Ecography

E7156
Wang, G., Hobbs, N. T., Slade, N. A., Merritt, J. F., Getz, L. L., Hunter, Jr, M., Vessey, S. H., Witham, J. and Guillaumet, A. 2011. Comparative population dynamics of large and small mammals in the Northern Hemisphere: deterministic and stochastic forces. – Ecography 34: xxx–xxx.

Supplementary material

Appendix 1: Table A1. Locations, study period and sources of small mammal population time series data.

Species	Study site	Geographic location	Period	Trapping time	Source of data[1]
Bank voles *Myodes glareolus*	Pallasjarvi, Finland	68°3' N, 24°9' E	1970-1992	Autumn	GPDD ID: 9921
Bank voles *M. glareolus*	Wytham, UK	51°42' N, 1°20' W	1949-1977	Summer	GDPP ID: 46
Brown lemming *Lemmus trimucronatus*	Point Barrow, Alaska, USA	76° N, 156°30'W	1946-1966	Annual[2]	GPDD ID: 9895
California voles *Microtus californicus*	Vasser, California	39° N, 123°20' W	1959-1977	Annual[3]	GPDD ID: 6713
Cotton rats *Sigmodon hispidus*	Lawrence, Kansas, USA	39°03' N, 95°12' W	1973-2003	August	Brady and Slade (2004)
Deer mice *P. maniculatus*	Algonquin Park, Ontario, Canada	48°30' N, 78°40' W	1952-1995	Annual[2]	Frxyell et al. (1998)
Deer mice *P. maniculatus*	Powdermill, Pennsylvania, USA	40 °10' N, 79°16' W	1979-1999	October	Merritt et al. (2001)
Eastern chipmunks *Tamias striatus*	Algonquin Park, Ontario, Canada	48°30' N, 78°40' W	1952-1995	Annual[2]	Frxyell et al. (1998)
Eastern chipmunks *T. striatus*	Salisberry[4], Vermont, USA	43°56' E, 73°5' W	1979-1994	July	Brooks et al. (1998)
Field voles *M. arvalis*	Rochefort, France	45°57 N, 0°55' W	1969-1988	August	GPDD ID: 10037
Grey-sided voles *M. rufocanus*	Kilspijarvi, Finland	60°3' N, 20°49' E	1949-1996	September	Hansen et al. (1999)
Masked shrews *Sorex cinerus*	Algonquin Park, Ontario, Canada	48°30' N, 78°40' W	1952-1995	Annual[2]	Frxyell et al. (1998)
Meadow voles *M. pennsylvanicus*	Urbana, Illinois, USA	40º15' N, 88º28' W	1985-1995	June	Getz et al. (2001)
Montane voles	Grand Teton,	43°50' N, 110°50' W	1970-1987	August	GPDD ID: 1042

M. montanus	Wyoming, USA				
Northern red-backed voles *M. rutilus*	Pallasjarvi, Finland	68°3’ N, 24°9’ E	1970-1992	Autumn	GPDD ID: 9919
Northern short-tailed shrews *Blarina brevicauda*	Algonquin Park, Ontario, Canada	48°30’ N, 78°40’ W	1952-1995	Annual[2]	Fryxell et al. (2009)
Northern short-tailed shrews *B. brevicauda*	Powdermill, Pennsylvania, USA	40 °10’ N, 79°16’ W	1979-1999	October	Merritt et al. (2001)
Northern short-tailed shrews *B. brevicauda*	Salisberry[4], Vermont, USA	43°56’ E, 73°5’ W	1979-1994	July	Brooks et al. (1998)
Northern short-tailed shrews *B. brevicauda*	Urbana, Illinois, USA	40º15’ N, 88º28’ W	1985-1995	June	Getz et al. (2004)
Prairie voles *M. ochrogaster*	Lawrence, Kansas, USA	39°03’ N, 95°12’ W	1973-2003	August	Brady and Slade (2004)
Prairie voles *M. ochrogaster*	Urbana, Illinois, USA	40º15’ N, 88º28’ W	1985-1995	June	Getz et al. (2001)
Red squirrels *Tamiasciurus hudsonicus*	Algonquin Park, Ontario, Canada	48°30’ N, 78°40’ W	1952-1995	Annual[2]	Fryxell et al. (2009)
Southern red-backed voles *M. gapperi*	Algonquin Park, Ontario, Canada	48°30’ N, 78°40’ W	1952-1995	Annual[2]	Fryxell et al. (2009)
Southern red-backed voles *M. gapperi*	Powdermill, Pennsylvania, USA	40 °10’ N, 79°16’ W	1979-1999	October	Merritt et al. (2001)
Southern red-backed voles *M. gapperi*	Salisberry[5], Vermont, USA	43°56’ E, 73°5’ W	1979-1994	July	Brooks et al. (1998)
Western harvest	Lawrence, Kansas,	39°03’ N, 95°12’W	1973-2003	August	Brady and Slade

mice	USA				(2004)
Reithrodontomys megalotis					
White-footed mice *P. leucopus*	Holt Forest, Maine, USA	43.75 N, 69.77 W	1984-2005	August	Elias et al. (2004)
White-footed mice *P. leucopus*	Carter wood, Ohio, USA	41.38 N, 83.60 W	1973-1995	August	Lewellen and Vessey (1998)
White-footed mice *P. leucopus*	Lawrence, Kansas, USA	39°03' N, 95°12'W	1973-2003	August	Brady and Slade (2004)
White-footed mice *P. leucopus*	Mountain Lake, Virginia, USA	37°10' N, 80°3' W	1983-1993	October	Wolff (1996)
White-footed mice *P. leucopus*	Powdermill, Pennsylvania, USA	40 °10' N, 79°16' W	1979-1999	October	Merritt et al. (2001)
Wood mice *Apodemus sylvaticus*	Wytham, UK	51°42' N, 1°20' W	1949-1977	Summer	GDPP ID: 44
Woodland jumping mice *Napaeozapus insignis*	Algonquin Park, Ontario, Canada	48°30' N, 78°40' W	1952-1995	Annual[2]	Fryxell et al. (2009)
Yellow-necked mice *A. flavicollis*	Wytham, UK	51°42' N, 1°20' W	1967-1983	Summer	Flowerdew (1985)

Notes:

[1] The code is the time series code, recorded in March of 2011, of the Global Population Dynamics Database (GPDD; NERC Center for Population Biology, Imperial College 2011).

[2] Abundance indices were the mean or sum of multiple trappings over a year.

[3] The time series was annual numbers of total voles captured over 365 days by alcohol pit traps. The time series of annual total captures was positively correlated with the time series of numbers of voles captured during one-day live trapping in summer (Pearson correlation coefficient: 0.88, $P < 0.001$).

[4]There were two population time series of the species, which were abundance estimates of lower- and middle-slope trapping plots, respectively.

[5] Only one time series from the lower-slope trapping plot was used in the analysis.

Appendix 2: Reconstruction of phylogenetic tree of 35 mammal species

Method

One complete (or almost complete) cytochrome b sequence was retrieved from Genbank for each of the thirty-five species of mammals used in this study (mean length = 1136 bp; see the list of Genbank accession numbers below). Alignment was performed using the program CLUSTAL W (Thompson et al. 1994). Pairwise genetic distances were calculated with Kimura's two-parameter model (Kimura 1980), and phylogenetic reconstruction was performed using the Neighbor-Joining method and pairwise gap removal option with PHYLO_WIN (Galtier et al. 1996). Following supertree reconstruction for placental mammals (Liu et al. 2001), the Soricidae were used to root the tree (Fig. B1). Branch lengths represent the evolutionary distances between two consecutive nodes or taxa.

List of Genbank accession IDs of cytochrome b *gene sequences for the 35 mammal species used in the reconstruction of phylogenetic tree*

The following sequences were obtained from Genbank at the URL address: http://www.ncbi.nlm.nih.gov/nuccore/

Alces alces JF489131.1, *Apodemus flavicollis* AY158453.1, *Apodemus sylvaticus* AY158459.1, *Bison bison* AF036273.1, *Blarina brevicauda* FJ667511.1, *Capra ibex* AF217256.1, *Capreolus capreolus* Y14951.1, *Cervus elaphus* (elk) AF423198.1, *Cervus elaphus* (red deer) AY070226.1, *Cervus nippon* EF139156.1, *Dama dama* AJ000022.1, *Lemmus trimucronatus* AF119276.1, *Microtus arvalis* AY220789.1, *Microtus californicus* AF163891.1, *Microtus montanus* AF119280.1, *Microtus ochrogaster* DQ432006.1, *Microtus pennsylvanicus* AF119279.1, *Myodes gapperi* AY309435.1, *Myodes glareolus* FJ881479.1, *Myodes rufocanus* AY309417.1,

Myodes rutilus AF119274.1, *Napaeozapus insignis* AJ389535.1, *Odocoileus hemionus* AF091630.1, *Ovibos moschatus* U17862.1, *Ovis aries* DQ903227.1, *Ovis canadensis* HM222706.1, *Peromyscus leucopus* AY859474.1, *Peromyscus maniculatus* JF489123.1, *Rangifer tarandus* (Caribou) AY726730.1, *Rangifer tarandus* (Reindeer) AJ000029.1, *Reithrodontomys megalotis* AF108707.1, *Sigmodon hispidus* AF108702.1, *Sorex cinereus* AY014952.1, *Tamias striatus* AY292715.1, and *Tamiasciurus hudsonicus* FJ200743.1.

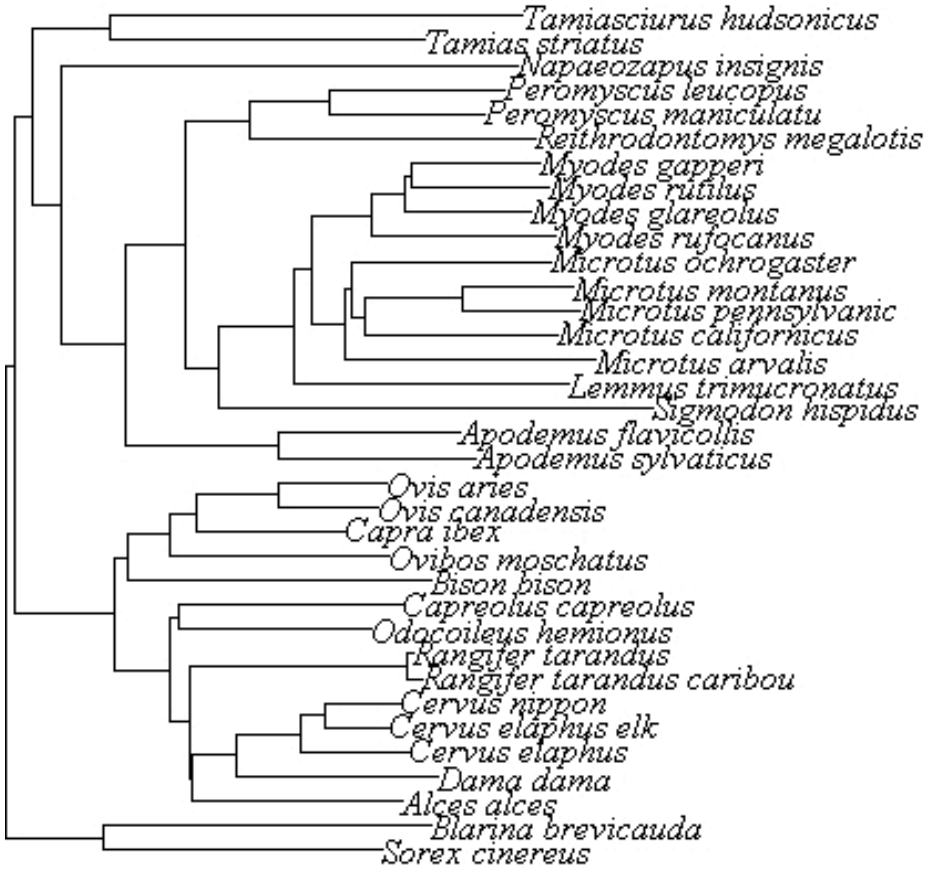

Figure A1. Phylogenetic tree of the 35 mammal species constructed with the cytochrome *b* gene sequence.

References

Brady, M. J. and Slade, N. A. 2004. Long-term dynamics of a grassland rodent community. — Journal of Mammalogy 85: 552-561.

Brooks, R. T. et al. 1998. Small-mammal abundance at three elevations on a mountain in central Vermont, USA: a sixteen-year record. — Forest Ecology and Management 110: 181-193.

Carbyn, L. N. et al. 1998. Trends in the distribution and abundance of bison in Wood Buffalo National Park. — Wildlife Society Bulletin 26: 463-470.

Elias, S. P. et al. 2004. Peromyscus leucopus abundance and acorn mast: Population fluctuation patterns over 20 years. — Journal of Mammalogy 85: 743-747.

Flowerdew, J. R. 1985. The population dynamics of wood mice and yellow-necked mice. — In: Flowerdew, J. R. et al. (eds), The ecology of woodland rodents bank voles and wood mice. Clarendon Press, pp. 315-338.

Galtier, N. et al. 1996. SEAVIEW and PHYLO_WIN: Two graphic tools for sequence alignment and molecular phylogeny. — Computer Applications in the Biosciences 12: 543-548.

Getz, L. L. et al. 2001. Twenty-five years of population fluctuations of *Microtus ochrogaster* and *M. pennsylvanicus* in three habitats in east-central Illinois. — Journal of Mammalogy 82: 22-34.

Getz, L. L. et al. 2004. Population dynamics of the northern short-tailed shrew, *Blarina brevicauda*: insights from a 25-year study. — Canadian Journal of Zoology 82: 1679-1686.

Hansen, T. F. et al. 1999. Multiannual vole cycles and population regulation during long winters: An analysis of seasonal density dependence. — American Naturalist 154: 129-139.

Kimura, M. 1980. A simple method for estimating evolutionary rates of base substitutions through comparative studies of nucleotide-sequences. — Journal of Molecular Evolution 16: 111-120.

Lewellen, R. H. and Vessey, S. H. 1998. The effect of density dependence and weather on population size of a polyvoltine species. — Ecological Monographs 68: 571-594.

Liu, F. G. R. et al. 2001. Molecular and morphological supertrees for eutherien (placental) mammals. — Science 291: 1786-1789.

Liu, W. et al. 2009. Effects of supplemental food on the social organization of Mongolian gerbils during the breeding season. — Journal of Zoology 278: 249-257.

Merritt, J. F. et al. 2001. Seasonal regulation in fluctuating small mammal populations: feedback structure and climate. — Oikos 94: 505-514.

Thompson, J. D. et al. 1994. CLUSTAL-W - Improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position-specific gap penalties and weight matrix choice. — Nucleic Acids Research 22: 4673-4680.

Wolff, J. O. 1996. Population fluctuations of mast-eating rodents are correlated with production of acorns. — Journal of Mammalogy 77: 850-856.