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Small Mammal Communities of the Kluane Region, Yukon Territory

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Abstract. A survey of small mammals was carried out near Kluane National Park in the southwestern Yukon in 1973 and 1974. Of 19 species recorded, 9 species of voles, mice, and lemmings were studied in detail with snap-trapping lines. Twenty-one habitats were analyzed, and the species composition of each determined. Kluane Park is in a zoogeographic tension zone and several species of small mammals reach their northern (or southern) limits in or near the park. Species diversity was highest in marshes along the Dezadeash River, where three rare species were found. The deer mouse, *Peromyscus maniculatus*, and northern red-backed vole, *Clethrionomys rutilus*, were the most abundant small mammals and occupied the widest habitat spectrum. There is very little niche overlap among the nine species of small-rodents in the habitats they occupy. Abundance changes do not occur in synchrony in the northern and southern parts of the Kluane region.

If we are to conserve our natural resources, we must first catalogue them. Nowhere is this more important than in national parks, which should preserve whole ecosystems for future generations. This study attempts to add to the knowledge of the Kluane National Park region in the southwestern Yukon through an ecological survey of the shrews, mice, and lemmings.

Methods

The survey was carried out in and around Kluane National Park from 18 June 1973 to 26 September 1973 and from 27 April to 15 October 1974. The basic sampling technique used was snap-trap lines of 20 stations spaced at 50-ft (15.2-m) intervals in a straight line with three traps per station (Krebs 1964). Each line was left in position for 3 days and checked daily. Parallel lines were placed at least 200 ft (61 m) apart. Peanut butter was used as bait on all traps. Disturbance of traps by red squirrels (*Tamiasciurus hudsonicus*) and arctic ground squirrels (*Spermophilus parryii*) was occasionally severe and in general reduced the accuracy of the survey procedure.

Habitat was classified around each trapping station so that the observational unit was one trapping station with three traps set for 3 nights (or 9 trap nights). We used this unit because it was difficult to place an entire trap line in a single habitat. Our habitat classification attempted to follow the plant survey conducted by George Douglas (personal communication), but we were only partly successful with this coordination. We sampled some of the same sites that Douglas sampled, but were forced to classify habitats more crudely.

In our survey, we recognized 21 habitats, listed in Table 1 along with the plant communities recognized by Douglas. The alpine plant communities occur on a spatial scale that is coarse-grained to the rodents (Douglas, personal communication). Hence we group these tundra areas into two broad zones based on the density of shrubs. Alpine tundra areas support only small vascular plants and almost no shrubs are present.

TABLE 1—Habitats sampled during this survey and the equivalent plant communities recognized by Douglas (1974 unpublished report, Parks Canada)

Habitat sampled	Plant communities included
1. Alpine tundra	(complex mosaic)
2. Subalpine shrub tundra	(several shrub and herb communities)
3. Closed spruce communities	
(a) Closed spruce — moss	*Picea glauca/ Hypnum revolutum* *Picea glauca/ Thuidium abietinum*
(b) Closed spruce — birch	*Picea glauca/ Betula glandulosa/ Empetrum nigrum* *Picea glauca/ Betula glandulosa/ Carex aquatilis*
(c) Closed spruce — willow	*Picea glauca/ Salix glauca*
(d) Closed spruce — buffaloberry	*Picea glauca/ Shepherdia canadensis* (closed phase)
(e) Closed spruce — aspen	*Picea glauca/ Populus tremuloides/ Shepherdia canadensis/ Linnaea borealis*
(f) Closed spruce	
4. Open spruce communities	
(a) Open spruce — aspen	3(e) above
(b) Open spruce — willow	*Picea glauca/ Salix glauca/ Arctostaphylos*
(c) Open spruce — birch	*Picea glauca/ Betula glandulosa/ Carex aquatilis*
(d) Open spruce — buffaloberry	*Picea glauca/ Shepherdia canadensis* (open phase)
5. Deciduous forest communities	
(a) Aspen	*Populus tremuloides/ Arctostaphylos uva-ursi/*
(b) Balsam poplar	*Populus balsamifera* (dry phase) *Populus balsamifera* (mesic phase)
(c) Balsam poplar-buffaloberry	*Populus balsamifera/ Shepherdia canadensis*
6. Shrub communities	
(a) Willow	*Salix glauca*
(b) Shrub birch-meadow	*Betula glandulosa/ Festuca altaica*
(c) Beach ridges	*Juniperus communis/ Arctostaphylos uva-ursi/ Artemisia alaskana*
7. Other communities	
(a) Marsh	(not classified)
(b) Dryas flats	*Dryas drummondii*
(c) Grass-fireweed	*Calamagrostis*

There are several types of closed spruce forest and we include in this category everything that included white spruce (*Picea glauca*) as the important tree and in which trees were closely spaced (distance between trees, 3–6 m). Open spruce forests occur in a variety of forms and are often successional to fires. Spruce trees in these habitats are widely spaced (15 to 30 m) and other trees (trembling aspen, *Populus tremuloides*, or willows, *Salix* spp.) may be co-dominant with spruce. There is little difference in the dominant plants of open spruce and closed spruce communities of the same designation, and Douglas did not recognize this distinction for all forested communities.

Many other specialized habitats can be recognized and we have trapped only a few of these, the marshes along the Dezadeash River and the Slims River, beach ridges along the Dezadeash River, and *Dryas drummondi* flats.

The area studied was divided into three subregions as shown in Figure 1. The southern areas included the regions south and east of Bear Creek Summit, including the southern part of Kluane National Park. The southern areas were sampled along the Alaska Highway (Mile posts 1022–1028), Haines Highway (Mile posts 120–158), and the old Dezadeash Road west of Haines Junction. Helicopter surveys in the summer of 1973 to Goatherd Mountain, Sockeye Lake, Bates Lake, Profile Mountain, and Marble Creek completed our coverage of the southern areas. The central areas sampled included the area crossed by the Alaska High-

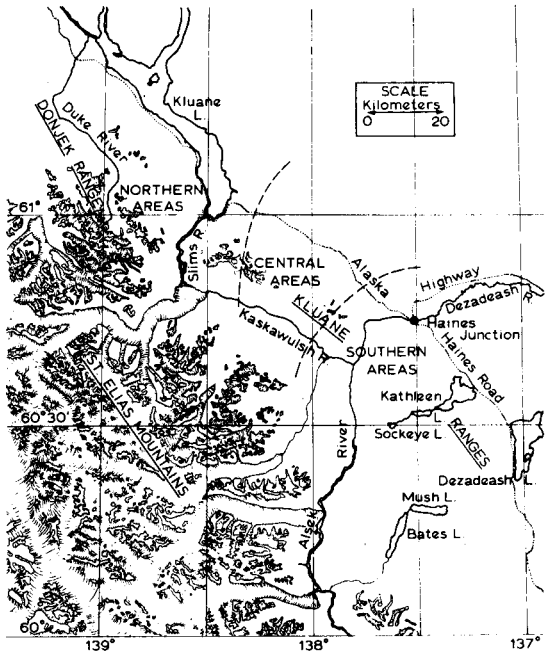

FIGURE 1. Map of study area in the Kluane region of the southwestern Yukon Territory.

way from Bear Creek Summit (Mile 1028.5) to Boutellier Summit (Mile 1049.8). The northern areas sampled included the Alaska Highway from Mile 1050 to Mile 1071, the Slims River area, and the Donjek River Valley around Hoge Creek. Helicopter surveys to Observation Mountain and Vulcan Mountain were made in 1973.

Species diversity was measured by Brillouin's formula (Pielou 1966), and evenness was calculated thus:

$$\text{evenness} = \frac{\text{observed species diversity}}{\text{maximum possible diversity}}$$

(see Pielou 1966).

Niche breadth, based on habitats occupied, was calculated from MacArthur's formula

$$B = \frac{1}{\Sigma p_i^2}$$

where B = niche breadth, p_i = proportion of species total density in habitat i.

Note that p is defined from our average density estimates:

$$p_i = \frac{d_i}{\Sigma d_i}$$

where d_i = number of individuals per 100 trap nights in habitat i.

Niche breadth can vary from 1.0 to the number of habitats sampled, and can be expressed as standardized niche breadth by dividing the number of habitats (range 0 to 1.0). Note that we deal here with only one dimension of the niche of these small mammals, the habitat niche.

Niche overlap between two species of small mammals was calculated from Pianka (1973) as follows:

$$o_{ij} = o_{ji} = \frac{\Sigma(x_{ik}\ x_{jk})}{\sqrt{\Sigma x^2_{ik}\ \Sigma x^2_{jk}}}$$

where $o_{ij} = o_{ji}$ = niche overlap between species i and species j (range 0–1),

x_{ik} = proportion of species i numbers in habitat k

x_{jk} = proportion of species j numbers in habitat k.

Species reported in this paper were identified from keys provided in Hall and Kelson (1959) and Cowan and Guiguet (1956). Scientific nomenclature follows Banfield (1974). Some uncertainty in the field of distinguishing the dusky shrew, *Sorex obscurus*, and the masked shrew, *Sorex cinereus*, resulted in these two shrews being grouped in some of the data.

Results

Species Distributions

We recorded two species of shrews and nine species of rodents in the family Cricetidae during our survey. Table 2 lists these species along with other small mammals recorded, a total of 19 species. There are some notable species missing from this list. No bats were seen; the little brown bat, *Myotis lucifugus*, should also be in the area but was not seen.

Kluane National Park is situated in a zoogeographic tension zone. Many southern species of small mammals reach their distributional limits in or near the park, and many northern species extend south into this area. The deer mouse, *Peromyscus maniculatus*, is near the northwestern limit of its range in the Kluane region, as is the heather vole, *Phenacomys intermedius*, and the least chipmunk, *Eutamias minimus*. The southern limits of the ranges of the northern red-backed vole, *Clethrionomys rutilus*, the tundra vole, *Microtus oeconomus*, and

TABLE 2—Species of small mammals recorded in the region of Kluane National Park by this survey. Total number of specimens of cricetid and zapodid rodents obtained by snap trapping are given in parentheses

Order Insectivora
Family Soricidae
Sorex cinereus, masked shrew
Sorex obscurus, dusky shrew
Order Rodentia
Family Sciuridae
Eutamias minimus, least chipmunk
Spermophilus parryii, arctic ground squirrel
Tamiasciurus hudsonicus, American red squirrel
Glaucomys sabrinus, northern flying squirrel
Family Cricetidae
Peromyscus maniculatus, deer mouse (498)
Clethrionomys rutilus, northern red-backed vole (495)
Phenacomys intermedius, heather vole (23)
Microtus pennsylvanicus, meadow vole (111)
Microtus oeconomus, tundra vole (61)
Microtus longicaudus, long-tailed vole (45)
Microtus miurus, singing vole (40)
Lemmus sibiricus, brown lemming (4)
Synaptomys borealis, northern bog lemming (5)
Family Zapodidae
Zapus hudsonius, meadow jumping mouse (5)
Family Erethizontidae
Erethizon dorsatum, porcupine
Order Lagomorpha
Family Leporidae
Lepus americanus, snowshoe hare
Family Ochotonidae
Ochotona princeps, American pika

the singing vole, *M. miurus*, occur near the park. The brown lemming, *Lemmus sibiricus*, has been recorded only recently by Youngman (1975) from this part of the Yukon, and our records represent a further range extension. Voucher specimens are deposited in the Vertebrate Museum, University of British Columbia.

Other rodent species observed were common boreal forest and tundra mammals with broad geographical distributions. The red squirrel, snowshoe hare (*Lepus americanus*), and the porcupine (*Erethizon dorsatum*) are the best examples of these widespread species.

Area Effects

We analyzed the distribution and relative abundance of the cricetid rodents separately for the northern, central, and southern areas depicted in Figure 1. Some of the less common species are not present in all these areas. The singing vole, *Microtus miurus*, has not been caught south of Mile 1050 of the Alaska Highway, and is thus absent from the central and southern areas. *Zapus* has never been caught in the northern areas.

We calculated the abundance of the cricetid species in the different areas by combining data over all months and over all habitats. Figure 2 gives the abundances for 1973 and Figure 3 for 1974. In 1973, 794 rodents were collected in 16 740 trap nights, and in 1974, 490 individuals in 21 870 trap nights. Central areas were trapped little in 1973, and these few data suggest that *Clethrionomys* was quite common in the central areas in 1973 and *Peromyscus* was rare.

Peromyscus and *Clethrionomys* were clearly the dominant species in southern areas in 1973 and 1974. *Peromyscus* constituted 47% of the catch in 1973 (649 specimens total of all species) and 43% in 1974 (114 specimens total of all species), while the corresponding percentages for *Clethrionomys* were 41% and 44%. In the central areas *Clethrionomys* was dominant in 1974 (69% of catch of 157 individuals) and *Peromyscus* was rare; *Microtus pennsylvanicus* was a distant co-dominant composing 13% of the samples. In the northern areas *Peromyscus* was again dominant making up 53% of the catch in 1973 (137 specimens total of all species) and 34% in 1974 (219 specimens total). *Clethrionomys* and a group of three species of *Microtus* were distant co-dominants, with each having about 10% of the catch in 1973, and in 1974 *Microtus pennsylvanicus* (26%) and *Clethrionomys* (20%) were co-dominants with *Peromyscus*.

Populations of small rodents often fluctuate in size from year to year, and hence the relative abundances of the different species can change. The variations among areas shown in Figures 2 and 3 are thus not surprising, and if anything may be less dramatic than one might expect. In general the small mammal communities of the Kluane region are dominated by *Clethrionomys rutilus* and *Peromyscus maniculatus*, which together constitute 70–80% of the catch.

Species diversity for each habitat was calculated from Brillouin's formula and also measured by the number of cricetid species. We used these two diversity measures in a two-way analysis of variance to determine whether the

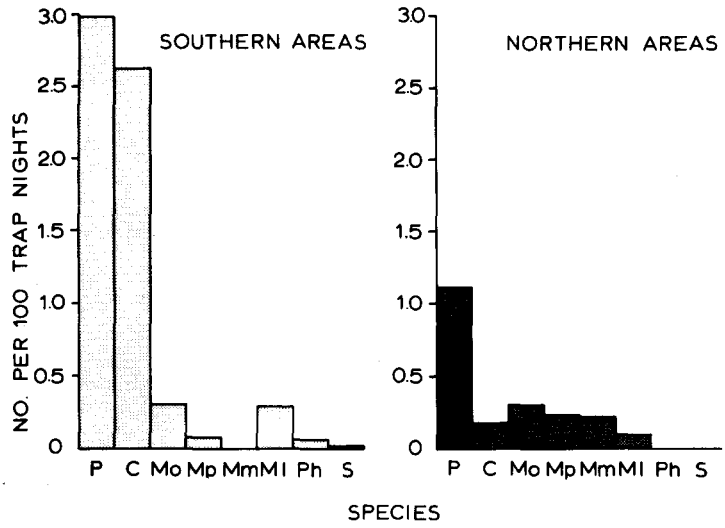

FIGURE 2. Density indices for small rodents during the summer of 1973. P = *Peromyscus maniculatus;* C = *Clethrionomys rutilus*; Mo = *Microtus oeconomus*; Mp = *M. pennsylvanicus*; Mm = *M. miurus*; Ml = *M. longicaudus*; Ph = *Phenacomys intermedius*; S = *Synaptomys borealis.*

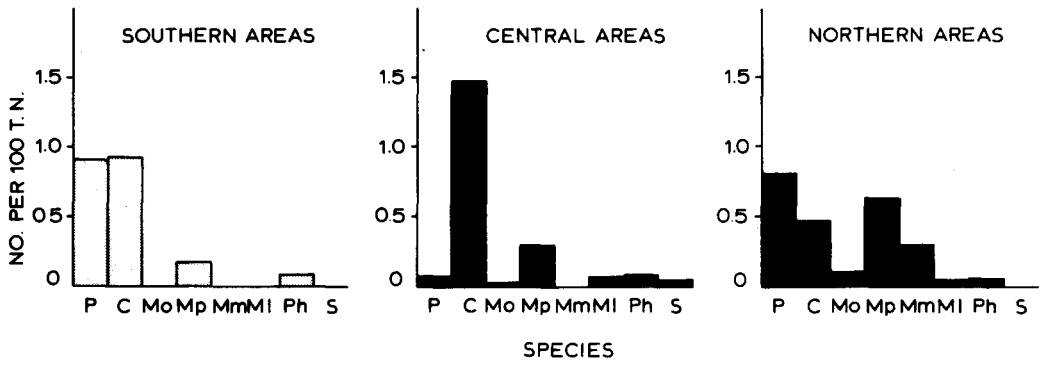

FIGURE 3. Density indices for small rodents during the summer of 1974. Species abbreviations as in Figure 2.

three areas sampled or the different habitats had different species diversity levels. We did two separate analyses, one for 1973 and one for 1974. For 1973 we compared the northern and southern areas and seven habitats sampled in both areas (alpine tundra, subalpine tundra, closed spruce, open spruce, balsam poplar, marsh, and *Dryas*). For 1974 we compared three areas and four habitats sampled in all areas (closed spruce, open spruce, marsh, willow). No comparison was significant, and consequently, within the data we have obtained, we can detect no significant variation in either measure of species diversity in different areas or in different habitats. Table 3 presents the average values for these measures of diversity. We did the same type of analysis on Pielou's measure of evenness and on the community dominance index and again found no significant variations due to area or habitat. Table 3 gives the average values. Thus if a given major habitat is trapped in the Kluane area, one can expect to catch 3.3–3.4 species, with 80–90% of the catch contained in the two dominant species, and an average diversity of

TABLE 3—Average values for measures of species diversity and dominance for small mammals in the Kluane region of the southern Yukon

Year	Number of species	Brillouin's diversity[a]	Evenness[b]	Community dominance index[c]
1973	3.4	0.95	0.76	80.1
1974	3.3	0.79	0.70	91.2

[a]Measured in bits per individual.
[b]Measured as a ratio, maximum 1.0.
[c]Percentage of individuals contained in two most common species.

0.8–0.9 bits per individual.

Habitat Effects

Table 4 indicates the abundance of the cricetid rodents in the different habitats during 1973 and 1974. These data were obtained by grouping the data from the northern, central, and southern areas. Some species, such as *Peromyscus maniculatus*, occur in almost all of the habitats; others, such as *Microtus pennsylvanicus*, are much more restricted in habitat range. We have quantified these differences by the measurement of standardized niche breadth (Pianka 1973) and, in Table 5 the niche breadths of each species for 1973 and for 1974 are shown.

Niche breadths are consistent over the two years, and the two dominant species, *Peromyscus maniculatus* and *Clethrionomys rutilus*, have the widest niches. Changes in niche breadths from year to year seem to parallel changes in abundance for all the *Microtus* species and for *Phenacomys* and *Synaptomys*. As population density increases in these voles, they seem to move into more habitats. This phenomenon did not occur in either of the two dominant species. Both *Peromyscus* and *Clethrionomys* declined in abundance from 1973 to 1974, yet their niche breadths increased slightly.

TABLE 5—Standardized niche breadths of eight cricetid rodents sampled by snap trapping in 18 habitats, Kluane area, Yukon Territory

Species	Standardized niche breadth 1973	1974
Peromyscus maniculatus	0.40	0.42
Clethrionomys rutilus	0.33	0.39
Microtus oeconomus	0.24	0.13
Microtus pennsylvanicus	0.07	0.12
Microtus miurus	0.12	0.12
Microtus longicaudus	0.19	0.16
Phenacomys intermedius	0.14	0.42
Synaptomys borealis	0.06	0.07

Species can occupy different habitats or may overlap each other. For example, both *Synaptomys borealis* and *Microtus pennsylvanicus* reached maximum abundance in marsh habitats (Table 4). To quantify this overlap, we used the niche overlap measure of Pianka (1973). Table 6 shows these values for 1973 and 1974. There is surprisingly little niche overlap for these eight species of rodents. The highest overlap was between *Synaptomys* and *M. pennsylvanicus* in both years. Other significant overlaps occurred only during one year. For example, the two dominant species, *Peromyscus maniculatus* and *Clethrionomys rutilus*, showed high overlap in 1973 but reduced overlap in 1974 when both species were less common. The net result is that most of these rodent species exploited the range of available habitats in different ways so that they did not usually overlap greatly. This result should reduce the possibility of interspecific competition.

The small-mammal fauna of some habitats is very similar. For example, both aspen and closed spruce habitats have *Peromyscus* as the dominant species, *Clethrionomys* as the subdominant, and low densities of *Phenacomys*. We have quantified this measure of similarity among habitats by the use of a hierarchical cluster analysis (Sneath and Sokal 1973, p. 230). The tree diagram of habitat similarity is shown in Figure 4. Similarity was measured by the percentage of similarity (Southwood 1966, p. 333) of the relative abundances.

Habitats in the Kluane region fall into five

TABLE 4—Number of rodents per 100 trap nights for each habitat trapped during 1973 (normal print) and 1974 (italics), Kluane region, Yukon (— indicates no animals caught)

	Closed spruce habitats								Open spruce habitats													
Species	Alpine tundra	Subalpine tundra	Closed spruce — moss	Closed spruce — birch	Closed spruce — willow	Closed spruce — buffaloberry	Closed spruce — aspen	Closed spruce	Open spruce — aspen	Open spruce — willow	Open spruce — birch	Open spruce — buffaloberry	Aspen	Balsam poplar	Balsam poplar — buffaloberry	Marsh	*Dryas drummondi*	Beach Ridge	Willow	Grass-fire weed	Shrub birch — meadow
Peromyscus	0.08	0.24	1.67	2.50	1.05	20.5	4.17	10.67		0.64	2.94		10.27	1.12	4.72	0.14	2.22	11.67	1.73	2.31	
maniculatus	—	—	*1.65*	—	*0.31*	*2.30*	*0.69*	*0.86*	*1.79*	*0.31*	*0.28*	*2.57*	*0.88*	*0.36*		—			*0.50*	—	—
Clethrionomys	0.28	0.16	—	19.16	3.00	10.0	10.0	5.22		1.04	4.90		5.72	0.40	—	0.14	—	0.28	1.48	0.93	
rutilus	—	*0.24*	*0.95*	*5.56*	*3.21*	*0.16*	*1.94*	*0.99*	*1.79*	*0.69*	*1.83*	*0.70*	*1.32*	*0.18*		—			*0.33*	—	—
Microtus	0.67	0.12	—	—	—	—	—	0.11		0.08	—		—	0.30	—	0.83	—	—	—	0.93	
oeconomus	—	*0.14*	—	—	—	—	—	—	—	*0.03*	—	*0.35*	—	—		*0.05*			—	—	—
M.	—	—	0.12	—	—	—	—	—		—	—		—	—	—	2.92	—	0.28	—	—	
pennsylvanicus	—	*0.19*	—	—	*0.10*	—	—	—	—	*0.03*	*0.17*	*0.12*	—	—		*3.06*			—	—	*1.11*
M. miurus	—	—	1.19	—	—	—	—	—		0.16	—		—	0.10	—	—	—	—	—	0.46	
	—	*0.28*	*0.55*	—	—	—	—	—	—	*0.03*	—	—	—	—		*0.05*			—	*1.46*	—
M.	0.02	0.91	—	—	—	—	—	—		0.56	—		0.17	0.10	—	—	0.37	—	—	—	
longicaudus	—		—	—	*0.30*	*0.08*	—	—	—	*0.03*	—	*0.12*	—	—		*0.05*			—	—	—
Phenacomys	—	—	—	—	—	—	—	0.11		—	—		—	0.20	—	—	—	—	0.37	—	
intermedius	—	—	—	—	*0.05*	*0.08*	—	—	—	*0.21*	*0.06*	*0.12*	*0.15*	*0.18*		—			*0.17*	—	*0.22*
Synaptomys	—	—	—	—	—	—	—	—		—	—		—	—	—	0.14	—	—	—	—	
borealis	—	*0.02*	—	—	—	—	—	—	—	—	—	—	—	—		*0.15*			—	—	—
Trap nights 1973	5040	2520	837	360	765	180	360	900		1251	306		594	981	360	720	540	360	810	216	
1974	*360*	*4221*	*1269*	*108*	*1962*	*1260*	*720*	*810*	*279*	*2880*	*1800*	*855*	*1359*	*558*		*2061*			*1206*	*342*	*900*

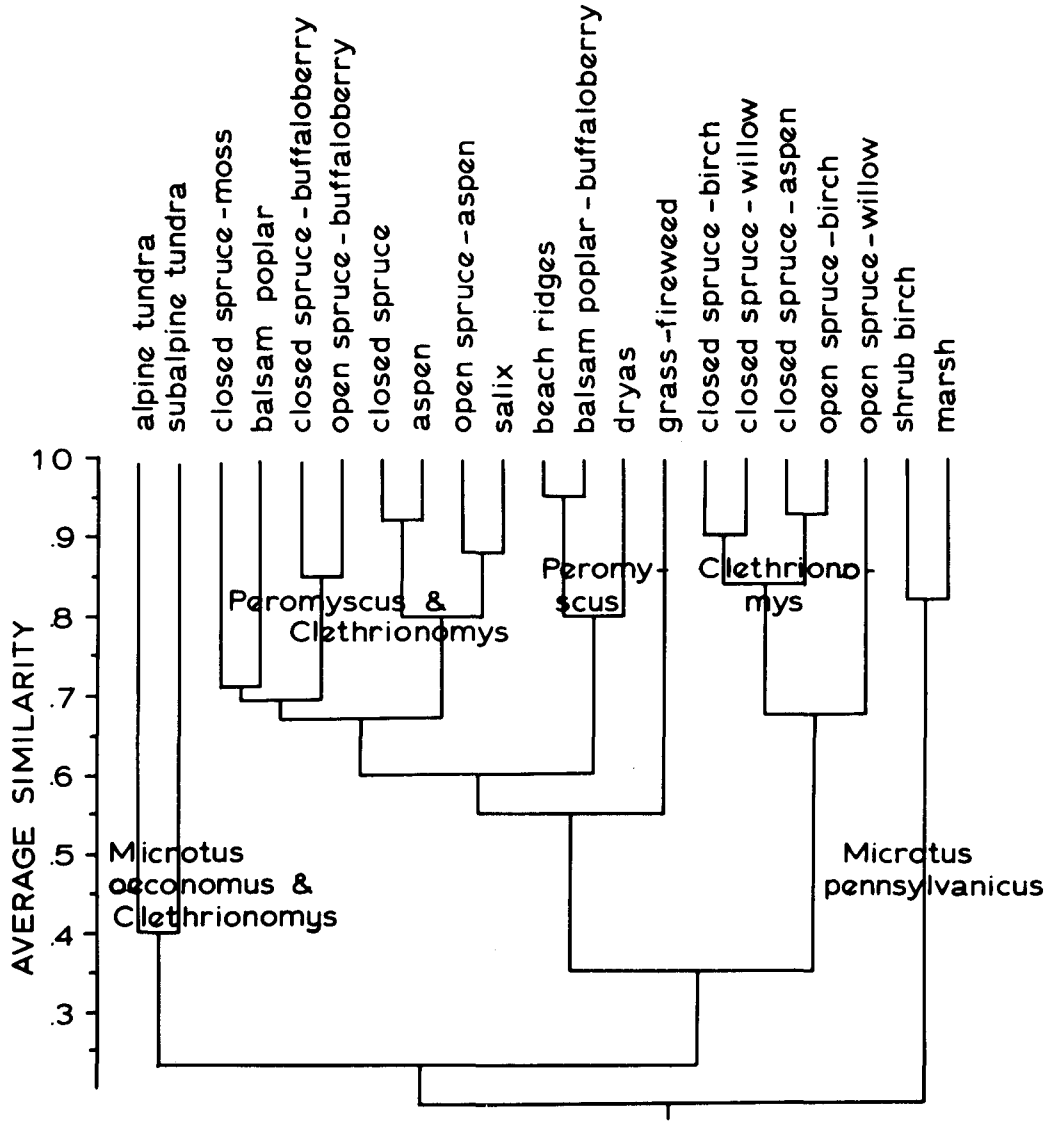

FIGURE 4. Cluster analysis of 21 habitats in Kluane region on the basis of their small-mammal communities.

broad categories on the basis of rodent species. Subalpine and alpine tundras are dominated by *Clethrionomys* and *Microtus oeconomus*. A broad range of common spruce habitats is dominated by a mixture of *Peromyscus* and *Clethrionomys*, and three minor habitats (beach ridges, *Dryas*, and balsam poplar-buffaloberry) are dominated completely by *Peromyscus*. *Clethrionomys* is the major species in a second set of widespread spruce habitats, and finally *Microtus pennsylvanicus* is the major species in marshes and in shrub birch, two communities that are infrequent in the Kluane area.

Year Effects

Populations of most rodents fluctuate dramatically in size. We have indicated in the previous sections how year-to-year changes can

TABLE 6—Niche overlap values based on habitat distribution of eight cricetid rodents in 18 habitats, Kluane area, Yukon Territory. Values above the diagonal are for 1973 data, below the diagonal are for 1974 data. High values for niche overlap are in bold face

Species	*Peromyscus*	*Clethrionomys*	*M. oeconomus*	*M. pennsylvanicus*	*M. miurus*	*M. longicaudus*	*Phenacomys*	*Synaptomys*
Peromyscus	1.0	**0.58**	0.09	0.04	0.09	0.10	0.16	0.00
Clethrionomys	*0.36*	1.0	0.05	0.01	0.02	0.06	0.11	0.01
Microtus oeconomus	**0.53**	*0.11*	1.0	**0.57**	0.25	0.12	0.12	**0.57**
M. pennsylvanicus	*0.03*	*0.03*	*0.17*	1.0	0.04	0.00	0.00	**0.99**
M. miurus	*0.13*	*0.05*	*0.07*	*0.04*	1.0	0.07	0.04	0.00
M. longicaudus	*0.38*	*0.43*	*0.34*	*0.18*	*0.01*	1.0	0.04	0.00
Phenacomys	*0.42*	*0.23*	*0.28*	*0.19*	*0.01*	*0.28*	1.0	0.00
Synaptomys	*0.00*	*0.01*	*0.19*	**0.93**	*0.06*	*0.14*	*0.00*	1.0

affect some overall measures of species diversity and niche overlap. With only two years of data it is impossible to discuss the 3- to 4-year cycles that characterize the populations of many small rodents (Krebs and Myers 1974), and we present here only some preliminary information.

Abundance changes do not necessarily occur in synchrony in the northern, central, and southern areas shown in Figure 1. Table 7 presents abundance data for the four species that are most common in our catches. *Peromyscus* densities remained approximately constant in the northern areas from 1973 to 1974, dropped slightly in the central areas, and dropped sharply in southern areas. *Clethrionomys* increased in the northern areas from 1973 to 1974, but declined in central and especially in southern areas in 1974. The two closely related voles, *Microtus oeconomus* and *M. pennsylvanicus*, showed quite different density shifts from 1973 to 1974.

Other species were sometimes judged to be at high density on restricted areas. *Microtus miurus* was relatively common in tundra areas in 1974, and less common in 1973. A localized high density of *Microtus longicaudus* was found in subalpine tundra near Sockeye Lake in 1973, but we have not found this species in large numbers anywhere else. *Phenacomys intermedius* was more common in 1974 than in 1973 but was still an uncommon species. We have not yet found a brown lemming population at high density and this species is very rare in the Kluane areas we have studied.

Discussion

There are few detailed surveys of the small mammals of the southwestern Yukon. The most detailed survey was carried out by N. A. Olsen (1968. An ecological study of the Alsek River area, 1967. B.Sc. thesis in Forestry, University of British Columbia) who surveyed eight habitats along the Alsek River (our southern area). He found a high species divesity in aquatic associations (marsh) along the Dezadeash River, with *Microtus pennsylvanicus* and *Zapus hudsonius* predominating. Our conclusions (see Figure 4) in general agree with those of Olsen who classified dominant species as follows:

Alpine and subalpine	*Microtus oeconomus, Clethrionomys*
Dense spruce forest	*Clethrionomys rutilus*
Open spruce forest	*Peromyscus, Clethrionomys*
Aspen forest	*Peromyscus*

Olsen's study was based on 3737 trap nights and 415 small-mammal captures, and was by far the

TABLE 7—Abundance (number per 100 trap nights) of four rodent species in 1973 and 1974 in different areas. All trap indices are based on a minimum of 360 trap nights; most are based on more than 1000 trap nights. Numbers in parentheses are actual numbers of individuals captured (— indicates no data available)

	Area					
	Northern		Central		Southern	
Species and area	1973	1974	1973	1974	1973	1974
Peromyscus maniculatus						
(a) Subalpine tundra	0.6(6)	0.0(0)		0.0(0)	0.0(0)	—
(b) Closed spruce	1.7(18)	1.5(53)	0.3(1)	0.2(2)	8.2(160)	0.8(13)
(c) Open spruce	0.5(5)	1.1(21)	—	0.1(4)	2.1(12)	2.6(16)
Clethrionomys rutilus						
(a) Subalpine tundra	0.1(1)	0.0(0)	—	0.7(10)	0.2(3)	—
(b) Closed spruce	0.1(1)	0.8(29)	5.8(21)	4.6(50)	8.7(171)	1.7(26)
(c) Open spruce	0.6(6)	0.7(13)	—	1.3(42)	3.8(22)	1.5(9)
Microtus oeconomus						
(a) Subalpine tundra	0.3(3)	0.3(6)	—	0.0(0)	0.0(0)	—
(b) Marsh	0.0(0)	0.0(0)	—	0.2(1)	1.7(6)	0.0(0)
Microtus pennsylvanicus						
(a) Subalpine tundra	0.0(0)	0.0(0)	—	0.6(8)	0.0(0)	—
(b) Closed spruce	0.1(1)	0.0(0)	0.0(0)	0.2(2)	0.0(0)	0.0(0)
(c) Open spruce	0.0(0)	0.1(2)	—	0.1(3)	0.0(0)	0.0(0)
(d) Marsh	3.9(14)	4.7(55)	—	1.1(6)	1.9(7)	0.6(2)

most complete survey for this area.

Five other surveys of the small mammals of the Kluane region have been reported in the literature. Rand (1945) drew together some general data on the mammals of the Yukon. Baker (1951) reported on some collections taken along the Alaska Highway and the Haines Highway, including a northward range extension for *Phenacomys intermedius* to the south end of Dezadeash Lake. Cameron (1952) reported on further collections in the area, including a northern range extension for the northern flying-squirrel, *Glaucomys sabrinus*, at Kathleen River. Banfield (1961) described a survey to the northern side of the park, and obtained a range extension for *Peromyscus maniculatus* at Wade Creek on the Donjek River.

There has been little information on the distribution of the singing vole, *Microtus miurus*, in the Kluane region. Murray and Murray (1969) described this species from its haypiles and sounds as being present between Sheep and Bullion Creeks in the Slims River area and on the north side of Steele Valley. Rand (1945) reported this species from the "St. Elias area" and cited a collection by C. H. D. Clarke at Tepee Lake. Youngman (1975) recorded the singing vole from Sheep Mountain and the head of Kluane Lake. We did not record this vole from either Observation Mountain or Vulcan Mountain, but we did obtain specimens from a live-trapping area at Mile 1050 on the Alaska Highway. We can find no records of *Microtus miurus* south of this locale, and this location is the currently known southern limit of the singing vole.

The brown lemming (*Lemmus sibiricus*) has never been recorded from the Kluane Game Sanctuary, and we have obtained two specimens from a live-trapping area at Bear Creek Summit, above Mile 1029 on the Alaska Highway. We have also obtained two specimens from a marsh near Mile 1047 on the Alaska Highway and two additional specimens from the Chikat Pass area of British Columbia. The maps of the brown lemming's distribution presented in Hall and Kelson (1959, p. 759) and in Banfield (1974, p. 186) are in error. Youngman (1975) was the first to record the presence of the brown lemming in the southwestern Yukon, and we have extended the distribution still further to the south.

Species diversity among small rodents is relatively high in the Kluane area. Hawes (1975,

p. 90) has shown that the highest diversity of microtine rodents in North America occurs in the mountains of the Yukon and Alaska. We have caught a higher diversity of rodents in trap-lines at Kluane than we have in similar trapping near Vancouver, British Columbia, near Berkeley, California, or in southern Indiana. Most habitats in Kluane contain three to four species of cricetid rodents, and a marsh along the Dezadeash River contained six species, the highest diversity we found in any habitat. Some competition might be expected in this situation, particularly among similar voles such as *Microtus oeconomus* and *M. pennsylvanicus*.

There is little information of a specific nature on habitat selection of small rodents in the Kluane region, except for the report by Olsen described previously. We cannot explain for any of these small mammals why they live in some habitats but not in others. In order to understand habitat preferences we would have to know the food habits and the competitive relationships among the species, and this work is yet to be done. A field study of *Peromyscus maniculatus* would be particularly interesting; at the edge of its geographic range, this species is a dominant in many habitats and has the broadest niche breadth of all the small mammals. These problems now await an experimental attack.

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