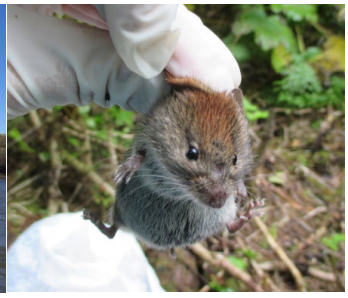
THE ALASKA SMALL MAMMAL GROUP

2023 NEWSLETTER





Reminder: The 13th International Mammalogical Congress (IMC-13; https://imc13.com/) will be held in Anchorage (July 14-20, 2023)!
This event will be jointly hosted by the American Society of Mammalogists and the International Federation of Mammalogists. See you there!

Contents

Introduction

Small mammals are important members of Alaska's terrestrial wildlife community – they represent a large proportion of the state's mammalian diversity and play critical roles as herbivores, insectivores, seed dispersers, disease vectors, and prey species. This newsletter highlights current research and monitoring projects investigating small mammals across the state of Alaska in 2022 and 2023. We have included brief summaries of ongoing projects and abstracts from published or submitted peer-reviewed articles. We also provide a list of recent publications on small mammals in Alaska, as well as taxonomic updates.

For more information or to join the Alaska Small Mammal Group, please contact Julie Hagelin and Andy Baltensperger julie.hagelin@alaska.gov and abaltens@alaska.edu.

More details about our annual meeting and past newsletters are also available here: https://accs.uaa.alaska.edu/wildlife/small-mammal-ecology

Photo: Northern red-backed vole (*Clethrionomys rutilus*); Photos: ADF&G

Northern red-backed vole population cycles

Sarah Swanson, Knut Kielland, Josh Schmidt, Shawn Crimmins, Mel Flamme

Seasonal drivers of amplitude patterns in a variably cyclic population of red-backed voles (*Clethrionomys rutilus*)*

Northern red-backed voles (*Clethrionomys rutilus*) are an important food source for many mammalian and avian predators in the Interior Alaska boreal forest ecosystem. However, they exhibit dramatic inter- and intra-annual population fluctuations, for which causes are not clear. Additionally, winter mortality is often very high, and altered weather conditions due to climate change may increase stress during an already difficult season. We studied red-backed voles in Denali National Park with the goal of assessing population dynamics over time and investigating how weather variables influenced patterns of mortality. Using 30-years of mark-recapture data, we applied spatially-explicit methods to calculate density estimates for autumn and early summer trapping sessions, then used post-hoc linear modeling to examine patterns in the amplitude and period of population fluctuations. We found that this microtine population appears to be cycling on a 2-4 year period, with some differentiation between plots. Models of autumn amplitudes suggested a linkage between white spruce *(Picea glauca*) seed mast, either as a food source during winter seasons, or a coincidental product of underlying multi-annual environmental patterns that promote high seed fall. We also found a negative effect of combined late snowfall and cold temperatures. Lastly, models of early summer density showed an apparent inverse density dependence, in which high autumn population densities were followed by low densities the next spring. Continued monitoring of voles, alongside more thorough assessments of snow conditions, habitat, diet, and predator status would assist further attempts to cast light upon this complex system.

*Oral presentation at the Alaska Chapter of The Wildlife Society, Fairbanks, 2023

Contact: Sarah Swanson, University of Alaska Fairbanks, scswanson2@alaska.edu

Small mammal field work along the Colville River (Photo: Jesika Reimer)

Diversity transect along Colville River

Models vs. Reality: A small mammal diversity transect along the Colville River, AK

Jesika Reimer, Lindsay Flagstad, Andy Baltensperger.

Changes in climate are causing vegetation shifts in the Arctic, and subsequently, range expansions for some animals should be anticipated. Understanding the current presence and habitat associations of small mammals at northern latitudes is important for documenting ongoing changes to occupancy and community composition. Over a three-week period during June 2016, we conducted small mammal and bat surveys along the Colville River, Alaska. We sought to determine species occurrence and diversity along the Colville River; assess the accuracy of published habitat models in predicting species occurrence in this region; describe small mammal-habitat associations in the area; and investigate recent changes in species diversity by re-surveying a small mammal sampling site in Umiat, which was originally surveyed in 1952. We confirmed the presence of brown lemmings (*Lemmus trimucronatus*), Northern collared lemmings (*Dicrostonyx groenlandicus*), root vole (*Microtus oeconomus*), singing voles (*Microtus miurus*) and Northern red-backed voles (*Clethrionomys rutilus*), and observed that species diversity increased from west to east, with the highest diversity at downriver sites, on hillslopes, and in mixed-shrub-sedge tussock tundra and open low willow habitats. No bat species were detected, likely due to a lack of roosting habitat. Models underpredicted the distribution of Northern red-

backed voles and overpredicted the occurrence of brown lemmings. Historic records for Umiat illustrated fluctuations in community composition between 1931 and 1969 and identified the presence of Northern red-backed voles as early as 1931, but in lower abundance relative to other species. This interannual variation supports our conclusion that a lack of sampling and training data combined with cyclical small mammal populations are likely responsible for discrepancies between modeled and observed species occurrence.

Contact: Jesika Reimer, U.C. Davis: jpreimer@ucdavis.edu

Boreal-tundra ecotone research

Boreal-tundra ecotone research on small mammals

Andrew Hope, Ben Wiens, Sandra Talbot, Joseph Cook

Sampling efforts of small mammal and parasites specimens from the boreal-tundra ecotone across northern Alaska in past years (supported by NPS ARCN and USFWS Arctic-NWR) have provided valuable materials for investigating both ecological and evolutionary consequences of changing Arctic environments. These preserved samples are being used for multiple scientific investigations by the Hope lab at Kansas State University, collaborators, and colleagues.

One ongoing study focuses on hybridization between masked shrews (*Sorex cinereus* - boreal) and barren-ground shrews (*Sorex ugyunak* - tundra), using genomic data. Results in preparation for publication records that hybridization occurs but is rare. However, presence of multi-generation hybrids suggests that limited gene flow may still be consequential for future evolutionary trajectories. Perhaps more concerning, as masked shrews shift northward, barren-ground shrews are potentially being displaced. Future field re-survey efforts would be a critical need for understanding these dynamics and to establish rates of change through community turnover.

Additional investigations into the co-evolutionary dynamics of community complexity among shrews are in preparation. These include host-parasite-symbiont network analyses of host specificity and parasite/symbiont richness, accompanied by description of endoparasite diversity associated with different biomes.

Finally extensive sampling from across both Alaska, and North America more broadly of shrews of the *Sorex cinereus* complex are now yielding genomic insights to species limits, histories of diversification, and intra-specific diversity among these species. Alaska supports multiple shrew species of conservation concern including the Pribilof shrew (*Sorex pribilofensis*) on St. Paul Island, which we have shown to be both evolutionarily highly distinct and exhibiting extremely low genomic diversity (Wiens et al. 2022).* This group also includes the St. Lawrence Island shrew (*Sorex jacksoni*) which is more closely related to mainland barren-ground shrews, but future field sampling of *S.*

jacksoni will be important for further assessment of conservation status. Finally, an insular population of masked shrews on Unimak Island in proximity to the Alaska Peninsula is genetically distinct, and may represent either a Last Glacial refugial population, or post-glacial isolation on Unimak followed by rapid drift, as is evident for the St. Paul Island shrew, a close relative. Updates on systematic relationships among these shrews is being prepared for publication.

*Wiens et al. (2022) is cited in the Publications section, below.

Contact: Andrew Hope, Kansas State University ahope@ksu.edu

Collared pika (*Ochotona collaris*). Photo: Jeff Wagner

Collared pika density

Nowhere to run: Climate influences density of an alpine indicator species in the arctic-boreal region*

Jeff Wagner, Paul Schuette, David Christianson, Katie Christie

Alpine and high-latitude species evolved in cool climates but now face the fastest rates of climate warming. Collared pika (*Ochotona collaris*) are indicators of ecosystem stability found only in isolated patches of high-elevation habitat throughout the subarctic. Decades of research on their southern cousins, American pika, suggest collared pika populations should be highly sensitive to climate, yet they remain understudied. We sought to evaluate how climate affects pika population densities in the core of their range. We conducted surveys at 47 alpine sites in Alaska and fit novel Bayesian hierarchical distance-sampling models to estimate population densities. We identified a strong negative effect of summer warmth, a strong negative effect of winter snow depth,

a slight positive effect of annual snow melt cycles on pika density. These results suggest that collared pika are likely experiencing heat stress, but infrequent cold-related mortality. We identified a strong positive effect of growing season NDVI, suggesting pikas thrive in areas with higher productivity, while deep snow may pose a barrier to forage and reproduction. Finally, our models provide the first density estimates for the species. Monitoring climatic forces driving this indicator species may inform our understanding of how climate change threatens alpine ecosystems more generally.

*To be submitted to *Global Change Biology* in Spring 2023.

Contact: Jeff Wagner, University of Wyoming, Jeff.Wagner@uwyo.edu

Collared pika (*Ochotona collaris*). Photo: Lily Harrison

Collared pika territory occupancy

Collared pika territory occupancy and foraging behavior

Lily Harrison, Katie Christie, Colette Brandt

Collared pikas (*Ochotona collaris*) are vulnerable to direct and indirect effects of climate change, but we do not yet know to what extent they can adapt to these changes. The goal of our research was to determine whether territory-specific microclimate and microhabitat characteristics influence occupancy of individual collared pika territories across years. We quantified both summer and winter thermal stresses, which have not often been tested in conjunction but are known drivers of pika extinctions. We trapped 175 pikas, fit colored ear-tags, recorded territory characteristics, and placed temperature loggers within 197 pika dens across 3 study areas with contrasting climate gradients in southcentral and interior Alaska during 2017-2022. We examined changes in pika den occupancy by estimating annual colonization and extinction rates with a

Bayesian dynamic occupancy model. Our top models indicated that chronic rather than acute temperature metrics best predicted pika occupancy rates and that den persistence was highest in cooler dens in both summer and winter. Additionally, dens with larger rocks were more consistently occupied and had cooler and more stable temperatures in summer. These results demonstrate that specific microclimate requirements within pika dens, during both summer and winter, can influence territory occupancy. Our next step is to characterize daily and seasonal foraging patterns of collared pikas through behavioral observations in the field and on video cameras paired with temperature sensors set in their dens from 2018-2021 to identify thermal limitations and understand how warmer conditions may affect food acquisition. We use results of these studies to assess whether this species of concern might be positively or negatively influenced by changing climactic conditions in alpine ecosystems.

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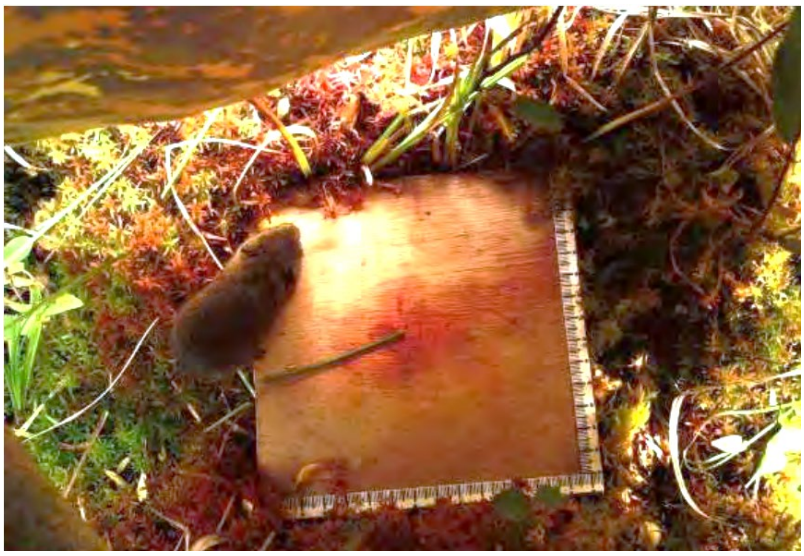

Northern bog lemming (*Mictomys borealis*) visits a “scat board,” a field method for collecting fecal pellets.

Photo: Montana Fish, Wildlife and Parks

Northern bog lemming species status update

Species Status Assessment for Northern bog lemming*

Kaiti Ott

The Northern bog lemming (*Mictomys borealis*) was petitioned for listing under the Endangered Species Act. The U.S. Fish and Wildlife Service (USFWS) created a multi-

state, interdisciplinary Species Status Assessment (SSA) Research Team charged with gathering the best available scientific information. Since the last Small Mammal Working group meeting, the SSA Team requested, but was not granted from USFWS, an additional 1-year extension to accommodate on-going field efforts in portions of the species' range in the lower 48 as well as genetic analysis (species ID from fecal samples collected in 2022, and phylogenetic analysis of museum specimens).

Collaborating with Andy Baltensperger (UAF) and biologists with USFWS' Branch of SSA Science Support, we used occurrence records to project climatically suitable habitat (CSH) for northern bog lemmings throughout their range for three future time periods at 30-year intervals under three climate scenarios (SSP2-4.5, SSP3-7.0, and SSP5-8.5). Given extremely limited information on the species, we used CSH as a proxy for habitat quality and quantity to assess viability in terms of the 3Rs (resiliency, redundancy, and representation).

A draft SSA was submitted for peer and partner review in late 2022. Improvements included a revision of the species taxonomic nomenclature, from *Synaptomys* to *Mictomys*, as well as recent preliminary phylogenetic results from Andrew Hope (KSU) suggesting separation of the *M. b. sphagnicola* subspecies in a monophyletic clade. This subspecies occurs in the northeastern U.S. (Maine and New Hampshire) and New Brunswick and is geographically separated from other portions of the species' range by the St. Lawrence River.

A final draft of the SSA was submitted to the Service's recommendation team in early February 2023, and the recommendation team meeting (RTM) took place in early March. However, due to insufficient time, a decision was not reached. An additional RTM is pending, and we expect a decision on whether to list the species under the Endangered Species Act to publish by the end of September 2023.

*Summarized in Taxonomic Updates, below.

Contact: Kaiti Ott, U.S. Fish and Wildlife Service, Kaithryn_Ott@fws.gov

Northern bog lemming (*Mictomys borealis*)
Photo: Dean Pearson, USDA, Montana

Northern bog lemming conservation genomics

Conservation genomics of Northern bog-lemmings (*Mictomys borealis*)*

Andrew Hope, Kaitlyn Headlee, Zachary Olson, and Ben Wiens

Northern bog-lemmings are currently being assessed for listing by the U.S. Fish and Wildlife Service under the Endangered Species Act. Specimens from throughout Alaska and more broadly across North America have been included in a recent genomic study by the Hope lab at Kansas State University and colleagues. Results based on thousands of nuclear loci support distinction of bog lemming lineages that are geographically consistent with multiple recognized sub-species. In Alaska, bog lemmings from Southeast Alaska are distinct from interior Alaska populations, although a sample from mainland Southeast exhibits genetic signatures of gene flow between three distinct lineages (interior Alaska, Southeast Alaska, and Central Canada). Alaska populations appear to be robust from both a genetic diversity perspective and considering relative abundance of specimens in museum collections. A major hurdle to more rigorous conservation assessment of this species is a range-wide scarcity of specimen resources available for analyses using modern methods. Phylogenetic placement of northern bog lemmings in relation to other genera of lemmings across the Holarctic strongly supports recognition of *Mictomys* as the accepted generic nomenclature, given that otherwise, the genus *Synaptomys* would constitute a paraphyletic group.

*Summarized in Taxonomic Updates, below.

Contact: ahope@ksu.edu

Northern bog lemming diet

High dietary and habitat diversity indicate generalist tendencies for Northern bog lemmings (*Synaptomys*† *borealis*) in Alaska*

Andy Baltensperger, Julie Hagelin, Paul Schuette, Amanda Droghini, Kaithryn Ott

The Northern bog lemming (*Synaptomys borealis*) is a rare small mammal in North America that is undergoing a federal Species Status Assessment (SSA) under the U.S. Endangered Species Act (ESA). Despite a wide North American distribution, very little is known about its dietary and habitat needs or its projected responses to climate change. To quantify diet composition of northern bog lemmings (NBL) in Alaska, we used mitochondrial DNA metabarcoding from 59 archived specimens to describe the diversity and relative abundance of foods in recent diets. DNA analyses revealed a broad diet composed of 110 families and 92 genera of bryophytes, graminoids, fungi, forbs, and woody shrubs. Nine bryophyte genera and *Carex* sedges composed the largest portions of NBL diets. To quantify habitat preference, we attributed 467 georeferenced occurrence records of NBL with remotely sensed landcover classes and used a compositional analysis framework that considers relative abundance of landcover types in Alaska. We did not detect significant habitat preference for specific landcover types, although bog lemmings frequently occurred in evergreen forest, woody wetlands, and adjacent to water. This research highlights the importance of bryophytes, among a diversity of dietary components, and describes NBL as boreal habitat generalists. Our results will inform the SSA by quantifying the ecological constraints of NBL in a rapidly changing climate.

†Publication occurred prior to recommended nomenclature change to *Mictomys* (discussed in previous abstract)

*Details in publication section below

Contact: Andy Baltensperger, University of Alaska Fairbanks, abaltens@alaska.edu

Photo: Dr. Nick Kerhoulas from Humboldt State University scans for marmots in the Chilkat Mountains of SE Alaska (L.E. Olson)

University of Alaska Museum Update

University of Alaska Museum continues its small-mammal inventory, archival, and research programs

Link Olson

With generous funding from a private foundation, UAM mammalogists and collaborators from multiple agencies and institutions continue to document and study numerous aspects of small mammal diversity in SE Alaska, with a focus on alpine species. Vouchering efforts continue to expand on the "extended specimen" concept, wherein the maximum amount of material and information associated with each collected specimen is obtained, carefully curated, and made available to scientists. Notable findings from 2022 include the first ticks ever documented (and collected) from hoary marmots (Marmota caligata) as well as a number of surprising phenological, distributional, and reproductive observations. The Museum's ongoing collaboration with the U.S. Centers for Disease Control and Prevention (CDC) and the Alaska Division of Public Health on identifying the zoonotic sources of the recently discovered Alaskapox virus (AKPV) within the state has uncovered evidence of AKPV in small-mammal tissues collected from Interior Alaska and archived in UAM's Genomic Resources facility dating back multiple decades, and a nascent collaboration with researchers from the Field Museum (Chicago) and Chicago State University will significantly expand the temporal and geographic scope of these surveys. UAM's Mammal Collection looks forward to hosting visiting scientists from around the world following the 13th International Mammalogical Congress (IMC-13; https://imc13.com/), to be held in July

2023 in Anchorage and jointly hosted by the American Society of Mammalogists and the International Federation of Mammalogists. We look forward to seeing you all there!

Contact: Link Olson, University of Alaska Fairbanks, leolson@alaska.edu

Photo*:* Chris Barger capturing an Alaska Hare (ADF&G).

Alaska hare study update

Chris Barger, Travis Booms, Richard Merizon

Alaska hare (*Lepus othus*) have long been a widely used recreational and subsistence food source for many residents of rural western Alaska. However, vital rates, geographic distribution, and current population trends remain very poorly understood. Current abundance of this species is believed to be well below average in most areas of its current range throughout western and southwestern Alaska. This study has two main objectives: 1) attempt to document general movement of a small sample of individuals using GPS necklace collars and 2) develop a technique to estimate abundance of hares using fecal DNA. The winter/spring of 2022 represented the last year of fieldwork for this project and in total we captured and collared 12 adult hares throughout the species range in western Alaska. Individuals have been captured using bow nets and pen traps. Secondly, this study will evaluate a long-term population monitoring technique by genotyping individuals through pellet collections at discrete locations throughout the species range in western Alaska. Due to the reclusive nature of this species, pellet DNA related population monitoring has proven to be the most efficient and cost-effective

method for the ADF&G to institute a long-term population trend monitoring program. To date, over 2,800 pellets have been collected, representing fewer than 130 individual hares. As a result of this study and knowledge gained about this species to date, regulatory action has been taken both on state and federal hunting regulations to adopt a much more conservative management strategy.

Contact: Chris Barger, Alaska Department of Fish and Game, chris.barger@alaska.gov

Small mammal publications

Baltensperger, A.P., Hagelin, J.C., Schuette, P.A., Droghini, A. and Ott, K., 2022. High dietary and habitat diversity indicate generalist behaviors of northern bog lemmings *Synaptomys borealis* in Alaska, USA. Endangered Species Research 49:145-158. https://www.int-res.com/articles/esr2022/49/n049p145.pdf

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Glass, T.W., Magoun, A.J., Robards, M.D., and Kielland, K. 2022. Wolverines (*Gulo gulo*) in the Arctic: Revisiting distribution and identifying research and conservation priorities amid rapid environmental change. Polar Biology 45:1465-1482. https://doi.org/10.1007/s00300-022-03079-4

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Mills, K.K., Everson, K.M., Hildebrandt, K.P., Brandler, O.V., Steppan, S.J. and Olson, L.E. 2022. Ultraconserved elements Improve resolution of marmot phylogeny and offer insights into biogeographic history. Available at SSRN 4248211. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4248211

Roffler, G.H., Eriksson, C.E., Allen, J.M., and Levi, T. 2023. Recovery of a marine keystone predator transforms terrestrial predator–prey dynamics. Proceedings of the National Academy of Sciences, 120(5), e2209037120. https://www.pnas.org/doi/full/10.1073/pnas.2209037120

Tape, K.D., Clark, J.A., Jones, B.M., Kantner, S., Gaglioti, B.V., Grosse, G., and Nitze, I. 2022. Expanding beaver pond distribution in Arctic Alaska, 1949 to 2019. Scientific Reports:12(1): 7123. https://www.nature.com/articles/s41598-022-09330-6

Tinker, T., Schuette, P., Weitzman, B., Eisaguirre, J. and Beatty, W., 2023. The combined impact of killer whale consumptive and non-consumptive effects on northern sea otter population viability in the Western Aleutians Archipelago, Alaska. bioRxiv, pp.2023-01. https://www.biorxiv.org/content/10.1101/2023.01.30.526353.full.pdf

Wiens, B.J., Combe, F.J., Dickerson, B., Divine, L.M., Padula, V.M., Sage, G.K., Talbot, S.L. and Hope, A.G., 2022. Genetic drift drives rapid speciation of an Arctic insular endemic shrew (*Sorex pribilofensis*). Molecular Ecology 31(20): 5231-5248. https://doi.org/10.1111/mec.16658

Taxonomic updates

Amanda Droghini

1) **Red-backed voles:** The taxonomy of red-backed voles was unresolved for decades as both *Clethrionomys* and *Myodes* were used by different researchers. A paper by Kryštufek et al. (2020), however, found that "*Myodes* is a junior synonym of *Lemmus* Link, 1795, and is not available for red-backed voles". All species in the genus *Myodes* have therefore been moved (back) to *Clethrionomys*. Two species of red-backed voles occur in Alaska*:* the southern red-backed vole (*C. gapperi*), which is restricted to Southeast Alaska, and the ubiquitous, trap-happy northern red-backed vole *(C. rutilus)*.

Citation: Kryštufek, B., A. S. Tesakov, V. S. Lebedev, A. A. Bannikova, N. I. Abramson, and G. Shenbrot. 2020. Back to the future: the proper name for red-backed voles is *Clethrionomys* Tilesius and not *Myodes* Pallas. Mammalia 84(2):214-217. https://doi.org/10.1515/mammalia-2019-0067

2) **American mink:** Proposed reclassification to the genus *Neogale*, following evidence that points to the close relationship between the American mink (previously *Neovison vison*) and 3 species that were previously classified in the *Mustela* genus (Patterson et al. 2021). The authors conclude that a comprehensive taxonomic revision of both *Neogale* and *Mustela* is warranted.

Citation: Patterson, B. D., H. E. Ramirez-Chaves, J. F. Vilela, A. E. R. Soares, and F. Grewe. 2021. On the nomenclature of the American clade of weasels (Carnivora: Mustelidae). Journal of Animal Diversity 3(2):1-8. http://dx.doi.org/10.52547/JAD.2021.3.2.1

3) **Preliminary update for Northern bog lemming**. As detailed in Kaiti Ott's and Andrew Hope's updates, above, an ongoing USFWS Species Status Assessment and

preliminary phylogenetic analysis of the Northern bog lemming recommends revision of the species taxonomic nomenclature from *Synaptomys* to *Mictomys*. A major hurdle to more rigorous conservation assessment of this species is a range-wide scarcity of specimen resources available for analyses using modern methods. Phylogenetic placement of Northern bog lemmings in relation to other genera of lemmings across the Holarctic strongly supports recognition of *Mictomys* as the accepted generic nomenclature, given that, otherwise, the genus *Synaptomys* would constitute a paraphyletic group. In addition, the Hope lab at Kansas State University suggests separation of the *M. b. sphagnicola* subspecies as a monophyletic clade. The subspecies occurs in the northeastern U.S. (Maine and New Hampshire) and New Brunswick and is geographically separated from other portions of the species' range by the St. Lawrence River.