

MORICE RIVER STEELHEAD TROUT  
THE 1976 AND 1977 SPORT FISHERY  
AND LIFE HISTORY CHARACTERISTICS  
FROM ANGLERS' CATCHES

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MORICE RIVER STEELHEAD  
TROUT: THE 1976 AND 1977  
BJES c. 1 mm SMITHERS

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## INTRODUCTION

Morice River, located in West-central British Columbia, is one of several Skeena River tributaries that support a late summer and fall sport fishery for steelhead trout (Salmo gairdneri Richardson). In response to declining angler success on the Morice over the past decade, an angler use and creel census was conducted in the autumn of 1976 and 1977 by the Fish and Wildlife Branch. The results of the survey will form the basis for future management decisions regarding the maintenance, or enhancement, of this important steelhead fishery.

Aspects of the Morice steelhead fishery were first described by Taylor (M.S. 1968), who provided a brief history of the fishery and summarized several years of casual creel survey data. Pinsent (M.S. 1970) described the results of a randomized (12-day) creel census conducted during the 1969 fishery. Results of an opinion survey conducted among Morice steelhead anglers have been reported by Remington, et al. (M.S. 1975). Some life history characteristics of Morice steelhead have been described by Taylor and Whately and Imbleau (M.S. 1975). Interim results of the current study were reported by Morris, et al (M.S. 1976) and Whately, et al (M.S. 1977).

The objective of this study was to collect detailed information on angler origin and distribution in the fishery, catch, angling methods, fishing effort and life history of the Morice steelhead.

## DESCRIPTION OF THE STUDY AREA AND THE STEELHEAD FISHERY

The Morice and Bulkley Rivers combine flows approximately 6.5 km. west of Houston, B.C., 54° 24' N, 126° 43' W (Fig. 1). Although the Morice is by far the larger of the two systems, "Bulkley" was the name given the river below the confluence. The Morice is approximately 75 kilometers long from its source in Morice Lake to the Bulkley, and drains an area of 1,911 km.<sup>2</sup>. Morice Lake is a large, deep and cold body of water lying in a depression at the base of the eastern slopes of the Coast Mountains (Fig. 1). This lake provides a moderating influence (a characteristic feature of most viable northern steelhead streams) on Morice River temperatures, flows, and sediment loads so critical to the Morice steelhead populations.

Logging and recreation are the major activities within the Morice Drainage area. Access to the major portion of the Morice is gained via the Morice Forest Road, originating near Houston, which runs adjacent to the river for approximately 50 km. The final 25 km. are accessible only by boat upstream from the end of the road, or downstream from the lake. Access from Burns Lake and Francois Lake is also gained by a road which enters the valley via a route along Nadina River (Fraser drainage) and Owen Creek (a Morice tributary) (Fig. 2).

The Morice steelhead is subjected to several fisheries prior to entering the Morice. Like most Skeena summer-run fish, it enters the Skeena estuary in July and August during the peak of the commercial gill net fishery where it is taken incidental to sockeye and pink salmon.

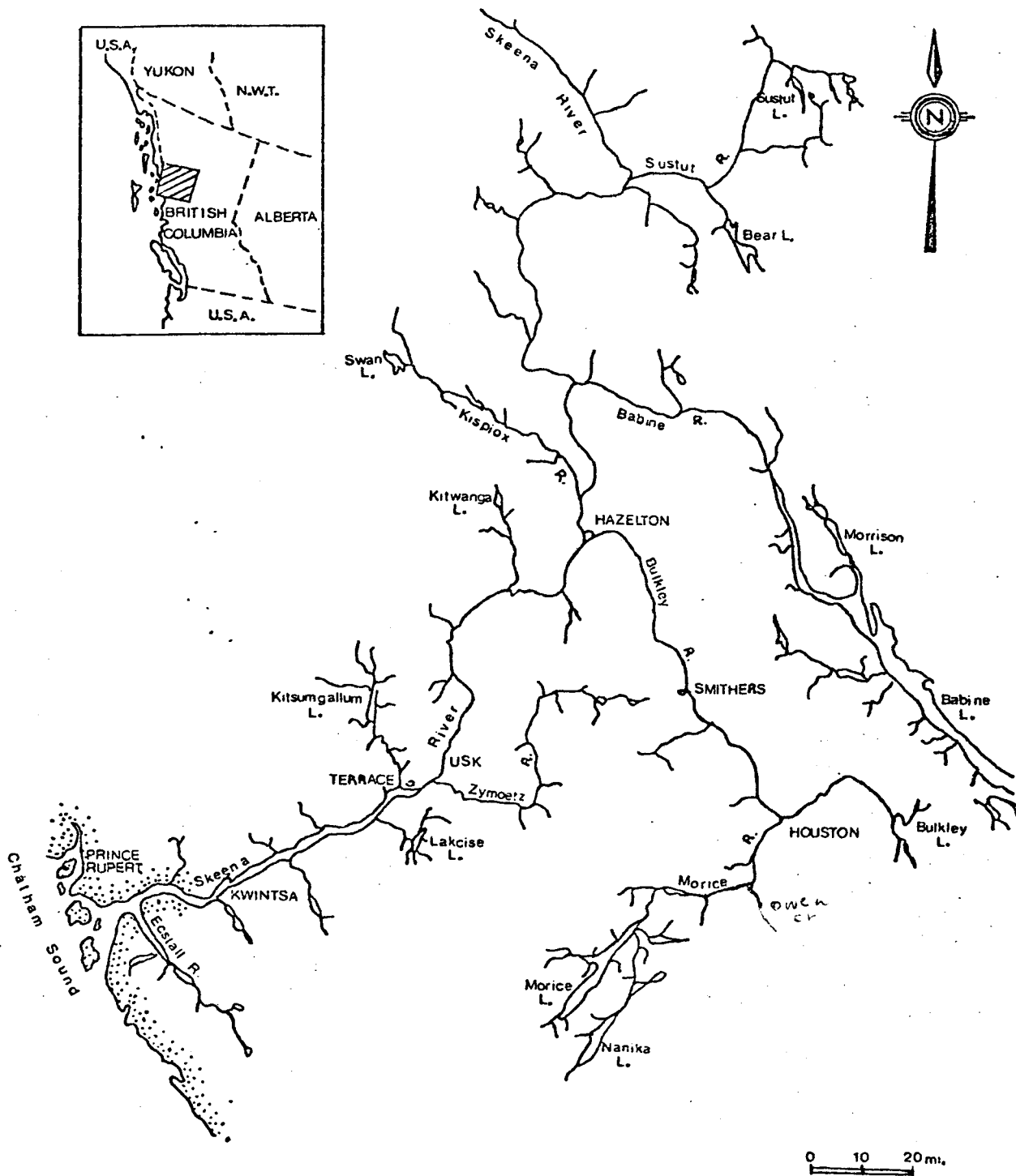


Fig. 1. The Skeena River and main tributaries.

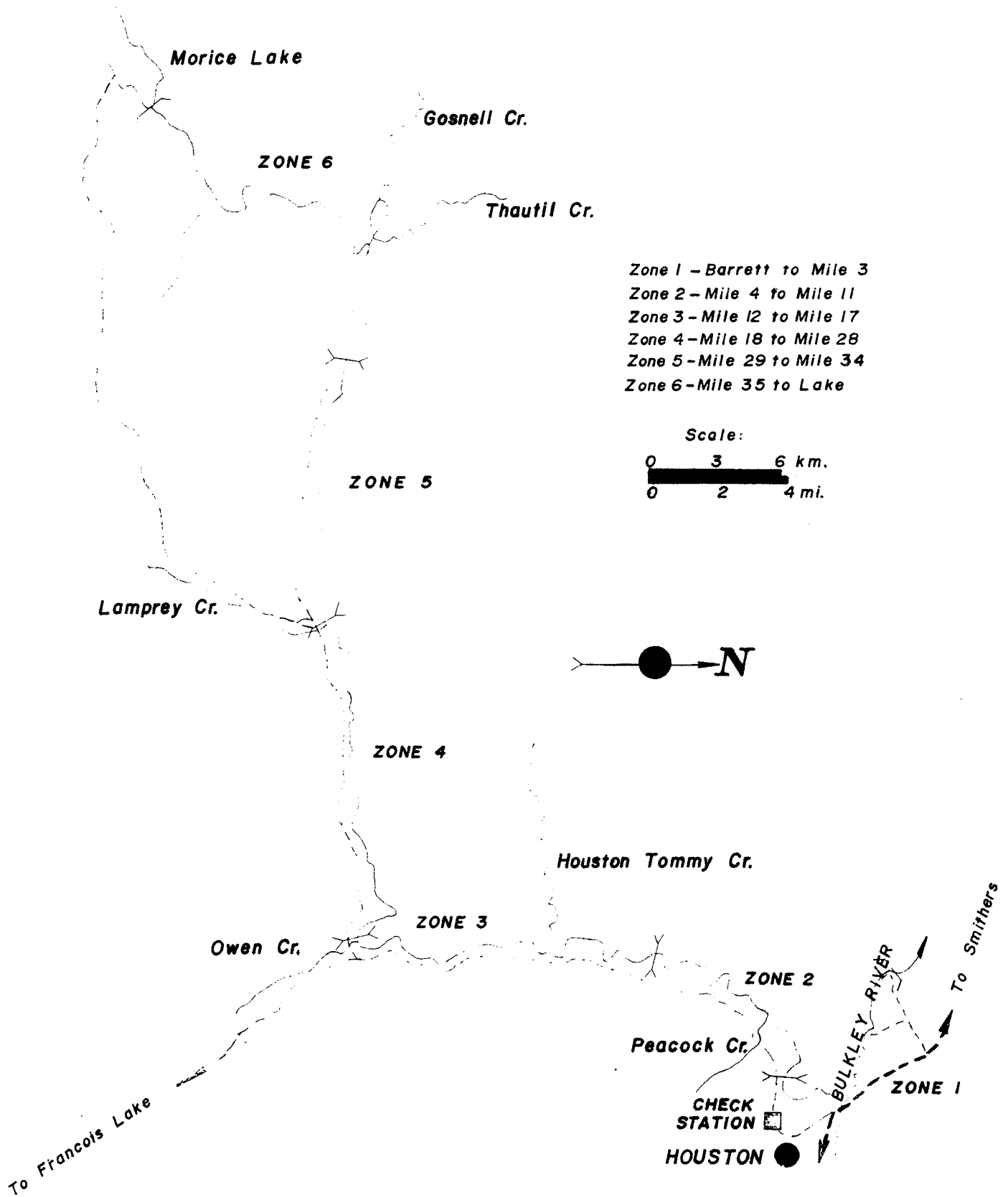


Fig. 2 Morice River - Access routes and angling zones.

Indian gillnets are set, primarily for salmon, at various sites along the Skeena and in Bulkley River. The last major obstacle to Moricebound steelhead are Moricetwon Falls on the Bulkley, where chinook, coho and steelhead are the object of an Indian gaff fishery and a concentrated sport fishery.

At this point it should be made clear that there should be no distinction made between the Morice and Bulkley Rivers. Except for a small population of coho salmon and some remnant chinooks that migrate to the Bulkley headwaters, the major portion of all anadromous species (steelhead trout, pink, sockeye, coho and chinook salmon) that enter the Bulkley are bound for the Morice (Taylor, M.S. 1968; Pinsent and Chudyk, M.S. 1973). Morice-bound steelhead, then, are subjected to an intense sport fishery along the length of the Bulkley prior to becoming available to anglers on the Morice.

Steelhead begin appearing in Morice angler's catches in the latter part of August. The fishery continues until freezeup, which may occur anytime after November 1st. Steelhead over-winter in the Morice and spawn, principally at or near the lake outflow, during late May and June.

British Columbia sport fishing regulations for the years during which this study was conducted list an angling closure on the Morice from January 15 to June 30, a ban on fish roe, a daily catch limit of two steelhead, and a possession limit of four steelhead. For the purposes of this study, the Morice includes that part of the Bulkley downstream of the confluence to the CN railroad crossing at Barrett, a distance of 6 kilometers (Fig. 2). Angling on the stretch of water between the first access point on the Morice at "Mile 3" and Barrett (11 kilometers) is done primarily by boat, downstream or upstream from either access point, respectively. The above regulations also apply to this portion of the Bulkley.

#### METHODS

A permanent angler check station was established on the Morice Road, four kilometers (Mile 2.5) from the junction with Highway 16, ten kilometers southwest of Houston, B.C. The station was manned by two fisheries technicians from 11:00 a.m. to 1 hour after sunset each day, for the duration of the study (September 4 to December 13 in 1976; August 15 to November 30 in 1977). A roving assistant periodically interviewed anglers at Barrett, the "Forks" (Bulkley-Morice confluence) and the campsites at Mile 3 and Mile 11 (Fig.2). On heavily fished (holiday) weekends, an additional check point was set up at the Owen Lake Road turn-off to intercept anglers leaving the valley via the Francois Lake route.

At each road check, signs were set up to direct anglers off the road and onto a siding, away from traffic. Each group of anglers was then interviewed and the information recorded on creel data cards. The information requested included residence, length of trip, location of effort, success, and tackle used. In 1977, the name of each angler was also recorded in order to establish the precise number of individual anglers fishing the Morice for future<sup>1</sup> comparison with Steelhead Harvest Analysis, which is the Fish and Wildlife Branch publication presenting annual steelhead harvest data estimated from punchcard returns.

Scale samples were collected and lengths, weights, and sex determined from anglers' catches. Anglers were invited to participate by collecting scale samples and other information from both killed and released steelhead.

Methods used in collection and analysis of steelhead scales were as described by Narver and Withler (1974). Two high quality scales from each adult were placed on acetate strips and impressions made with a heated press. The impressions were interpreted and measured (freshwater growth zone from scale focus to end of last winter) using a Microcom 1600 microfiche viewer.

Juvenile steelhead (rainbow trout) were collected during the summer of 1976 and 1977 by means of "Gees" traps and angling. Lengths were recorded and a number of scales from each fish were placed between two microscope slides and taped securely. These scales were analyzed as above. A relationship between fork length and anterior scale radius was established and used to back calculate smolt length from freshwater radius of adult scales (Appendix 1).

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<sup>1</sup>At time of this writing, 1977-78 steelhead harvest data from punchcard and questionnaire returns were not available.



The age designation formula used is also as described by Narver and Withler (1974). For example, a 3.2S1+ fish spent its initial three years (winters) of life in freshwater (denoted by the "3" to the left of the decimal point); smolted and went to sea where it spent two complete years (winters) before returning to its natal stream to spawn (S) (one winter in the river). After spawning, the fish returned to sea where it spent one entire year and part of the next (1+) before being caught on its second spawning migration. In this example, the fish was in its eighth year of life (the "5" denotes one complete year).

## RESULTS

### ANGLER ORIGIN

The Morice River angler population was separated into residence categories corresponding to Steelhead Harvest Analysis areas (Table 1). A further breakdown compared numbers of anglers arbitrarily designated as "Local Residents" (generally those within a 2 or 3 hour round-trip drive of the Morice) and anglers from Prince George (Table 2).

The angler residence data indicates that the Morice fishery is comprised mainly of B.C. residents (85.3% of the total number of anglers; 86% of the total number of angler-trips<sup>1</sup>) (Table 1). In 1977 there were 284 local resident anglers (36%) of which 148 were from Houston (Table 2).

<sup>1</sup>In recording angler residence data on the census forms in 1976, no effort was made to identify individual anglers who were checked more than once. Therefore, it was not possible to determine the number of anglers from any one town in 1976 only the number of angler-trips. For example, one angler from Smithers who was checked on five separate days would appear in the data as five anglers from Smithers, or five angler-trips originating from Smithers.

Table 1. Areas of residence and numbers of Morice River steelhead anglers from creel census in 1976 and 1977. Areas of residence are the same as areas in Steelhead Harvest Analysis, 1976 - 77.

Angler Residence	Number <sup>1</sup> of Anglers		Number Of Angler Trips		Percent of Total Anglers <sup>1</sup>		Percent Of Total Angler Trips	
	1977	1976	1976	1977	1977	1976	1976	1977
<u>B.C. Residents</u>								
Vancouver Island	4	16	11	11	.5	1	1	1
Lower Mainland	27	136	43	43	3.5	9	3	3
Kamloops	8	19	10	10	1.0	1	1	1
Okanagan-Kootenay	33	18	45	45	4.3	1	3	3
Caribou	17	18	27	27	2.2	1	2	2
Northern Interior	338	597	545	545	44.0	40	38	38
Upper Mainland Coast	229	497	555	555	29.8	33	39	39
Queen Charlotte Isl.	0	0	0	0	0	0	0	0
	<u>656</u>	<u>1301</u>	<u>1236</u>	<u>1236</u>	<u>85.3</u>	<u>86</u>	<u>87</u>	
<u>Non Resident Canadians</u>								
Alberta		103	68	68		7	5	5
Ontario	58	2	8	8	7.5	<1	<1	<1
Manitoba		0	1	1			<1	<1
		<u>105</u>	<u>77</u>	<u>77</u>		<u>7</u>	<u>5</u>	
<u>Non Canadians</u>								
USA Northwest		54	73	73		4	5	5
USA Southwest		16	25	25		1	2	2
USA Central		20	12	12		1	1	1
USA East	55	1	4	4	7.2	<1	<1	<1
USA Unknown		3	0	0		<1	0	0
Germany		3	0	0		<1	0	0
Unknown		<u>97</u>	<u>114</u>	<u>114</u>		<u>6</u>	<u>8</u>	
Total	769	1503	1427	1427	100	100	100	100

<sup>1</sup>Actual number of anglers not recorded in 1976

Table 2. Number of local resident and Prince George resident angler trips to the Morice River, Autumn 1976 and 1977

Angler Residence	Number of Anglers <sup>1</sup> total anglers		Number of angler trips		Percent of total angler trips	
	1977	1977 (n = 769)	1976	1977; (n = 1503)	1976	1977 (n = 1427)
a) <u>Local</u>						
Smithers, Telkwa	58	7	97	90	7	6
Houston	148	19	347	434	23	31
Topley, Granisle	5	<1	15	10	1	1
Francois Lake	1	<1	13	2	1	<1
Decker Lake	23	3	30	16	2	1
Burns Lake	49	6	80	116	5	8
	<u>284</u>	<u>36</u>	<u>582</u>	<u>668</u>	<u>39</u>	<u>47</u>
b) <u>Prince George</u>	247	32	420	362	28	25

<sup>1</sup>Actual number of anglers not recorded in 1976.

Thirty-two per cent (Table 2) of the total number of anglers in 1977 were from Prince George which is located 320 kilometers east of the Morice River (a seven-hour, round-trip drive).

Among non-locals other than Prince George, the largest percentage of angler-trips in 1976 originated from the Lower Mainland, Alberta, and Northwestern United States (9%, 7%, and 4%, respectively). In 1977, the percentage of Lower Mainland angler trips dropped considerably to 3 per cent, but there was a three-fold increase in the percentage of angler trips originating from the Okanagan-Kootenay Region (Table 1). Representation from all other regions remained relatively constant between 1976 and 1977.

## ANGLER EFFORT AND SUCCESS

Seven hundred and sixty-nine anglers were interviewed on the Morice during the 1977 fishery (Table 3). The total number of angler days expended during the 1977 season was 1,833, compared with 1,971 in 1976. In 1977, Morice anglers killed 416 steelhead, a 33 per cent increase over the previous year's total of 279 steelhead. Morice River anglers caught and released a total of 211 steelhead in 1977, which was a 45 per cent increase over the previous year's total of 115.

The total catch in 1976 was 394 fish, of which 29 per cent (115) were released. In 1977, 33 per cent (211) of the total catch of 627 steelhead were released. Non-Canadian anglers released 55 percent of their catch in 1976, B.C. residents released 30 per cent, local anglers released 24 per cent, and non-resident Canadian anglers released less than one per cent. In 1977, however, local anglers released 43 per cent of their catch while other B.C. residents only released 8 per cent. Non-Canadian anglers continued to release a high proportion of their catch in 1977 (50%).

In both 1976 and 1977, local anglers caught the most fish (44%) followed by other B.C. residents (average 30%). In terms of catch per unit effort, however, a significant shift in success was observed between 1976 and 1977.

Table 3. Morice River steelhead angler harvest and catch per unit effort from (a) creel survey 1976, and (b) creel survey 1977.

Category	Number		Number Angler Days	Number		Catch per Catch per	
	Anglers	Angler Trips		Anglers	Trips	Day	Angler
(a) Creel Survey 1976							
Local Residents	-	582	650	130	42	0.26	-
Other B.C. Residents	-	719	959	117	51	0.18	-
Other Canadian	-	105	142	15	1	0.11	-
Non Canadians	-	<u>97</u>	<u>220</u>	<u>17</u>	<u>21</u>	<u>0.17</u>	-
Total		1503	1971	279	115	0.20 <sup>1</sup>	
(b) Creel Survey 1977							
Local Residents	284	668	704	162	117	0.40	0.98
Other B.C. Residents	372	568	845	171	15	0.26	0.50
Other Canadians	58	77	80	6	2	0.10	0.14
Non Canadians	<u>55</u>	<u>114</u>	<u>204</u>	<u>77</u>	<u>77</u>	<u>0.75</u>	<u>2.80</u>
Total	769	1427	1833	416	211	0.34 <sup>1</sup>	0.82 <sup>1</sup>

<sup>1</sup>Average C.U.E. for all residence categories combined.

Although local anglers experienced a success rate increase of 0.40 fish per day in 1977 from 0.26 fish per day in 1976, non-Canadian anglers went from 0.17 in 1976 to 0.75 in 1977 (Table 3). In terms of catch per angler in 1977, non-Canadian residents were by far the most successful (2.8 fish per angler), followed by local residents, other B.C. residents, and non residents of Canada (0.98, 0.50, and 0.14 fish per angler, respectively).

#### STEELHEAD CATCH DISTRIBUTION

##### Timing

As mentioned previously, Morice River steelhead first become available to the Morice angler during the latter half of August. In 1976, the fishery continued until the middle of December when cold weather finally forced the closure of the check station. In 1977, a hard, prolonged freeze terminated the fishery, and the creel survey, during the last week of November (Fig. 3 and 4). During both years, peaks in terms of weekly harvest rate (Fig. 3) and in terms of angler-trips per week occurred in late September, the second week in October, and the second week in November (Figs. 4 and 5). These peaks roughly coincide with, in order, the best in local autumn weather (pers. obs.) combined with the height of tourist traffic (angling and hunting), followed by Thanksgiving Day weekend and Remembrance Day weekend.

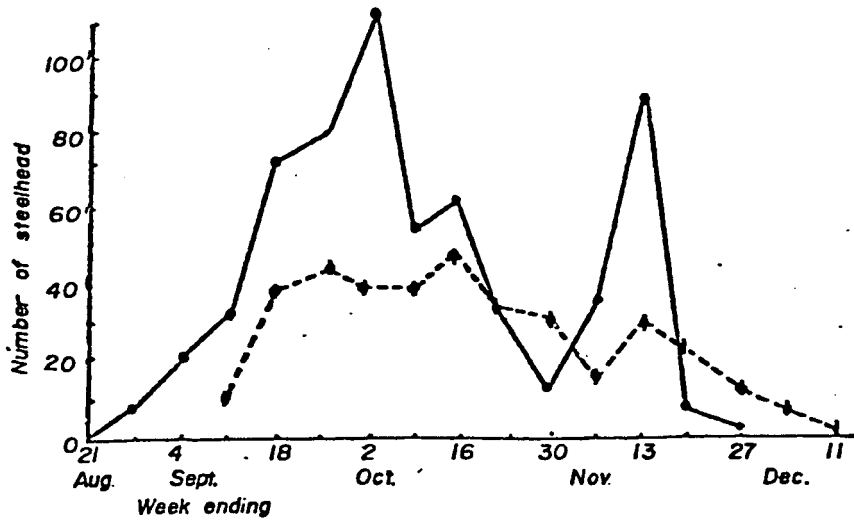


FIG. 3. Weekly steelhead Harvest (kills plus releases) Morice River creel survey 1976 and 1977

— 1976 creel survey  
 ---- 1977 creel survey

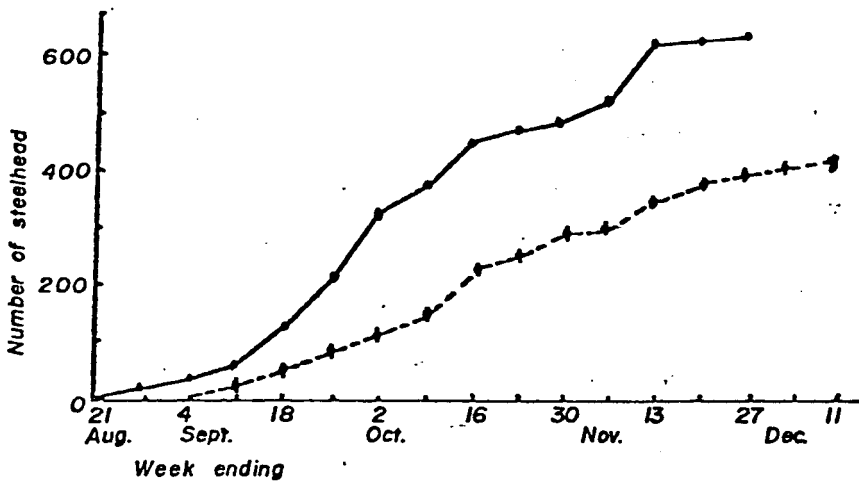


Fig. 4. Weekly cumulative steelhead harvest (kills plus releases) Morice River creel survey 1976 and 1977

— 1976 creel survey  
 ---- 1977 creel survey

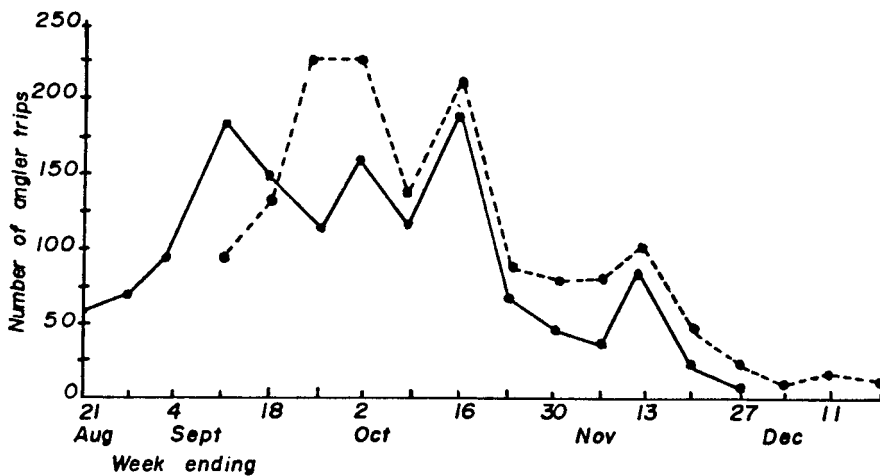


Fig. 5. Weekly total number of angler trips Morice River creel survey 1976 and 1977

— 1976 creel survey  
 ---- 1977 creel survey



## Location of Effort and Tackle Type

During both years of the study, the area between Mile 3 and Barrett attracted the greatest proportion of angler effort (38% of total number of angler-trips in 1976; 40% in 1977) (Table 4) . The next most frequented "zone" was the area between Mile 12 and Mile 17 (20% in 1976; 21% in 1977), followed closely by the area between Mile 4 and Mile 11 (17% and 19%). Distance from Houston and difficult access (boat only for the most part) restricted effort accordingly in the area between Mile 29 and the lake.

In 1976, the total steelhead catch throughout the study area was 394, of which 207 (52%) were caught in the area between Barrett and Mile 3 (Table 4). Of 627 fish caught in 1977, 353 (56%) were from the above area. The next most "productive" area was the Mile 18 to Mile 28 zone where the catch was 53 fish (13%) in 1976 and 91 fish (14%) in 1977.

Trips to the Morice by lure anglers outnumbered those of fly fishermen by a wide margin in both 1976 and 1977. In 1977, however, fly fishermen outnumbered and "outfished" lure anglers in the Barrett to Mile 3 zone (418 trips to 322; 250 fish to 103) (Table 4). In both years, fly anglers concentrated heavily in the Barrett zone (58% in 1976, 70% in 1977), whereas lure anglers spread themselves relatively evenly throughout the 4 zones from Barrett to Mile 28.

Table 4. Location by "zone" (Fig. 2) and numbers of angler trips and steelhead harvest (kill plus release) by two angling methods, Morice River, Autumn 1976 and 1977.

Location <sup>1</sup>	Angler-trips			Catch		
	Lure	Fly	Total	Lure	Fly	Total
<u>1976</u>						
Barrett to Mile 3	482	236	719	113	94	207
Mile 4 to Mile 11	269	48	317	32	10	42
Mile 12 to Mile 17	318	57	375	31	5	36
Mile 18 to Mile 28	273	31	304	53	0	53
Mile 29 to Mile 34	59	13	72	14	4	18
Mile 35 to Lake outflow	<u>90</u>	<u>21</u>	<u>111</u>	<u>29</u>	<u>9</u>	<u>8</u>
Total	1491	406	1897 <sup>2</sup>	272	122	394
<u>1977</u>						
Barrett to Mile 3	322	418	740	103	250	353
Mile 4 to Mile 11	280	70	350	42	13	55
Mile 12 to Mile 17	328	57	385	34	15	49
Mile 18 to Mile 28	263	33	296	72	19	91
Mile 29 to Mile 34	46	6	52	15	0	15
Mile 35 to Lake outflow	<u>31</u>	<u>14</u>	<u>45</u>	<u>33</u>	<u>31</u>	<u>64</u>
Total	1270	598	1868 <sup>2</sup>	299	328	627

<sup>1</sup>The six angling "zones" listed are delineated by the major access points to the river as follows:

- Mile 3 - Bymac Park and boat launch;
- Mile 11 - B.C.F.S. campsite;
- Mile 17 - Owen Lake turnoff, campsite, boat launch;
- Mile 28 - Lamprey Creek, B.C.F.S. campsite;
- Mile 34 - End of Morice West road.

<sup>2</sup>Totals do not tally with numbers of angler-trips presented in other tables, as many anglers fished several zones during one trip.

The total catch per fly angler-trip was 0.30 in 1976, and 0.55 in 1977. Success of lure anglers in 1976 and 1977 was 0.18 and 0.23 fish per trip, respectively (Table 4).

The peak of the fishery in terms of effort occurs during September and October (Table 5). In August, September and October of 1977, fly fishermen were consistently more successful than lure anglers. Catch per angler day in 1977 for fly fishermen was 0.17 in August, 0.63 in September, 0.37 in October, and 0.40 in November. During the same months, lure anglers experienced C.U.E.'s of 0.0, 0.18, 0.25, and 0.82 (Table 5). Note that November was the most successful month for lure anglers, and the only month during which fly fishermen were "outfished".

During the two-year study, lure anglers killed 87 per cent of their catch (498 of 572 steelhead) (Table 6). Fly fishermen, on the other hand, killed only 44 percent of their total catch of 449 steelhead. There was no significant difference in the kill to release ratio among the two angler groups between years.

## LIFE HISTORY OF MORICE RIVER STEELHEAD

### Adult Steelhead Age-Sex Relationships

Of 539 steelhead sampled from anglers' catches on the Morice during the study, 518 samples had scales that were readable for total age determination.

Table 5. Monthly effort expended and catch of fly fishermen and lure anglers during Morice River steelhead fishery in 1976 and 1977.

	August <sup>1</sup>		September		October		November		December <sup>2</sup>	
	Lure	Fly	Lure	Fly	Lure	Fly	Lure	Fly	Lure	Fly
<u>(a) 1976 Creel Survey</u>										
Anglers	-	-	-	-	-	-	-	-	-	-
Angler Trips	394	178	461	133	183	17	19	2		
Angler Days	556	222	659	153	200	17	19	2		
Total Catch <sup>3</sup>	59	64	109	53	73	2	7	1		
Catch/Angler-trip	0.15	0.36	0.24	0.40	0.40	0.12	0.37	0.5		
Catch 1 Day	0.11	0.29	0.17	0.35	0.37	0.12	0.37	0.5		
<u>(b) 1977 Creel Survey</u>										
Anglers	67	27	288	107	241	105	81	28		
Angler Trips	76	53	372	235	342	197	118	34		
Angler Days	78	53	497	273	465	282	146	38		
Total Catch <sup>3</sup>	-	9	91	173	115	104	120	15		
Catch/Angler	-	0.33	0.32	1.62	0.48	0.99	1.48	0.54		
Catch/Angler Trip	-	0.17	0.25	0.74	0.34	0.53	1.02	0.44		
Catch/Day	-	0.17	0.18	0.63	0.25	0.37	0.82	0.40		
<sup>1</sup> Census began September 4, 1976 and August 15, 1977										
<sup>2</sup> Census discontinued December 13, 1976 and December 1, 1977 by adverse weather conditions.										
<sup>3</sup> Includes Kill and release										

Table 6. Numbers and percentages of steelhead killed and released by lure anglers and by fly fishermen, Morice River, 1976 and 1977.

		Steelhead Killed	Fly	Steelhead	Released
		Lure		Lure	Fly
a) 1976 Creel Survey	Number	230	49	43	72
	%	84	40	16	60
b) 1977 Creel Survey	Number	268	150	31	178
	%	90	46	10	54

Fifteen age groups were identified among the two-year sample (Table 7). Some of the more minor age groups (e.g. 2.1+) were not represented in one or the other of the 1976 or 1977 runs; there were 12 age groups among the 1976 sample (n = 225) and 13 age groups among the 1977 sample (n = 293). The most frequently observed age groups were 4.1+ (38.2%), 4.2+ (25.5%), 3.1+ (11.4%), and 3.2+ (10.8%).

Adult Morice steelhead sampled over the two year period had spent two (0.2%), three (23.5%), four (69.9%), and five (6.4%) winters in fresh water before migrating to sea (Table 8).

Table 8. Numbers of male and female steelhead of different freshwater ages, Morice River, 1976 (n = 225) and 1977 (n = 293).

Freshwater Age	1976			1977			Grand Total (%)
	M	F	Total (%)	M	F	Total (%)	
2.	1	0	1 (0.4)	0	0	0 (0)	1 (0.2)
3.	25	34	59 (26.2)	31	32	63 (21.5)	122 (23.5)
4.	76	81	157 (69.8)	87	118	205 (70.0)	362 (69.9)
5.	<u>4</u>	<u>4</u>	<u>8</u> (3.6)	<u>11</u>	<u>14</u>	<u>25</u> (8.5)	<u>33</u> (6.4)
TOTAL	106	119	225	129	164	293	518



There was no difference between males and females in age at smolting (males 69.4% at 4., females 70.3% at 4). In ocean age, however, male firsttime spawners were largely of age .1+ (66.97,) whereas maiden females were almost evenly distributed between age .1+ (52.3%) and age .2+ (47.7%) (Table 9). In the sample of 484 first-time spawners, only 6 (1.2%) were of ocean age .3+. All were male steelhead.

In 1976, 14 steelhead among the total scale sample of 225 (6.2%) were observed to be repeat spawners (Table 10). Among the total scale sample of 293 in 1977 only 20, or 6.8 percent, were repeat spawners. The ratio of female to male repeat spawners was approximately 2.5:1 in 1976 and 2:1 in 1977.

The majority of female repeat spawners had spent two winters in the ocean prior to their initial spawning migration. Without exception male repeat spawners were of ocean age .1S1+ (only one ocean winter prior to initial spawn). Only one steelhead, a female in 1977, was returning for its third time.



Table 9. Numbers and percentages of male and female steelhead of different ocean ages, Morice River 1976 (n = 211) and 1977 (n = 273) (Repeat spawners excluded).

		Ocean Age										Total	
		.1+		.2+		.3+		.3+		Total		Grand Total	
		1976	1977	1976	1977	1976	1977	1976	1977	1976	1977	1976	1977
Male	n	65	85	150	35	33	68	2	4	6	102	122	224
	%	63.7	69.7	67.0	34.3	27.1	30.4	2.0	3.2	2.7	100	100	46.3
Female	n	53	83	136	56	68	124	0	0	0	109	151	260
	%	48.6	55	52.3	51.4	45	47.7	-	-	-	100	100	53.7
Total	n	118	168	286	91	101	192	2	4	6	211	273	484
	%	55.9	61.6	59.1	43.2	37.0	39.7	0.9	1.4	1.2	100	100	100

Table 10. Numbers and percentages of repeat spawning steelhead of different ocean age groups sampled from Morice River anglers' catches, 1976 (n = 225) and 1977 (n = 293).

1976		Ocean Age			Total	% Total Sample
		.1S1+	.2S1+	.2S1S1+		
M	n	4	0	0	4	
	%	100	-	-	100	1.8
F	n	2	8	0	10	
	%	25	75	-	100	4.4
Total	n	6	8	0	14	
	%	42.9	57.1	0	100	6.2
<u>1977</u>						
M	n	7	0	0	7	
	%	100	-	-	100	2.4
F	n	5	7	1	13	
	%	38.5	53.8	7.7	100	4.4
Total	n	12	7	1	20	
	%	60	35	5	100	6.8

## Adult Steelhead Length-weight Relationships

Male and female steelhead of ocean age .1+ make up over 50 percent of the total angler catch on Morice River (Table 9). The average weight of male .1+ steelhead over the two year period was 1.8 kg. (4 pounds), and of females - 1.6 kg. (3.5 pounds) (Table 11). Two-ocean males weighed 4.5 kg (9.9 pounds) and their female counterparts weighed 3.7 kg. (8.1 pounds). Three-ocean fish were scarce; only 5 (all males) were encountered during the study. These fish weighed from 7.2 to 9.5 kg. (15.8 to 21 pounds) with an average weight of 7.9 kg. (17.4 pounds).

## Smolt Age-size Relationships

During the month of August in both 1976 and 1977, a number of rainbow trout were collected for smolt length determination (total sample size = 100). Length measurements were recorded and scale samples were taken from each fish. The linear regression of fork length on scale radius of these fish was  $y = 40.46 + 2.9 X$  and was used to estimate smolt lengths from measurements of the freshwater radius of the adult steelhead scales collected in 1977 (Appendix 1).

The sample pie of rainbow trout contained 6 age groups, ranging from 0+ to 5+ (Table 12). Fork lengths ranged from 55 mm. (2.2 inches) to 265 mm. (10.4 inches), of which the former was represented by one age 0+ fish, and the latter by one age 5+ fish. Fish aged 1+ averaged 97 mm, 2+ fish averaged 138 mm., 3+ fish averaged 170 mm., and 4+ fish averaged 222 mm. (3.8, 5.4, 6.7, and 8.7 inches respectively).

Table 11. Round weights and fork lengths of male and female steelhead of different ocean ages from Morice River anglers' catches in the fall of 1976 and 1977. Repeat spawners excluded; numbers of fish for each age category vary because of incomplete information as to weight or length or both.

Sex	Ocean Age	Average 1976	Average 1977	Total Average	Range 1976	Range 1977	Number 1976	Number 1977
		<u>Weights - Kg.</u>						
Male	.1	1.6	1.9	1.8	0.9-2.9	1.0-4.0	38	63
	.2	4.2	4.7	4.5	2.3-7.2	2.2-7.5	20	25
	.3	-	7.9	7.9	8.1	7.2-9.5	1	4
Female	.1	1.5	1.8	1.6	0.7-2.0	0.9-4.5	33	64
	.2	3.6	3.9	3.7	2.7-5.0	2.7-5.5	33	60
	.3	-	-	-	-	-	0	0
		<u>Lengths - Cm.</u>						
Male	.1	54.6	59.7	57.1	50.0-64.0	52.0-72.5	59	89
	.2	74.9	79.3	77.1	65.0-88.5	62.0-96.5	32	33
	.3	-	91.0	91.0	95.0	88.9-93.0	1	4
Female	.1	55.0	56.9	56.0	49.5-66.0	50.5-66.0	50	90
	.2	71.8	74.1	72.9	62.0-82.0	64.0-90.5	58	77
	.3	-	-	-	-	-	0	0

Table 12. Age and size (fork length in mm.) of a sample of juvenile rainbow trout from Morice River in August of 1976 and 1977.

Age	Mean 1976	Mean 1977	Total Mean	Range 1976	Range 1977	Total Sample Size
0+	-	55	55	-	-	1
1+	99	95	97	87-146	-	8
2+	126	150	138	101-144	119-191	47
3+	160	179	170	150-187	150-213	37
4+	209	234	222	175-230	-	6
5+	265	-	265	-	-	<u>1</u>
						100

Back calculated smolt lengths for seven steelhead age groups (from 1977 anglers' catches) ranged from 128 mm. (5 inches) to 257 mm. (10.1 inches) (Table 13).

Table 13. Means and ranges of estimated fork lengths (mm.) at time of formation of last freshwater annulus for Morice River steelhead trout sampled from anglers' catches in 1977, according to age and year-class (sexes combined; repeat spawners not included).

Year-class	Age-group	Mean Length at Smolting (Range)		
		n		mm.
1973	3.1+	35	142	(128-194)
1972	3.2+	24	150	(128-180)
1972	4.1+	110	173	(142-209)
1971	4.2+	72	182	(151-238)
1970	4.3+	4	180	(174-186)
1971	5.1+	21	203	(157-257)
1970	5.2+	3	193	(171-209)

The estimated mean smolt lengths for the most important Morice steelhead age-groups -3.1+, 3.2+, 4.1+ and 4.2+ (Table 7) - were 142 mm. (5.6 inches), 150 mm. (5.9 inches), 173 mm. (6.8 inches), and 182 mm. (7.2 inches), respectively.

## DISCUSSION

## DISCUSSION

Because of the limited number of access routes to the Morice River, we felt that by means of the permanent check station at Mile 2.5 and the periodic roving road checks we were able to contact and record information from almost 100 per cent of the angler population. The results of the two year study should therefore accurately portray the true state of the Morice steelhead fishery.

Although a "Special River" by regulation, the Morice does not attract large numbers of non-resident anglers to the degree that the nearby Kispiox River does. In fact, the two rivers are almost the opposite of each other in terms of non-resident effort - non resident anglers expended only 11 per cent of the total number of angler days monitored on the Morice, whereas non residents accounted for approximately 76 per cent of the effort on the Kispiox in 1975 (Whately, 1977). Good accommodation (two camps and a lodge) on the Kispiox for long staying anglers, and its established reputation for trophy-sized fish (>9 kg [>20 pounds]) are two major features not shared by the Morice. With respect to the latter, the predominant ocean age group among Morice steelhead is .1+ with an average weight of only 1.7 kg. (3.9 pounds). The majority of Kispiox steelhead, on the other hand, are of ocean age .2+ and .3+ (>.70% of the total number of Kispiox age groups) with average weights ranging from 5 to 12.5 kg. (11 to 27.5 pounds) (Whately, 1977).

The large numbers of Central Interior (Smithers and Prince George) anglers that make day or weekend trips to the Morice attest to its location (the most "inland" of Skeena steelhead tributaries) and its popularity as a "local" steelhead fishery. The fishery has been adequately termed an "everyman's fishery" by Pinsent and Chudyk, M.S. 1973.

Morice anglers tend to kill a higher proportion of their catch than Kispiox anglers. Over the two-year period, Morice anglers killed 68 per cent of their total catch, compared with only 24 per cent by Kispiox anglers in 1975 (Whately, 1977). As is usual in most steelhead fisheries, however, Morice fly fishermen killed a lesser percentage of their catch than did lure anglers (44 per cent as opposed to 87 per cent). Fly fishermen concentrated most heavily in the section of river between Mile 3 and Barrett.

Among Morice steelhead age groups, fish of freshwater age 4. accounted for 70 per cent of the total sample, while only 23.5 per cent were of age 3.. Again using Kispiox steelhead as a comparison, 56 per cent of a sample taken in 1975 were of freshwater age 4. and 40 per cent were age 3. (Whately, 1977). Narver (1969) found that only 15 per cent of a sample of Babine River steelhead were age 4. with 82 per cent age 3.. Note that the mouth of the Kispiox in the Skeena is only 16 km. upstream from the mouth of the Bulkley-Morice and the Babine is only another 35 km. upstream.



Although geographically close, the three systems obviously differ widely in terms of those factors affecting freshwater growth with the Morice apparently providing the least productive environment. This assumption seems to be supported by the greater proportions of older smolts, as mentioned above, and the small size of estimated juvenile lengths. The estimated average smolt lengths for Morice steelhead were: age 3. - 145 mm. age 4. - 178 mm., and age 5. - 200 mm. Kispiox smolt lengths for the same ages were 163 mm., 195 mm., and 241 mm., respectively (Whately, 1977), while Babine fish were even larger at 187, 203, and 246 mm. respectively (Narver, 1969).

Repeat spawners among the Morice steelhead sample comprised only 6.6 per cent of the total. This is low compared with the 17.6 per cent observed in the Kispiox sample (Whately, 1977) but agrees with Withler's (1966) premise that incidence of repeat spawning in summer steelhead stocks is generally low (5.0%, based on several southern B. C. streams).

## CONCLUSIONS

Results of the study reported herein generally indicate that Morice River anglers are predominantly local in origin, and they kill most of the fish that they catch, most of which do not exceed 4.5 kg. (10 pounds). This type of fishery would lend itself well to almost any type of enhancement even to the point of hatchery introductions (if absolutely necessary) because of the low risk. In the short term, regulations should be designed to (1) exemplify the non-specialized and local nature of the fishery, (2) protect this important but delicate stock. Some recognition may be given fly fishermen in the future in terms of the possible establishment of a fly fishing only zone.

## SUMMARY

1. During the periods September through December 13, 1976 and August 15 through November, 1977, a creel survey and catch sampling program was conducted on the Morice River to gather information on the steelhead fishery including angler origin, effort, methods used and success. Scale samples, lengths and weights were also collected from the anglers' catches for a life history analysis. An angler check station operated on a daily basis throughout the above periods assured almost 100 per cent angler coverage.
2. Morice River steelhead anglers were found to be primarily British Columbia residents (85.3% in 1977). "Local" residents (Smithers to Burns Lake) had the highest representation in 1977 (36% of the total angler population of 769) followed closely by residents of Prince George (32%).
3. Total effort expended by all anglers on the Morice was 1,971 angler days in 1976 and 1,833 angler days in 1977.
4. The total catch in 1976 was 394 steelhead of which 115 (29%) were released. In 1977, 211 (33%) of the total catch of 627 steelhead were released. The majority of the total catch over two years is attributable to local residents (44%) followed by other B.C. residents (30%).

5. The catch per day for all anglers in 1976 was 0.20, and in 1977, 0.34. In terms of catch per angler in 1977, non-Canadian anglers were by far the most successful, averaging 2.8 fish per angler followed by local residents, other B.C. residents, and non-resident Canadians (0.98, 0.50, and 0.14 fish per angler respectively).
  
6. The Morice steelhead fishery begins in mid-August and continues until freezeup, which occurred on December 13 in 1976, and on November 30, in 1977. Peaks in harvest rate occurred in early October and early November. Heaviest concentrations of anglers occurred generally during the holiday weekends of Labour Day, Thanksgiving Day and Remembrance Day.
  
7. Of six "zones" delineated by major access points to the river, the most heavily utilized in terms of angler effort was the area between Mile 3 (Bymac Park) and Barrett with 40 per cent of the total number of angler-trips in 1977. The next most-frequented zone was the area between Mile 12 and Mile 17 (21% of total 1977 angler-trips.) The Mile 3 to Barrett zone was also the most productive; in 1976 52 per cent of the total catch (394) and in 1977 56 per cent of the total catch (627) came from that zone. The next most productive zone was the area between Mile 18 and Mile 28 with 13 per cent and 14 per cent of the catch in 1976 and 1977, respectively.

8. Lure anglers accounted for 78 per cent of the total effort (angler days) in 1976, and 65 per cent in 1977. Lure anglers caught 69 per cent of the total of 394 steelhead in 1976 but only 48 per cent of 627 in 1977. Fly fishermen were generally more successful than lure anglers in all months except November and December. Most fly fishermen concentrated in the Mile 3 to Barrett zone.
9. Lure anglers killed 84 per cent of their catch in 1976 and 90% in 1977. Fly fishermen on the other hand, killed only 40% of their catch in 1976 and 46 percent in 1977.
10. Among 518 readable scale samples collected over the two year period, fifteen age groups were identified. The most frequently observed age groups were 4.1+ (38.2%), 4.2+ (25.5%), 3.1+ (11.4%), and 3.2+ (10.8%). The majority of Morice steelhead spent four (69.9%) years in freshwater prior to seaward migration.
11. Among first-time spawners, 66.9% of the males and 52.3% of the females were of ocean age .1+. Only 30 per cent of the males were of ocean age .2+ whereas 47.7 per cent of the females were two-ocean fish. Only 6 steelhead, all males, were of ocean age .3+.
12. Repeat spawners accounted for only 6.2% of the total sample in 1976 (n = 225) and 6.8% in 1977 (n = 293). Female repeat spawners outnumbered male repeat spawners by ratios of 2.5:1 in 1976 and 2:1 in 1977.

Over the two year study period only one fish, a female, was observed to have spawned more than once prior to capture.

13. Weights of male steelhead at ocean age .1+, .2+, and .3+ averaged 1.8, 4.5, and 7.9 kg. respectively. Females of ocean age .1+ weighed on average 1.6 kg. and two ocean females weighed 3.7 kg.
  
14. The relationship of fork length to anterior scale radius of a sample of 100 rainbow trout (juvenile steelhead) was used to estimate lengths of Morice steelhead smolts. The average estimated smolt lengths for steelhead of age 3.1+ 3.2+, 4.1+ and 4.2+ were 142 mm., 150 mm., 173 mm., and 182 mm. respectively.

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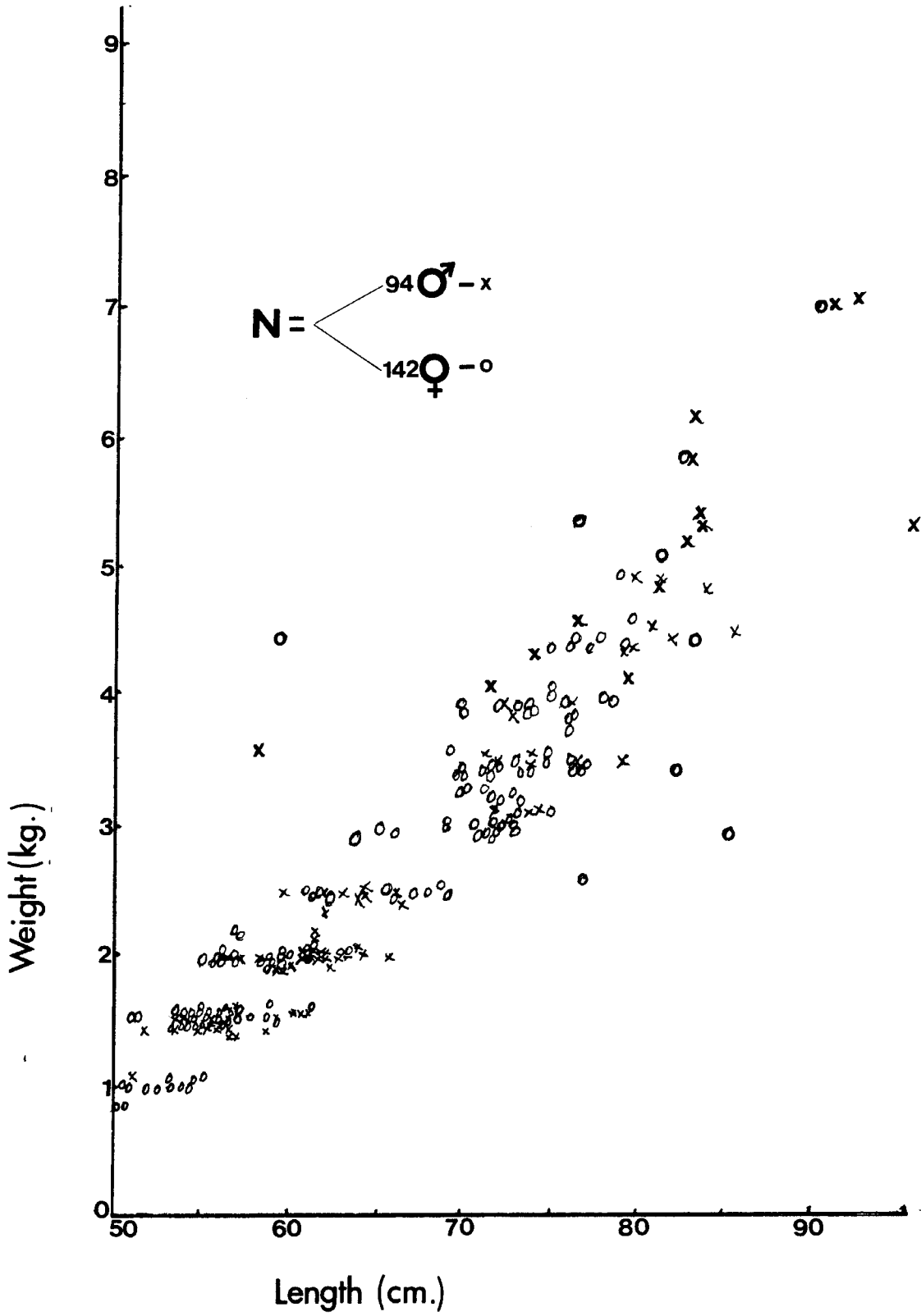
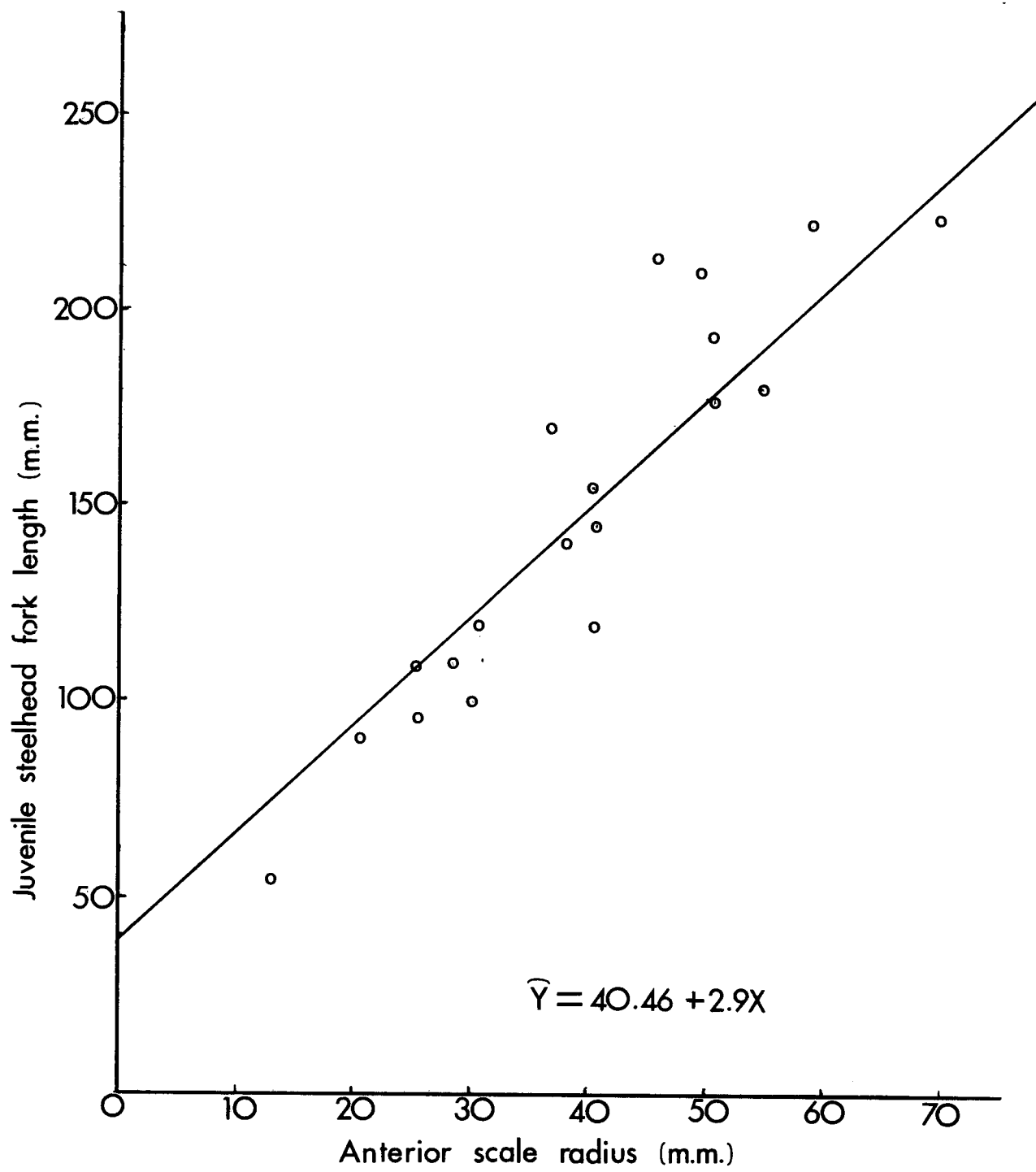


Fig. Length-weight relationships for Morice River creel survey





Appendix Relationship of scale radius and fork length of juvenile steelhead in Morice River