Yukon Marten Management

Progress to August, 1985

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Yukon
Renewable Resources

ABSTRACT

Marten is one of three top priority furbearer species for management effort in Yukon (besides lynx and wolverine). It is the second most important species in economic terms, the "bread and butter" of many traplines, and it is heavily in demand by trappers in general.

Management effort is being expended in four main areas:

1. Population status monitoring.
2. Harvest monitoring.
3. Providing trappers with "trapline management" information.
4. Population enhancement through re-introductions and trapping restrictions.

The specific components of the 1985/86 management program are

1. Population monitoring through winter track-counts and trapper questionnaire responses.

2. Fur harvest data analysis.

3. Completion of research on marten habitat selection in Yukon.

4. Marten re-introduction and trapping restrictions in the "Conservation Area" of southwest Yukon.

5. Trapline management education of trappers through brochures and presentations at trapper meetings.

All analyzed data from the management program are summarized.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (contd.).

LIST OF FIGURES

ACKNOWLEDGEMENTS

Numerous individuals have contributed to the collection of data presented in this report. Most notable are the efforts of Harvey Jessup and Ralph Archibald, who refined the fur harvest data system and designed the Evelyn Creek marten research. The technicians and contributors to the studies cited here are acknowledged in their respective project reports. We thank the Yukon trappers for their willingness to return their questionnaires and contribute, in many ways, to the management of marten. Pauline Erickson of Edmonton, Alberta analyzed the marten scats.

This is the first progress report of the marten transplant project, therefore we would like to acknowledge those individuals who shared in the project.

The success of the transplant is in a large measure the result of the cooperation of trappers, E. Johnson, E. Leach, D. Lange, C. Geddes, L. Heisz, M. Robson and D. Sumanik, who provided us with live martens and/or assisted us with our trapping efforts and in other ways. H. Jessup, H. Slama and R. Markel monitored marten movements on several occasions. Monitoring flights were piloted by B. Watson, W. Muff, H. Kitchen (Alkan Air Ltd.) and T. Hudgin (Hudgin Air Service Ltd.). Veterinarians Pat Smith and K. Kilpatrick performed the radio transmitter implantations. Mr. and Mrs. Neil Anderson looked after our equipment during trapping activities near Morley Lake. Catherine Kennedy supplied an overview of existing vegetation and potential marten habitat in the Marten Conservation Area. Dr. D.A. Gauthier assisted in the statistical analysis. The Conservation Officers of the Haines Junction, Whitehorse and Watson Lake district offices lent their support on many occasions during the work, particularly during the live trapping and release phases. The officers are to be credited also with keeping record of the accidental capture of marten by trappers, and for providing incidental track observations. Dan Drummond, who logs many miles of winter snowmobile travel is to be commended in this regard. T.C. Rodger drafted the figures while Elaine Gustafson, with the assistance of Grace Snider, typed the manuscript. Many other persons, too numerous to mention, contributed in some way or other to the project. We thank them all.

1. INTRODUCTION

Marten has been identified as a priority species for research and management effort in Yukon due to its pre-eminent contribution along with lynx, to the local fur harvest and trapping economy. Research was conducted between 1978 and 1982 in the Evelyn Creek area of the Nisutlin drainage to gain insight into the ecology of the marten for management purposes. Aspects of this work which have been written up are population dynamics of the marten (Archibald and Jessup 1984), winter ecology of the marten (Northern Biomes Ltd. 1983) and habitat preference of the northern red-backed vole, the major marten prey species (Beare 1984). Data on food habits are presented in this report. A detailed analysis of dynamics of recolonizing marten, marten habitat and aging and sexing techniques have yet to be completed. A preliminary marten management plan is in the works for 1985/86. Trapline management brochures will be produced for the information of trappers following completion of the research reports.

The distribution, abundance and harvest of marten has been monitored through a comprehensive program of collecting data from the annual fur harvest, trapper questionnaire and winter track-count surveys. These data are summarized here.

A region of the southwestern Yukon was identified from the above sources as supporting an unusually low marten population relative to that of the surrounding area. This region has been termed the "Marten Conservation Area" (MCA) and has been selected for a special management project where marten are being fostered to achieve carrying capacity populations. The project has a number of aspects in support of this objective. Initially, marten habitat was identified within the area to the best of our knowledge. Secondly, marten populations are being protected and enhanced through trapping restrictions and reintroductions. This report includes the background information leading to, and preliminary results of, the marten population enhancement project.

2. HISTORICAL FUR HARVEST

The degree of trapping effort by non-native trappers has traditionally been more variable than that of natives, as whites were more sensitive to market prices, while Indians trapped more for social or cultural reasons (Archibald, Klassen and McDonald 1977). In the past decade we have seen natives become influenced to a greater degree by market prices, although not to the extent that most non-natives are. Whites, therefore, still contribute to a majority of the harvest of "economic" species such as marten, especially when prices are high. Table 1 and Figure 1 show the marten harvest from 1919/20, when records were first tabulated for Statistics Canada reports, until 1983/84. The table also shows the value of the marten harvest relative to the total Yukon fur value, and the total Canadian marten harvest. The marten harvest has varied considerably, influenced primarily by market conditions and the proportion of white trappers. Natives presently hold 70% of the trapping concessions, while only 65% of the licenced trappers are natives, showing a greater interest in trapping by whites. In addition, up to 50% of the value of the fur harvest is taken by whites. Marten harvest peaks which were influenced by pelt prices occurred in 1919/20, 1939/40 through 1946/47 and 1977/78 to date.

Table 1 Yukon Marten Harvest, 1919/20-1983/84

Trapping Season	Harvest	Nominal Value	Total Value (Species)	Total Fur Value (Yukon)	Total Marten Harvest (Canada)
1919/20	4335	32.73	141,885	323,467	57,072
20/21	762	21.76	16,582	78,189	47,292
21/22	1786	20.30	36,256	203,402	58,989
22/23	964	22.64	21,815	199,522	45,579
23/24	1170	26.24	30,701	347,079	46,407
24/25	147	21.52	3,163	309,549	41,504
25/26	18	21.11	380	320,803	36,940
26/27	56	26.43	1,480	382,261	42,048
27/28	2222	31.70	70,437	610,348	38,058
28/29	2132	36.80	78,458	484,919	34,497
29/30	4272	18.78	80,228	295,492	27,396
30/31	2037	15.75	32,083	145,224	25,879
31/32	1976	11.50	22,724	132,268	21,925
32/33	2263	12.00	27,156	146,055	23,725
33/34	2154	10.64	22,919	122,999	17,660
34/35	2727	17.50	47,723	230,074	22,906
35/36	2890	17.50	50,575	276,946	24,586
36/37	1969	22.00	43,318	347,558	24,433
37/38	3471	21.67	75,217	295,857	23,851
38/39	2418	25.61	61,925	267,721	21,843
39/40	3887	26.54	103,161	288,292	22,023
40/41	3191	40.55	129,395	373,399	22,453
41/42	2586	42.48	109,853	398,132	20,242
42/43	1573	42.00	66,066	338,035	15,087
43/44	2024	53.00	107,272	467,188	19,565
44/45	2715	52.00	141,180	669,217	20,014
45/46	2581	48.00	123,888	677,495	19,831
46/47	2582	45.00	116,190	373,176	20,661
47/48	1433	32.00	45,856	230,117	15,090
48/49	1163	18.00	20,934	143,810	13,243
49/50	1439	22.15	31,874	199,086	14,428
50/51	2045	25.24	51,616	361,969	21,109
51/52	1703	20.00	34,060	173,252	16,976
52/53	-	-	-	-	16,574
53/54	858	8.00	6,864	182,238	14,981
54/55	-	-	-	-	17,710
55/56	949	10.00	9,490	155,777	16,641
56/57	247	6.00	1,482	108,873	13,381
57/58	455	12.00	5,460	118,607	16,575
58/59	-	-	-	-	18,047
59/60	908	10.00	9,080	158,232	29,226
60/61	920	9.00	8,280	105,031	39,009
61/62	1088	8.00	8,704	125,348	36,102
62/63	1190	10.18	12,114	87,625	37,432
63/64	2010	11.00	22,110	171,209	49,664

Table 1 continued

Trapping Season	Harvest	Nominal Value	Total Value (Species)	Total Fur Value (Yukon)	Total Marten Harvest (Canada)
1964/65	2962	11.09	32,849	172,936	40,948
65/66	438	12.67	5,549	64,929	43,890
66/67	1743	9.00	15,687	92,837	55,042
67/68	1334	9.41	12,553	87,585	43,152
68/69	2126	8.85	18,815	104,612	64,803
69/70	2234	9.56	21,357	70,673	58,521
70/71	420	13.95	5,859	41,727	52,312
71/72	1012	18.00	18,216	136,007	56,231
72/73	1370	22.00	30,140	339,437	61,109
73/74	1765	14.51	25,610	499,001	62,356
74/75	1354	22.62	30,627	403,543	47,598
75/76	1263	28.17	35,579	367,677	53,108
76/77	2892	20.59	59,546	430,104	102,628
77/78	4509	24.80	111,823	420,009	115,905
78/79	5727	35.70	201,062	934,508	139,123
79/80	6496	36.20	235,155	917,657	176,343
80/81	4829	37.69	232,472	1,318,875	151,710
81/82	4945	44.67	220,893	1,617,782	161,052
82/83	4093	51.25	217,146	1,178,518	139,638
83/84	3036	60.66	184,164	737,103	154,515

Date Sources: 1919-20 through 1975-76, Affidavits
1976-77 to present, export permits/dealer returns.
Yukon data not available for the seasons 1952/53, 1954/55 and 1958/59.
Known errors have been corrected in 1978/79 to 1983/84 harvest figures.

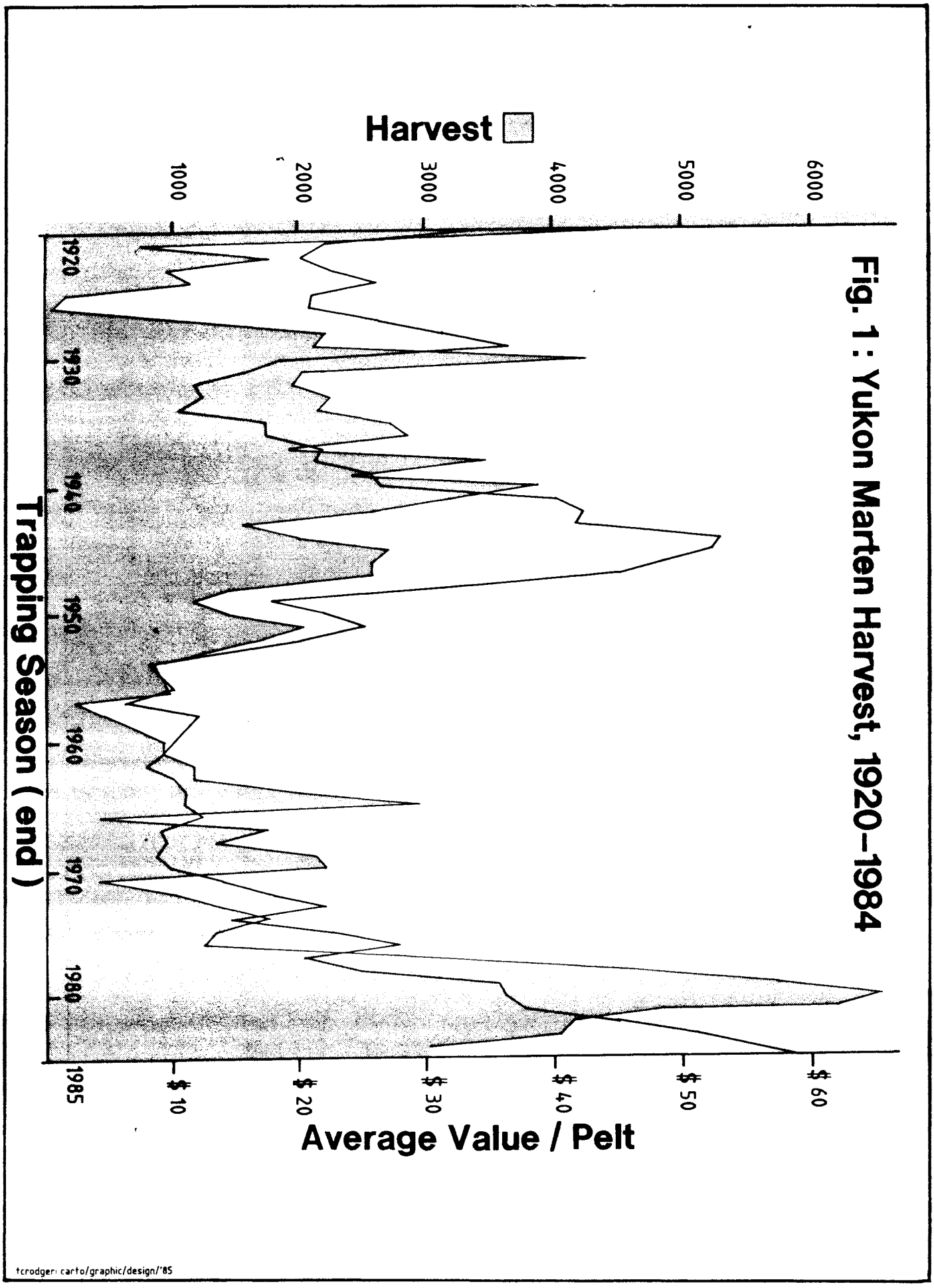

Fig. 1 : Yukon Marten Harvest, 1920–1984

In 1919/20 40% of the value of the Yukon fur harvest was attributed to marten. In the early 40's marten contributed about 35% of the harvest and since 1977/78 12% to 27%. Their contribution is proportionally lower when the lynx harvest is higher. In the interim years the marten was not as signficant. Fluctuating with market conditions, it only contributed 5-25% of the total fur value.

Prior to 1952/53 the Yukon trappers regularly harvested 10% of all marten harvested in Canada (and sometimes as much as 18%). Since that time the Canadian marten harvest has increased as much as ten fold, while the Yukon harvest remained stable (until recently). It is now less than 5% of the Canadian total.

Table 2 shows the completeness of our computerized fur harvest statistics. Initiated in 1950/51 when traplines were first registered, trapline statistics were recorded from affidavits (on the backs of General Hunting Licences). Total statistics were compiled from royalties. The proportion of the total marten harvest accountable by trapline was very low until 1972/73. The present system using fur export permits and dealer returns came on-line in 1976/77 and within two years the vast majority of the fur harvest was accountable by trapping concessions. These concessions now represent viable management units, particularly for area-specific data analyses of harvest and population indices (trapper questionnaire). There are currently 390 management units (375 concessions, five group areas and ten radius areas) 70% of which are active annually (Table 2). Of the active concessions, 61% show a marten harvest (43% of all concessions).

In the marten conservation area (M.C.A.) (Figure 2), 18% of the management units produce 4% of the Territories' marten harvest (Table 3) (146 out of 38,370 pelts over ten seasons). Over the past ten seasons, 71 out of 472, or 15% of trapline/years produced a marten harvest in the M.C.A., and in the remainder of Yukon, 1264 out of 1803, or 70% of trapline/years produced marten.

3. TRAPPER QUESTIONNAIRE

Population indices calculated from trapper questionnaire responses are presented in Table 4. The G-statistic was used to compare the distribution of responses over categories between years and between areas (i.e. - Yukon vs. M.C.A.) for the same year. The G test is a log-likelihood ratio goodness of fit test.

The 1984 marten population level has significantly declined from the 1981 and 1982 levels. The trend index is lower than those of the three previous years, and indicates a declining population. The marten harvest (Table 1) has shown a similar decline. Although 1984/85 data is not yet available, indications are that the harvest has recovered to former levels.

The data for the M.C.A. (quota = 0) and "quota = 10" areas were combined for analysis. The combined "quota area" has signficantly lower population level indices than the total Yukon. The majority of trappers in this area have reported marten to be scarce. The trend indices for the quota area show no differences between years or in comparison with the total Yukon.

Table 2 Marten Harvest Accountable by Trapping Concession, 1950/51-1983/84

Trapping Season	Harvest	Marten Harvest Acc'tble. by TL	Traplines With Marten Harvest	Traplines with Returns and no Marten Harvest
50/51	2045	456	41	127
51/52	1703	255	24	120
52/53	--	106	20	142
53/54	858	134	18	129
54/55	--	0	0	6
55/56	949	0	0	0
56/57	247	0	0	0
57/58	455	0	0	2
58/59	--	0	0	3
59/60	908	26	1	0
60/61	920	0	0	0
61/62	1088	0	0	0
62/63	1190	0	0	0
63/64	2010	752	39	119
64/65	2962	174	24	132
65/66	438	82	19	102
66/67	1743	0	0	2
67/68	1334	0	0	2
68/69	2126	43	6	11
69/70	2234	28	2	3
70/71	420	198	16	38
71/72	1012	290	16	74
72/73	1370	1184	71	98
73/74	1765	1598	89	103
74/75	1354	888	64	85
75/76	1263	1108	79	88
76/77	2892	1635	77	56
77/78	4509	3803	131	88
78/79	5727	5674	179	109
79/80	6496	5892	172	84
80/81	4829	4709	141	115
81/82	4151	4144	160	116
82/83	4093	4007	186	98

Table 3 Marten Harvest Accountable by Trapping Concession

Marten Conservation Area, 1974/75 - 1983/84.

	MARTEN HARVEST		NO. TRAPPING CONCESSIONS*			
Trapping Season	Yukon, excluding MCA (Quota Area)	MCA	With Marten Harvest	With Returns and no Marten Harvest	With No Returns	Total
1974/75	1353 (0)	1	1	28	40	69
1975/76	1263 (9)	0	0	37	32	69
1976/77	2886 (4)	6	4	23	42	69
1977/78	4492 (32)	17	12	38	19	69
1978/79	5721 (33)	26	10	43	16	69
1979/80	6472 (93)	24	10	45	14	69
1980/81	4819 (77)	10	4	52	13	69
1981/82	4135 (83)	16	7	51	11	69
1982/83	4064 (74)	28	13	47	9	69
1983/84	3019 (24)	17	10	37	22	69
1984/85		(14)	(6)			
TOTALS:	38,224 (429)	145				

* Total No. of trapping concessions 375, plus five group areas, ten radius areas.

M.C.A. includes five radius areas and 64 concessions.

Quota = ten in 17 concessions.

1984/85 data, not included in totals, is compiled from sundry permits issued for the possession of marten harvested in the M.C.A. where there was no open season.

Other data for M.C.A. (zero quota):

Season	Concession	Harvest
1952/53	277	6
1963/64	296	1
1973/74	308	2

The following computer records were excluded from the tables, as they are exceptionally high and cannot be verified from original documents. They are assumed to be errors.

Season	Concession	Harvest
1979/80	265	21
1980/81	279	14

Table 4 Marten Population Indices from Trapper Questionnaire

a) Yukon

Population Level

Year	Abundant	Common	Scarce	Not Present	Total Responses	Index
1981	32	58	25	40	135	49.63
1982	65	85	52	42	244	48.36
1983	49	103	80	52	284	40.53
1984	34	90	71	43	238	38.61

The 1984 index is significantly lower than the 1981 and 1982 indices. The 1983 index is significantly lower than the 1982 index. (G - statistic, = 0.05).

Population Trend

Year	Increased	Stable	Decreased	Total Responses	Index
1981	19	61	17	97	2.06
1982	30	105	26	161	2.48
1983	30	107	42	179	-6.70
1984	23	80	63	166	-24.10

The 1984 index is significantly lower than the 1981, 1982 and 1983 indices. (G - statistic, = 0.05).

cont'd. ...

Table 4 cont'd.

b) Quota Area (Zero and 10 Quota Trapping Concessions)

Population Level

Year	Abundant	Common	Scarce	Not Present	Total Responses	Index*
1981	0	2	5	12	19	n.c.
1982	4	3	18	29	54	14.20
1983	1	5	37	36	79	9.99
1984	1	6	29	30	66	9.93

No significant differences for indices between years (G - statistic, = 0.05)

Population Trend

Year	Increased	Stable	Decreased	Total Responses	Index*
1981	1	4	0	5	n.c.
1982	3	12	4	19	-5.26
1983	6	8	9	23	-13.04
1984	6	11	9	26	-11.54

No significant differences for indices between years (G - statistic, α = 0.05)

* All quota area population level indices are significantly lower than Yukon indices for the same year.

All quota area population trend indices are not significantly different from Yukon indices for the same year.

n.c. = not calculated due to insufficient number of responses.

Index values are calculated from weighted averages as follows:

Population Level	Weight (Ri)	Index
Abundant	9	100
Common	5	55.55....
Scarce	1	11.11....
Not Present	0	0
Not Known	Not included	-

Index = $(\sum_{i=1}^{i=n} Ri)/9n \times 100\%$, where n = number of valid responses.

Population Trend	Weight (Ri)	Index
Increased	1	100
Stable	0	0
Decreased	-1	-100
Not Present	Not included	-
Not Known	Not included	-

Index = $(\sum_{i=1}^{i=n} Ri)/n \times 100\%$

4. TRACK-COUNT SURVEYS

Winter track-count surveys have been conducted by the Department of Renewable Resources in various study areas since 1982 (Figure 3). Track-counts are used to describe furbearer distribution, abundance and population trends. They provide an index of relative abundance which is comparable between geographic areas, habitat types and sample dates. The results are summarized in Table 5.

The highest reported track count for marten (0.820 tracks/km day) was measured in the Coal River area in 1984. The densities in the Liard Basin in 1979 and the Evelyn Creek area in 1980-81 were 0.79 (Penner 1979) and 0.80 (Northern Biomes Ltd. 1983) respectively. The actual marten density in the Evelyn Creek area was 0.4 to 0.6/km^2 (Archibald and Jessup 1984). The Evelyn Creek study is interesting in that it provides the only track density estimate for marten over time in a specific area. The mean monthly track densities were 0.8 (Nov.), 0.3 (Dec.), 1.4 (Jan.), 1.0 (Feb.) and 0.6 (March) tracks/km day.

The Liard, Coal River and Evelyn Creek areas are known as outstanding marten producers. The North Canol is another region where marten are abundant (0.306 tracks/km-day in 1982, 0.182 tracks/km-day in 1983). Marten generally prefer mature coniferous forests, white or black spruce or alpine fir in Yukon, entering the edges of burns where small mammals are abundant. In the Coal River area the preference for the intermittent burn (4.638 tracks/km-day) is outstanding (Slough and Slama 1985)). Penner (1979) noted the highest track density in the mixed pine-spruce type (1.43 tracks/km-day). In the North Canol study area (Slough and Jessup 1984) marten preferred alpine fir cover although all coniferous types were utilized, as were willow thickets adjacent to forest cover. The low marten track densities in the Frenchman-Tatchun, Kluane, Southern Lakes and Ibex study areas reflect low marten populations. The Southern Lakes and Ibex areas are within the M.C.A., while the Frenchman-Tatchun and Kluane areas are on the periphery. The data are too few to characterize habitat preferences in the M.C.A.

5. PREVIOUS MARTEN RESEARCH IN YUKON

The following reports have resulted from the marten research conducted in the Evelyn Creek (Nisutlin) drainage near the South Canol road (km 42) between 1978 and 1982.

5.1 Population Dynamics

Archibald and Jessup (1984) studied the population dynamics of pine marten between 1978 and 1981. Their abstract has been quoted, in part, in the following discussion.

"Fall and spring densities for resident marten were .6 and .4/km^2, respectively. Male home ranges averaged 6.2 km^2; female home ranges averaged 4.7 km^2. Home ranges were exclusive within sexes. There appeared to be two periods of dispersal, one for young-of-the-year marten" (between mid-July and mid-September) "and one for overwintering marten" (probably in the early spring). "The conception rate for yearling marten

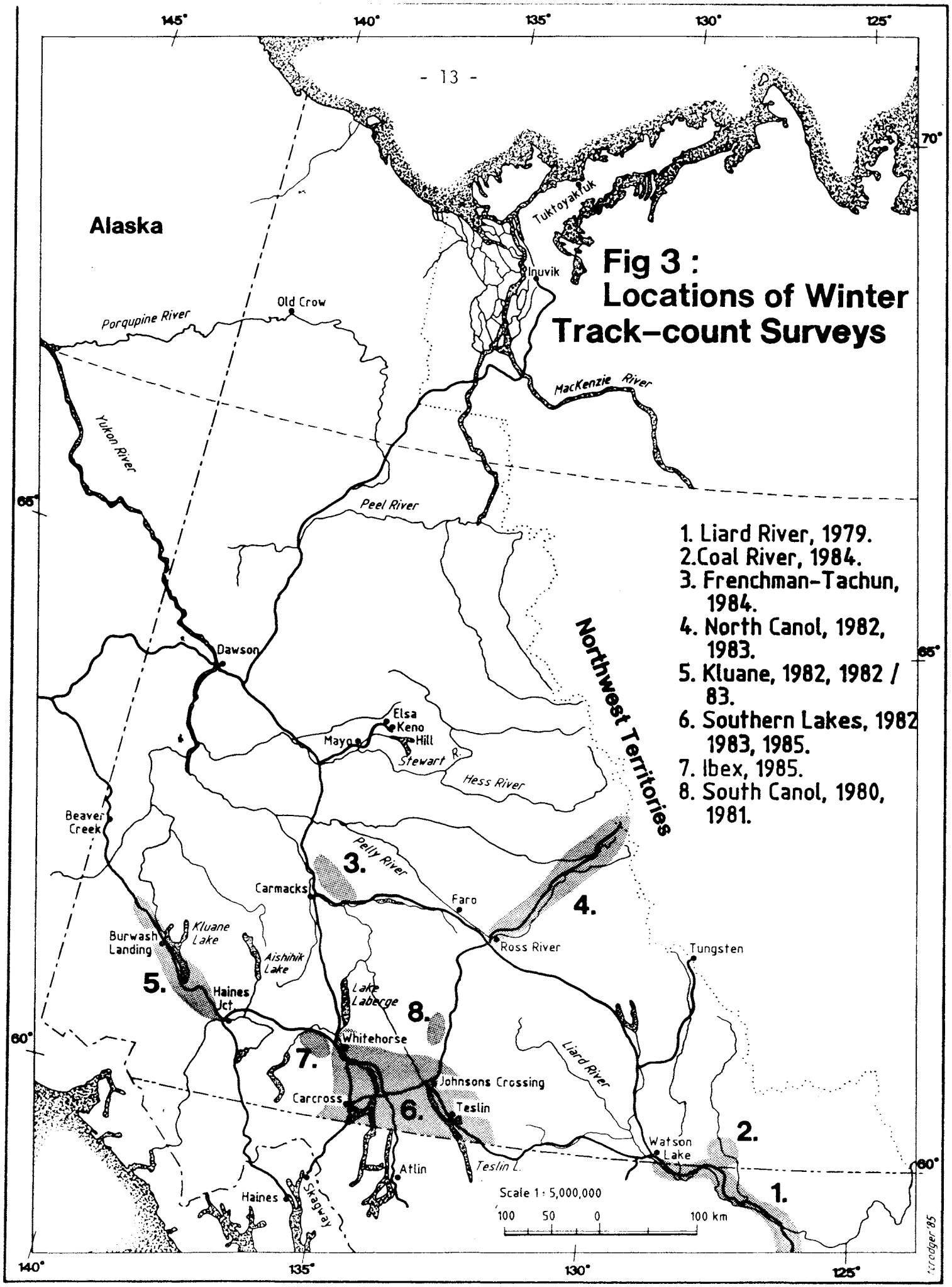
Alaska
Fig 3 :
Locations of Winter
Track-count Surveys
1. Liard River, 1979.
2.Coal River, 1984.
3. Frenchman-Tachun, 1984.
4. North Canol, 1982, 1983.
5. Kluane, 1982, 1982 / 83.
6. Southern Lakes, 1982 1983, 1985.
7. Ibex, 1985.
8. South Canol, 1980, 1981.
Northwest Territories
Inuvik
Tuktoyaktuk
Old Crow
Porqupine River
MacKenzie River
Yukon River
Peel River
Dawson
Elsa
Keno Hill
Mayo
Stewart R.
Hess River
Beaver Creek
Pelly River
Carmacks
Faro
Ross River
Tungsten
Burwash Landing
Kluane Lake
Aishihik Lake
Haines Jct.
Lake Laberge
Whitehorse
Johnsons Crossing
Carcross
Teslin
Liard River
Watson Lake
Teslin L.
Atlin
Haines
Skagway
Scale 1 : 5,000,000
100 50 0 100 km
70°
65°
60°
145°
140°
135°
130°
125°

Table 5

Marten Track-Counts

Study Area	Date	Sample Intensity (km-days)	Total Transect Distance	No. Tracks	Track Density (tracks/km-day)	Reference*
Liard River (B.C.-Yukon)	February-March 1979	471	141.7	453	0.79	1
Coal River (Yukon)	November-December 1984	187.9	152.8	154	0.820	2
Frenchman - Tachun	March 1984	2352.3	87.2	1	0.0004	3
Kluane	a) February-April 1982	606.9	239.2	0	0	4
	b) October '82-April '83	3517.8	490.2	8	0.002	4
North Canol	a) February-April 1982	856.5	232.2	262	0.306	4
	b) January-April 1983	1421.0	360.5	259	0.182	4
South Canol	November 1980-March 1981	242.5	?	194	0.8	5
Southern Lakes	a) February-April 1982	741.1	384.7	51	0.069	4
	b) January-April 1983	3104.7	545.3	162	0.052	4
	c) January-February 1985	718.9	?	2	0.003	6
Repeated transects (from a and c)	d) February-April 1982	130.5	?	11	0.084	6
	e) January-February 1985	487.3	?	2	0.004	6
Ibex	January 1985	513.5	?	0	0	6

*
1. Penner 1979
2. Slough and Slama 1985
3. Smits and Slough 1984
4. Slough and Jessup 1984
5. Northern Biomes Ltd. 1983
6. Slama 1985

(3.3) was significantly different from that of older marten (3.8). Population growth rates in a harvested population appear to be a function of trapping frequency and trapping intensity", which effect age and sex structure. When resident marten are removed from an area the void is filled by dispersing marten which are largely young of the year. The mean age of the population will therefore decrease. Inexhaustive trapping results in a sex ratio which favours males due to their larger home range (and hence greater trap vulnerability) than females, even though the sex ratio is equal.

Management strategies can be synthesized from this work. Trapping trails through a block of marten habitat should be no less than 10 km (three marten home ranges) apart to preserve a resident population of older, more productive individuals. The size of the harvest will be regulated by the productivity of the reservoirs. The harvest could be exhaustive as animals from the "reservoir" are not dispersing at this time and vacant habitat would be made available the following year to dispersing young-of-the-year. Overtrapping would be impossible even during natural population declines as long as reservoirs are not trapped to compensate for low harvests.

5.2 Winter Ecology

Catherine McEwen and W.G. Johnston reported on the winter ecology of marten in the Evelyn Creek study area over the winter of 1980/81 (Northern Biomes Ltd. 1983). The vegetation types (from Yukon Department of Renewable Resources, unpublished data) of their area are as follows:

1. Lodgepole Pine (Pinus contorta) with Alpine Fir (Abies lasiocarpa) and White Spruce (Picea glauca).
1a. Regenerating Lodgepole Pine with Balsam Poplar (Populus balsamifera) and occasional spruce.
2. Alpine Fir with occasional spruce.
3. Alpine Fir with White Spruce.
4. White and Black Spruce (Picea mariana) with Alpine Fir.
5. Open Black Spruce with White Spruce.
6. Willow (Salix spp.) and Alder (Alnus crispa) shrub.

Marten used all types in proportion to availability except Type 5 which was used less than expected. Type 4 was used primarily for hunting. Type 6 had the deepest snow, while the shallowest snow was recorded in Type 4. Mean winter snow depths were 75 to 82 cm, with the peak being in February (100 cm) and trough in November (28 cm). Snow depth did not appear to affect selection of vegetation types by marten in winter. Marten accessed the subnivean habitat passively employing branches, saplings and deadfalls protruding above the snow. Marten spent little time in trees.

The winter food habit results presented in the report have been revised to include some additional scats which have since been analyzed. The marten food habits are discussed subsequently in this report.

5.3 Small Mammal Populations

Beare (1984) studied small mammals on the Evelyn Creek marten study area in 1979, 1980 and 1981. The initial purpose of the study was to determine the relative abundance and diversity of prey species in each habitat type.

The objective was broadened to include a study of habitat preference by the most abundant small mammal and most significant food item of the marten, the red-backed vole (Clethrionomys rutilus). Beare's "habitat units" have been converted to Northern Biomes Ltd.'s(1983) vegetation types for simplicity in the following discussion.

The greatest abundance of C. rutilus was found in Types 2 and 3, and the least was recorded in Types 1 and 4, with Type 5 usually intermediate. Types 2 and 3 were the oldest and most mature (age greater than 170 years) and contained a large quantity of debris in the form of fallen logs, trees and branches. Very little debris occurs in Type 1 and varying amounts occurred in Types 4 and 5. Types 1 and 4 had the greatest abundance of overwintering berries while 2 and 3 had the least, although possibly enough to supply winter food to the small mammal population. Winter habitat selection by small mammals may differ from summer habitat which was measured by Beare. Types 2 and 3 offer greater protection from predation by providing cover. Snow cover at higher elevations (Type 2), may also provide an extended period of protection from predators. Types 2 and 3 also had more standing water, Type 1 the least. In terms of abundance, physical condition and productivity of the voles, Types 2 and 3 were ranked highest (2.1 and 2.0), (ranking of 1 is best), respectively, while Type 3 and 4 were ranked at 3.4, and Type 1 was ranked at 4.1.

Other trapping studies of small mammals in Yukon have been conducted in the Kluane National Park area. Olson (1968) classified dominant species as follows:

Alpine and Subalpine	Microtus oeconomus, Clethrionomys rutilus
Dense spruce forest	C. rutilus
Open spruce forest	Peromyscus maniculatus, C. rutilus
Aspen forest	P. maniculatus

Krebs and Wingate (1974) found similar results (no./100 trap nights in parentheses):

Alpine tundra	C. rutilus (0.6), M. oeconomus (0.5)
Closed spruce forest	P. manicalatus (23.3), C. rutilus (7.5)
Spruce-willow forest	C. rutilus (4.0)
Balsam poplar forest	Phenacomys intermedius (1.0), P. maniculatus (0.5
Dry willow community	P. maniculatus (2.5), C. rutilus (1.4)
Marsh	M. pennsylanicus (1.9), M. oeconomus (1.7)
Beach ridges	P. maniculatus (11.7)

The major differences between results from the Kluane and Evelyn Creek areas are the absence of Peromyscus and high density of Clethrionomys at Evelyn Creek. Buskirk and MacDonald (1984) found a similar species composition and dominance by Clethrionomys in south-central Alaska, where marten are abundant.

5.4 Food Habits

Methods

Marten scats were collected on the Evelyn Creek marten study area concurrent with live-trapping and snow-tracking studies during the summers

of 1979 through 1981 and the winter of 1980/81. A sample of 597 scats was analyzed.

Scats were cleaned with methyl salicylate and sorted into gross categories (hairs, bones, feathers, vegetation etc.). Guard hairs were placed on a thermo plastic film which was in turn placed on a slide. Another slide was placed over the film, and the "sandwich" was heated in a microscope oven at 120°C for 15-20 minutes. The top slide and the hair were removed, exposing the scale pattern of the hair.

Prey items were identified; using medully hair structures, to the most specific taxon possible by comparing them to a reference collection of hairs, skulls, teeth and seeds, and keys (Moore, Spence and Dugnole 1974; Kennedy and Carbyn 1980). Hairs were also examined for length, continuity, width and general type after clearing in methyl salicylate. Birds, insects and fruits were identified by specialists at the University of Alberta.

Results

The scats were grouped into four seasons (three summers and one winter) totalling 15 collection months over a three year period. Detailed results (Tables 6-9) are summarized in Tables 10 and 11 and Figure 4. Cricetid rodents occurred in 76.4% of the 597 scats. Fruit occurred in 16.8%, snowshoe hare in 16.4% and birds in 10.7%. Sciurids, soricids, cervid carrion, unknown mammals and insects make up the remaining food items in lesser frequencies. The winter of 1980/81 was an anomilee since snowshoe hares were found in 42.2% of the scats, cricetids in only 59.5% and scuirids, soricids, insects and fruit were absent.

The following food groups are discussed in more detail:

Cricetids

Seven species of cricetids were identified in the prey remains. The northern red-backed vole (Clethrionomys rutilus) occurred in 72.3% of the scats, the brown lemming (Lemmus sibericus) in 14.7% and the meadow vole (Microtus pennsylvanicus) in 6.4%. The Northern bog lemming (Synaptomys borealis), long-tailed vole (M. longicaudus), heather vole (Phenacomys intermedius) and deer mouse (Peromyscus maniculatus) occurred infrequently. During Beare's (1984) study, no other cricetid species were trapped on the study area in 23,940 trap nights.

Sciurids

Six species of sciurid rodents occur in or near the study area: red squirrels (Tamiasciurus hudsonicus), arctic ground squirrels (Spermophilus parryii) , northern flying squirrels (Glaucomys sabrinus), hoary marmots (Marmota caligata), woodchucks (M. monax) and least chipmunks (Eutamias minimus). Only red squirrels and least chipmunks occurred in marten scats in low frequencies (five food items).

Soricids

Beare (1984) trapped dusky shrews (Sorex obscurus) and masked shrews

Table 6 Number of Occurrences and Percent Frequency of Occurrences of Food Items in 102 Marten Summer Scats, Evelyn Creek Study Area, June - August 1979

Month	June n=21		July n=29		August n=23[1]		Unknown n=29		Total n=102	
	#	% freq.	#	% freq.	#	% freq.	#	% freq.	#	% freq.
Clethrionomys rutilus	8	38.1	11	37.9	11	47.8	9	31.0	39	38.2
Lemmus sibericus	5	23.8	5	17.2	1	4.3	3	10.3	14	13.7
Microtus pennsylvanicus	1	4.8	1	3.4			1	3.4	3	2.9
Microtus longicaudus							1	3.4	1	1.0
Synaptomys borealis	1	4.8	1	3.4					2	2.0
Phenacomys intermedius									--	--
MICROTINAE, unknown	1	4.8	5	17.2	4	17.4	1	3.4	11	10.8
Peromyscus maniculatus									--	--
CRICETIDAE, unknown	2	9.5	2	6.9	1	4.3	3	10.3	8	7.8
Total Cricetids	18	85.7	25	86.2	17	73.9	18	62.1	78	76.5
Tamiasciurus hudsonicus	1	4.8							1	1.0
Eutamias minimus									--	--
Total Sciurids	1	4.8							1	1.0
SORICIDAE SPP.					1	4.3			1	1.0
Lepus americanus	1	4.8	2	6.9	1	4.3			4	3.9
CERVIDAE SPP.									--	--
Mammal, unknown	1	4.8	2	6.9	3	13.0	1	3.4	7	6.9
Tetronidae	2	9.5					1	3.4	3	2.9
Eggshell	1	4.8	1	3.4			1	3.4	3	2.9
Bird, unknown			2	6.9	2	8.7			4	3.9
Total Birds	3	14.3	3	10.3	2	8.7	2	6.9	10	9.8
Hymenoptera			1	3.4	5	21.7	3	10.3	9	8.8
Insect, unknown			1	3.4					1	1.0
Total Insects			2	6.9	5	21.7	3	10.3	10	9.8
Empetrum nigrum	1	4.8	1	3.4	8	34.8	11	37.9	21	20.6
Vaccinium uliginosum					1	4.3	1	3.4	2	2.0
Vaccinium vitis-idaea							2	6.9	2	2.0
Vaccinium Spp.									--	--
Rubus idaeus									--	--
Rubus Spp.									--	--
Ribes triste							1	3.4	1	1.0
Rosa acicularis					1	4.3			1	1.0
Fruit, unknown							2	6.9	2	2.0
Total Fruit	1	4.8	1	3.4	10	43.5	17	58.6	29	28.4

1. Includes four scats collected in September.

Table 7 Number of Occurrences and Percent Frequency of Occurrences of Food Items in 243 Marten Summer Scats, Evelyn Creek Study Area, May - August 1980

Month	May n=32		June n=96		July n=28		August n=31[1]		Unknown n=56		Total n=243	
	#	% freq.	#	% freq.	#	% freq.	#	% freq.	#	% freq.	#	% freq.
Clethrionomys rutilus	9	28.1	45	46.9	5	17.9	19	61.3	22	39.3	100	41.2
Lemmus sibericus	1	3.1	11	11.5	1	3.6	5	16.1	10	17.9	28	11.5
Microtus pennsylvanicus	1	3.1	7	7.3	2	7.1			1	1.8	11	4.5
Microtus longicaudus			1	1.0							1	0.4
Synaptomys borealis	1	3.1	3	3.1					3	5.4	7	2.9
Phenacomys intermedius	1	3.1	2	2.1	2	7.1			1	1.8	6	2.5
MICROTINAE, unknown	5	15.6	16	16.7	2	7.1	1	3.2	11	19.6	35	14.4
Peromyscus maniculatus			1	1.0	1	3.6			2	3.6	4	1.6
CRICETIDAE, unknown	2	6.3	2	2.1	3	10.7	2	6.5	3	5.4	12	4.9
Total Cricetids	20	62.5	88	91.7	16	57.1	27	87.1	53	94.6	204	84.0
Tamiasciurus hudsonicus			1	1.0					1	1.8	2	0.8
Eutamias minimus									1	1.8	1	0.4
Total Sciurids			1	1.0					2	3.6	3	1.2
SORICIDAE SPP.	1	3.1	5	5.2	2	7.1	1	3.2	3	5.4	12	4.9
Lepus americanus	10	31.3	10	10.4	4	14.3			5	8.9	29	11.9
CERVIDAE SPP.[2]			2	2.1							2	0.8
Mammal, unknown	2	6.3	3	3.1	3	10.7	3	9.7	2	3.6	13	5.3
Tetronidae			2[3]	2.1			1	3.2			3	1.2
Eggshell	4	12.5	6	6.2					1	1.8	11	4.5
Bird, unknown	1	3.1	2	2.1	3	10.7	1	3.2	4	7.1	11	4.5
Total Birds	5	15.6	10	10.4	3	10.7	2	6.5	5	8.9	25	10.3
Hymenoptera	1	3.1	1	1.0	1	3.6					3	1.2
Insect, unknown					3	10.7			1	1.8	4	1.6
Total Insects	1	3.1	1	1.0	4	14.3			1	1.8	7	2.9
Empetrum nigrum	10	31.3	27	28.1	5	17.9	4	12.9	7	12.5	53	21.8
Vaccinium uliginosum			2	2.1							2	0.8
Vaccinium vitis-idaea			1	1.0							1	0.4
Vaccinium Spp.							2	6.5			2	0.8
Rubus idaeus											--	--
Rubus Spp.							1	3.2			1	0.4
Ribes triste											--	--
Rosa acicularis											--	--
Fruit, unknown			1	1.0			1	3.2	2	3.6	4	1.6
Total Fruit	10	31.3	31	32.3	5	17.9	8	25.8	9	16.1	63	25.9

1. Includes one scat collected in September.
2. Calf moose.
3. One identifed as spruce grouse.

Table 8 Number of Occurrences and Percent Frequency of Occurrences of Food Items in 116 Marten Winter Scats, Evelyn Creek Study Area, November 1980 - March 1981

Month	November n=23		December n=12		January n=44		February n=16		March n=56		Total n=116	
	#	% freq.	#	% freq.	#	% freq.	#	% freq.	#	% freq.	#	% freq.
Clethrionomys rutilus	12	52.2	6	50.0	12	27.3	5	31.3	11	52.4	46	40.0
Lemmus sibericus	4	17.4	1	8.3			1	6.3			6	5.2
Microtus pennsylvanicus					1	2.3					1	0.9
Microtus longicaudus												
Synaptomys borealis									1	4.8	1	0.9
Phenacomys intermedius												
MICROTINAE, unknown	2	8.7	1	8.3	5	11.4			4	19.0	12	10.3
Peromyscus maniculatus												
CRICETIDAE, unknown			1	8.3	2	4.5					3	2.6
Total Cricetids	18	78.3	9	75.0	20	45.5	6	37.5	16	76.2	69	59.5
Tamiasciurus hudsonicus												--
Eutamias minimus												--
Total Sciurids												--
SORICIDAE SPP.												--
Lepus americanus	6	26.1	4	33.3	22	50.0	11	68.8	6	28.6	49	42.2
CERVIDAE SPP.[1]							1	6.3	1	4.8	2	1.7
Mammal, unknown	1	4.3	1	8.3	5	11.4	2	12.5	1	4.8	10	8.6
Tetronidae					2	4.5					2	1.7
Eggshell					1	2.3					1	0.9
Bird, unknown			1	8.3							1	0.9
Total Birds			1	8.3	3	6.8					4	3.4
Hymenoptera											--	--
Insect, unknown											--	--
Total Insects											--	--
Empetrum nigrum											--	--
Vaccinium uliginosum											--	--
Vaccinium vitis-idaea											--	--
Vaccinium Spp.											--	--
Rubus idaeus											--	--
Rubus Spp.											--	--
Ribes triste											--	--
Rosa acicularis											--	--
Fruit, unknown											--	--
Total Fruit											--	--

1. Probably moose.

Table 9 Number of Occurrences and Percent Frequency of Occurrences of Food Items in 136 Marten Summer Scats, Evelyn Creek Study Area, June - August 1981

Month	June n=62 [1]		July n=20		August n=51 [2]		Unknown n=3		Total n=136	
	#	% freq.	#	% freq.	#	% freq.	#	% freq.	#	% freq.
Clethrionomys rutilus	40	64.5	9	45.0	27	52.9			76	55.9
Lemmus sibericus	1	1.6			2	3.9	2	66.7	5	3.7
Microtus pennsylvanicus	2	3.2	3	15.0	3	5.9			8	5.9
Microtus longicaudus	1	1.6							1	0.7
Synaptomys borealis					1	2.0			1	0.7
Phenacomys intermedius									--	--
MICROTINAE, unknown	7	11.3	4	20.0	9	17.6			20	14.7
Peromyscus maniculatus									--	--
CRICETIDAE, unknown	2	3.2			1	2.0			3	2.2
Total Cricetids	53	85.5	16	80.0	43	84.3	2	66.7	114	83.8
Tamiasciurus hudsonicus	1	1.6							1	0.7
Eutamias minimus									--	--
Total Sciurids	1	1.6							1	0.7
SORICIDAE SPP.					1	2.0			1	0.7
Lepus americanus	13	21.0	1	5.0	2	3.9			16	11.8
CERVIDAE SPP.									--	--
Mammal, unknown			2	10.0	3	5.9	1	33.3	6	4.4
Tetronidae	1	1.6	1	5.0	3	5.9			5	3.7
Eggshell	6	9.7	1	5.0	1	2.0			9	6.6
Bird, unknown	3	4.8	3	15.0	6	11.8			12	8.8
Total Birds	10	16.1	5	25.0	10	19.6			25	18.4
Hymenoptera	2	3.2			7	13.7			9	6.6
Insect, unknown									--	--
Total Insects	2	3.2			7	13.7			9	6.6
Empetrum nigrum	4	6.5			2	3.9			6	4.4
Vaccinium uliginosum									--	--
Vaccinium vitis-idaea									--	--
Vaccinium Spp.									--	--
Rubus idaeus	1	1.6							1	0.7
Rubus Spp.									--	--
Ribes triste									--	--
Rosa acicularis									--	--
Fruit, unknown			1	5.0					1	0.7
Total Fruit	5	8.1	1	5.0	2	3.9			8	5.9

1. Includes six scats collected in May.
2. Includes two scats collected in September.

Table 10 Comparison of Percent Frequency Occurrence of Marten Food Groups Between the Evelyn Creek Study Area and Neighboring Jurisdictions

	Summer 1979	Summer 1980	Winter 1980/81	Summer 1981	Total	Southcentral Alaska[1]	Interior Alaska[2]	N.W.T.[3]
Cricetid	76.5	84.0	59.5	83.8	76.4	88.2	73	89
Sciurid	1.0	1.2	0	0.7	0.8	7.2	< 1	6
Soricid	1.0	4.9	0	0.7	2.3	1.7	0	~ 6
Snowshoe Hare	3.9	11.9	42.2	11.8	16.4	1.1	< 1	5
Cervid	0	0.8	1.7	0	0.7	2.7	< 1	0
Unknown Mammal	6.9	5.3	8.6	4.4	6.0	1.3	0	0
Bird	9.8	10.3	3.4	18.4	10.7	9.7	10	19
Insect	9.8	2.9	0	1.5	4.3	< 1.0	0	~ 14
Fruit	28.4	25.9	0	5.9	16.8	20.5	17	~ 23
Total Scats	102	243	116	136	597	467	466	499

1. From Buskirk 1983, 1980-81, combined seasons.
2. From Lensink, Skoog and Buckley 1955, June-August 1952-53.
3. From More, 1978, all seasons 1973-75.

Table 11 Marten Use of Cricetids by Season Based on Percent Frequency Occurrence of Food Items Identified to Species

	Summer 1979	Summer 1980	Winter 1980/81	Summer 1981	Total
C. rutilus	66.1	63.7	85.1	83.5	72.3
L. sibiricus	23.7	17.9	11.1	5.5	14.7
M. pennsylvanicus	5.1	7.0	1.9	8.8	6.4
M. longicandus	1.7	0.6	0	1.1	0.8
S. borealis	3.4	4.5	1.9	1.1	3.0
P. intermedius	0	3.8	0	0	1.7
P. maniculatus	0	2.5	0	0	1.1
TOTAL	100.0	100.0	100.0	100.0	100.0

Table 12 Relative Abundance of Cricetids Based on Proportion Captured During Snap-Trapping in Evelyn Creek Study Area (adapted from Beare 1984)

	Summer 1979	Summer 1980	Summer 1981
C. rutilus	87.0	91.1	79.1
L. sibiricus	3.0	1.8	4.2
M. pennsylvanicus	6.7	4.7	4.2
M. longicandus	0	0.3	2.1
S. borealis	0.7	0.9	4.2
P. intermedius	2.6	1.2	6.2
P. maniculatus	0	0	0
TOTAL	100.0	100.0	100.0

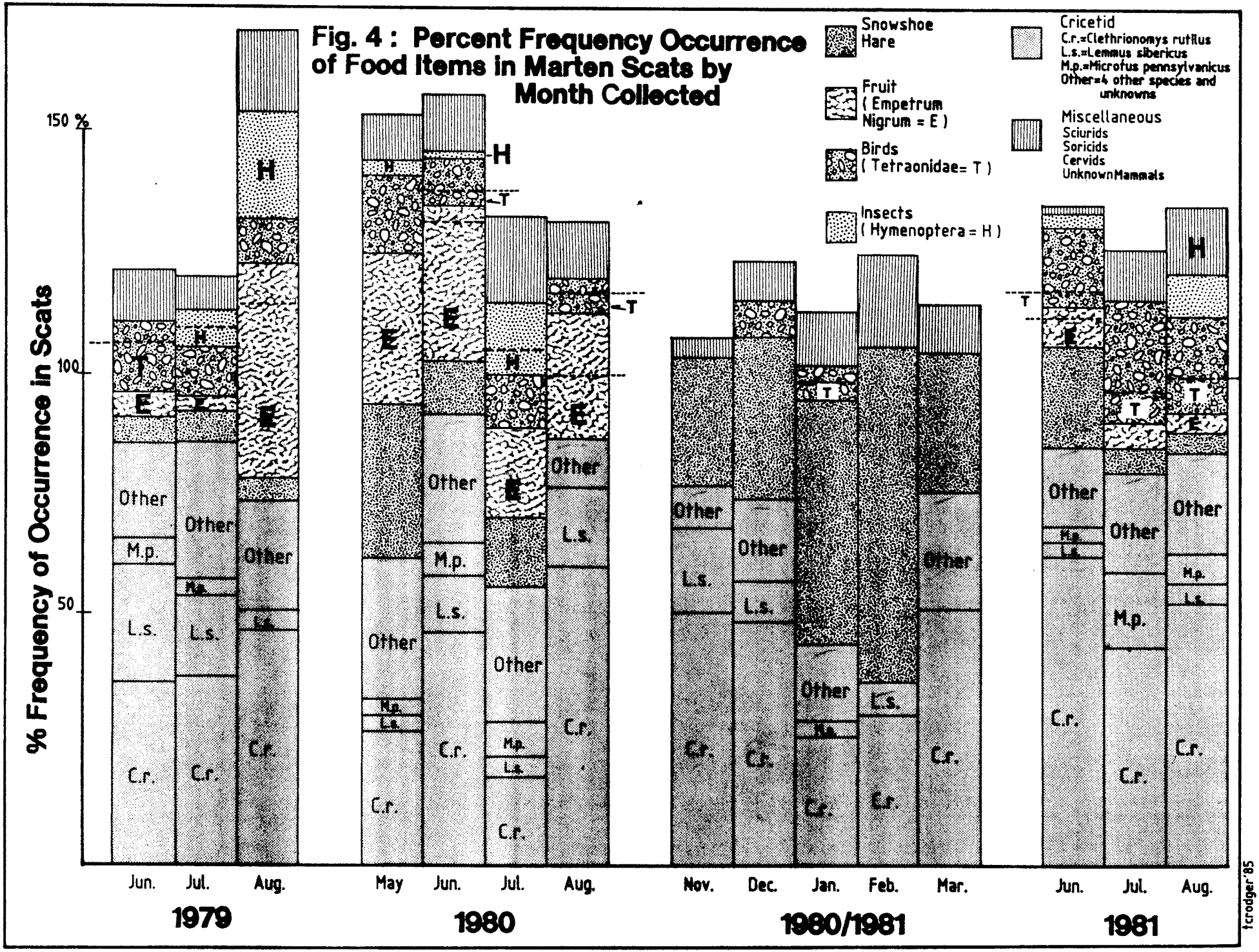
Fig. 4 : Percent Frequency Occurrence of Food Items in Marten Scats by Month Collected
% Frequency of Occurrence in Scats
150 %
100
50
Snowshoe Hare
Fruit (Empetrum Nigrum = E)
Birds (Tetraonidae= T)
Insects (Hymenoptera = H)
Cricetid
C.r.=Clethrionomys rutilus
L.s.=Lemmus sibericus
M.p.=Microtus pennsylvanicus
Other=4 other species and unknowns
Miscellaneous
Sciurids
Soricids
Cervids
UnknownMammals
Jun.
Jul.
Aug.
1979
May
Jun.
Jul.
Aug.
1980
Nov.
Dec.
Jan.
Feb.
Mar.
1980/1981
Jun.
Jul.
Aug.
1981
tcrodger'85

(Sorex cinereus) on the study area. The navigator shrew (S. palustris) and pygmy shrew (Microsorex hoyii) are also known to occur in the region. Sorex spp. were identified in 2.3% (14) of the scats.

Snowshoe Hare

Snowshoe hares increased in abundance throughout southern Yukon to an extended peak lasting from 1980/81 to 1981/82 (Slough 1984). Snowshoe hare carrion was available in early 1982 from starved animals; however, it is not known whether hares were taken as prey or carrion in 1980/81, when 42.2% of 116 marten scats contained snowshoe hare remains.

Birds

Birds were the fourth most important prey item, occurring in 10.7% of the scats. It is unfortunate that more complete results were not obtained from the analysis. Thirteen of 64 bird remains were Tetraonids, one of which was identified as a spruce grouse (Canachites canadensis). In addition 24 scats contained eggshell, and 28, unidentified feathers. Other tetraonids in the area might include ruffed grouse (Bonasa umbellus), blue grouse (Dendragapus obscurus), willow ptarmigan (Lagopus lagopus) and rock ptarmigan (Lagopus mutus). Spruce grouse are probably the most common (D. Mossop, pers. comm.).

Cervids

Local cervids include moose (Alces alces) and caribou (Rangifer tarandus). Cervid hair, from carrion, was found in four scats. They were identified as "probably moose" which, in two instances, were calves.

Insects

Insects occurred in 26 summer scats. Most were identified as Hymenopterans (wasps).

Fruit

Berries of several species occurred in 16.8% of the scats, making them the second most important food item overall. Empetrum nigrum, the crowberry, comprised 80% the fruit. Occurring in lesser quantities were Vaccinium spp., Rubus spp., Ribes triste, and Rosa acicularis.

Discussion

Marten are adaptable predators, able to subsist on a wide range of food items depending on their availability or vulnerability. Cricetids are the most important food of marten across North America, however the species involved may vary widely (see Buskirk 1983). Many researchers in the northwest have reported a preference for the red-backed vole, as has been demonstrated by this study (Table 10). The utilization of the red-backed vole compares closely with its availability (Table 11, 12), as does the selection of most cricetids. The brown lemming was taken more frequently than expected and the meadow vole less, however small numbers present in both scats and snap-trap samples make statistical comparison difficult. Deer mice are a low preference food (More 1978) regardless of availability.

Shrews are seldom taken relative to availability, either due to their low palatability, or to the lack of a strong smell emitted by their musk glands (Cowan and MacKay 1951, Newby 1951).

The red squirrel, often a major food item in the western continental states (Newby 1951, Marshall 1942), is seldom a dominant food in the north (Table 10).

Snowshoe hares have seldom been reported as a major food as they were, in this study, during the winter of 1980/81. Quick (1955) reported on 61 scats collected at a marten den during the winter of 1947/48. Hares occurred in 86.5% of the scats, and red-backed voles in 11.5%. Marten are quite capable of killing hares when they are abundant.

The other food types, insects, birds and fruits are taken during the seasons in which they are most abundant, generally during the summer. In the present study area, spruce grouse, wasps and crowberries were taken consistently. In the N.W.T., spruce grouse, passerines, bold-faced hornets, and the berries of 4 plant species, rose, raspberry, cranberry and common bearberry were minor food items (More 1978). In southcentral Alaska, rose, raspberry, crowberry, blueberries and low-bush cranberries were alternative species, along with spruce grouse (Buskirk and MacDonald 1984). In Washington, insects have been a major food in summer (Newby 1951)

5.5 Unreported Data

The Evelyn Creek marten research has not been completely reported to date. Data are on file, and are being analyzed, to complete these aspects of the work:

1. Marten aging technique using cementum annuli. We have information from several known age specimens (R.H. Jessup, in prep.).

2. Marten sexing technique using skull measurements (P. Merchant, in prep.)

3. Dynamics of marten recolonizing depleted areas (B.G. Slough, in prep.).

4. Habitat description, from a plot of individual marten home ranges on a vegetation/small mammal habitat map (B.G. Slough, in prep.).

6. MARTEN REINTRODUCTION PROJECT

6.1 Introduction

Marten are very scarce in a large portion of the southwestern Yukon Territory (the Marten Conservation Area, (M.C.A.), Figure 2), indicating a history of fires and overharvesting. Fur harvest, trapper questionnaire and winter track count data, previously discussed in this report, have been used to delineate the area. Recolonization, a very slow process at best due to the patchiness of suitable marten habitat in this area (Lands, Parks and Resources Branch 1984) is being prevented by trapping pressure and the isolation of available habitat from healthy marten populations by habitat

and physical (i.e. Yukon and Teslin rivers) barriers. Relocation of marten into the M.C.A. was chosen as a tool to restore marten populations to the ecological carrying capacity of the area. In addition the area was closed to marten trapping from November 1, 1984 until an undetermined future date. Marten were released at five locations in the area during the winters of 1983/84 and 1984/85. More relocations are planned for future winters. A number of marten were implanted with radio transmitters and their movements were monitored at frequent intervals throughout the life of either the transmitter or marten. Information is included on marten capturing, relocation, movements and habitat use.

Game transplants are a common wildlife population enhancement technique whether for the reintroduction of extinct populations, or for the establishment of new populations into habitat that is unoccupied or below carrying capacity. There have been numerous attempts made at re-introducing marten into former ranges in North America. These releases have been summarized in Table 13. The success of most marten transplants is unknown, or only marginal at best. Only four of 22 attempts reported in Table 13 have been successful at establishing viable marten populations. At least three attempts were failures. Good accounts of transplant techniques are given by Davis (1983) and Bateman (1982a, 1982b, 1984, 1985a, 1985b). Ideally a wildlife transplant should follow a basic procession of steps:

1. Identify unoccupied habitat

2. Transplant breeding stock in sufficient numbers and distribution, so that they will form a nucleus to an expanding population.

3. Monitor the status of the new population.

Unfortunately few wildlife managers are equipped with the financial or informational resources to satisfactorily complete the above steps. The present study selected release sites by comparing known habitat characteristics with those reported in the literature or known from elsewhere in Yukon (e.g. - from the Evelyn Creek study area). Little is known on the numbers of marten required to initiate breeding and population growth. It is felt that habitat isolation is an asset. Slow release methods have been favoured in other recent transplants (Davis 1983 and Bateman 1982b, 1984, 1985a, 1985b) however, manpower and logistical constraints have limited its use in this study. An extensive furbearer population and harvest monitoring program is in place in Yukon.

6.2 Capture Areas

Marten were captured on trapping concession's no. 336, 344 and 348 (Fig. 5). All three concessions are situated in an area of high marten abundance (unpubl. annual fur harvest data, Yukon Fish and Wildlife Branch). On concession no. 348, trapping was carried out in the valleys of the middle reach of the Rancheria River and tributary creeks, and around Daughny Lake and the valley of Goat Creek. On concession no. 344 trapping efforts were concentrated in the upper Smart River valley, while the Morley Lake shore and upper Morley River valley were the locations of the trapping activities on concession no. 336.

Table 13 Status of North American Marten Re-introductions

Release Location	Date	No. of Marten	Status	Reference*
Prince of Wales Is., AK	1933-34	10	Success	1
Baranof Is., Alaska	1933-34	7	Success	1
Kayak Is., Alaska	1940's	?	Not Known	1
Patterson Is., Alaska	1940's	?	Not Known	1
Chichagof Is., Alaska	1949-52	15	Success	1
Afognak Is., Alaska	1952	20	Success but low pop'n.	1
Manitoba	1960-61	13	Failure	2
Manitoba	1967-68	99	Success, but low pop'n.	2
Manitoba	1969	42	Not Known	2
Sibley Prov. Park, Ont.	1950-51	47	Not Known	3
Ontario	1956-63	249	Success	4
Fundy National Park, NB	1984	6	Unknown	5
Newfoundland	1975	4	Unknown	2
Terra Nova National Park, NFLD.	1982-83	8	Unknown	6
Liscomb Game Sanctuary, N.S.	1956	12	Failure	7
Montana	1950's	Several Groups of 5-10	Unknown	2
New Hampshire	1975	29	Unknown	2
Stockton Is., Wisconsin	1953, 1956	5+	Success but low pop'n.	2
Nicolet National Forest, Wisconsin	1975-76	124	Unknown	8
Porcupine Mountain, State Park, Michigan	1955-57	29	Failure	2
Hiawatha National Forest, Michigan	1969-70	99	Success but low pop'n.	2
Upper Peninsula, Michigan	1978-80	?	Not Known	9

*
1. Burris and McKnight 1973
2. Schupbach 1977
3. de Vos 1952
4. M. Stickland, Ontario Ministry of Nat. Res., Unpub.
5. Bateman 1985a
6. Bateman 1982b, 1984
7. Dodds and Martell 1971
8. Davis 1983
9. Churchill et al 1981

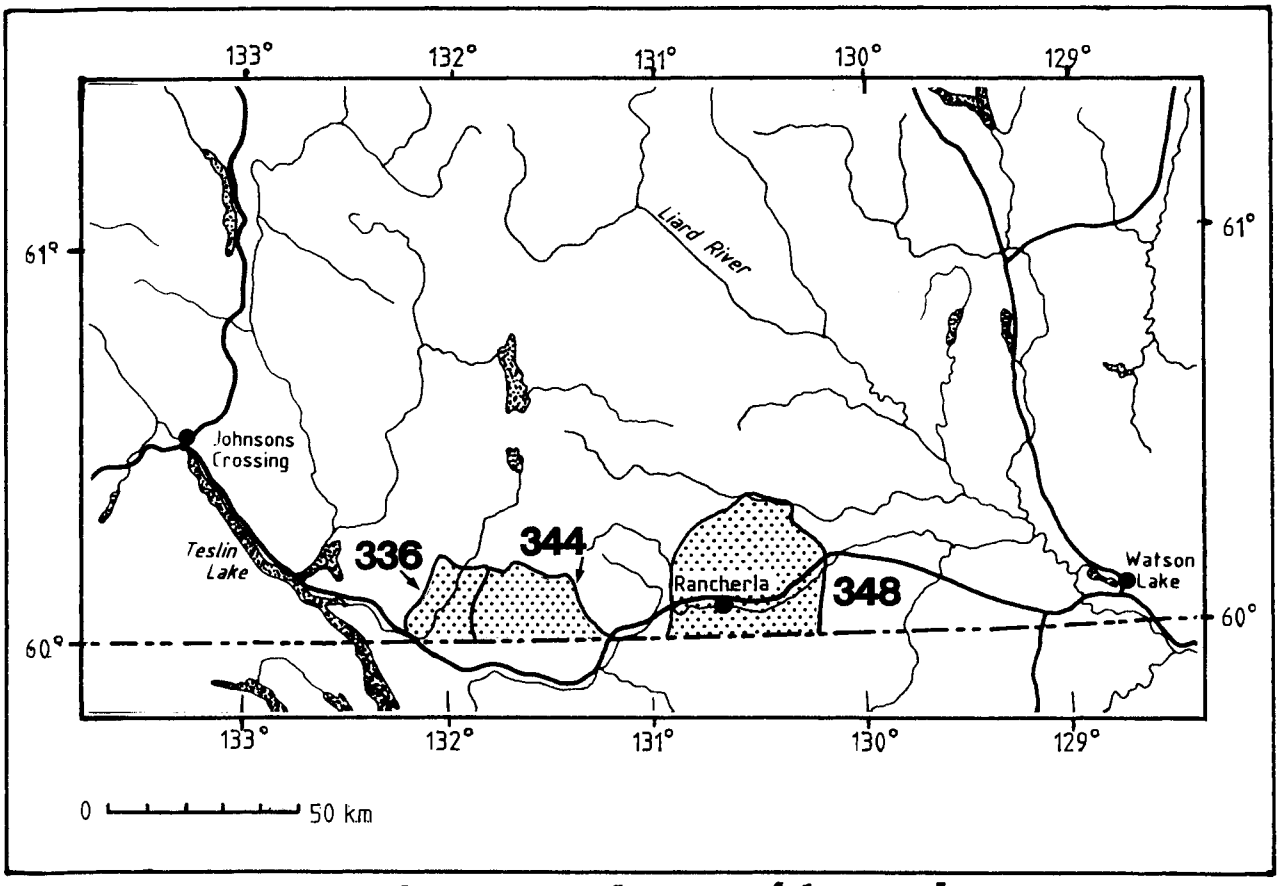

Fig. 5 : Marten Capture Areas (trapping concessions nos. 336, 344 & 348.)

The trapping concessions are situated in the southern section of the Lake Laberge Ecoregion (no. 336) and the southern section of the Pelly Mountains Ecoregion (no's. 344 and 348) (Oswald and Senyk 1977). The area comprises part of the Cassiar Mountains and Nisutlin Plateau physiographic subdivisions of Bostock (1965). Most of the terrain lies between 700 and 1500 m in elevation, but a few peaks are over 1800 m. a.s.l., the highest being 2037 m. Annual precipitation increases from 375 mm at the western side of concession no. 336 to 500 mm at the eastern side of concession no. 348. Mean annual temperature of the area is -2°C to -6°C (Burns 1973). Trapping was carried out in the valleys where open-growing Black and White Spruce are the dominant tree components of the vegetation. Lodgepole Pine is common following fires, and Alpine Fir is prevalent in the subalpine. Hardwoods are scarce, but aspen (Populus tremuloides) and balsam poplar P. balsamifera) on warmer floodplains, and paper birch (Betula papyrifera) is scattered in poorly drained areas. Feather moss (Pleurozium schreberi), frequently with sphagnum (Sphagnum spp.), are common in the understory on plateaus. Ericaceous shrubs and willows occur over much of the area, but forbs are not plentiful.

6.3 Release Areas

Marten are generally considered to prefer forest types characterized by a mature coniferous and mixed/deciduous forest in a late seral or climax stage with greater than 30% canopy cover (de Vos 1951; Koehler and Hornocker 1977). A description of the marten habitat in the Evelyn Creek, Yukon study area is being prepared at present, however descriptions of the vegetation complex is contained in Archibald and Jessup (1984), Northern Biomes Ltd. (1983) and Beare (1984). The presence of open meadows and burns is also considered to be important for summer and fall foraging (Koehler and Hornocker 1977). Marten population numbers may be reduced substantially when extensive areas of forest are disturbed by fire or clear-cut logging (Shepard 1978; Johnson 1981). In the M.C.A. fires have resulted in a major reduction of optimum cover types. They are not the only cause of the limited capability of the area for suitable forest cover, physiography and climate being other important limiting factors (Lands, Parks and Resources Branch 1984). Due to high average elevation in combination with very low precipitation, the northwesternmost portion of the M.C.A. is unable to support the growth of trees, particularly extensive coniferous forests. This is the reason for the withdrawal of this portion from the M.C.A. (Fig. 2).

Other marten habitat requirements such as snow depth (microclimatic protection), access to the subnivean layer, standing water, etc., are not as well understood and are more difficult to assess when choosing release sites. Deadfall, an important habitat factor for small mammals (marten prey) is not abundant in the M.C.A., except in limited old growth stands and in the recent Takhini and Teslin burns. Squirrel middens provide subnivean nesting sites and presumably, protection from the cold (Buskirk 1983). Squirrels are abundant throughout the M.C.A.

Suitable forest cover types are unevenly distributed throughout the M.C.A.. Lands, Parks and Resources Branch's (1984) investigation of marten habitat capability in the M.C.A. lists the following distribution of marten habitat

throughout the area, with the southeastern portion offering the greatest potential for re-establishment of marten:

i) the Upper Ibex River Valley.

ii) lower elevations west of Mount Ingram and east of the Takhini River.

iii) upper valleys of the Wheaton and Watson Rivers.

iv) vicinity of Haines Junction northeast to the Alaska Highway and southeast to Rainbow Lake.

v) vicinity of Kluane Lake: the plain west of the Alaska Highway and the lower reaches of Gladstone Creek.

vi) vicinity of Dalton Post: confluence of Tatshenshini, Klukshu and Takhanne Rivers.

vii) area surrounding Little Fox, Claire, Mandanna, Coghlan and Frank Lakes and their drainages.

viii) area along Nordenskiold and Thirty Mile Rivers lower Klukshu Creek and around Braeburn and Fox Lakes.

ix) the southeastern portion of the study area, extending from the southern tip of Lake Laberge, south to the B.C. border, and east to Teslin River and Teslin Lake.

A natural ingress into the southeastern portion of the M.C.A. is currently taking place (see Section 6.7, Miscellaneous Marten Track Sightings), reducing the need for marten relocation to this area. Areas chosen for marten relocation in 1983/84 and 1984/85 include: Takhini Lake, Takhini River/Ibex River, Wheaton River, Haines Junction, and Braeburn Lake (Fig. 2). Additional areas will be considered for future relocation.

The following general descriptions of the ecoregions in which the release sites are located in terms of physiography, climate and vegetation are drawn from Oswald and Senyk (1977). The Takhini River/Ibex River and Wheaton River relocation sites are part of the Coast Mountains Ecoregion. The area includes portions of the Coast Mountains, Kluane Range, Kluane Plateau, Duke Depression and Shakwak Trench physiographic subdivisions of Bostock (1965). Only major lakes and drainage systems lie below 900 m elevation. Limited climatic data are available from the ecoregion. The mean annual temperature varies from -3°C immediately to the southwest of the area, to -1°C at Whitehorse which is situated off the northeast corner of the region. Annual precipitation varies from 761 mm to 260 mm across the same range. Mature coniferous forest is limited to valley bottoms, geographically isolated from one another by broad expanses of untreed mountainous areas. The dominant forest type consists of White Spruce, often mixed with Balsam Poplar and Willow where drainage is restricted. Some Lodgepole Pine and Alpine Fir is present along the eastern margin.

The primary shrub growth at lower elevations consists of soapberry and willows. Moss, herbs, graminoids and ericaceous shrubs are common throughout. Sedge dominates poorly drained sites and is frequently accompanied by sphagnum and ericaceous shrubs.

The above physical and biotic characteristics generally apply also to the Haines Junction release site. The Takhini Lake, Takhini River/Ibex River, Wheaton River and Haines Junction release sites were located in mature stands of White Spruce. The Takhini/Ibex site borders the 1958 Takhini burn.

The Braeburn Lake release site is located in the Lake Laberge Ecoregion. The region covers parts of the Lewes and Nisutlin Plateaus, all of the Teslin Plateau and the southern part of the Big Salmon Range physiographic subdivisions of Bostock (1965). Most of the terrain lies between 600 and 1500 m elevation, but a few peaks are over 1800 m a.s.l., the highest being 2084 m. The topography is characterized by dissected plateaus and rolling hills. Annual precipitation is less than 250 mm. White Spruce probably forms the climax species. Fires, however, have been frequent and extensive. Lodgepole Pine occupies the burn areas and currently constitutes the most abundant tree species. Black spruce occupies wetter sites, whereas balsam poplar is common on recent alluvium, and aspen occurs on warmer aspects. The understory vegetation is mostly feathermoss, with or without a wide variety of shrubs and/or forbs. Sagewort (Artemesia frigida) grassland occurs on steep, silty river banks and on low elevation dry slopes. Sedge meadows are not prevalent, but occur in depressional situations. Marten were released in a dense stand of mature white spruce with an understory dominated by feathermoss; shrubs are sparse. The Braeburn site borders the northern extent of the Takhini Burn.

6.4 Materials and Methods

Trapping was carried out during February 1 - March 10, 1984 (concession no. 344), November 5 - December 20, 1984 (concession no. 348) and January 26 - March 13, 1985 (concession no. 336). Up to 40 traps (Tomahawk single-door collapsible live traps, National Live Trap Co., Tomahawk, WI, (size 23 X 23 X 43 cm) were set along snowmobile trails at 500-1500 m intervals. They were positioned under trees and covered with boughs to protect captured marten from inclement weather. Bait used included whitefish, beaver and horse, and scent (fish oil, beaver castor, artificial banana extract or various concoctions) was rubbed on nearby trees to lure the marten to the vicinity of the trap. Traps were checked once daily by snowmobile. Captured marten were run into a holding cone (Hawley, n.d.), ear-tagged with numbered metal tags (style 1005 monel, size 1, National Band and Tag Co., Newport, KY, U.S.A.), sexed and weighed. They were then transferred to a holding tube (PVC or sheet metal, dimensions 48 X 20 cm or 43 X 15 cm and lined with straw) for transport back to the camp where they were kept in holding cages. Holding cages were rectangular boxes (inside dimensions 29 X 31 X 63 cm or 56 X 46 X 56 cm) constructed from 3/4" plywood with lids drilled for ventilation.

Caged marten were provided with straw and fed and watered daily. Food was strawberry jam (a few spoonfulls the first day only) and lean ground beef or fish. Marten were kept in the holding cages until enough animals had

been captured to warrant a relocation (usually less than seven days). They were transported to the release sites in "transplant tubes" (6" diameter plastic tubes, sealed at both ends) by automobile or airplane. A number of individuals were implanted intraperitoneally with radio transmitters (Telonics Inc. Mesa, Arizona U.S.A.) according to the procedures outlined in Melquist and Hornocker (1979). Implantation was performed by Whitehorse veterinarians. Implanted marten were kept in the holding cages for a few days to monitor their physical condition. Radioed marten were released in the Takhini Lake, Wheaton River and Takhini River/Ibex River areas.

The radioed marten were relocated at frequent intervals from airplanes (Cessna 185 and 206, Piper Super Cub 150) using standard tracking techniques (Brander and Cochran 1971). Locations were plotted on 1:50,000 topographical maps and a note was made of the surrounding vegetation type(s).

The concept "home range" is used in the sense of Jewell (1966:103) as "the area over which an animal normally travels in pursuit of its routine activities". Excluded from this definition are excursions for mating and routes of movement which, together with the "home range" as here defined, would be more appropriately termed "lifetime range" (Jewell 1966). Marten captures among traplines were tested for differences with a log-likelihood ratio test (Sokal and Rohlf 1981).

6.5 Results

6.5.1 Trapping Program

Table 14 reveals the results of the trapping program. During the first season of the project trapping was commenced towards the end of the season and a total of 26 marten was captured. Three of these died; one in the trap after a cold night (-20°C), following a warm day (+6°C), the other two in the cages, one from hypoglycemia and the other a dislocated jaw from trying to escape. One escaped from the field camp after chewing its way through metal screening material.

The second season saw an increase in trapping effort. The total number of active traps was increased to 40 over the first month (versus 16 the season before). Trapping was carried out whenever the weather permitted. Towards the end of December extremely cold weather (<-35°C) halted trapping efforts due to the very high mortality risk for captured animals. The unseasonally warm weather during most of January, coupled with high snowfall, prevented the establishment of snowmobile trails. A total number of 66 marten were captured in trapping season 1984/85. The results of the log-likelihood ratio test for differences in trapping success during November 5, 1984 - March 13, 1985 show a significantly greater capture rate per unit effort on trapping concession 348 East than on either trapline 348 West or 336. Mortality occurred in the live traps (in five instances), the travelling tubes (in one instance) and the holding cages (in one instance). The high mortality rate of marten captured during November 30 - December 20, 1984 is probably the result of hypothermia caused by very low temperatures at night (<-25°C). The situation is further aggravated by the collection of snow on their fur from the boughs overlaying the trap by their struggle to escape. All mortalities occurred after nights of below -20°C temperatures. Escapes

Table 14 Results of Live Trapping During the Period February 1/84 through March 13/85

Period	Trapping Concession	Number of Trapping Day Units[1]	Number of Captures	Number of Trapping Day Units/Number Captures[2]	Number of Escapes	Number of Mortalities (before release)	Number Released
February 1 - March 10, 1984	344	(≤300-500)	26	≤14-23	1	3	22
November 5-29, 1984	348 East	360-372	32	11.2-11.6	2	1	29
November 30-December 20, 1984	348 West	571	18	31.7	1	5	12
January 26-March 13, 1985	336	893	16	59.5	0	1	15
TOTALS			92		4	10	78[3]

1. A trapping day unit is a period of 24 hours that a trap is active. Trapping day units were not recorded for the period February 1 - March 10, 1984.

2. Trapping success was significantly greater on Concession 348 east than on either 348 west or 336 (Log-likelihood ratio test, $\alpha = 0.05$).

3. We obtained an additional 4 marten from trappers not involved directly with the trapping program. Therefore the total number of marten released was 82.

were the results of either handling (in two instances) or a marten chewing its way through metal screening material (in one instance).

6.5.2 Relocation

A total of 82 marten were relocated during the two trapping seasons (Table 15); 35 females and 47 males. Little is known of the fate of the relocated marten not fitted with radio transmitters. Two of these animals are known to have died (Table 16). Three radioed marten were found dead. Female marten no. 46/47 that suffered from intussception represents the second known case of this condition in marten. The other case occurred recently in Quebec (Michael Jean, Ministere du Loisoir, de la Chasse et de la Peche, pers. comm.). The marten in this case was a small female with an identical implant. The condition is believed to be caused by the transmitters' interference with normal intestinal operation.

6.5.3 Monitoring and Movements

An attempt was made to pinpoint all radioed marten during monitoring flights (Fig. 6). The relatively low strength of the transmitter signals combined with the tendency of marten to retreat in hollow stumps, cavities in windfalls and standing trees, crevices in rock and soil (Herman and Fuller 1974, Davis 1983) are likely responsible for the recurrent inability to locate all transmitters. In addition, transmitter life, predicted to be approximately nine months by the manufacturer, appeared to be considerably shorter in all but one marten as suggested by the dates they were last located (Tables 17a, 17b, 17c).

Some marten seem to establish home ranges near the release site (no's. 61/62, 65/67, 100/99, 401/448, 32/33), others away from it (no's. 38/39, 55/54, 59/60, 97/98) (Fig. 6a-f). A few marten displayed wandering movements throughout the life of the transmitter (no's. 479/480, 40/41). The limited number of relocations in most cases does not warrant an analysis of home range size. Any qualified statement about home range establishment is complicated by the uncertainty about whether to regard the movements involved as post-release exploratory or wandering movements, or as movements within a newly established home range. Nevertheless, for a few radioed marten relocated five or more times in a relatively confined area, home range sizes (minimum area method, Mohr 1947) were calculated (Table 18).

6.5.4 Habitat Use

A detailed habitat utilization/availability analysis is not possible at this stage of the project. The limited number of relocations of individual marten precludes a quantification of habitat available to each individual. Table 19 presents the distribution of habitat units in which the radioed marten were recorded during monitoring flights. The data include the combined relocations of radioed marten in all release areas during 1984 and 1985. For various reasons not all relocations were assigned to a habitat unit. A forest cover type map has been completed for the Takhini River/Ibex River area. Figure 7 shows the plotted locations for all radioed marten released in this area.

Table 15 Number and Sex of Marten Released in the Marten Conservation Area During the Winters 1983/84, 1984/85

Release Location	Release Period	Number of Females		Number of Males		Total	
Takhini Lake	February 5/84 - March 3/84	4	12	4	10	8	22
Takhini Lake	December 1/84 - December 12/84	8		6		14	
Wheaton River	February 19/84 - March 13/84	4		5		9	
Haines Junction	March 2/84	4	6	1	13	5	19
Haines Junction	November 8/84 - November 19/84	2		12		14	
Braeburn Lake	November 26/84 - March 14/85	9		13		22	
Takhini River/Ibex River	February 8/85 - March 19/85	4		6*		10	
TOTAL		35		47		82	

* Includes two males released north of Takhini River, one near Flat Creek and one (purchased privately by trapper D. Sumanik) on Long Lake. (Fig. 2)

Table 16

Mortality of Transplanted Marten

Ear Tag No. Left/Right	Sex	Date of Release	Date of Mortality	Cause of Mortality	Location Where Found Dead	Radio Transmitter Implanted. Date of Implantation in Parentheses
210/251	F	Nov. 19/84	Nov. 19-20/84	Collision with vehicle (snowmachine).	Pine Lake (Haines Jct)	-
92/91	M	Feb. 19/84	Feb. 24/84	Captured in leghold trap.	Wheaton River	-
46/47	F	Mar. 3/85	Before March 14/85	Intussusception.	Takhini River	+ (Feb. 26/85)
100/99	F	Feb. 5/84	Shortly after release.	Unknown. Probably hypothermia.	Takhini Lake	+ (Feb. 2/84)
97/98	M	Feb. 5/84	July 26/84	Unknown.	Johns Lake (north of Takhini Lake)	+ (Feb. 3/84)

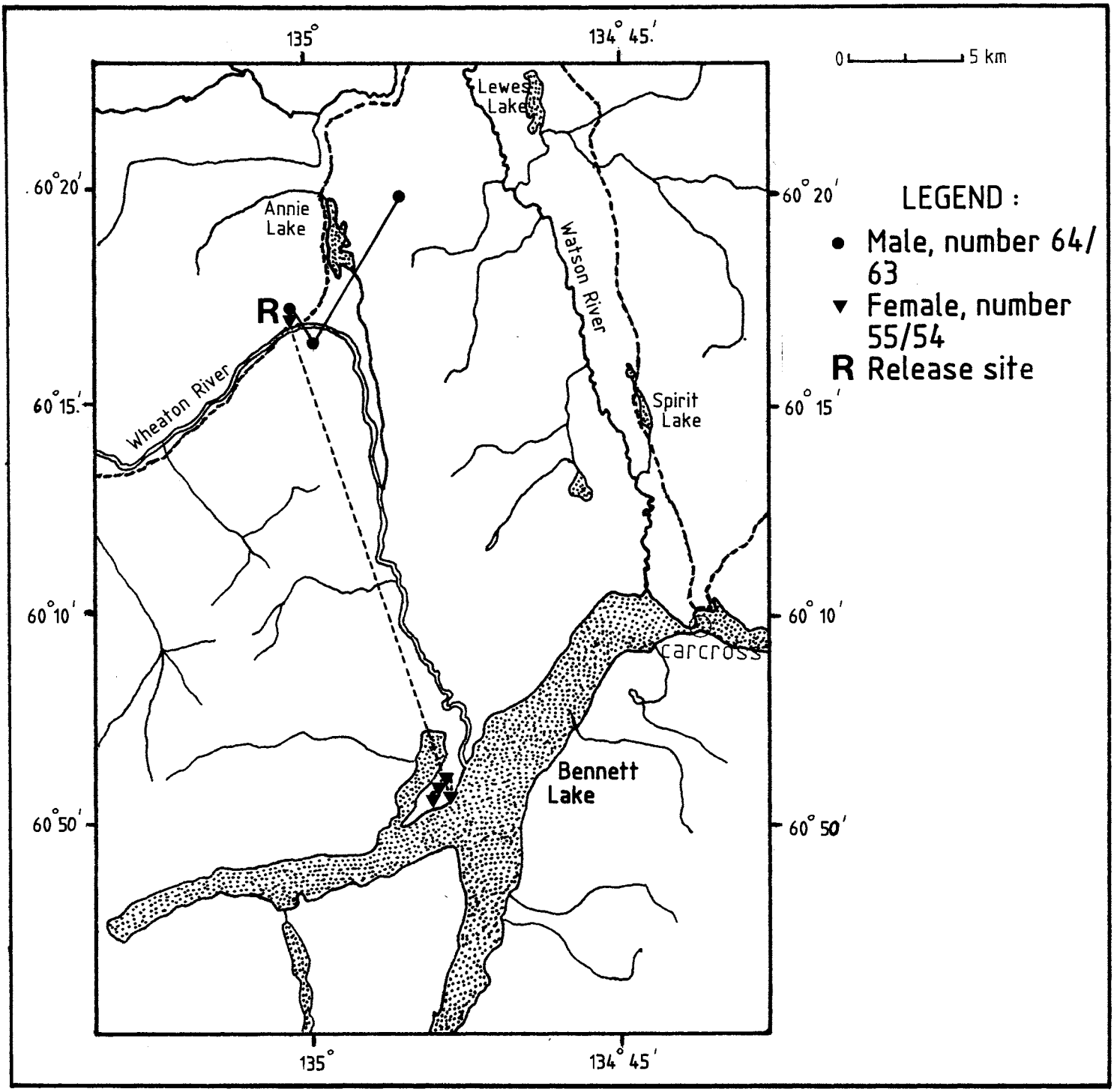

Fig.6 a. : Marten Re-locations for the period March 13,'84 – January 14,'85 – Wheaton River

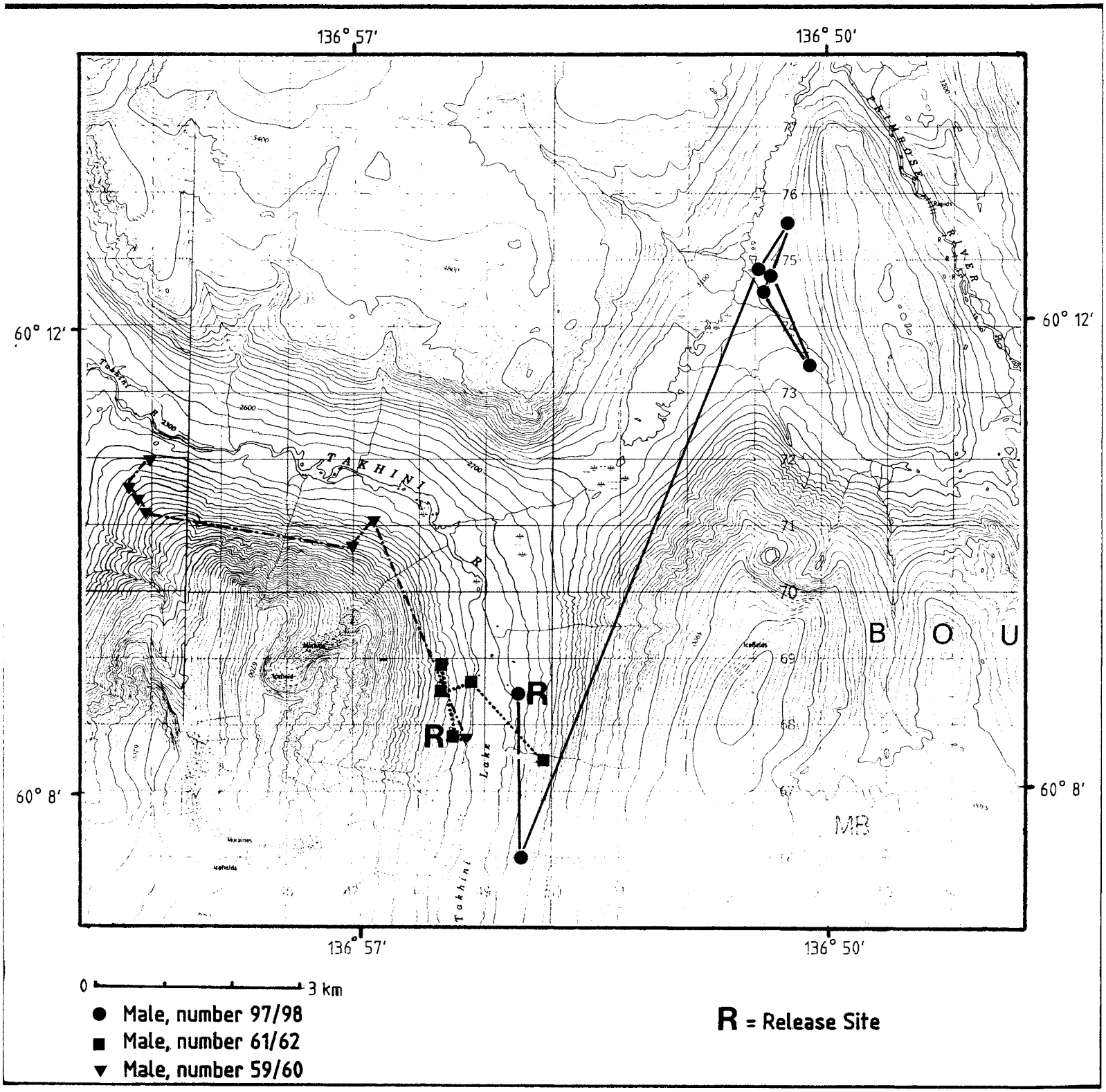

Fig. 6b. : Marten Re–locations for the period February 5, '84–September 18,'84–Takhini Lake

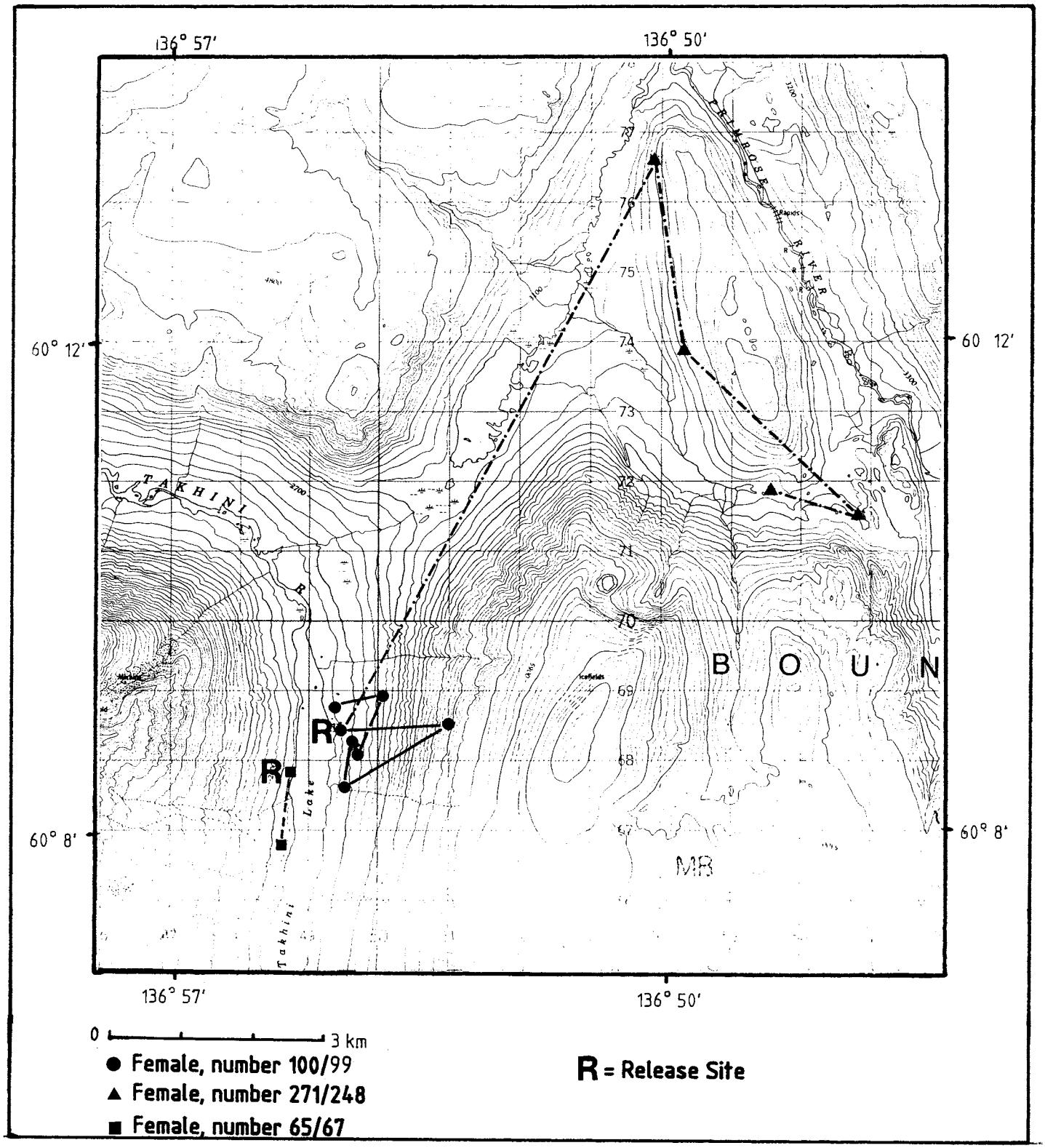

Fig. 6c. : Marten Relocations for the period February 5,'84 to August 16,'84– Takhini Lake

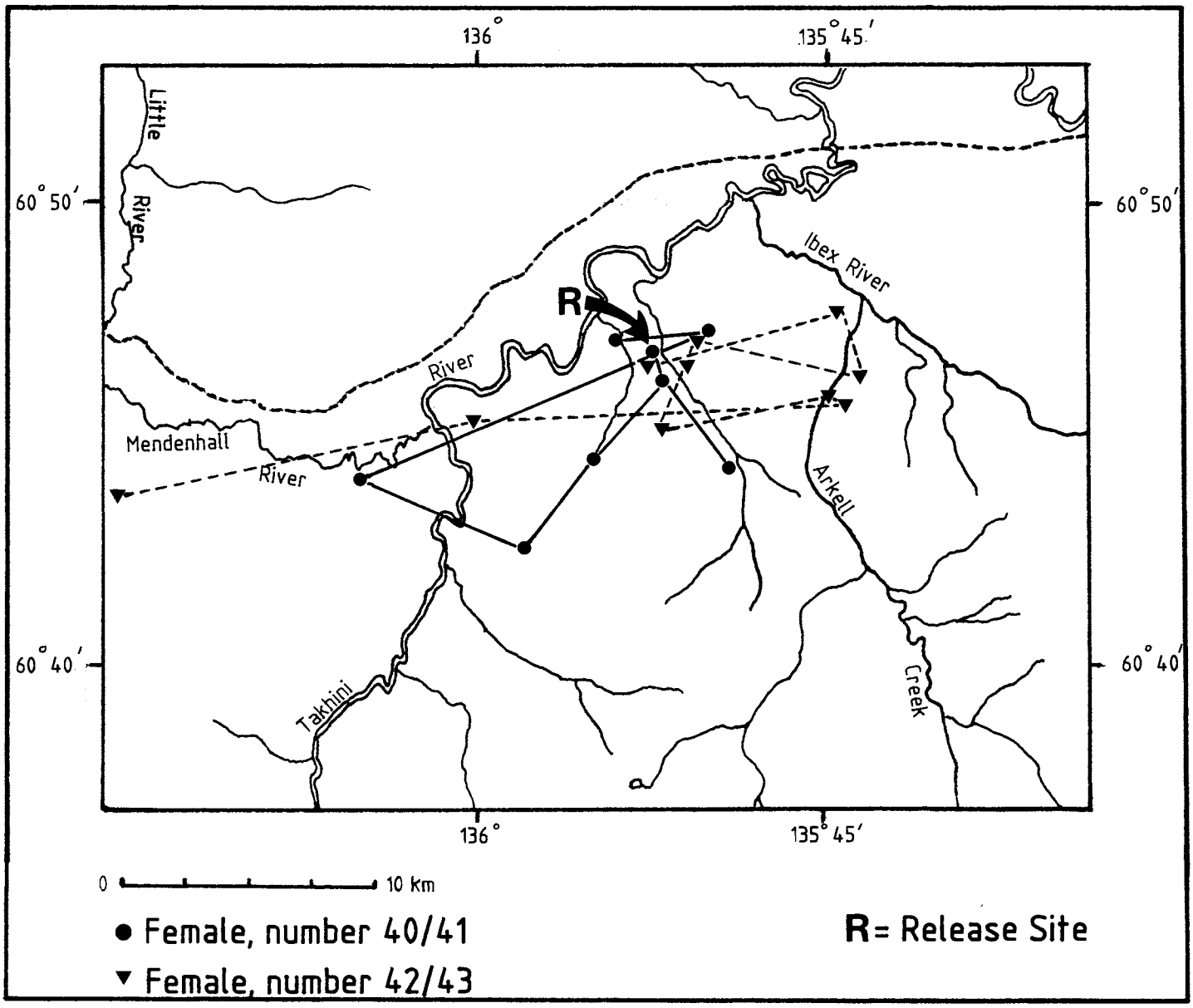

Fig. 6d. : Marten Relocations for the period March 6,'85– April 10,'85 –Takhini River/Ibex River

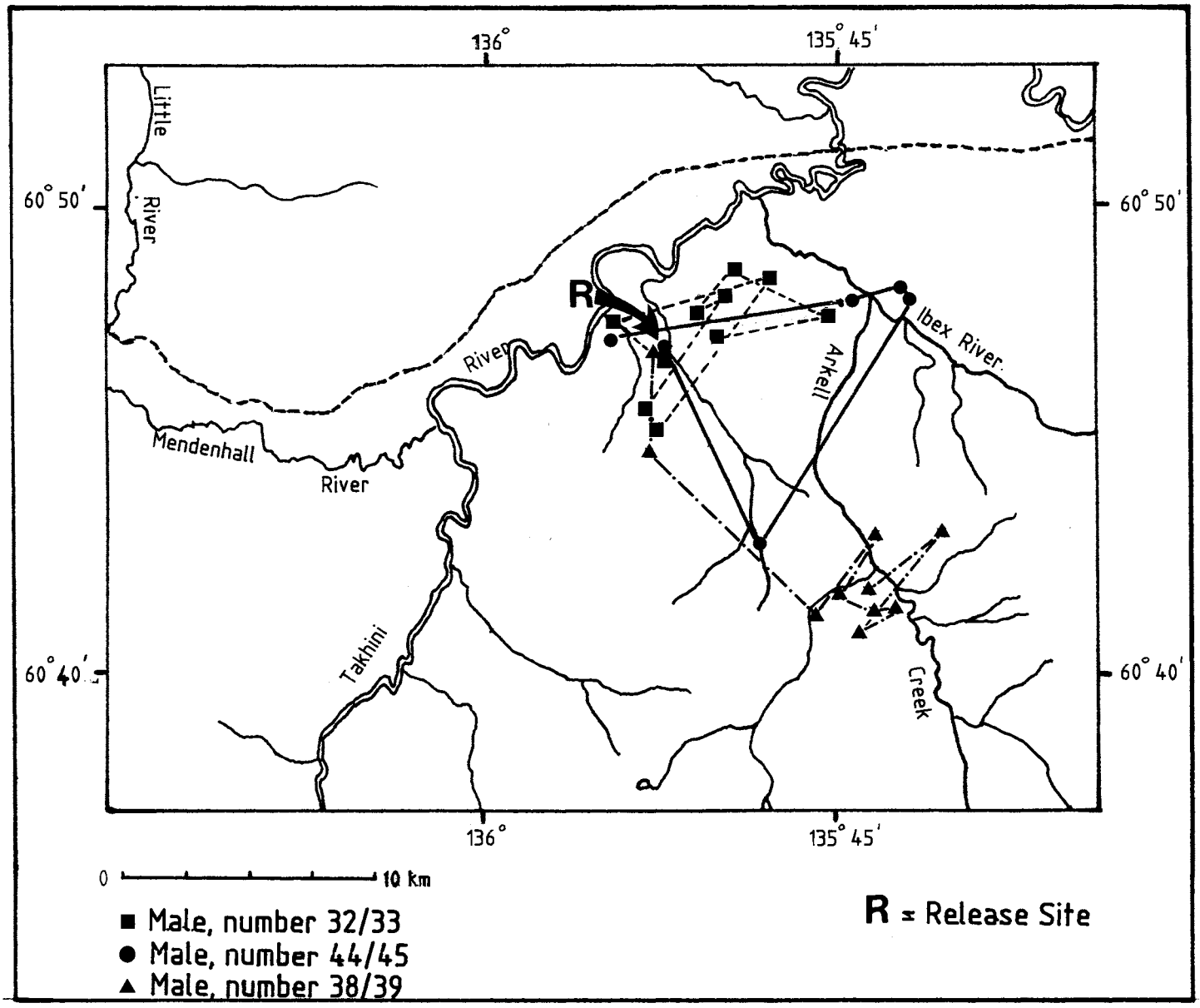

Fig. 6e. : Marten Relocations for the period March 6,'85– April 22,'85 – Takhini River/Ibex River

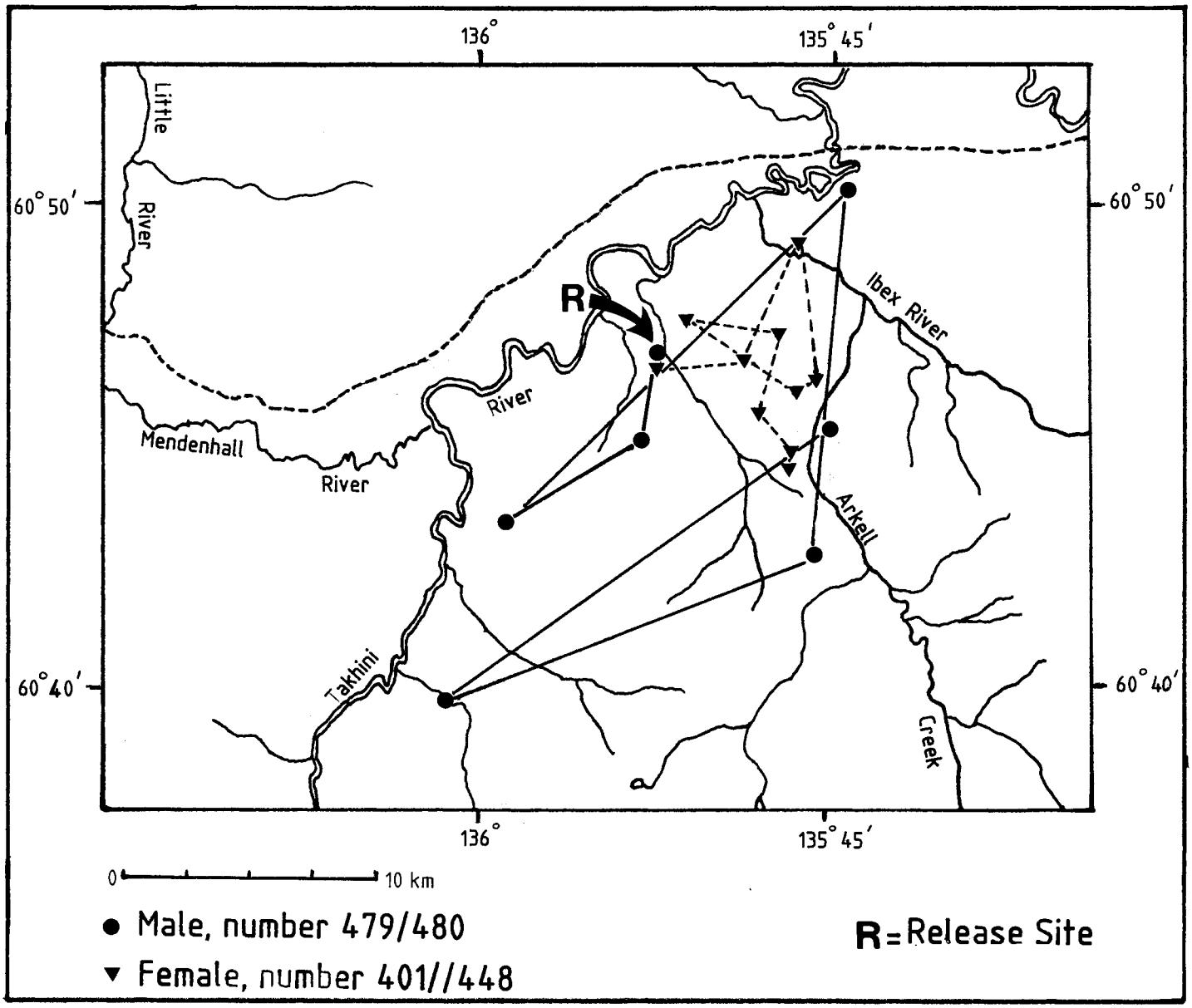

Fig. 6f. : Marten Relocations for the period March 14,'85– April 22,'85 – Takhini River/Ibex River

Table 17a

Monitoring Periods and Maximum Distances Between Known Locations of Radioed Marten in the Takhini Lake Area

Ear Tag No. Left/Right	Sex	Date of Release	Last Date of Relocation	Number of Known Locations	Maximum Distance Between Known Locations (km)
271/248	F	February 5/84	June 12/84	5	9.2
97/98	M	February 5/84	August 10/84	8	10.3
100/99	F	February 5/84	August 16/84	9	1.8
65/67	F	March 14/84	April 26/84	2	1.0
61/62	M	March 14/84	September 18/84	5	1.3
59/60	M	March 14/84	September 18/84	7	6.4

Table 17b

Monitoring Periods and Maximum Distances Between Known Locations Of Radioed Marten in the Wheaton River Area

Ear Tag No. Left/Right	Sex	Date of Release	Last Date of Relocation	Number of Known Locations	Maximum Distance Between Known Locations (km)
55/54	F	March 13/84	February 21/85	6	21.7
64/63	M	March 13/84	May 15/84	3	7.5

Table 17c

Monitoring Periods and Maximum Distances Between Known Locations of Radioed Marten in the Takhini River/Ibex River area

Ear Tag No. Left/Right	Sex	Date of Release	Last Date of Relocation	Number of Known Locations	Maximum Distance Between Known Locations (km)
46/47	F	March 6/85	March 14/85	5*	0.2
44/45	M	March 6/85	March 25/85	6	6.8
42/43	F	March 6/85	April 10/85	10	15.2
40/41	F	March 6/85	April 10/85	8	7.8
38/39	M	March 14/85	May 6/85	11	6.6
32/33	M	March 14/85	April 22/85	10	4.0
479/480	M	March 14/85	April 2/85	7	11.8
401/448	F	March 14/85	April 22/85	9	3.8

* These were all in the same location or very close together and may have represented the location where this individual died.

Table 18 Minimum Home Range Polygon Sizes of Radioed Marten With Five or More Sequential Re-locations in a Relatively Confined Area (see Figures 5b, 5c, 5e for locations of individual marten)

Marten No.	Sex	No. of known Locations	Period of Sequential Locations	Minimum Home Range Polygon Size (km^2)
61/62	M	5	March 14 - September 18/84	4.95
100/99	F	7	February 5 - July 12/84	5.26
38/39	M	8	March 14 - May 6/85	4.58
97/98	M	5	March 14 - June 12/84	4.68

Table 19 Distribution of Relocations of Radioed Marten Over Different Habitat Units (Forest Types)

	White Spruce Forest (Cover > 20%)	Burned Area	Open White Spruce Forest (Cover ≤ 20%)	Lodgepole Pine Forest	White Spruce/ Lodgepole Pine Forest
No. Relocations	25	14	9	9	5

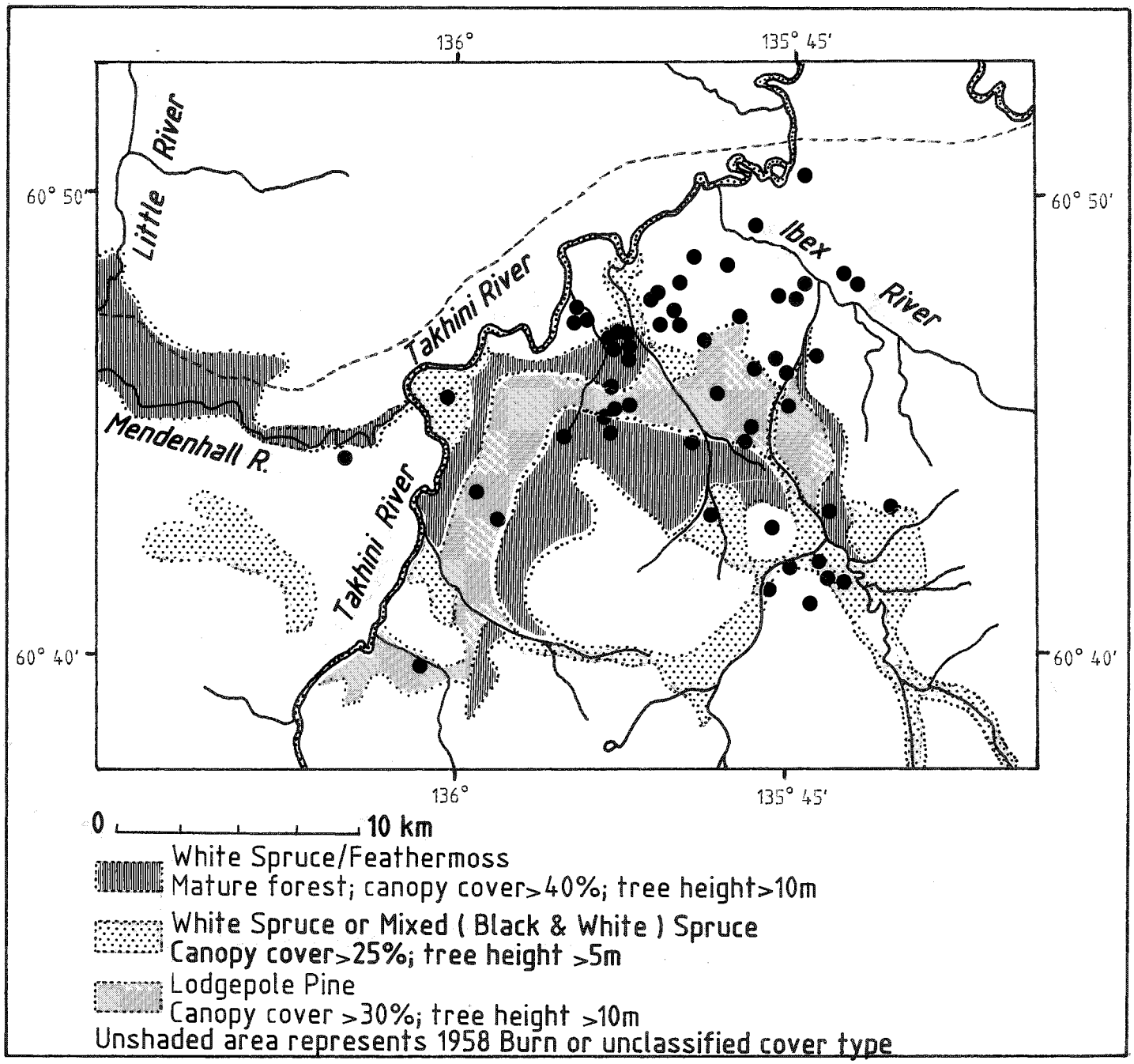

Fig. 7. : Locations for all radioed marten in the Takhini River/Ibex River area in relation to forest cover types.

6.6 Marten Trapping in the Conservation Area

Transplanted and immigrating marten need protection from trapping in order to successfully establish populations. For this reason the marten season was closed in 1984/85 on 108 concessions and 6 radius areas (out of a total of 375 concessions, ten radius areas and five group areas) (Fig. 2). Trappers reporting accidental captures were given sundry permits to possess and sell the pelts. A total of 14 marten were captured on five concessions (Table 20). The historical marten harvest in the M.C.A. is given in Table 3. Over the past ten years, the mean annual marten harvest has been 14.6. The spatial distribution of this harvest in the M.C.A. is shown on Figure 8. There is a definite concentration of marten-takes on the eastern boundary of the M.C.A. Twenty-seven (27) concessions and one radius area were removed from the M.C.A. for the 1985/86 season. They were excluded from the conservation area because habitat factors such as climate (aridity) and low areal extend of dense forest suggest the low capability of the area to support marten. These concessions were not included in the data included in Table 3 or Figure 8. An additional 17 concessions were given a quota of ten, rather than zero, permitting a limited harvest, while facilitating the need for a reservoir to provide emigrants to the west.

6.7 Miscellaneous marten track sightings

Several track observations of marten have been made in the M.C.A. by trappers, members of the public and Fish and Wildlife Branch staff who are aware of the marten project and the general uncommoness of marten (Fig.9). Additional observations were made in 1982 and 1983 on track count surveys. Of particular note are the concentrations of tracks noted in the Bennett Lake, McRae, Tagish and Takhini Hot Springs areas. The tracks noted by the senior author on Milhaven Bay are believed to be those of female 55/54. The tracks seen south of Takhini Lake could very well be from one of 22 released 25 km to the north.

The several marten tracks were seen on a reconnaissance of the McClintock/Michie area. Interviews with the local trappers (Randall Joe and family) and analysis of the historic fur harvest show a recent general influx of marten west of the Yukon and Teslin rivers.

6.8 Discussion

Live trapping success, with the exception of the period January 26-March 13, 1985 fell within the range reported from other studies (de Vos and Guenther 1952, Hawley and Newby 1957, Koehler and Hornocker 1977, Archibald and Jessup 1984). The decrease in trapping success after November 30, 1984 may be attributable to the extreme snow depth during this period. Buskirk (1983) found that marten spend less time active in late winter/early spring than in autumn, which he explains by the energetic cost of exposure to cold air and the reduced efficiency of foraging when snow is deep. The preponderance of males in the catch agrees with other marten trapping studies (Marshall 1942, Yeager 1950, Lensink 1953, Hawley and Newby 1957) and is likely the result of the larger home range sizes of males (Hawley and Newby 1957, Buskirk 1983, Archibald and Jessup 1984). Post release movements of marten might result in some female home ranges not being overlapped by male home ranges. The larger number of males released will

Table 20 Sundry Permits Issued for Marten Possession in Conservation Area 1984/85

Trapping Concession	No. of Marten	Date Trapped
277	1	March 18, 1985
291	1	?
303	4	?
318	6	Feb. 7, 12, 18?
319	1	?
327	1	?
Total	14	

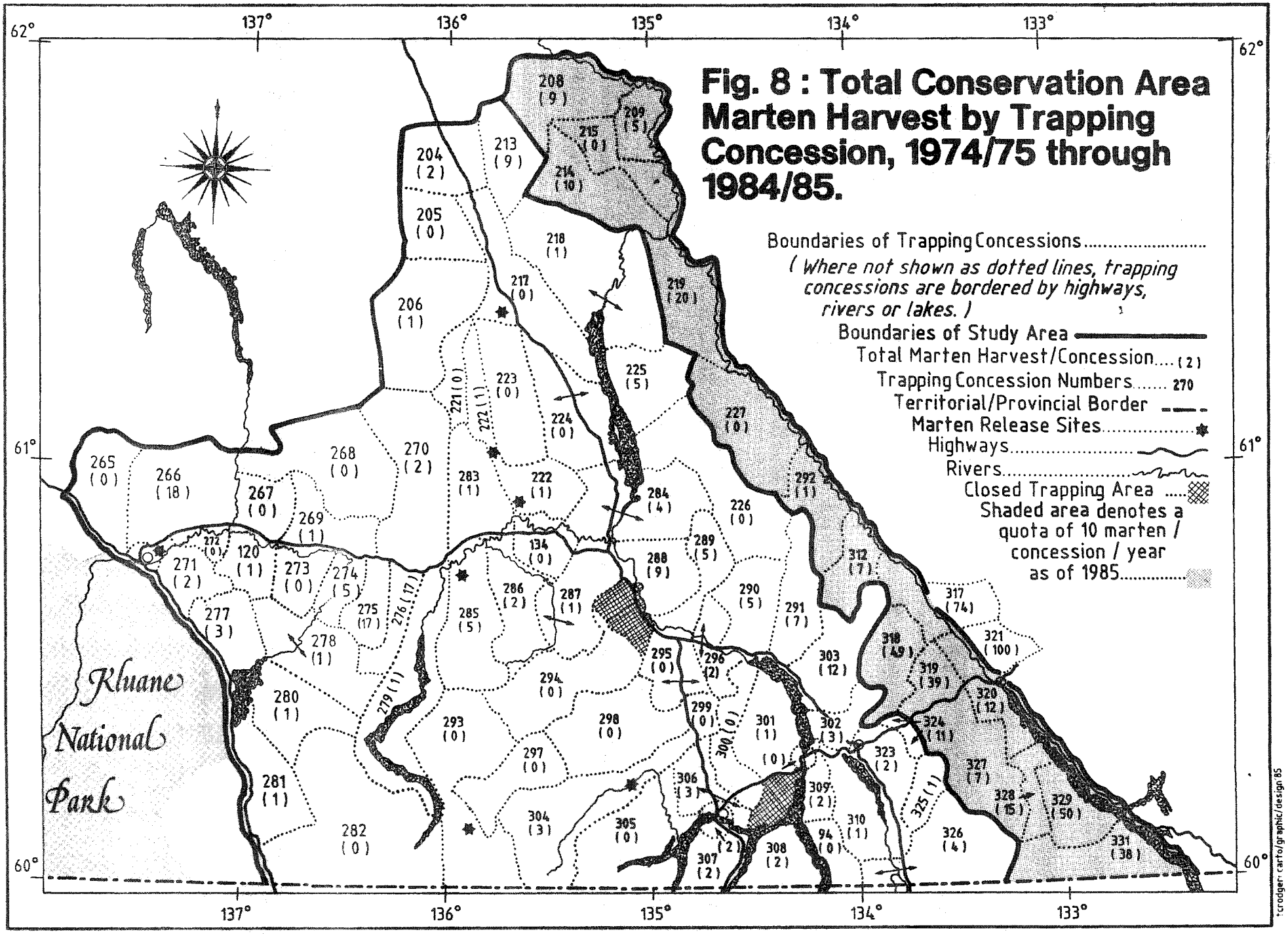
Fig. 8 : Total Conservation Area Marten Harvest by Trapping Concession, 1974/75 through 1984/85.
Boundaries of Trapping Concessions
(Where not shown as dotted lines, trapping concessions are bordered by highways, rivers or lakes.)
Boundaries of Study Area
Total Marten Harvest/Concession (2)
Trapping Concession Numbers 270
Territorial/Provincial Border
Marten Release Sites
Highways
Rivers
Closed Trapping Area
Shaded area denotes a quota of 10 marten / concession / year as of 1985
Kluane National Park
62°
61°
60°
137°
136°
135°
134°
133°

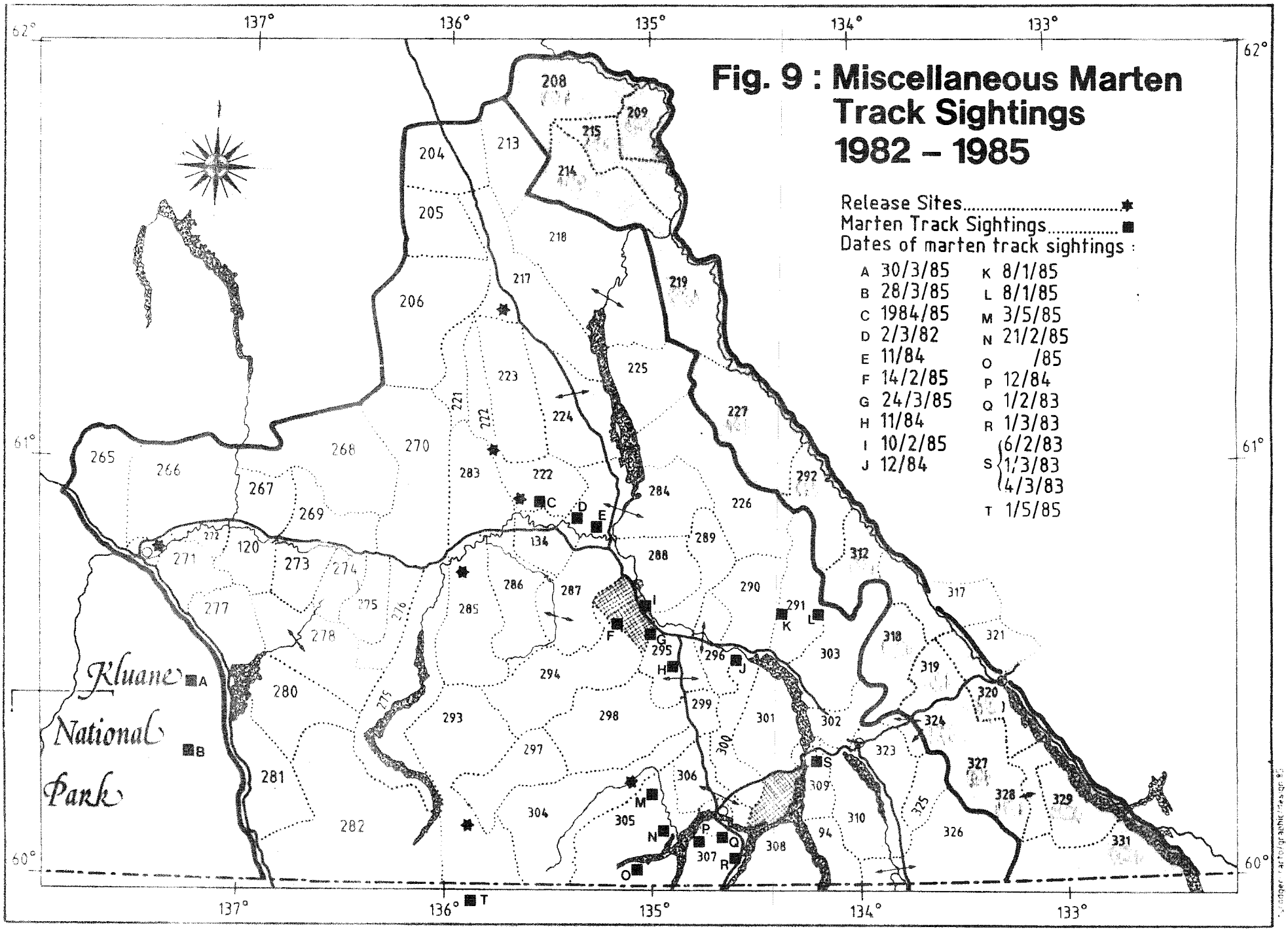
Fig. 9 : Miscellaneous Marten Track Sightings 1982 – 1985
Release Sites
Marten Track Sightings
Dates of marten track sightings :
A 30/3/85
B 28/3/85
C 1984/85
D 2/3/82
E 11/84
F 14/2/85
G 24/3/85
H 11/84
I 10/2/85
J 12/84
K 8/1/85
L 8/1/85
M 3/5/85
N 21/2/85
O /85
P 12/84
Q 1/2/83
R 1/3/83
S 6/2/83, 1/3/83, 4/3/83
T 1/5/85
Kluane National Park
62°
61°
60°
137°
136°
135°
134°
133°

therefore increase the likelihood of all females getting bred. Ashbrook and Hanson (1930:6) found that the normal breeding season of marten occurs "usually between the middle of July and the third week in August ... "If the locations where the radioed marten of the Takhini Lake and Wheaton River areas were last located are an indication of the extent of their newly established home ranges, female no. 55/54 might not have met a male during the 1984 breeding season. Another male will be introduced near where this female was last located.

A future consideration with regard to the location for marten release sites should be the proximity of large water bodies. Dispersal subsequent to reintroduction (which is usually carried out in a period when waterbodies are frozen) might result in females being physically separated from males during the following open water season (during which breeding occurs). Hawley and Newby (1957) and Buskirk (1983) found no indications that marten had crossed a body of water which required them to swim. Marten no. 61/62 appears to be an exception to these findings, being relocated on opposite sides of Takhini Lake (Fig. 6b) on August 16 and September 18, 1984. On both dates the lake, as well as the Takhini River, was open.

The sedentary behaviour of a number of marten (no.'s 401/448, 32/33, 100/99) indicated that adequate habitat is present. Intraspecific competition with other released marten, as well as a "homing instinct", may have been the cause for some marten to move away from the release site. Another explanation is that the wandering and exploratory marten may have been analagous to the temporary transients as reported for native populations (Hawley and Newby 1957, Archibald and Jessup 1984). The home range sizes reported in Table 18 for apparently established marten is similar to that reported by Archibald and Jessup (1984).

The case of intussusception suffered by marten no. 46/47 points to the need of monitoring feeding behaviour after transmitter implantation. Food passage through the gut is blocked in this condition and should prevent food intake.

Telemetry-based sampling schemes are subject to sampling errors. The errors involved in delineating home ranges that are relatively small, with the aid of transmitters producing relatively weak signals, can be expected to account for large samplings errors. The short transmitter life precludes qualitative statements about home range establishment of several radioed marten. Buskirk (1983) experienced periods of transmitter life of similarly short duration. This contrasts sharply with telemetry studies of other carnivores (Mech 1974).

The most important forest type with which radioed marten were associated during monitoring flights was white spruce forest with a basal cover of over 20%. Figure 7 shows no apparent vegetation affinity, as all cover types were utilized including a regenerating burn. Whether their association with the utilized forest types represents an active selection/avoidance or a mere random distribution over the available habitats remains material for further investigation.

The numerous marten sightings shown on Figure 9 are in part generated by an awareness created by the marten project. Therefore, while they are not

necessarily due to an increasing population, they do serve to document the present distribution of marten. Track sightings, systematic track-counts, accidental marten captures and trapper questionnaire responses will all serve as gauges of success of the project in future years.

7.0 Conclusions

Marten are not being overharvested in Yukon even though up to 5700 per year are taken. They are generally common to abundant except in the southwest. Marten are believed to be below carrying capacity in this area, where the reintroduction program was initiated in 1984. 82 marten have been released to date, and further releases are planned for 1985/86.

The ecology of the marten is generally well understood, especially in terms of population dynamics and food habits. Habitat requirements need further analysis.

A formal brochure is needed for trapper education on marten management on a trapline basis.

A management plan will give long-term direction and strength to the management of this valuable Yukon furbearer.

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