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Age determination and morphological characteristics of Wild mink from Maryland, USA

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Abstract

A total of 169 wild mink were collected during the 1976–1979 trapping seasons in Maryland. Three aging techniques were applied: 1. aging by cementum annuli, 2. the presence or absence of the zygomatic suture, and 3. size of the suprasesamoid tubercle. The age distribution was 111 juveniles to 58 adults and the sex ratio was 108 males to 61 females (177 males/100 females). Significant correlations were found for testes weight, epididymides weight, spleen weight, nasal length and nasal width with age for male mink. Significant correlations were found for spleen weight, kidney weight, liver weight, nasal length and nasal width with age for female mink. Spermatogenic activity began in mid-December and continued through February.

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Introduction

There has never been a comprehensive study of wild mink, *Mustela vision* (Schreber) in Maryland. Related marphometrical studies have been conducted by Bährens (1960), Pohle (1970), Drescher (1975), Kruska (1977. 1979), Apfelbach and Kruska (1979) and others in Europe. The objectives of this study were to measure sex and age ratios, develop sexing and aging techniques, and to describe reproduction and morphology of the wild mink in Maryland.

Study area

Mink collected for this study were from Maryland's 3 western geographical provinces (Fig. 1). Nelson and Chapman (1982) describe in detail the several physiographic provinces in Maryland.

Materials and methods

Mink carcasses were collected from Maryland trappers during the following trapping seasons: November–March 1976–1977, 1977–1978, 1978–1979, and 1979–1980. A $ 3.00 reward was given for each carcass. The animals were trapped with leg-hold and body-gripping traps.

Unpelted carcasses were weighed (gm) and measured (mm) before dissection. The kidney, liver, heart, spleen, adrenal glands, testes and epididymides were weighed fresh to the nearest 0.01 gm on a top-loading Mettler Balance (Model P-163). Reproductive organs and adrenal glands were preserved in Bouins fluid. The skull and femur were removed and cleaned by boiling.

Each animal was sexed by external genitalia except when they were removed during the skinning process by the trapper. These animals were then sexed by internal examination.

The left femur from each mink was examined for the presence or absence of a suprasesamoid tubercle on the distal end of the femur. There were 4 categories of tubercles: non-existent, small, medium and large, with non-existent and small representing juveniles and medium and large representing adults (Greer 1957).

Cementum layers of the canine tooth were counted to determine year age classes (Mowbray et al. 1979; Matson 1981). The lower left canine from each specimen was removed and decalcified in EDTA (Ethylene dinitrilo-Tetra Acetic Acid) for 2 weeks. Tooth sections were then made at 14 μm thickness on a freezing mictrotome (International Cryostat Model CTL) at −20°C. The sections were then mounted on slides and stained with Harris' haematoxylin for 24 hours and examined at 40X under a light microscope. Specimens lacking cementum annulae were assigned to the juvenile age class, with each cementum ring designating a year class (Matson 1981).

The presence or absence of the jugal squamosal suture was used to separate juveniles and adults (Greer 1957).

The following skull measurements were taken as described by Deblase and Martin (1974): basilar

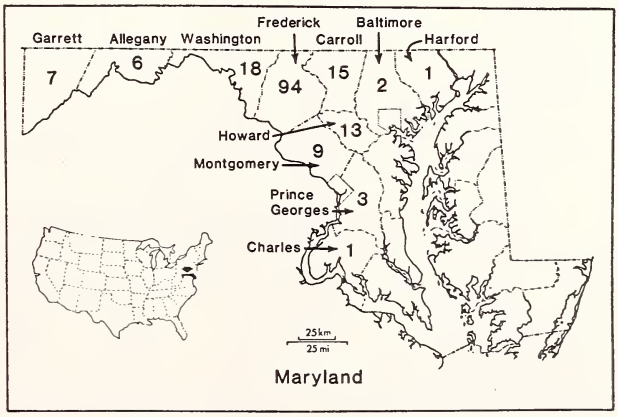

Fig. 1. Study area from which 169 mink were collected in Maryland, 1976–1980 (numerals represent number of specimens collected)

length, zogomatic breadth, postorbital contriction, length of nasals, width of nasals, diameter of external auditory meatus, breadth of brain case, length of palatal bridge, and length of bulla.

Testes of mink were examined for the presence or absence of sperm to determine the onset of the breeding season in males. The amount of sperm contained in the testes and epididymides was estimated on a subjective scale of absent (0), few (1), moderate (2), and abundant (3). No female mink were collected during the breeding season.

The Breakdown, Analysis of Variance (ANOVA), Condescriptive and Scattergram programs were employed from the Statistical Package for Social Sciences (SPSS) to analyze the data collected during this study (Nie et al. 1975).

Male and female data were analyzed separately. ANOVA was used for body measurements, organ weights and cranial measurements, with sex and age as factors. These weights and measurements were also tested against the variable age with regression analysis. The level of significance for the 2-way ANOVA and regression analysis was established at alpha = .05.

Results and discussion

A total of 169 mink were collected from 11 Maryland counties during the 1976–1977 to 1979–1980 trapping seasons (see Fig. 1). The trapping season lasted from November 15 to March 15 in all years of the study. The largest number of mink were trapped in November, with a continuing decline through March (Table 1). We sampled 16 percent of the estimated harvest of 1,050 mink (Table 2).

Age ratios for Maryland mink are presented in Table 3 and 4 for each of the 3 aging techniques employed. Aging by cementum annuli revealed a ratio of 1.9 juveniles to 1 adult (111 to 58). The juvenile male to adult male ratio was 2.5 : 1 (77 to 51). The juvenile female to a adult female ratio was 1.3 : 1 (34 to 27). A binomial proportions test (Mendenhall and Ott 1976, page 201) was applied to the zygomatic suture aging technique, suprasesamoid aging technique and cementum annuli aging technique. There was no significant difference between the aging techniques.

The sex ratio of the sample was 1.8 males to 1 female (108 males and 61 females). In an Ohio study, Petrides (1950) found a balanced sex ratio in 249 wild mink. A ratio of 145 males to 100 females was reported by Burns (1964) from a wild mink population in the

Table 1

Number of mink captured in Maryland by month and sex (1976–1980)

	Males		Females		Total
	Number	Percentage number	Number	Percentage number	Percentage number
November	67	39.6	42	24.8	64.5
December	29	17.2	15	8.9	26.0
January	8	4.7	2	1.2	5.9
February	3	1.8	2	1.2	3.0
March	1	.6			.6
Total	108	63.9	61	36.1	100.0

Table 2

Fur harvest for Maryland (1976–1980), with percentage of sample for each season

	1976–1977	1977–1978	1978–1979	1979–1980	Total
Number harvested	268	221	224	337	1050
Number sampled	6	35	75	53	169
Percent sampled of harvest	2.2	15.8	33.4	15.7	16.1

Table 3

Age distribution of male and female mink collected in Maryland according to two techniques (1976–1980)

	Juveniles	Adults	Total	Juveniles	Adults	Total
	Suprasasamoid Tubercle			Zygomatic suture		
Males	65	38	103	62	36	98
	41.1 %	24.0 %	65.2 %	40.5 %	23.5 %	56.8 %
Females	27	28	55	25	30	55
	17.1 %	17.7 %	34.8 %	16.3 %	19.6 %	43.1 %
Total	9.2 %	6.6 %	159	87	56	153
	58.2 %	41.7 %	100 %	56.8 %	43.1 %	100.0 %

Table 4

Age distribution of male and female mink collected in Maryland as determined by cementum annuli (1976–1980)

Juveniles	0	1	2	3	4	Total
Males	77	16	10	4	1	108
	45.5 %	9.4 %	5.9 %	2.3 %	.6 %	63.9 %
Females	34	19	6	2	–	61
	20.1 %	11.2 %	3.5 %	1.1 %	–	36.1 %
Total	111	35	16	6	1	169
	65.6 %	20.7 %	9.4 %	3.5 %	.6	100.0 %

Table 5

Correlation coefficient values of variables versus age for male and female mink collected in Maryland (1976–1980)

	Male	Female
Body weight	.135	.152
Total body length	–.001	–.110
Tail length	–.045	–.093
Hind foot length	.055	–.111
K-measurement length	–.001	.017
Ovary or testes weight	.235*	.152
Spleen weight	.226*	.470*
Kidney weight	.129	.352*
Heart weight	.123	–.001
Liver weight	.022	.267*
Epididymides weight	.255*	
Adrenal weight	.102	–.115
Basilar length	–.001	–.115
Zygomatic breadth	.110	.071
Postorbital constriction	.089	.071
Nasal length	.581*	.482*
Nasal width	.581*	.421*
Maxillary tooth row length	.122	–.214
Diameter of external auditory meatus	–.001	.089
Bread of brain case	.063	.161
Palatal bridge length	.063	.089
Bulla length	–.001	.110

* = significant correlation value at the .05 level.

Yukon Kuskokwin Delta of Alaska. In Alaska, a reverse ratio of 81 : 100 males to females was believed due to an uneven sex ratio in the population (Croxton 1960).

Burns (1964) attributed the higher male to female ratio to the wide ranging movement of males early in the trapping season. Increased movement early in the season when trapping pressure is the greatest, results in a higher possibility of being caught. Also, the more traps encountered the higher the chance of being trapped.

A significant regression relationship was found between the variable age and the variables testes weight, epididymides weight, spleen weight, nasal length and nasal width in the male mink (Table 5). A significant regression relationship was found between the variable age and the variables spleen weight, kidney weight, liver weight, nasal length and nasal width in the female mink (Table 5). Some significant regression relationships for both sexes are plotted in Fig. 2. Drescher (1975) studying the effects of domestication on mink found that wild mink had lighter organ weights than farm mink, but did not report on the ages of the animals he studied.

A 2-way ANOVA with the mink body and skull measurements was made using sex and

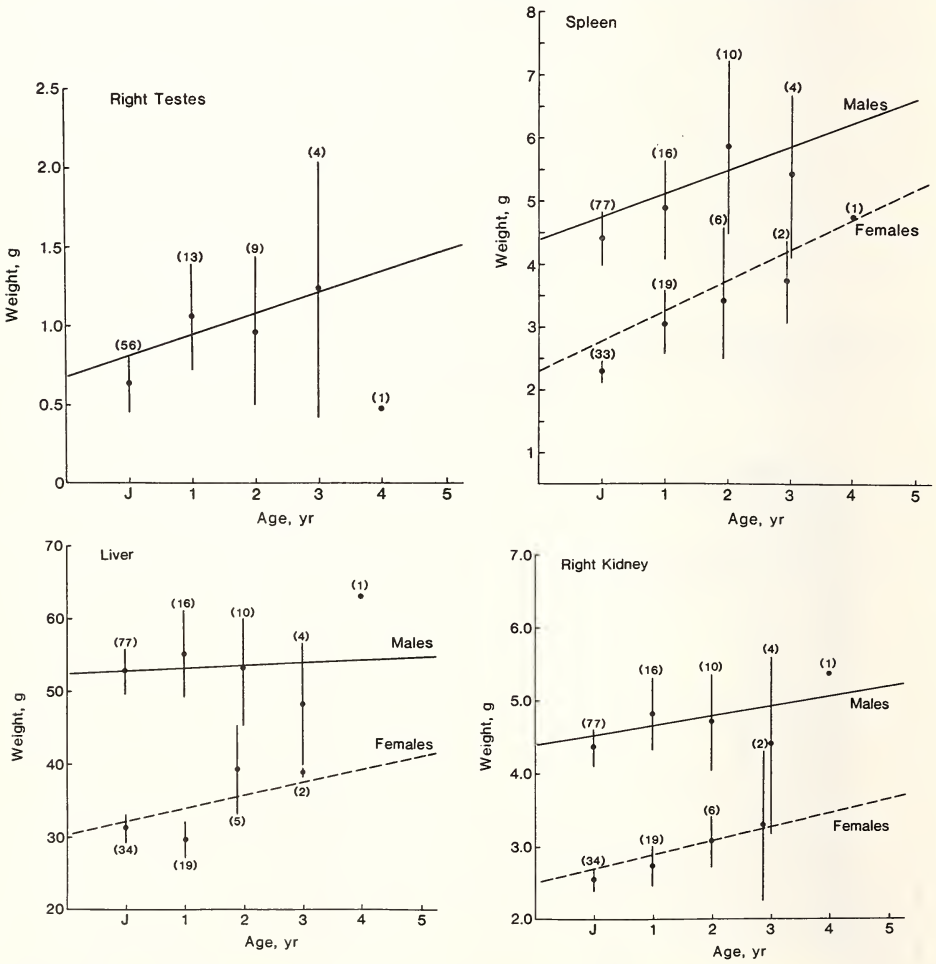

Fig. 2. Regression of testes weight, spleen weight, kidney weight, and liver weight on age for mink collected in Maryland, 1976–1980

Table 6

Comparison of mean values of morphological characteristics of male and female mink collected in Maryland (1976–1980)

Variables	Males	Females
Body weight	989.4*	563.5
Body length	614.8*	534.1
Tail length	216.9*	185.5
Hind foot length	66.0*	56.1
K-measurement	545.5*	474.8
Spleen weight	4.6*	2.7
Kidney weight	4.4*	2.7
Heart weight	8.5*	5.1
Liver weight	53.0*	31.7
Adrenal weight	.06*	.04
Basilar length	62.2*	55.8
Zygomatic breadth	40.2*	34.6
Postorbital constriction	13.7*	13.2
Nasal length	49.9	67.7
Nasal width	7.8	8.3
Maxillary tooth row length	20.5*	18.8
Diameter of external auditory meatus	3.6*	3.3
Breadth of brain case	29.8*	26.9
Palatal bridge length	28.2*	24.9
Bulla length	17.9*	16.2

* = significant value at the .05 level.

age as main effects (Table 5). Sex was found to be a significant factor in all variables except nasal length and nasal width (Table 6). Age was a significant factor with the variables spleen weight, post orbital constriction, nasal length, nasal width and external auditory meatus. Sex/age interaction was significant in the ANOVA of maxillary tooth row length.

The various weights and measurements taken on Maryland mink revealed definite sexual dimorphism (see Table 6).

Burns (1964) reported a basilar length range of 70.5–63.3 mm for males and 63.2–57.4 mm for females from Alaska. This study found ranges for basilar length of 70.2 mm–52.9 mm for males and 61.5 mm–50.02 mm for females. Substantial overlap precludes the use of this characteristic to sex Maryland mink.

In studying maxillary tooth row length, Burns (1964) found a range of 27.6 mm–24. 9 mm for males and 24.9 mm–22.3 mm for females. Burns proposed using a maxillar tooth row length of 25 mm to separate males from females. In this study, we found ranges for maxillary tooth row length of 22.7 mm–17.1 mm for males and 28. 3 mm–13.1 mm for females. Again, a substantial overlap precludes the use of this characteristic to sex mink from the Maryland population.

In a study of 20 mink cranial measurements, Lechleitner (1954) concluded no reliable means of determining age based on skull measurements existed. However, age was significant in the ANOVA of post-orbital constriction, diameter of the auditory meatus, nasal length and nasal width in this study. The nasal sutures were discernable in 61.3 percent of juvenile males and 41.1 percent of juvenile females in a study conducted by Greer (1957). Kruska (1979) found that the skulls of farm mink became smaller in several measurements with increasing age.

Epididymides weight showed a significant increase from November to February. There was a positive correlation with month and epididymides weight ($p < .001$). Testes weights also showed a significant increase from November to February.

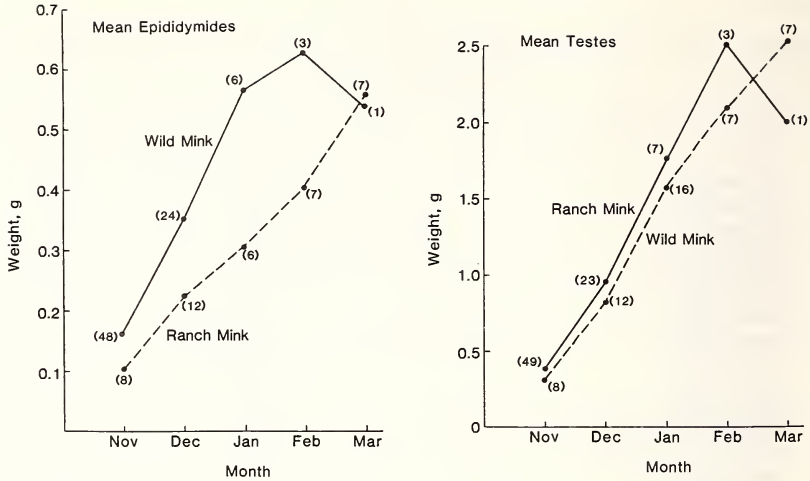

Fig. 3. Epididymides and testis weights from Maryland wild mink compared to epididymides and testis weights of ranch mink (Bostrom et al. 1968)

A 2-way ANOVA was run on each of the variables testes weight and epididymides weight using month and age as the main effects. Month was a significant factor with both testes and epididymides weights. However, age and month/age interaction were not significant factors with testes and epididymides weight.

The earliest presence of sperm in either the testes or epididymides was December 16. The presence of sperm and the monthly increase in weight of the testes and epididymides agrees with the onset of the breeding season reported by Linscombe et al. (1983) (Fig. 3).

Spermatogentic activity was seen in the positive correlation between month and epididymides weight and testes weight and month. Based on this fact, the breeding season in Maryland male mink begins in middle December and lasts at least until March. Bostrom et al. (1968) found that the mean testes and epididymides weights progressively increase from mid-November until the onset of the mating season in early March.

Comparison of mean testes and epididymides weights of ranch mink to those of wild mink from this study show a positive correlation of testes and epididymides weight with month. This study shows a decrease in testes and epididymides weight from February to March, probably because of the small sample size. There was no available information for comparing breeding data on wild mink with this study. For this reason, we used ranch mink for comparisons.

A 2-way ANOVA was run on the variable ovary weight using month and age as main effects. Month and age were not significant factors probably because only 2 females were collected in February and none in March. The breeding season for female mink is from late February to early April (Linscombe et al. 1983).

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Zusammenfassung

Altersbestimmung und morphologische Eigenschaften bei Wildnerzen von Maryland, USA

Drei Verfahren zur Altersschätzung von 169 Wildnerzen wurden angewandt. Die Tiere waren in den Jahren 1976–1980 im Bundesstaat Maryland erlegt worden. Die Methoden waren wie folgt: 1. Zahl der jährlichen Zementablagerungen an den Zähnen; 2. An- bzw. Abwesenheit der Jochbeinnaht; 3. Zustand des Jugendknötchens am Unterarmknochen. Der Jungnerzanteil in der Population betrug 66 % und im Geschlechterverhältnis ergaben sich 64 % Männchen. Statistisch bedeutende Korrelationen zwischen Alter der Tiere und Gewicht der Hoden und Nebenhoden, der Milz sowie der Länge und Breite des Nasenbeins wurden bei Rüden festgestellt, während bei den Fähen Milz-, Nieren- und Lebergewichte und Länge und Breite des Nasenbeins sich auf zunehmendes Alter bezogen. Spermatogenese begann Mitte Dezember und dauerte bis Ende Februar.

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