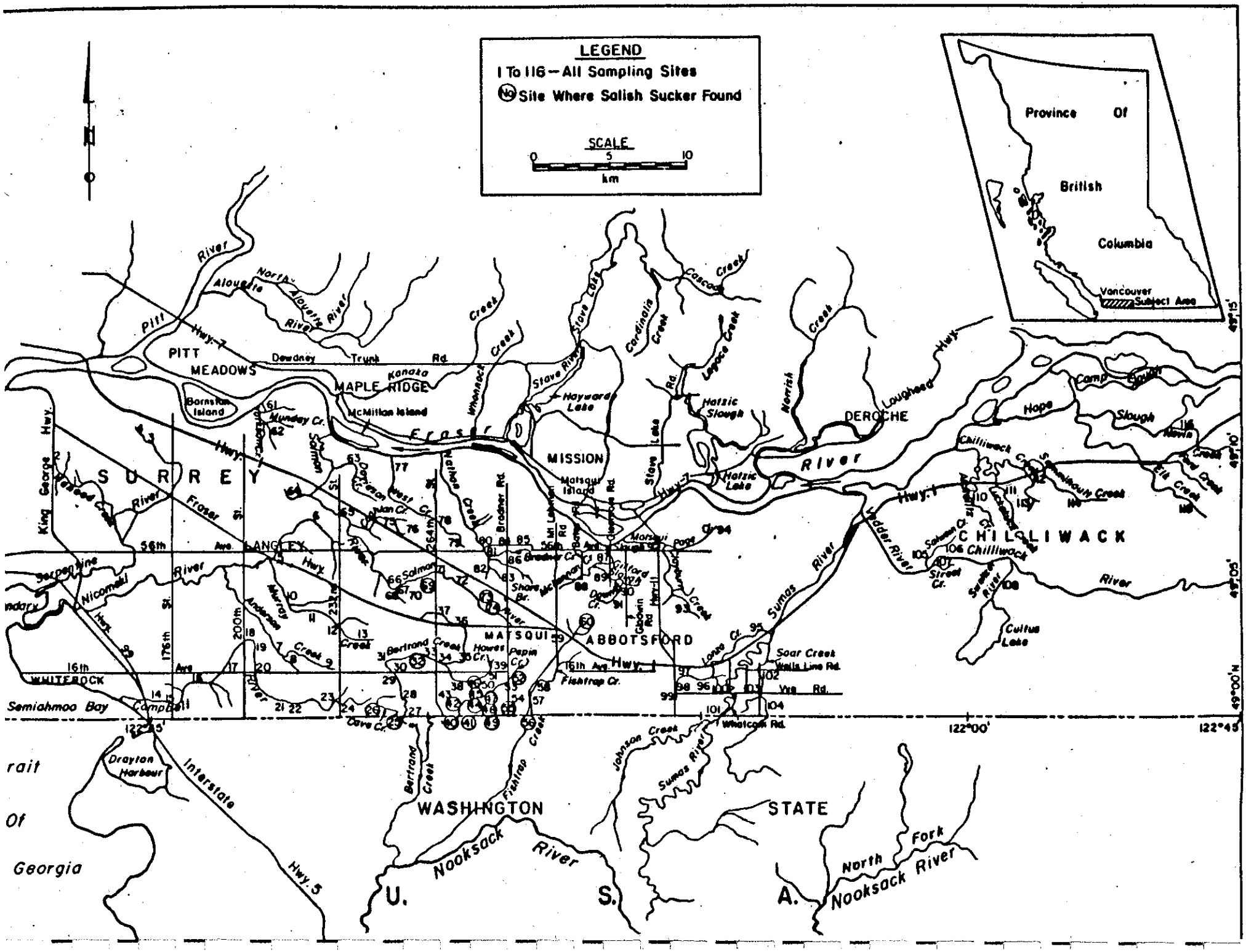

Table 1. Fish species captured at each sample site. The site number corresponds to site numbers in Figure 1 and are marked in bold where Salish suckers were found.

SITE	SPECIES
SERPENTINE WATERSHED	
Mahood Ck.	
1	PS
	ST
	RM
	RDS
	CPS
	CO
	LAM
2	ST
	CT
	CO
	STKL
Serpentine R.	
3	CO
	STKL
	ST
	CT
	LAM
	PS
4	CO
	STKL
NICOMEKL WATERSHED	
Nicomekl R.	
5	CT
	ST
	PS
	CO
	STKL
	BM
6	PS
	ST
	CT
	STKL
	CO
	LAM
Anderson Ck.	
7	CO
	STKL
8	CO
	STKL
9	CO
	STKL
Murray Ck.	
10	PS
	ST
	CT
	CO
	STKL
11	CT
	CO
	STKL
	LAM
12	CO
	STKL
	TR
13	CT
	CO
CAMPBELL WATERSHED	
Campbell R.	
14	CO
	TR
	STKL
15	LAM
	CO
	PS
	ST
	TR
16	ST
	CT
	PKS
	CO
	TR
	PS
	CPS
	STKL
17	ST
	ST
	PS
	CO
	PKS
	STKL
	TR
18	PS
	ST
	CT
	CPS
	STKL
	CO
	PKS
	TR
19	CO
	STKL
	LAM
20	PS
	STKL
21	CO
	CT
	STKL
22	BM
	STKL
	BC
	PKS
	PKS
	RHM
23	PKS
	STKL
	CO
	BM
	PKS
24	STKL
	PKS
	CO
NOOKSACK WATERSHED	
Cave Ck.	
25	SA
	NKD
	STKL
	CO
	TR
26	SA
	STKL
	TR
	BM
	RHM
Bertrand Ck.	
27	CO
	TR
	CT
	PS
	NKD
28	ST
	PS
	CT
	NKD
	CO
	TR
29	STKL
	STKL
	LSS
	LAM
	CO
	PS
	ST
	STKL
	NKD
30	TR
	CT
	STKL
	ST
31	LAM
	TR
	NKD
	CT
32	SA
	CT
	STKL
	NKD
	TR
	LAM
33	CT
	ST
	NKD
	STKL
	TR
	CO
34	LSS
	CO
	CT
	ST
	TR
	STKL
	NKD
	LAM
35	STKL
36	STKL
	NKD
37	STKL
Howes Ck.	
38	CT
	STKL
	TR
39	CT
	STKL
Pepin Ck.	
40	SA
	CT
	CO
	STKL
	ST
	TR
41	SA
	CO
	STKL
	CT
42	SA
	CT
	CO
	STKL
	TR
	ST
	LAM
43	NKD
	CT
	ST
	CO
	TR
	STKL
	LAM
44	SA
	CT
	CO
	TR
	ST
	STKL
	NKD
45	SA
	CO
	STKL
	LAM
46	SA
	CO
	CT
	STKL
	LAM
47	SA
	CO
	TR
	CT
	STKL
	LAM
48	SA
	CO
	CT
	TR
	STKL
	LAM
49	SA
	NKD
	CT
	CO
	TR
	STKL
	LAM
50	CT
	CO
	TR
	STKL
51	CO
	CT
	TR
	STKL
	LAM
52	SA
	ST
	CO
	CT
	TR
	STKL
	LAM
53	STKL
54	STKL
55	SA
	TR
	STKL
	LAM
Fishtrap Ck.	
56	SA
	STKL
57	CO
	CT
	ST
	TR
	STKL
58	SA
	CT
	CO
	TR
	NKD
	STKL
	LAM
59	CO
	STKL
	LAM
60	SA
	LSS
	TR
	STKL
FRASER WATERSHED	
Munday Ck.	
61	LSS
	STKL
	MN
62	CT
	TR
	CO
	LAM
Salmon R.	
63	CT
	CO
	STKL
64	STKL
65	CO
	CT
	ST
	TR
	PS
	STKL
	LAM
66	CT
	ST
	CO
	TR
	STKL
67	CT
	CO
	STKL
	LAM
68	CT
	STKL
69	SA
	TR
	CO
	ST
	CT
	STKL
	LAM
70	TR
	CT
	CO
	STKL
	LAM
71	CO
	CT
	STKL
72	STKL
73	SA
	CO
	STKL
74	
Coghlan Ck.	
75	CT
	CO
	TR
76	CT
	CO
	STKL
West Ck.	
77	ST
	CO
	PS
	STKL
	LAM
78	CO
	TR
	STKL
	LAM
79	CO
	BC
	STKL
Nathan Ck.	
80	CT
	ST
	CO
	TR
81	CT
	ST
	CO
	TR
	COT
82	CO
83	CT
	CO
84	CT
	CO
	TR
85	CT
	CO
	TR
86	CO
	CT
	TR
McLennon Ck.	
87	BM
	STKL
88	–
Gifford SI.	
89	STKL
Downes Ck.	
90	CT
	CO
	TR
	LAM
91	ST
	CO
	CT
	TR
	STKL
	LAM
Clayburn Ck.	
92	RDS
	PS
	STKL
93	CO
	ST
	CT
	LAM
Page Ck.	
94	CT
	STKL
Lonzo Ck.	
95	STKL
96	CO
	SO
	PS
	STKL
97	CO
	TR
	STKL
	LAM
98	CT
	CO
	PS
	TR
99	CT
	ST
	TR
	PS
	LAM
100	–
Sumas R.	
101	PS
	STKL
Soar Ck.	
102	PS
	BM
	STKL
103	CO
	STKL
104	CT
	ST
	STKL
Salwein Ck.	
105	CO
	PS
106	CO
	CT
	PS
	STKL
	LAM
Street Ck.	
107	CO
Sweltzer R.	
108	PS
	CO
	SO
109	ST
	PS
Atchelitz Ck.	
110	CT
	PS
	CO
	TR
	STKL
	LAM
Luckakuck Ck.	
111	PS
	CT
	CO
	STKL
Chilliwack Ck.	
112	–
113	STKL
Semmihault Ck.	
114	PS
	STKL
Elk Ck.	
115	CT
	CO
	STKL
Nevin Ck.	
116	PS
	CT
	CO
Lorenzetta Ck.	
117	–

KEY TO SPECIES NAMES

SA	Catostomus sp. (Salish sucker)
LSS	Catostomus macrocheilus
NKD	Rhinichthys sp. (Nooksack dace)
RM	Mylocheilus caurinus
SO	Ptychocheilus oregonensis
RDS	Richardsonius balteatus
RHM	Pimephales promelas
BM	Hybognathus hankinsoni
MN	Juvenile Cyprinidae not identifiable to species
CO	Oncorhynchus kisutch
ST	Oncorhynchus mykiss
CT	Oncorhynchus clarki clarki
TR	Not identifiable to species Oncorhynchus mykiss or Oncorhynchus clarki clarki
STKL	Gasterosteus aculeatus
PS	Cottus asper
CPS	Cottus aleuticus
COT	Not identifiable to species Cottus asper or Cottus aleuticus
PKS	Lepomis gibbosus
BC	Ameiurus nebulosus
LAM	Lampetra richardsoni

Salish suckers were found to cohabit with a great diversity of fish species (Table 1. and Figure 2). They were found to be associated with Sticklebacks 100% of the time, trout and Coho 73.7%, Cutthroat 63.2%, Lamprey 57%, Nooksack dace and Steelhead 26.3%, and Brassy minnow 0.1% of the time. The term `trout' was assigned to salmonid species that were too immature to identify in the field.

Fig.2. The density of different fish species as compared to Salish sucker density for each habitat site sampled. The population estimate and standard error were calculated using the Seber and LeCren method described by Platts, et al (1983).

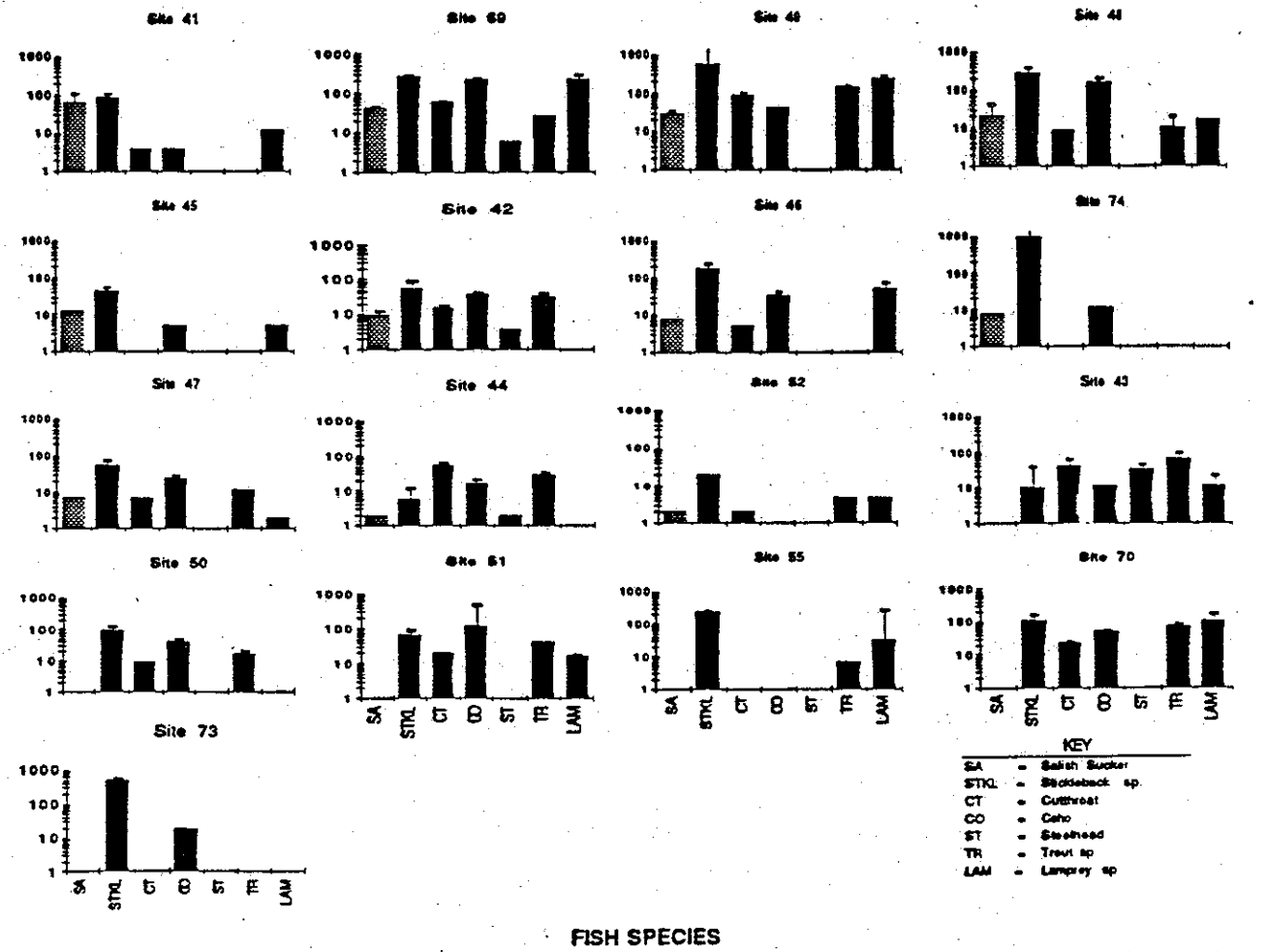

Figure 2 illustrates that there was no relationship between the density of other fish species in a particular site and the abundance of Salish suckers. Of the different species present at these sites, Cutthroat and Coho are possible predators of Salish suckers. In fact, we noted on several occasions small `nip' marks on the caudal fin of juvenile Salish suckers less than 80 mm in length. The relationship between these three species of fish in respect to their preferred location within the habitat is shown in Table 4. Salish suckers differ from Coho and Cutthroat in their stream location in all parameters except the maximum water depth and D90 values which they share with Coho.

Table 4. Habitat parameters for three species of fish; Sa=Catostomus sp., Co=Oncorhynchus kisutch, Ct=Oncorhynchus clarki clarki. Standard error and sample sizes (n) are shown for parameter means.*

Sample Size	Mean Velocity (m/s)		Mean Depth (m)		Maximun Depth (m)		D90 (m)		Fines (%)		Over-Stream Vegetation (%)		In-Stream Vegetation (%)	
n	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.
						Catostomus sp.								
81	0.026	0.004	0.394	0.02	0.928	0.034	0.055	0.006	51.61	4.194	19.51	1.439	21.15	2.109
						Oncorhynchus clarki clarki								
151	0.062	0.003	0.33	0.015	0.56	0.024	0.082	0.004	15.05	1.786	7.49	1.047	21.34	1.534
						Oncorhynchus kisutch								
372	0.039	0.002	0.499	0.01	0.874	0.016	0.041	0.003	39.86	2.191	11.79	0.672	18.8	0.984
						Species Shared Parameters								
	Sa Co Ct		Sa Co Ct		Sa Co Ct		Sa Co Ct		Sa Co Ct		Sa Co Ct		Sa Co Ct	

*Note. The means are weighted and $p<0.05$.

DISCUSSION

The Salish sucker is limited to a Canadian range of only five streams located in the growing urban setting of the lower Fraser Valley in British Columbia. The other closest observed population of Salish suckers is found in Washington State and this population is separated from the British Columbia population by two drainage systems. The Salish sucker, therefore, has a `genuinely restricted distribution' in British Columbia (McPhail unpublished).

Our survey indicates that this distribution has become even more restricted. Within the last twenty-five years this species of fish has been completely extirpated from the Campbell River. The last reported sighting of Salish suckers in this river was in 1976 (McPhail 1987). The number of Salish suckers found in the Salmon River has also declined and none were found in Salwein Creek, making Salmon River the last refuge for this species of fish in the Fraser River Watershed.

The Nooksack Watershed has four streams that contain Salish suckers. These populations however, are fragile. The only large population of adults and juveniles found in Fishtrap Creek had to be salvaged and moved to detention ponds as their habitat was dewatered to prevent urban flooding. Bertrand Creek is another known Salish sucker habitat that they now appear to have been extirpated from. However large numbers of Salish suckers were located for the first time in Cave Creek, which is a tributary of Bertrand Creek. All the animals in this population were juveniles. The water temperature in Cave Creek was so high and the water levels so low though, their survival this summer, in this creek, is questionable.

Whether Cave Creek is a juvenile rearing area, the water levels too low this summer for adults to inhabit, or if these fish have been pushed into this tributary due to ecological pressures in Bertrand Creek is not known due to the lack of information on Salish sucker life history. All of the above mentioned streams, however, are under severe urban pressure and manipulation. According to our survey, Pepin Creek is the only creek that maintains a healthy number of Salish sucker populations. This is probably due to over three-quarters of the stream running through protected park land.

As stated earlier very little is known about the life history of the Salish sucker including important management information such as their seasonal migration and spawning requirements. The answers to these questions are beyond the scope of this study, but we have been able to distinguish five age classes in their Canadian range. This information confirms McPhail's findings (1987) of five age classes in British Columbia. The growth exponent derived from the weight-length relationship illustrated in Figure 3 indicates an almost isometric growth relationship which can be explained by the range of age classes this curve is based on.

The largest specimen we recovered was from Pepin Creek and had a recorded fork length of 244 (mm). This is significantly larger than the largest specimen recorded by McPhail (159 mm) in 1987 and places it comparative in size to the Washington populations that regularly reach 200 mm in length. According to McPhail (1987) Salish suckers spawn in the early spring. We, however, observed suckers in spawning condition as late as early August. These inconsistencies illustrate the real need for more life history information on this fish before proper management decisions can be made.

Understanding the relationship between physical habitat characteristics and fish abundance in streams is important if damage from development is to be evaluated and managed. We were unable, due to our sample size, to determine a definitive Salish sucker habitat profile, but we are able to infer certain habitat preferences. Salish suckers were generally found in small streams with long glides, shallow riffles, and usually silt bottom pools with a relatively small D90 value (Table 5) and some over or instream vegetation. In particular we found that in streams with a moderate to fast current, suckers were found in amongst the aquatic macrophytes.

Juvenile Salish suckers showed a significant preference for more over-stream cover than adults which is consistent behavior of young that are predated on by other organisms. While juveniles were found in all three hydraulic types, adults were confined to pools and glides. This is probably a component of the minimum water depth required for adults to live in.

Although no preference for a particular water velocity was apparent, there was always a measurable water current present. The elongated, cylindrical body form further indicates a design that is adapted to stream life. Fish can sustain their position in a water current 3X their body length without expending much energy (Blake 1986). This relationship allows water velocity to

be less of a habitat restriction than one might assume. Most of our measured stream velocities were within this range.

Salish suckers were found with Coho and Cutthroat well over 50% of the time, even though these fish probably predate on newly hatched young and juvenile suckers. While Salish suckers do share with Coho a preference for a greater maximum depths and smaller substrate composition than Cutthroat, the three species differ in their preferred location in the other habitat parameters we measured. Salish suckers were more abundant in streams with a slower mean velocity, a higher percentage of fines and more over-stream cover than Coho and Cutthroat. Salish suckers were rarely found in open and unprotected stream areas. This behavior may offer some form of protection for them from salmonid predation.

Streams are one of the most manipulated aquatic habitats by man. We are constantly changing the amount and quality of water flowing through them to suit our needs. An ecosystem indicator is therefore necessary to monitor the amount and kind of change brought about by this human activity. The Salish sucker from all indications is very sensitive to stream manipulation. Because Salish suckers are a non-game fish their populations are not effected by fishing pressure. The decline in Salish sucker number can therefore be attributed to the general decline in stream health and available stream habitat.

This study has illustrated the real danger this unique species of fish is of extinction from Canada due to habitat destruction. We have determined that there are definite preferences for certain types of stream habitat and that much more information on the life history of this fish is necessary for proper management and conservation. Without immediate habitat protection, the Salish sucker will certainly disappear from Canadian streams.

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