PROGRESS REPORT ON THE STUDY OF MOVEMENTS OF MARTEN IN THE MACKENZIE VALLEY - SAHTU DISTRICT

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ABSTRACT

We have radio-tracked 12 marten (*Martes americana*) over fourteen months as part of a continuing study of their movements and habitat use in the taiga of the northwestern Northwest Territories. The study area is 35 km^2 and is divided equally into two distinct habitat types: a black spruce (*Picea mariana*)-lichen association (primarily *Cladonia* and *Cladina* spp.), the dominant forest type in the area, and a 21 year old burn. A total of 181 marten re-locations have been made to date. Of the 7 adult marten ($\geq$1 yr) captured in March and June 1990, 4 are known to have remained on the study area until the present time. Mean total home range size was 9.7 km^2 and varied considerably (s.d.=7.7). The total home ranges of males ($x=10.9\pm8.7$ km^2, n=6) were larger than those of females ($x=6.1\pm2.8$ km^2, n=2). Using the 95% convex polygon technique to exclude outlying fixes, mean range size was 5.8 ± 5.1 km^2 (males: 6.5 ± 5.8 km^2; females: 3.9 ± 2.5 km^2). Males overlapped with one another considerably less, but this too was variable ; the ranges of the two adult females were exclusive. Four juvenile marten captured on the study area in September remained on the study area until at least December and their ranges overlapped widely with those of the adults. The 95% home ranges of two adult marten and three juveniles were entirely within the burn; these marten did not show any preference for either of two regeneration types within the burn. Another seven marten home ranges included both burned and unburned habitat. They also did not show a significant preference for the burned portion of their ranges.

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INTRODUCTION

In the Northwest Territories, marten occur across the entire forested region as far north as the Mackenzie Delta (Fig. 1). They remain the most important furbearing animal as measured by the dollar value of fur sold mainly by trappers of aboriginal origin. For example, in 1990 $1.3 million worth of marten fur from the Northwest Territories was sold by southern fur auctions compared to $466,000 worth of lynx, the second-most economically important furbearer.

Despite their economic importance to a segment of the human population which, in many settlements, has no other major source of income, virtually nothing is known about the basic ecology of marten in the Northwest Territories. Studies conducted in the Yukon and Alaska during the last ten years remain the most relevant, although these were generally in areas of better developed, boreal forest rather than the open, black spruce (*Picea mariana*)-lichen forest type (taiga) that covers much of the forested portion of the western Northwest Territories. At present, except for a regulated season on marten, there is no active management of marten in the Northwest Territories. Trapping is based almost entirely on traditional community areas and the location of individual trap lines is determined mainly by family tenure in an area and mutual agreement between trappers. At present, we have no information on which more refined recommendations concerning trapline spacing in relation to marten behaviour can be made.

As in other northern areas, the suppression of forest fire is a contentious issue. The public often wishes to see greater efforts devoted to the control of fire over vast tracts of land because of the perception that all fire is deleterious to wildlife, including economically important furbearing species. Governments, on the other hand, may be faced with fixed or reduced financial and other resources. Compounding the issue, is the paucity of information on the effects of forest fire on wildlife, especially furbearers, in the northern boreal forest and how wildlife responds to recently burned areas.

The objectives of this continuing study of marten in the western Northwest Territories are:

1) To determine the home range characteristics of marten in a representative area of taiga forest in the Northwest Territories

2) To determine the movements of marten relative to the two major habitat types in the above area, open black spruce forest (taiga) and burned forest

3) To make recommendations concerning the spacing of traplines in the taiga of the western Northwest Territories allowing for a sustained harvest

STUDY AREA

The study area is situated in the Mackenzie Valley, approximately 20 km west of the town of Norman Wells (Fig. 1). Half of the study area consists of open black spruce forest. Tree height ranges from 5-10 m and trunk diameters from 4-14 cm (breast height). The other half consists of a 21 yr. old burn (Fig. 2). This was an intense burn leaving little in the way of islands or stringers, even along watercourses. The study area contains several seismic exploration lines cleared over the last 10-20 years which allow for access into all parts by snowmobile in winter and on foot in summer.

The study area has a cold, dry subarctic climate. The mean annual temperature is +8°C, ranging from a mean minimum of -34°C to a mean maximum of +22°C. Annual precipitation averages 330 mm with 200 mm of rain and 1200 mm of snow. Snow covers the area from approximately late October until early May. The area is underlain by discontinuous permafrost.

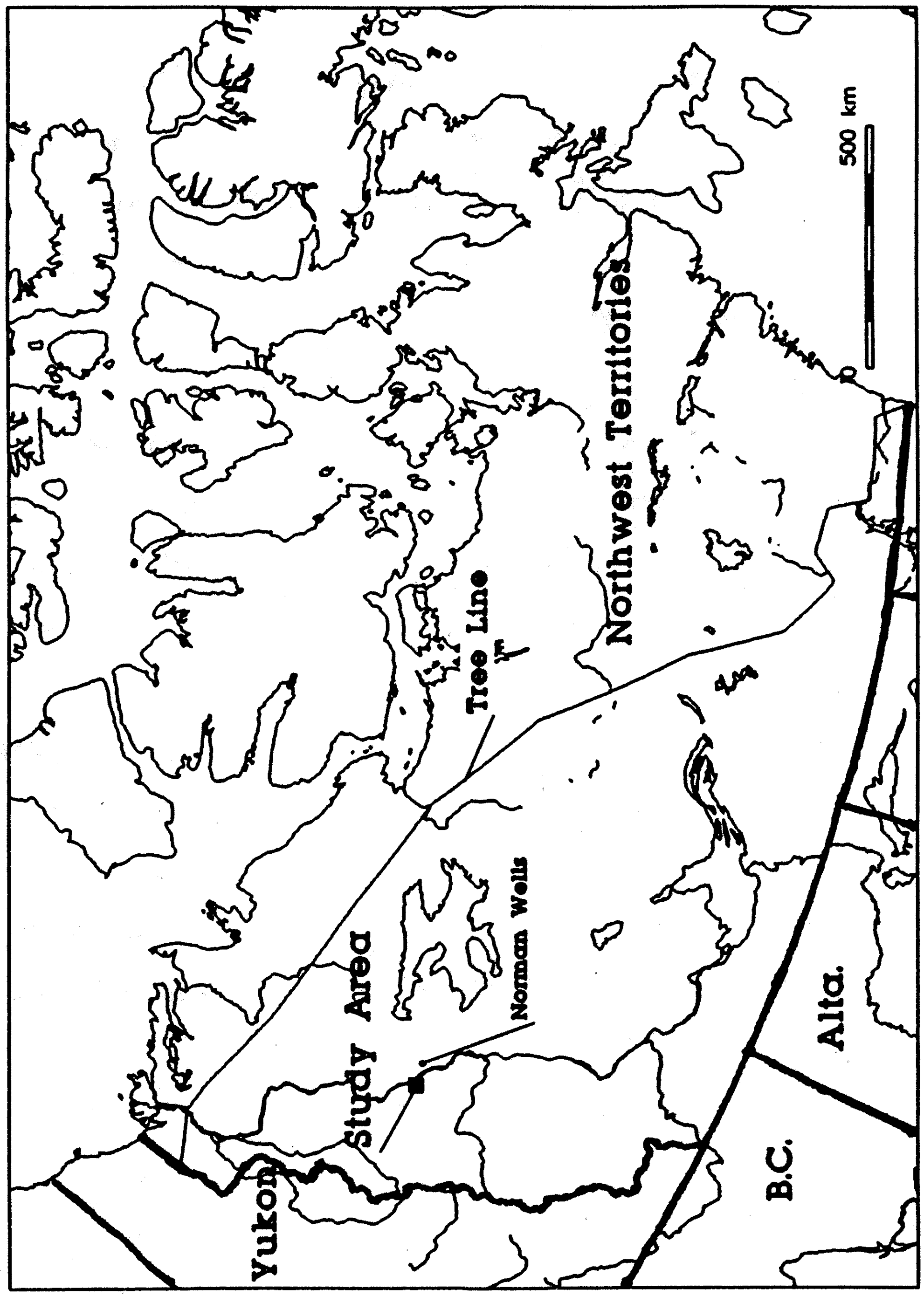

Figure 1. The forested portion of the Northwest Territories and study area location.

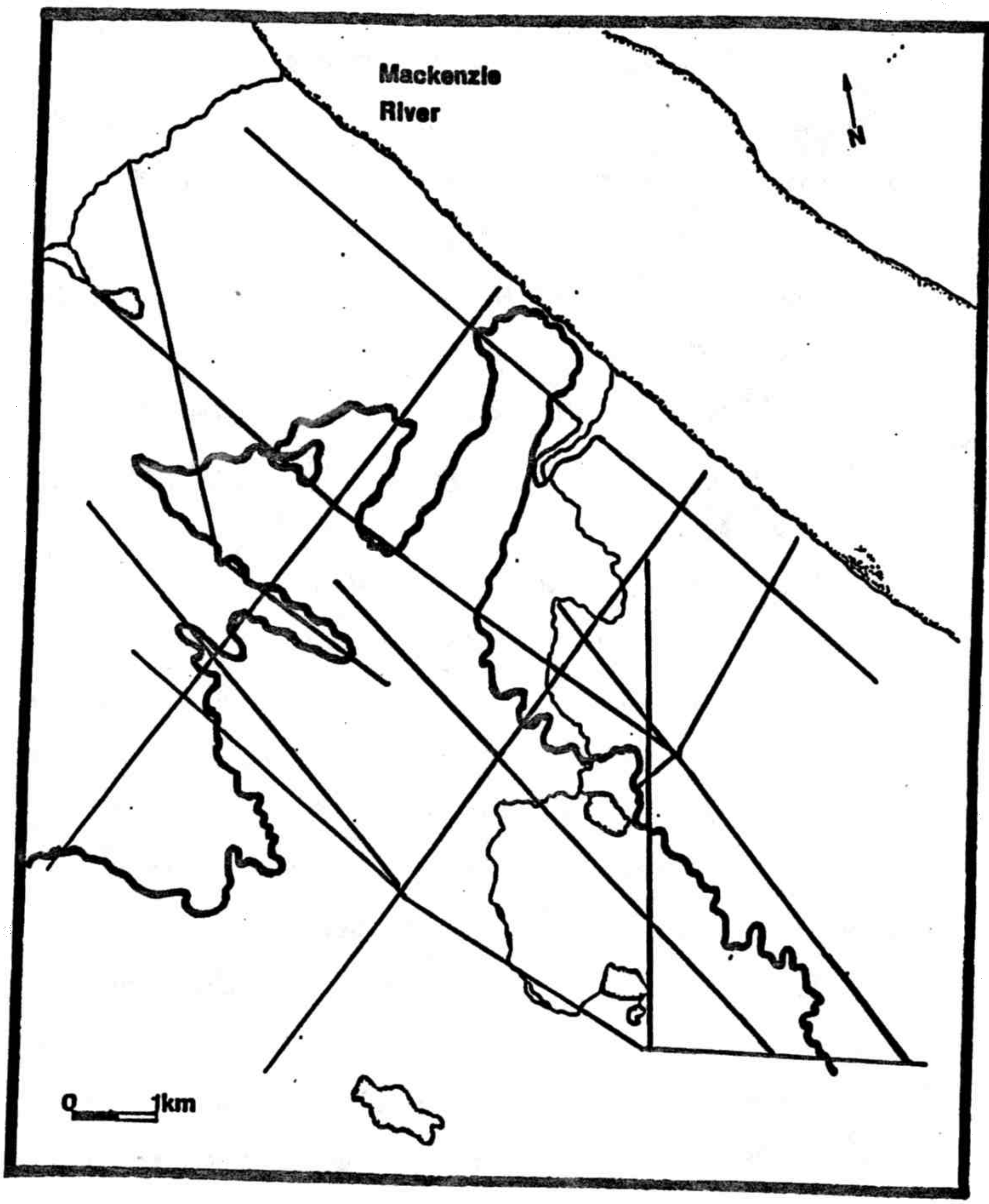

Figure 2. The study area showing the burn edge,and trails used for access.

MATERIALS AND METHODS

Marten were captured in 75 x 20 x 20 cm Tomahawk traps (Tomahawk Live Trap Co. Tomahawk, WI.) spaced at 400-600 m intervals along seismic lines within the study area (Fig. 3). Trapping periods were of 4-7 days duration when traps were checked once per day except when nightly low temperatures exceeded -25°C when traps were checked twice per day. Trapping periods were in spring (early June), autumn (early September), and winter (once per month December through March). Marten were run into a capture cone and immobilized with Telazol (A.H. Robbins Co., Richmond, VA.) (.06-.08 ml/animal). All marten were weighed, ear-tagged, and a pre-molar tooth pulled for age determination. A radio transmitter (Lotek Engineering, Aurora, ONT.; Telonics, Mesa, AZ.) was affixed to each new marten by means of a neck collar. These radios transmitted on the 151 mHz band, had a total weight of 35-45 g, and had a functional life of 6-14 mo depending on the model and manufacturer. All marten were released at the capture location.

Relocation of radio-collared marten was attempted approximately every ten days using helicopter in summer (Bell 206B) or, in winter, from snowmobile augmented by monthly helicopter searches. The accuracy of relocations was tested for both aerial and ground modes of relocation by placing transmitters randomly in the study area and having field personnel search for them.

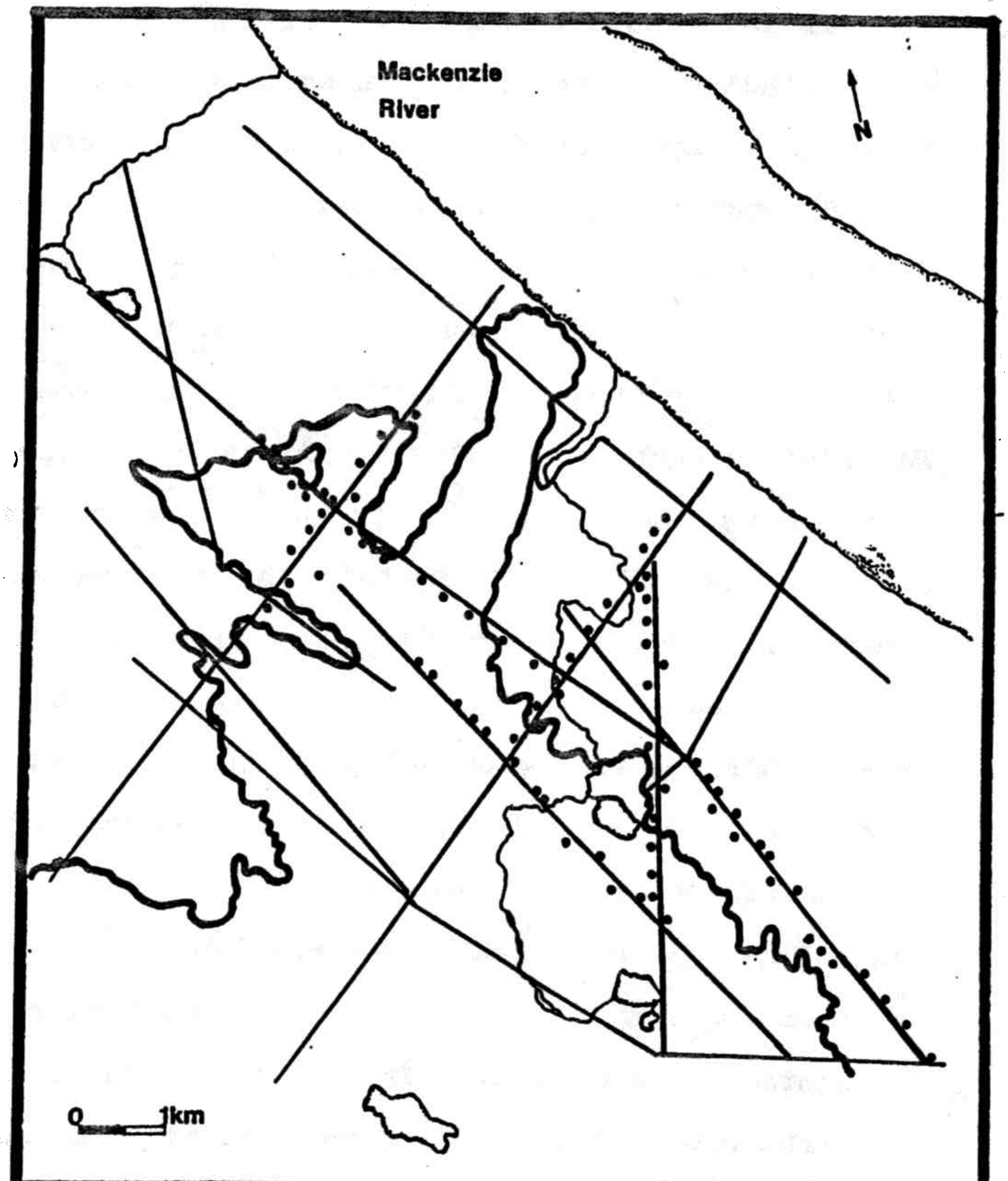

Figure 3. Distribution of traps within the study area.

Relocation data were analysed using the HOMERANGE program most recently documented by Ackerman et al. (1990). Because of the sample sizes obtained thus far and for comparison with other studies, marten home ranges were represented by both total home ranges and 95% minimum convex polygons.

Stretch enhancements of satellite imagery were used to determine the vegetational composition of marten home ranges area. For home ranges totally within the burn, the surface area of the two major regeneration types, deciduous (primarily *Populus tremuloides, Betula papyrifera, Salix spp.*) 2-4 m in height and black spruce 1-2 m in height, was determined using a Geographic Information System. The observed coverages of these two regeneration types within each marten home range was then compared to the expected based on the coverage of each type within the entire burned portion of the study area. To determine the use relative to abundance of the two regeneration types, the technique of Byers et al. (1984) was used. Here the confidence intervals based on expected and observed amounts of use of a set of habitat classes were calculated using Bonferroni intervals. For marten home ranges including both burned and unburned habitat, the use relative to abundance of six vegetation classes was also calculated using Bonferroni intervals.

In this analysis, April to the following April was considered the first year of life. Marten estimated to have been born in the preceeding year, as determined by tooth sectioning, were therefore classified as juveniles until April of the following year; all others were considered adults.

RESULTS

We confined our trapping to a 35 km^2 area (Fig.3). Traps were set for a total of 1319 trap days and there were a total of 32 marten captures (including recaptures) for a trapping average of 1 marten/41 trap days.

Checks on the accuracy of our aerial relocating indicated that 60% of relocations were within 100 m of true and 70% were within 200 m. Similar results were obtained during checks of our ground relocating accuracy.

As of May 1991, 12 marten were radio-tracked for a total of 181 relocations. Marten were relocated an average of 17 times. Figure 4 shows the time of marten capture and their periods of study. Of 7 marten captured in March and June 1990, at the onset of the study, 4 remained on the study area until at least May 1990; the fate of the others is unknown. Three of these 4 were adults at least one year old and one was at least 2 years old. An additional 5 marten were captured in September 1990, one adult (5 yrs.) and four juveniles of the year. Two of these juveniles are known to have remained on the study area until present and one died on the study area in January 1991. As of May 1991, there were a minimum of eight marten (6 adults; 2 yearlings) using the 35 km^2 trapped area for an average of one marten/4.4 km^2. However, the marten used a total area of 140 km^2 for a density of one marten/17.5 km^2.

Mean total home range size for the 8 adult marten was 9.7 km^2 although this varied considerably (s.d.=7.7 km^2). The total

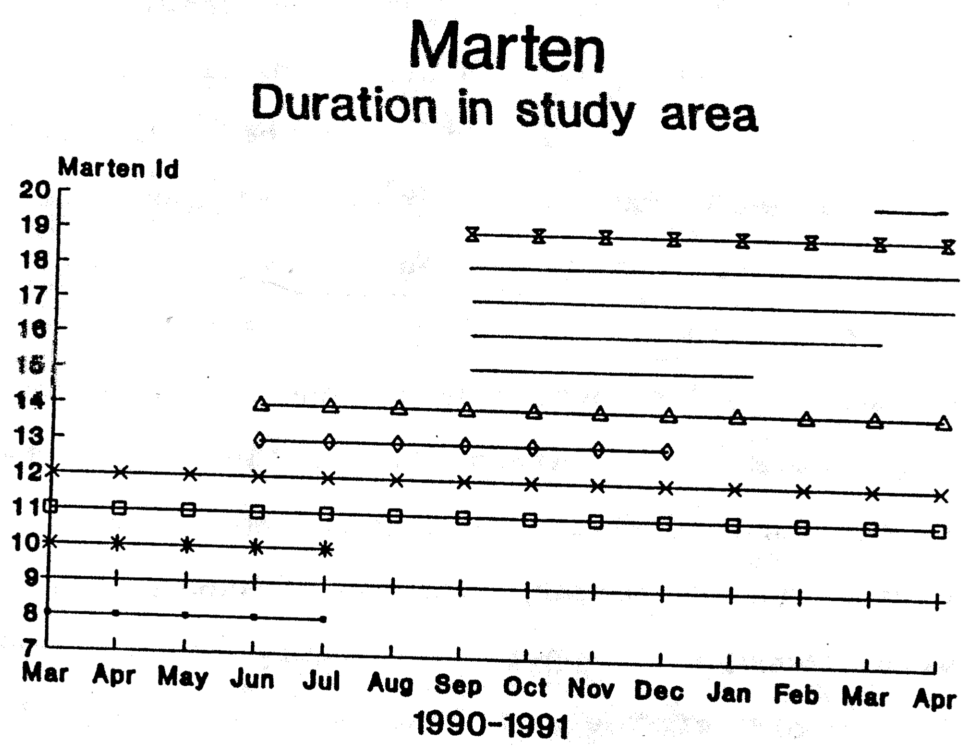

Figure 4. Times of first capture and study periods for all marten caught on the study area.

home ranges of males ($\bar{x}$=15 reloc.) were larger than those of females ($\bar{x}$=21 reloc.)(males:$\bar{x}$=10.9±8.7 km^2, n=6; females:$\bar{x}$=6.1±2.8 km^2, n=2) for a ratio of 1.8:1. Mean home range size for all adult marten, as defined by 95% convex polygons, was 5.8±5.1 km^2. For males, the mean was 6.5±5.8 km^2 and females 3.9±2.5 km^2 for a ratio of 1.7:1.

The 95% convex polygon home ranges of adult males overlapped broadly with those of adult females. If the ranges of three males that disappeared in the spring are disregarded, the two female ranges were still overlapped broadly by those of males (Fig. 5). There was, however, virtually no overlap between the home ranges of four male adult martens known to be on the study area during March-June (9 relocations each)(Fig. 6). Similarly, there was very little overlap between three males (10 relocations each) known to be on the study area during June-September, although a fourth male, with a very large range, overlapped considerably with all three (Fig. 7). The ranges of the two females were separated by several kilometers while preliminary data on a third indicates little or no overlap with these other two females. The home ranges of the four juveniles captured in September overlapped widely with the resident adults until December and the remaining two did until April (Fig. 8).

The 95% home ranges of two adult marten were entirely within the burn during the first year of the study. One, an adult female, denned and produced young in the burn. Another adult male (1.5 yrs.) also had a range entirely within the

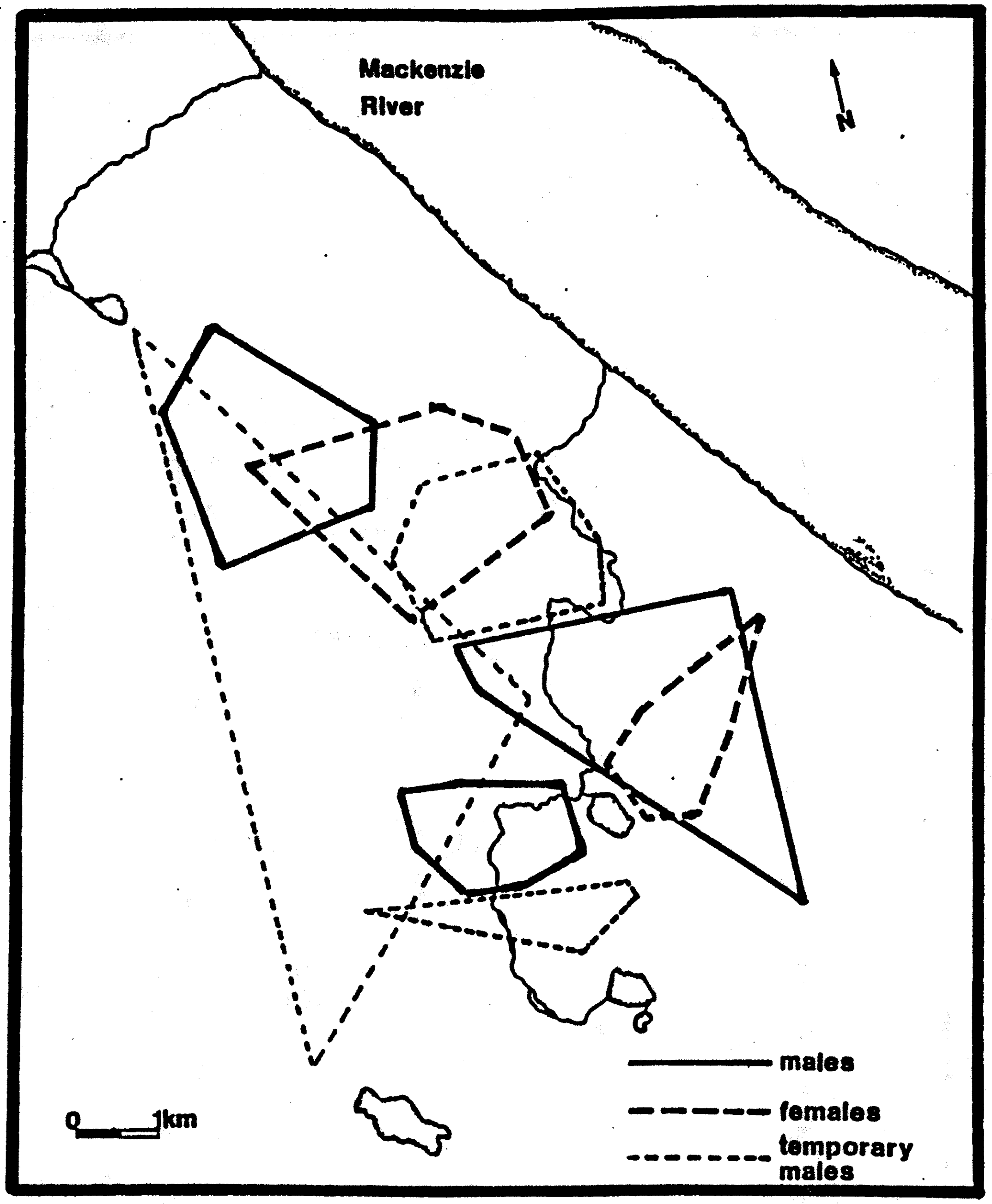

Figure 5. 95% minimum convex polygon home ranges of eight adult (> 1 yr.) marten captured on the study area.

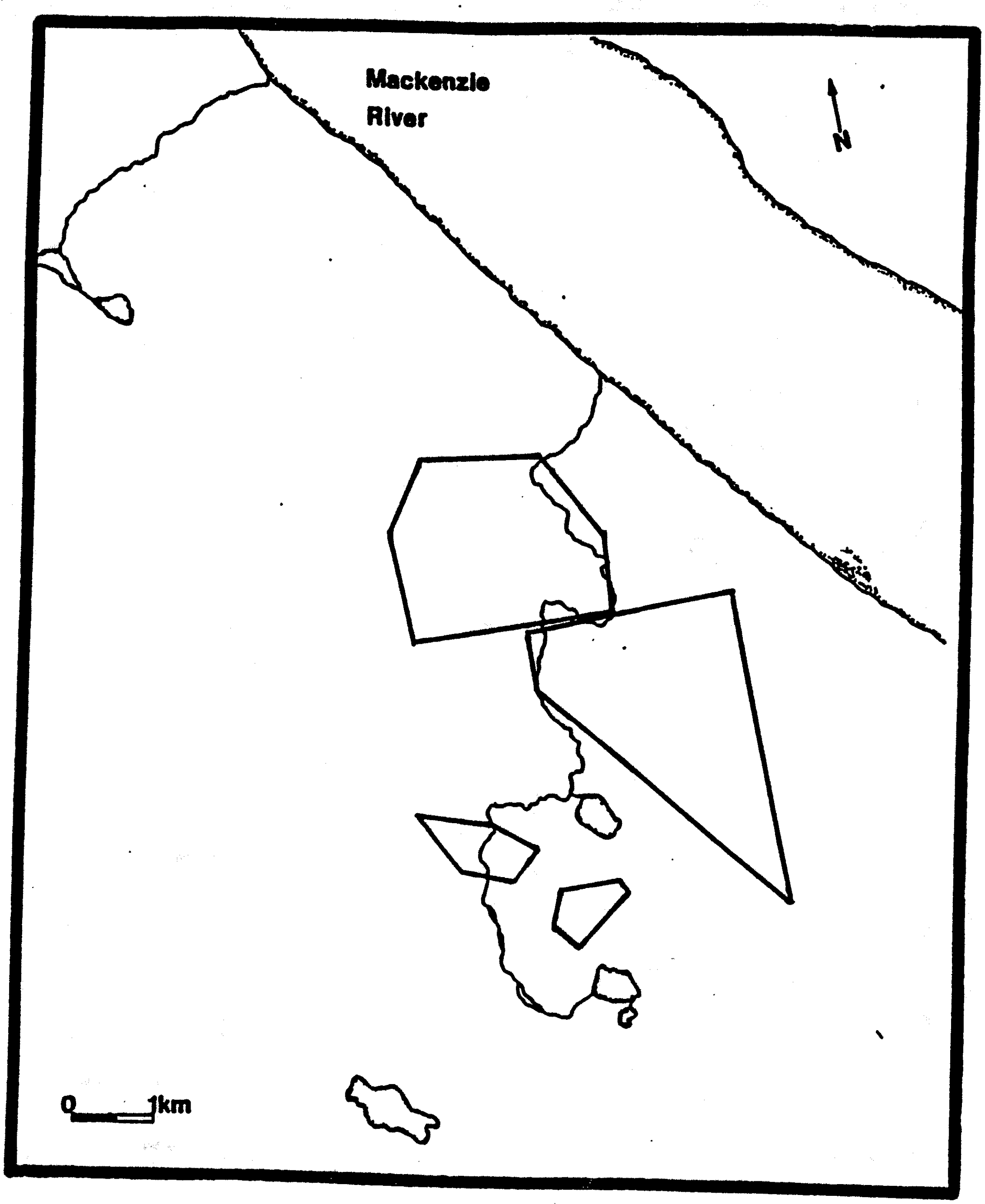

Figure 6. 95% minimum convex polygon home ranges of four males on the study area during March-June.

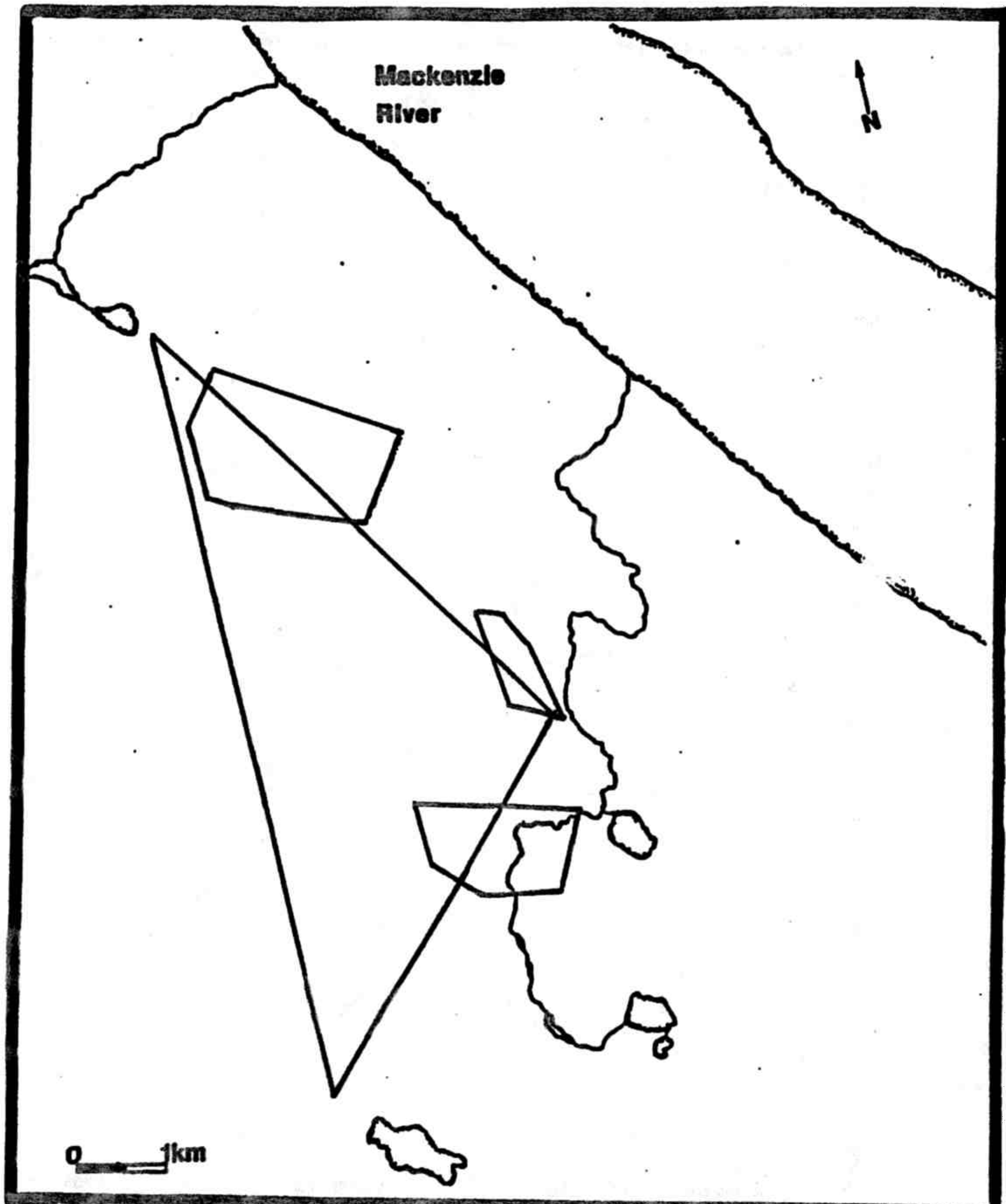

Figure 7. 95% minimum convex polygon home ranges of four males on the study area during June-September.

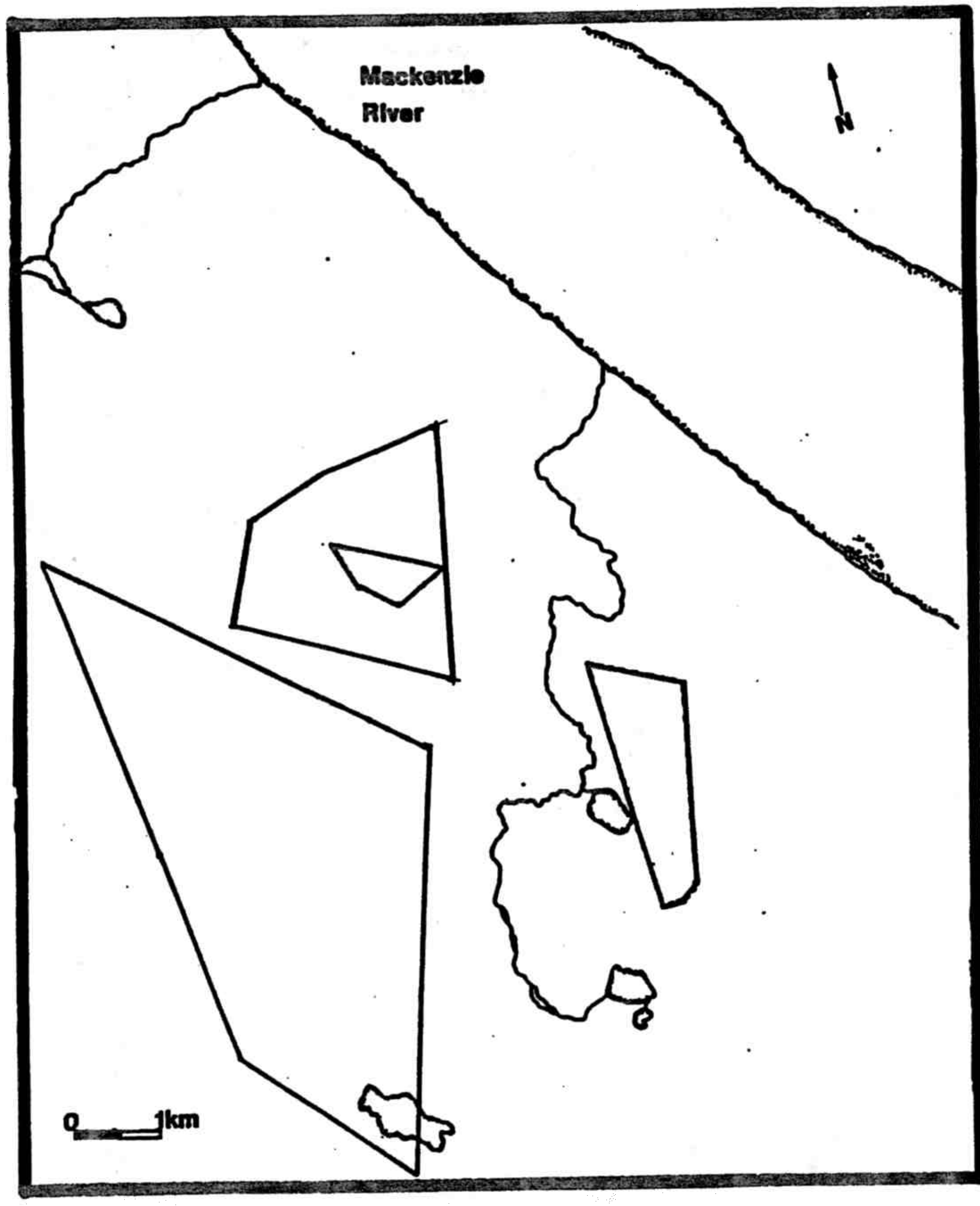

Figure 8. 95% minimum convex polygon home ranges of four juveniles captured in September and and radio-tracked through winter, 1990-1991.

burn before it disappeared after 4 months of study. The home ranges of three juveniles were also entirely within the burn. There were no trends with respect to the relative amounts of the two major regeneration types within the home ranges of these marten (sign test, $P>.05$) (Table 1), and they did not use the two regeneration types any more or less than expected by chance (Table 2). Martens having home ranges including both burned and unburned habitat did not show a significant preference for the burned portions of their home ranges over five other vegetation classes as indicated by the expected value of P_i (.539) lying within the calculated Bonferroni interval (Table 3).

Table 1. Amounts of deciduous regeneration within ranges of marten occurring entirely within the burn.

Marten	Observed area (km^2)	Expected area (km^2)	Sign
9	0.66	0.58	+
10	0.97	0.45	+
13	3.06	4.81	-
15	0.06	0.11	-
18	5.00	5.01	0

Table 2. Average use of the two regeneration types relative to abundance by marten with home ranges entirely within the burn.

Regeneration type	Expected proportion of use (P_{io})	Actual proportion of use (P_i)	Bonferonni intervals for P_i
deciduous	.280	.350	.207 < P < .492
spruce	.720	.649	.506 < P < .798

Table 3. Use of six vegetation classes relative to their abundance by marten with home ranges in both burned and unburned forest.

Vegetation type	Expected proportion of use (P_{io})	Actual proportion of use (P_i)	Bonferonni intervals for P_i
burn	.539	.542	.413 < P < .670
spruce	.205	.238	.128 < P < .347
spruce/decid.	.162	.209	.104 < P < .313
bog	.011	.000	P=.000
riparian	.035	.009	.000 < P < .033
unclassified	.035	.009	.000 < P < .033

DISCUSSION

Although our study remains in progress, the radio-tracked martens in this study appear to be at lower density and the sizes of their ranges larger than radio-tracked martens in southern areas of their North American range and martens in other northern boreal regions. In telemetry studies done in Wyoming, Minnesota, Wisconsin, Maine (cited in Strickland and Douglas 1987 and Buskirk and McDonald 1989), and Ontario (Thompson and Colgan 1987) the average range size for males was 7.5 km^2 and for females 3.8 km^2 compared to the 10.9 km^2 and 6.5 km^2 of this study. Studies done in the boreal forest in the Yukon, Alaska and Newfoundland are likely the most comparable from the standpoint of habitat. The marten home ranges in the present study were, however, 35% larger than in the Yukon (Archibald and Jessop 1984) and at least that for those reported in Alaska (Buskirk 1983; Magoun and Vernam 1986). Marten home ranges in Newfoundland (Bisonette et al. 1988 cited in Buskirk and McDonald 1989) appear to be at least as large as those of the present study, although their results were from a disturbed study area. Body weights of male marten did not differ significantly (t-test, P>.05) from the weights of male marten in Alaska (Buskirk 1983) thus the larger home ranges in this study cannot be attributed to solely differences in body size (Harestad and Bunnell 1979) and as discussed by Buskirk (1983). Despite the geographic differences in home range size, however, the male:female ratio of home range size in this study (1.7:1) was similar to that reported by Buskirk (1983)(1.8:1) and Archibald and Jessop (1984)(1.3:1). As in most other studies (Strickland and Douglas 1987), the home ranges of all adult marten and juveniles present on the study area simultaneously overlapped widely. Likewise, there was a large degree of intra-sexual separation of home ranges as reported by Archibald and Jessop (1984). There was no indication, however, that during the July-August breeding season males expanded their home ranges as discussed by Archibald and Jessop (1984), but it may be that our sampling was not frequent enough to detect this.

Some martens used the burn exclusively while others used both burned and unburned forest. Past studies have described the importance of an overstory (Koehler and Hornocker 1977; Hargis and McCullough 1984) or a dense complex of logs and deadfall for marten to effectively hunt in burns and open areas (Hargis and McCullough 1984; Magoun and Vernam 1986). In winter, this complex must be of sufficient height to allow access to sub-nivean spaces for hunting small mammals. In summer, this complex is important as both protective cover for marten and for hunting. In this study, much of the burned timber in both deciduous and spruce regeneration types remains standing 21 years after the burn and what deadfall their is lies directly on the ground. This is a common feature of burns within the open boreal forest. The marten in this study, however, appear capable of hunting in a burn having a thin overstory and a sparse deadfall layer, both during winter when little of it projects through the >1 m deep snow and during summer when, at best, it would be sparse protective cover. Small mammals (*Clethrionomys rutilus, Microtus*. spp.) are known to be the major prey of marten in the western Northwest Territories (Douglass et al. 1983) but how the martens on our study area in winter regularly access sub-nivean space thought necessay for obtaining this prey (Hargis and McCullough 1984; Magoun and Vernam 1986) is unknown. There is the possibility that snowshoe hares (*Lepus americanus*) are major prey during at least part of the winter (Slough et al. 1989; Thompson 1986). Parts of the burn, especially deciduous regeneration, contained large numbers of hares. In summer, how these marten contend with the lack of protective cover in the burn remains unknown. Detailed information on seasonal food habits, seasonal movements and how marten are exploiting the burn, deduced for example through snow tracking, are required for a better understanding of the importance of the burn to these marten.

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