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Mammal monitoring in the Finnish bird survey schemes

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Introduction

Finland has a long tradition of both bird and mammal monitoring. Winter bird counts started in 1956/57 (Fraixedas et al. 2013, Lehikoinen 2016) and annual breeding bird surveys in 1975 (Lehikoinen & Väisänen 2023). The monitoring of larger common mammal species has been conducted through snow track surveys by hunters during winter along so-called wildlife triangle censuses (Pellikka et al. 2005). The wildlife triangles cover most part of Finland and provide population trends for common species especially for hunting management purposes (Helle et al. 2016). Small mammal populations have also been monitored in Finland for decades, using snap traps (Korpela et al. 2013). The fact that wildlife triangles are based on snow tracks and climate change has already decreased the snow cover, especially in South Finland (Deshpande et al. 2022), can make this method vulnerable if winters become snowless in the future. Wildlife triangles are also mainly targeted to forested landscapes and hence the mammals of farmlands and especially in and around urban areas have received less monitoring attention. To complement these existing national mammal schemes, a mammal survey option was added to the Finnish common bird monitoring schemes in 2010s. This happened first to the winter bird counts (since winter 2014/2015) and followed by line transect surveys (2018) and point counts (2019) of the breeding season survey, when database systems of these schemes were updated. The new mammal monitoring components in Finland's bird surveys were inspired by schemes elsewhere in the Europe, e.g. UK (see Haywood 2023) and Sweden (Svensk fågeltaxering 2023). This article will present the first population trends calculated from the mammal surveys conducted during Finnish winter bird counts.

Material and methods

Monitoring of wintering birds in Finland is based on freely chosen line transects (c. 10 km long) surveyed by volunteers. Because most Finns live in the southern half of the country, the survey sites are also biased toward south. The survey effort has been relatively constant for a long time and between 621 and 670 routes have been surveyed annually since 2014/2015 (hereafter 2015). There are three census seasons: 1–15 November (counted since 1975), 25 December to 7 January (since winter 1956–1957) and 21 February to 6 March (since 1967) (Lehikoinen 2016). The voluntary option also to count mammals in the surveys was added in winter 2014/2015 and since then c. 75 % of the routes have surveyed mammals on annual basis (min–max 58–92 %, with increasing tendency). The volunteers are required to tick a box if they have reported all the observed (seen or heard) mammal species during the survey. Volunteers have not been given any specific species list of mammals to observe, but all species have been covered, including small-sized species such as rodents and bats; especially small rodents have traditionally high population fluctuations (Hanski et al. 1991), which could be at least in theory picked up in the surveys. Among domestic mammal species, free-roaming Feral Cats *Felis catus* and semi-domestic reindeers *Rangifer tarandus* were also counted.

The population trends were calculated using rtrim-package (Bogaart et al. 2018) in R (version 4.0.5., R Core Team 2021), which is commonly used tool in bird monitoring work in Europe. The package calculates annual population indices and long-term trend using Poisson regression models. The number of individuals in a given route is the dependent variable, and year and route ID are the explanatory variables. The data from mid-winter (Dec-Jan) survey season only were used as this

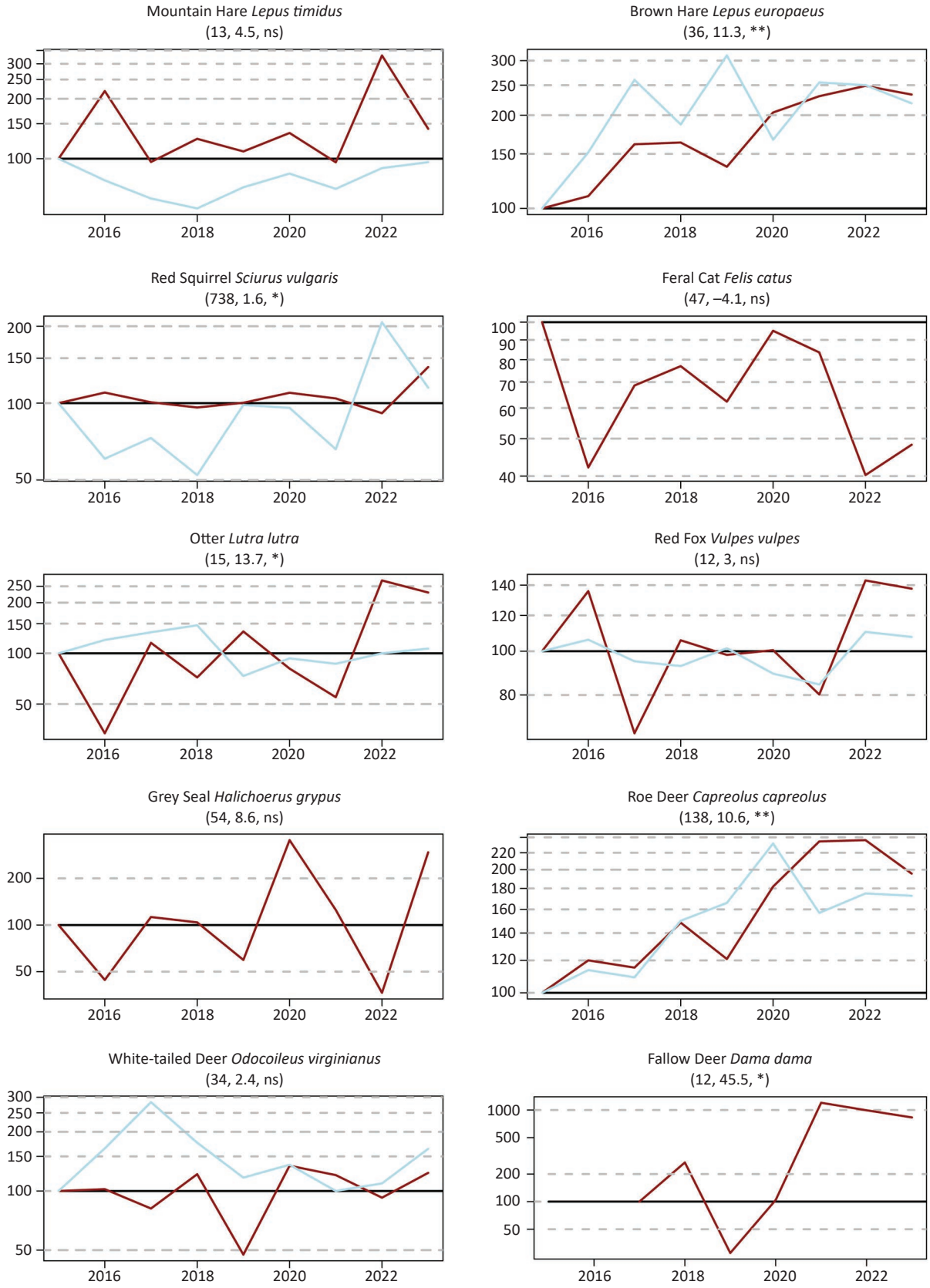

Figure 1. Population trends for ten mammal species in the Finnish winter bird counts (in red) during 2014/2015–2022/2023 and the corresponding abundance indices based on snow track surveys of wildlife triangles (in blue). For three species the wildlife triangles did not give decent data and the data is not shown (Feral Cat *Felis catus,* Grey Seal *Halichoerus grypus* and Fallow Deer *Dama dama*). The values in the brackets shows the annual sample sizes, annual population growth rate of the winter bird survey data and asterisk shows the significancy of the trend (ns = not significant, * = P < 0.05, ** = P < 0.01).

Table 1. List of species observed in the Finnish winter bird counts during 2014/2015–2022/2023. The number of individuals in all three seasons and during the mid-winter period only are given.

Species name	All seasons	Mid-winter
Sciurus vulgaris	20830	6641
Capreolus capreolus	3884	1245
Odocoileus virginianus	1069	307
Felis catus	984	425
Lepus europaeus	949	324
*Rangifer tarandus**	826	54
Halichoerus grypus	539	482
Lepus timidus	354	120
Dama dama	292	108
Vulpes vulpes	266	107
Alces alces	248	85
Lutra lutra	217	134
Oryctolagus cuniculus	59	12
Rattus norvegicus	54	37
Myodes glareolus	49	23
Apodemus flavicollis	42	15
Neovison vison	38	20
Mustela nivalis	33	10
Mustela erminea	27	12
Arvicolinae	20	9
Ondatra zibethicus	20	2
Nyctereutes procyonoides	11	5

Species name	All seasons	Mid-winter
Microtus agrestis	10	5
Sorex araneus	10	5
Soricidae	10	5
Martes martes	8	4
Arvicola amphibius	7	4
Mus musculus	6	3
Eptesicus nilssonii	5	2
Lynx lynx	5	1
Myotis nattereri	4	1
Myotis mystacinus/brandtii	3	0
Talpa europaea	2	0
Myotis daubentonii	2	1
Pteromys volans	2	1
Meles meles	1	0
Apodemus agrarius	1	0
Neomys fodiens	1	1
Erinaceus europaeus	1	0
Plecotus auritus	1	0
Myodes rufocanus	1	0
Pusa hispida	1	1
Microtus	1	1
Myodes rutilus	1	0

*includes both forest reindeer *Rangifer tarandus fennicus* (Central Finland) and semi-domestic reindeer (North Finland).

has had the best coverage among all three seasons. The trends were calculated for all species which had at least 100 individuals observed in nine study years. The annual abundance indices were plotted together with snow track survey results for those species which had decent annual abundance indices produced based on the the wildlife triangles (available at https://luonnonvaratieto.luke.fi/numerotieto/raportit?panel=lumijalkilaskennat). The original snow track results are tracks per 10 km route, which has been standardised over the species so that the every species get an abundance index set at 100 in 2015 (see Fig. 1).

Results

Altogether 41 mammal species were observed in the surveys, but most of them were observed in very small numbers (Table 1). Twenty-three species were observed at least ten times and 12 species had more than 100 individuals observed in all surveys altogether (Table 1).

The population trends were calculated for the ten most abundance species, which had more than 100 individuals observed during the mid-winter season surveys. Among these ten species six showed increasing population trends: Red Squirrel *Sciurus vulgaris*, Roe Deer *Capreolus capreolus*, Brown Hare *Lepus europaeus*, Grey Seal *Halichoerus grypus*, Fallow Deer *Dama dama* and Otter *Lutra lutra* (Fig. 1, Table 2).

Discussion

The data collected on the winter bird counts provides useful information on population trends of common mammal species. Nine years of monitoring already shows that some species have had significant population changes and several species have increased their population sizes, including nationally poorly monitored non-native Feral Cat and Fallow Deer. Coarse comparisons based on Fig. 1, suggest that the increasing trends seem to be consistent in both winter bird count and wildlife triangle data in Red Squirrel, Roe Deer

Table 2. Population trends of ten most abundant mammal species in the Finnish winter bird counts during 2014/2015–2022/2023. The annual population growth rates and their standard errors are given. The species with significant population changes are bolded.

Species	slope	se
Sciurus vulgaris	0.016	0.006
Capreolus capreolus	0.106	0.021
Odocoileus virginianus	0.024	0.041
Felis catus	–0.041	0.024
Lepus europaeus	0.113	0.027
Halichoerus grypus	0.086	0.042
Lepus timidus	0.045	0.055
*Dama dama**	0.455	0.159
Vulpes vulpes	0.030	0.041
Lutra lutra	0.137	0.049

*trend only from winter 2016/2017 onwards.

and Brown Hare. However, no comparable statistics were conducted due to lack of raw data from the wildlife triangle surveys.

Data on the habitat types is collected in the winter bird counts, which could also help to examine if the population changes differ between habitats. The coverage of the surveys are improving, especially in human settlement habitats. The collection of mammal data in the breeding bird surveys of the Finnish line transect and point count schemes has only been occurring for six and five years respectively, but will be able to complement the trend analyses in the coming years.

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References

Bogaart, P., van der Loo, M. & Pannekoek, J. 2018 rtrim: Trends and Indices for Monitoring Data. R package version 2.0.6. https://CRAN.R-project.org/package=rtrim

Deshpande, P., Lehikoinen, P., Thorogood, R. & Lehikoinen, A. 2022. Snow depth drives habitat preference of birds in built up, rural and forest habitats. Journal of Biogeography 49: 630–639.

Fraixedas, S., Lehikoinen, A., Lindén, A. 2015. Impact of climate and land-use change on wintering bird populations in Finland. Journal of Avian Biology 46: 63–72.

Hanski, I., Hansson, L. & Henttonen, H. 1991. Specialist predators, generalist predators and the microtine rodent cycle. Journal of Animal Ecology 60: 353–367.

Haywood, J. J. N. 2023. Mammal monitoring through bird surveys. Bird Census News 36 (1–2): 7–11.

Helle, P., Ikonen, K. & Kantola, A. 2016. Wildlife monitoring in Finland: online information for game administration, hunters, and the wider public. Canadian Journal of Forest Research 46: 1491–1496.

Korpela, K., Delgado, M., Henttonen, H., Korpimäki, E., Koskela, E., Ovaskainen, O., Pietiäinen, H., Sundell, J., Yoccoz, N. G. & Huitu, O. 2013. Nonlinear effects of climate on boreal rodent dynamics: mild winters do not negate high-amplitude cycles. Global Change Biology 19: 697–710.

Lehikoinen, A. 2016. Winter bird counts in Finland. Bird Census News 29 (1–2): 9–13.

Pellikka, J., Rita, H. & Lindén, H. 2005. Monitoring wildlife richness – Finnish applications based on wildlife triangle censuses. Annales Zoologici Fennici 42: 123–134.

R Core Team. 2021. *R: A language and Environment for Statistical Computing*. Vienna: R Foundation for Statistical Computing. Retrieved from www.R-project.org/

Svensk fågeltaxering 2023. https://www.fageltaxering.lu.se/resultat/trender/trender-daggdjur (accessed 25 September 2023).

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