Marten Research In The Nwt
Catalogue Number: 5-1-49

MARTEN RESEARCH IN THE NWT

Sector: Wildlife Products

5-1-49
Analysis/Review

MARTEN RESEARCH

IN THE NWI’, 1989-90

Northwest Territories Renewable Resources

MARTEN RESEARCH
IN THE NWT, 1989-90

KIM G. POOLE
DEPARTMENT OS? RENEWABLE RESOURCES
GOVERNMENT OF THE NORTHWEST TERRITORIES
YELLOWKNIFE, NWT

1990

Northwest Territories Renewable Resources

Manuscript Report No. 38

The interpretations presented in this report are those of the author and do not necessarily represent those of the Department.

ABSTRACT

This report summarizes marten harvest trends and analysis of the second year of a carcass collection program conducted in the NWT during 1989-90.

The 1988-89 harvest was 29,730 pelts, a decline from the 1987-88 high of over 37,000 pelts, but still among the highest harvests recorded this century. Average pelt price dropped 18% to $87. Figures for the 1989-90 season are not yet available.

A total of 355 carcasses were collected from trappers in Ft. Good Hope, Ft. Franklin, and Ft. Rae, to: a) evaluate differences in trapping intensity, morphometrics, body condition, and reproductive parameters, and b) examine techniques to determine sex (if heads alone are collected) and separate juveniles from older age classes.

The age structure of martens harvested differed considerably among the three communities. Juveniles made up 65% of the Ft. Good Hope sample, 24 %" of the Ft. Rae sample, and only 3% of the Ft. Franklin sample. The Ft. Franklin sample was heavily skewed toward older animals. Age and sex ratios suggest that trapping pressure by the Ft. Rae trapper, and one of the three Ft. Good Hope trappers was high. The unusual age structure of the Ft. Franklin harvest may indicate a widespread prey decline and recent reproductive failures or large scale movements related to large, intense wildfires in recent years.

Body fat content did not differ among areas or between years; juveniles had more fat than older martens. Body fat contents did not differ between sexes. Martens from the Sahtu were significantly larger and had higher productivity than martens from the other communities. These martens are among the largest and most productive in North America.

Total skull length was superior to lower canine width or root length for separating sexes. Pulp cavity :tooth width ratios (percent pulp cavity) were slightly more accurate than length of temporal muscle coalescence for separating juveniles from older martens within each sex. However, the percent pulp cavity technique was considerable y more labour-intensive. The temporal muscle coalescence technique can be used by trappers in the field to determine the proportion of juveniles and older marten in their harvest. Both aging techniques likely give adequate results for most management purposes.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Martens (*Martes americana*) continue to be the single most valuable furbearing resource to trappers in the Northwest Territories (NWT). Marten pelt prices generally have weathered the recent downturn in the fur industry, ensuring that pressure on marten stocks likely will remain high for the near future.

Given the importance of martens to northern trappers, a program has been developed to monitor the marten harvest in selected areas. This annual report will summarize marten harvest trends, and ongoing research programs conducted during the past year. Some analyses and interpretations of the data have been conducted, but the information and conclusions provided here should be considered preliminary. Previous studies have been summarized in Poole (1989). Marten research conducted by Ron Graf, Regional Biologist in Ft. Smith, including carcass collections and the South Slave live-trapping study, and a radio-tracking study of marten habitat use in a bum near Norman Wells, will be reported elsewhere.

The following areas will be covered in this report:

1. Trends in harvest and pelt price.
2. Carcass collections conducted primarily to:
   a) examine age and sex ratios in the harvest,
   b) provide body and reproductive condition indices, and morphometric comparisons, and
   c) examine techniques for rapidly determining sex (if heads alone are collected) and age class.

MARTEN HARVEST

During 1988-89, 1324 out of 2352 trappers in the NWT sold marten pelts, and harvested 29,730 pelts worth $2,584,()()0. Marten harvests have remained high for much of the past decade (Fig. 1). Figures for the 1989-90 season are not yet available.

Harvests in recent years were concentrated throughout the western NWT (Table 1). A general drop in production was observed in most communities compared with 1987-88. No assessment of harvest effort has been conducted, but the total number of trappers decreased 20% and the number of trappers who sold marten pelts declined 12% between years, possibly indicating an overall decrease in trapper effort.

The average price of a marten pelt increased during the late 1970s and increased again in the late 1980s to peak at $110 in the 1986-87 season (Fig. 1). The average pelt price for the 1988-89 season was $87, a drop of 18% from 1987-88.

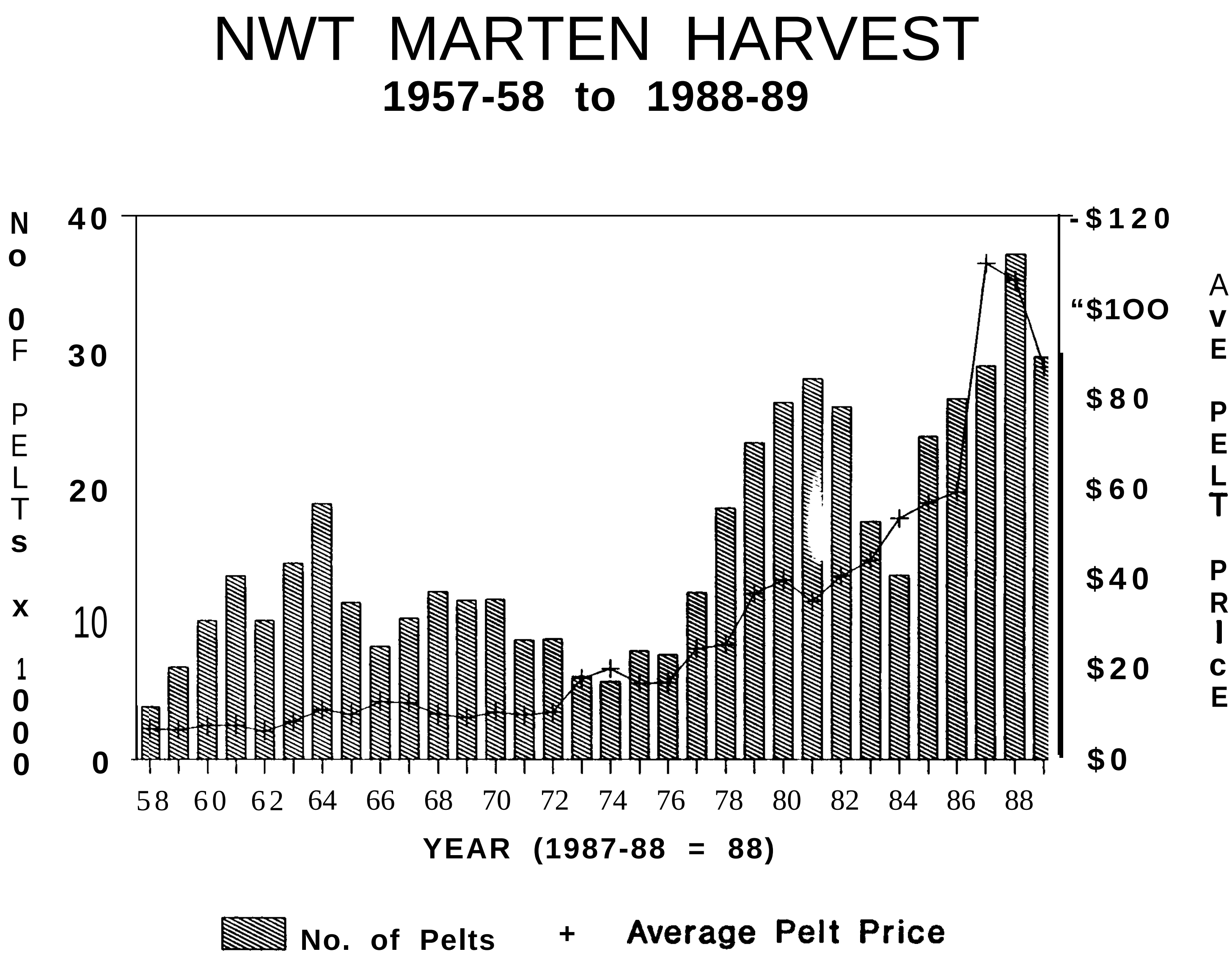

Figure 1. Marten harvest and average pelt price for the NWT, 1957-58 to 1988-89.

Table 1. **NWT** marten harvest from fur returns for 1987-88 and 1988-89.

Community	1987-88	1988-89	% Change
Aklavik	472	185	-61
Arctic Red River	669	354	-47
Colville Lake	1282	1084	-15
Ft. Franklin	2332	1802	-23
Ft. Good Hope	2793	1780	-36
Ft. McPherson	1583	1617	i!
Ft. Norman, N Wells	1479	1154	-22
Inuvik	1201	727	-39
Tuktoyaktuk	778	227	-71
Paulatuk	116	83	-28
Dettah	264	73	-72
Ft. Liard	3693	2280	-38
Ft. Providence	1312	1556	19
Ft. Rae	3316	2861	-14
Ft. Reliance	67	37	-45
Ft. Resolution	637	569	-11
Ft. Simpson	3448	2968	-14
Ft. Smith	919	875	-5
Hay River	854	705	-17
Jean Marie River	230	265	15
Kakisa Lake	350	393	12
Lac La Martre	1005	1056	5
Nahanni Butte	396	375	-5
Pine Point	66	45	-32
Rae Lakes	1494	1282	-14
Snare Lake	298	380	28
Snowdrift	1587	801	-50
Trout Lake	1943	2285	18
Yellowknife	601	344	-43
Wrigley	1698	1567	-8
Other	366	0	
Total NWT	37249	29730	-20

CARCASS COLLECTIONS

Introduction

The winter of 1989-90 was the second season that marten carcass collections were conducted in several areas in the NVVT. Ron Graf, Regional Biologist in Ft. Smith, collected approximately 800 carcasses from Trout Lake, Ft. Resolution and Ft. Smith; data from his sample will be reported elsewhere. This paper deals with a collection of 355 carcasses from Sahtu (Ft. Good Hope and Ft. Franklin) and Ft Rae trappers.

The purpose of this collection was several-fold:

1. Because of differences in vulnerability to trapping between males and females and between juveniles and adults, age and sex ratios of harvested animals provide an indication of trapping intensity on a marten population (Strickland and Douglas 1987). Because of seasonal variation in the relative proportion of age and sex classes of martens harvested, the entire harvest from a trapper or area must be examined. Carcass examination can also document the chronology of age and sex classes in the harvest, that is, which classes tend to be taken more frequently at which time of the season.
2. Examination of carcasses provides a comparison of marten body condition (using fat indices) and reproductive parameters among martens from various areas. Examination of body and skull measurements will also determine the degree of morphometric differences among NWT martens.
3. Rapid and cost-effective techniques are needed to separate juvenile (young-of-the-year) from older age classes, and determine sex (if heads alone are collected), so that large samples of carcasses may be processed. Several methods to identify the juvenile age class have been proposed (summarized in Strickland and Douglas 1987, Magoun et al.

1989), and two of them will be examined here. Radiographs have been used to determine the percentage of pulp cavity in marten canines. Little or no overlap between juveniles and older animals has been reported (Dix and Strickland 1986, Nagorsen et al. 1988). The degree of coalescence of the temporal muscle on the top of the skull has also been suggested as an inexpensive and effective technique to distinguish between juveniles and adults (Magoun et al. 1989).

If heads alone are collected, a method to determine sex is needed. Martens are sexually dimorphic, and skull measurements of males are on average greater than fernales (Brown 1983). Three measurements will be examined for use as criteria to identify sex from heads alone; canine tooth width and root length (Brown 1983), and total skull length (Magoun et al. 1989).

Methods

With the assistance of Department of Renewable Resources (DRR) staff in Ft. Good Hope, Ft. Franklin and Ft. Rae, cooperative trappers with a history of high marten harvests were provided with carcass tags, and were asked to tag all martens harvested, noting location and date taken. Trappers were asked to turn in their entire season's catch so that the complete chronology of age and sex over the trapping season would be obtained. A total of 3S5 carcasses was collected from Ft. Good Hope (166 carcasses from three trappers), Ft. Franklin (140 carcasses from one trapper) and Ft. Rae (49 carcasses from one trapper). Because of the relative proximity of trapping areas (< 120 km apart), samples from Ft. Good Hope and Ft. Franklin were combined into the Sahtu area for some analyses. The Ft. Rae sample was taken 700 km south of the Sahtu trapping areas.

Carcasses were examined in Yellowknife. Sex, body and tail length, weight, and fat indices (weight of fresh omental fat over fresh weight [minus stomach contents] of skinned carcass) (Buskirk and Harlow 1989) were recorded. Skinned carcass weight approximates *83%* of whole body weight (Strickland and Douglas 1987). Stomach contents were weighed and frozen for later examination.

Ovaries from females judged to be 1 year or older (based on temporal muscle coalescence; Magoun et al. 1989) were stored in 70% alcohol, and subsequently soaked in water overnight and sectioned by freeze-microtome. Staining with Masson's trichrome was not conducted since there appeared to be no overall benefit to the process (Poole 1989) . Corpora lutea counts were used to assess ovulation rates and *in utero* litter size in serially sectioned ovaries (Strickland and Douglas 1987). Counts were conducted by two technicians. Because marten exhibit delayed implantation (Strickland and Douglas 1987), corpora lutes counts reflect the number of young that would have been born during the spring after harest had the female remained alive.

Total skull length (measured from below lambdoidal crest to top of incisors), zygomatic width at widest point, and length of temporal muscle coalescence (from below lambdal crest to the point where the temporal muscles join [Magoun et al. 1989]) were measured with dial callipers to the nearest 0.1 mm. The temporal muscle is on the top of the skull adjacent to the sagittal crest; length of temporal muscle coalescence approximates length of sagittal crest (Magoun et al. 1989). Sixteen (1.8%) of the skull lengths and 36 (4.0%) of the temporal muscle lengths from 1988-89 and 1989-90 ($\underline{n}$ = 903) were unreadable because of crushed or bloodied skulls.

All lower canines were extracted by simmering lower jaws in hot water for 30-40 minutes, and tooth width and root length were measured with callipers to the nearest 0.1 mm (Dix and Strickland 1986). Following procedures outlined in Dix and Strickland (1986), the ratio of pulp cavity width: tooth width (percent pulp) in lower canines, as determined from radiographs, was examined to determine the dividing point for separating juveniles ($\leq$12 months) from older martens (>12 months). Radiographs were taken at the Stanton

Yellowknife Hospital using a Senograph 600T Mammo Unit and Kodak Mammography film exposed at 30 Kv and 7 Mas. Tooth width and pulp cavity were measured in a dissecting scope equipped with a micrometer eyepiece. Seventeen (1.9%) of the tooth images on the radiographs were unreadable.

Lower canines from martens with <50% pulp cavity were aged by cementum analysis by Matson's Laboratory in Milltown, MT. In an effort to save money, most martens with > 50% pulp cavity were not sent for aging, since these were assumed to be juveniles. This division was a conservative figure based on previous results and published literature (see Results and Discussion). Combining samples between years, 19% (81/426) of the juveniles were cementum aged (range in pulp cavity 42-70%). Of 15 juveniles with <50% pulp cavity not cementum aged, 12 were females, and only one had <46% pulp cavity.

Determination of the most reliable technique to determine sex from samples of heads only was examined by discriminant function analysis. The distance between the populations (calculated by dividing the difference between the sample means by the mean standard deviation [Snedecor and Cochran 1967:415]) was used to judge which variable had the highest degree of accuracy in classification. This value must exceed 3.0 for a high degree of accuracy. The SAS-DISCRIM procedure (SAS 1988) produced a generalized squared distance between groups that also approximated this distance (Snedecor and Cochran 1967:4 15), and provided error count estimates. Skull length, canine width and canine root length were examined. Dividing points to separate sexes in each sample were derived from the formula of Dix and Strickland (1986):

$$D = \bar{x}_a + (\bar{x}_b + \bar{x}_a)(SD_a)/SD_b + SD_a$$

where SD = standard deviation of each group, $\bar{x}$ = mean of each group, and $\bar{x}_a < \bar{x}_b$.

Dividing points for separating age classes (juveniles from older) were calculated for percent pulp cavity. Lengths of coalescence of temporal muscles (non-normal data) were plotted by sex to examine the relationship to age.

Data were examined using SAS (1988) software. Some analyses reported here combine the two years of data. In this *report* age class "O" (juvenile) denotes martens in their first winter of life; yearling martens (in their second winter of life) are designated by age class "1". Statistical significance is at the $\underline{P} \leq 0.05$ level.

Results

The age distribution of martens taken in the three areas differed considerably (Fig. 2). Juveniles made up 65% of the Ft. Good Hope sample, 24% of the Ft. Rae sample, and only 3% of the Ft. Franklin harvest. Yearlings made up 41% of the Ft. Rae martens. The Ft. Franklin harvest was heavily skewed towards older animals. The oldest martens were 13 years of age.

Partly as a result of these differences in age structure, the age and sex ratios from the three areas also differed considerably (Table 2). I was unable to examine the relationship of period of capture with age and sex ratios in the harvest: the Ft. Rae sample was undated (mainly taken in November and early December), the Ft. Franklin sample had virtually no young marten at any time, and the Ft. Good Hope harvest was concentrated in November and early December, during which no trend could be detected.

There were no significant differences in fat content by age and sex classes between communities (SAS, PROC GLM $\underline{P} > 0.5$); however, differences did exist within age classes (Table 3). In both sexes, juveniles had greater mean body fat than older age classes, significantly so in the Ft. Good Hope sample (Duncan's Multiple Range Test, $\underline{P} < 0.05$). Combining all communities, there was also no difference in the body fat by age class between sexes (PROC GLM, $\underline{P}$ = O. 15). Comparing body fat by community between the 1988-89 (Poole 1989) and 1989-90 carcass samples also revealed no significant differences (PROC GLM, $\underline{P} > 0.2$).

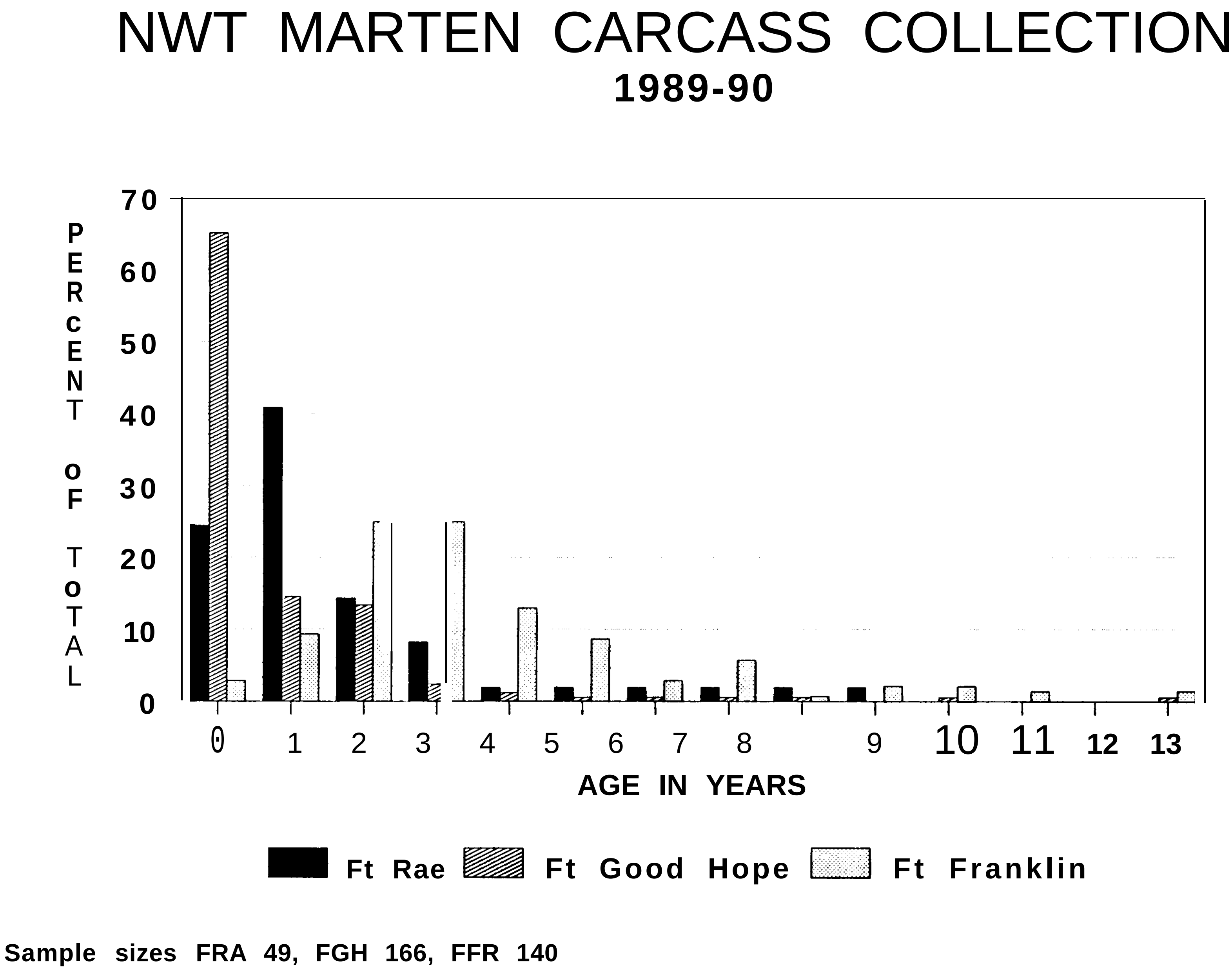

Figure 2. Age structure of marten carcasses collected from three **NWT** communities, Ft. Rae (n = 49), Ft. Good Hope (n = 166), and Ft. **Franklin (n = 140).**

Table 2. Age and sex ratios from marten carcasses, 1989-90.

Community/ Trapper	Sample Size	Ratios		
		Juv: 1 +Fem	Juv:2 +Fem	Male: Female
Ft. Good Hope				
All	166	3.72	5.68	1.02
Trapper A	42	7.50	10.00	1.33
Trapper B	48	4.71	11.00	1.00
Trapper C	76	2.50	3.46	0.90
Ft. Franklin	140	0.07	0.77	1.46
Ft. Rae	49	0.66	1.33	0.96

Table 3. Mean body fat of marten carcasses by sex and community.

Sex/ Community	Age Class (n)			
	o	1	2	3+
Male				
Sahtu[2]	2.49 (172)	1.71 (81)	1.89 (49)	1.94 (90)
Ft. Rae	2.43 (52)	1.66 (20)	2.15 (11)	1.88 (11)
Female				
Sahtu[2]	2.85 (138)	1.61 (38)	1.70 (38)	1.89 (65)
Ft. Rae	2.46 (40)	1.96 (18)	2.31 (7)	1.87 (14)

[1] Body fat derived from the following formula from Buskirk (1983):
Body fat = 603 x (omentum wt/carcass wt) + 0.87.
[2] Ft. Franklin and Ft. Good Hope samples combined.

Although the 2+ age class had higher mean *in utero* litter size than yearlings in all three communities (Table 4), the differences were not significant (t-test, P > 0.4). Ft. Good Hope martens had higher mean corpora lutes counts per pregnant female (1+ years, 4.45 CL) than females from Ft. Rae (4.00 CL), which were in turn higher than females from Ft. Franklin (3.63 CL)(ANOVA, P = 0.001, Duncan's Multiple Range Test). Pregnancy rates were also higher in both age classes in Ft. Good Hope martens than the other two communities (Table 4). Comparison of mean litter size for Ft. Good Hope and Ft. Rae between 1988-89 and 1989-90 revealed no significant differences Q-test, P > 0.38).

Analysis of variances to examine the relationship of skull length, zygomatic width and body length between O, 1 and 2+ age classes showed that in most cases juveniles were significantly smaller (P > 0.05); therefore, the O age class was eliminated to examine morphological differences among the three communities. Although there were exceptions, in general the Ft. Good Hope and Ft. Franklin martens were significantly larger than those from Ft. Rae (Table 5). In most cases, the Ft. Good Hope martens were larger, but not significantly so, than their nearby counterparts from the Ft. Franklin trapper. The differences among communities appeared to be the greatest for male martens.

Comparisons of criteria used to distinguish sex were combined for 1988-89 and 1989-90 samples, and were analyzed by area (Sahtu and Ft. Rae) to account for between-area differences. In both areas skull length had a higher degree of accuracy for determining sex (mean distance between sexes 4. 17), followed by canine width (mean 3.82) and root length (mean 3.25). Error count estimates (SAS, PROC DISCRIM) using skull length were < 0.5 % for females in both communities, and 4.6% and 2.2% for males in Sahtu and Ft. Rae, respectively. Error estimates using canine width and root length were higher (average error for canine width -1.2-5. 1%, and for root length -2.0-9.2 %). Calculated dividing points for separating female from male martens by skull length were 82.7 mm and 82.5 mm

Table 4. Mean counts of corpora lutes (CL) and percentage of females pregnant by age class of martens, 1989-90.

Community	Age Class	n	Percent Pregnant	Mean CL/ Preg. Fem.	Mean[1] Fecundity
Ft. Good Hope	1	10	100	4.30	4.30
	2+	19	100	4.53	4.53
Ft. Franklin	1	4	50	3.00	1.50
	2+	52	88	3.65	3.23
Ft. Rae	1	8	88	3.85	3.37
	2+	8	100	4.12	4.12

[1] Mean fecundity = mean CL per pregnant female X pregnancy rate.

Table 5. Skull length, zygomatic width and body length for marten harvested near Ft. Good Hope (FGH), Ft. Franklin (FFR), and Ft. Rae (RAE), 1988-89 and 1989-90 trapping seasons[1].

	Skull Length (mm)			Zygo. Width (mm)			Body Length (mm)		
Sex/ Comm	n	Mean	SD	n	Mean	SD	n	Mean	SD
Male									
FGH	152	88.5 A	2.25	151	52.3 A	1.76	152	466.5 A	16.30
FFR	80	87.8 A	2.15	79	51.8 A	2.35	80	465.1 A	15.91
RAE	43	86.9 B	1.73	45	51.2 B	1.83	43	457.7 B	12.18
Female									
FGH	100	79.6 A	1.51	100	45.4 A	1.02	97	417.0 A	12.45
FFR	56	78.8 B	1.83	56	45.1 A	1.67	56	410.8 AB	14.03
RAE	40	79.0 AB	1.82	43	44.4 B	0.94	42	414.5 B	18.56

[1] ANOVA tests on all communities by sex were significant ($\underline{P} < 0.04$). Among variables, means with same letter were not significantly different (Duncan's Multiple Range Test).

Table 6. Percent pulp cavity ([pulp width/tooth width] x 100) of lower canine teeth in juvenile and adult martens taken from two areas, 1988-89 and 1989-90.

Area	Sex	Age	n	Mean	SD	Dividing Point	% Aged correctly
Sahtu	M	o	184	58.7	4.57	47.9	98.4
		1+	226	25.6	9.87		100.0
	F	o	142	53.7	5.05	42.2	99.3
		1+	152	22.3	8.61		99.3
Ft. Rae	M	o	54	51.4	4.78	44.2	90.2
		1+	45	29.0	10.18		93.3
	F	o	41	48.0	4.12	40.6	100.0
		1+	41	23.8	9.33		98.1

for Sahtu and Ft. Rae, respectively. Using canine width, the dividing point for discriminating sex was 4.53 mm and 4.38 mm for Sahtu and Ft. Rae, respectively.

Because of sexual dimorphism in tooth development, pulp cavity ratios for discriminating between juveniles and adults (1+ years) in each community were calculated separately for males and females (Table 6). The calculated dividing points were lower for females than for males in both communities, and were lower in Ft. Rae than in Sahtu for both sexes. In each sex and age class 90-100% of the animals could be placed in the correct age class using pulp cavity ratios. Removal of the Ft. Rae sample of males brings the accuracy of the technique to >98 % for each sex and age class.

Magoun et al. (1989) proposed that female martens with O mm temporal muscle coalescence were juveniles, and those >0 mm were yearlings or older. Male martens in the

Table 7. Distribution of martens within each age class by groups of length of temporal , muscle coalescence (after Magoun et al. 1989).

Temporal Muscle Length (mm)	Age Class		
	0	1	2+
Females			
0	57	3	4
1-1o	3	15	28
>11	0	5	48
% Aged correctly	94.7	93.2 (1+)	
Males			
0-30	58	1	0
>30	3	31	92
% Aged correctly	95.1	99.2 (1+)	

O age class were distinguished by temporal muscle coalescence of <10 mm. Using these criteria, 93.2 -99.2 % of the martens in these categories were aged correctly (Table 7). The technique appears to be more accurate for males. The data are presented by O, 1 and 2+ age classes in the table in an effort to determine whether or not the yearling category can be distinguished reliably. This did not seem possible, especially with males. A further suggestion by Magoun et al. (1989) was to call female martens with O mm temporal muscle coalescence but <2.0 mm width between the narrowest point between the two muscles (NARWID) adults. This increased the accuracy of the 1+ age class to 97.1%, but decreased the accuracy of the juveniles to 87.6%, thus no overall gain in the reliability of the technique was realized.

Discussion

Population indices as obtained from carcass analyses provide an indication of harvest impact. As summarized by Strickland and Douglas (1987:541) "the differences in vulnerability between males and females, and between juveniles and adults, are reflected in the sex- and age ratios of trapped animals, and these ratios form the bases of indices of overharvest." A harvest with a low proportion of juveniles and a high proportion of adult females indicates that the population may be overharvested (Strickland and Douglas 1987, Thompson and Colgan 1987).

Strickland and Douglas (1987) suggest that a healthy harvest has occurred if the ratio of juveniles to adult female 2+ years old is twice, or more, the fecundity rate (based on corpora lutea counts in the previous winter). If radiographs are used to separate juveniles from adults (1+ years), a harvest rate of at least three juveniles per adult female 1 + years represents an adequate harvest level (Strickland and Douglas 1987, Thompson and Colgan 1987). Sex ratios will similarly indicate potential overharvest, although less strongly (Strickland and Douglas 1987, Thompson and Colgan 1987). Since usually two or three males are caught per female caught, sex ratios that are nearly even or are dominated by females may indicate overharvest (Quick 1956, Soukkala 1983, Archibald and Jessup 1984).

The sex and age ratios obtained from the 1989-90 carcass collection suggest that harvest pressure from the Ft. Rae trapper and Trapper C in Ft. Good Hope was high. In both cases the male: female ratio approached 1:1 and the ratio of juveniles:2 + females was considerably less than twice the fecundity rate from the previous year (mean fecundity Ft. Good Hope 4.22, Ft. Rae 3.64 in 1988-89; Poole 1989). Both of these trappers supplied carcasses in 1988-89, and obtained age and sex ratios that indicated more conservative harvest pressure.

The age structure of martens harvested from the Ft. Franklin trapper is perplexing, to say the least.' It is difficult to suspect simple overharvesting as the cause of the observed age structure, since so few juveniles (4/140) were caught. Similar numbers of martens were taken from these same traplines in the 1988-89 season; it is indeed unfortunate that these carcasses were not examined. The trapper works on a large peninsula on the west side of Great Bear Lake, in an area that recorded several large and intense wildfires during the previous three summers, including a 28,000 ha bum in 1988 within 8 km of one of the lines. It is possible that these fires affected reproduction and/or caused large numbers of martens to migrate through the traplines. Alternative] y, widespread prey declines may have reduced marten productivity in the previous year and caused dispersal of residents from nearby areas (Thompson and Colgan 1987); however, the peak in the number of 2- and 3-year-olds may not bear out such a prey decline. The area will be monitored in future trapping seasons.

The body fat of NWT martens (1.61-2.85%) is similar to the few published reports from Alaska (2.37%), yet lower than Wyoming (4.62%) (Buskirk and Harlow 1989). Some between-area differences could be accounted for by age of martens sampled or trap type. Juveniles had more body fat than older martens. Thompson and Colgan (1987) found significantly higher fat contents and body weights in martens taken in Conibear (quick-kill) traps than in animals taken in leg-hold traps.

The pregnancy rates and mean corpora lutes counts, and thus the mean fecundity, from NWT females, especially those from the Ft. Good Hope area, is high when compared with other areas. From a large data set from southcentral Ontario, Strickland and Douglas (1987) found mean corpora lutes counts of 3.29 for yearlings and 3.57 for 2 + females, and pregnancy rates averaging 80% for yearlings and 93% for older animals. In northcentral Ontario, Thompson and Colgan (1987) had mean counts of about 2.0. In the Yukon, Archibald and Jessup (1984) found mean pregnancy rates of 74 % and mean corpora lutes counts of 3.3 and 3.8 for yearlings and 2+ females, respectively. Although corpora lutes counts are only an index to litter size, since some *in utero* mortality likely occurs, the data suggest that NWT martens have one of the highest reproductive capacities documented for the species. Reasons for this high reproductive output are unknown, but may relate to optimum prey availability and habitat.

Sahtu martens were generally larger than martens from the Ft. Rae area. Further comparisons with other populations in the NWT will be conducted.

Total skull length is an easy variable to measure, and proved accurate at assigning sex where only heads were collected. Although only slight differences existed in skull size between areas, carcass collections should be conducted in all areas where heads are to be obtained, so that accurate dividing points for distinguishing sex by skull length can be calculated.

The calculated dividing points used to distinguish juveniles from older animals on the basis of pulp cavity development (males 44-48%, females 40-42%) are considerably higher than those reported elsewhere (Ontario: M 37%, F 33% - Dix and Strickland 1986; Quebec: M 35%, F 34% - Fortin et al. 1988; Pacific coast: M 30-38%, F 27-34% - Nagorsen et al. 1988). This may be a result of slower development by NWT martens, or a later birth date such that juvenile martens have less time to develop prior to the start of the trapping season.

Both aging techniques, percent pulp cavity and the degree of temporal muscle coalescence, obtain results that give an acceptable margin of error for most management purposes. Even cementum aging is not the ultimate answer, since some errors in distinguishing O age class from older martens have been detected in the past (pers. data). Use of radiographs produced results that were slightly more accurate than the temporal muscle method, but required more time and funding to obtain. The dividing point between juveniles and older martens also requires determination in each new area examined. Radiograph quality must be high in order to render the images sharp and measurable. The temporal muscle technique, however, requires some training, since with female martens it is critical, and sometimes difficult, to determine whether or not coalescence has occurred. The technique can, however, be used by trappers in the field to monitor their harvests as the season progresses.

The marten carcass collection program will continue next season. Efforts will be extended to ensure that the entire season's harvest from a trapping area is collected. Further testing will be conducted to evaluate the two aging techniques.

ACKNOWLEDGEMENTS

I thank DRR Officers in Ft. Good Hope, Ft. Franklin, Norman Wells and Ft. Rae for their efforts at coördinating carcass collections and shipments. Joachim Obst, Chris O'Brien and Bruno Croft assisted in carcass analysis and tooth preparation, and Mika Sutherland and Francis Jackson sectioned ovaries.

Radiographs were taken at Stanton Yellowknife Hospital, and I am grateful for the cooperation of those involved. I thank Rus Hall and Alison Welch for reviewing this report.

Finally, I appreciate the cooperation of marten trappers in the Sahtu and Ft. Rae for their support by collecting and donating carcasses.

LITERATURE CITED

Archibald, W. R., and R.H. Jessup. 1984. Population dynamics of the pine marten (Martes americana) in the Yukon Territory. Pp 81-97. In: R. Olson, R. Hastings, and F. Geddes (eds.). Northern ecology and resource management. Univ. Alberta Press, Edmonton.

Brown, M. W. 1983. A morphometric analysis of sexual and age variation in the American marten (Martes americana). M. SC. Thesis. Univ. of Toronto. Toronto, Ont. 190pp.

Buskirk, S. W. 1983. The ecology of marten in south-central Alaska. Ph.D. Dissertation, Univ. of Alaska, Fairbanks.

Buskirk, S. W., and H.J. Harlow. 1989. Body-fat dynamics of the American marten (Martes americana) in winter. J. Mamm. 70:191-193.

Dix, L. M., and M.A. Strickland. 1986. The use of radiographs to classify marten by sex and age. Wildl. Sot. Bull. 14:275-279.

Fortin, C., M. Cantin, and M. Fortin. 1988. Experimentation d'une methode radiographique pour la determination du sexe et l'estimation de l'age chez la Martre D'Amerique. Quebec Min. du Loisir, de la Chasse et de la Peche. 23pp.

Magoun, A. J., R.M. Gronquist, and D.J. Reed. 1989. Development of a field technique for sexing and aging marten. Final rept. Alaska Dept. of Fish and Game. 36pp.

Nagorsen, D. W., J. Forsberg, and G.R. Giannico. 1988. An evaluation of canine radiographs for sexing and aging Pacific coast martens. Wildl. Sot. Bull. 16:421-426.

Poole, K.G. 1989. Marten management and research in the NWT, 1988-89. Northwest Territories Dept. of Renewable Resources, Unpubl. Manuscript Rept. Yellowknife. 39pp.

Quick, H.E. 1956. Effects of exploitation on a marten population. J. Wildl. Manage. 20:267-274.

SAS. 1988. SAS/STAT user guide, release 6.03 edition. Cary, NC. 1028pp.

Snedecor, G. W., and W. G. Cochran. 1967. Statistical methods, sixth ed. The Iowa State Univ. Press, Ames. 593pp.

Soukkala, A.M. 1983. The effects of trapping on marten populations in Maine. M. SC. Thesis, Univ. of Maine, Orono. 4 lpp.

Strickland, M. A., and C.W. Douglas. 1987. Marten. Pp 532-546. In: M. Novak, J.A. Baker, M.E. Obbard and B. Malloch. (eds.). Wild furbearer management and conservation in North America. Ontario Min. Nat. Resour. Toronto, Ont. 1168pp.

Thompson, I. D., and P. W. Colgan. 1987. Numerical responses of martens to a food shortage in northwestern Ontario. J. Wildl. Manage. 51:824-835.