

A Note on Status and Habitat of Northern Lemming Vole, *Synaptomys borealis*

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In the first half of the Twentieth Century, research on small mammals in western Canada consisted almost exclusively of specimen collection, for which the principal method was snap-trapping. But in recent decades the objectives of small mammal study broadened to encompass ecological interests, and snap-trapping came into question as a valid indicator of small mammal numbers and species presence/absence. Among the many alternative sampling methods which were tried, the best assessments of small mammals were obtained through use of pitfall traps and visual surveys. These methods are not simple replacements for conventional trapping; they require suitable conditions on the study site, and more field-time, including a preparation period, before they produce results. The effectiveness of pitfall trapping and other alternative field techniques has been demonstrated in comparative studies.

The literature on alternative methods is too extensive to discuss here, one or two quotations will suffice. McLeod & Lethiecq (1963) used pitfall traps in conjunction with snap-traps, and compared their results:

Even though the number of pitfall traps was only one-third the number of snap traps in the grid and only one-sixth the number of snap-traps in the traplines, the number of shrews captured in [pitfall traps] comprised 91.4% of the total captures in the grid and 88.3% of the total captures in the traplines.

Brown (1967), using both types of trap in the western U.S., had similar results:

A comparison of snap traps and sunken can methods of collecting shrews revealed that snap-traps failed to demonstrate the presence of *Sorex nanus* and *Microsorex [Sorex] hoyi* in areas where they were abundant. Also, densities of *Sorex vagrans* and *Sorex cinereus* indicated by snap traps were considerably below those indicated by sunken cans.

During the 1980's, it became clear that snap-traps also produced misleading results for studies of mice and voles.

This enquiry examines the records for one mammal species, northern lemming vole (bog lemming), *Synaptomys borealis*, whose status in our area, until the 1970's, was known entirely by the results of snap-trapping. Most field workers in the west have regarded the lemming vole as generally uncommon to rare (Soper 1964; Nagorsen *in press*), and restricted to bog or wetland environments. The present note discusses specimen and field data, particularly records from more recent surveys using a variety of field methods, to re-assess numbers and environmental preferences of *Synaptomys*.

When I analyzed results of field work from the 1960's through the 1980's, it seemed that *Synaptomys* taken in snap-traps had usually been captured "incidentally" as they crossed the traps and not while taking bait. Other workers had already noted the difficulty of snap-trapping *Synaptomys* (Dalquest, 1948; Soper, *loc. cit.*; Hoffmann & Pattie, 1968). I had used Museum Special traps and Sherman live traps, some arranged in grids, some placed selectively to improve capture-rate. Lemming voles were caught only in selectively-placed traps, not in those on lines or grids. More than 80% of the *Synaptomys* captured were taken in runways or travel-ways; over 50% of these (at least 13 of 24) were caught in deep runways or travel-ways, where a vole could not avoid the trap, and had therefore run across it. I made no live-captures of *Synaptomys* until I began to set traps so that small mammals could not easily avoid them.

When I looked at results from other studies, it seemed that the proportion of *Synaptomys* captured by interval trapping was appreciably lower than that taken on selectively-placed trap sites. Lemming voles represented 30% or more of the total capture in some selective trap sites, whereas on grids and lines the proportion was always less than 5%, and usually not greater than 1% to 2% of total captures. Other workers have had similar results. During the biophysical surveys of Banff and Jasper National Parks in the 1970's, Holroyd & Van Tighem (1983) reported that captures of *Synaptomys* were just 1.25% of the total catch, that is, 47 lemming voles, compared with 1001 red-backed voles (*Clethrionomys gapperi*) and 1647 deer mice (*Peromyscus maniculatus*). On several occasions in the 1970's and 1980's I noted lemming voles along traplines during nocturnal and early-morning trap-checks in Kananaskis region and during the Jasper and Banff biophysical surveys. I hand-captured some individuals to verify identification, record sex and reproductive condition and even weights.

Using pitfall trapping and night survey methods, lemming voles were recorded in various environments, none of them considered the "typical" bog or wetland habitat preferred by the species. Cowan & Guiguet observed in 1956 that an inter-mountain race of *Synaptomys* (*S. borealis artemisiae*), at elevations as low as 730 m ASL, commonly resorted to dry arid habitats in British Columbia (Nagorsen *loc. cit.*).

I queried fellow researchers from the period 1972 to 1998, and compared field notes and specimen data from major mammal surveys. At higher altitude and with alternative methods, *Synaptomys* was found more frequently on study-sites. An inventory of Yoho National

Park, for Cottonwood Consultants of Calgary and Parks Canada, recorded many *Synaptomys* in "atypical" habitat, particularly at middle and higher elevations. The species was recorded uncommonly and sporadically at low elevations in damp to wet conditions, but appeared with increasing frequency on higher, relatively dry slopes, and the largest number of captures was from high subalpine meadows or parkland, or open heath-like terrain. In August 1994, Ray Wershler collected a series of 9 *Synaptomys* from two small trap sections on subalpine slopes above McArthur Pass, a considerable distance from any bog or wet areas, in vegetation types designated EG3 and LV1 (Achuff, Taylor & Knapik 1993). The first of these sites yielded 4 heather voles (*Phenacomys*), 6 long-tailed voles (*Microtus longicaudus*), and 7 *Synaptomys* (almost 50% of total captures!), while the second recorded 2 *Synaptomys*, 11 red-backed voles, 1 heather vole and 1 Columbia ground squirrel (*Spermophilus columbianus*). Both sites consisted of parkland-like larch (*Larix lyallii*), open or sparsely treed subalpine "tundra" and rich graminoid/forb meadow (Wershler pers. comm.).

Table 1 examines the species associations of *Synaptomys* from field collections in Alberta and south-eastern B.C. The information was drawn from surveys for which complete field records were available, and is tabulated to show the numbers of all other species trapped on the same lines or sites with *Synaptomys*. Much early field work was not sufficiently well documented to be analyzed this way, or the specimens available were not a proportional representation of all captures from a study-site. I thus relied heavily upon more recent field-sampling with documentation, and on records from those

projects with which I was personally involved or for which a detailed account was available.

Column 1 of the Table lists all small mammal species found on 38 trap sites where Lemming Voles were recorded. Column Two is the number of these 38 sites in which each species was found; Column three indicates the total number of each species collected and/or recorded in all sites where it was found with *Synaptomys*.

The Table shows *Synaptomys* appearing in a wide variety of ecological associations, or habitats, whose diversity is indicated by the other small-mammal species taken on the same trap-sites. Many of these associates — for example, some of the shrews, heather vole (*Phenacomys*), wood rat (*Neotoma cinerea*), the chipmunks (*Tamias*), the ground squirrels (*Spermophilus columbianus*, *S. lateralis*) and pika (*Ochotona princeps*) — are not species of wetlands or bogs and fens.

The enquiry revealed little change in geographic distribution of lemming voles in Alberta since it was mapped by Soper in 1964. The altitudinal range in Alberta and eastern British Columbia is also much as earlier field-workers described it: *Synaptomys* occurs from

about 250 m above sea level (Wood Buffalo Park vicinity) to about 2300 m (Rocky Mountains). However, the habitat selection or ecological preference of *Synaptomys* appears to be much broader than that indicated by earlier studies, particularly those conducted prior to the 1970's.

Table 2 classifies the records of lemming vole from the sites in Table 1, grouping them according to general habitat and altitudinal range. The

SPECIES:	No. of Sites	Total No. Recorded
<i>Synaptomys borealis</i>	38	68
<i>Sorex cinereus</i>	8	44
<i>Sorex vagrans</i>	2	2
<i>Sorex monticolus</i>	9	11
<i>Sorex palustris</i>	4	4
<i>Sorex hoyi</i>	1	1
<i>Ochotona princeps</i>	2	3
<i>Tamias minimus</i>	3	3
<i>Tamias amoenus</i>	3	4
<i>Tamiasciurus hudsonicus</i>	5	31
<i>Spermophilus lateralis</i>	1	1
<i>Phenacomys intermedius</i>	11	33
<i>Microtus longicaudus</i>	7	27
<i>Microtus pennsylvanicus</i>	17	70
<i>Clethrionomys gapperi</i>	22	316
<i>Microtus richardsoni</i>	6	6
<i>Neotoma cinerea</i>	2	4
<i>Peromyscus maniculatus</i>	8	21
<i>Zapus princeps</i>	6	16
<i>Zapus hudsonius</i>	1	1

Table 1: Small-mammal species found with *Synaptomys* in 38 study-sites in Alberta and eastern British Columbia.

habitats are: Wet (bog-like environment); Rich (seasonal moist to dry meadow); and Dry (localities with heath or relatively scant ground-cover and no moisture-retention. The Transitional heading is applied to sites (such as snow-melt areas) which were thoroughly dry, at time of sampling, although they might remain quite wet for part of the spring. Twenty-five study areas (38 individual study-sites) are represented, most in Alberta. They are: Highwood Pass; Kananaskis Lakes; Banff, Jasper; Lake Louise vicinity; Waterton Lakes National Park; Elk Passes; and Yoho Park in British Columbia.

The data of Table 2 suggest a change in habitat selection and small-mammal associations of the lemming vole with increase in elevation. At the lower altitudes, most records of *Synaptomys* have been from wet sites such as bogs, whereas at middle and higher elevations the vole seems to diversify its habitat selection, becoming widespread in heath, krummholz, and subalpine meadow.

Elevational Range:	Wet:	Rich:	Dry:	Transitional :
270-1000 metres	6	0	0	0
1000-1500 metres	10	7	1	(3)
1500-2300 metres	6	27	15	(13)

Table 2: Occurrence and habitat selection of *Synaptomys* in Alberta and the B.C. Rockies at 3 elevation ranges.

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Most specimens examined are from the Provincial Museum of Alberta, the University of Alberta Department of Zoology, and Royal British Columbia Museum. I also had access to many trap and live-capture records kept by field-workers on the biophysical surveys of the Rocky Mountain National Parks, from 1975 to 1996. Collection localities and sources included Ft. McMurray region (1954-55, Lister/Moore); Battle Lake vicinity (1937-38 and 1942, Soper, 1972-75, J. Salt); Kananaskis Provincial Park (1976-78, J. Salt/R. Clarke et al); Willow Creek in Jasper Park (1971, L. Carbyn); Yoho National Park (1992-94, C. Wallis, C. Wershler, R. Wershler, W. Smith, J. Salt, L. Gyug et al); Waterton Lakes National Park (1995-96, W. Smith et al).

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