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Ecology of Martens in Southeast Alaska

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SUMMARY

We spent this report period on data management, analysis, and report preparation. Fieldwork and data collections for all of the jobs have been completed. Many of the results have already been reported in previous performance reports. In this report, we present information on body mass relationships and blood chemistry.

The body mass of some individual martens varied substantially among captures, often within a short time. The greatest range in mass for an individual male was 530 g and for a female it was 270 g. Adult martens showed sexual dimorphism with the mean mass of captured males 48.2% larger than females (% dimorphism). The body mass of captured male martens averaged 1187 g, varying from 880 to 1700 g. Females averaged 801 g, varying from 620 to 1000 g. The mean body mass of juvenile females (777 g) was only slightly less than adult females (808 g). Juvenile males were significantly lighter in the summer/fall (1088 g) compared to the winter/spring (1205 g). By their first winter, juvenile males were similar in mass to adults (1205 to 1241 g).

For adults, mean body condition indices (BCIs) were lowest in fall and greatest in the summer for both males and females. In contrast, mean BCIs for juvenile males and females were lowest in the summer. For juvenile males, fall was the next lowest season and by winter/spring their values were similar to the adults. For juvenile females, mean BCIs were lower in the winter/spring and greatest in the fall. Mean BCIs varied significantly among years for adult males in the fall, adult males in the winter/spring, and adult females in the winter/spring. Adult martens consistently showed low body condition in 1991–1992 and 1996–1997, including fall and winter/spring seasons. Adult males were high in fall 1994–1995 and adult males and females were high in winter/spring 1997–1998. Adult females were also high in 1992–1993 winter/spring. Mean BCIs for juvenile males were always low and below zero in the fall, ranging from a low of -0.32 in 1992–1993 to a high of -0.05 in 1994–1995.

Summer BCIs of females and rodent numbers explained 90% of the variation in marten fecundity. Marten fecundity was low in 1991–1992 and 1996–1997 (0.68 and 0.50 corpora

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lutea/adult female), years with low mean adult female BCI (0.07 and 0.22) and rodent numbers (5.3 and 8.6 captures/100 TN). Likewise, marten fecundity was near maximum in 1993–1994 and 1994–1995 (3.25 and 3.5 corpora lutea/adult female), years with high adult female mean BCI (0.45 and 0.51) and rodent numbers (9.1 and 26.0 captures/100 trap nights [TN]).

Female summer diets were lower and less variable on the food web compared to male summer diets. Also, females had lower blood urea nitrogen (BUN) and higher lactate values. Adult females in the fall were less different from adult males during the summer. In winter, all blood chemistry means were higher for males. Body condition indices were not strongly correlated with any of the blood chemistry parameters.

Key words: Chichagof Island, demographics, forestry, habitat use, martens, *Martes americana*, modeling, old-growth forests, population biology, Southeast Alaska.

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BACKGROUND

We have studied marten ecology in Southeast Alaska for 9 years from 30 June 1990 to 30 June 1999. The background, methods, and more significant results for these investigations have been included in previous performance reports (Flynn 1991, Flynn and Blundell 1992, Flynn 1993, Flynn and Schumacher 1994, Flynn and Schumacher 1994, Flynn and Schumacher 1995, Flynn and Schumacher 1996, Flynn and Schumacher 1997, Flynn and

Schumacher 1999, and Flynn and Schumacher 2000). In this report, we present results on recent analyses on body mass relationships.

OBJECTIVES

This research describes the habitat and population ecology of martens on northeast Chichagof Island.

The specific study objectives (Jobs 1–8) are listed below.

- 1 Determine seasonal habitat use and selection patterns of a sample of martens living in logged and unlogged landscapes at the microsite, stand, and landscape level;
- 2 Determine the composition of habitats within the northeast Chichagof Island study area;
- 3 Evaluate the interagency habitat capability model;
- 4 Determine the demographic characteristics of marten populations on northeast Chichagof Island;
- 5 Determine marten movement and spatial patterns of martens on northeast Chichagof Island;
- 6 Determine the relative abundance of small mammal prey within the Chichagof Island study area;
- 7 Determine the seasonal diets of martens on northeast Chichagof Island; and
- 8 Evaluate whether the skull-size criteria developed by Magoun et al. (1988) correctly classify Southeast martens by sex and age.

STUDY AREA

We chose northeast Chichagof Island for the study because its topography and habitats were typical of northern Southeast Alaska. In addition, part of the area had been logged, logging roads provided good access, camp facilities were available at a Forest Service float house, and the area was relatively close to Juneau. The primary study area comprised lands adjacent to Salt Lake Bay (58° 56' N, 135° 20' E), located about 90 km (56 miles) west of Juneau and 26 km (16 miles) south of Hoonah (Fig. 1). The Salt Lake Bay study area (125 km²) is bounded by Port Frederick to the north, Tenakee Inlet to the south, the portage (a narrow strip of land between the large water bodies) on the west, and the Game Creek and Indian River drainages on the east and north. In 1992 we extended the study into the upper Game Creek watershed (102 km²), located north of Salt Lake Bay. Most of the study area was under the jurisdiction of the USDA Forest Service within the Chatham Area, Tongass National Forest. Habitats in the study area were further described in Flynn (1991).

METHODS

JOB 1. HABITAT USE

See previous performance report (Flynn and Schumacher 2000).

JOB 2. HABITAT COMPOSITION

See previous progress report (Flynn and Schumacher 2000).

JOB 3. HABITAT CAPABILITY MODEL EVALUATION

See previous progress report (Flynn and Schumacher 2000).

JOB 4. POPULATION ECOLOGY

Body mass relationships

We live-trapped martens throughout the year at permanent trap sites located systematically along logging roads to capture martens on the study area. Trap sites were usually about 500 m apart. Traps (Models 203 and 205, Tomahawk Live Trap Co., Tomahawk, Wisconsin USA) were baited with either strawberry jam, sardines, or venison scraps, covered with a green tarp, and placed under a log or the base of a tree at trap sites. We checked the traps daily. Captured martens were pressed into the end of the trap using a folded blanket and injected with a mixture of 18.0 mg/kg ketamine hydrochloride (Vetalar) and 1.6 mg/kg xylazine hydrochloride (Rompun) for immobilization. For short-term chemical restraint, we used a dosage of 13.0 mg/kg of ketamine and 1.0 mg/kg xylazine. All captured martens were weighed with a hand-held spring balance scale to the nearest gram. We measured each animal for total body length, tail length, neck circumference, and chest girth. All martens were eartagged (Size 1, Style 1005, National Band and Tag Co., Newport, KY) for permanent identification. Two first premolar teeth were pulled for age determination by cementum analysis (Matson's Laboratory, Milltown, Montana USA). We drew a 3.0 cc blood sample from the jugular vein from most captured animals, separated the serum, and then froze both portions. We radiocollared some captured martens. On female martens, we used 2 radio collar types; each weighed about 35 g with an expected life of 12 months (Telonics MOD-073, Telonics, Mesa, Arizona USA and Lotek SMRC-4, Lotek Engineering, Newmarket, Ontario CAN). On males, we used a 49-g collar (Telonics MOD-080, expected life of 12–18 months). After a marten had recovered from the immobilization, we released it near the capture site. Martens recaptured during the same trapping session were released without additional processing. During subsequent trapping sessions, all recaptures were chemically restrained, weighed, and measured.

We considered radiocollared martens that showed fidelity to a home range area a resident animal. Martens that moved over an area >2 home ranges within a season and covered areas occupied by other resident martens were labeled transients. We classified martens more than 1-year-old as adults. Young of the year, or birth-year martens, were called juveniles.

Body condition index

We used deviations from the body mass predicted by linear regressions between body mass and total body length as an index to body condition in captured martens. First, the mean total length was computed for each animal with multiple captures. We assumed that individuals had reached their full length when first captured, and any subsequent differences in body length were attributed to measurement error. Because of strong sexual dimorphism, we computed regression equations for males and females separately (males: $y = 2.6598x - 534.6$, $R^2 = 0.13$; females: $y = 2.002x - 355.1$, $R^2 = 0.18$). The residuals from the regression analyses ranged from -382 to 479 for males and -181 to 251 for females. In order to compare males and females, we scaled the residuals for each sex by dividing each by the largest value. Thus, we divided all the male residuals by 479 and the females by 251, resulting in a condition index for both sexes varying from -1 to 1.

We collected the carcasses of trapper-caught martens taken on or near the study area to determine fecundity. Ovaries were extracted from each female carcass, preserved in 10% formalin, then washed in tap water before being sent to Matson's Laboratory (Milltown, Montana USA) for evaluation for the presence and number of corpora lutea (Strickland and Douglas 1987). We assumed that corpora lutea counts, expressed as the mean number per adult female, were a measure of population fecundity.

Blood chemistry

Beginning in fall 1992, we drew a 2- to 3-cc sample of blood from the jugular vein of most captured martens. At camp the blood was spun at 3000 rpm in an electric centrifuge. We siphoned the serum into a separate vial, leaving the clotted blood cells. Both samples were stored frozen. We sent the clotted blood cells to Merav Ben-David, University of Alaska Fairbanks, for analysis of the stable isotopes of carbon and nitrogen (Schell et al. 1988, Ben-David et al. 1997). Many of these results have been published as part of Job 7. Additional analyses are included here. Most of the serum samples were sent to Castelli's Lab, University of Alaska Fairbanks USA, to determine the levels of beta-hydroxybutyrate (BHBA), blood urea nitrogen (BUN), lactate, and glucose.

Additional methods on other aspects of the study have been reported previously (Flynn and Schumacher 2000).

JOB 5. MOVEMENTS AND SPATIAL PATTERNS

See previous performance report (Flynn and Schumacher 2000).

JOB 6. SMALL MAMMAL ABUNDANCE

See previous performance report (Flynn and Schumacher 2000).

JOB 7. SEASONAL DIETS

See previous performance report (Flynn and Schumacher 2000).

JOB 8. EVALUATION OF FIELD SEXING AND AGING TECHNIQUE

See previous performance report (Flynn and Schumacher 2000).

RESULTS AND DISCUSSION

JOB 1. HABITAT USE

Fieldwork has been completed and the results presented (Flynn and Schumacher 2000). Additional analyses will be presented in final report.

JOB 2. HABITAT COMPOSITION

Job completed. Analyses will be presented in final report.

JOB 3. HABITAT CAPABILITY MODEL EVALUATION

In a previous performance report (Flynn 1991), we compared the habitat selection indices from this study to the habitat capability coefficients in the habitat capability model. No additional analyses were completed for this report.

JOB 4. POPULATION ECOLOGY

Body mass relationships

We found the expected sexual dimorphism with the mean mass of captured males 48.2% larger than females (% dimorphism), or a dimorphism ratio of 1.48 (male:female). The body mass of captured male martens averaged 1187 g (SD = 148) but varied from 880 to 1700 g. Females averaged 801 g (SD = 93) but varied from 620 to 1000 g. Only 6.7% of the male captures overlapped with the range of female masses, but 27.6% of the females overlapped with the male range. Thus, a few males (mostly juveniles) had very low body masses that greatly increased the lower range for males.

The average mass of juvenile females (777 g, SD = 88) was slightly smaller than adults (808 g, SD = 94; $t = -2.12$, $df = 250$, $P = 0.035$). The average mass of juvenile males (1118g, SE = 10.9) was less compared to adults (1223 g, SE = 8.3) ($t = -7.5$, $df = 447$, $P < 0.001$). Juvenile males were significantly lighter in the summer/fall (1088 g, SE = 10.9) compared to the winter/spring (1205 g, SE = 8.3). By their first winter, juvenile males were similar in mass to adults (1205 to 1241 g, $t = -1.5$, $df = 148$ $P = 0.13$). Juvenile females did not differ in mass between summer/fall (779 g) and winter/spring (774 g) ($t = 0.203$, $df = 51$ $P = 0.84$).

Sometimes the body mass of individual martens differed dramatically among captures. The greatest range in mass for an individual male was 530 g and 270 g for a female. Often the change occurred over a relatively short period. For example, male marten #36 decreased 33% from 1590 g on 12 December 1993 to 1060 g on 11 February 1994. By 29 March 1994, he was back to 1260 g (+19%). For females, #188 increased 37% from 730 g on 4 March 1997 to 1000 g on 25 June 1997. By 19 October 1997, she was back to 760 g (-24%). Thus, a male

marten's largest mass was 50% more than its lowest, and a female had increased her mass by 37%.

We found that neck circumference was the body measurement that best predicted mass in martens ($R^2 = 0.48$ for females and $R^2 = 0.67$ for males). In contrast, total body length was a weak predictor of body mass for males ($y = 2.6598x - 534.6$, $R^2 = 0.13$) and females ($y = 2.002x - 355.1$, $R^2 = 0.18$). Chest girth was a poorer predictor of body mass than neck circumference ($R^2 = 0.38$ for males and $R^2 = 0.31$ for females). In a multiple regression model, the addition of total length and chest girth improved the prediction of mass only slightly (males $R^2 = 0.72$; females $R^2 = 0.63$) over neck circumference (males $R^2 = 0.67$; females $R^2 = 0.48$). In females, neck circumference ranged from 91 to 131 mm (mean = 112 SD = 6.6); males ranged from 92 to 160 mm ($\bar{x} = 128$ SD = 9.1). For the individual male with the largest range in neck circumference (38), the range varied from 118 to 156 mm with a mean of 139 mm. For the individual female with the largest range in neck circumference (32), the range varied from 95 to 127 mm with a mean of 109 mm. Because of the changes in neck circumference, researchers need to be careful when attaching neck collars.

In the summer/fall, juvenile males were significantly lighter than adult males (1088 to 1212 g) ($t = -7.5$, $df = 297$, $P < 0001$). By winter, juveniles and adults were similar (1205 g and 1241 g) ($t = -1.5$, $df = 148$, $P = 0.133$). In contrast, juvenile females differed little from adults in the summer/fall (779 to 815 g) ($t = -1.8$, $df = 137$ $P = 0.34$).

Body Condition

The body condition index (BCI) was highly correlated to body mass for males ($r = 0.931$) and females ($r = 0.904$).

For all captures, the BCI for adult females ($\bar{x} = 0.023$) did not differ significantly from adult males ($\bar{x} = 0.067$) ($t = 0.113$) (Table 1). Likewise, juvenile females ($\bar{x} = -0.069$) did not differ from juvenile males ($\bar{x} = -0.127$, $t = -1.29$, $df = 208$, $P = 0.198$). For all captures, the mean BCI for females by age class did not differ (J = -0.069 and Ad = 0.023, $t = -1.79$, $df = 251$, $P = 0.73$). For males, the mean BCI for juveniles was lower than for adults (J = -0.127 and Ad = 0.067, $t = -7.17$, $df = 447$, $P < 0.001$).

Seasonal Comparisons of BCI. The mean BCI for juvenile females ($\bar{x} = -0.183$) differed from adult females in summer only ($\bar{x} = 0.302$, $t = -4.39$, $df = 44$, $P < 0.001$) (Table 2). Few juvenile females were captured in the summer ($n = 8$). Thus, juvenile females were combined with adults for fall and winter/spring seasons.

For males, juveniles had a lower mean BCI compared to adults in summer and fall, but by winter/spring the means were similar (Table 3). Thus, juvenile males were combined with adults for winter/spring, following a similar pattern for body mass.

For adults, mean BCIs were lowest in fall and greatest in summer for both males and females. In contrast, mean BCIs for juvenile males and females were lowest in the summer. Apparently, low mean BCIs in summer reflected that juveniles had obtained their adult body length but were still gaining body mass. For juvenile males, fall was the next lowest season

and by winter/spring their values were similar to the adults. For juvenile females, mean BCIs were lower in the winter/spring and greatest in the fall.

Yearly Comparisons of BCI. Mean BCIs varied significantly among years for adult males in the fall, adult males in the winter/spring, and adult females in the winter/spring (ANOVA). In the fall, the mean BCIs for adult males were significantly lower in 1991, 1993, and 1996 than in 1994. For winter/spring, mean BCIs for adult males and females were lower in 1991–1992 and 1996–1997 compared to 1997–1998. In addition, mean BCIs for adult females were lower in 1996–1997 than in 1992–1993. Thus, adult martens consistently showed low body condition in 1991–1992 and 1996–1997, including fall and winter/spring seasons. Adult males were high in fall 1994–1995 and adult males and females were high in winter/spring 1997–1998. Adult females were also high in 1992–1993 winter/spring.

Mean BCIs for juvenile males were always low and below zero in the fall, ranging from a low of -0.32 in 1992–1993 to a high of -0.05 in 1994–1995. In most years we did not capture enough juvenile females for an adequate sample, and the values were quite variable.

Fecundity

Fecundity of adult females was estimated by the number of corpora lutea in the ovaries of trapper-caught carcasses collected in the fall (Flynn 1997). We found that marten fecundity was positively correlated with the mean BCI of females in summer ($r = 0.670$, $P = 0.05$) and deer mouse numbers in the fall ($r = 0.715$, $P = 0.036$). Although fecundity was negatively correlated with marten numbers the previous winter ($r = -0.431$, $P = 0.197$), the correlation was not significant. In a multiple regression model, summer BCI of females and rodent numbers explained 90% of the variation in marten fecundity. Marten fecundity was low in 1991–1992 and 1996–1997 (0.68 and 0.50 corpora lutea/adult female), years with low mean adult female BCI (0.07 and 0.22) and rodent numbers (5.3 and 8.6 captures/100 TN). Likewise, marten fecundity was near maximum in 1993–1994 and 1994–1995 (3.25 and 3.5 corpora lutea/adult female), years with high adult female mean BCI (0.45 and 0.51) and rodent numbers (9.1 and 26.0 captures/100 TN).

Blood chemistry

We used discriminate function analyses to explore whether males and females could be separated based on the blood chemistry values. Adult martens in the summer season could be classified by sex based on blood serum values (68% classification rate). Primarily, summer female diets were lower on the food web compared to males and less variable (SDs of C and N larger for males). Also, females had lower BUN and higher lactate values.

Adult females in the fall were less different from adult males than during the summer. We observed the same trends, but the classification rate dropped to 57%. Fall females had lower mean C and N and BUN, but higher lactate. SDs for C and N were greater for males, indicating greater variability in diet. All females in the winter showed some difference from all males; there were similar trends for C & N but classification rate was at 68%. In winter all blood chemistry means were higher for males. Body condition index was not strongly correlated with other blood chemistry parameters.

BHBA. For all captures, most values were near the mean ($\bar{x} = 0.129$, $SD = 0.037$, $CV = 29\%$), except for a few possible outliers (i.e., 0.37, 0.33, and 0.29). Means grouped by sex, age, and year varied only from 0.11 to 0.19. We found no significant differences in means grouped by sex for all captures, adults, and juveniles. For adults, winter/spring mean BHBA ($\bar{x} = 0.126$) was significantly greater than in summer ($\bar{x} = 0.113$, ANOVA, $P = 0.03$), indicating possible seasonal differences.

BUN. For all captures, mean values ranged 6.35 for adult females in summer of 1996–97 to a high of 9.82 for adult males in the winter/spring of 1993–94. Generally, BUN values were variable ($\bar{x} = 8.31$, $SD = 3.23$, $CV = 39.9\%$) with no clear pattern. We found only a weak negative correlation with body condition. For all captures, there were no differences in mean values by sex or by season. There was significant negative correlation with rodent numbers ($r = -0.700$, $P = 0.094$). Mean adult male BCI in fall negatively correlated with mean adult male BUN in fall (Spearman's rho = -0.949 , $P = 0.026$). Females in fall also showed a negative correlation but not significantly.

Lactate. For all captures ($\bar{x} = 5.05$, $SD = 2.21$, $CV = 47.8\%$), lactate values were not significantly correlated with body condition index. Sex, age, and year means varied from 2.45 for adult females in fall of 1993–94 to 10.25 for juvenile females in summer of 1996–97. For all captures, mean lactate values in summer ($\bar{x} = 7.04$, $SE = 0.43$) were significantly greater compared to fall ($\bar{x} = 4.8$, $SE = 0.20$) and winter spring ($\bar{x} = 4.6$, $SE = 0.16$).

Glucose. For all captures ($\bar{x} = 8.69$, $SD = 2.60$, $CV = 30\%$), glucose values were not correlated with body condition. Sex, age, and year means varied from 5.18 for adult females in summer of 1996–97 to 11.33 for juvenile males in winter of 1995–96. Mean glucose for adult females ($\bar{x} = 8.4$, $SE = 0.32$) was significantly greater than for juvenile females ($\bar{x} = 7.20$, $SE = 0.45$) (t -test, $P = 0.051$). Juvenile males ($\bar{x} = 8.71$, $SE = 0.45$) were greater than juvenile females ($\bar{x} = 7.20$, $SE = 0.45$) (t -test, $P = 0.016$). Adult males ($\bar{x} = 8.83$, $SE = 2.48$) did not differ from adult females ($\bar{x} = 8.44$, $SE = 0.32$).

JOB 5. MOVEMENTS AND SPATIAL PATTERNS

No additional results were available.

JOB 6. SMALL MAMMAL ABUNDANCE

Job completed (Flynn and Schumacher 2000).

JOB 7. SEASONAL DIETS

Previous results were published.

JOB 8. EVALUATION OF FIELD SEXING AND AGING TECHNIQUE

No additional results were available.

JOB 9. SCIENTIFIC MEETINGS AND WORKSHOPS

FLYNN, R. W. AND T. V. SCHUMACHER. 2000. Habitat selection by American martens in managed landscapes on northeast Chichagof Island, Southeast Alaska. Presented at the 10th Northern Furbearer Symposium, Fairbanks, Alaska, April 17-18, 2000.

SCHUMACHER, T. V., R. W. FLYNN, AND S. W. BUSKIRK. Denning and resting structures of American martens in Southeast Alaska. Presented at the 10th Northern Furbearer Symposium, Fairbanks, Alaska, April 17-18, 2000.

JOB 10. REPORTS AND SCIENTIFIC PAPERS

SCHUMACHER, T. V., R. W. FLYNN, AND S. W. BUSKIRK. In review. Denning and resting structures of American martens in Southeast Alaska.

STONE, K. D., R. W. FLYNN, AND J. A. COOK. In review. Phylogeography of American martens (*Martes americana*).

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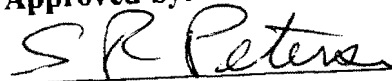
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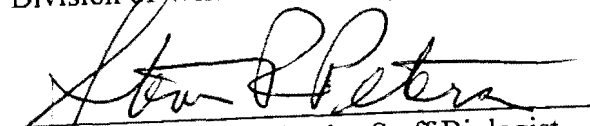
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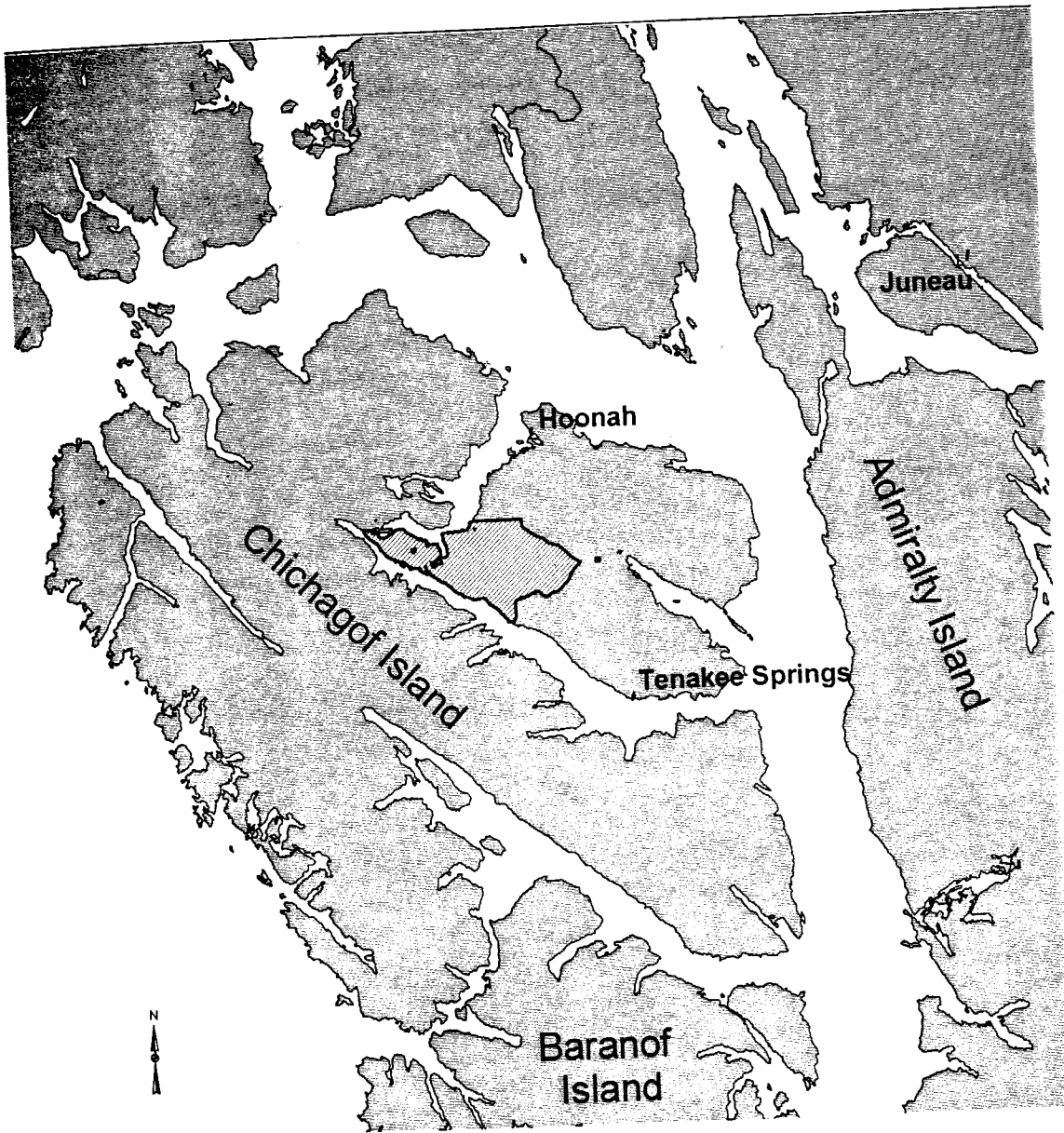


Figure 1. Location of study area on northeastern Chichagof Island, Southeast Alaska.

Table 1 Body condition indices of captured martens by sex, age, and season. Age-group means within a season were compared using t-test.

Sex	Age	Season	<i>n</i>	\bar{x}	SE	<i>P</i>
Females	J	Summer	8	-0.183	0.129	<0.001*
	A	Summer	38	0.302	0.043	
	J	Fall	28	0.014	0.063	0.090
	A	Fall	65	-0.104	0.036	
	J	Winter/spring	17	-0.154	0.071	0.068
	A	Winter/spring	97	-0.001	0.032	
Males	J	Summer	16	-0.233	0.075	<0.001*
	A	Summer	58	0.216	0.035	
	J	Fall	100	-0.176	0.023	<0.001*
	A	Fall	125	-0.040	0.024	
	J	Winter/spring	41	0.035	0.037	0.101
	A	Winter/spring	109	0.110	0.024	

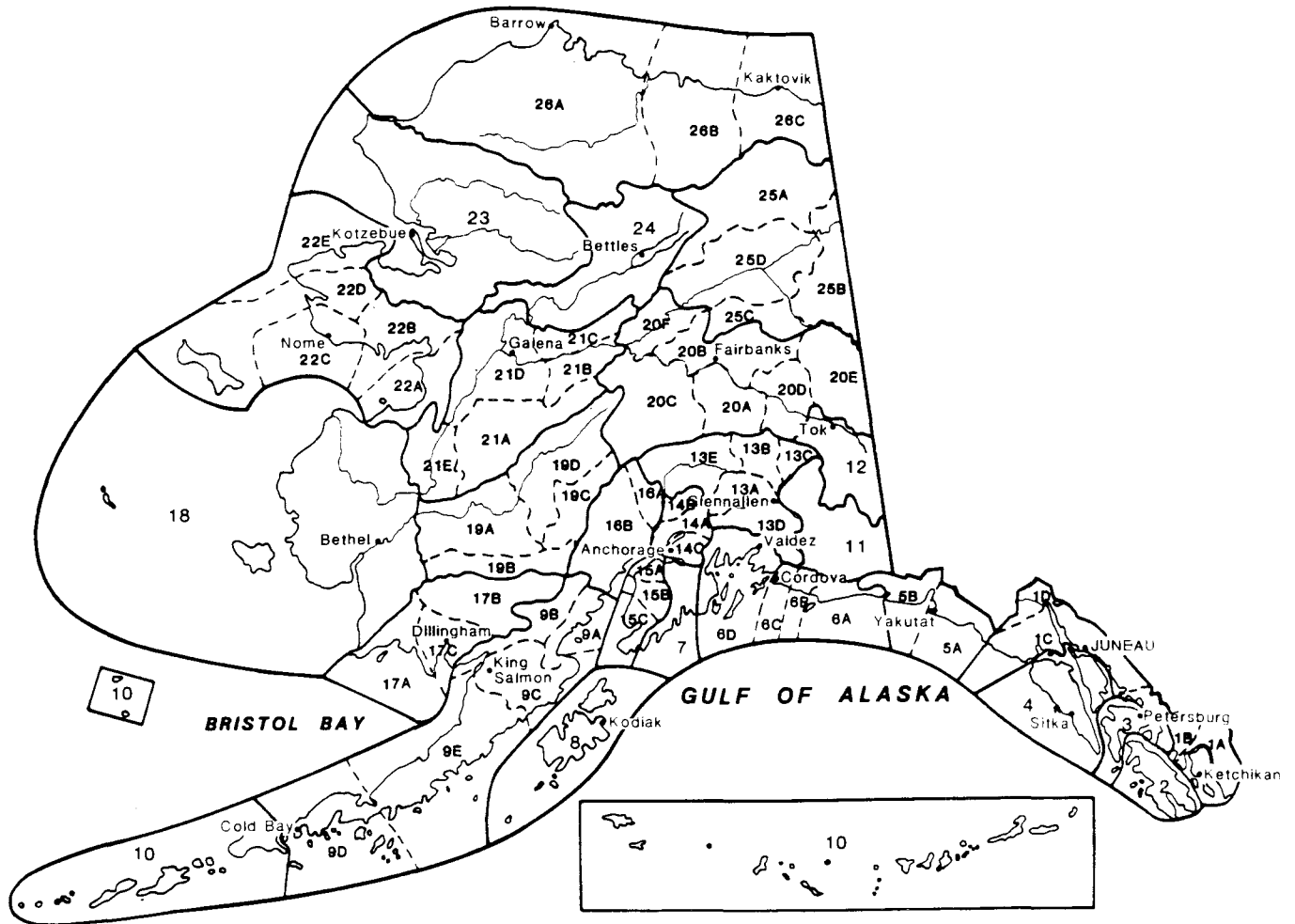
Table 2 Body condition indices of captured martens by sex, age, and season. Age-group means within a season were compared using t-test and nonsignificant age groups within a season were combined.

Sex	Age	Season	<i>n</i>	\bar{x}	SE	<i>P</i>
Females	J	Summer	8	-0.183	0.129	<0.001*
	A	Summer	38	0.302	0.043	
	All	Fall	94	-0.070	0.049	
	All	Winter/spring	155	-0.028	0.030	
Males	J	Summer	16	-0.233	0.075	<0.001*
	A	Summer	58	0.216	0.035	
	J	Fall	100	-0.176	0.023	<0.001*
	A	Fall	125	-0.040	0.024	
	All	Winter/spring	152	0.089	0.020	0.101

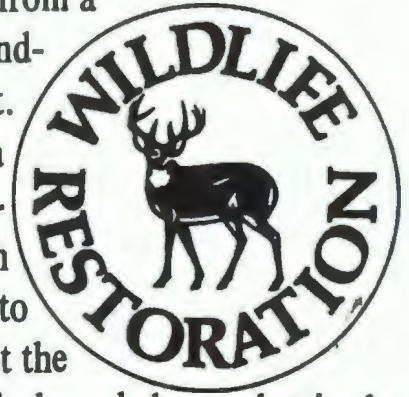
Table 3 Body condition indices of captured martens by sex, age, and season. Seasonal means for each sex-age group compared using 1-way ANOVA. Means with the same letter were not significant different ($P < 0.1$) using Sheffee post-hoc test

Sex	Age	Season	<i>n</i>	\bar{x}	SE	<i>P</i>
Females	0	Summer	8	-0.183	0.129	a
	0	Fall	28	0.015	0.063	a
	0	Winter/spring	17	-0.154	0.071	a
	0	All	53	-0.069	0.046	0.15
Females	1	Summer	38	0.302	0.043	a
	1	Fall	65	-0.104	0.036	b
	1	Winter/spring	97	-0.001	0.032	b
	1	All	200	0.023	0.024	<0.001
Males	0	Summer	16	-0.233	0.075	a
	0	Fall	100	-0.176	0.023	a
	0	Winter/spring	41	-0.035	0.038	b
	0	All	157	-0.127	0.021	<0.001
Males	1	Summer	58	0.216	0.035	a
	1	Fall	125	-0.040	0.024	b
	1	Winter/spring	109	0.110	0.024	c
	1	All	292	0.067	0.016	<0.001

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve, and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes for responsible hunting. Seventy-five percent of the funds for this report are from Federal Aid.



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