RADIO TELEMETRY INVESTIGATIONS OF STEELHEAD TAGGED IN THE LOWER BULKLEY RIVER, 1989.

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Abstract

Between September 11 and October 2, 1989, twenty three steelhead (Oncorhynchus mykiss) were radio tagged in the Bulkley River downstream from Moricetown Canyon. The objective was to assess the rate of migration through Moricetown Canyon. Tagged fish movements were monitored by stationary radio receiver stations until November 11, 1989, and by air from October 6, 1989 to May 24, 1990. Only five of 23 tagged fish migrated through Moricetown Canyon. Among these, migration rates ranged from 2.4 to 9.3 kilometres/day with a mean of 5.1 kilometres/day. Details of tagged steelhead behaviour are discussed.

Acknowledgements

Fisheries Branch staff R. Tetreau and J. Lough assisted in the capture, tagging and monitoring of steelhead movements. R. Hooton and C. Spence conceived and directed the study. All of the above reviewed and edited the manuscript.

Introduction

Historically, Native fishermen have trapped salmon and steelhead at the Moricetown Falls on the Bulkley River (Figure 1). Basket traps were hung under falls in the canyon to capture leaping fish that were unsuccessful in ascending these falls and dropped into the baskets. In 1931 and 1932, conflict over allocation of fish between families on the adjacent reserve led the Department of Fisheries and Oceans (DFO) to grant fishing privileges only to the head of each family. In an attempt to resolve this conflict fishermen were given gillnets and dipnets by the D.F.O.. In time, native fishermen discovered that some species of fish could be caught more readily through the use of gaffs which, to this day remain an integral part of the canyon fishery (T. Turnbull, D.F.O.

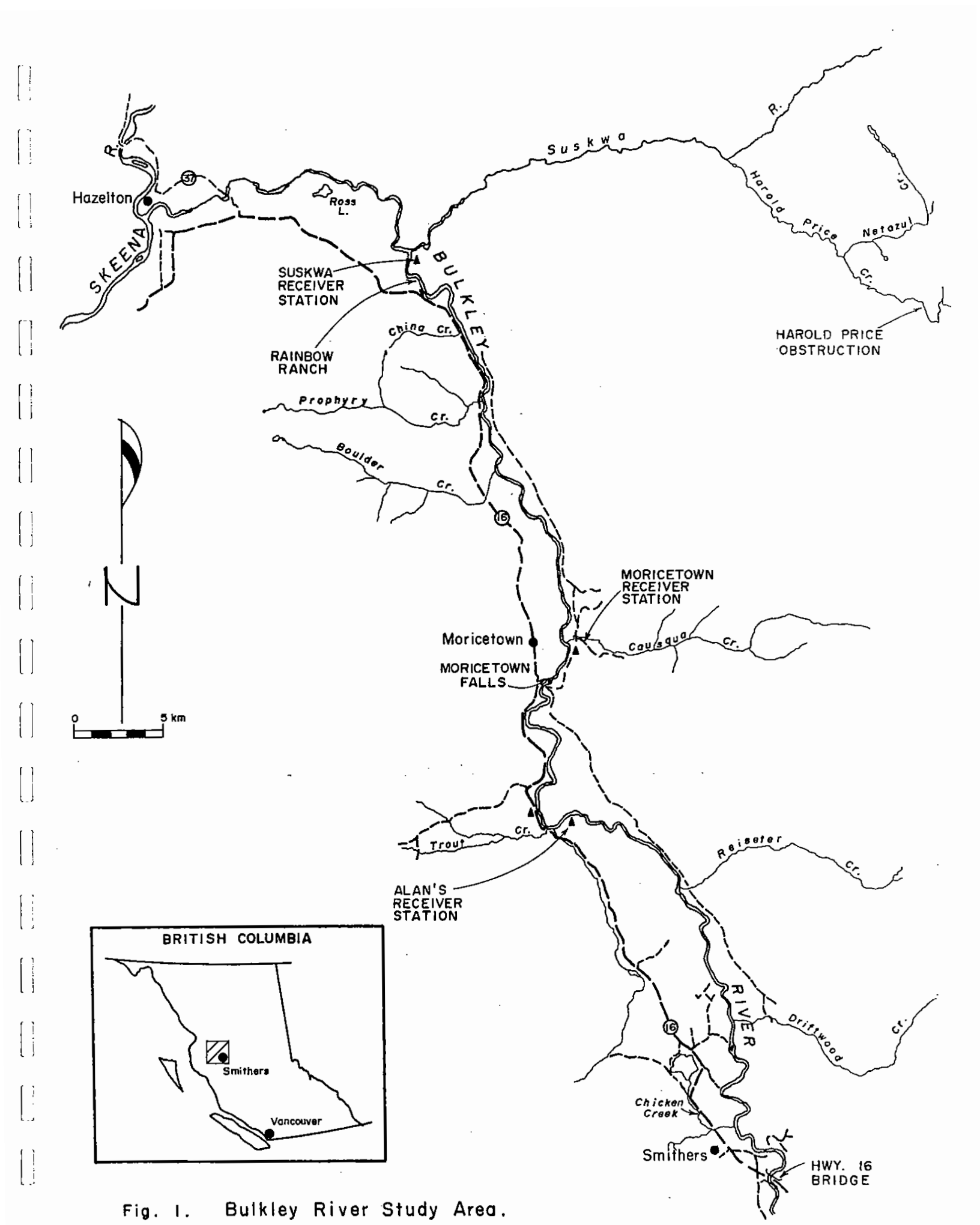

Fig. 1. Bulkley River Study Area.

Smithers, pers. comm.). Harvest rates of salmon and steelhead in this escalating fishery are unknown.

In the summer and fall of 1989, the Ministry of Environment conducted a radio telemetry study to investigate steelhead migration behaviour in the lower Bulkley River and to assess the vulnerability of steelhead to harvest in the Moricetown Falls fishery.

Study Area

The Bulkley system drains a total area of 12 173 kilometres^2 and flows 137 kilometres before entering the mainstem Skeena at Hazelton (55° 14'N; 127°41' W) (Figure 1). The major tributary to the Bulkley is Morice River which originates at Morice Lake, a natural basin at the headwaters of the 74 kilometre long river. The Morice flows in a general east-northeast direction to the Bulkley confluence near Houston.

Moricetown Canyon is located on the Bulkley River 41 kilometres upstream of the Bulkley River-Skeena River confluence. It consists of a constriction and a short series of cascades which drop approximately 6 metres over a 50 metre length. Mean monthly discharge at the falls ranges from a high in June of 473 cubic metres per second to a low in March of 22.6 cubic metres per second (Water Survey of Canada).

Materials and Methods

Wild summer steelhead were captured by project staff using conventional angling gear. Fish were tagged on the reach of the Bulkley River from 2 kilometres upstream of the Bulkley River-Suskwa River confluence to the Moricetown Canyon. Only those in good condition were tagged. A radio transmitter was inserted orally into the stomach with the aid of a hollow fibreglass tube (Hooton and Lirette, 1986). Two numbered anchor tags were placed at the base of the dorsal fin as additional identification. Sex, fork length and general condition were recorded for all fish tagged. No anaesthetic was used in the tagging process.

Radio transmitters (Lotek Engineering, Aurora, Ontario) were equipped with an external whip antenna which protruded from the fish's mouth. Transmitters were cylindrically shaped and varied in size according to fish size and battery size (life expectancy). Tag dimensions were 2.0 x 7.5 centimetres and 1.6 x 4.5 centimetres, corresponding to 5 and 7 month life expectancies respectively. Radio transmitters of different pulse rates were used (pulse repetition encoding) to allow more than one tag to transmit on a single frequency and still be individually distinguishable. Scanning efficiency was thereby increased due to the reduced number of frequencies scanned. Radio transmitter frequencies used ranged from 151.034 MHz to 151.533 MHz.

Transmitters were tracked by jet boat, fixed wing aircraft (Cessna 206) and stationary receivers. Four stationary receiver/data loggers were connected to single three or four element Yagi antennae and were placed along the Bulkley River. Two receivers were placed 9.5 and 12 kilometres upstream of the Moricetown Falls, and a third 3.5 kilometres downstream. A fourth receiver was deployed at the lower end of the study area (at the Bulkley River-Suskwa River confluence), 31 kilometres below the falls. Telemetry equipment and migration monitoring has been described previously (Spence 1989).

Stationary receivers were in operation from September 8, 1989 to November 11, 1989. Eight individual flights were conducted between October 6, 1989 and May 24, 1990. In addition, a single jet-boat tracking run occurred November 9, 1990.

Average migration rates were calculated by dividing the distance travelled by the elapsed time between detections.

Results and Discussion

Between September 11, 1989 and October 2, 1989 twenty three steelhead were radio tagged. Twenty two steelhead were tagged within the 5 kilometre stretch of Bulkley River upstream of the Suskwa-Bulkley junction. A single fish was tagged approximately 30 kilometres upstream of the junction (Table 1).

TABLE 1 Tagging date, description and fate of radio tagged adult steelhead caught in the Bulkley River, Autumn, 1989.

Tagging Date	Transmitter			Sex	Length	Tagging Location	Location and date of last detection
	Tag #	Frequency	Type				
Sept. 11	190	151.294	triple	F	71	Causqua Cr.	3 km d/s Moricetown Falls - Nov. 28
Sept. 14	203	.034	single	F	78	Rainbow Ranch Area	passed Suskwa station and lost - Sept. 19
Sept. 18	191	.314	triple	F	77	Rainbow Ranch Area	Suskwa-Bulkley confluence and lost - Mar. 29
Sept. 18	210	.174	single	F	79	Rainbow Ranch Area	d/s Suskwa-Bulkley confluence - May 24
Sept. 18	206	.094	single	F	73	Rainbow Ranch Area	5 km d/s Harold Price obstruction - May 24
Sept. 18	216	.294	single	M	81	Rainbow Ranch Area	2 km up Suskwa - May 16
Sept. 18	217	.314	single	F	89	Rainbow Ranch Area	Suskwa confluence - May 24
Sept. 18	218	.334	single	M	81	Rainbow Ranch Area	caught by angler at Bulkley Bridge, Smithers - Oct. 22
Sept. 18	219	.534	single	M	77	Rainbow Ranch Area	d/s Reiseter Cr. - Mar. 29
Sept. 20	220	.374	single	M	82	Rainbow Ranch Area	Rainbow Ranch area - May 24
Sept. 20	221	.394	single	M	97	Rainbow Ranch Area	d/s Driftwood Cr. - May 24
Sept. 20	222	.413	single	M	98	Rainbow Ranch Area	Netalzul Cr.-Harold Price Cr. confluence - May 24
Sept. 20	223	.434	single	M	90	Rainbow Ranch Area	2 km up Suskwa - May 24
Sept. 20	224	.455	single	F	86	China Cr.	d/s Boulder East Cr. - May 24
Sept. 22	192	.334	triple	M	88	Rainbow Ranch Area	Lake Kathlyn Cr.-Bulkley River confluence - Nov. 28
Sept. 22	193	.533	triple	F	85	Rainbow Ranch Area	Suskwa-Bulkley confluence - May 16
Sept. 22	194	.374	triple	M	89	Rainbow Ranch Area	d/s Suskwa-Bulkley confluence - May 3
Sept. 28	195	.394	triple	F	77	Rainbow Ranch Area	u/s Suskwa-Bulkley confluence - Mar. 29
Sept. 28	196	.413	triple	F	90	Rainbow Ranch Area	0.5 km d/s Harold Price obstruction - May 24
Sept. 28	197	.434	triple	M	81	Rainbow Ranch Area	Suskwa-Bulkley confluence - Mar. 29
Sept. 28	225	.474	single	F	77	Rainbow Ranch Area	Rainbow Ranch area - May 24
Sept. 28	198	.455	triple	F	84	Rainbow Ranch Area	u/s Trout Cr. - Nov. 28
Oct. 2	199	.474	triple	M	80	Rainbow Ranch Area	Rainbow Ranch area - Oct. 6

Tagged fish ranged in length from 71 to 98 centimetres. The average length of all tagged fish was 83 centimetres. The length-frequency distribution of radio tagged steelhead is included in Appendix I. The sex ratio was 1.09:1, female to male (12♀, 11♂).

Of 23 fish radio tagged, seven were tracked to the Suskwa River junction. An additional five tagged fish actually ascended the Suskwa River; four of these fish migrated up the Suskwa to Harold Price Creek. Five fish were tracked to Bulkley tributary confluences: Reiseter, Trout, Driftwood, Chicken and Boulder East creeks. Four steelhead remained in the Bulkley mainstem at or near the point of tagging. A single tagged fish passed the Suskwa receiver station 5 days after initial capture and was never relocated. Finally, one steelhead was caught by an angler near the Highway 16 bridge crossing of the Bulkley in Smithers 25 days after the initial tagging. The transmitter was removed by the angler, but the same fish was angled for a third time 8 days later in the same general area.

Ten of 23 fish (43.5%) were located on the last telemetry flight May 24, 1990, approximately eight months after the initial capture. Only five (21.7%) had migrated upstream through Moricetown Canyon. Four of these fish were detected by stationary receivers. The fifth fish was detected upstream of the falls during a telemetry flight November 28, 1989. This fish most likely held below the

falls until after the stationary receivers were dismantled (November 11, 1989). The average migration rate for the five fish that ascended the falls was 5.1 kilometres/day (range 2.4 to 9.3 kilometres/day). Complete details of the dates that radio tagged steelhead were detected by stationary receivers are given in Appendix II. These rates were minimal because migration rates were calculated by dividing the maximum distance travelled by the total time elapsed between initial capture and detection at the uppermost location; migration rates may be misleading if tagged fish were stationary at some time along their migration route. Also, capture and tagging processes are known to affect behaviour (Burger et al. 1983, 1985; Cleugh and Russell 1980; Hooton and Lirette 1986; Monan and Liscom 1972; Pettit and Lindland 1979; Spence 1980).

Access difficulties for jet boat necessitated tagging the majority of fish nearer to the Suskwa River than Moricetown Falls. As a result few of the tagged steelhead were actually found to have migrated through the Moricetown Canyon while the remainder either utilized the Suskwa River watershed or smaller streams tributary to the Bulkley River.

None of the tagged steelhead were intercepted in the Moricetown Canyon Native fishery. This result is not surprising given the very limited sample size (n=23) of radio tagged fish and the small number of tagged steelhead that were actually found to have migrated through the canyon (n=5). Also, a survey conducted by the

Ministry of Environment (Beere, 1991) demonstrated that fishing effort at Moricetown diminished towards the beginning of September, prior to the time of deployment of the first radio transmitter, therefore minimizing the opportunity for recapture in the fishery.

At least twelve of twenty-three radio tagged steelhead migrated to the Bulkley River-Suskwa River junction or actually entered the Suskwa system. Suskwa River steelhead utilized the eight kilometres of the Bulkley River upstream of the Bulkley-Suskwa junction as overwintering habitat. This is consistent with the findings of Lough (1980) who found that four of six steelhead radio tagged at the Suskwa-Bulkley River confluence overwintered in the mainstem Bulkley River as far as 12 kilometres upstream of the confluence.

Conclusions and Recommendations

i- In order to better understand harvest rates through the Moricetown fishery steelhead should be radio tagged immediately downstream of the Moricetown canyon and tagging should occur in late July and early August. This would maximize the possibility of recapturing tagged steelhead and eliminate the problem of tagging Suskwa River steelhead that overwinter in the Bulkley mainstem and do not ascend Moricetown falls.

ii- Combining a Moricetown native creel survey with a radio telemetry project of a slightly larger magnitude (ie. radio tag more fish) could provide further information on the steelhead migration and catch at Moricetown.

iii- The catch and release regulation designed to protect Suskwa River steelhead should be altered to reflect the findings of this study: Suskwa River steelhead overwinter in the mainstem Bulkley River as far upstream as China Creek. At present the area from Bulkley Canyon Station to the Suskwa River forestry bridge is designated catch and release. This area should be extended upstream to the Bulkley-China Creek confluence if the desire is to protect the Suskwa River steelhead stock.

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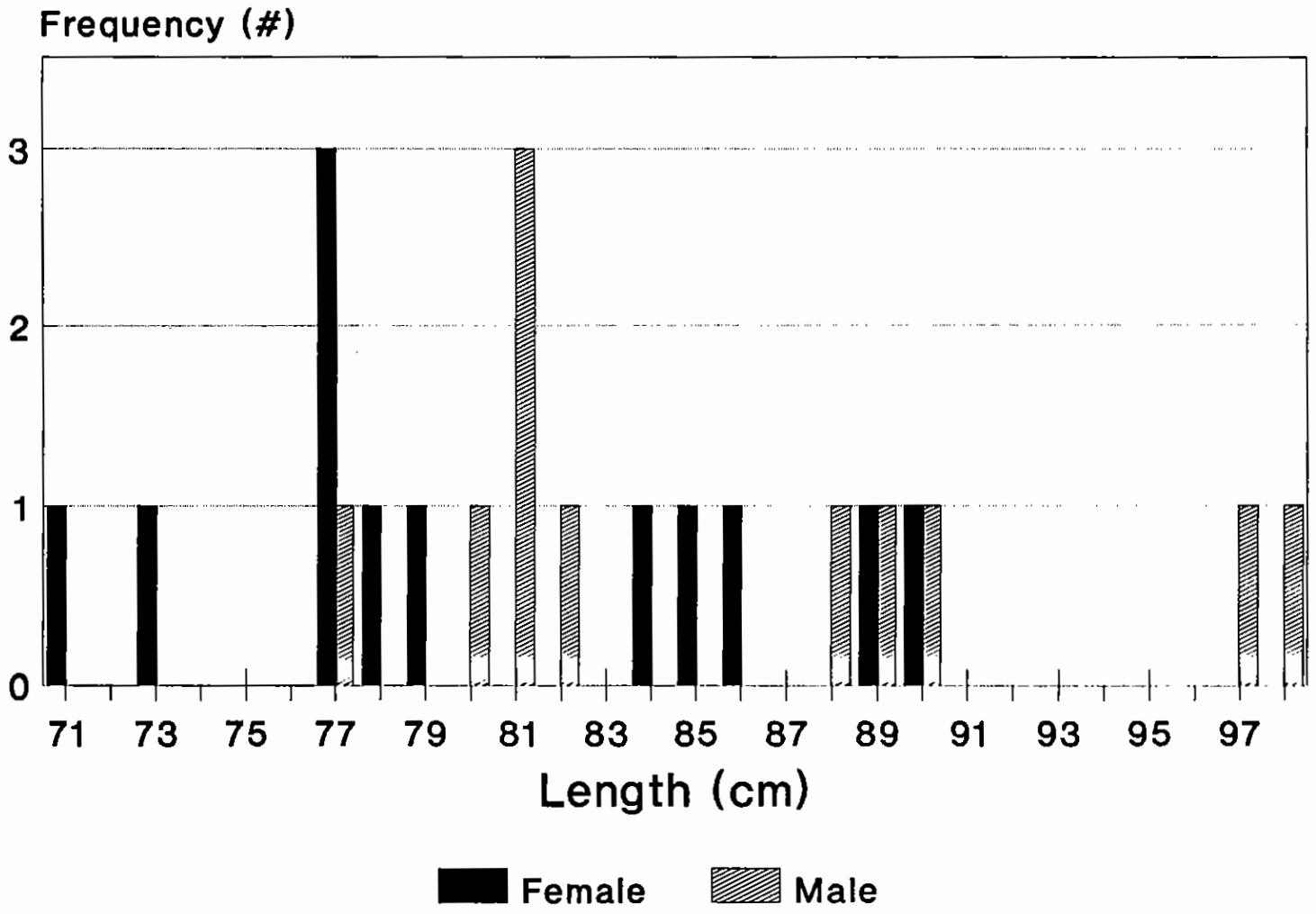
Appendix I. Length-frequency distribution of steelhead radio tagged on the Bulkley River, 1989.


Frequency (#)
3
2
1
0
71
73
75
77
79
81
83
85
87
89
91
93
95
97
Length (cm)
Female
Male

Appendix II. Dates that radio tagged steelhead caught in the Bulkley River, September 11 - October 2, 1989, were detected by stationary radio receivers positioned along the Bulkley River above and below Moricetown Canyon.

Date Tagged	Tag #	Suskwa Station 31 km d/s Moricetown Falls	Eric's Station 9.5 km u/s Moricetown Falls	Al's Station 12 km u/s Moricetown Falls
Sept 14	203	Sept. 19		
Sept 18	191	Sept. 18		
Sept 18	216	Sept. 18		
Sept 18	218		Oct. 4	Oct. 4
Sept 18	219		Sept. 26	Sept. 26
Sept 20	221		Sept. 24	Sept. 24
Sept 22	192		Oct. 1	Oct. 1
Sept 22	193	Sept. 22		
Sept 22	194	Oct. 1		
Sept 28	197	Oct. 1		
Sept 28	225	Oct. 1		