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The Small Mammals of the Mackenzie Delta Region, Northwest Territories, Canada

ARTHUR M. MARTELL[1] and ARTHUR M. PEARSON[2]

ABSTRACT. The paper reports on 3800 small mammals taken in taiga and tundra east of the Mackenzie River Delta between 1971 and 1974. Local distributions are given for all 10 species of small mammals recorded in the region, plus two accidentals. In addition, abundance, body and cranial measurements, and reproductive information is presented for the 8 species collected during the study. The taxonomic status of *Clethrionomys rutilus platycephalus* is discussed.

INTRODUCTION

The Mackenzie Delta region (Fig. 1) lies in the northwestern corner of the District of Mackenzie, Northwest Territories, Canada. The region forms an interface between alpine tundra, low arctic tundra, and the northernmost extension of taiga in North America.

In this paper we consider the small mammals of the region; that is, those insectivores and rodents of less than 100 g mean body weight. To the west of the region detailed small mammal information is available from the North Slope of Alaska (Bee and Hall 1956) and the Yukon Territory (Youngman 1975), but information is much less specific from the taiga to the south (Preble 1908) and the tundra to the east (Kelsall 1970). Because of the distribution of our collection sites (Fig. 1), we limit our discussion to the 10 species of small mammals found east of the Richardson Mountains. If the Richardson Mountains were included, the long-tailed vole (*Microtus longicaudus*) (Youngman 1964) and possibly the singing vole (*Microtus miurus*) (Youngman 1975) would be added to the list. Within 150 km south of the Region the Arctic shrew (*Sorex arcticus*), pygmy shrew (*Mircosorex hoyi*), deer mouse (*Peromyscus maniculatus*), and heather vole (*Phenacomys intermedius*) reach the northernmost point of their ranges.

The first documentation of the small mammals of the Mackenzie Delta region was made by MacFarlane (1905, 1908) who, between 1857 and 1866, collected a large number of specimens from the taiga near Fort Anderson and from tundra to the north and northeast. Other collections were made by Preble (1908), near Fort McPherson, in 1904; Anderson (1913, 1917, 1937), primarily along the coast, between 1908 and 1918; and Porsild (1945), primarily from the Mackenzie Delta and the Caribou Hills, between 1927 and 1931. More recently, local collections have been made in the Mackenzie Delta by Banfield (1951), on tundra east of the Delta by Slaney (1973, 1974), and in the Anderson River Delta by Barry (1967).

[1]Canadian Wildlife Service, 204 Range Road, Whitehorse, Yukon Territory, Y1A 4Y4
[2]4 Kluhini Crescent, Whitehorse, Yukon Territory, Y1A 3P3

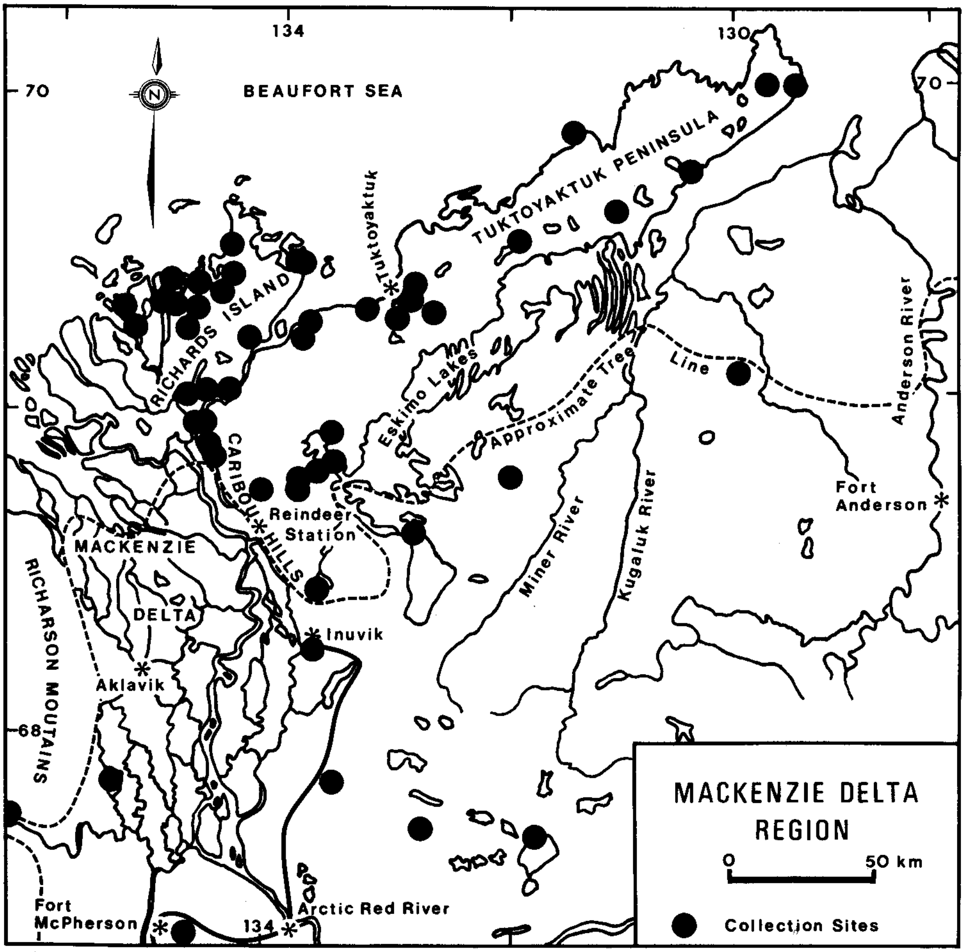

FIG. 1. Map of Mackenzie Delta region showing collection sites

The region supports a varied mammal fauna because it contains a diversity of both tundra and taiga habitats, and because it was invaded, after deglaciation, by species from both northern and southern refugia. Information on the biology of mammals of the region is therefore of interest to ecologists, zoogeographers, and taxonomists.

MACKENZIE DELTA REGION

The Mackenzie Delta region, described by Mackay (1963), is composed of the Richardson Mountains, the modern Mackenzie Delta (present delta of the Mackenzie River), and a series of uplands and plains east of the modern Delta. The general vegetation of the region is described by Lambert (1972) and Mackay (1963), and the distribution of vascular plants is best given by Hultén (1968, 1973).

South of the tree line, uplands and plains east of the modern Delta support white spruce (*Picea glauca*) — black spruce (*Picea mariana*) — lichen forests and, on warm, well-drained slopes, seral stands of white birch (*Betula papyrifera*) and white spruce. North of the tree line, uplands are covered by low shrub tundra and lowlands by sedge meadows. The upper Tuktoyaktuk Peninsula (north of about 69°45') is a flat, featureless polygon plain which supports extensive sedge meadows.

During the Wisconsin Glaciation most of the region was covered by ice, but at least the upper Tuktoyaktuk Peninsula and possibly much of the coastal half of the Tuktoyaktuk Peninsula and the northern end of Richards Island, was unglaciated (Mackay 1963, Rampton 1972). Manning (1956) hypothesised that the unglaciated area could have been a refugium for northern red-backed voles (*Clethrionomys rutilus platycephalus*) and meadow voles (*Microtus pennsylvanicus arcticus*). West of the Richardson Mountains was the large refugium of Beringia, which supported a diverse mammalian fauna (Hopkins 1972).

After deglaciation (about 12,500 B.P.), habitats in the Delta region were initially suitable for invasion by tundra small mammals from Beringia, and later for taiga dwellers from the south (Ritchie 1972, Ritchie and Hare 1971). Of the 10 species of small mammals presently found in the region, five are dispersers from Beringia (Macpherson 1965, Youngman 1975): tundra shrew (*Sorex tundrensis*), northern red-backed vole, tundra vole (*Microtus oeconomus*). brown lemming (*Lemmus sibiricus*), and collared lemming (*Dicrostonyx torquatus*). Four species are dispersers from the south: dusky shrew (*Sorex obscurus*), meadow vole, yellow-cheeked vole (*Microtus xanthognathus*), and northern bog-lemming (*Synaptomys borealis*). The remaining species, the masked shrew (*Sorex cinereus*), is represented in the region by a tundra subspecies which dispersed from Beringia (*S. c. ugrunak*) and a taiga subspecies (*S. c. cinereus*) which dispersed from the south.

MATERIALS AND METHODS

We report on 3800 small mammals taken in the Mackenzie Delta region as follows: A.M. Martell — 3038 specimens from tundra and taiga between 1971 and 1974; F. F. Slaney, Ltd. — 255 specimens from tundra in 1972 and 1973; B. K. Boles — 313 specimens from taiga in 1973; R. W. Wein — 78 specimens from tundra and taiga in 1974; and A. M. Pearson — 116 specimens from tundra in 1974. All specimens were autopsied either by or under the direction of one of the present authors.

Specimens were taken with Victor or Museum Special mouse traps using a mixture of peanut butter and rolled oats for bait. Traps were set in a variety of patterns ranging from fixed grids to burrow trapping. Martell trapped black spruce and white birch-white spruce communities in the taiga near Inuvik using grids with 15 m spacing between pairs of traps, and dwarf shrub-heath communities on the tundra near Tununuk Pt. (the southern tip of Richards Island) along paired lines with 15 m between pairs of traps (see Martell

1975b). That trapping provides an index of the abundance of small mammals in the two areas. Because of the difference in trapping procedures, indices on the tundra are likely relatively higher than those in the taiga for a given population density.

In the species accounts we present information on status, local distribution, measurements, and reproduction. Standard, external measurements were taken to the nearest millimeter and body weight was taken to the nearest 0.1 g. Cranial measurements were taken with calipers to the nearest 0.05 mm. Except for insectivores, all measurements, unless otherwise specified, are for fully grown, overwintered individuals taken between July and October. Overwintered *Clethrionomys rutilus* were identified by tooth development (Martell 1975b) and overwintered individuals of the other species were identified by the degree of cant formation on the skull.

SPECIES ACCOUNTS

Masked shrew *Sorex cinereus* Kerr
Sorex cinereus ugrunak Anderson and Rand

Although *S. c. cinereus* was relatively common in the taiga, *S. c. ugrunak* was rare on the tundra. *S. c. cinereus* was taken at most taiga sampling sites, but never on the tundra, while *S. c. ugrunak* was taken on upland tundra just east of the modern Delta and on the Tuktoyaktuk Peninsula, but never in the taiga. Porsild (1945) reported that *S. c. cinereus* shows considerable annual fluctuation in numbers in the region and our data (Table 1) support that observation.

A total of 86 *S. c. cinereus* and 10 *S. c. ugrunak* were caught. *S. c. cinereus* (taken throughout the year) is significantly larger than *S. c. ugrunak* (taken in July and August) in total length ($t = 3.64$, $P < 0.001$), tail length ($t = 9.17$, $P < 0.001$), hind foot length ($t = 2.61$, $0.05 > P < 0.01$), and condylobasal length ($t = 4.07$, $P < 0.001$) (Table 2).

The only pregnant masked shrew taken was in the taiga (4 August 1973); she was carrying 7 viable embryos. Male *S. c. cinereus* were observed to be coming into breeding condition in April and were functional at least from the last week in May through the first week of August.

All *S. c. ugrunak* had a much more narrow and distinct dorsal color band than *S. c. cinereus*, and tended to be tricolored rather than bicolored. That, and the significant difference in size, agrees with van Zyll de Jong's (1976) findings. Populations of *S. c. cinereus* are found at Reindeer Station and populations of *S. c. ugrunak* are found at Parsons Lake, only 28 km to the northeast. As van Zyll de Jong (1976) noted, the observed differences between *S. c. cinereus* and *S. c. ugrunak* suggest possible divergence beyond the subspecies level. *S. c. ugrunak* is probably of Beringian origin (Hoffman and Peterson 1967, Macpherson 1965) while *S. c. cinereus* was isolated south of the ice sheets.

Table 1. Indices (Number/1000 trap nights) of abundance of small mammals on tundra near Tununuk Pt., N.W.T., mid-June to October, 1971 to 1973; and in taiga near Inuvik, N.W.T., late-May to October, 1971 to 1974 (Number of trap nights in parentheses).

	1971			1972			1973			1974		
	May-June	July-Aug	Sept-Oct	May-June	July-Aug	Sept-Oct	May-June	July-Aug	Sept-Oct	May-June	July-Aug	Sept-Oct
TUNDRA	(700)	(690)		(2550)	(16,200)	(5,100)	(3000)	(12,000)	(2964)			
Sorex spp.	-	-		-	0.2	0.6	-	0.2	-			
Clethrionomys rutilus	2.9	4.4		2.4	14.0	54.5	-	6.0	21.3			
Microtus pennsylvanicus	-	-		-	0.1	1.0	-	0.2	-			
Lemmus sibiricus	-	-		-	0.1	-	-	-	-			
Dicrostonyx torquatus	1.4	-		0.4	0.3	-	0.3	0.3	0.3			
Total	4.3	4.4		2.8	14.7	56.1	0.3	6.7	21.6			
TAIGA	(1140)	(3496)	(2411)	(7038)	(8460)	(5940)	(8802)	(8700)	(2400)	(1500)		(600)
Sorex spp.	-	1.1	4.2	0.3	1.1	0.8	0.9	1.4	11.2	2.7		15.0
Clethrionomys rutilus	43.9	68.9	78.0	16.1	31.1	21.7	10.3	14.7	68.3	28.7		58.3
Microtus pennsylvanicus	-	1.1	0.4	0.8	0.2	-	-	1.4	1.7	-		-
Lemmus sibiricus	0.9	-	0.4	2.0	0.5	-	0.6	-	0.4	0.7		-
Synaptomys borealis	-	0.3	-	0.3	-	-	-	-	-	-		-
Total	44.7	71.5	83.0	19.5	32.9	22.6	11.8	17.5	81.7	32.0		73.3

Dusky shrew *Sorex obscurus* Merriam

The only specimen of *S. obscurus* recorded in the region is an adult male taken at Tuktoyaktuk in 1952 (Banfield 1960). Other than that specimen, the closest collections to the region are an individual taken at Old Crow, Yukon Territory (Youngman 1975), and several specimens taken in the Brooks Range, Alaska (Bee and Hall, 1956).

Tundra shrew *Sorex tundrensis* Merriam

Although Porsild (1945) reported only one record of tundra shrew, we found it to be common in the taiga and uncommon on the tundra. A total of 69 *S. tundrensis* were taken in a wide range of habitats. Measurements are presented for specimens taken throughout the year (Table 2).

Pregnant or lactating tundra shrews were taken between late May and early August. Four females, all taken in the taiga, were carrying 8, 9, 10, and 12 viable embryos. Males began sexual development in April and became functional by late May.

Northern red-backed vole *Clethrionomys rutilus dawsoni* Merriam
Clethrionomys rutilus platycephalus Manning

The northern red-backed vole is the most common small mammal in the Delta region and made up 87% of the small mammals collected. It occurs in all tundra and taiga habitats except those which are exclusively sedges and grasses. The species is much more abundant in the taiga then on the tundra (Table 1). Abundance in the taiga at the end of summer was similar in 1971, 1973, and 1974, but was lower in 1972 due to high mortality in September probably related to adverse weather (Martell 1975b). Abundance at the beginning of summer was more variable. On the tundra, red-backed voles were scarce at the beginning of each summer and reached varying abundances by the end of summer (Table 1). Martell (1975b) concluded that factors controlling vole populations were mainly extrinsic on the tundra and intrinsic in the taiga.

A total of 3298 *C. rutilus* were captured. Most taiga collections were made near Inuvik from 1971 to 1974. Tundra collections were made primarily on upland tundra east of the Delta and on Richards Island from 1971 to 1973 and on the Tuktoyaktuk Peninsula in 1974. Overwintered *C. r. dawsoni* taken from tundra and taiga between July and October (Table 3) show greater variation in size between years than between habitats. In general, *C. rutilus* tended to be smaller in the taiga in 1971 and on the tundra in 1974 then in either area in 1972 and 1973. Body size did not appear to be related to population density (Table 1 and Martell 1975b).

There was no pronounced difference in the timing of reproduction between tundra and taiga. Overwintered males were reproductively active from early May through late September, with regression of the testes beginning in late August. Overwintered females produced their first litter between early June and mid-July and their second litter between early July and late September. Some first-litter young became reproductively active at about one month of

Table 2. Measurements of small mammals taken on tundra and taiga of the Mackenzie Delta Region, N.W.T., between July and October, 1971 to 1974 (Lengths are in millimeters and weight is in grams).

	TOTAL LENGTH sample size mean ± SE (range)	TAIL LENGTH sample size mean ± SE (range)	HIND FOOT LENGTH sample size mean ± SE (range)	BODY WEIGHT sample size mean ± SE (range)	CONDYLOBASAL LENGTH sample size mean ± SE (range)	ZYGOMATIC BREADTH sample size mean ± SE (range)
Sorex cinereus *S.c. cinereus*	84 94.1 ± 0.65 (79 - 109)	84 33.9 ± 0.26 (26 - 39)	84 11.5 ± 0.07 (10 - 13)	84 3.6 ± 0.09 (2.3 - 6.6)	48 15.63 ± 0.090 (14.35 - 16.70)	
S.c. ugrunak	9 86.2 ± 2.91 (74 - 99)	9 26.6 ± 0.56 (24 - 29)	9 10.9 ± 0.31 (9 - 12)	9 3.3 ± 0.20 (2.9 - 4.7)	7 14.66 ± 0.063 (14.55 - 14.90)	
Sorex tundrensis	66 100.5 ± 0.70 (92 - 115)	66 30.5 ± 0.23 (26 - 37)	66 12.6 ± 0.08 (11 - 14)	66 6.3 ± 0.22 (4.4 - 12.4)	23 17.88 ± 0.101 (17.10 - 18.60)	
Microtus pennsylvanicus tundra	25 166.5 ± 1.38 (152 - 180)	25 37.8 ± 0.72 (32 - 45)	25 19.4 ± 0.17 (17 - 21)	25 47.0 ± 1.51 (31.9 - 62.0)	21 26.55 ± 0.124 (25.45 - 27.75)	22 15.28 ± 0.128 (14.35 - 16.40)
taiga	19 158.8 ± 1.47 (151 - 178)	19 37.8 ± 1.04 (30 - 46)	19 19.1 ± 0.20 (17 - 20)	19 35.8 ± 1.56 (25.4 - 52.4)	13 25.89 ± 0.130 (25.00 - 26.60)	13 14.63 ± 0.111 (14.15 - 15.50)
Microtus oeconomus	7 170.1 ± 3.19 (161 - 187)	7 34.7 ± 1.69 (29 - 42)	7 19.9 ± 0.40 (18 - 21)	7 54.0 ± 2.56 (45.5 - 63.5)	7 27.81 ± 0.227 (26.90 - 28.40)	7 16.44 ± 0.198 (15.70 - 16.90)
Lemmus sibiricus	15 143.4 ± 0.78 (140 - 150)	15 15.5 ± 0.78 (12 - 21)	15 18.9 ± 0.13 (18 - 20)	15 46.9 ± 2.91 (27.3 - 64.6)	11 29.56 ± 0.344 (28.25 - 31.30)	12 18.91 ± 0.320 (17.20 - 20.75)
Synaptomys borealis	4 125.8 ± 4.77 (117 - 134)	4 19.2 ± 0.75 (17 - 20)	4 17.2 ± 0.48 (16 - 18)	4 25.1 ± 2.34 (18.1 - 28.2)	3 25.38 ± 0.192 (25.10 - 25.75)	2 15.55 ± 0.050 (15.50 - 15.60)
Dicrostonyx torquatus 1971 + 1973	7 136.6 ± 1.53 (133 - 145)	7 10.7 ± 0.42 (9 - 12)	7 18.1 ± 0.34 (17 - 19)	7 53.1 ± 3.30 (38.6 - 66.5)	4 27.45 ± 0.430 (26.45 - 28.35)	6 18.38 ± 0.282 (17.70 - 19.50)
1972	7 149.6 ± 1.66 (143 - 155)	7 12.0 ± 0.72 (10 - 14)	7 18.6 ± 0.43 (17 - 20)	7 66.7 ± 4.87 (53.4 - 83.7)	5 29.49 ± 0.282 (28.50 - 30.05)	5 20.00 ± 0.425 (19.10 - 21.15)

Table 3. Measurements of overwintered *Clethrionomys rutilus dawsoni* taken on tundra and taiga of the Mackenzie Delta Region, N.W.T., between July and October, 1971 to 1974 (Lengths are in millimeters and weight is in grams).

	TOTAL LENGTH sample size mean ± SE (range)	TAIL LENGTH sample size mean ± SE (range)	HIND FOOT LENGTH sample size mean ± SE (range)	BODY WEIGHT sample size mean ± SE (range)	CONDYLOBASAL LENGTH sample size mean ± SE (range)	ZYGOMATIC BREADTH sample size mean ± SE (range)
TUNDRA						
1972-1973[1]	51 [2] 145.0 ± 1.32^{c} (120 - 161)	51 31.2 ± 0.25^{b} (27 - 34)	51 18.6 ± 0.12^{b} (17 - 20)	51 27.6 ± 0.47^{b} (20.0 - 41.0)	33 24.11 ± 0.104^{b} (23.15 - 25.45)	34 13.39 ± 0.060^{b} (12.70 - 14.35)
1974	8 134.0 ± 1.54^{a} (127 - 139)	8 26.6 ± 0.46^{a} (25 - 28)	8 18.8 ± 0.16^{b} (18 - 19)	8 26.7 ± 0.96^{a,b} (23.6 - 31.7)	8 23.72 ± 0.128^{a} (23.15 = 24.30)	8 13.64 ± 0.117^{c} (13.30 - 14.20)
TAIGA						
1971	64 138.2 ± 0.75^{b} (128 - 153)	64 32.9 ± 0.32^{c} (27 - 37)	64 18.2 ± 0.09^{a} (16 - 20)	64 26.3 ± 0.39^{a} (21.2 - 33.1)	44 23.65 ± 0.089^{a} (22.30 - 25.15)	61 12.95 ± 0.054^{a} (12.05 - 13.75)
1972-1973[1]	142 146.2 ± 0.47^{c} (131 - 161)	142 32.9 ± 0.08^{c} (25 - 41)	142 18.7 ± 0.07^{b} (17 - 21)	141 27.3 ± 0.22^{b} (21.9 - 35.8)	77 24.19 ± 0.063^{b} (22.35 - 25.40)	114 13.34 ± 0.040^{b} (12.00 - 14.15)

[1] There were no significant differences between 1972 and 1973

[2] Samples with the same letter are not significantly different from each other at the P = 0.05 level.

age and produced one or two litters during the summer. Pregnancy in second-litter young was rare. Based on embryo counts, average (and extreme) litter sizes in the taiga were as follows: overwintered — 69 first litters = 6.6 ± 0.12 (4-9), and 45 second litters = 7.0 ± 0.16 (4-10); first-litter young — 23 first litters = 6.1 ± 0.47 (4-8), and 9 second litters = 5.9 ± 0.26 (5-7). Average (and extreme) litter sizes on the tundra were as follows: overwintered — 16 first litters = 7.9 ± 0.19 (7-10), and 11 second litters = 7.3 ± 0.32 (5-9); first-litter young — 18 first litters = 7.0 ± 0.42 (2-11), and 10 second litters = 6.5 ± 0.52 (4-9). The first litter of overwintered females was significantly larger on the tundra than in the taiga ($t = 5.13$, $P < 0.001$), but this is the only significant difference in litter size between areas.

Manning (1956) described *C. r. platycephalus* from collections made at Tuktoyaktuk and about 13 km south of Tuktoyaktuk primarily in October 1952. He noted that it was significantly smaller than *C. r. dawsoni* and was darker and greyer in color. He suggested that *C. r. platycephalus* occupied the tundra of the Tuktoyaktuk Peninsula from Tuktoyaktuk east, while *C. r. dawsoni* occupied the tundra from Kittigazuit (29 km west of Tuktoyaktuk) west. Manning reported that standard[1] (and extreme) measurements of 10 second year animals of *C. r. platycephalus* were 136.4 (130-142), 31.8 (29-36), 18.8 (17.5-19.5) mm. His values are intermediate to our measurements of overwintered *C. r. dawsoni* from the tundra in 1974 and from the taiga in 1971 (Table 3). Condylobasal length of Manning's overwintered *C. r. platycephalus* was 23.51 ± 0.126 (23.1-24.5) mm and zygomatic breadth of 11 specimens was 13.25 ± 0.110 (12.8-14.2) mm. Condylobasal length is significantly less than that found on the tundra in 1974 ($t = 3.12$, $0.01 > P > 0.001$) but is not significantly different from that found in the taiga in 1971 ($t = 1.24$, $0.5 > P > 0.1$). Zygomatic breadth is also significantly less than that found on the tundra in 1974 ($t = 6.64$, $P < 0.001$) but is significantly greater than that found in the taiga in 1971 ($t = 5.29$, $P < 0.001$).

Manning reported that the skull depth of 10 second year *C. r. platycephalus* was 8.38 ± 0.055 (8.1-8.7) mm, and of 22 overwintered *C. r. dawsoni* from Aklavik-Caribou Hills was 8.94 ± 0.53 (8.5-9.4) mm; the former were significantly smaller than the latter. Skull depth of 8 overwintered animals we trapped on the tundra in 1974 was 8.79 ± 0.087 (8.55-9.30) mm; significantly greater than Manning's *platycephalus* ($t = 4.14$, $P < 0.001$) but not significantly different from his *dawsoni* ($t = 1.46$, $0.5 > P > 0.1$).

All of the 32 animals we collected from within 17 km of Tuktoyaktuk, 7-14 September 1974, were young-of-the-year. Condylobasal length and skull depth of those specimens are 21.37 ± 0.169 (19.50-23.05) mm and 8.60 ± 0.032 (8.15-8.95) mm, respectively. Manning reported that condylobasal length and skull depth of 82 first year *platycephalus* were 21.67 ± 0.67 (19.8-23.1) mm and 8.24 ± 0.19 (7.8-8.7) mm, respectively; and of 65 first year *dawsoni* from Aklavik were 22.79 ± 0.63 (21.6-24.3) mm and 8.75 ± 0.022 (8.3-9.2) mm,

[1]Standard measurements, in order, are: total length, tail length, hind foot length.

respectively. The two subspecies were significantly different in both characters. In condylobasal length, our animals were only just significantly different from Manning's *platycephalus* ($t = 1.998$, $P = 0.05$) and were significantly smaller than his *dawsoni* ($t = 3.67$, $P < 0.001$). In skull depth, our animals were significantly larger than Manning's *platycephalus* ($t = 9.89$, $P < 0.001$) and significantly smaller than his *dawsoni* ($t = 3.67$, $P < 0.001$). Condylobasal length of our animals is also significantly less ($t = 6.70$, $P < 0.001$) than that for 112 young-of-the-year we collected in the taiga in September-October, 1971 (22.10 ± 0.033).

The significant variation in the size of *C. rutilus* both between years (Table 3) and between age classes (Martell 1975b) indicates that one should proceed cautiously in taxonomic separation of the subspecies on the basis of size. Overwintered animals taken in the taiga in 1971 are closer in size to *platycephalus* than *dawsoni*, and overwintered animals taken on the tundra in 1974 might easily be referred to subspecies *dawsoni* on the basis of size. However, young-of-the-year taken near Tuktoyaktuk in 1974 most closely resemble *platycephalus* in size. We, like Youngman (1975), suggest that the status of *platycephalus* needs reassessment. If it is a valid subspecies, its range is likely restricted to within less than 20 km of Tuktoyaktuk.

Meadow vole *Microtus pennsylvanicus drummondi* Audubon and Bachman

The meadow vole is common in the forests of the region but its range is restricted on the tundra. It is locally common on mainland tundra between the modern Mackenzie Delta and the Eskimo Lakes, and on Richards Island and adjacent islands of the modern Delta. A colony found on the Tuktoyaktuk Peninsula (69°40' N, 131°07'W) may be the result of northward movement from taiga near the mouth of the Kugaluk River across the "fingers" of the Eskimo Lakes. The meadow vole was not taken elsewhere on the Tuktoyaktuk Peninsula nor has it been found in the Anderson River Delta (Barry 1967). We found *M. pennsylvanicus* in a wide range of habitats but it appeared to prefer wet, lowland sites, particularly those sites dominated by grasses and sedges. *M. pennsylvanicus* is common in many disturbed sites in the taiga and on the tundra, where the original shrub vegetation has been replaced by grasses and sedges.

A total of 160 *M. pennsylvanicus* were caught. Animals on the tundra are significantly larger than those in the taiga in total length ($t = 3.78$, $P < 0.001$), condylobasal length ($t = 3.50$, $0.01 > P > 0.001$), zygomatic breadth ($t = 3.47$, $0.01 > P > 0.001$), and body weight ($t = 5.05$, $P < 0.001$).

In the taiga, reproductively active animals were captured between late May and late August. The smallest breeding female was 130 mm long and weighed 18 g, and the smallest breeding male was 138 mm long and weighed 27 g. The mean (and extreme) embryo count for 6 overwintered females was 6.00 ± 0.365 (5-7). For 9 young-of-the-year the embryo count was 4.22 ± 0.324 (3-5), significantly less ($t = 3.58$, $0.01 > P > 0.001$) than that for overwintered animals. Females in both age classes produced no more than two litters during the summer.

On the tundra, reproductively active animals were captured between mid-June (earliest tundra sampling) and mid-September. The smallest breeding female was 134 mm long and weighed 24 g, and the smallest breeding male was 138 mm long and weighed 24 g. The mean (and extreme) embryo count for 11 overwintered females was 8.64 ± 0.473 (6-10). For 7 young-of-the-year the embryo count was 6.86 ± 0.340 (6-8), significantly less ($t = 2.71$, $0.05 > P > 0.01$) than that for overwintered animals. Embryo counts for both overwintered females and young-of-the-year on the tundra were significantly greater than those of their taiga counterparts ($t = 3.76$, $0.01 > P > 0.001$; $t = 5.56$, $P < 0.001$; respectively). Both age classes of females produced no more than two litters during the summer.

Cowan (1951) described the subspecies *M. p. arcticus* from the tundra of Richards Island on the basis of size and color. Martell (1975a), however, showed that although animals on the tundra were larger than those in the taiga, a north-south gradient in size existed. He concluded that there seemed to be no valid reason for recognizing the tundra subspecies *arcticus* and consequently referred all *M. pennsylvanicus* in the area to the subspecies *drummondi*. That conclusion is further supported by the large size of *M. p. drummondi* in the northern Yukon (Youngman, 1975). We consider all *M. pennsylvanicus* in the region to be subspecies *drummondi*, but have presented data on tundra and taiga populations separately because of the great difference between those two ecotypes.

Tundra vole *Microtus oeconomus macfarlani* Merriam

We collected tundra voles only on the upper Tuktoyaktuk Peninsula, east of 131°30'W. Most individuals were taken in wet, lowland sedge meadows, usually near lakes or ponds. The species probably occurs in that habitat at least from Tuktoyaktuk eastward (Anderson 1913, 1937; Barry 1967; MacFarlane 1905; Porsild 1945; Preble 1908). In the taiga, *M. oeconomus* has been recorded only from Aklavik (Anderson 1937) and Fort Anderson (Anderson 1937, Preble 1908). In both cases, however, the actual collections could have been made some distance from the settlements. There are no records of *M. oeconomus* from tundra near the modern Mackenzie Delta where *M. pennsylvanicus* occurs. The only mixed colony we found was on the Tuktoyaktuk Peninsula (69°40'N, 131°07'W) although such mixed colonies are often found in the Yukon (Youngman 1975).

A total of 57 *M. oeconomus* were caught; measurements of 7 overwintered animals are presented (Table 2). We have no information on the length of the breeding season. The smallest breeding female was 143 mm long and weighed 31 g, and the smallest breeding male was 133 mm long and weighed 23 g. Two overwintered females taken in early August had 14 and 16 placental scars. Four young-of-the-year were carrying 5, 6, 8, and 9 embryos.

Yellow-cheeked vole *Microtus xanthognathus* Leach

We did not catch any specimens of *M. xanthognathus*. Yellow-checked voles were common in the region about 100 years ago and were recorded from Fort

McPherson, Fort Anderson, and the Anderson River (MacFarlane 1905, Preble 1908). Recently colonies have been found on the Anderson River (pers. comm. V.D. Hawley, Canadian Wildlife Service, Edmonton, Alberta) and at Odizen Lake (67°45'N, 132°45'W) and Fish Lake (66°58'N, 131°52'W) (pers. comm. B. K. Boles and J. Roland, formerly Northwest Territories, Game Management Division, Inuvik, NWT). Specimens from Fish Lake are deposited in the Museum of Zoology of the University of Alberta.

Brown lemming *Lemmus sibiricus trimucronatus* Richardson

Brown lemmings were found throughout the region but they were more common in the taiga than on the tundra (Table 1). Specimens were taken even at our most southerly taiga collecting sites. Population density varied considerably between years (Table 1). Near Inuvik the population indices at the beginning of summer were highest in 1972, and densities were higher in early summer than in late summer in all years.

A total of 62 *L. sibiricus* were caught. Although the population density varied between years, we did not find a conspicuous related difference in size of individuals (Table 2). In most years, reproductively active individuals were taken between late May and mid-September. On 22 January 1972, a male was captured near Inuvik with sperm in the testis but not in the epididymus; that individual was probably coming into breeding condition. On 13 April 1972, a female was captured near Inuvik with a flaccid reproductive tract and 4 placental scars, indicating recent birth. Winter breeding, therefore, preceded the year of highest numbers.

The smallest breeding females were 105 mm long and weighed 25.6 g, and the smallest breeding males were 108 mm long and weighed 23.5 g. Three overwintered females, all from the taiga, had 3, 6, and 7 viable embryos. Mean (and extreme) embryo count for 4 young-of-the-year on the tundra was 5.75 ± 0.854 (4-8), and for 7 young-of-the-year in the taiga was 4.57 ± 0.481 (3-6). The difference is not significant ($t = 1.31$, $0.5 > P > 0.1$).

Northern bog lemming *Synaptomys borealis borealis* Richardson

We collected four *S. borealis*, the only records from the region (Martell 1974). All four specimens were taken within 1 km of each other in taiga near Inuvik. Average measurements are presented in Table 2. A female was reproductively active when collected in late May, and males were reproductively active when taken in late June and late August.

Collared lemming *Dicrostyonyx torquatus kilangmiutak* Anderson and Rand.

Collared lemmings were captured only on tundra. Dry upland sites with a low shurb cover were preferred summer habitat, and the lower slopes of hills, where snow accumulation was greatest, were preferred wintering sites. Colonies were usually located on or near ridge tops, and were very scattered.

A total of 54 *D. torquatus* were collected. In 1972, individuals were significantly larger in total length ($t = 5.76$, $P < 0.001$), condylobasal length ($t = 4.12$, $0.01 > P > 0.001$), zygomatic breadth ($t = 3.28$, $0.01 > P > 0.001$) and body weight ($t = 2.31$, $0.05 > P > 0.01$) than in 1971 and 1973 (Table 2).

Reproductively active animals were taken between mid-June (earliest tundra trapping) and August. A female taken on the sea ice north of Richards Island on 29 February 1972 had 8 placental scars, indicating that winter breeding occurs, at least in some years. Based on placental scar counts, overwintered females may produce two litters during the summer, but young-of-the-year probably have only one litter. The smallest reproductively active female was 119 mm long and weighed 36 g, and the smallest reproductively active male was 109 mm long and weighed 35 g. Two overwintered females had 7 and 8 viable embryos, and 3 young-of-the-year had 3, 4, and 5 viable embryos. The large body size in 1972 and the presence of winter breeding in 1971-1972 suggest that 1972 was a peak year. Population indices (Table 1), however, do not support that conclusion.

Accidentals

Both deer mice *(Peromyscus maniculatus)* and house mice *(Mus musculus)* have been accidentally introduced to the region by barges bringing supplies from farther south. Anderson (1917) reported that an adult male *P. maniculatus* was taken at Herschel Island 6 August 1914 from a Hudson Bay Company scow which came from Fort McPherson. That individual probably came to Fort McPherson from even farther south. Porsild (1945) noted that two *M. musculus* were taken at a reindeer camp on the lower East Channel in October 1931. He suggested that they were introduced the preceding summer.

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