

Monitoring mammals during the Dutch breeding bird monitoring program

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Since 1984 the Sovon Dutch Center for Field Ornithology has run a monitoring scheme for breeding birds (BMP) in the Netherlands (Van Turnhout et al. 2010). Since 1994 volunteers from Sovon were asked by the Dutch Mammal Society (ZV) to also collect data from those mammals that can easily be spotted in early daylight during their monitoring rounds for breeding birds: day-active mammals. This was the start of a cooperation between two NGO's in collecting data for two species groups in one monitoring scheme. Since 2009 mammal data from a second bird monitoring scheme coordinated by Sovon (Monitoring Urban Species, MUS), was incorporated in the monitoring scheme for mammals. The bird survey BMP consists of territory mapping. Both schemes include multiple visits to the study plot annually. The mammal data were selected by using the maximum number of animals

per species per year. Data include only living mammals, so roadkill or traces of mammal presence, like faeces or footprints are not included. Statistics Netherlands (CBS) analyses the data and calculates trends and indices using the specially developed R-package RTRIM (Bogaart et al. 2020). Trends and indices are calculated for the entire period of data collecting and for the last 12 years.

Over the years, the number of plots where data on mammals are collected grew significantly from about 200 in 1994 to over 1,600 in 2022 (Figure 1). This growth is the result of a growing number of volunteers involved in bird and nature monitoring, stimulated by an increasing awareness of threats to nature and continuous technical developments in collecting and processing data, to make data reporting easier for volunteers and to improve feedback. The general distribution of the

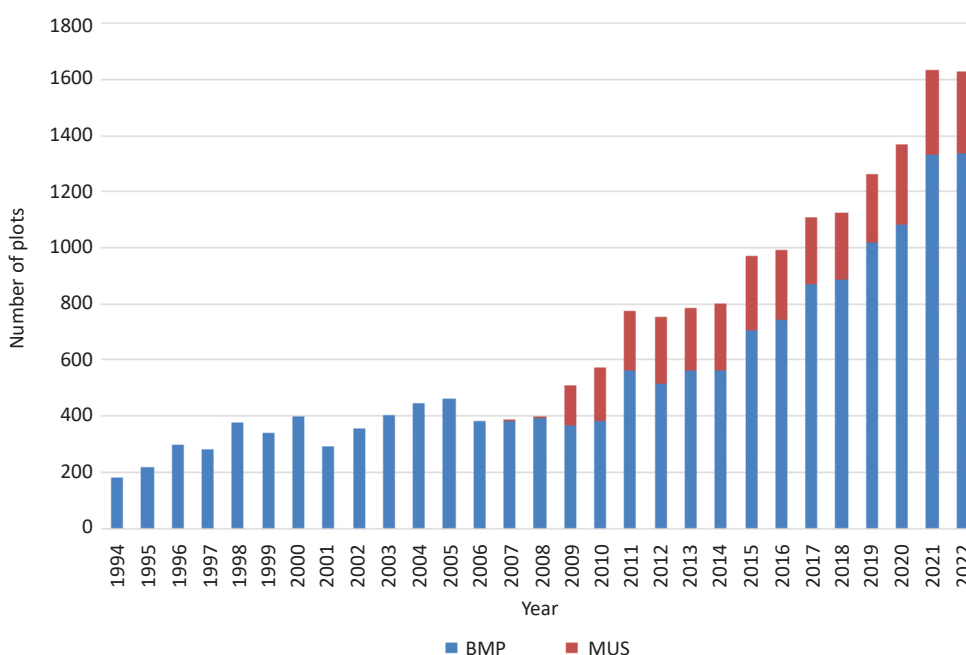


Figure 1. Annual number of plots where mammal data has been collected in the Netherlands. Two monitoring schemes on birds are incorporated in the monitoring scheme for mammals; BMP = Breeding Bird Survey and MUS = Monitoring Urban Species.

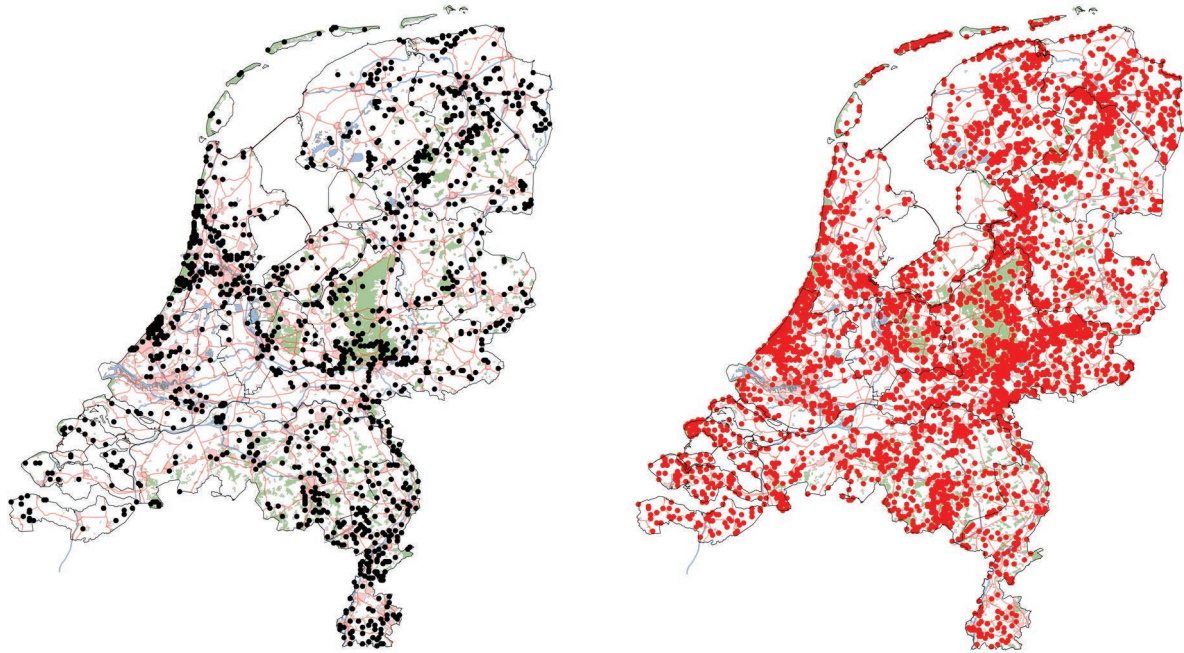


Figure 2. Distribution of plots where mammal data has been collected in the Netherlands during monitoring schemes for birds (2a left; black dots 1994–2010, 2b right: red dots 2011–2022).

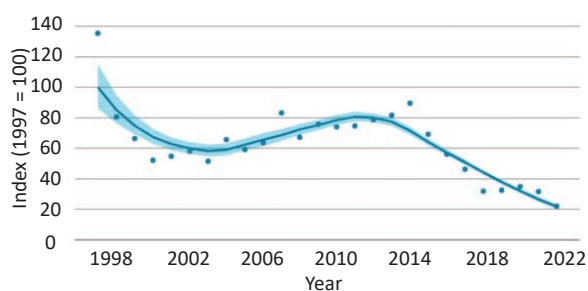
Table 1. An overview of population trends and other technical data on seven mammal species in the Netherlands until 2022.

	Starting year	Trend entire period	Standard error	Trend category	Number of plots	Trend last 12 years	Standard error	Trend category	Number of plots
European hare <i>Lepus europaeus</i>	1997	0.989	0.002	Moderate decrease (p<0.01)	3366	1.008	0.003	Moderate increase (p<0.05)	2187
Rabbit <i>Oryctolagus cuniculus</i>	1997	0.968	0.004	Moderate decrease (p<0.01)	1884	0.884	0.005	Strong decrease (p<0.01)	896
Red Squirrel <i>Sciurus vulgaris</i>	1996	0.992	0.004	Moderate decrease (p<0.05)	1044	1.028	0.008	Moderate increase (p<0.05)	548
Red Fox <i>Vulpes vulpes</i>	1994	0.990	0.005	Moderate decrease (p<0.05)	1386	0.991	0.008	Stable	730
Roe Deer <i>Capreolus capreolus</i>	1994	1.007	0.002	Moderate increase (p<0.05)	2711	1.010	0.003	Moderate increase (p<0.05)	1728
Hedgehog <i>Erinaceus europaeus</i>	1994	0.961	0.007	Moderate decrease (p<0.01)	459	1.004	0.017	Stable	172
Muskrat <i>Ondatra zibethicus</i>	1995	0.915	0.008	Strong decrease (p<0.01)	273	0.881	0.020	Strong decrease (p<0.05)	61

plots in the Netherlands is nowadays almost ideal and is shown in Figure 2.

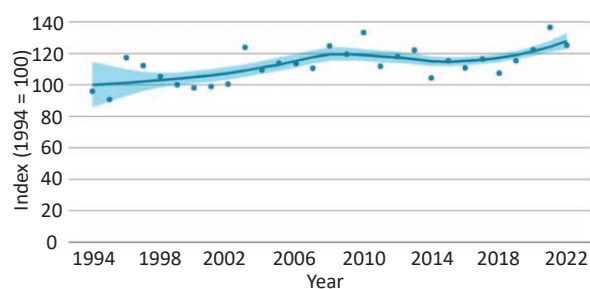
At the moment national trends can be generated for seven mammal species. An overview of these species with trends until 2022, trends over the last 12 years (2011–2022) and other information is given in Table 1. Five of these species have a

trend in the category moderate decrease for the entire period of data collecting (European Hare *Lepus europaeus*, Rabbit *Oryctolagus cuniculus*, Red Squirrel *Sciurus vulgaris*, Red Fox *Vulpes vulpes* and European Hedgehog *Erinaceus europaeus*). While four of those species have stable or increasing trends for the last 12 years (Euro-



Bron: NEM (Zoogdierverseniging, CBS), 2023

Figure 3. Indices (spots) and trendline of the population development of Rabbit *Oryctolagus cuniculus* in the Netherlands (source: ZV/CBS). The blue band represents the 95% confident intervals of the trend.



Bron: NEM (Zoogdierverseniging, CBS), 2023

Figure 4. Indices (spots) and trendline of the population development of Roe Deer *Capreolus capreolus* in the Netherlands (source: ZV/CBS). The blue band represents the 95% confident intervals of the trend.

pean Hare, Red Squirrel, Red Fox and European Hedgehog), the downfall of the Rabbit population has been even stronger for the last 12 years (Figure 3). This is due to the Rabbit Haemorrhagic Disease virus (RHD). The non-native Muskrat *Ondatra zibethicus* shows a strong decrease in population numbers because of the culling activities by a few hundred professional trappers to protect Dutch dikes and water banks. The only species that shows an increase in numbers for both periods is Roe Deer *Capreolus capreolus* (Figure 4).

In addition to national trends and indices, for some species there are also trends calculated on a more detailed geographic level, such as for provinces or natural versus agricultural areas. The extent to which this results in reliable and plausible trends varies per species and is mainly

influenced by number of plots and counts and the representativity of the plots for the distribution of the species involved. For other mammal species, like European Beaver *Castor fiber*, European Badger *Meles meles* and some ungulates, the number of plots and consistency of counts is too low to calculate robust trends, but these counts are still valuable because they can be used to determine the distribution of species.

The results of this monitoring scheme are used to compile the national Red List of threatened mammals. Besides that, trends are used for the national Living Planet Index and determine nature quality in the agricultural landscape. The results are also used for hunting policy and fauna management plans in some provinces.

We thank Sovon and its volunteers for making this mammal monitoring scheme possible.

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