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WHATELY, M. R. P/FR/SK/10
KISPIOX RIVER STEELHEAD
TROUT: THE 1975 SPORT
AJAS c. 6 mm SMITHERS

KISPIOX RIVER STEELHEAD TROUT:

THE 1975 SPORT FISHERY AND LIFE HISTORY

CHARACTERISTICS FROM ANGLERS' CATCHES

by

M. R. Whately¹

¹Fish and Wildlife Branch, Smithers, B.C.

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INTRODUCTION

Kispiox River, located in northwestern British Columbia, is widely recognized by anglers for its trophy-sized steelhead trout (*Salmo gairdneri* Richardson). This reputation has given the Kispiox steelhead fishery a unique status in the minds and plans of both steelheaders and fish managers. Accordingly, an angler use and creel census was conducted during autumn, 1975 by the Fish and Wildlife Branch to provide a basis for future management and protection of this world-renowned trophy steelhead fishery.

Aspects of the Kispiox 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 Kispiox steelhead anglers have been reported by Remington, *et al.* (M.S. 1975). Some life history characteristics of Kispiox steelhead have been described by Taylor and Whately and Imbleau (M.S. 1975).

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 Kispiox steelhead. Results of the creel census are compared with data presented in the annual Branch publication "Steelhead Harvest Analysis."

DESCRIPTION OF THE STUDY AREA AND THE STEELHEAD FISHERY

The Kispiox River flows into the Skeena River approximately 16 kilometers north of Hazelton, B.C., 55° 15" N, 127° 40' W (Fig. 1). The river is approximately 137 kilometers long, and drains an area of 2,086 km². The Kispiox Valley is situated in a northwest to southeast direction and lies in a climate and vegetation transition zone between the coast and interior.

Although the river originates in glaciers of the Skeena Mountains, it is also fed by many lakes and bogs situated in the series of benches and low hills characterizing the northwestern boundary of the drainage (Fig. 2). These bodies of water provide moderate flows and high water quality, though frequent autumn rains often cause freshets which reduce water quality and fishability.

In the upstream portion of the valley above the Nangeese River (Fig. 2), the valley bottom is narrow and access is severely restricted. Riparian vegetation consists of thick stands of over-mature conifers. Downstream of Nangeese River, the valley is wider (width to 6.5 km) and is developed as farming and residential units. Access to and through this southern portion is via a well-maintained public road system which extends to Nangeese River. Most of the steelhead fishery is in the southern part of the valley.

Several species of fish inhabit the Kispiox River system. A large run of pink salmon (primarily odd-year) and a small run of chum salmon spawn in the river. Sockeye salmon spawn and rear in headwater lakes, and coho and chinook salmon use the river for spawning and rearing. Resident populations of mountain whitefish, long nose suckers, rainbow trout, Dolly Varden and cutthroat trout occur in the watershed. (Anadromous forms of the latter two species may exist but have not been documented.) Landlocked coho populations are reported in some small lakes in the valley. (Skunsnat)

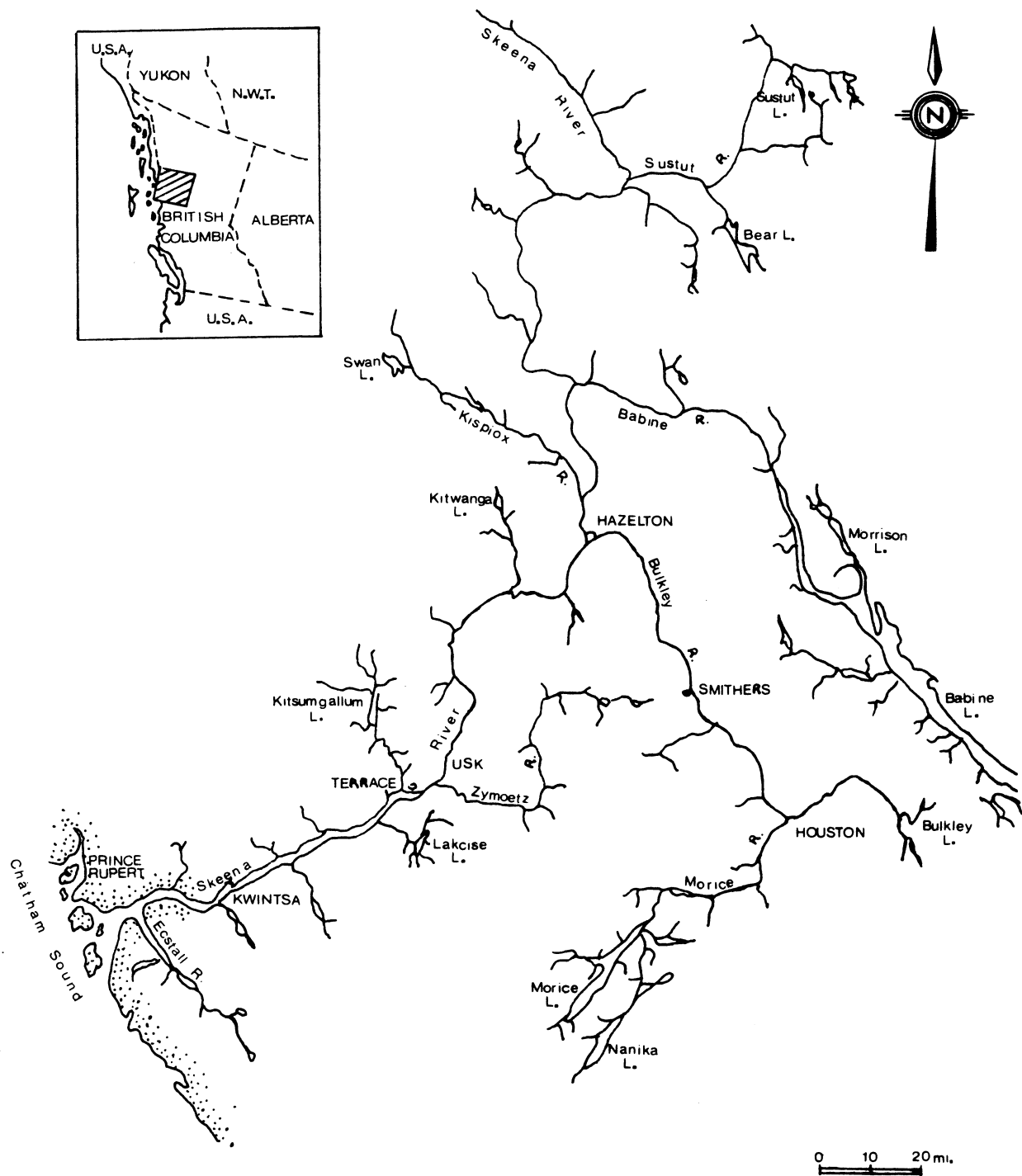


Fig. 1. The Skeena River and main tributaries.

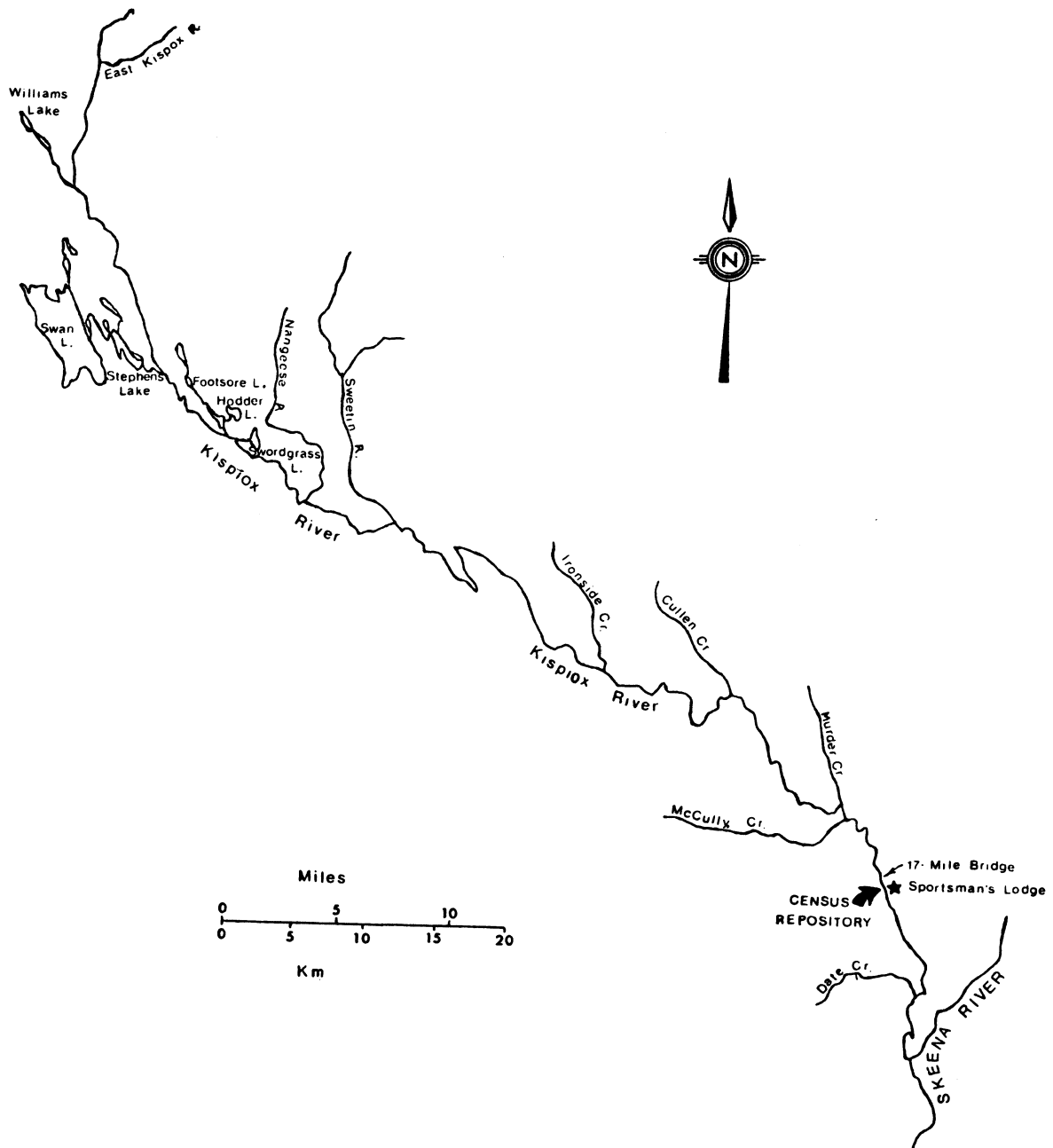


Fig. 2. The Kispiox River and location of the creel census repository.

The Kispiox steelhead trout is a summer-run fish, or more aptly, a fall-run fish. Unlike winter-runs, the Kispiox steelhead leaves its ocean feeding grounds and enters the Skeena River estuary during mid-summer (July-August). After exposure to a very concentrated commercial fishery in the estuary and several Indian gillnets set along the Skeena to the mouth of the Kispiox, the steelhead first becomes available to the Kispiox angler near the end of August. Steelhead continue to enter the Kispiox throughout the fall and possibly into winter. Spawning occurs during May and June after which the kelts move seaward through the commercial and Indian net fisheries.

The sport fishery extends from late August until freeze-up (Taylor M.S. 1968), which occurs after November 1st. Following freeze-up, limited and sporadic angling may take place through the ice or in ice-free pools throughout the winter.

British Columbia sport fishing regulations¹ for the year during which this study was conducted list an angling closure on the Kispiox from March 1 to May 31, a ban on fish roe, a ban on boat-angling, a daily catch limit of one steelhead, and a possession limit of three steelhead.

METHODS

Anglers were directed by several signs posted strategically throughout the Kispiox Valley to report results of each angling trip to the Sportsman's Kispiox Lodge (Fig. 2). Creel census forms (Appendix 1) were provided at the Lodge, along with a repository. In addition, census forms were provided with instructions to the other two steelhead resort camps in the valley.

A fisheries assistant interviewed anglers for most of the season to ensure that anglers completed the forms. It was important to contact anglers along the nine miles of river downstream of the Sportman's Lodge, as many of these anglers would not pass the Lodge on their way home. The fishery effectively ended by the end of the first week in November due to ice conditions, and angler interviews were terminated at the end of October.

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) by the author and an assistant using a Microcom 1600 microfiche viewer.

Juvenile steelhead (rainbow trout) were collected during the summer of 1976 by means of "Gees" traps and angling. Lengths were recorded and a number

¹Regulations have since been amended and will come into effect April 1, 1976:
(1) Angling closure from December 1 to May 31, (2) Daily catch limit, one steelhead; possession limit, one steelhead.

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 2).

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 "S" denotes one complete year).

RESULTS

ANGLER ORIGIN AND RESPONSE

The Kispiox angler population was separated into four categories according to place of residence:

1. Steelhead Harvest Analysis Area 6: Upper Mainland Coast Region (local residents).
2. Steelhead Harvest Analysis Area 0 through 5 plus 7 [B.C. residents other than (1) above].
3. Steelhead Harvest Analysis Area 8: Non-resident Canadians.
4. Steelhead Harvest Analysis Area 9: Non-Canadians.

Angler residence data indicates that non-Canadian anglers, and particularly those from the Northwestern American States, far outnumbered Canadian anglers (Table 1). Local residents (generally those within 3 or 4 hours drive of the Kispiox River) comprise a small percentage of the anglers, although the number of local residents who returned creel census forms is probably a small percentage of the actual number of Local Resident anglers on the river.

Data from Steelhead Harvest Analysis (1975-76) were used to compare to creel survey estimates of resident area and angler numbers (Table 2). The greatest discrepancy in numbers of anglers reporting by the two methods occurs in the Local Resident (Upper Mainland Coast) category. Estimated angler numbers from the census and harvest analysis are 50 and 218 respectively, or a 300% discrepancy. The reverse is observed for the non-Canadian category in which the estimated numbers of anglers in the census and the harvest analysis are 243 and 188 respectively. Similarities between the two methods are only evident among angler categories that are not well-represented, such as Vancouver Island (census - 10 anglers; harvest analysis - 15 anglers), and Kamloops (census - 21; analysis - 31).

Table 1. Areas of residence of Kispiox anglers as reported on creel census forms during autumn, 1975.

<u>Local Residents</u>	<u>Number</u>	<u>B.C. Residents</u>	<u>Number</u>
Kispiox	5	Lower Mainland	20
Kitimat	5	Northern Interior	15
Smithers	4	Kamloops	10
Telkwa	4	Vancouver Island	5
Terrace	3	Okanagon-Kootenay	3
Hazelton	2	Cariboo	2
Houston	1	Unknown	1
	<u>24 (10.9%)</u>		<u>56 (25.5%)</u>

<u>Non-Resident Canadian</u>	<u>Number</u>	<u>Non-Canadian</u>	<u>Number</u>
Alberta	21 (9.6%)	U.S.A. Northwest	82
		U.S.A. Central	13
		U.S.A. Southwest	5
		U.S.A. East	8
		U.S.A. South	3
		U.S.A. Unknown	2
		Japan	1
		Denmark	1
		Switzerland	3
			<u>118 (54.0%)</u>

Table 2. Reported and estimated numbers of Kispiox steelhead anglers from the fall, 1975 survey and from Steelhead Harvest Analysis, 1975-76.

<u>Resident Area</u>	<u>Reported¹</u>	<u>Percent</u>	<u>Estimated²</u>	<u>S. H. A.³</u>	
				<u>Rep.</u>	<u>Est.</u>
Vancouver Island	5	2.3	10	3	15
Lower Mainland	20	9.2	41	23	102
Kamloops	10	4.6	21	7	31
Okanagon-Kootenay	3	1.4	6	8	38
Cariboo	2	0.9	4	3	10
Northern Interior	15	6.9	31	36	128
Upper Mainland Coast	24	11.0	50	60	218
Q.C. Islands	0	0.0	0	0	0
Non-B.C. Canadians	21	9.7	44	34	118
Non-Canadians	<u>118</u>	<u>54.0</u>	<u>243</u>	<u>121</u>	<u>188</u>
	219	100.0%	450	295	848

¹Total includes one angler of unknown origin (B.C. resident).

²The figures in this column are computed by applying the percentages in column 2 to the estimated total angler population of 450.

³Steelhead Harvest Analysis.

The estimated total number of anglers (450) in Table 2 is an educated guess only, but is considered to be within $\pm 10\%$. Accordingly, validity of the data comparison is limited by the apparent lack of response by local residents,

and the increased probability of non-resident response owing to greater length of stay (Table 3).

ANGLER EFFORT

Non-Canadian anglers expended the greatest amount of effort on Kispiox River - a reported total of 1570 angler-days, expanded to an estimated 3159 angler-days (Table 3). Non-Canadians also reported the greatest degree of success; 61% reported catching one or more steelhead. However, this group of anglers expended, on average, at least twice as much time (13 days) as the next most successful group of anglers (Local Residents - 7 days) (Table 3).

Table 3. Angler effort and success in the Kispiox steelhead fishery, 1975 (derived from the creel survey).

Category	Number		Effort			Number and % Successful Anglers ²		
	Rep.	Est.	Rep.	Mean ¹	Est.	Rep.	%	Est.
Local Residents	24	50	169	7	350	12	50	25
B.C. Residents	56	113	229	4	452	17	30	34
Non-B.C. Canadians	21	44	82	4	176	7	33	15
Non-Canadians	118	243	1570	13	3159	72	61	148
	219	450	2050		4137	108	49%	222

¹Mean number of days expended per angler.

²"Successful anglers" - anglers who killed and/or released one or more steelhead.

The average number of days spent per successful angler was about twice that expended by the non-successful angler (Table 4).

Table 4. Effort expended by successful anglers as opposed to effort expended by unsuccessful anglers during the Kispiox steelhead fishery, autumn, 1975.

Category	Mean No. Angler Days	Mean Days per Successful Angler	Mean Days per Unsuccessful Angler
Local Residents	7	11 (137) ¹	3 (32)
B.C. Canadians	4	6 (102)	3 (127)
Non-B.C. Canadians	4	5 (37)	3 (45)
Non-Canadians	13	17 (1240)	7 (330)

¹Figures in parentheses denote total angler-days.

STEELHEAD HARVEST AND SUCCESS OF ANGLERS

The 219 anglers that responded in the creel survey reported a total kill of 114 steelhead and a total release of 389 steelhead. Results from the

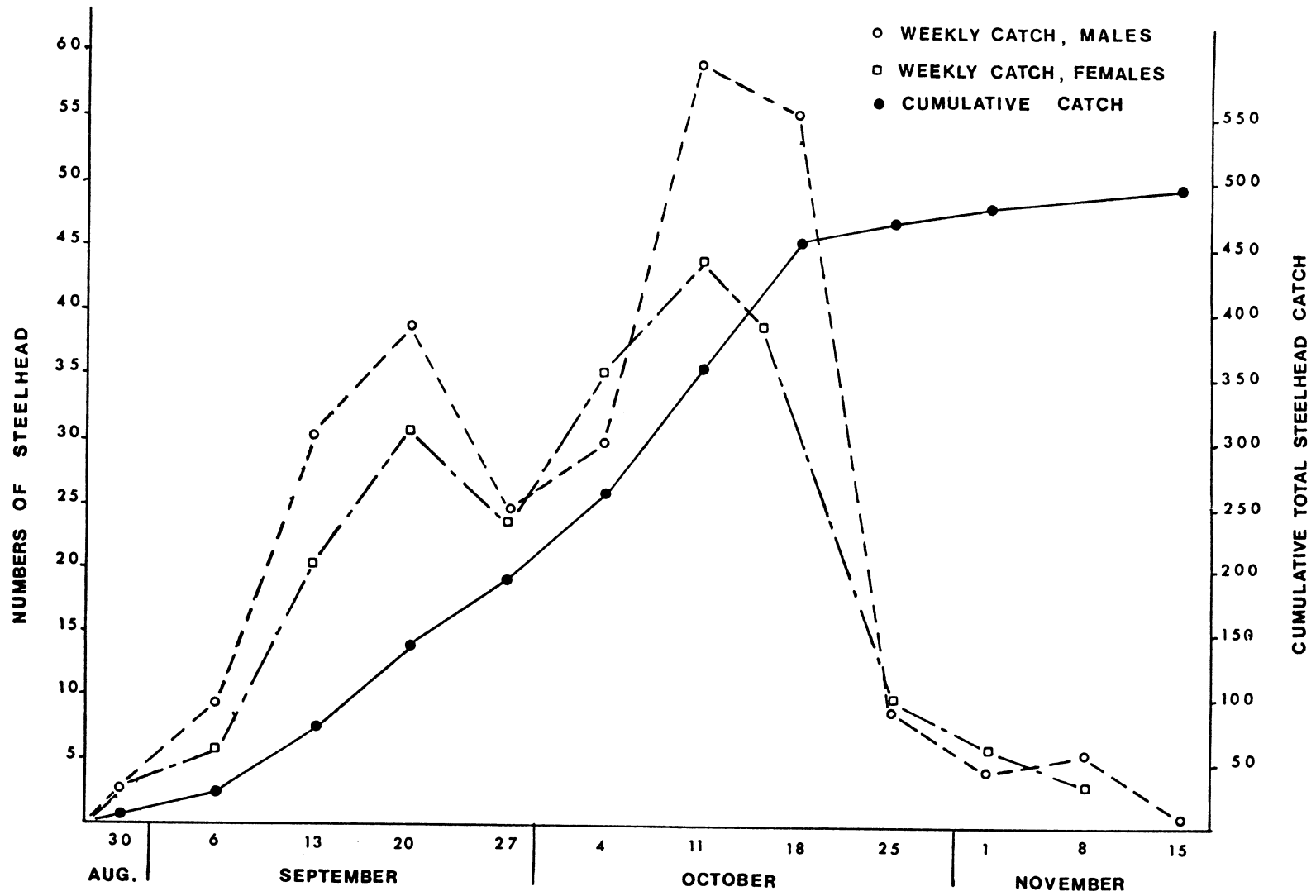


Fig. 3. Weekly and cumulative catch of steelhead trout on the Kispiox River during 1975.

Steelhead Harvest Analysis (1975-76) were compared to the creel survey for total catch, effort and success.

Success rate, or catch per angler-day, averaged 0.245 for all angler categories during the 1975 autumn season (Table 5). Local anglers appeared to be the most successful, catching almost 0.3 fish per day. Non-Canadians and other B.C. residents were slightly less successful. In terms of catch per angler, however, non-Canadian anglers averaged over three fish per man, locals slightly over two, and B.C. residents and other Canadians one or less. Steelhead per angler was associated, as expected, with the average number of days spent on the river (Table 4 and 5). There is a high probability of frequent non-reporting by unsuccessful anglers and this bias tends to inflate the total estimated catch and release figures (Table 5).

Table 5. Angler harvest of Kispiox steelhead, reported and estimated (), plus catch per unit effort from (a) autumn, 1975 survey and (b) Steelhead Harvest Analysis, 1975-76.

<u>Category</u>	<u>Number Anglers</u>	<u>Effort Angler Days</u>	<u>Kill</u>	<u>Release</u>	<u>Catch¹ Day</u>	<u>Catch¹ Angler</u>
<u>(a) Fall 1975 Survey</u>						
Local Residents	24 (50)	169 (350)	7 (15)	43 (90)	0.296	2.1
B.C. Residents	56 (113)	229 (452)	18 (36)	36 (73)	0.236	1.0
Non-B.C. Canadians	21 (44)	82 (176)	5 (10)	5 (10)	0.122	0.5
Non-Canadians	118 (243)	1570 (3159)	84 (173)	305 (628)	0.248	3.3
Totals	219 (450)	2050 (4137)	114 (234)	389 (801)	0.245	2.3
<u>(b) Steelhead Harvest Analysis</u>						
	295 (848)	1837 (4396)	101 (247)	444 (887)	0.297	1.8

¹Computed using Kill (reported) plus Release (reported).

STEELHEAD CATCH DISTRIBUTION

Timing

The Kispiox fishery is frequently interrupted by periodic autumn rains that cause the river to become unfishable. In 1975, rainstorms occurred only during the first and last weeks of September. Only the latter storm appeared to have an impact on the fishery, which demonstrated a slight decline (Fig. 3). The fishery peaked during mid-October after which the weekly catch declined swiftly.

Location

Over 60 percent of the total steelhead catch in fifty miles of river occurred in two five-mile zones (Table 6). Of these, 166 fish (77%) were caught in two runs--the "Potato Patch" (Zone 1) and the "Cottonwood" (Zone 3). Fly anglers were most concentrated on the above sites and "outfished" lure anglers (43 fish to 22 fish) on the Cottonwood run.

Table 6. Location and numbers of fly and/or lure caught steelhead trout by zone¹, river mileage, and road (east bank) mileage, Kispiox River, autumn, 1975.

<u>Zone</u>	<u>River Mile</u>	<u>Road Mile</u>	<u>Fly</u>	<u>Lure</u>	<u>Total² (%)</u>
1	0-5	0-4	35	44	79 (22.5)
2	5-10	4-8	8	38	46 (13.2)
3	10-15	8-12	57	79	136 (39.3)
4	15-20	12-16	0	39	39 (11.2)
5	20-24	16-20	6	25	31 (8.9)
6	24-49	20-42	4	13	17 (4.9)
			---	---	-----
			110	238	348 (100)

¹There are at least 30 names given various "holes" or "runs" ofl Kispiox River. Since identifying all of the sites and locating them by mile post may lead to increased pressure in specific areas, the river has been separated into zones for the purpose of this table (Kispiox regulars will know in which zone their favorite run lies).

Mile 0 - confluence: Mile 9 - Sportsman's Lodge;
Mile 24 - Cullen Creek: Mile 49 - Sweetin River (river mileage)

²Total does not tally with reported harvest (503), as several anglers did not report location of catch.

Tackle

Of the 219 anglers sampled, 190 returned census forms with angling methods specified. Spin, or bait-casting anglers totalled 142, whereas the fly-fishing group accounted for the remaining 48, or 24 percent. Favorite lures included "cherry bobbers", "Spin-glos", "T-spoons", "Kitimats", "Corkies", and "Oakie Drifters", the Oakie Drifters being most prevalent. Since fish roe is prohibited, bait fishing was almost non-existent, except for two or three anglers with shrimp or worms.

Many fishermen invented and tied their own flies, but "Doe Spratleys" and "Forest Powells" were common Kispiox patterns along with various bucktails.

Fly fishermen comprised only 25 percent of total angler numbers, but accounted for 36 percent of the total effort expended in angler days (Table 7). Catch per effort on flies was surprisingly close to that on lures, .16 and .19 respectively (Tables 6 and 7).

Table 7. Effort expended by fly fishermen and lure anglers on the Kispiox River during 1975.

Angler Type	Number Reporting	%	Angler Days	%	Catch/Day
Lure	140	75	1206	64	0.19
Fly	<u>47</u>	<u>25</u>	<u>677</u>	<u>36</u>	<u>0.16</u>
Total	187	100	1883	100	

Sex Ratio in Anglers' Catches

The overall sex ratio (male:female) of steelhead taken (kills and releases) by both fly and lure fishermen was 1:1.25 (Table 8).

Table 8. Sex ratio of steelhead trout in anglers' catches on Kispiox River during 1975, in terms of kills vs releases, and fly tackle vs lures.

Tackle	MALE STEELHEAD			FEMALE STEELHEAD			Grand Total (%)
	Kill (%)	Rel. (%)	Tot. (%)	Kill (%)	Rel. (%)	Tot. (%)	
Fly	11 (15)	62 (85)	73 (45)	8 (9)	81 (91)	89 (55)	162 (32)
Lure	<u>54 (36)</u>	<u>97 (64)</u>	<u>150 (44)</u>	<u>42 (22)</u>	<u>148 (78)</u>	<u>191 (56)</u>	<u>341 (68)</u>
Total	65 (29)	159 (71)	223 (44)	50 (18)	229 (82)	280 (56)	503

There was no difference in sex ratio related to tackle type. The total steelhead harvest by fly consisted of 45 percent males, and the total harvest by lure consisted of 44 percent males. Both angler groups killed a higher proportion of male than female steelhead. Total males killed was 29 percent of the harvest of 223, whereas females killed represented only 18 percent of the harvest of 280. Lure anglers tended to kill greater numbers (and proportions) of both sexes than did fly fishermen. Of the 160 males taken by lures, 36 percent were killed; of the 73 fly-caught male steelhead, only 15 percent were killed. Twenty-two percent of lure-caught females (total 191) were killed, whereas only 9 percent of the fly-caught females (total 89) were killed.

LIFE HISTORY OF KISPIOX RIVER STEELHEAD

Adult Steelhead Age-Sex Relationships

Of the 209 angler-caught steelhead sampled on the Kispiox during 1975, 195 samples had scales that were readable for total age determination. Eighteen age groups were identified among the Kispiox River steelhead angler catch during 1975 (Table 9). The most frequently observed age groups were 4.2+ (30.3) percent, 3.2+ (14.9 percent), 3.3+ (also 14.9 percent), and 4.3+ (10.3 percent).

Table 9. Steelhead trout age groups, Kispiox River, 1975

<u>Age Group</u>	<u>Number Steelhead</u>	<u>Number M</u>	<u>Number F</u>	<u>Percent Total</u>
2.1+	1	0	1	0.5
2.2+	2	1	1	1.0
3.1+	4	3	1	2.1
3.2+	29	8	21	14.9
3.3+	29	24	5	14.9
3.1S1+	1	1	0	0.5
3.2S1+	14	0	14	7.2
3.3S1+	1	0	1	0.5
4.1+	4	3	1	2.1
4.2+	59	26	33	30.3
4.3+	20	15	5	10.3
4.1S1+	1	1	0	0.5
4.4+	5	4	1	2.5
4.2S1+	18	3	15	9.2
4.5+	1	1	0	0.5
4.2S1S1+	1	0	1	0.5
5.2+	3	1	2	1.5
5.3+	2	1	1	1.0
18	195	92	103	100%

Adult Kispiox steelhead sampled in 1975 had spent two (1.5 percent), three (40 percent), four (55.9 percent), and five (2.6 percent) winters in freshwater before migrating to sea (Table 10).

Table 10. Numbers and percent of male and female steelhead of different freshwater ages, Kispiox River, 1975. (n = 195)

		<u>Freshwater Age</u>				<u>Total</u>
		<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	
M	n	1	36	53	2	92
	%	1.1	39.1	57.6	2.2	
F	n	2	42	56	3	103
	%	1.9	40.8	54.4	2.9	
Total	n	3	78	109	5	195
	%	1.5	40.0	55.9	2.6	

There was no difference between males and females in age at smolting (males 57.6% at 4., females 54.4% at 4.). However, there appeared to be a significant difference in ocean age (Table 11). The majority of first-time female spawners returned at age .2+ (79.1%), whereas male first-time spawners were almost evenly distributed between age .2+ (41.4%) and age .3+ (46.0%). Only 15.3 percent of the females in this sample were of ocean age .3+.

Table 11. Numbers and percentages of male and female steelhead of different ocean ages, Kispiox River, 1975. (Repeat spawners not included.) (n = 159.)

		Ocean Age					Total
		.1+	.2+	.3+	.4+	.5+	
M	n	6	36	40	4	1	87
	%	6.9	41.4	46.0	4.6	1.1	
F	n	3	57	11	1	0	72
	%	4.2	79.1	15.3	1.4	0	
Total	n	9	93	51	5	1	159
	%	5.7	58.5	32.1	3.1	0.6	

Among the total scale sample of 209 steelhead, 37 or 17.6 percent (including one scale sample with regenerated freshwater growth) were observed to be repeat spawners (Table 12). The ratio of female to male repeat spawners was approximately 5:1. The majority of female repeat spawners were of the .2S1+ ocean age category, but were evenly split between freshwater age 3. and 4. Only two steelhead (females, age 4.2S1S1+ and R.2S1S1+) were returning for the third time.

(Includes reg. scales)

Table 12. Numbers and percentages of different ocean age groups of repeat spawning steelhead. Kispiox Rivers 1975. (Sample size 209.)

		Ocean Age				Total	Total
		.1S1+	.2S1+	.3S1+	.2S1S1+		
M	n	2	3	0	0	5	
	%	40	60	-	-	100	2.4
F	n	0	29	1	2	32	
	%	-	90.6	3.1	6.3	100	15.2
Total	n	2	32	1	2	37	
	%	5.4	86.5	2.7	5.4	100	17.6

Steelhead Length-Weight Relationships

Length and weight data was collected from as many adult steelhead as possible during the 1975 survey. In all ocean age groups, Kispiox male steelhead

were both longer and heavier than their female age-counterpart (Table 13). As expected, repeat spawners did not exhibit much growth following the initial spawning. The average weight of 27 females of age .2S1+ was 7 Kg (15.4 lb), range 3.6 kg (8 lb) - 10.4 kg (23 lb). This is only slightly larger than first-time female spawners of age .3+ which have, in fact, one less year of post-smolt growth. Three-ocean females averaged 6.9 kg (15.2 lb), range 3.6 kg (8 lb) -9.1 kg (20 lb). The two females of age .2S1S1+ were 8.2 kg (18 lb) and 10.9 kg (24 lb).

Table 13. Round weights and fork lengths of male and female steelhead of different ocean ages among anglers' catches from Kispiox River, fall, 1975. Repeat spawners are not included; numbers of fish for each age category vary because of incomplete information as to weight or length or both. (English measurements are given in parentheses.)

Sex	Ocean		Average				Range		Number
	Age		Weight - Kg.						
Male	.1+	2.6	(5.7 lb.)	1.6-	5.0	(3.5-11	lb.)	5	
	.2+	6.5	(14.3 lb.)	3.2-	12.3	(7 -27	lb.)	32	
	.3+	9.8	(21.6 lb.)	6.8-	12.5	(15 -27.5	lb.)	37	
	.4+	10.2	(22.4 lb.)	7.9-	12.5	(17 -27.5	lb.)	4	
Female	.1+	2.3	(5.1 lb.)	1.8-	2.7	(4 - 6	lb.)	3	
	.2+	5.1	(11.2 lb.)	3.2-	10.0	(7 -22	lb.)	56	
	.3+	6.9	(15.2 lb.)	3.6-	9.1	(8 -20	lb.)	12	
	.4+	10.0	(22.0 lb.)	3.6-	9.1	(8 -20	lb.)	1	
<u>Length - Cm</u>									
Male	.1+	61.3	(24 inches)	52.1-	71.1	(20.5-28	inches)	6	
	.2+	83.5	(33 inches)	58.4-	104.1	(23 -41	inches)	31	
	.3+	97.8	(38 inches)	83.8-	106.7	(33 -42	inches)	35	
	.4+	101.7	(40 inches)	99.1-	110.5	(39 -43.5	inches)	5	
Female	.1+	53.4	(21 inches)	48.3-	55.9	(19 - 22	inches)	3	
	.2+	78.9	(31 inches)	53.3-	99.1	(21 - 39	inches)	45	
	.3+	85.9	(34 inches)	78.8-	99.1	(31 - 39	inches)	13	
	.4+	99.1	(39 inches)	-	-	-	-	1	

Smolt Age-size Relationship

During the summer of 1976, 85 rainbow trout were collected from which lengths were recorded and scale samples taken. The linear regression of fork length on scale radius of these fish (which included two fish of age 6+) was $y = 14.93 + 3.68x$ and was used to estimate smolt lengths from measurements of freshwater radius of the adult steelhead scales collected in 1975 (Appendix 2).

The ages of the trout (juvenile steelhead) ranged from 1+ to 4+, and fork lengths ranged from 50 mm (2 inches) to 225 mm (10 inches) (Table 14). The two trout of age 6+ were 380 mm. Fish aged 1+ averaged 65 mm, 2+ fish averaged 108 mm, 3+ fish averaged 145 mm, and 4+ fish averaged 251 mm (2.6, 4.2, 5.7 and 9.9 inches respectively). Since the majority of Kispiox steelhead appear to

smolt in their fifth year (age 4+) (Tables 9 and 10), it was not unexpected that there would be a scarcity of age 4+ juveniles in the sample (Table 14).

Table 14. Age and size (fork length in mm) of a sample of juvenile rainbow trout from Kispiox River, summer, 1976.

Age	Sample Periods									Total Mean
	May-June			July - August			September			
	Mean	Range	n	Mean	Range	n	Mean	Range	n	
1	65	62- 69	9	65	50- 80	2				65
2	102	65-130	23	114	83-137	9	131	121-143	3	108
3	130	110-153	17	143	137-150	8	179	152-200	8	145
4				250		1	251	246-255	3	251
6				380		2				380

Back calculated average smolt lengths for twelve steelhead age groups ranged from 118 mm (4.6 inches) to 254 mm (10 inches) (Table 15). The average size of age 2+ juveniles sampled from the river was 108 mm but with a range in size of 65 to 143 mm. Since it is assumed that only the largest of age 2+ juveniles would smolt, the back calculated smolt lengths for age 2. adults (118 to 144 mm) seems to be representative (Table 15).

Table 15. Means and ranges of estimated fork lengths (mm) at time of formation of last freshwater annulus for Kispiox River steelhead trout sampled from anglers' catches, 1975, according to age and year-class (sexes combined; repeat spawners not included).

Year Class	Age-Group	n	Mean Length at Smolting (Range) mm	
1972	2.1+	1	118	
1971	2.2+	2	131	(118-144)
1971	3.1+	4	156	(147-169)
1970	3.2+	29	159	(125-180)
1969	3.3+	29	168	(144-192)
1970	4.1+	4	196	(162-217)
1969	4.2+	59	197	(162-247)
1968	4.3+	20	195	(162-236)
1967	4.4+	5	179	(169-199)
1966	4.5+	1	199	
1968	5.2+	3	248	(236-254)
1967	5.3+	2	235	(217-254)

Estimated smolt lengths for adults of age 3. ranged from 125 to 192 mm and averaged 163 mm. The age 3+ juveniles sampled from the river ranged from 110 to 200 mm and averaged 145 mm. Again, it is probable that only large age 3+

juveniles would smolt and the estimated smolt lengths are therefore comparable.

Age 4+ juveniles averaged 251 mm. However, since these fish were captured between mid-summer and fall, it could be assumed that these fish were larger than their age counterparts that smolted in the spring due to 1 - 2 months extra growth. Age 3+ juveniles captured in September, near the end of the growing season, ranged in size from 152 to 200 mm, and averaged 179 mm. If these fish were to smolt the following spring at age 4, they would be comparable in size to the estimated smolt lengths of age 4. steelhead, which ranged in size from 162 to 247 mm and averaged 195 mm.

Size at smolting did not vary in relation to length of adult ocean residency. In other words, steelhead of ages 4.1+, 4.2+ and 4.3+ had estimated smolt lengths of 196, 197 and 195 mm respectively (Table 15). Steelhead of age 4.4+ were, however, smaller as smolts (179 mm) than the above age-groups, and age 5.3+ smolts (235 mm) were smaller than age 5.2+ smolts (248 mm).

DISCUSSION

Although the results of the creel census reported herein were compared with data of the Steelhead Harvest Analysis it must be made clear that the survey was not designed for this purpose. Both methods depended upon voluntary submission of information by anglers and therefore both were open to problems inherent in any census program conducted on a voluntary basis, not the least of which was lack of response.

Despite publicity, signs, and the continual presence of a technician, it was evident that local anglers were not reporting all their activities. The repository, situated eight (road) miles upstream of the river mouth, was inconvenient for anglers entering the valley, fishing the lower river for a short time, and then leaving without having been contacted by the technician.

On the other hand, it is possible that the lack of response by local residents was balanced by a lack of response of a proportional number of non local residents--those "passers-through" who only fished for a brief period of time before moving on. The proximity of large camping and trailer grounds in nearby Hazelton would suggest a casual presence of potentially large numbers of anglers.

Finally, the feeling, or misunderstanding, of many anglers that lack of success in terms of actually catching a fish need not be reported was likely a factor in the overall response error.

The estimated total number of anglers ($450 \pm 10\%$) is considered to be much closer to the actual total than that presented by Steelhead Harvest Analysis (848). The estimate was based largely upon periodic counts by the technician, particularly in the area below the repository.

Regardless of the response error, the survey results indicate the attraction of the Kispiox steelhead fishery to the non-resident angler. In a recent angler opinion survey (Remington, et al. M.S. 1974) non-resident anglers reported that the primary reason for travelling to the Kispiox was the opportunity of catching a wild, trophy-class steelhead. In searching for large fish, anglers

also catch and release numerous smaller fish. Of 503 steelhead reported caught in 1975, 76 percent (389) were released. Largely as a result of the habits of the non-resident angler, the Kispiox steelhead fishery is both a "trophy" fishery and a "catch and release" fishery.

Both lure anglers and fly fishermen tend to adhere to the two basic "premises" of the Kispiox fishery, i.e. 1) female steelhead should not be killed, and 2) only trophy steelhead (large males) should be killed. In 1975, lure anglers killed only 28% of their total catch, fly fishermen killed less than 12%. Of females caught by lure, only 22% were killed; of fly caught females, only 9% were killed.

A lure angler on the Kispiox could probably expect to catch one steel-head for every five days angling, a fly fisherman, one steelhead for every six days.

Life histories were determined from scales taken from 209 angler caught steelhead. Eighteen age groups were identified. The large discrepancy between the 1975 age group total and that from a less intensive sampling program in 1974 (Whately and Imbleau, M.S. 1975) in which only seven age groups were found can be attributed to the fact that both released and killed fish were sampled in 1975, whereas in 1974 only retained fish were sampled. Since approximately three-quarters of all fish caught in the Kispiox are released, an adequate cross section of the population is not possible by sampling only dead fish. This is especially true when one considers the "philosophy" of Kispiox anglers, in which it is frowned upon to kill anything other than large (trophy) males and sometimes, small females.

Among Kispiox steelhead making their initial spawning run, 55.9 percent were of freshwater age 4. and 40 percent were age 3. Narver (1969) found that among Babine River summer steelhead, only 15 percent were age 4. (82% - age 3.). Leggett and Westover (1976) reported that Dean River steelhead were 74 and 70.8 percent age 3., for 1973 and 1974 respectively. Thirty-two percent of the Kispiox fish sampled had spent 3 winters in the ocean, males accounting for the greatest proportion (78.4%). Babine steelhead, on the other hand, were only 20.3 percent three-ocean fish (Narver, 1969) and Dean River steelhead 12 - 18 percent (Leggett and Westover, 1976).

Repeat spawners among the Kispiox steelhead sample totalled 37 fish, or 17.6 percent. The discrepancy between the above data and that reported by Whately and Imbleau (M.S. 1975) (repeat spawners in 1974 were only 3.6 percent of the sample) can again be explained by a broader sample base (released fish as well as killed fish) in 1975. The majority of repeat spawning steelhead are not within that category of sex and size (female, less than 20 pounds) that Kispiox anglers are likely to kill. The large percentage of repeat spawners suggests that the population is not being pressured too heavily considering that survival of summer steelhead beyond the initial spawn is not, as a rule, high (Withler, 1966 and Narver, 1969). However, Leggett and Westover (1976) reported that repeat spawners comprised 11 to 17.9 percent of samples from Dean River.

The large percentage (32.1) of 3 - ocean fish among the Kispiox steel-head population accounts for its reputation as a "trophy" fishery. The average weight of male steelhead of age .3+ was 9.8 kg (21.6 lb.) (Table 13).

The estimated average smolt lengths for Kispiox steelhead were:
age 2. - 127 mm (5 inches), age 3. - 163 mm (6.4 inches), age 4. - 195 mm

(7.7 inches), and age 5. - 241 mm (9.5 inches). Smolts of the most important age groups - 3.2+, 3.3+, 4.2+ and 4.3+ - had estimated mean lengths of 159, 168, 197, and 195 mm, respectively. Kispiox smolts of the 3.2+ and 3.3+ age groups are comparable in size to their age group counterparts in Dean River but are generally smaller than those in Babine River (Table 16). On the other hand, sizes of Kispiox and Babine smolts are comparable within the 4.2+ and '4.3+ age groups while Dean River smolt sizes are smaller.

Table 16. A comparison of estimated mean smolt lengths (mm) in four major age groups of summer steelhead from Kispiox, Babine, and Dean Rivers. Sample sizes in parentheses.

	3.2+	3.3+	4.2+	4.3+
Babine ^{1, 2}	189 (62)	194 (17)	210 (9)	200 (1)
Dean ³	153 (235)	166 (38)	161 (2)	-
Kispiox	159 (29)	168 (29)	197 (59)	195 (20)

¹Narver, 1969.
²Tow years' data.
³Hemus, M.S. 1973.

CONCLUSIONS

Results of the study indicate that the Kispiox steelhead fishery is not in immediate danger of serious decline. The high release frequency and the high incidence of repeat spawners in the population would suggest that the stock is not under undue angler pressure and over-harvest. Accordingly, regulation changes that would further curtail the number of kills would normally not be contemplated.

The situation is not, however, stable and pressures from both within the sport fishery and from outside may make additional regulations necessary. Among those pressures are: 1) the large and apparently growing numbers of fly fishermen on the river (25% of all anglers, 36% of total effort in 1975) who are requesting recognition of their sport in management plans, and 2) the presence of the large and concentrated commercial fishing industry in the Skeena estuary which is quite efficiently harvesting several thousands of upper Skeena steelhead (anglers have commented on a noticeable decline in numbers of early [September] steelhead).

Otherwise, maintenance of the Kispiox fishery must also depend on protection of habitat. Logging and its attendant road building in the upper watershed and land clearing for agriculture and housing in the lower, are beginning to affect soils stability and impair water quality. The capability of the river system for producing maximum numbers of steelhead smolts is probably declining. Considering the length of time required to produce a Kispiox smolt--3 to 4 years--stringent protection and maintenance of habitat is of paramount importance.

SUMMARY

1. During the months of September, October and November of 1975, a creel survey and catch sampling program was conducted on the Kispiox 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. The survey was based upon the voluntary return of census forms by anglers; the census was therefore not a total survey of all anglers.
2. The Kispiox angler population was found to be composed primarily of non-residents, of which non-Canadians (mainly Americans from Washington, Oregon and California) were by far the largest single group (54%).
3. The total number of anglers checked was 219 and the estimated total angler population was 450 ($\pm 10\%$). This is approximately one-half of an estimate of angler numbers (848) generated by the Steelhead Harvest Analysis.
4. The reported total number of angler days on the Kispiox was 2050 with an estimate of 4137 (S.H.A. - 1837 and 4396). The average number of angler days by local residents, B.C. residents, non-B.C. Canadians was 7, 4, 4 and 13 respectively. The percent of successful anglers in the above categories was 50, 30, 33 and 61 respectively.
5. The 219 anglers checked reported a total kill of 114 steelhead and a release of an additional 389 steelhead (76%). Estimated total kills and releases were 234 and 801 respectively. Catch per day averaged 0.245 for all anglers, and catch per angler averaged 2.3 fish. Data reported in S.H.A. were: estimated kill - 247, estimated releases - 887, catch/day - 0.297, catch angler - 1.8.
6. The fishery commenced during the last week in August and ended during the second week in November with a major peak during mid-October after a minor peak late in September.
7. The Kispiox sport fishery is confined to the lowest 40 miles of stream wherein most productive or fishable runs or pools are named. The most heavily fished and productive runs were the "Potato Patch" (Zone 1) and the "Cottonwood" (Zone 3). Lure and fly fishermen reported catching 17.8 and 18.7 percent of the total steelhead harvest in the above areas, respectively.
8. Seventy-five percent of the anglers checked were using lures, 25 percent used fly gear. Angler effort in terms of percent of total angler days, however, was 64% for lure anglers and 36% for fly anglers.
9. The overall sex ratio of steelhead in anglers' catches was 1:1.25 (male: female). Both types of anglers killed more male steelhead than females; lure anglers killed a greater percentage of both sexes than did fly anglers (lure kill - 36% male, 22% female; fly kill - 15% male, 9% female).
10. A broad sample of both released and killed fish from the 1975 anglers' catch provided life history data which included a total of eighteen age groups. The most frequently observed age groups were 4.2+ (30.3%), 3.2+ (14.9%), 3.3+ (14.9%), and 4.3+ (10.3%). The majority of Kispiox steelhead spent three (40%) and four (56%) years in freshwater prior to seaward migration.

11. Among Kispiox steelhead making their initial spawning run, 79 percent of the females and 41.4 percent of the males were of ocean age .2+. Forty-six percent of the males were of ocean age .3+ and 4.6 percent were age .4+.
12. Among the total scale sample of 209 steelhead, 37 or 17.6 percent were repeat spawners. Female repeat spawners outnumbered male repeat spawners by a ratio of 5:1. A 4.2S1S1+ female and an R.2S1S1+ female were the only fish in the sample that had spawned more than once prior to capture.
13. In all age groups (initial spawners) male steelhead were longer and heavier than female steelhead. Weights of males at ocean age .1+, .2+, .3+ and .4+ averaged 2.6, 6.5, 9.8, and 10.2 kg respectively. Females at similar ocean ages averaged 2.3, 5.1, 6.9 and 9.9 kg respectively.
14. The relationship of fork length to anterior scale radius of a sample of 85 rainbow trout (juvenile steelhead) was used to estimate lengths of Kispiox steelhead smolts. The average estimated lengths were 127 mm (5 inches), 163 mm (6.4 inches), 193 mm (7.7 inches), and 241 mm (9.5 inches) for age 2., 3., 4., and 5. fish respectively.

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FISH AND WILDLIFE BRANCH

Post Office Box 3250
Smithers, B.C.

KISPIOX RIVER STEELHEAD DATA SHEET - (1 per angler)

Dear Fellow-steelheader:

The B.C. Fish and Wildlife Branch is conducting a research project on the steelhead of Kispiox River. One of the major facets of the program - angler use and success - must come from you, the angler. Please assist us by "filling in the blanks" below, as best you can, at the end of your fishing trip. You may deposit completed forms with your guide, at steelhead camp offices, at the SPORTSMAN'S KISPIOX LODGE or the Fish and Wildlife Branch, Smithers, (Box 3250). Have a pleasant day, and we hope your trip was a success.

M.R. Whately
Regional Fisheries Biologist

Box 3250
Smithers, B.C. VOJ 2N0

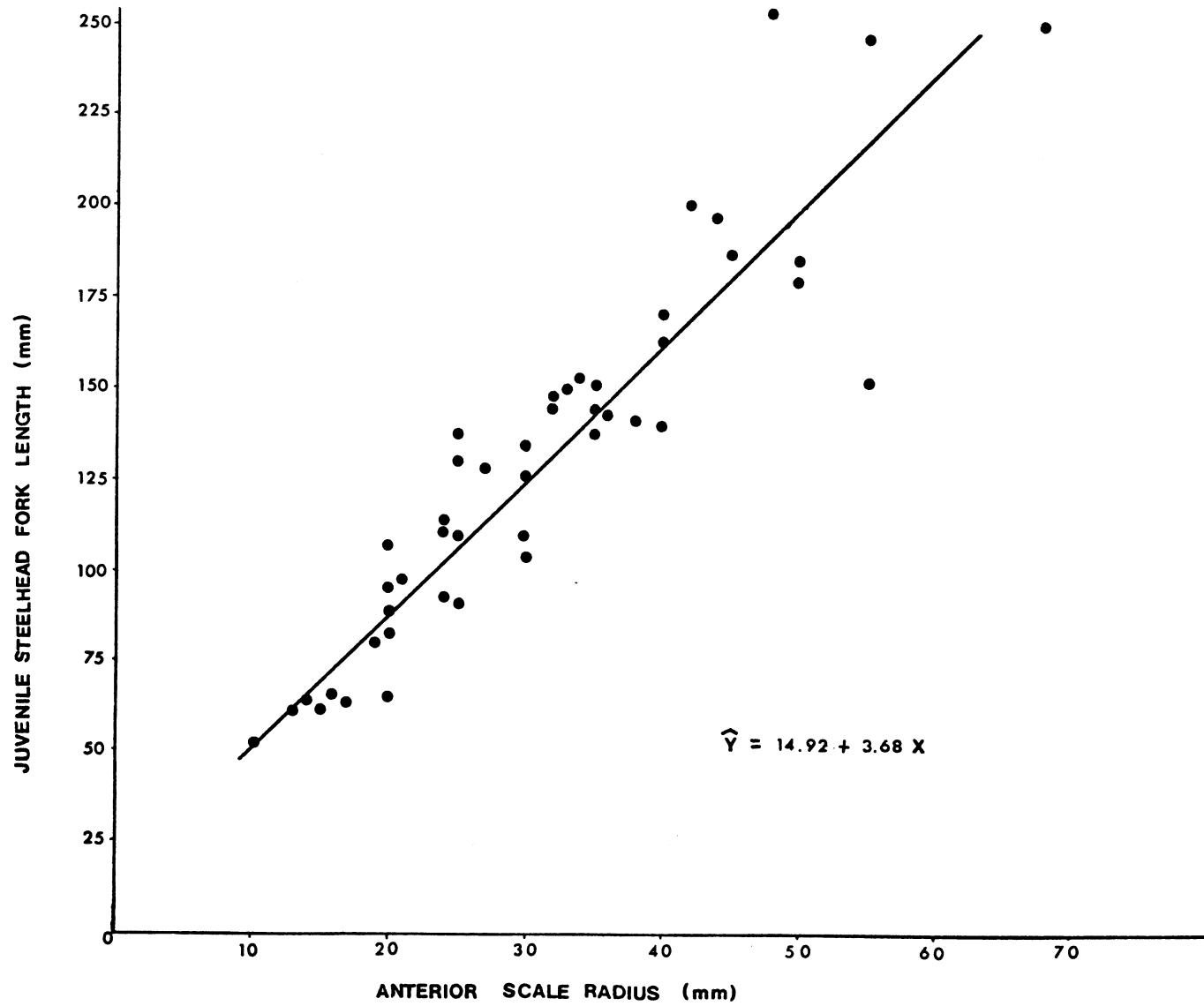
- 1) Residence _____
(City) (Province/State)
- 2) Were you guided? _____
(Yes) (No)
- 3) If "yes", by whom? _____
- 4) Name of Lodge or Camp _____
- 5) Steelhead catch information (use as much space as needed)

Dates	Location of Catch	Males		Females		Main Method of Capture	Tag #
		Killed	Released	Killed	Released		

6. Other species caught: _____

7. Comments _____

8. Total Number of Days Fished _____



Appendix 2. Relationship of scale radius and fork length of juvenile steelhead in the Kispiox River.